Index of /ds/2N/

Name	Last modified	Size	Description
Parent Directory			
2N3390.pdf	22-Dec-99 00:00	25K	
2N3391.pdf	22-Dec-99 00:00	25K	
2N3391A.pdf	22-Dec-99 00:00	25K	
2N3392.pdf	22-Dec-99 00:00	25K	
2N3393.pdf	22-Dec-99 00:00	25K	
2N3415.pdf	22-Dec-99 00:00	22K	
2N3416.pdf	22-Dec-99 00:00	24K	
2N3417.pdf	22-Dec-99 00:00	24K	
2N3663.pdf	29-Jan-00 00:00	29K	
2N3702.pdf	22-Dec-99 00:00	23K	
2N3703.pdf	22-Dec-99 00:00	22K	
2N3704.pdf	22-Dec-99 00:00	23K	
2N3859A.pdf	22-Dec-99 00:00	22K	
2N3903.pdf	22-Dec-99 00:00	34K	
2N3904.pdf	11-Feb-00 00:00	64K	
2N3905.pdf	22-Dec-99 00:00	26K	
2N3906.pdf	22-Dec-99 00:00	49K	
2N4123.pdf	22-Dec-99 00:00	32K	
2N4124.pdf	22-Dec-99 00:00	93K	
2N4125.pdf	22-Dec-99 00:00	23K	
2N4126.pdf	22-Dec-99 00:00	94K	
2N4400.pdf	22-Dec-99 00:00	42K	
2N4401.pdf	22-Dec-99 00:00	29K	

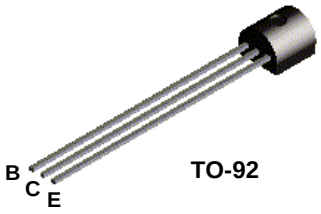
2N4402.pdf	22-Dec-99 00:00	26K
2N4403.pdf	22-Dec-99 00:00	42K
2N4410.pdf	22-Dec-99 00:00	24K
2N4953.pdf	22-Dec-99 00:00	24K
2N5086.pdf	22-Dec-99 00:00	58K
2N5087.pdf	22-Dec-99 00:00	58K
2N5088.pdf	22-Dec-99 00:00	211K
2N5089.pdf	22-Dec-99 00:00	211K
2N5172.pdf	22-Dec-99 00:00	23K
2N5210.pdf	22-Dec-99 00:00	77K
2N5306.pdf	22-Dec-99 00:00	23K
2N5307.pdf	22-Dec-99 00:00	23K
2N5308.pdf	22-Dec-99 00:00	23K
2N5400.pdf	22-Dec-99 00:00	24K
2N5401.pdf	22-Dec-99 00:00	109K
2N5457.pdf	22-Dec-99 00:00	105K
2N5458.pdf	22-Dec-99 00:00	105K
2N5459.pdf	22-Dec-99 00:00	105K
2N5460.pdf	01-Feb-00 00:00	522K
2N5461.pdf	01-Feb-00 00:00	522K
2N5462.pdf	01-Feb-00 00:00	522K
2N5484.pdf	22-Dec-99 00:00	73K
2N5485.pdf	22-Dec-99 00:00	73K
2N5486.pdf	22-Dec-99 00:00	73K
2N5550.pdf	22-Dec-99 00:00	28K
2N5551.pdf	22-Dec-99 00:00	110K
2N5769.pdf	22-Dec-99 00:00	26K

2N5770.pdf	22-Dec-99 00:00	25K
2N5771.pdf	22-Dec-99 00:00	126K
2N5830.pdf	22-Dec-99 00:00	24K
2N5961.pdf	22-Dec-99 00:00	25K
2N5962.pdf	22-Dec-99 00:00	41K
2N6076.pdf	22-Dec-99 00:00	18K
2N6426.pdf	22-Dec-99 00:00	25K
2N6427.pdf	22-Dec-99 00:00	93K
2N6428.pdf	06-Dec-99 00:00	30K
2N6428A.pdf	06-Dec-99 00:00	30K
2N6428_6428A.pdf	17-Apr-99 00:00	32K
2N6515.pdf	22-Dec-99 00:00	53K
2N6516.pdf	22-Dec-99 00:00	31K
2N6517.pdf	22-Dec-99 00:00	31K
2N6518.pdf	22-Dec-99 00:00	32K
2N6519.pdf	22-Dec-99 00:00	32K
2N6520.pdf	22-Dec-99 00:00	90K
2N7000.pdf	05-Feb-00 00:00	538K
2N7002.pdf	05-Feb-00 00:00	538K
2N7052.pdf	22-Dec-99 00:00	42K
2N7053.pdf	22-Dec-99 00:00	42K

FAIRCHILD SEMICONDUCTOR TM

Discrete POWER & Signal Technologies

2N3390
2N3391
2N3391A
2N3392
2N3393



TO-92

NPN General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 300 mA. Sourced from Process 10. See PN100A for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	25	V
V_{CBO}	Collector-Base Voltage	25	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	500	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N3390 / 3391/A / 3392 / 3393	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

NPN General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

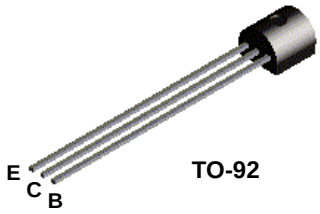
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 10 mA, I_B = 0	25		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 μA, I_E = 0	25		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 μA, I_C = 0	5.0		V
I_{CBO}	Collector-Cutoff Current	V_{CB} = 18 V, I_E = 0		100	nA
I_{EBO}	Emitter-Cutoff Current	V_{EB} = 5.0 V, I_C = 0		100	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 4.5 V, I_C = 2.0 mA			
		2N3390	400	800	
		2N3391/A	250	500	
		2N3392	150	300	
		2N3393	90	180	
SMALL SIGNAL CHARACTERISTICS					
C_{ob}	Output Capacitance	V_{CB} = 10 V, f = 1.0 MHz	2.0	10	pF
h_{fe}	Small-Signal Current Gain	I_C = 2.0 mA, V_{CE} = 4.5 V, f = 1.0 kHz			
		2N3390	400	1250	
		2N3391/A	250	800	
		2N3392	150	500	
		2N3393	90	400	
NF	Noise Figure	V_{CE} = 4.5 V, I_C = 100 μA, R_G = 500 Ω, **2N3391A only** B_W = 15.7 kHz		5.0	dB

*Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%

FAIRCHILD SEMICONDUCTOR TM

Discrete POWER & Signal Technologies

2N3415



TO-92

NPN General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 300 mA. Sourced from Process 10. See PN100A for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	25	V
V_{CBO}	Collector-Base Voltage	25	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	500	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N3415	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

NPN General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

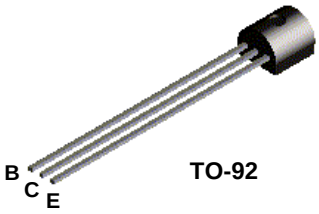
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 10 mA, I_B = 0	25		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 µA, I_E = 0	25		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	5.0		V
I_{CBO}	Collector-Cutoff Current	V_{CB} = 25 V, I_E = 0 V_{CB} = 25 V, I_E = 0, T_A = 100°C		0.1 15	µA µA
I_{EBO}	Emitter-Cutoff Current	V_{EB} = 5.0 V, I_C = 0		0.1	µA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 4.5 V, I_C = 2.0 mA	180	540	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 50 mA, I_B = 3.0 mA		0.3	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 50 mA, I_B = 3.0 mA	0.6	1.3	V
SMALL SIGNAL CHARACTERISTICS					
h_{fe}	Small-Signal Current Gain	I_C = 2.0 mA, V_{CE} = 4.5 V, f = 1.0 kHz	180		

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD SEMICONDUCTOR TM

Discrete POWER & Signal Technologies

2N3416
2N3417



TO-92

NPN General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 300 mA. Sourced from Process 10. See PN100A for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	50	V
V_{CBO}	Collector-Base Voltage	50	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	500	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N3416 / 2N3417	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

NPN General Purpose Amplifier
(continued)

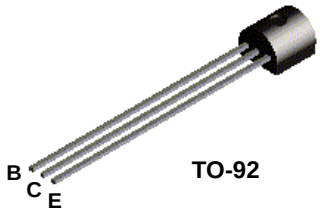
Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 10 mA, I_B = 0	50		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 μA, I_E = 0	50		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 μA, I_C = 0	5.0		V
I_{CBO}	Collector-Cutoff Current	V_{CB} = 25 V, I_E = 0 V_{CB} = 18 V, I_E = 0, T_A = 100°C		100 15	nA μA
I_{EBO}	Emitter-Cutoff Current	V_{EB} = 5.0 V, I_C = 0		100	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 4.5 V, I_C = 2.0 mA **2N3416** **2N3417**	 75 180	 225 540	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 50 mA, I_B = 3.0 mA		0.3	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 50 mA, I_B = 3.0 mA	0.6	1.3	V
SMALL SIGNAL CHARACTERISTICS					
h_{fe}	Small-Signal Current Gain	I_C = 2.0 mA, V_{CE} = 4.5 V, f = 1.0 kHz **2N3416** **2N3417**	 75 180		

*Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%

FAIRCHILD
SEMICONDUCTOR TM

2N3663



TO-92

NPN RF Transistor

This device is designed for use as RF amplifiers, oscillators and multipliers with collector currents in the 1.0 mA to 30 mA range. Sourced from Process 43. See PN918 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	12	V
V_{CBO}	Collector-Base Voltage	30	V
V_{EBO}	Emitter-Base Voltage	3.0	V
I_C	Collector Current - Continuous	50	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N3663	
P_D	Total Device Dissipation Derate above 25°C	350 2.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	125	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	357	°C/W

© 1997 Fairchild Semiconductor Corporation

Electrical Characteristics

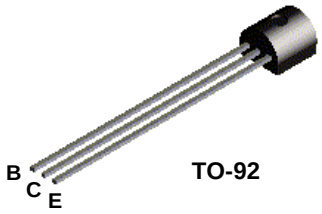
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 1.0 mA, I_B = 0	12		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 100 µA, I_E = 0	30		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 100 µA, I_C = 0	3.0		V
I_{CBO}	Collector-Cutoff Current	V_{CB} = 15 V, I_E = 0		0.5	µA
I_{EBO}	Emitter-Cutoff Current	V_{EB} = 2.0 V, I_C = 0		0.5	µA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 10 V, I_C = 8.0 mA	20		
SMALL SIGNAL CHARACTERISTICS					
f_T	Current Gain - Bandwidth Product	I_C = 5.0 mA, V_{CE} = 10 V, f = 100 MHz	700	2100	MHz
C_{ob}	Output Capacitance	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz	0.8	1.7	pF
$rb'C_C$	Collector Base Time Constant	I_C = 8.0 mA, V_{CE} = 10 V, f = 79.8 MHz		80	pS
FUNCTIONAL TEST					
NF	Noise Figure	I_C = 1.0 mA, V_{CE} = 6.0 V, f = 60 MHz, Rg = 400 Ω		6.5	dB
G_{pe}	Amplifier Power Gain	I_C = 6.0 mA, V_{CE} = 12 V, f = 200 MHz	1.5		dB

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD
SEMICONDUCTOR TM

2N3702



TO-92

PNP General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 300 mA. Sourced from Process 68. See PN200 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	25	V
V_{CBO}	Collector-Base Voltage	40	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	500	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N3702	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

PNP General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 100μA, I_B = 0	25		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 mA, I_E = 0	40		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 100 μA, I_C = 0	5.0		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 20 V, I_E = 0		100	nA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 3.0 V, I_C = 0		100	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 5.0 V, I_C = 50 mA	60	300	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 50 mA, I_B = 5.0 mA		0.25	V
$V_{BE(on)}$	Base-Emitter On Voltage	V_{CE} = 5.0 V, I_C = 50 mA	0.6	1.0	V
SMALL SIGNAL CHARACTERISTICS					
C_{ob}	Output Capacitance	V_{CB} = 10 V, f = 1.0 MHz		12	pF
f_T	Current Gain - Bandwidth Product	I_C = 50 mA, V_{CE} = 5.0 V	100		MHz

*Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™
CoolFET™
CROSSVOLT™
E^2CMOS^{TM}
FACT™
FACT Quiet Series™
FAST®
FASTr™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
POP™
PowerTrench™
QS™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
TinyLogic™

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.
As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

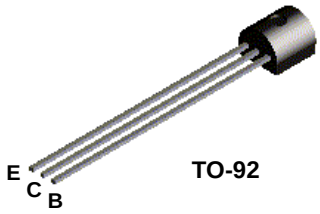
Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

FAIRCHILD SEMICONDUCTOR TM

Discrete POWER & Signal Technologies

2N3703



TO-92

PNP General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 300 mA. Sourced from Process 68. See PN200 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	30	V
V_{CBO}	Collector-Base Voltage	50	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	500	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N3703	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

PNP General Purpose Amplifier
(continued)

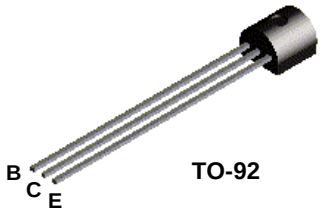
Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 10 mA, I_B = 0	30		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 100 µA, I_E = 0	50		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 100 µA, I_C = 0	5.0		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 20 V, I_E = 0		100	nA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 3.0 V, I_C = 0		100	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 5.0 V, I_C = 50 mA	30	150	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 50 mA, I_B = 5.0 mA		0.25	V
$V_{BE(on)}$	Base-Emitter On Voltage	V_{CE} = 5.0 V, I_C = 50 mA	0.6	1.0	V
SMALL SIGNAL CHARACTERISTICS					
C_{ob}	Output Capacitance	V_{CB} = 10 V, f = 1.0 MHz		12	pF
f_T	Current Gain - Bandwidth Product	I_C = 50 mA, V_{CE} = 5.0 V, f = 20 MHz	100		MHz

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD
SEMICONDUCTOR TM

2N3704



TO-92

NPN General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 300 mA. Sourced from Process 10. See PN100 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	30	V
V_{CBO}	Collector-Base Voltage	50	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	500	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N3704	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

NPN General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 10 mA, I_B = 0	30		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 100 µA, I_E = 0	50		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 100 µA, I_C = 0	5.0		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 20 V, I_E = 0		100	nA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 3.0 V, I_C = 0		100	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 2.0 V, I_C = 50 mA	100	300	
$V_{BE(on)}$	Base-Emitter ON Voltage	V_{CE} = 2.0 V, I_C = 100 mA	0.5	1.0	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 100 mA, I_B = 5.0 mA		0.6	V
SMALL SIGNAL CHARACTERISTICS					
C_{ob}	Output Capacitance	V_{CB} = 10 V, f = 1.0 MHz		12	pF
f_T	Current Gain - Bandwidth Product	I_C = 50 mA, V_{CE} = 2.0 V,	100		MHz

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™
CoolFET™
CROSSVOLT™
E^2CMOS^{TM}
FACT™
FACT Quiet Series™
FAST®
FASTr™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
POP™
PowerTrench™
QS™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
TinyLogic™

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.
As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

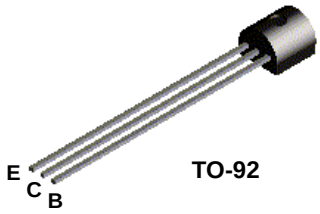
Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

FAIRCHILD SEMICONDUCTOR TM

Discrete POWER & Signal Technologies

2N3859A



TO-92

NPN General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 300 mA. Sourced from Process 10. See PN100 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	60	V
V_{CBO}	Collector-Base Voltage	60	V
V_{EBO}	Emitter-Base Voltage	6.0	V
I_C	Collector Current - Continuous	500	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N3859A	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

NPN General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

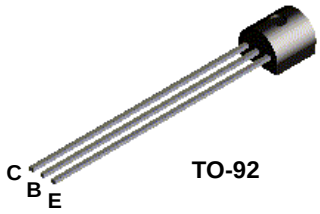
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 1.0 mA, I_B = 0	60		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 100 µA, I_E = 0	60		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 100 µA, I_C = 0	6.0		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 18 V, I_E = 0		0.5	µA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 4.0 V, I_C = 0		0.5	µA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 1.0 V, I_C = 1.0 mA V_{CE} = 1.0 V, I_C = 10 mA	75 100	 200	
SMALL SIGNAL CHARACTERISTICS					
C_{ob}	Output Capacitance	V_{CB} = 10 V, f = 1.0 MHz		4	pF
f_T	Current Gain - Bandwidth Product	I_C = 2.0 mA, V_{CE} = 10 V	90	250	MHz
$rb'C_c$	Collector - Base Time Constant	V_{CE} = 10 V, I_C = 2.0 mA, f = 31.9 MHz		150	pS

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD SEMICONDUCTOR™

Discrete POWER & Signal Technologies

2N3903



TO-92

NPN General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 100 mA. Sourced from Process 23. See 2N3904 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	40	V
V_{CBO}	Collector-Base Voltage	60	V
V_{EBO}	Emitter-Base Voltage	6.0	V
I_C	Collector Current - Continuous	200	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N3903	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

NPN General Purpose Amplifier
(continued)

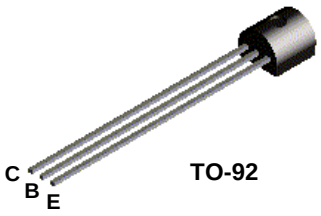
Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 1.0 mA, I_B = 0	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 µA, I_E = 0	60		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	6.0		V
I_{CEX}	Collector Cutoff Current	V_{CE} = 30 V, V_{OB} = 3.0 V		50	nA
I_{BL}	Base Cutoff Current	V_{CE} = 30 V, V_{OB} = 3.0 V		50	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 1.0 V, I_C = 0.1 mA V_{CE} = 1.0 V, I_C = 1.0 mA V_{CE} = 1.0 V, I_C = 10 mA V_{CE} = 1.0 V, I_C = 50 mA V_{CE} = 1.0 V, I_C = 100 mA	20 35 50 30 15	 150 	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA		0.2 0.3	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA	0.65	0.85 0.95	V V
SMALL SIGNAL CHARACTERISTICS					
C_{ob}	Output Capacitance	V_{CB} = 5.0 V, f = 100 kHz		4.0	pF
C_{ib}	Input Capacitance	V_{EB} = 0.5 V, f = 100 kHz		8.0	pF
h_{fe}	Small-Signal Current Gain	I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	2.5		
h_{fe}	Small-Signal Current Gain	V_{CE} = 10 V, I_C = 1.0 mA	50	200	
h_{ie}	Input Impedance	f = 1.0 kHz	1.0	8.0	kΩ
h_{re}	Voltage Feedback Ratio		0.1	5.0	x 10^{-4}
h_{oe}	Output Admittance		1.0	40	µmhos
NF	Noise Figure	V_{CE} = 5.0 V, I_C = 100 µA, R_S = 1.0 kΩ, B_W = 10 Hz to 15.7 kHz		6.0	dB
SWITCHING CHARACTERISTICS					
t_d	Delay Time	V_{CC} = 3.0 V, I_C = 10 mA,		35	ns
t_r	Rise Time	I_{B1} = 1.0 mA , $V_{ob\ (off)}$ = 0.5 V		35	ns
t_s	Storage Time	V_{CC} = 3.0 V, I_C = 10 mA		175	ns
t_f	Fall Time	I_{B1} = I_{B2} = 1.0 mA		50	ns

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

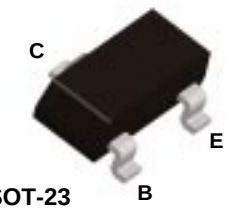
FAIRCHILD
SEMICONDUCTOR TM

2N3904



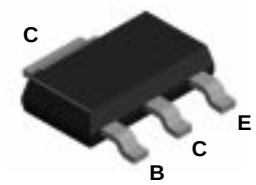
TO-92

MMBT3904



SOT-23
Mark: 1A

PZT3904



SOT-223

NPN General Purpose Amplifier

This device is designed as a general purpose amplifier and switch. The useful dynamic range extends to 100 mA as a switch and to 100 MHz as an amplifier. Sourced from Process 23.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	40	V
V_{CBO}	Collector-Base Voltage	60	V
V_{EBO}	Emitter-Base Voltage	6.0	V
I_C	Collector Current - Continuous	200	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

© 1997 Fairchild Semiconductor Corporation

NPN General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	I_C = 1.0 mA, I_B = 0	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 µA, I_E = 0	60		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	6.0		V
I_{BL}	Base Cutoff Current	V_{CE} = 30 V, V_{EB} = 0		50	nA
I_{CEX}	Collector Cutoff Current	V_{CE} = 30 V, V_{EB} = 0		50	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	I_C = 0.1 mA, V_{CE} = 1.0 V I_C = 1.0 mA, V_{CE} = 1.0 V I_C = 10 mA, V_{CE} = 1.0 V I_C = 50 mA, V_{CE} = 1.0 V I_C = 100 mA, V_{CE} = 1.0 V	40 70 100 60 30	 300 	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA		0.2 0.3	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA	0.65	0.85 0.95	V V
SMALL SIGNAL CHARACTERISTICS					
f_T	Current Gain - Bandwidth Product	I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	300		MHz
C_{obo}	Output Capacitance	V_{CB} = 5.0 V, I_E = 0, f = 1.0 MHz		4.0	pF
C_{ibo}	Input Capacitance	V_{EB} = 0.5 V, I_C = 0, f = 1.0 MHz		8.0	pF
NF	Noise Figure (except MMPQ3904)	I_C = 100 µA, V_{CE} = 5.0 V, R_S =1.0kΩ, f=10 Hz to 15.7 kHz		5.0	dB
SWITCHING CHARACTERISTICS (except MMPQ3904)					
t_d	Delay Time	V_{CC} = 3.0 V, V_{BE} = 0.5 V, I_C = 10 mA, I_{B1} = 1.0 mA		35	ns
t_r	Rise Time			35	ns
t_s	Storage Time	V_{CC} = 3.0 V, I_C = 10mA I_{B1} = I_{B2} = 1.0 mA		200	ns
t_f	Fall Time			50	ns

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

Spice Model

NPN (Is=6.734f Xti=3 Eg=1.11 Vaf=74.03 Bf=416.4 Ne=1.259 Ise=6.734 Ikf=66.78m Xtb=1.5 Br=.7371 Nc=2 Isc=0 Ikr=0 Rc=1 Cjc=3.638p Mjc=.3085 Vjc=.75 Fc=.5 Cje=4.493p Mje=.2593 Vje=.75 Tr=239.5n Tf=301.2p Itf=.4 Vtf=4 Xtf=2 Rb=10)

NPN General Purpose Amplifier
(continued)

Thermal Characteristics
TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N3904	*PZT3904	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	1,000 8.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	125	°C/W

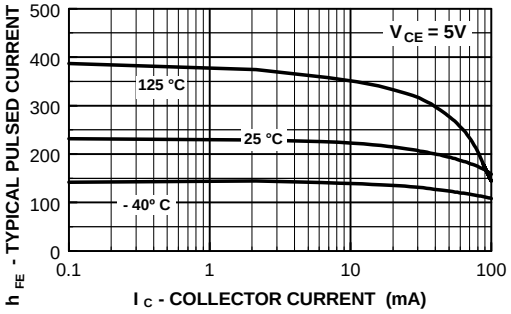
Symbol	Characteristic	Max		Units
		**MMBT3904	MMPQ3904	
P_D	Total Device Dissipation Derate above 25°C	350 2.8	1,000 8.0	mW mW/°C
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient Effective 4 Die Each Die	357	 125 240	°C/W °C/W °C/W

*Device mounted on FR-4 PCB 36 mm X 18 mm X 1.5 mm; mounting pad for the collector lead min. 6 cm^2.

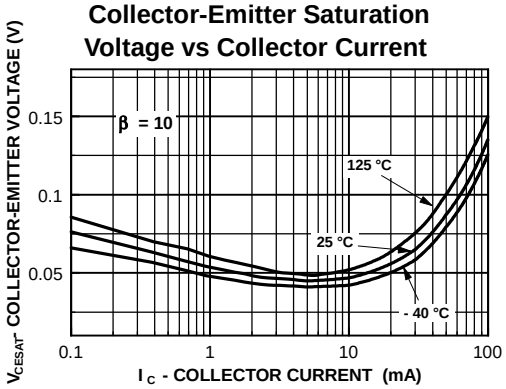
**Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

Typical Characteristics

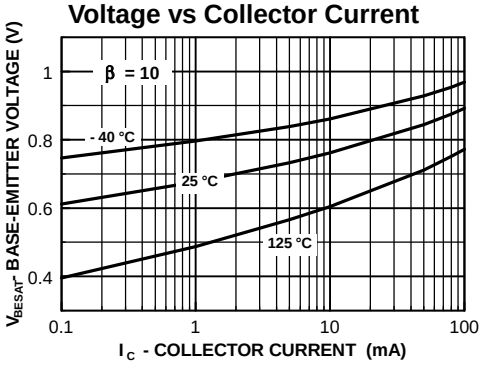
Typical Pulsed Current Gain vs Collector Current



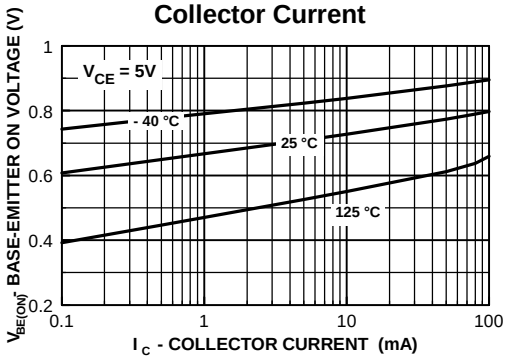
Collector-Emitter Saturation Voltage vs Collector Current



Base-Emitter Saturation Voltage vs Collector Current

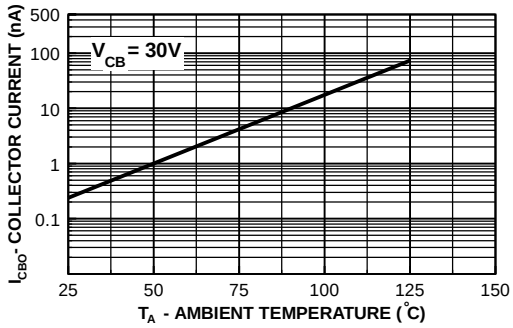


Base-Emitter ON Voltage vs Collector Current

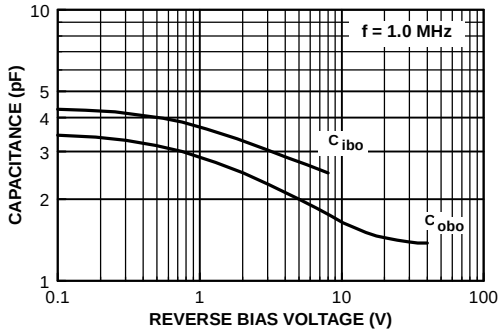


Typical Characteristics (continued)

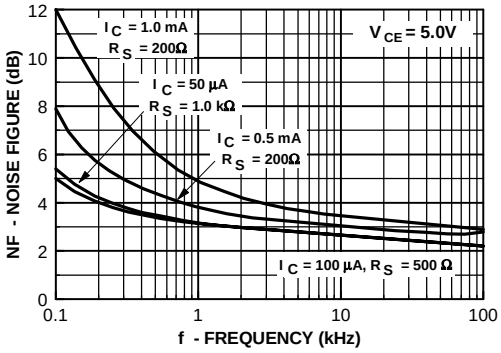
Collector-Cutoff Current vs Ambient Temperature



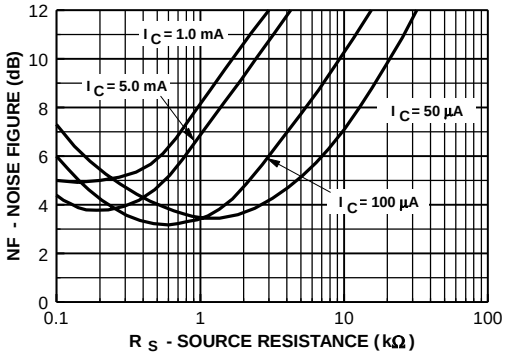
Capacitance vs Reverse Bias Voltage



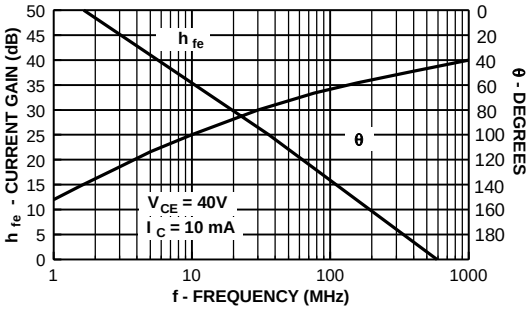
Noise Figure vs Frequency



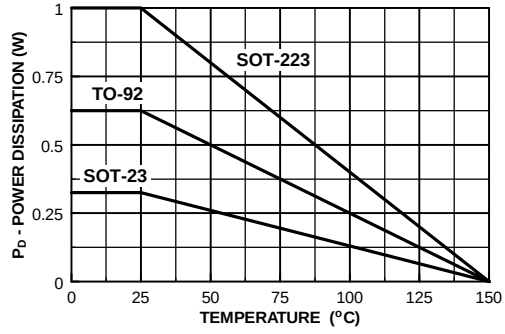
Noise Figure vs Source Resistance



Current Gain and Phase Angle vs Frequency

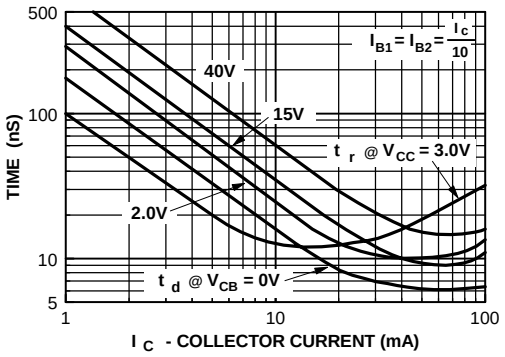


Power Dissipation vs Ambient Temperature

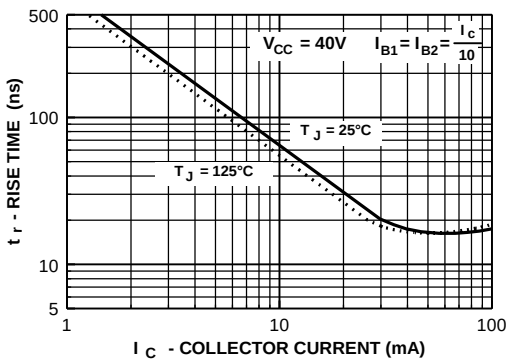


Typical Characteristics (continued)

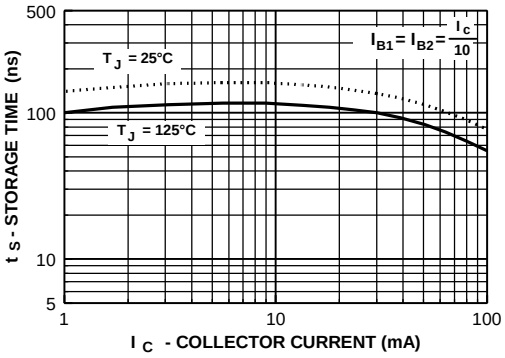
Turn-On Time vs Collector Current



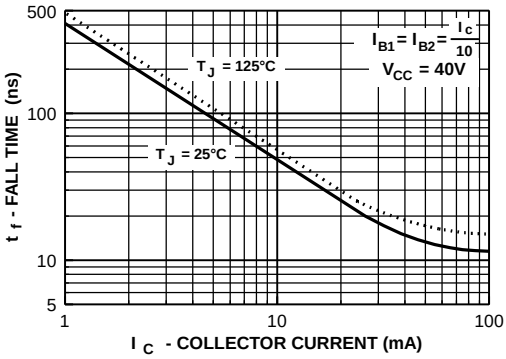
Rise Time vs Collector Current



Storage Time vs Collector Current



Fall Time vs Collector Current



Test Circuits

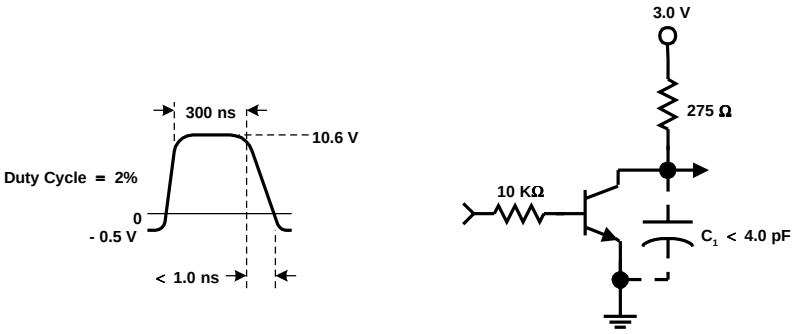


FIGURE 1: Delay and Rise Time Equivalent Test Circuit

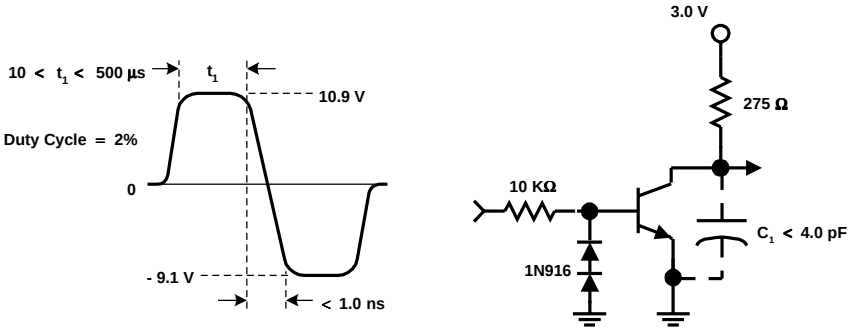


FIGURE 2: Storage and Fall Time Equivalent Test Circuit

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™
CoolFET™
CROSSVOLT™
E^2CMOS^{TM}
FACT™
FACT Quiet Series™
FAST®
FASTr™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
POP™
PowerTrench™
QS™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
TinyLogic™

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.
As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

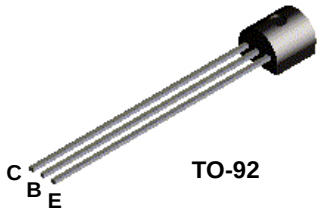
Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

FAIRCHILD SEMICONDUCTOR TM

Discrete POWER & Signal Technologies

2N3905



TO-92

PNP General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 100 mA. Sourced from Process 66. See 2N3906 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	40	V
V_{CBO}	Collector-Base Voltage	40	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	200	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N3905	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

PNP General Purpose Amplifier
(continued)

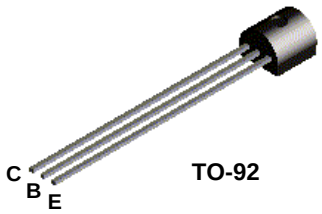
Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 1.0 mA, I_B = 0	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 µA, I_E = 0	40		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	5.0		V
I_{CEX}	Collector Cutoff Current	V_{CE} = 30 V, V_{OB} = 3.0 V		50	nA
I_{BL}	Base Cutoff Current	V_{CE} = 30 V, V_{OB} = 3.0 V		50	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 1.0 V, I_C = 0.1 mA V_{CE} = 1.0 V, I_C = 1.0 mA V_{CE} = 1.0 V, I_C = 10 mA V_{CE} = 1.0 V, I_C = 50 mA V_{CE} = 1.0 V, I_C = 100 mA	30 40 50 30 15	 150 	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA		0.25 0.40	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA	0.65	0.85 0.95	V V
SMALL SIGNAL CHARACTERISTICS					
C_{ob}	Output Capacitance	V_{CB} = 5.0 V, f = 1.0 MHz		4.5	pF
C_{ib}	Input Capacitance	V_{EB} = 0.5 V, f = 1.0 MHz		10	pF
h_{fe}	Small-Signal Current Gain	I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	2.0		
h_{fe}	Small-Signal Current Gain	I_C = 1.0 mA, V_{CE} =10 V, f = 1.0 KHz	50	200	
h_{re}	Voltage Feedback Ratio		0.1	5.0	x10 $^{-4}$
h_{ie}	Input Impedance		0.5	8.0	kΩ
h_{oe}	Output Impedance		1.0	40	µmhos
NF	Noise Figure	V_{CE} = 5.0 V, I_C = 100 µA, R_S = 1.0 kΩ, B_W = 10 Hz to 15.7 KHz		5.0	dB
SWITCHING CHARACTERISTICS					
t_d	Delay Time	V_{CC} = 3.0 V, I_{CS} = 10 mA, I_{B1} = 1.0 mA ,$V_{OB\,(off)}$ = 3.0 V		35	ns
t_r	Rise Time			35	ns
t_s	Storage Time	V_{CC} = 3.0 V, I_{CS} = 10 mA, I_{B1} = I_{B2} = 1.0 mA		200	ns
t_f	Fall Time			60	ns

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

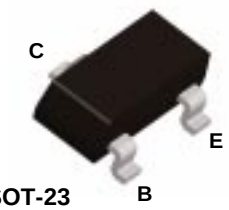
FAIRCHILD
SEMICONDUCTOR TM

2N3906



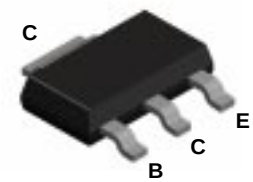
TO-92

MMBT3906



SOT-23
Mark: 2A

PZT3906



SOT-223

PNP General Purpose Amplifier

This device is designed for general purpose amplifier and switching applications at collector currents of 10 µA to 100 mA. Sourced from Process 66.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	40	V
V_{CBO}	Collector-Base Voltage	40	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	200	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

© 1997 Fairchild Semiconductor Corporation

PNP General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 1.0 mA, I_B = 0	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 µA, I_E = 0	40		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	5.0		V
I_{BL}	Base Cutoff Current	V_{CE} = 30 V, V_{BE} = 3.0 V		50	nA
I_{CEX}	Collector Cutoff Current	V_{CE} = 30 V, V_{BE} = 3.0 V		50	nA
ON CHARACTERISTICS					
h_{FE}	DC Current Gain *	I_C = 0.1 mA, V_{CE} = 1.0 V I_C = 1.0 mA, V_{CE} = 1.0 V I_C = 10 mA, V_{CE} = 1.0 V I_C = 50 mA, V_{CE} = 1.0 V I_C = 100 mA, V_{CE} = 1.0 V	60 80 100 60 30	 300 	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA		0.25 0.4	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA	0.65	0.85 0.95	V V
SMALL SIGNAL CHARACTERISTICS					
f_T	Current Gain - Bandwidth Product	I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	250		MHz
C_{obo}	Output Capacitance	V_{CB} = 5.0 V, I_E = 0, f = 100 kHz		4.5	pF
C_{ibo}	Input Capacitance	V_{EB} = 0.5 V, I_C = 0, f = 100 kHz		10.0	pF
NF	Noise Figure (except MMPQ3906)	I_C = 100 µA, V_{CE} = 5.0 V, R_S =1.0kΩ, f=10 Hz to 15.7 kHz		4.0	dB
SWITCHING CHARACTERISTICS (except MMPQ3906)					
t_d	Delay Time	V_{CC} = 3.0 V, V_{BE} = 0.5 V, I_C = 10 mA, I_{B1} = 1.0 mA		35	ns
t_r	Rise Time			35	ns
t_s	Storage Time	V_{CC} = 3.0 V, I_C = 10mA I_{B1} = I_{B2} = 1.0 mA		225	ns
t_f	Fall Time			75	ns

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

Spice Model

PNP (Is=1.41f Xti=3 Eg=1.11 Vaf=18.7 Bf=180.7 Ne=1.5 Ise=0 Ikf=80m Xtb=1.5 Br=4.977 Nc=2 Isc=0 Ikr=0 Rc=2.5 Cjc=9.728p Mjc=.5776 Vjc=.75 Fc=.5 Cje=8.063p Mje=.3677 Vje=.75 Tr=33.42n Tf=179.3p Itf=.4 Vtf=4 Xtf=6 Rb=10)

PNP General Purpose Amplifier
(continued)

Thermal Characteristics
TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N3906	*PZT3906	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	1,000 8.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	125	°C/W

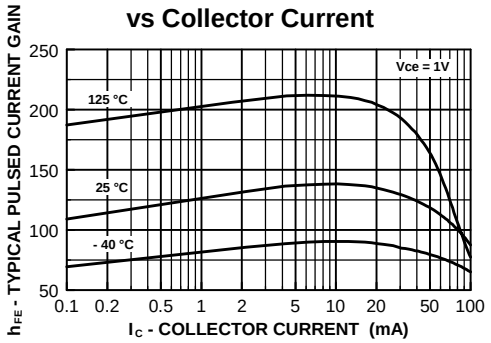
Symbol	Characteristic	Max		Units
		**MMBT3906	MMPQ3906	
P_D	Total Device Dissipation Derate above 25°C	350 2.8	1,000 8.0	mW mW/°C
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient Effective 4 Die Each Die	357	 125 240	°C/W °C/W °C/W

*Device mounted on FR-4 PCB 36 mm X 18 mm X 1.5 mm; mounting pad for the collector lead min. 6 cm^2.

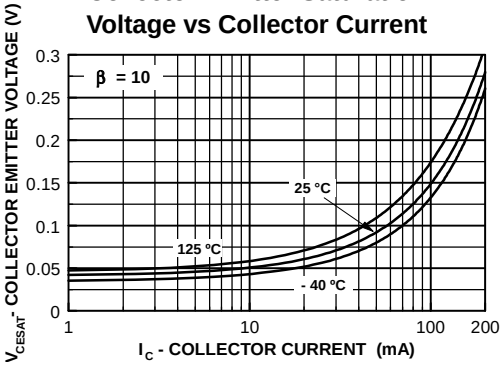
**Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

Typical Characteristics

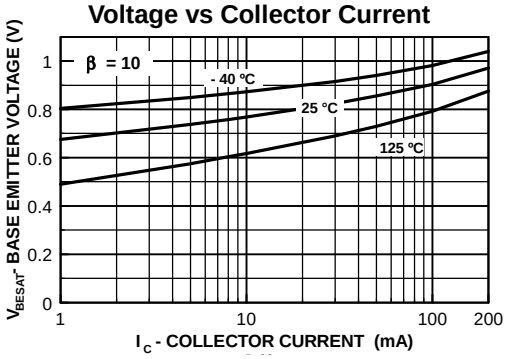
Typical Pulsed Current Gain vs Collector Current



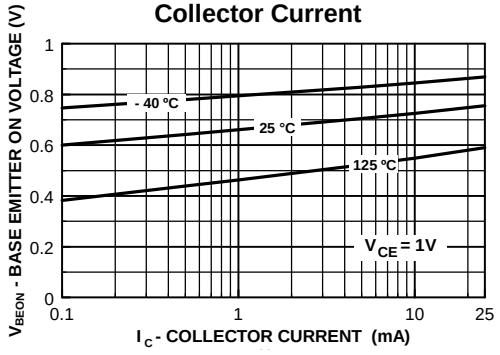
Collector-Emitter Saturation Voltage vs Collector Current



Base-Emitter Saturation Voltage vs Collector Current

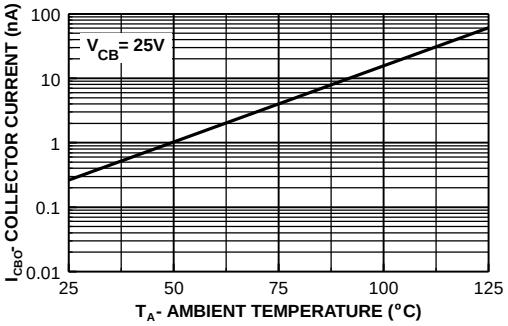


Base Emitter ON Voltage vs Collector Current

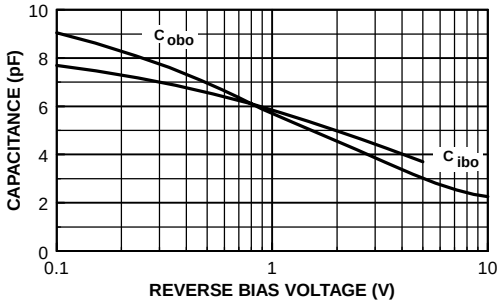


Typical Characteristics (continued)

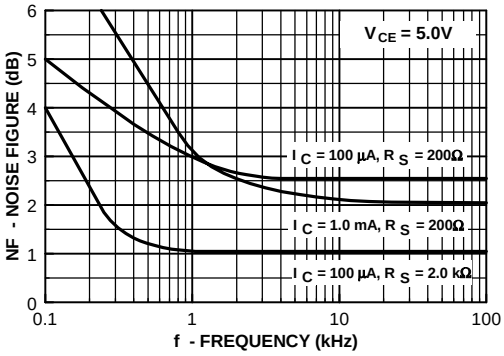
Collector-Cutoff Current vs. Ambient Temperature



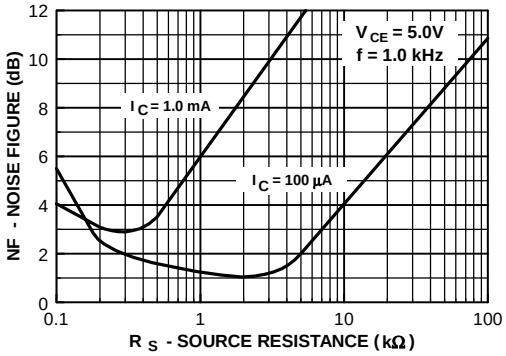
Common-Base Open Circuit Input and Output Capacitance vs Reverse Bias Voltage



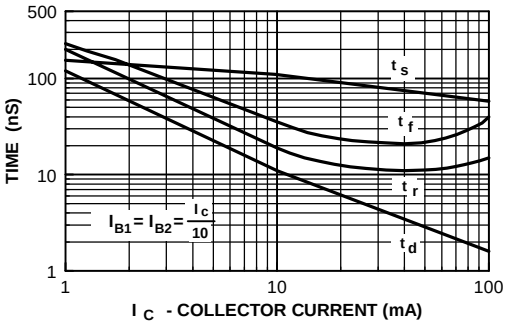
Noise Figure vs Frequency



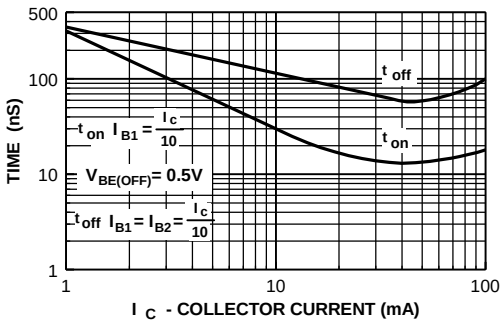
Noise Figure vs Source Resistance



Switching Times vs Collector Current

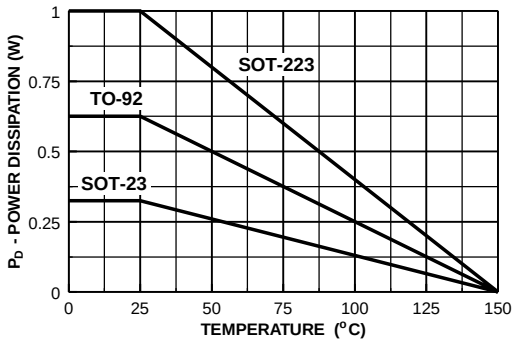


Turn On and Turn Off Times vs Collector Current



Typical Characteristics (continued)

Power Dissipation vs Ambient Temperature



TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™
CoolFET™
CROSSVOLT™
E^2CMOS^{TM}
FACT™
FACT Quiet Series™
FAST®
FASTr™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
POP™
PowerTrench™
QS™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
TinyLogic™

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.
As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

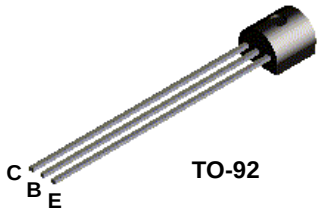
Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

FAIRCHILD SEMICONDUCTOR™

Discrete POWER & Signal Technologies

2N4123



TO-92

NPN General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 100 mA. Sourced from Process 23. See 2N3904 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	30	V
V_{CBO}	Collector-Base Voltage	40	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	200	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N4123	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

NPN General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

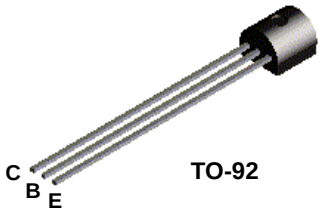
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 1.0 mA, I_B = 0	30		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 µA, I_E = 0	40		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	5.0		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 20 V, I_E = 0		50	nA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 3.0 V, I_C = 0		50	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 1.0 V, I_C = 2.0 mA V_{CE} = 1.0 V, I_C = 50 mA	50 25	150	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 50 mA, I_B = 5.0 mA		0.3	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 50 mA, I_B = 5.0 mA		0.95	V
SMALL SIGNAL CHARACTERISTICS					
C_{ob}	Output Capacitance	V_{CB} = 5.0 V, f = 100 kHz		4.0	pF
C_{ib}	Input Capacitance	V_{EB} = 0.5 V, f = 0.1 MHz		8.0	pF
h_{fe}	Small-Signal Current Gain	I_C = 2.0 mA, V_{CE} = 10 V, f = 1.0 kHz I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	50 2.5	200	
f_T	Current Gain - Bandwidth Product	I_C = 10 mA, V_{CE} = 20 V f = 100 MHz	250		MHz
NF	Noise Figure	V_{CE} = 5.0 V, I_C = 100 µA, R_S = 1.0 kΩ, B_W = 10 Hz to 15.7 kHz		6.0	dB

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

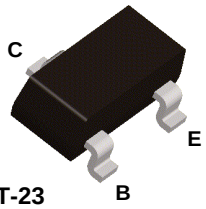
FAIRCHILD SEMICONDUCTOR™

Discrete POWER & Signal Technologies

2N4124 MMBT4124



TO-92



SOT-23
Mark: ZC

NPN General Purpose Amplifier

This device is designed as a general purpose amplifier and switch. The useful dynamic range extends to 100 mA as a switch and to 100 MHz as an amplifier. Sourced from Process 23. See 2N3904 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	25	V
V_{CBO}	Collector-Base Voltage	30	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	200	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N4124	*MMBT4124	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	350 2.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	°C/W

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

© 1997 Fairchild Semiconductor Corporation

NPN General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

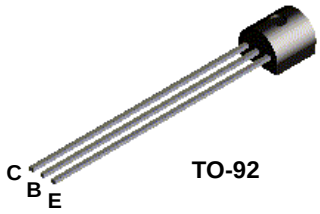
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	I_C = 1.0 mA, I_B = 0	25		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 µA, I_E = 0	30		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_C = 10 µA, I_C = 0	5.0		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 20 V, I_E = 0		50	nA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 3.0 V, I_C = 0		50	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	I_C = 2.0 mA, V_{CE} = 1.0 V I_C = 50 mA, V_{CE} = 1.0 V	120 60	360	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 50 mA, I_B = 5.0 mA		0.3	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 50 mA, I_B = 5.0 mA		0.95	V
SMALL SIGNAL CHARACTERISTICS					
f_T	Current Gain - Bandwidth Product	I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	300		MHz
C_{obo}	Output Capacitance	V_{CB} = 5.0 V, I_E = 0, f = 100 kHz		4.0	pF
C_{ibo}	Input Capacitance	V_{BE} = 0.5 V, I_C = 0, f = 1.0 kHz		8.0	pF
C_{cb}	Collector-Base Capcitance	V_{CB} = 5.0 V, I_E = 0, f = 100 kHz		4.0	pF
h_{fe}	Small-Signal Current Gain	V_{CE} = 10 V, I_C = 2.0 mA, f = 1.0 kHz	120	480	
NF	Noise Figure	I_C = 100 µA, V_{CE} = 5.0 V, R_S =1.0kΩ, f=10 Hz to 15.7 kHz		5.0	dB

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD SEMICONDUCTOR™

Discrete POWER & Signal Technologies

2N4125



TO-92

PNP General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents of 10 μA to 100 mA. Sourced from Process 66. See 3906 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	30	V
V_{CBO}	Collector-Base Voltage	30	V
V_{EBO}	Emitter-Base Voltage	4.0	V
I_C	Collector Current - Continuous	200	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N4125	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

PNP General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

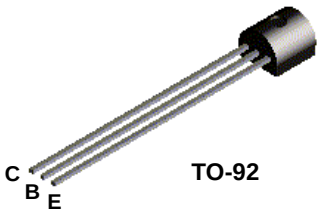
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 1.0 mA, I_B = 0	30		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 µA, I_E = 0	30		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	4.0		V
I_{CBO}	Collector-Cutoff Current	V_{CB} = 20 V, I_E = 0		50	nA
I_{EBO}	Emitter-Cutoff Current	V_{EB} = 3.0 V, I_C = 0		50	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 1.0 V, I_C = 2.0 mA V_{CE} = 1.0 V, I_C = 50 mA	50 25	150	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 50 mA, I_B = 5.0 mA		0.4	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 50 mA, I_B = 5.0 mA		0.95	V
SMALL SIGNAL CHARACTERISTICS					
C_{ob}	Output Capacitance	V_{CB} = 5.0 V, f = 100 kHz		4.5	pF
C_{ib}	Input Capacitance	V_{BE} = 0.5 V, f = 100 kHz		10	pF
h_{fe}	Small-Signal Current Gain	I_C = 2.0 mA, V_{CE} = 10 V, f = 1.0 kHz I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	50 2.0	200	
NF	Noise Figure	V_{CE} = 5.0 V, I_C = 100 µA, R_S = 1.0 kΩ, f = 10Hz to 15.7 kHz,		5.0	dB

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

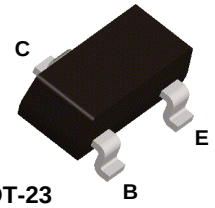
FAIRCHILD SEMICONDUCTOR™

Discrete POWER & Signal Technologies

2N4126 MMBT4126



TO-92



SOT-23
Mark: ZF

PNP General Purpose Amplifier

This device is designed for general purpose amplifier and switching applications at collector currents to 10 µA as a switch and to 100 mA as an amplifier. Sourced from Process 66. See 2N3906 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	25	V
V_{CBO}	Collector-Base Voltage	25	V
V_{EBO}	Emitter-Base Voltage	4.0	V
I_C	Collector Current - Continuous	200	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA= 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N4126	*MMBT4126	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	350 2.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	°C/W

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

© 1997 Fairchild Semiconductor Corporation

PNP General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

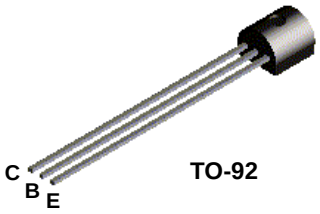
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	I_C = 1.0 mA, I_B = 0	25		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 µA, I_E = 0	25		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_C = 10 µA, I_C = 0	4.0		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 20 V, I_E = 0		50	nA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 3.0 V, I_C = 0		50	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	I_C = 2.0 mA, V_{CE} = 1.0 V I_C = 50 mA, V_{CE} = 1.0 V	120 60	360	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 50 mA, I_B = 5.0 mA		0.4	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 50 mA, I_B = 5.0 mA		0.95	V
SMALL SIGNAL CHARACTERISTICS					
f_T	Current Gain - Bandwidth Product	I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	250		MHz
C_{ibo}	Input Capacitance	V_{EB} = 0.5 V, I_C = 0, f = 1.0 MHz		10	pF
C_{cb}	Collector-Base Capcitance	V_{CB} = 5.0 V, I_E = 0, f = 100 kHz		4.5	pF
h_{fe}	Small-Signal Current Gain	I_C = 2.0 mA, V_{CE} = 10 V, f = 1.0 kHz	120	480	
NF	Noise Figure	I_C = 100 µA, V_{CE} = 5.0 V, R_S=1.0 kΩ, f=10 Hz to 15.7 kHz		4.0	dB

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD SEMICONDUCTOR TM

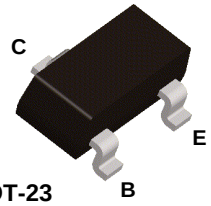
Discrete POWER & Signal Technologies

2N4400



TO-92

MMBT4400



SOT-23
Mark: 83

NPN General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 500 mA. Sourced from Process 19. See PN2222A for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	40	V
V_{CBO}	Collector-Base Voltage	60	V
V_{EBO}	Emitter-Base Voltage	6.0	V
I_C	Collector Current - Continuous	1.0	A
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N4400	*MMBT4400	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	350 2.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	°C/W

© 1997 Fairchild Semiconductor Corporation

NPN General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

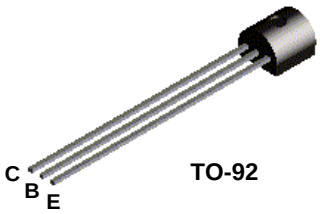
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 1.0 mA, I_B = 0	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 100 µA, I_E = 0	60		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 100 µA, I_C = 0	6.0		V
I_{CEX}	Collector Cutoff Current	V_{CE} = 35 V, V_{EB} = 0.4 V		0.1	µA
I_{BL}	Emitter Cutoff Current	V_{CE} = 35 V, V_{EB} = 0.4 V		0.1	µA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 1.0 V, I_C = 1.0 mA V_{CE} = 1.0 V, I_C = 10 mA V_{CE} = 1.0 V, I_C = 150 mA V_{CE} = 2.0 V, I_C = 500 mA	20 40 50 20	 150 	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 150 mA, I_B =15 mA I_C = 500 mA, I_B = 50 mA		0.40 0.75	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 150 mA, I_B =15 mA I_C = 500 mA, I_B = 50 mA	0.75	0.95 1.2	V V
SMALL SIGNAL CHARACTERISTICS					
C_{ob}	Output Capacitance	V_{CB} = 5.0 V, f = 140 kHz		6.5	pF
C_{ib}	Input Capacitance	V_{EB} = 0.5 V, f = 140 kHz		30	pF
h_{fe}	Small-Signal Current Gain	I_C = 20 mA, V_{CE} = 10 V, f = 100 MHz	2.0		
h_{fe}	Small-Signal Current Gain	V_{CE} = 10 V, I_C = 1.0 mA, f = 1.0 kHz	20	250	
h_{ie}	Input Impedance		0.5	7.5	KΩ
h_{re}	Voltage Feedback Ratio		0.1	8.0	x 10^{-4}
h_{oe}	Output Admittance		1.0	30	µmhos
SWITCHING CHARACTERISTICS					
t_d	Delay Time	V_{CC} = 30 V, I_C = 150 mA, I_{B1} = 15 mA ,$V_{BE(off)}$ = 0.0 V		15	ns
t_r	Rise Time			20	ns
t_s	Storage Time	V_{CC} = 30 V, I_C = 150 mA, I_{B1} = I_{B2} = 15 mA		225	ns
t_f	Fall Time			30	ns

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

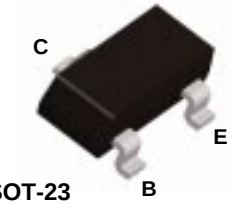
FAIRCHILD SEMICONDUCTOR™

Discrete POWER & Signal Technologies

2N4401 MMBT4401



TO-92



SOT-23
Mark: 2X

NPN General Purpose Amplifier

This device is designed for use as a medium power amplifier and switch requiring collector currents up to 500 mA. Sourced from Process 19. See PN2222A for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	40	V
V_{CBO}	Collector-Base Voltage	60	V
V_{EBO}	Emitter-Base Voltage	6.0	V
I_C	Collector Current - Continuous	1.0	A
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N4401	*MMBT4401	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	350 2.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	°C/W

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

ã 1997 Fairchild Semiconductor Corporation

NPN General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

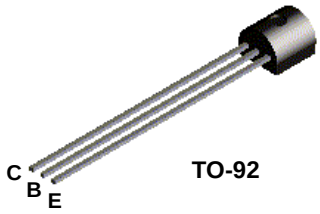
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 1.0 mA, I_B = 0	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 0.1 mA, I_E = 0	60		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 0.1 mA, I_C = 0	6.0		V
I_{BL}	Base Cutoff Current	V_{CE} = 35 V, V_{EB} = 0.4 V		0.1	µA
I_{CEX}	Collector Cutoff Current	V_{CE} = 35 V, V_{EB} = 0.4 V		0.1	µA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	I_C = 0.1 mA, V_{CE} = 1.0 V I_C = 1.0 mA, V_{CE} = 1.0 V I_C = 10 mA, V_{CE} = 1.0 V I_C = 150 mA, V_{CE} = 1.0 V I_C = 500 mA, V_{CE} = 2.0 V	20 40 80 100 40	 300 	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA		0.4 0.75	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA	0.75	0.95 1.2	V V
SMALL SIGNAL CHARACTERISTICS					
f_T	Current Gain - Bandwidth Product	I_C = 20 mA, V_{CE} = 10 V, f = 100 MHz	250		MHz
C_{cb}	Collector-Base Capacitance	V_{CB} = 5.0 V, I_E = 0, f = 140 kHz		6.5	pF
C_{eb}	Emitter-Base Capacitance	V_{BE} = 0.5 V, I_C = 0, f = 140 kHz		30	pF
h_{ie}	Input Impedance	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz	1.0	15	kΩ
h_{re}	Voltage Feedback Ratio	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz	0.1	8.0	$x 10^{-4}$
h_{fe}	Small-Signal Current Gain	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz	40	500	
h_{oe}	Output Admittance	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz	1.0	30	µmhos
SWITCHING CHARACTERISTICS					
t_d	Delay Time	V_{CC} = 30 V, V_{EB} = 0.2 V,		15	ns
t_r	Rise Time	I_C = 150 mA, I_{B1} = 15 mA		20	ns
t_s	Storage Time	V_{CC} = 30 V, I_C = 150 mA		225	ns
t_f	Fall Time	I_{B1} = I_{B2} = 15 mA		30	ns

*Pulse Test: Pulse Width £ 300 ms, Duty Cycle £ 2.0%

FAIRCHILD SEMICONDUCTOR TM

Discrete POWER & Signal Technologies

2N4402



TO-92

PNP General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 500 mA. Sourced from Process 63. See PN2907A for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	40	V
V_{CBO}	Collector-Base Voltage	40	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	800	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N4402	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

PNP General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

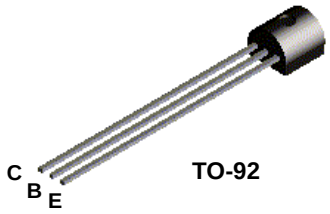
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 1.0 mA, I_B = 0	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 100 µA, I_E = 0	40		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 100 µA, I_C = 0	5.0		V
I_{CEX}	Collector Cutoff Current	V_{CE} = 35 V, V_{EB} = 0.4 V		0.1	µA
I_{BL}	Base Cutoff Current	V_{CE} = 35 V, V_{EB} = 0.4 V		0.1	µA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 1.0 V, I_C = 1.0 mA V_{CE} = 1.0 V, I_C = 10 mA V_{CE} = 2.0 V, I_C = 150 mA V_{CE} = 2.0 V, I_C = 500 mA	30 50 50 20	 150 	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA		0.40 0.75	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA	0.75	0.95 1.30	V V
SMALL SIGNAL CHARACTERISTICS					
C_{ob}	Output Capacitance	V_{CB} = 10 V, f = 140 kHz		8.5	pF
C_{ib}	Input Capacitance	V_{EB} = 0.5 V, f = 140 kHz		30	pF
h_{fe}	Small-Signal Current Gain	I_C = 20 mA, V_{CE} = 10 V, f = 100 MHz	1.5		
h_{fe}	Small-Signal Current Gain	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz	30	250	
h_{ie}	Input Impedance		0.75	7.5	kΩ
h_{re}	Voltage Feedback Ratio		0.10	8.0	$x10^{-4}$
h_{oe}	Output Admittance		1.0	100	µmhos
SWITCHING CHARACTERISTICS					
t_d	Delay Time	V_{CC} = 30 V, I_C =150 mA, I_{B1} = 15 mA, $V_{BE(off)}$ = 2.0 V		15	ns
t_r	Rise Time			20	ns
t_s	Storage Time	V_{CC} = 30 V, I_C =150 mA, I_{B1} = I_{B2} = 15 mA		225	ns
t_f	Fall Time			30	ns

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD SEMICONDUCTOR TM

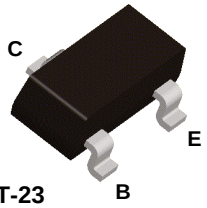
Discrete POWER & Signal Technologies

2N4403



TO-92

MMBT4403



SOT-23
Mark: 2T

PNP General Purpose Amplifier

This device is designed for use as a general purpose amplifier and switch requiring collector currents to 500 mA. Sourced from Process 63. See PN2907A for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	40	V
V_{CBO}	Collector-Base Voltage	45	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	800	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N4403	*MMBT4403	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	350 2.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	°C/W

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

© 1997 Fairchild Semiconductor Corporation

PNP General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

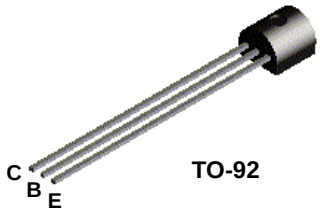
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 1.0 mA, I_B = 0	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 0.1 mA, I_E = 0	45		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 0.1 A, I_C = 0	5.0		V
I_{BEX}	Base Cutoff Current	V_{CE} = 35 V, V_{EB} = 0.4 V		0.1	µA
I_{CEX}	Collector Cutoff Current	V_{CE} = 35 V, V_{BE} = 0.4 V		0.1	µA
ON CHARACTERISTICS					
h_{FE}	DC Current Gain	I_C = 0.1 mA, V_{CE} = 1.0 V I_C = 1.0 mA, V_{CE} = 1.0 V I_C = 10 mA, V_{CE} = 1.0 V I_C = 150 mA, V_{CE} = 2.0 V* I_C = 500 mA, V_{CE} = 2.0 V*	30 60 100 100 20	 300 	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage*	I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA		0.4 0.75	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 150 mA, I_B = 15 mA* I_C = 500 mA, I_B = 50 mA	0.75	0.95 1.3	V V
SMALL SIGNAL CHARACTERISTICS					
f_T	Current Gain - Bandwidth Product	I_C = 20 mA, V_{CE} = 10 V, f = 100 MHz	200		MHz
C_{cb}	Collector-Base Capacitance	V_{CB} = 10 V, I_E = 0, f = 140 kHz		8.5	pF
C_{eb}	Emitter-Base Capacitance	V_{BE} = 0.5 V, I_C = 0, f = 140 kHz		30	pF
h_{ie}	Input Impedance	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz	1.5	15	kΩ
h_{re}	Voltage Feedback Ratio	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz	0.1	8.0	x 10^{-4}
h_{fe}	Small-Signal Current Gain	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz	60	500	
h_{oe}	Output Admittance	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz	1.0	100	µmhos
SWITCHING CHARACTERISTICS					
t_d	Delay Time	V_{CC} = 30 V, I_C = 150 mA,		15	ns
t_r	Rise Time	I_{B1} = 15 mA		20	ns
t_s	Storage Time	V_{CC} = 6.0 V, I_C = 150 mA		225	ns
t_f	Fall Time	I_{B1} = I_{B2} = 15 mA		30	ns

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD SEMICONDUCTOR TM

Discrete POWER & Signal Technologies

2N4410



TO-92

NPN General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 50 mA. Sourced from Process 16. See 2N5551 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	80	V
V_{CBO}	Collector-Base Voltage	120	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	200	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N4410	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

NPN General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

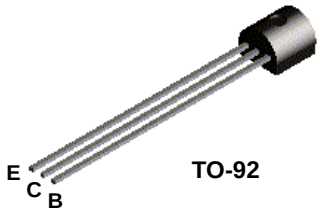
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 1.0 mA, I_B = 0	80		V
$V_{(BR)CEX}$	Collector-Emitter Breakdown Voltage	I_C = 500 µA, V_{BB} = 5.0 V R_{BE} = 8.2 kΩ	120		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 µA, I_E = 0	120		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	5.0		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 100 V, I_E = 0 V_{CB} = 100 V, I_E = 0, T_A = 100 °C	10 1.0		nA µA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 4.0 V, I_C = 0	100		nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 1.0 V, I_C = 1.0 mA V_{CE} = 1.0 V, I_C = 10 mA	60 60	 400	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 1.0 mA, I_B = 0.1 mA		0.2	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 1.0 mA, I_B = 0.1 mA		0.8	V
$V_{BE(on)}$	Base-Emitter On Voltage	V_{CE} = 5.0 V, I_C = 1.0 mA		0.8	V
SMALL SIGNAL CHARACTERISTICS					
C_{ob}	Output Capacitance	V_{CB} = 10 V, f = 100 kHz		12	pF
C_{ib}	Input Capacitance	V_{EB} = 0.5 V, f = 100 kHz		50	pF
h_{fe}	Small-Signal Current Gain	I_C = 10 mA, V_{CE} = 10 V, f = 30 MHz	2.0	10	

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD SEMICONDUCTOR™

Discrete POWER & Signal Technologies

2N4953



TO-92

NPN General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 500 mA. Sourced from Process 19. See PN2222A for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	30	V
V_{CBO}	Collector-Base Voltage	60	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	1.0	A
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N4953	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

NPN General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C =10 mA, I_B = 0	30		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 µA, I_E = 0	60		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	5.0		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 40 V, I_E = 0		50	nA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 3.0 V, I_C = 0		50	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 10 V, I_C = 1.0 mA V_{CE} = 10 V, I_C = 10 mA V_{CE} = 10 V, I_C = 150 mA	75 150 200	 600	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 150 mA, I_B = 15 mA		0.3	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 150 mA, I_B = 15 mA		1.3	V
$V_{BE(on)}$	Base-Emitter On Voltage	V_{CE} = 10 V, I_C = 150 mA		1.2	V
SMALL SIGNAL CHARACTERISTICS					
C_{ob}	Output Capacitance	V_{CB} = 10 V, f = 1.0 MHz		8.0	pF
h_{fe}	Small-Signal Current Gain	I_C = 20 mA, V_{CE} = 10 V, f = 100 MHz	2.5		
t_{on}	Turn-On Time	V_{CC} = 30 V, I_C = 150 mA,		40	ns
t_{off}	Turn-Off Time	I_{B1} = I_{B2} = 15 mA		400	ns

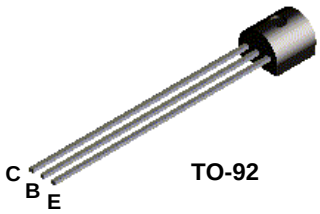
*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD SEMICONDUCTOR TM

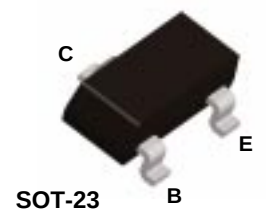
Discrete POWER & Signal Technologies

2N5086 2N5087

MMBT5086 MMBT5087



TO-92



SOT-23
Mark: 2P / 2Q

PNP General Purpose Amplifier

This device is designed for low level, high gain, low noise general purpose amplifier applications at collector currents to 50 mA. Sourced from Process 62.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	50	V
V_{CBO}	Collector-Base Voltage	50	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	100	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA= 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N5086 2N5086	***MMBT5086 *MMBT5087**	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	350 2.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	°C/W

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

ã 1997 Fairchild Semiconductor Corporation

PNP General Purpose Amplifier
(continued)

Electrical Characteristics
TA= 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Max	Units
OFF CHARACTERISTICS						
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 1.0 mA, I_B = 0		50		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 100 µA, I_E = 0		50		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 10 V, I_E = 0 V_{CB} = 35 V, I_E = 0			10 50	nA nA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 3.0 V, I_C = 0			50	nA
ON CHARACTERISTICS						
h_{FE}	DC Current Gain	I_C = 100 µA, V_{CE} = 5.0 V	**2N5086**	150	500	
			2N5087	250	800	
		I_C = 1.0 mA, V_{CE} = 5.0 V	**2N5086**	150		
			2N5087	250		
		I_C = 10 mA, V_{CE} = 5.0 V	**2N5086**	150		
			2N5087	250		
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA			0.3	V
$V_{BE(on)}$	Base-Emitter On Voltage	I_C = 1.0 mA, V_{CE} = 5.0 V			0.85	V
SMALL SIGNAL CHARACTERISTICS						
f_T	Current Gain - Bandwidth Product	I_C = 500 µA, V_{CE} = 5.0 V, f = 20 MHz		40		MHz
C_{cb}	Collector-Base Capacitance	V_{CB} = 5.0 V, I_E = 0, f = 100 kHz			4.0	pF
h_{fe}	Small-Signal Current Gain	I_C = 1.0 mA, V_{CE} = 5.0, f = 1.0 kHz	**2N5086**	150	600	
			2N5087	250	900	
NF	Noise Figure	I_C = 100 µA, V_{CE} = 5.0 V, R_S = 3.0 kΩ, f = 1.0 kHz	**2N5086**		3.0	dB
			2N5087		2.0	dB
		I_C = 20 µA, V_{CE} = 5.0 V, R_S = 10 kΩ, f = 10 Hz to 15.7 kHz	**2N5086**		3.0	dB
			2N5087		2.0	dB

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

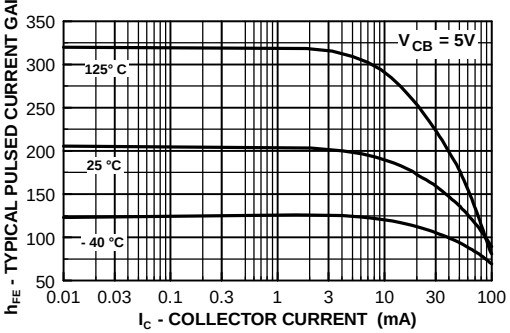
Spice Model

PNP (Is=6.734f Xti=3 Eg=1.11 Vaf=45.7 Bf=254.1 Ne=1.741 Ise=6.734f Ikf=.1962 Xtb=1.5 Br=2.683 Nc=2 Isc=0 Ikr=0 Rc=1.67 Cjc=6.2p Mjc=.301 Vjc=.75 Fc=.5 Cje=7.5p Mje=.2861 Vje=.75 Tr=10.1n Tf=467.8p Itf=.17 Vtf=5 Xtf=8 Rb=10)

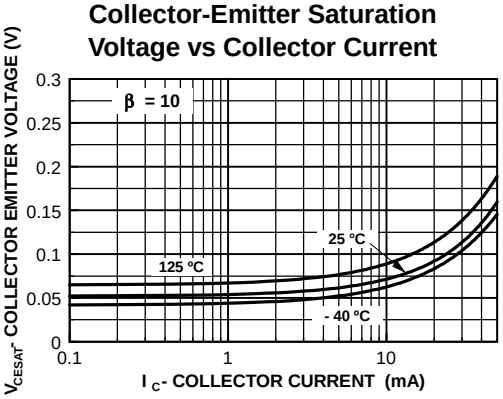
PNP General Purpose Amplifier
(continued)

Typical Characteristics

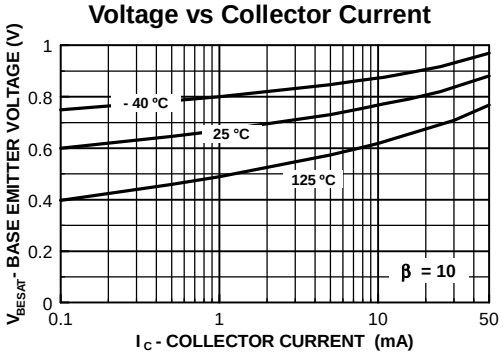
Typical Pulsed Current Gain vs Collector Current



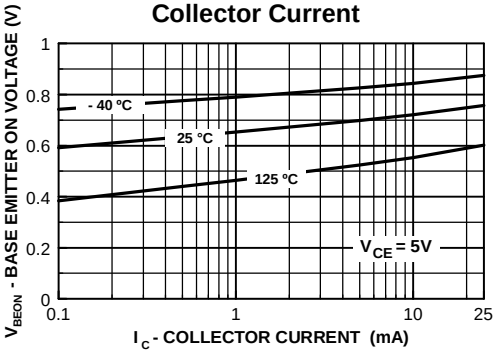
Collector-Emitter Saturation Voltage vs Collector Current



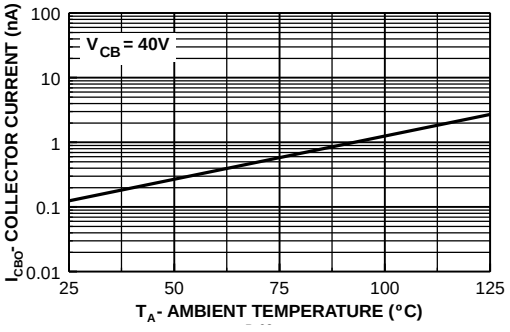
Base-Emitter Saturation Voltage vs Collector Current



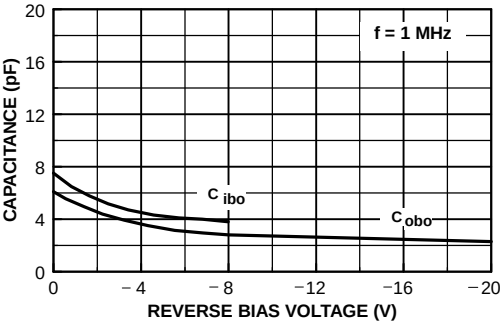
Base Emitter ON Voltage vs Collector Current



Collector-Cutoff Current vs. Ambient Temperature

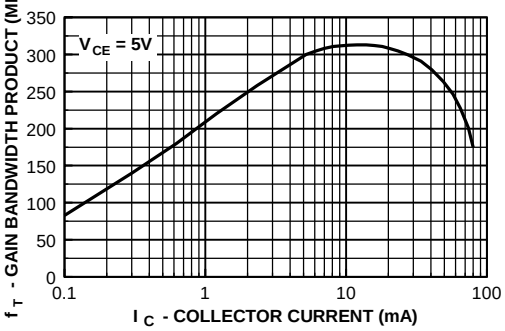


Input and Output Capacitance vs Reverse Bias Voltage

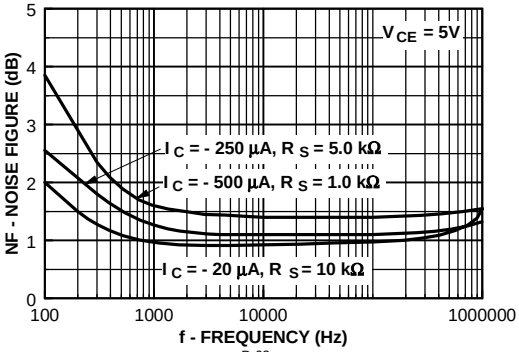


Typical Characteristics (continued)

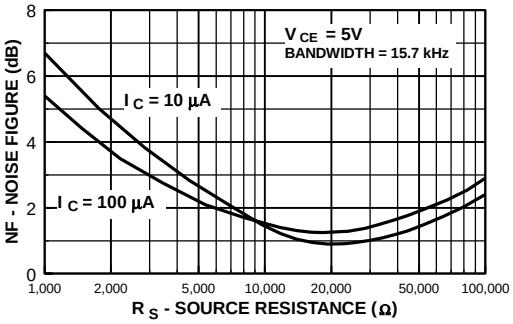
Gain Bandwidth Product vs Collector Current



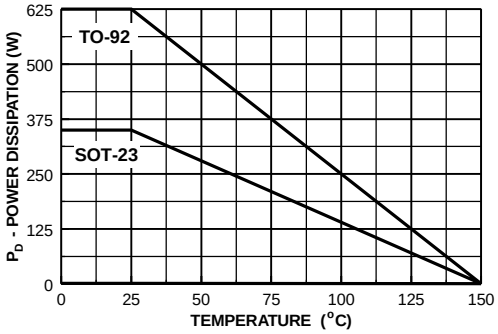
Noise Figure vs Frequency



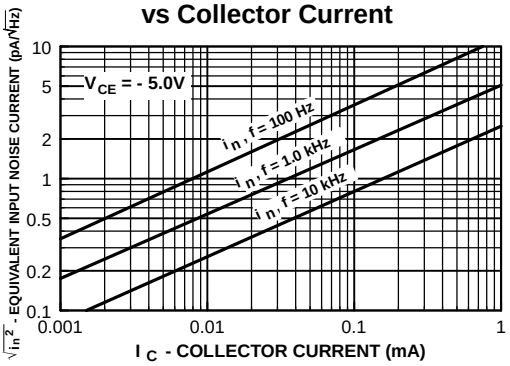
Wideband Noise Frequency vs Source Resistance



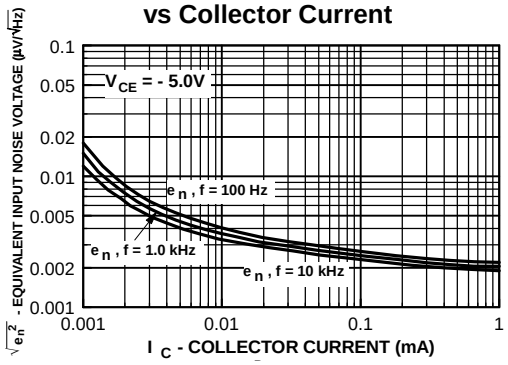
Power Dissipation vs Ambient Temperature



Equivalent Input Noise Current vs Collector Current

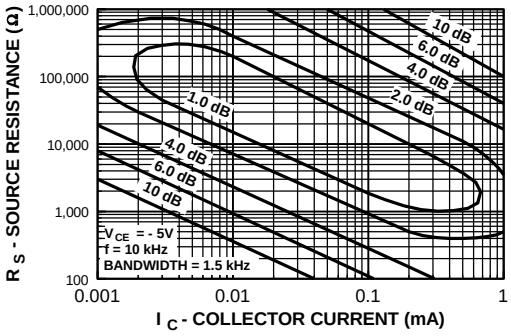


Equivalent Input Noise Voltage vs Collector Current

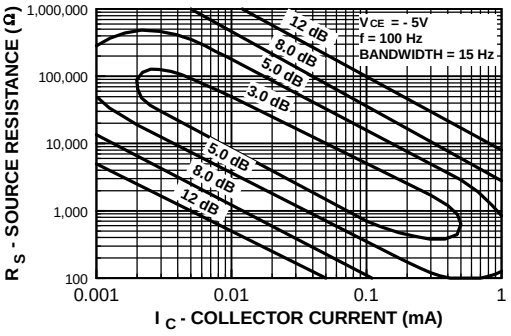


Typical Characteristics (continued)

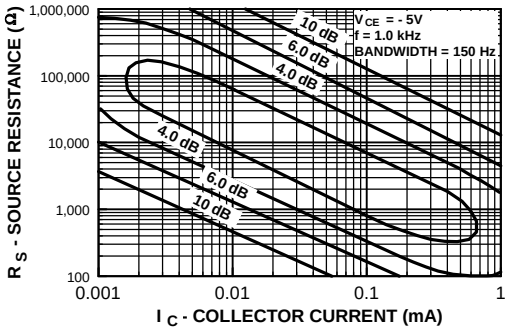
Contours of Constant Narrow Band Noise Figure



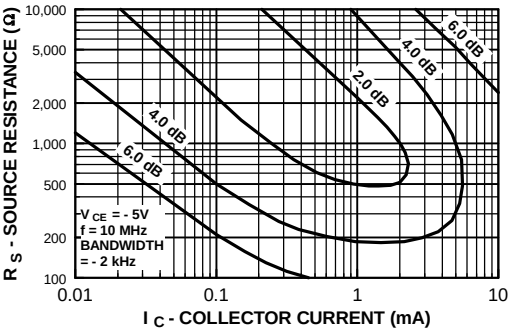
Contours of Constant Narrow Band Noise Figure



Contours of Constant Narrow Band Noise Figure



Contours of Constant Narrow Band Noise Figure



TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™
CoolFET™
CROSSVOLT™
E^2CMOS^{TM}
FACT™
FACT Quiet Series™
FAST®
FASTr™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
POP™
PowerTrench™
QS™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
TinyLogic™

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.
As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

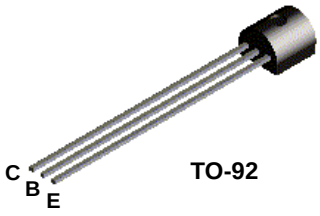
Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

FAIRCHILD SEMICONDUCTOR TM

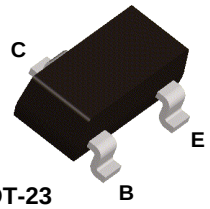
Discrete POWER & Signal Technologies

2N5088 2N5089

MMBT5088 MMBT5089



TO-92



SOT-23
Mark: 1Q / 1R

NPN General Purpose Amplifier

This device is designed for low noise, high gain, general purpose amplifier applications at collector currents from 1µA to 50 mA. Sourced from Process 07.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter		Value	Units
V_{CEO}	Collector-Emitter Voltage	**2N5088**	30	V
		2N5089	25	V
V_{CBO}	Collector-Base Voltage	**2N5088**	35	V
		2N5089	30	V
V_{EBO}	Emitter-Base Voltage		4.5	V
I_C	Collector Current - Continuous		100	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range		-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N5088 2N5089	***MMBT5088 *MMBT5089**	
P_D	Total Device Dissipation	625	350	mW
	Derate above 25°C	5.0	2.8	mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	°C/W

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

© 1997 Fairchild Semiconductor Corporation

NPN General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Max	Units
OFF CHARACTERISTICS						
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 1.0 mA, I_B = 0	**2N5088**	30		V
			2N5089	25		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 100 µA, I_E = 0	**2N5088**	35		V
			2N5089	30		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 20 V, I_E = 0	**2N5088**		50	nA
		V_{CB} = 15 V, I_E = 0	**2N5089**		50	nA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 3.0 V, I_C = 0			50	nA
		V_{EB} = 4.5 V, I_C = 0			100	nA
ON CHARACTERISTICS						
h_{FE}	DC Current Gain	I_C = 100 µA, V_{CE} = 5.0 V	**2N5088**	300	900	
			2N5089	400	1200	
		I_C = 1.0 mA, V_{CE} = 5.0 V	**2N5088**	350		
			2N5089	450		
		I_C = 10 mA, V_{CE} = 5.0 V*	**2N5088**	300		
			2N5089	400		
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA			0.5	V
$V_{BE(on)}$	Base-Emitter On Voltage	I_C = 10 mA, V_{CE} = 5.0 V			0.8	V
SMALL SIGNAL CHARACTERISTICS						
f_T	Current Gain - Bandwidth Product	I_C = 500 µA, V_{CE} = 5.0 mA, f = 20 MHz		50		MHz
C_{cb}	Collector-Base Capacitance	V_{CB} = 5.0 V, I_E = 0, f = 100 kHz			4.0	pF
C_{eb}	Emitter-Base Capacitance	V_{BE} = 0.5 V, I_C = 0, f = 100 kHz			10	pF
h_{fe}	Small-Signal Current Gain	I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz	**2N5088**	350	1400	
			2N5089	450	1800	
NF	Noise Figure	I_C = 100 µA, V_{CE} = 5.0 V, R_S = 10 kΩ, f = 10 Hz to 15.7 kHz	**2N5088**		3.0	dB
			2N5089		2.0	dB

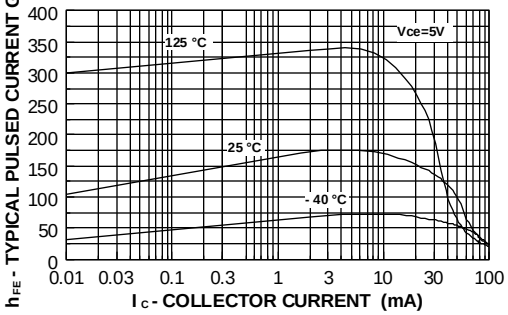
*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

Spice Model

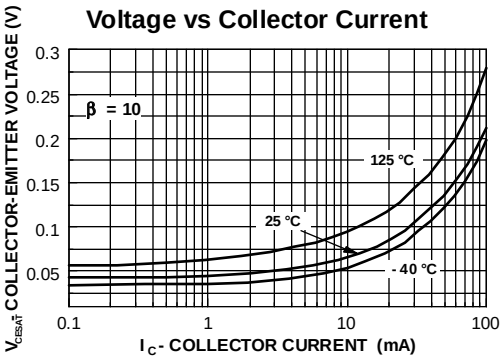
NPN (Is=5.911f Xti=3 Eg=1.11 Vaf=62.37 Bf=1.122K Ne=1.394 Ise=5.911f Ikf=14.92m Xtb=1.5 Br=1.271 Nc=2 Isc=0 Ikr=0 Rc=1.61 Cjc=4.017p Mjc=.3174 Vjc=.75 Fc=.5 Cje=4.973p Mje=.4146 Vje=.75 Tr=4.673n Tf=821.7p Itf=.35 Vtf=4 Xtf=7 Rb=10)

DC Typical Characteristics

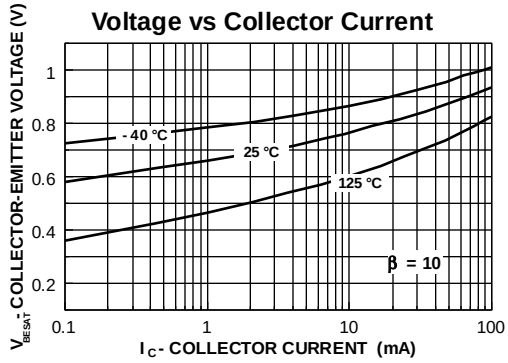
Typical Pulsed Current Gain vs Collector Current



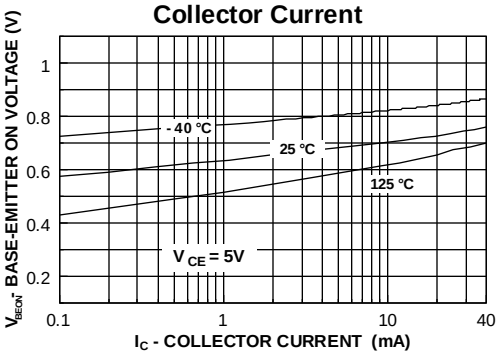
Collector-Emitter Saturation Voltage vs Collector Current



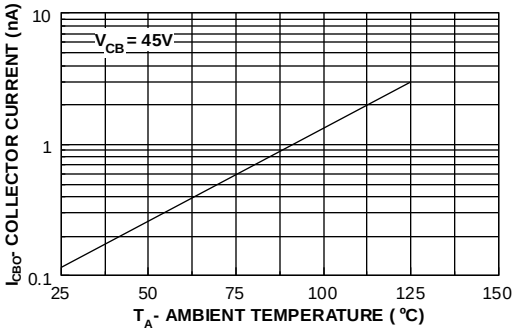
Base-Emitter Saturation Voltage vs Collector Current



Base-Emitter ON Voltage vs Collector Current

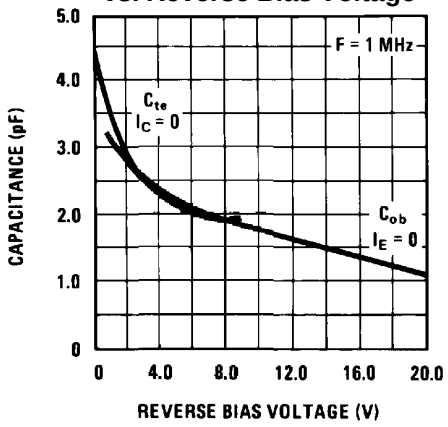


Collector-Cutoff Current vs Ambient Temperature

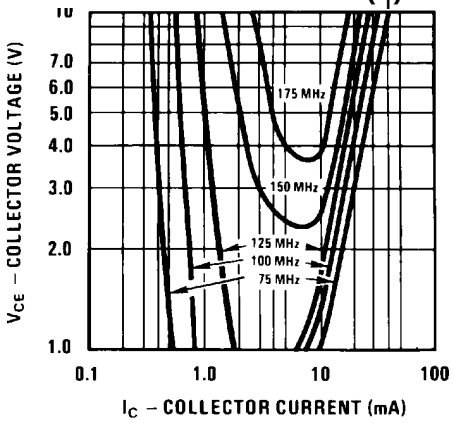


AC Typical Characteristics

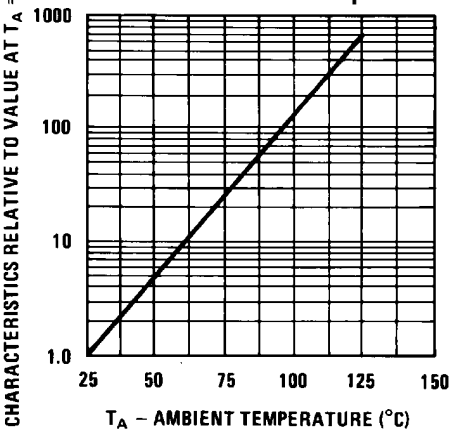
Input / Output Capacitance vs. Reverse Bias Voltage



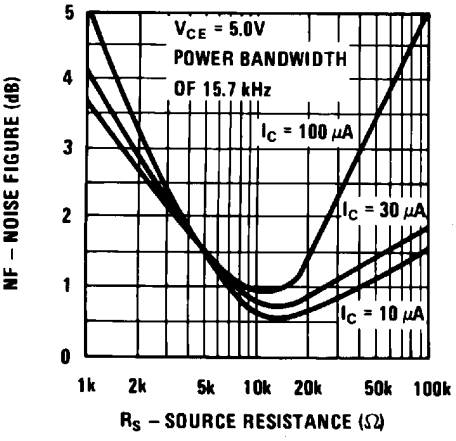
Contours of Constant Gain Bandwidth Product (f_T)



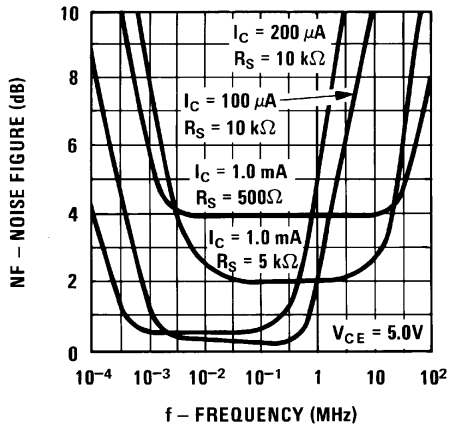
Normalized Collector Cutoff Current vs. Ambient Temperature



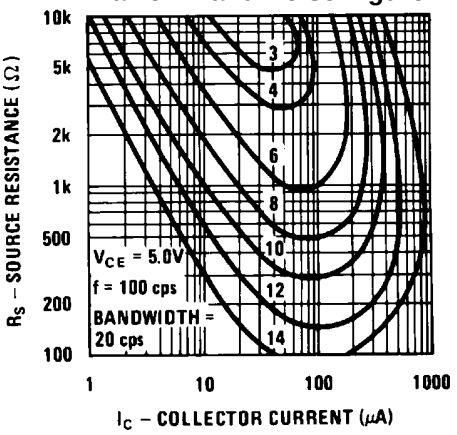
Wideband Noise Figure vs. Source Resistance



Noise Figure vs. Frequency

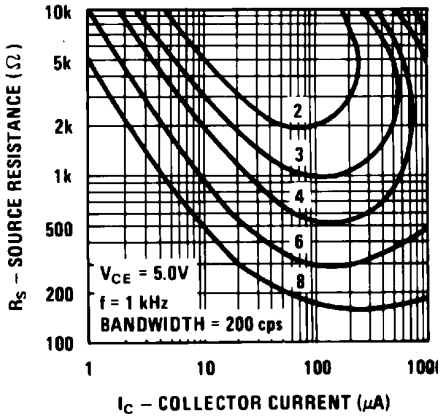


Contours of Constant Narrow Band Noise Figure

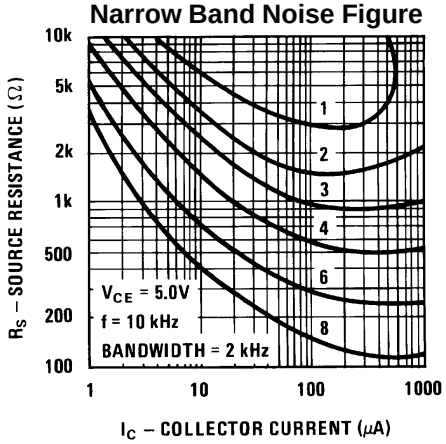


AC Typical Characteristics (continued)

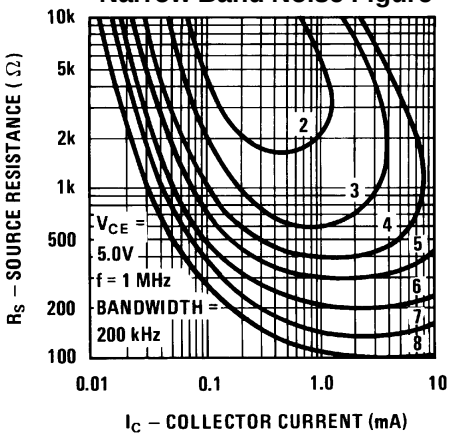
Contours of Constant Narrow Band Noise Figure



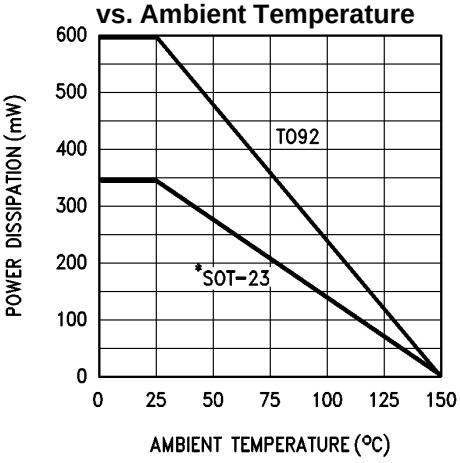
Contours of Constant Narrow Band Noise Figure



Contours of Constant Narrow Band Noise Figure

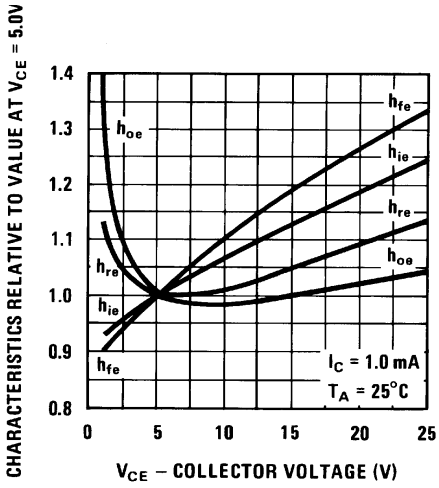


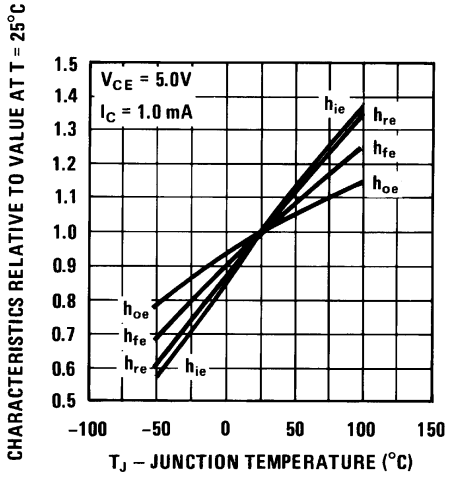
Maximum Power Dissipation vs. Ambient Temperature

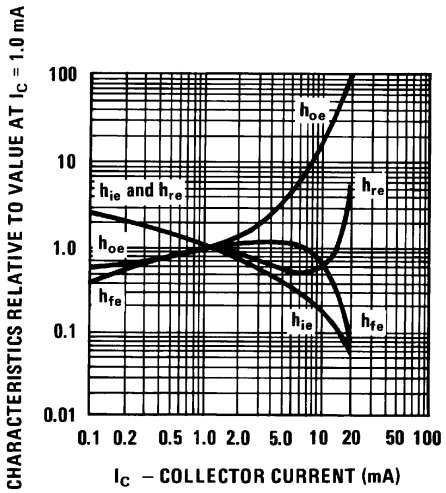


NPN General Purpose Amplifier
(continued)

Typical Common Emitter Characteristics (f = 1.0 kHz)

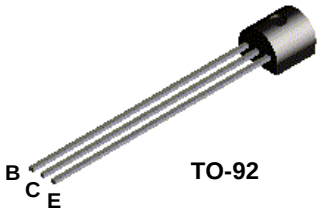






FAIRCHILD
SEMICONDUCTOR TM

2N5172



TO-92

NPN General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 300 mA. Sourced from Process 10. See PN100 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	25	V
V_{CBO}	Collector-Base Voltage	25	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	500	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N5172	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

NPN General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 10 mA, I_B = 0	25		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 µA, I_E = 0	25		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	5.0		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 25 V, I_E = 0		100	nA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 5.0 V, I_C = 0		100	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 10 V, I_C = 10 mA	100	500	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA		0.25	V
$V_{BE(on)}$	Base-Emitter On Voltage	V_{CE} = 10 V, I_C = 10 mA	0.5	1.2	V
SMALL SIGNAL CHARACTERISTICS					
C_{cb}	Collector- Base Capacitance	V_{CB} = 10 V, f = 1.0 MHz	1.6	10	pF
h_{fe}	Small-Signal Current Gain	I_C = 10 mA, V_{CE} = 10 V, f = 1.0 kHz	100	750	

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™
CoolFET™
CROSSVOLT™
E^2CMOS^{TM}
FACT™
FACT Quiet Series™
FAST®
FASTr™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
POP™
PowerTrench™
QS™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
TinyLogic™

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.
As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

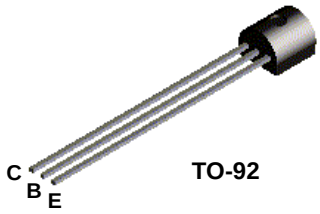
Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

FAIRCHILD SEMICONDUCTOR TM

Discrete POWER & Signal Technologies

2N5210



TO-92

NPN General Purpose Amplifier

This device is designed for low noise, high gain, general purpose amplifier applications at collector currents from 1µA to 50 mA. Sourced from Process 07. See 2N5088 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	50	V
V_{CBO}	Collector-Base Voltage	50	V
V_{EBO}	Emitter-Base Voltage	4.5	V
I_C	Collector Current - Continuous	100	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N5210	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

NPN General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

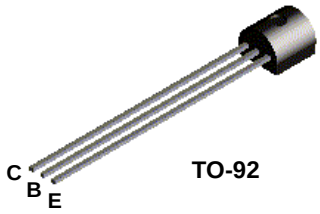
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	I_C = 1.0 mA, I_B = 0	50		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 0.1 mA, I_E = 0	50		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 35 V, I_E = 0		50	nA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 3.0 V, I_C = 0		50	nA
ON CHARACTERISTICS					
h_{FE}	DC Current Gain	I_C = 100 µA, V_{CE} = 5.0 V I_C = 1.0 mA, V_{CE} = 5.0 V I_C = 10 mA, V_{CE} = 5.0 V*	200 250 250	600	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA		0.7	V
$V_{BE(on)}$	Base-Emitter On Voltage	I_C = 1.0 mA, V_{CE} = 5.0 V		0.85	V
SMALL SIGNAL CHARACTERISTICS					
f_T	Current Gain - Bandwidth Product	I_C = 500 µA, V_{CE} = 5.0 V, f= 20 MHz	30		MHz
C_{cb}	Collector-Base Capacitance	V_{CB} = 5.0 V, I_E = 0, f = 100 kHz		4.0	pF
h_{fe}	Small-Signal Current Gain	I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz	250	900	
NF	Noise Figure	I_C = 20 µA, V_{CE} = 5.0 V, R_S = 22 kΩ, f = 10 Hz to 15.7 kHz I_C = 20 µA, V_{CE} = 5.0 V, R_S = 10 kΩ, f = 1.0 kHz		2.0 3.0	dB dB

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD SEMICONDUCTOR TM

Discrete POWER & Signal Technologies

2N5306



TO-92

NPN Darlington Transistor

This device is designed for applications requiring extremely high current gain at currents to 1.0 A. Sourced from Process 05. See MPSA14 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	25	V
V_{CBO}	Collector-Base Voltage	25	V
V_{EBO}	Emitter-Base Voltage	12	V
I_C	Collector Current - Continuous	1.2	A
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N5306	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

NPN Darlington Transistor
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

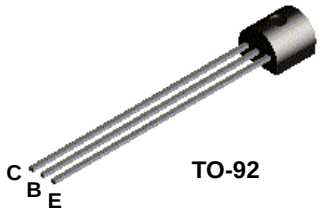
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C =10 mA, I_B = 0	25		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 0.1 µA, I_E = 0	25		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 0.1 µA, I_C = 0	12		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 25 V, I_E = 0 V_{CB} = 25 V, I_E = 0, T_A = 100 °C		0.1 20	µA µA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 12 V, I_C = 0		0.1	µA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 5.0 V, I_C = 2.0 mA V_{CE} = 5.0 V, I_C = 100 mA	7,000 20,000	70,000	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 200 mA, I_B = 0.2 mA		1.4	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 200 mA, I_B = 0.2 mA		1.6	V
$V_{BE(on)}$	Base-Emitter On Voltage	I_C = 200 mA, V_{CE} = 5.0 V		1.5	V
SMALL SIGNAL CHARACTERISTICS					
C_{cb}	Collector-Base Capacitance	V_{CB} = 10 V, f = 1.0 MHz		10	pF
h_{fe}	Small-Signal Current Gain	I_C =2.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz I_C =2.0 mA, V_{CE} = 5.0 V, f = 10 MHz	7,000 6.0		

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD SEMICONDUCTOR TM

Discrete POWER & Signal Technologies

2N5307



TO-92

NPN Darlington Transistor

This device is designed for applications requiring extremely high current gain at currents to 1.0 A. Sourced from Process 05. See MPSA14 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	40	V
V_{CBO}	Collector-Base Voltage	40	V
V_{EBO}	Emitter-Base Voltage	12	V
I_C	Collector Current - Continuous	1.2	A
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N5307	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

NPN Darlington Transistor
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

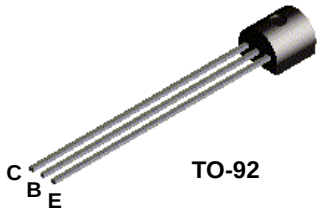
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C =10 mA, I_B = 0	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 0.1 µA, I_E = 0	40		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 0.1 µA, I_C = 0	12		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 40 V, I_E = 0 V_{CB} = 40 V, I_E = 0, T_A = 100 °C		0.1 20	µA µA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 12 V, I_C = 0		0.1	µA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 5.0 V, I_C = 2.0 mA V_{CE} = 5.0 V, I_C = 100 mA	2,000 6,000	20,000	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 200 mA, I_B = 0.2 mA		1.4	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 200 mA, I_B = 0.2 mA		1.6	V
$V_{BE(on)}$	Base-Emitter On Voltage	I_C = 200 mA, V_{CE} = 5.0 V		1.5	V
SMALL SIGNAL CHARACTERISTICS					
C_{cb}	Collector-Base Capacitance	V_{CB} = 10 V, f = 1.0 MHz		10	pF
h_{fe}	Small-Signal Current Gain	I_C =2.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz I_C =2.0 mA, V_{CE} = 5.0 V, f = 10 MHz	2,000 6.0		

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD SEMICONDUCTOR TM

Discrete POWER & Signal Technologies

2N5308



TO-92

NPN Darlington Transistor

This device is designed for applications requiring extremely high current gain at currents to 1.0 A. Sourced from Process 05. See MPSA14 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	40	V
V_{CBO}	Collector-Base Voltage	40	V
V_{EBO}	Emitter-Base Voltage	12	V
I_C	Collector Current - Continuous	1.2	A
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N5308	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

NPN Darlington Transistor

(continued)

Electrical Characteristics

TA = 25°C unless otherwise noted

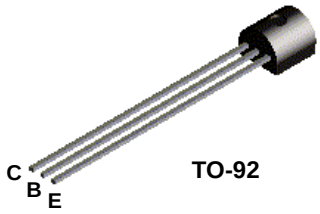
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C =10 mA, I_B = 0	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 0.1 µA, I_E = 0	40		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 0.1 µA, I_C = 0	12		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 40 V, I_E = 0 V_{CB} = 40 V, I_E = 0, T_A = 100 °C		0.1 20	µA µA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 12 V, I_C = 0		0.1	µA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 5.0 V, I_C = 2.0 mA V_{CE} = 5.0 V, I_C = 100 mA	7,000 20,000	70,000	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 200 mA, I_B = 0.2 mA		1.4	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 200 mA, I_B = 0.2 mA		1.6	V
$V_{BE(on)}$	Base-Emitter On Voltage	I_C = 200 mA, V_{CE} = 5.0 V		1.5	V
SMALL SIGNAL CHARACTERISTICS					
C_{cb}	Collector-Base Capacitance	V_{CB} = 10 V, f = 1.0 MHz		10	pF
h_{fe}	Small-Signal Current Gain	I_C = 2.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz I_C = 2.0 mA, V_{CE} = 5.0 V, f = 10 MHz	7,000 6.0		

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD SEMICONDUCTOR TM

Discrete POWER & Signal Technologies

2N5400



TO-92

PNP General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches requiring high voltages. Sourced from Process 74. See 2N5401 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	120	V
V_{CBO}	Collector-Base Voltage	130	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	200	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N5400	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

PNP General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

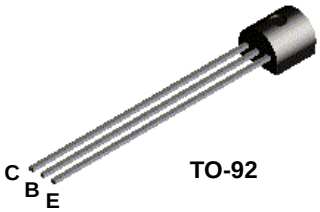
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 1.0 mA, I_B = 0	120		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 100 µA, I_E = 0	130		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	5.0		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 100 V, I_E = 0 V_{CB} = 100 V, I_E = 0, T_A = 100 °C		100 100	nA µA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 3.0 V, I_C = 0		50	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 5.0 V, I_C = 1.0 mA V_{CE} = 5.0 V, I_C = 10 mA V_{CE} = 5.0 V, I_C = 50 mA	30 40 40	 180 	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA		0.2 0.5	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA		1.0 1.0	V V
SMALL SIGNAL CHARACTERISTICS					
C_{ob}	Output Capacitance	V_{CB} = 10 V, f = 1.0 MHz		6.0	pF
f_T	Current Gain - Bandwidth Product	I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz	100	400	
h_{fe}	Small-Signal Current Gain	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz	30	200	
NF	Noise Figure	V_{CE} = 5.0 V, I_C = 250 µA, R_S = 1.0 kΩ, f = 10 Hz to 15.7 kHz		8.0	V

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD SEMICONDUCTOR™

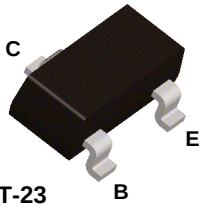
Discrete POWER & Signal Technologies

2N5401



TO-92

MMBT5401



SOT-23
Mark: 2L

PNP General Purpose Amplifier

This device is designed as a general purpose amplifier and switch for applications requiring high voltages. Sourced from Process 74.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	150	V
V_{CBO}	Collector-Base Voltage	160	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	200	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N5401	*MMBT5401	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	350 2.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	°C/W

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

© 1997 Fairchild Semiconductor Corporation

PNP General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 1.0 mA, I_B = 0	150		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 100 µA, I_E = 0	160		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	5.0		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 120 V, I_E = 0 V_{CB} = 120 V, I_E = 0, T_A = 100°C		50 50	nA µA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 3.0 V, I_C = 0		50	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	I_C = 1.0 mA, V_{CE} = 5.0 V I_C = 10 mA, V_{CE} = 5.0 V I_C = 50 mA, V_{CE} = 5.0 V	50 60 50	 240 	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA		0.2 0.5	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA		1.0 1.0	V V
SMALL SIGNAL CHARACTERISTICS					
f_T	Current Gain - Bandwidth Product	I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz	100	300	MHz
C_{obo}	Output Capacitance	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz		6.0	pF
NF	Noise Figure	I_C = 250 µA, V_{CE} = 5.0 V, R_S = 1.0 kΩ, f = 10 Hz to 15.7 kHz		8.0	dB

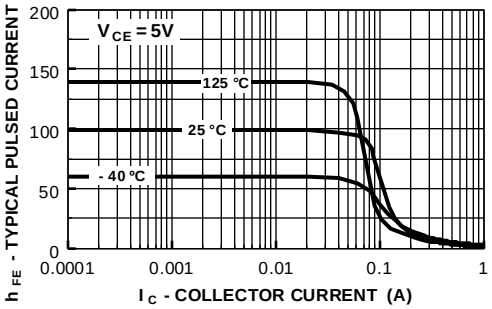
*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

Spice Model

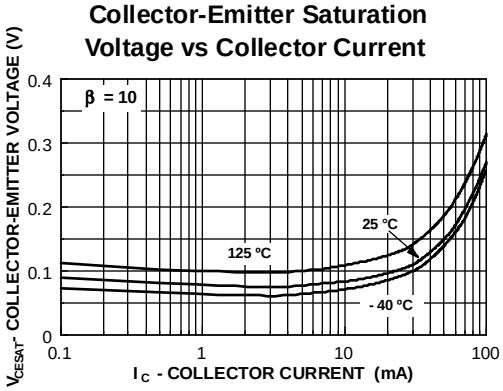
PNP (Is=21.48f Xti=3 Eg=1.11 Vaf=100 Bf=132.1 Ne=1.375 Ise=21.48f Ikf=.1848 Xtb=1.5 Br=3.661 Nc=2 Isc=0 Ikr=0 Rc=1.6 Cjc=17.63p Mjc=.5312 Vjc=.75 Fc=.5 Cje=73.39p Mje=.3777 Vje=.75 Tr=1.476n Tf=641.9p Itf=0 Vtf=0 Xtf=0 Rb=10)

Typical Characteristics

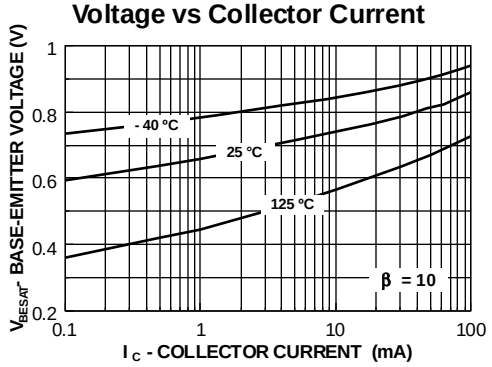
Typical Pulsed Current Gain vs Collector Current



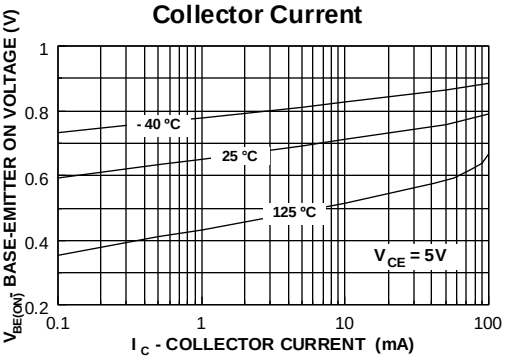
Collector-Emitter Saturation Voltage vs Collector Current



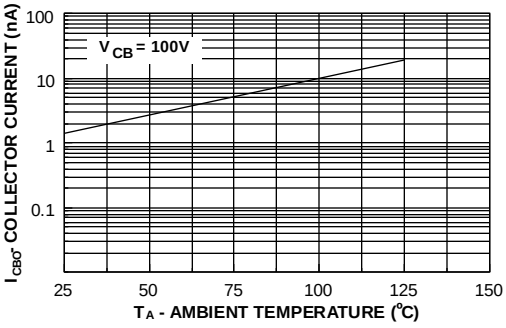
Base-Emitter Saturation Voltage vs Collector Current



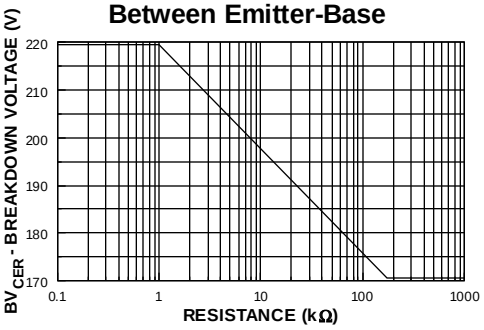
Base-Emitter ON Voltage vs Collector Current



Collector-Cutoff Current vs Ambient Temperature

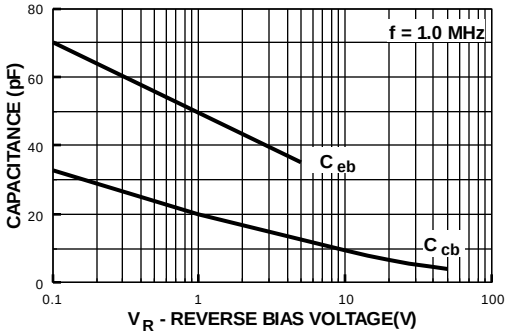


Collector-Emitter Breakdown Voltage with Resistance Between Emitter-Base

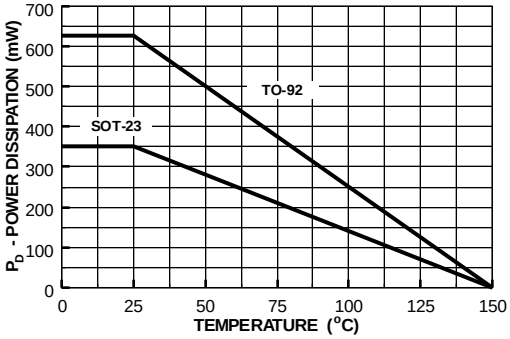


Typical Characteristics (continued)

Input and Output Capacitance vs Reverse Voltage



Power Dissipation vs Ambient Temperature

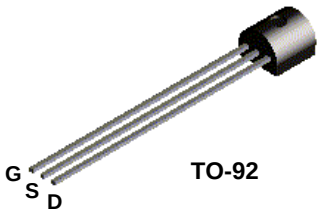


FAIRCHILD SEMICONDUCTOR TM

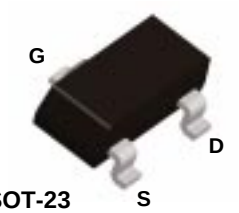
Discrete POWER & Signal Technologies

2N5457 2N5458 2N5459

MMBF5457 MMBF5458 MMBF5459



TO-92



SOT-23

Mark: 6D / 61S / 6L

N-Channel General Purpose Amplifier

This device is a low level audio amplifier and switching transistors, and can be used for analog switching applications. Sourced from Process 55.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{DG}	Drain-Gate Voltage	25	V
V_{GS}	Gate-Source Voltage	- 25	V
I_{GF}	Forward Gate Current	10	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N5457	*MMBF5457	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	350 2.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	°C/W

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

ã 1997 Fairchild Semiconductor Corporation

N-Channel General Purpose Amplifier
(continued)

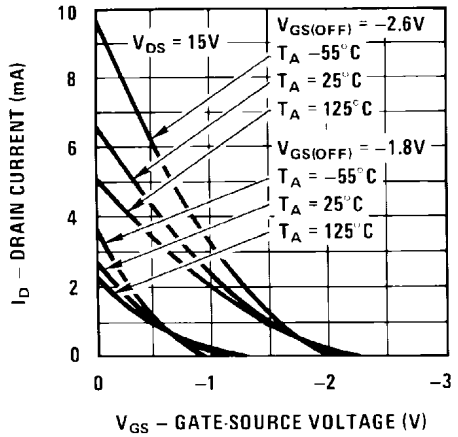
Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
OFF CHARACTERISTICS							
$V_{(BR)GSS}$	Gate-Source Breakdown Voltage	I_G = 10 μA, V_{DS} = 0		- 25			V
I_{GSS}	Gate Reverse Current	V_{GS} = -15 V, V_{DS} = 0				- 1.0	nA
		V_{GS} = -15 V, V_{DS} = 0, T_A = 100°C				- 200	nA
$V_{GS(off)}$	Gate-Source Cutoff Voltage	V_{DS} = 15 V, I_D = 10 nA	**2N5457**	- 0.5		- 6.0	V
			2N5458	- 1.0		- 7.0	V
			2N5459	- 2.0		- 8.0	V
V_{GS}	Gate-Source Voltage	V_{DS} = 15 V, I_D = 100 μA	**2N5457**		- 2.5		V
		V_{DS} = 15 V, I_D = 200 μA	**2N5458**		- 3.5		V
		V_{DS} = 15 V, I_D = 400 μA	**2N5459**		- 4.5		V
ON CHARACTERISTICS							
I_{DSS}	Zero-Gate Voltage Drain Current*	V_{DS} = 15 V, V_{GS} = 0	**2N5457**	1.0	3.0	5.0	mA
			2N5458	2.0	6.0	9.0	mA
			2N5459	4.0	9.0	16	mA
SMALL SIGNAL CHARACTERISTICS							
g_{fs}	Forward Transfer Conductance*	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 kHz					
			2N5457	1000		5000	μmhos
			2N5458	1500		5500	μmhos
			2N5459	2000		6000	μmhos
g_{os}	Output Conductance*	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 kHz			10	50	μmhos
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 MHz			4.5	7.0	pF
C_{rss}	Reverse Transfer Capacitance	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 MHz			1.5	3.0	pF
NF	Noise Figure	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 kHz, R_G = 1.0 megohm, BW = 1.0 Hz				3.0	dB

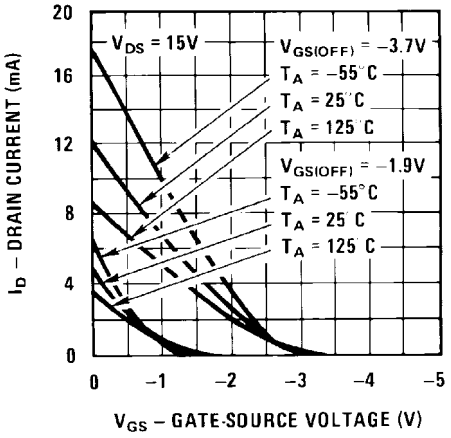
*Pulse Test: Pulse Width ≤ 300 ms, Duty Cycle ≤ 2%

Typical Characteristics

Transfer Characteristics

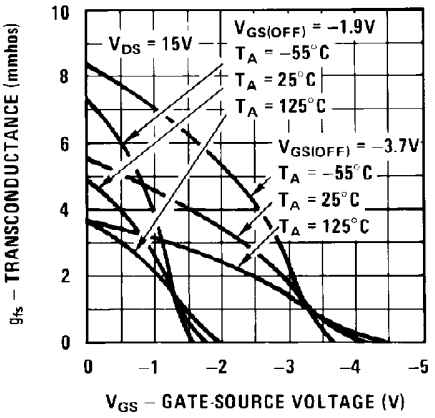


Transfer Characteristics

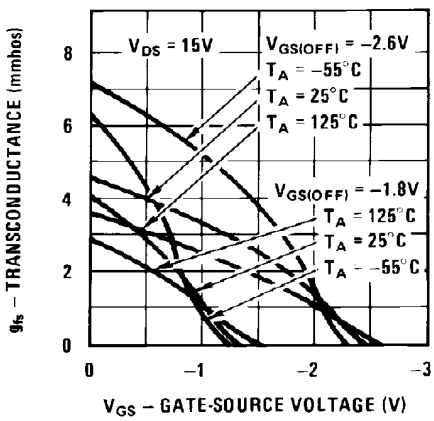


Typical Characteristics (continued)

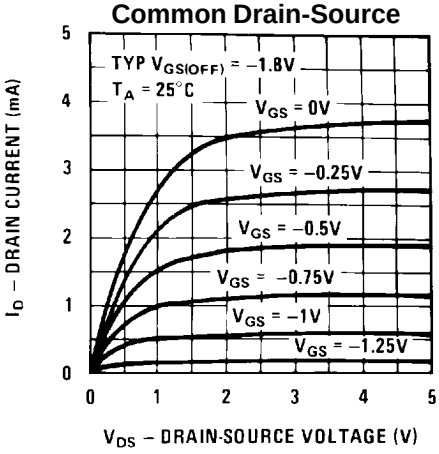
Transfer Characteristics



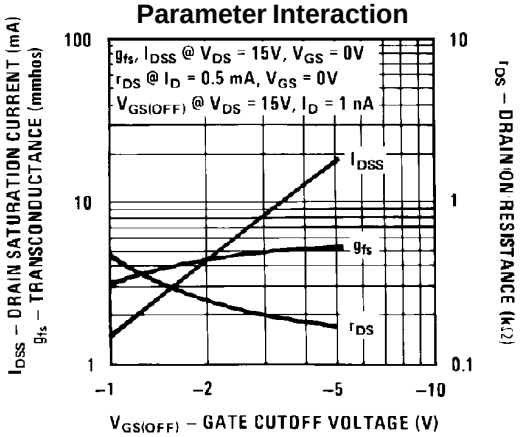
Transfer Characteristics



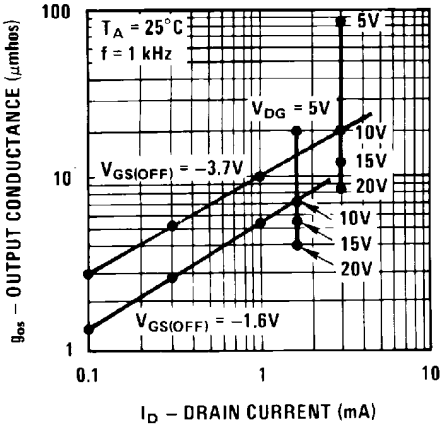
Common Drain-Source



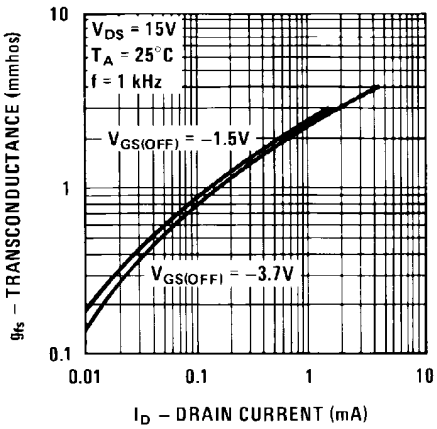
Parameter Interaction



Output Conductance vs. Drain Current

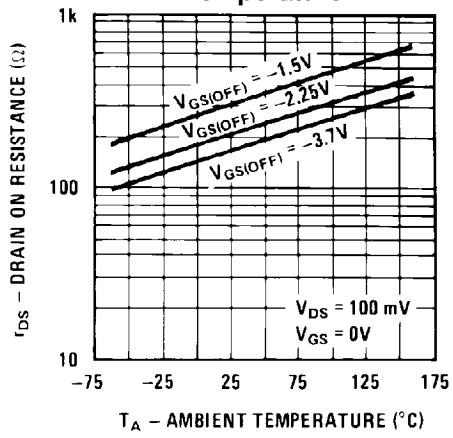


Transconductance vs. Drain Current

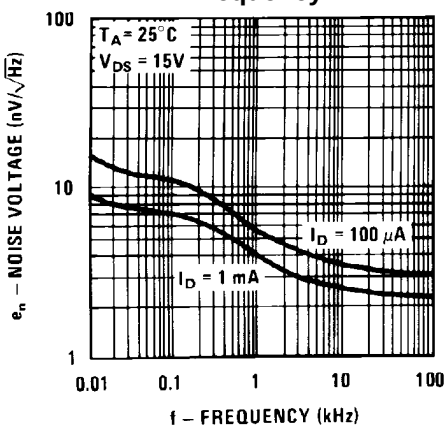


Typical Characteristics (continued)

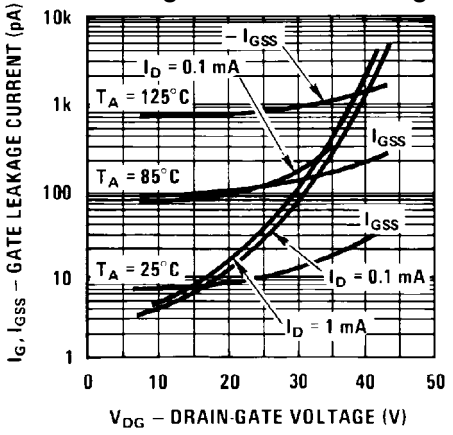
Channel Resistance vs. Temperature



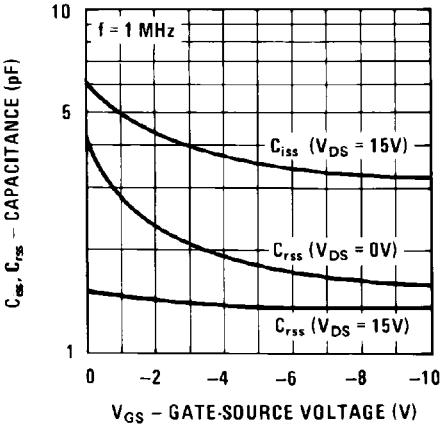
Noise Voltage vs. Frequency



Leakage Current vs. Voltage



Capacitance vs. Voltage

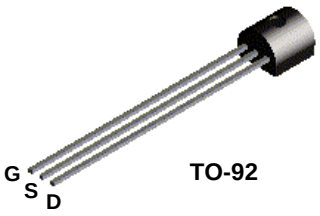


FAIRCHILD SEMICONDUCTOR TM

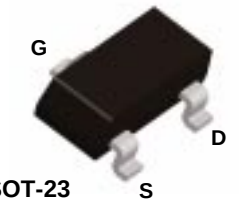
Discrete POWER & Signal Technologies

2N5460 2N5461 2N5462

MMBF5460 MMBF5461



TO-92



SOT-23
Mark: 6E / 61U

P-Channel General Purpose Amplifier

This device is designed primarily for low level audio and general purpose applications with high impedance signal sources. Sourced from Process 89.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{DG}	Drain-Gate Voltage	- 40	V
V_{GS}	Gate-Source Voltage	40	V
I_{GF}	Forward Gate Current	10	mA
T_J ,T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N5460	*MMBF5460	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	350 2.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	°C/W

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

ã 1997 Fairchild Semiconductor Corporation

P-Channel General Purpose Amplifier
(continued)

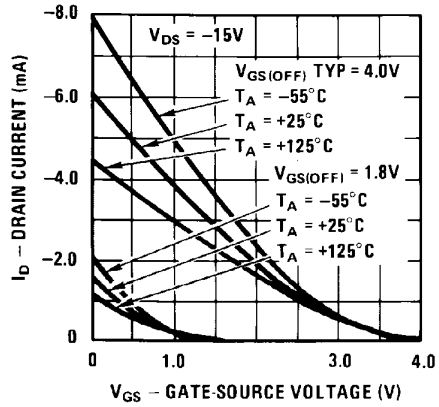
Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
OFF CHARACTERISTICS							
$V_{(BR)GSS}$	Gate-Source Breakdown Voltage	I_G = 10 μA, V_{DS} = 0		40			V
I_{GSS}	Gate Reverse Current	V_{GS} = 20 V, V_{DS} = 0				5.0	nA
		V_{GS} = 20 V, V_{DS} = 0, T_A = 100°C				1.0	μA
$V_{GS(off)}$	Gate-Source Cutoff Voltage	V_{DS} = 15 V, I_D = 1.0 μA	**2N5460**	0.75		6.0	V
			2N5461	1.0		7.5	V
			2N5462	1.8		9.0	V
V_{GS}	Gate-Source Voltage	V_{DS} = 15 V, I_D = 0.1 mA	**2N5460**	0.5		4.0	V
		V_{DS} = 15 V, I_D = 0.2 mA	**2N5461**	0.8		4.5	V
		V_{DS} = 15 V, I_D = 0.4 mA	**2N5462**	1.5		6.0	V
ON CHARACTERISTICS							
I_{DSS}	Zero-Gate Voltage Drain Current*	V_{DS} = 15 V, V_{GS} = 0	**2N5460**	- 1.0		- 5.0	mA
			2N5461	- 2.0		- 9.0	mA
			2N5462	- 4.0		- 16	mA
SMALL SIGNAL CHARACTERISTICS							
g_{fs}	Forward Transfer Conductance	V_{DS} = 15, V_{GS} = 0, f = 1.0 kHz					
			2N5460	1000		4000	μmhos
			2N5461	1500		5000	μmhos
			2N5462	2000		6000	μmhos
g_{os}	Output Conductance	V_{DS} = 15, V_{GS} = 0, f = 1.0 kHz				75	μmhos
C_{iss}	Input Capacitance	V_{DS} = 15, V_{GS} = 0, f = 1.0 MHz			5.0	7.0	pF
C_{rss}	Reverse Transfer Capacitance	V_{DS} = 15, V_{GS} = 0, f = 1.0 MHz			1.0	2.0	pF
NF	Noise Figure	V_{DS} = 15 V, V_{GS} = 0, R_G = 1.0 megohm, f = 100 Hz, BW = 1.0 Hz			1.0	2.5	dB
e_n	Equivalent Short-Circuit Input Noise Voltage	V_{DS} = 15 V, V_{GS} = 0, f = 100 Hz, BW = 1.0 Hz			60	115	$nV/\sqrt{Hz}$

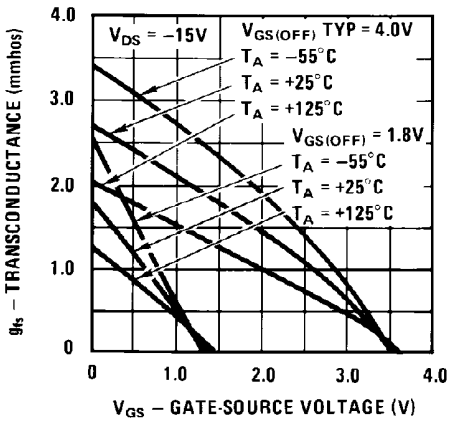
*Pulse Test: Pulse Width £ 300 ms, Duty Cycle £ 2%

Typical Characteristics (continued)

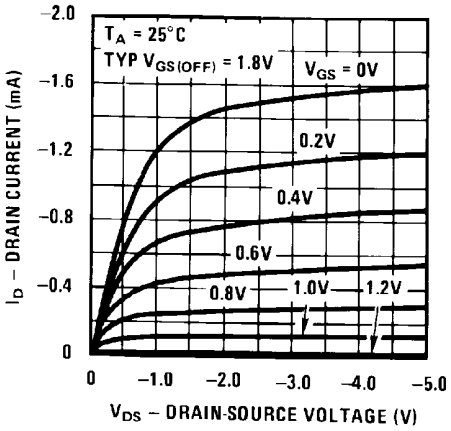
Transfer Characteristics



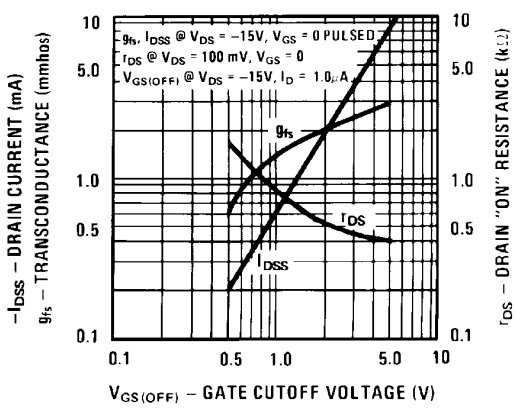
Transfer Charactersitics



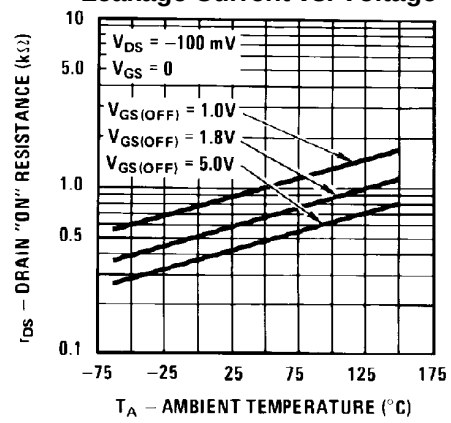
Common Drain-Source



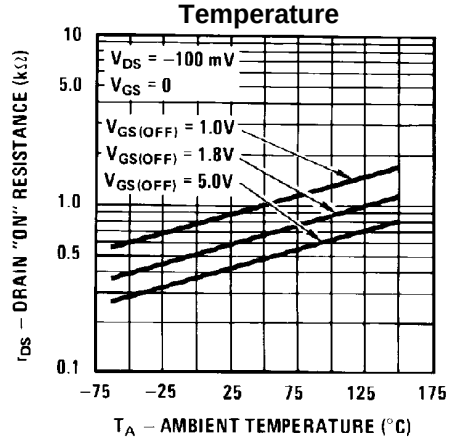
Parameter Interactions



Leakage Current vs. Voltage

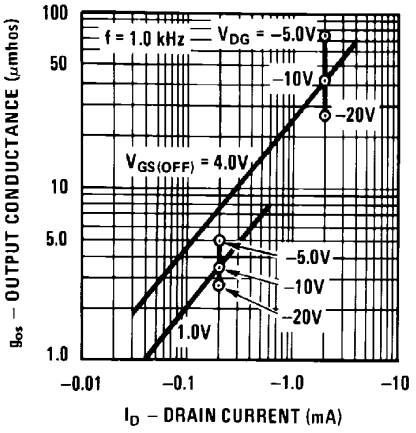


Channel Resistance vs. Temperature

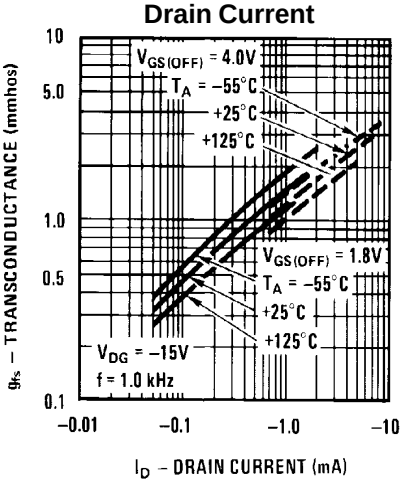


Typical Characteristics (continued)

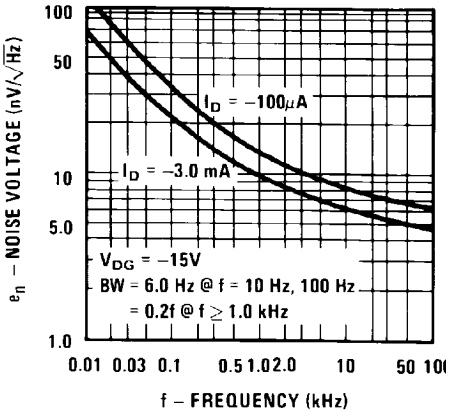
Output Conductance vs. Drain Current



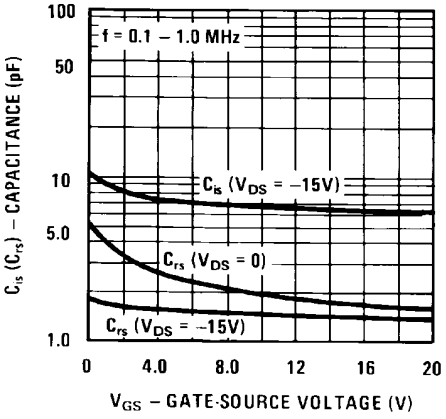
Transconductance vs. Drain Current



Noise Voltage vs. Frequency



Capacitance vs. Voltage

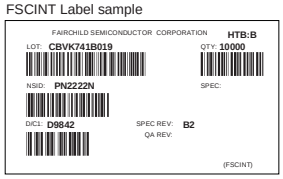


TO-92 Tape and Reel Data and Package Dimensions

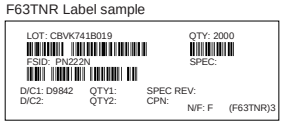
FAIRCHILD SEMICONDUCTOR™

TO-92 Packaging
Configuration: Figure 1.0

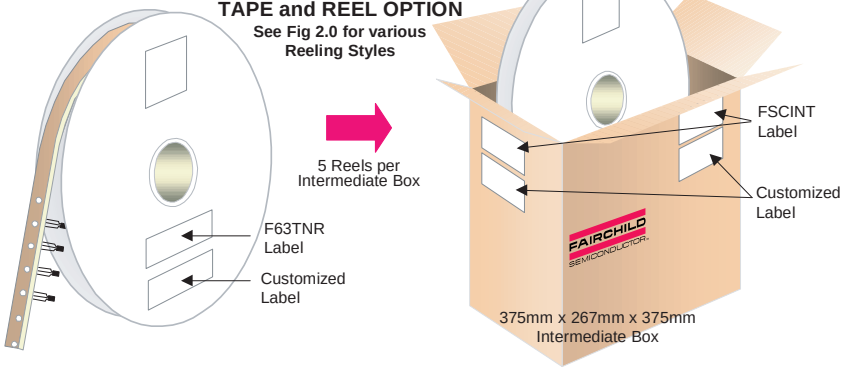
FSCINT Label sample



F63TNR Label sample



TAPE and REEL OPTION
See Fig 2.0 for various Reeling Styles

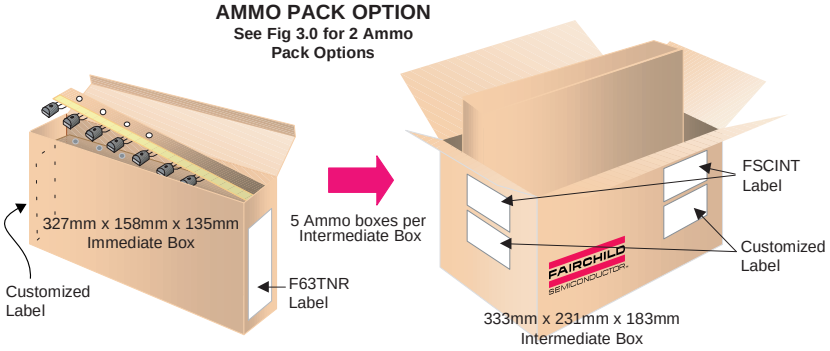


TO-92 TNR/AMMO PACKING INFROMATION

Packing	Style	Quantity	EOL code
Reel	A	2,000	D26Z
	E	2,000	D27Z
Ammo	M	2,000	D74Z
	P	2,000	D75Z

Unit weight = 0.22 gm
Reel weight with components = 1.04 kg
Ammo weight with components = 1.02 kg
Max quantity per intermediate box = 10,000 units

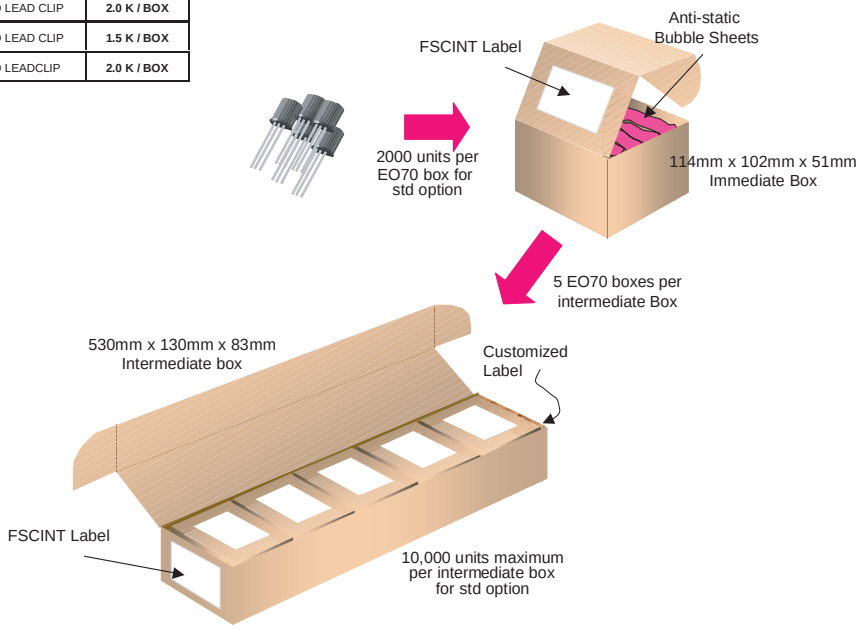
AMMO PACK OPTION
See Fig 3.0 for 2 Ammo Pack Options



(TO-92) BULK PACKING INFORMATION

EOL CODE	DESCRIPTION	LEADCLIP DIMENSION	QUANTITY
J18Z	TO-18 OPTION STD	NO LEAD CLIP	2.0 K / BOX
J05Z	TO-5 OPTION STD	NO LEAD CLIP	1.5 K / BOX
NO EOL CODE	TO-92 STANDARD STRAIGHT	NO LEADCLIP	2.0 K / BOX

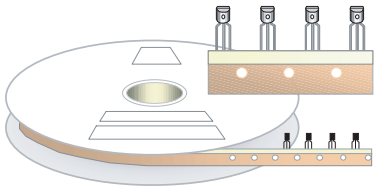
BULK OPTION
See Bulk Packing Information table



TO-92 Tape and Reel Data and Package Dimensions, continued

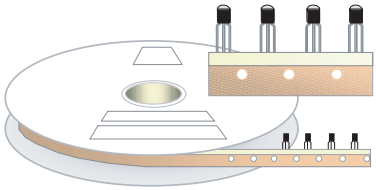
TO-92 Reeling Style
Configuration: Figure 2.0

Machine Option “A” (H)



Style “A”, D26Z, D70Z (s/h)

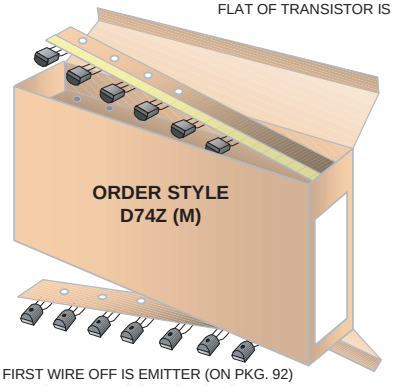
Machine Option “E” (J)



Style “E”, D27Z, D71Z (s/h)

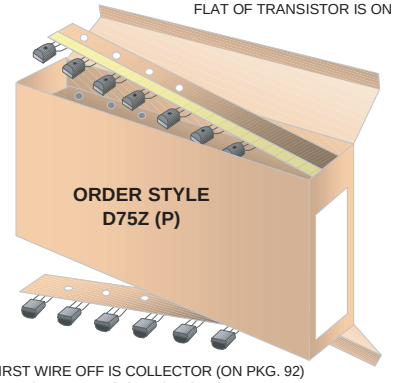
TO-92 Radial Ammo Packaging
Configuration: Figure 3.0

FIRST WIRE OFF IS COLLECTOR
ADHESIVE TAPE IS ON THE TOP SIDE
FLAT OF TRANSISTOR IS ON TOP



FIRST WIRE OFF IS EMITTER (ON PKG. 92)
ADHESIVE TAPE IS ON BOTTOM SIDE
FLAT OF TRANSISTOR IS ON BOTTOM

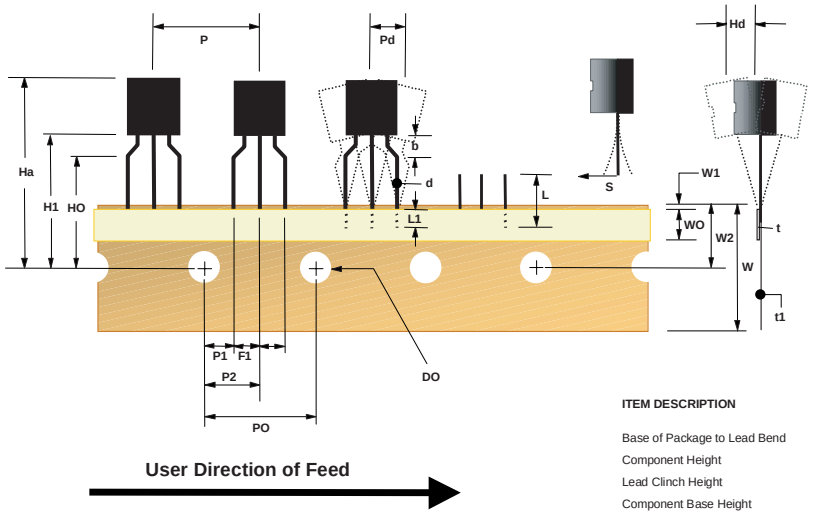
FIRST WIRE OFF IS EMITTER
ADHESIVE TAPE IS ON THE TOP SIDE
FLAT OF TRANSISTOR IS ON BOTTOM



FIRST WIRE OFF IS COLLECTOR (ON PKG. 92)
ADHESIVE TAPE IS ON BOTTOM SIDE
FLAT OF TRANSISTOR IS ON TOP

TO-92 Tape and Reel Data and Package Dimensions, continued

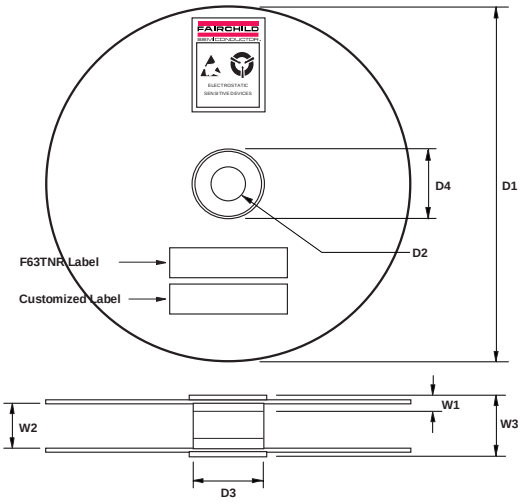
TO-92 Tape and Reel Taping
Dimension Configuration: Figure 4.0



ITEM DESCRIPTION	SYMBOL	DIMENSION
Base of Package to Lead Bend	b	0.098 (max)
Component Height	Ha	0.928 (+/- 0.025)
Lead Clinch Height	HO	0.630 (+/- 0.020)
Component Base Height	H1	0.748 (+/- 0.020)
Component Alignment (side/side)	Pd	0.040 (max)
Component Alignment (front/back)	Hd	0.031 (max)
Component Pitch	P	0.500 (+/- 0.020)
Feed Hole Pitch	PO	0.500 (+/- 0.008)
Hole Center to First Lead	P1	0.150 (+0.009, -0.010)
Hole Center to Component Center	P2	0.247 (+/- 0.007)
Lead Spread	F1/F2	0.104 (+/- 0 .010)
Lead Thickness	d	0.018 (+0.002, -0.003)
Cut Lead Length	L	0.429 (max)
Taped Lead Length	L1	0.209 (+0.051, -0.052)
Taped Lead Thickness	t	0.032 (+/- 0.006)
Carrier Tape Thickness	t1	0.021 (+/- 0.006)
Carrier Tape Width	W	0.708 (+0.020, -0.019)
Hold - down Tape Width	WO	0.236 (+/- 0.012)
Hold - down Tape position	W1	0.035 (max)
Feed Hole Position	W2	0.360 (+/- 0.025)
Sprocket Hole Diameter	DO	0.157 (+0.008, -0.007)
Lead Spring Out	S	0.004 (max)

Note : All dimensions are in inches.

TO-92 Reel
Configuration: Figure 5.0

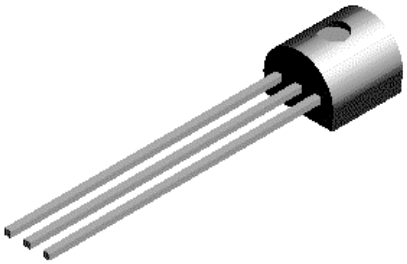


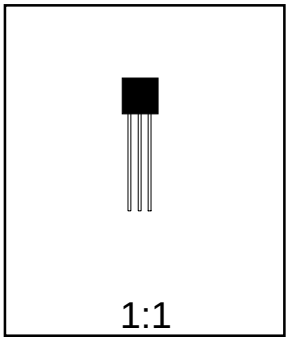
ITEM DESCRIPTION	SYSMBOL	MINIMUM	MAXIMUM
Reel Diameter	D1	13.975	14.025
Arbor Hole Diameter (Standard)	D2	1.160	1.200
(Small Hole)	D2	0.650	0.700
Core Diameter	D3	3.100	3.300
Hub Recess Inner Diameter	D4	2.700	3.100
Hub Recess Depth	W1	0.370	0.570
Flange to Flange Inner Width	W2	1.630	1.690
Hub to Hub Center Width	W3		2.090

Note: All dimensions are inches

TO-92 Tape and Reel Data and Package Dimensions

TO-92 (FS PKG Code 92, 94, 96)





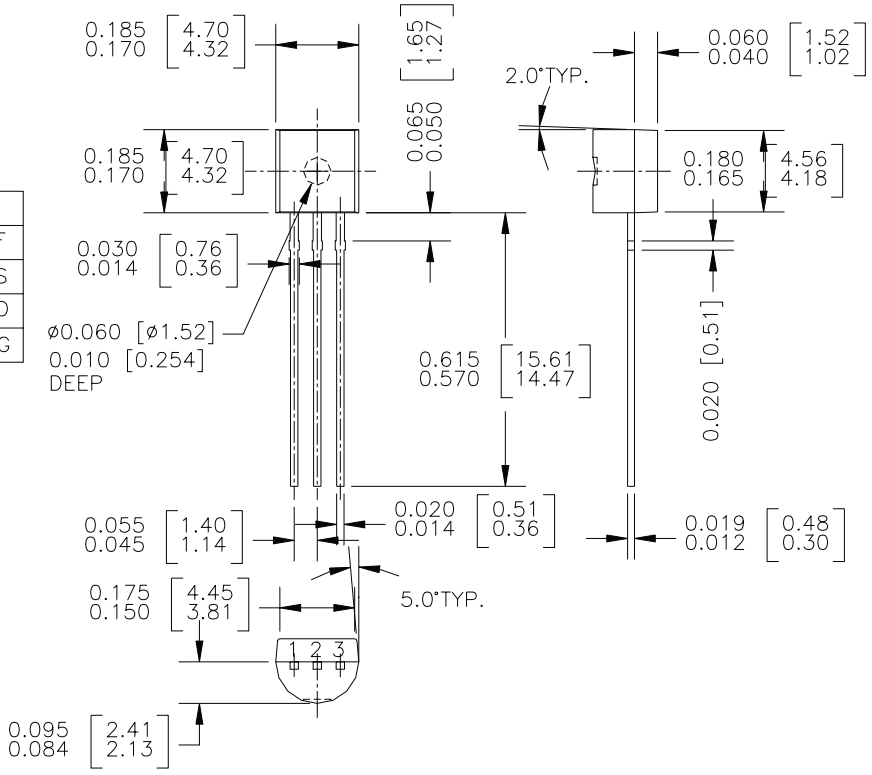
Scale 1:1 on letter size paper

Dimensions shown below are in:
inches [millimeters]

Part Weight per unit (gram): 0.1977

TO−92 (92,94,96)

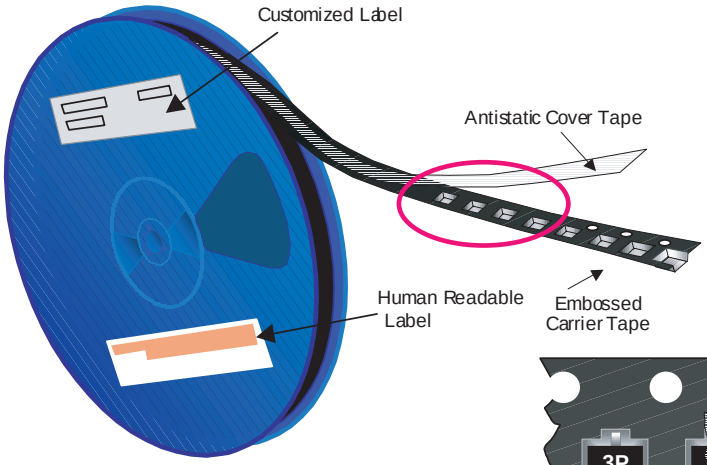
PIN	92		94		96	
	B	F	B	F	B	F
1	E	D	E	D	B	S
2	B	S	C	G	E	D
3	C	G	B	S	C	G



SOT-23 Tape and Reel Data and Package Dimensions

FAIRCHILD SEMICONDUCTOR™

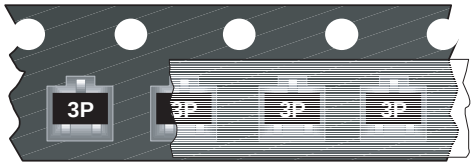
SOT-23 Packaging Configuration: Figure 10



Packaging Description:

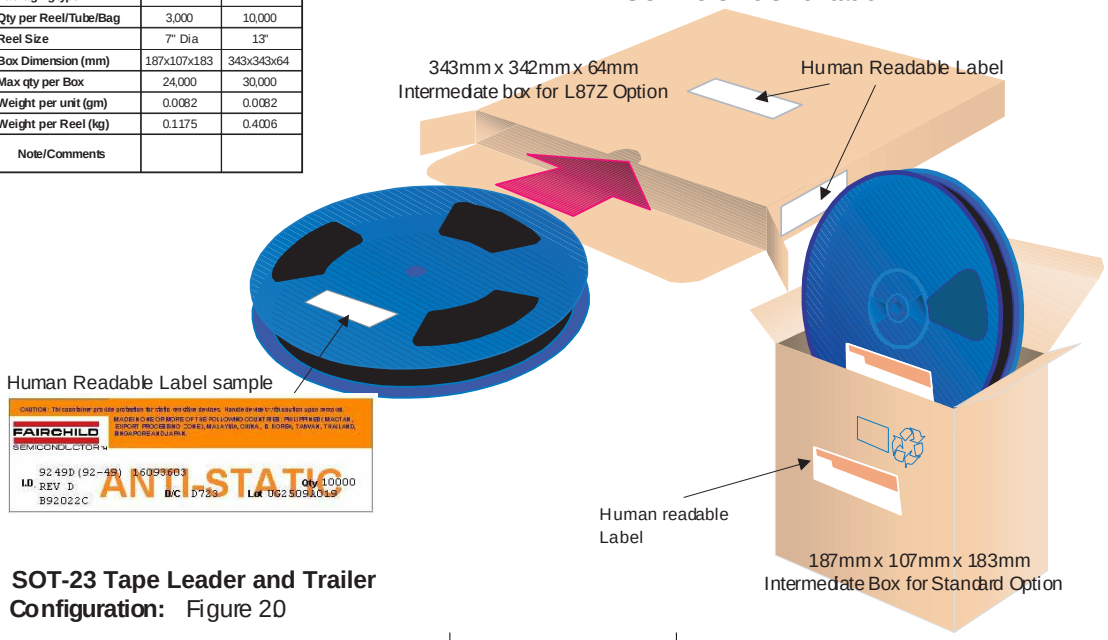
SOT-23 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000 units per 7" or 177cm diameter reel. The reels are dark blue in color and is made of polystyrene plastic (anti-static coated). Other option comes in 10,000 units per 13" or 330cm diameter reel. This and some other options are described in the Packaging Information table.

These full reels are individually labeled and placed inside a standard intermediate made of recyclable corrugated brown paper with a Fairchild logo printing. One pizza box contains eight reels maximum. And these intermediate boxes are placed inside a labeled shipping box which comes in different sizes depending on the number of parts shipped.

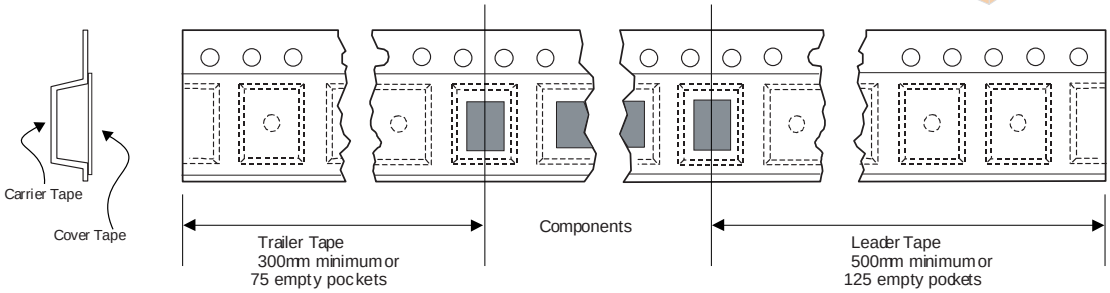


SOT-23 Packaging Information		
Packaging Option	Standard (no flow code)	D87Z
Packaging type	TNR	TNR
Qty per Reel/Tube/Bag	3,000	10,000
Reel Size	7" Dia	13"
Box Dimension (mm)	187x107x183	343x343x64
Max qty per Box	24,000	30,000
Weight per unit (gm)	0.0082	0.0082
Weight per Reel (kg)	0.1175	0.4006
Note/Comments		

SOT-23 Unit Orientation

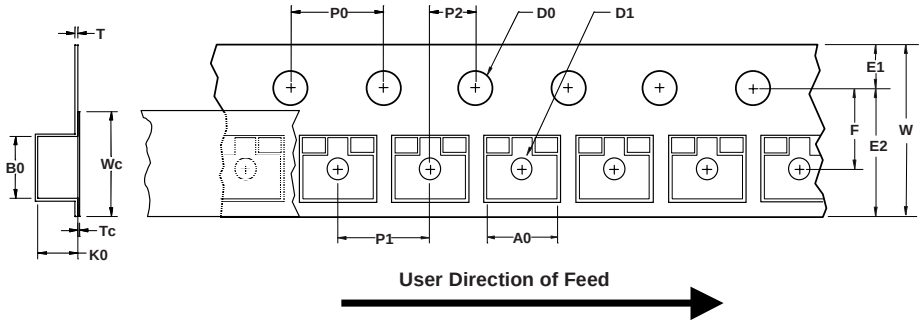


SOT-23 Tape Leader and Trailer Configuration: Figure 20



SOT-23 Tape and Reel Data and Package Dimensions, continued

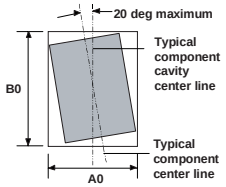
SOT-23 Embossed Carrier Tape
Configuration: Figure 3.0



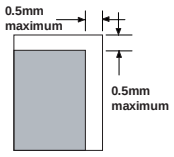
Dimensions are in millimeter														
Pkg type	**A0**	**B0**	**W**	**D0**	**D1**	**E1**	**E2**	**F**	**P1**	**P0**	**K0**	**T**	**Wc**	**Tc**
SOT-23 (8mm)	3.15 +/-0.10	2.77 +/-0.10	8.0 +/-0.3	1.55 +/-0.05	1.125 +/-0.125	1.75 +/-0.10	6.25 min	3.50 +/-0.05	4.0 +/-0.1	4.0 +/-0.1	1.30 +/-0.10	0.228 +/-0.013	5.2 +/-0.3	0.06 +/-0.02

Notes: A0, B0, and K0 dimensions are determined with respect to the EIA/Jedec RS-481 rotational and lateral movement requirements (see sketches A, B, and C).

Sketch A (Side or Front Sectional View)
Component Rotation

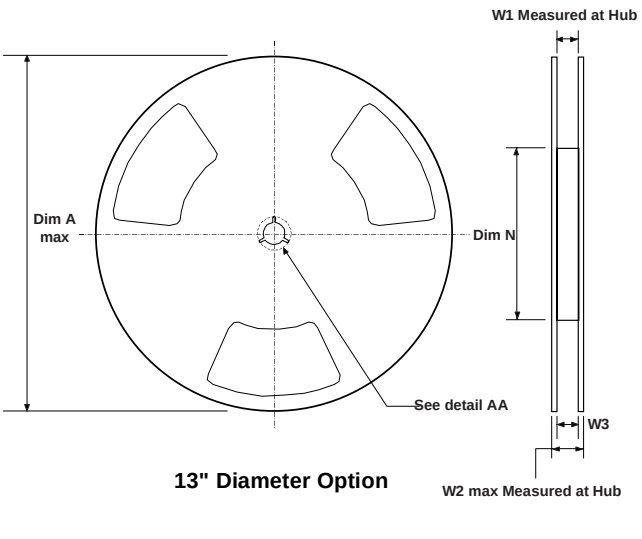


Sketch B (Top View)
Component Rotation

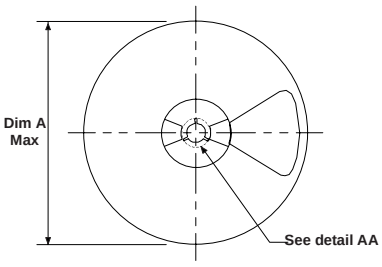


Sketch C (Top View)
Component lateral movement

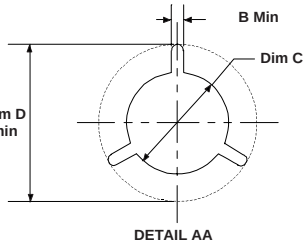
SOT-23 Reel Configuration: Figure 4.0



13" Diameter Option



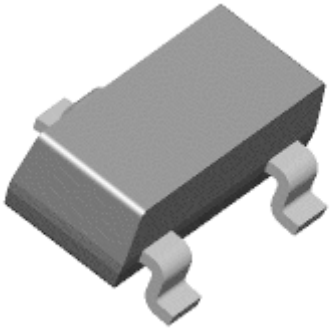
7" Diameter Option

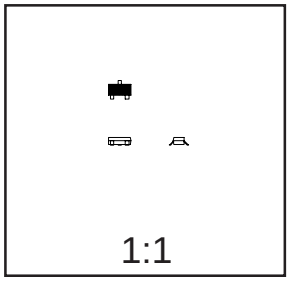


Dimensions are in inches and millimeters									
Tape Size	**Reel Option**	**Dim A**	**Dim B**	**Dim C**	**Dim D**	**Dim N**	**Dim W1**	**Dim W2**	**Dim W3 (LSL-USL)**
8mm	7" Dia	7.00 177.8	0.059 1.5	512 +0.020/-0.008 13 +0.5/-0.2	0.795 20.2	2.165 55	0.331 +0.059/-0.000 8.4 +1.5/0	0.567 14.4	0.311 – 0.429 7.9 – 10.9
8mm	13" Dia	13.00 330	0.059 1.5	512 +0.020/-0.008 13 +0.5/-0.2	0.795 20.2	4.00 100	0.331 +0.059/-0.000 8.4 +1.5/0	0.567 14.4	0.311 – 0.429 7.9 – 10.9

SOT-23 Tape and Reel Data and Package Dimensions, continued

SOT-23 (FS PKG Code 49)

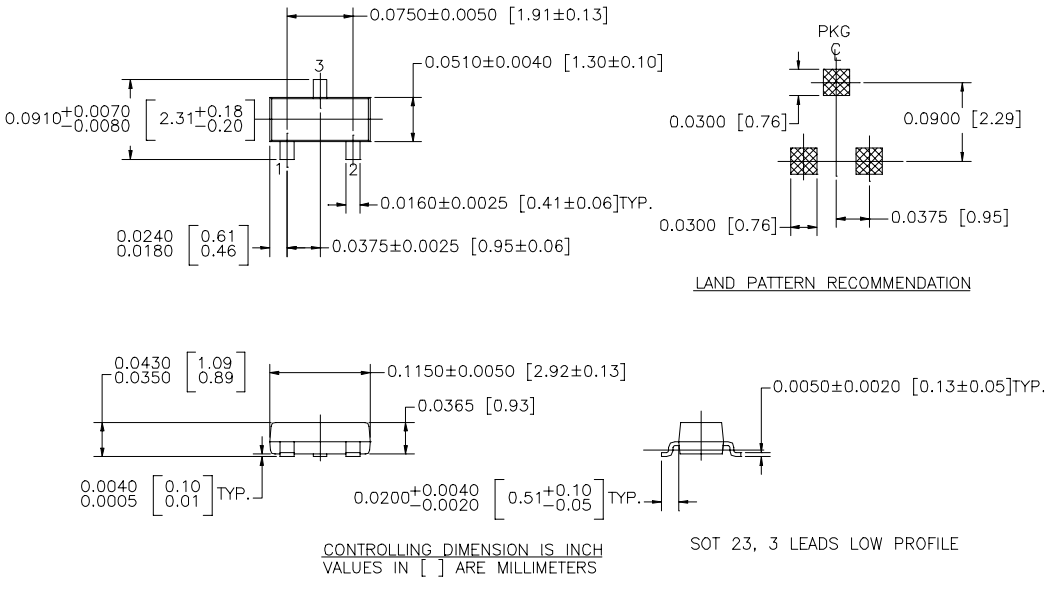




Scale 1:1 on letter size paper

Dimensions shown below are in:
inches [millimeters]

Part Weight per unit (gram): 0.0082



NOTE : UNLESS OTHERWISE SPECIFIED

1. STANDARD LEAD FINISH 150 MICROINCHES / 3.81 MICROMETERS MINIMUM TIN / LEAD (SOLDER) ON ALLOY 42
2. REFERENCE JEDEC REGISTRATION TO−236, VARIATION AB, ISSUE G, DATED JUL 1993

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™
CoolFET™
CROSSVOLT™
E^2CMOS^{TM}
FACT™
FACT Quiet Series™
FAST®
FASTr™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
POP™
PowerTrench®
QFET™
QS™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SyncFET™
TinyLogic™
UHC™
VCX™

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.
As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

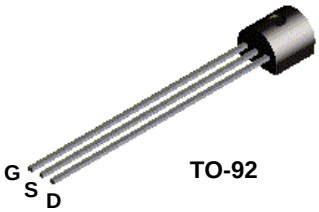
Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

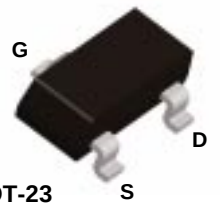
FAIRCHILD SEMICONDUCTOR TM

Discrete POWER & Signal Technologies

2N5484 2N5485 2N5486 MMBF5484 MMBF5485 MMBF5486



TO-92



SOT-23

Mark: 6B / 6M / 6H

N-Channel RF Amplifier

This device is designed primarily for electronic switching applications such as low On Resistance analog switching. Sourced from Process 50.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{DG}	Drain-Gate Voltage	25	V
V_{GS}	Gate-Source Voltage	- 25	V
I_{GF}	Forward Gate Current	10	mA
T_J ,T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N5484	*MMBF5484	
P_D	Total Device Dissipation Derate above 25°C	350 2.8	225 1.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	125		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	357	556	°C/W

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

ã 1997 Fairchild Semiconductor Corporation

N-Channel RF Amplifier
(continued)

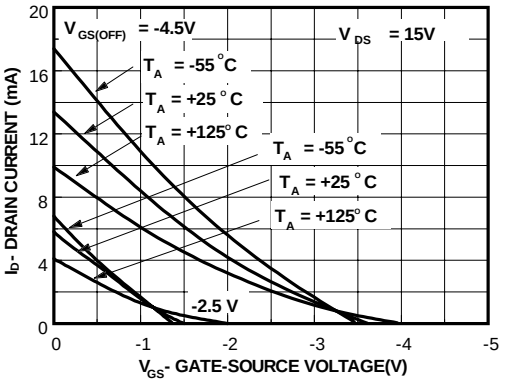
Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS						
$V_{(BR)GSS}$	Gate-Source Breakdown Voltage	I_G = - 1.0 µA, V_{DS} = 0	- 25			V
I_{GSS}	Gate Reverse Current	V_{GS} = - 20 V, V_{DS} = 0			- 1.0	nA
		V_{GS} = - 20 V, V_{DS} = 0, T_A = 100°C			- 0.2	µA
$V_{GS(off)}$	Gate-Source Cutoff Voltage	V_{DS} = 15 V, I_D = 10 nA **2N5484**	- 0.3		- 3.0	V
		2N5485	- 0.5		- 4.0	V
		2N5486	- 2.0		- 6.0	V
ON CHARACTERISTICS						
I_{DSS}	Zero-Gate Voltage Drain Current*	V_{DS} = 15 V, V_{GS} = 0 **2N5484**	1.0		5.0	mA
		2N5485	4.0		10	mA
		2N5486	8.0		20	mA
SMALL SIGNAL CHARACTERISTICS						
g_{fs}	Forward Transfer Conductance	V_{DS} = 15, V_{GS} = 0, f = 1.0 kHz				
		2N5484	3000		6000	µmhos
		2N5485	3500		7000	µmhos
		2N5486	4000		8000	µmhos
$Re(y_{is})$	Input Conductance	V_{DS} = 15, V_{GS} = 0, f = 100 MHz				
		2N5484			100	µmhos
		V_{DS} = 15, V_{GS} = 0, f = 400 MHz				
		2N5485 / 2N5486			1000	µmhos
g_{os}	Output Conductance	V_{DS} = 15, V_{GS} = 0, f = 1.0 kHz				
		2N5484			50	µmhos
		2N5485			60	µmhos
		2N5486			75	µmhos
$Re(y_{os})$	Output Conductance	V_{DS} = 15, V_{GS} = 0, f = 100 MHz				
		2N5484			75	µmhos
		V_{DS} = 15, V_{GS} = 0, f = 400 MHz				
		2N5485 / 2N5486			100	µmhos
$Re(y_{fs})$	Forward Transconductance	V_{DS} = 15, V_{GS} = 0, f = 100 MHz				
		2N5484	2500			µmhos
		V_{DS} = 15, V_{GS} = 0, f = 400 MHz				
		2N5485	3000			µmhos
		2N5486	3500			µmhos
C_{iss}	Input Capacitance	V_{DS} = 15, V_{GS} = 0, f = 1.0 MHz			5.0	pF
C_{rss}	Reverse Transfer Capacitance	V_{DS} = 15, V_{GS} = 0, f = 1.0 MHz			1.0	pF
C_{oss}	Output Capacitance	V_{DS} = 15, V_{GS} = 0, f = 1.0 MHz			2.0	pF
NF	Noise Figure	V_{DS}= 15 V, R_G = 1.0 kΩ,				
		f = 100 MHz **2N5484**			3.0	dB
		V_{DS}= 15 V, R_G = 1.0 kΩ,				
		f = 400 MHz **2N5484**		4.0		dB
		V_{DS}= 15 V , R_G = 1.0 kΩ,				
		f = 100 MHz **2N5485 / 2N5486**			2.0	dB
		V_{DS}= 15 V, R_G = 1.0 kΩ,				
		f = 400 MHz **2N5485 / 2N5486**			4.0	dB

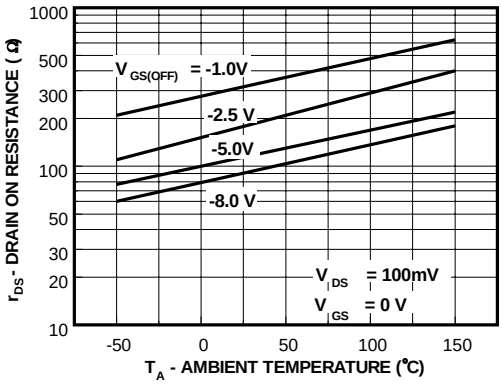
*Pulse Test: Pulse Width £ 300 ms, Duty Cycle £ 2%

Typical Characteristics

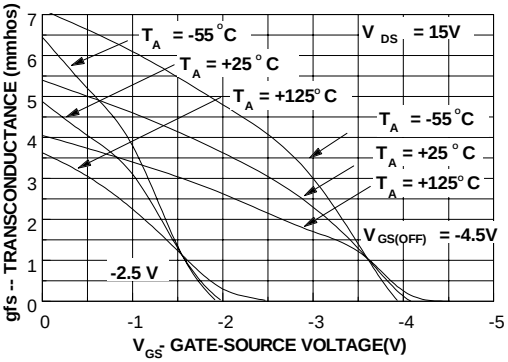
Transfer Characteristics



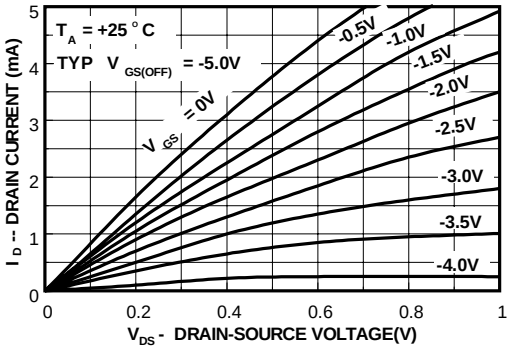
Channel Resistance vs Temperature



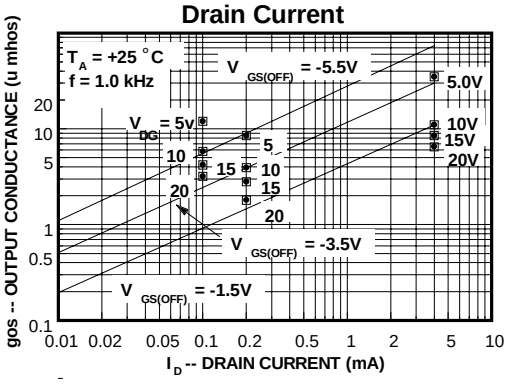
Transconductance Characteristics



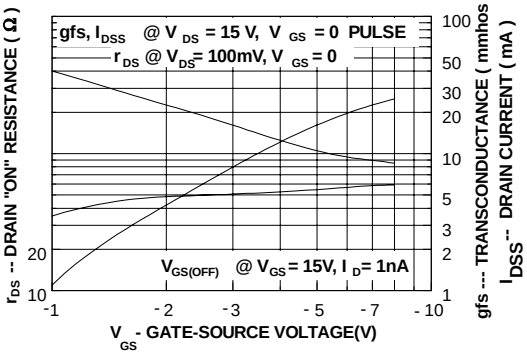
Common Drain-Source Characteristics



Output Conductance vs Drain Current

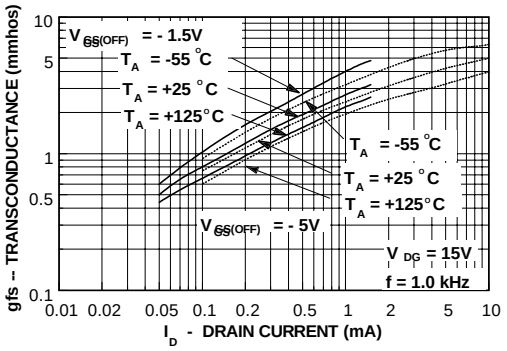


Transconductance Parameter Interactions

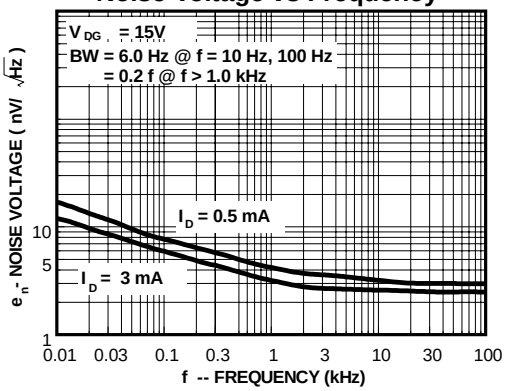


Typical Characteristics (continued)

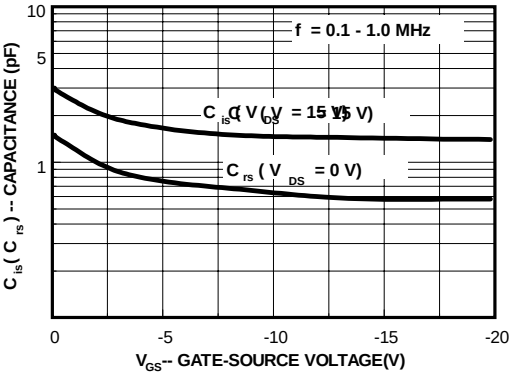
Transconductance vs Drain Current



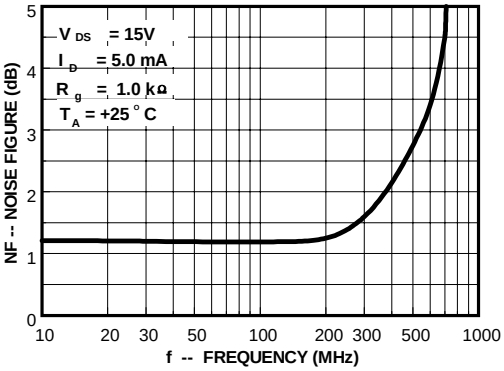
Noise Voltage vs Frequency



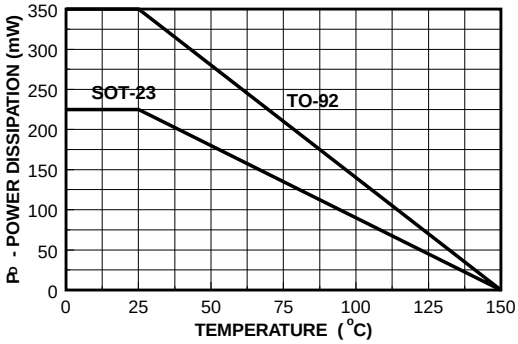
Capacitance vs Voltage



Noise Figure Frequency



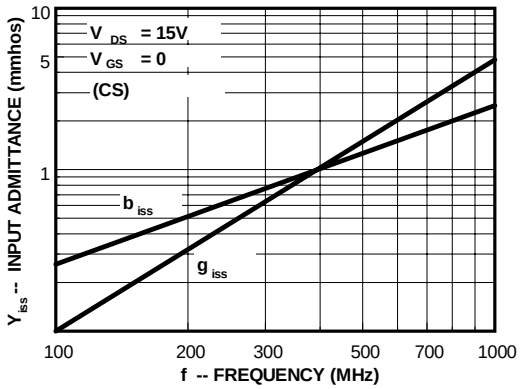
Power Dissipation vs Ambient Temperature



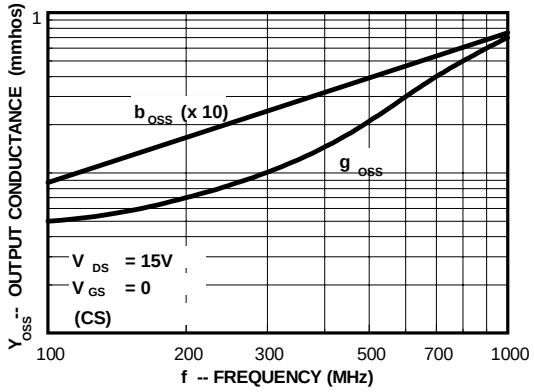
N-Channel RF Amplifier
(continued)

Common Source Characteristics

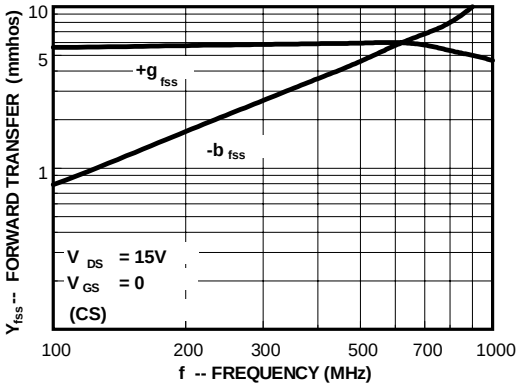
Input Admittance



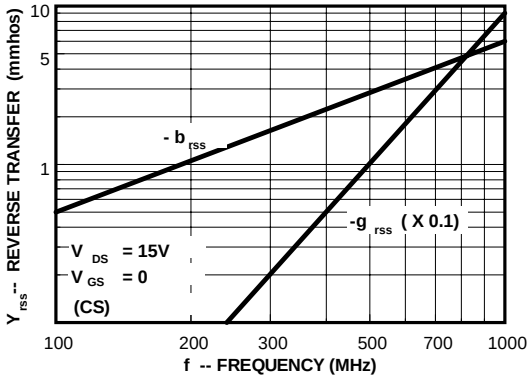
Output Admittance



Forward Transadmittance

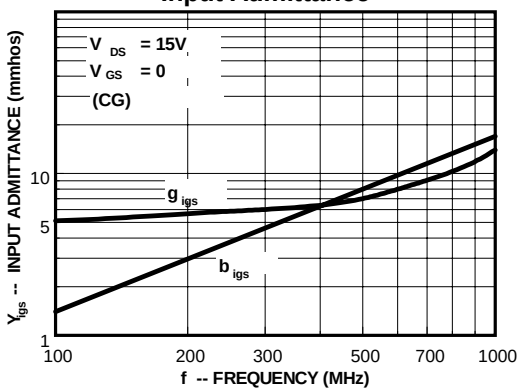


Reverse Transadmittance

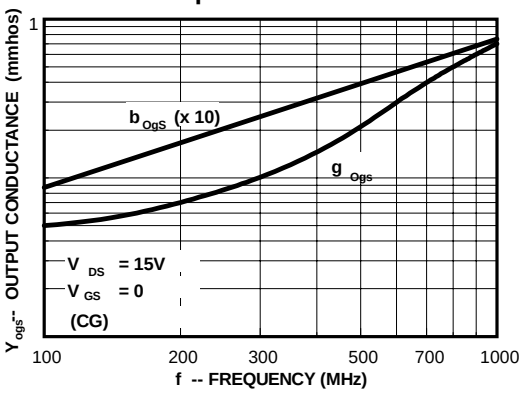


Common Gate Characteristics

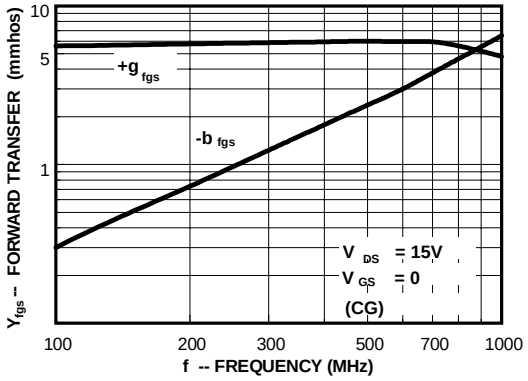
Input Admittance



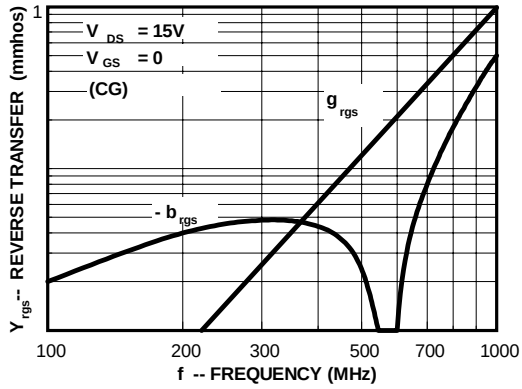
Output Admittance



Forward Transadmittance



Reverse Transadmittance



TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™
CoolFET™
CROSSVOLT™
E^2CMOS^{TM}
FACT™
FACT Quiet Series™
FAST®
FASTr™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
POP™
PowerTrench™
QS™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
TinyLogic™

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.
As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

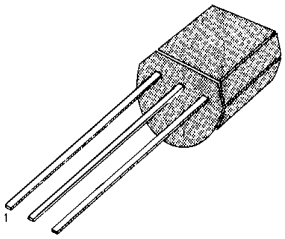
Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

2N5550 NPN EPITAXIAL SILICON TRANSISTOR

AMPLIFIER TRANSISTOR

- Collector-Emitter Voltage: V_{CEO}= 140V
- Collector Dissipation: P_C (max)=625mW

TO-92



1.Emitter 2. Base 3. Collector

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V_{CBO}	160	V
Collector-Emitter Voltage	V_{CEO}	140	V
Emitter-Base Voltage	V_{EBO}	6	V
Collector Current	I_C	600	mA
Collector Dissipation	P_C	625	mW
Junction Temperature	T_J	150	°C
Storage Temperature	T_{STG}	-55 ~ 150	°C

- Refer to 2N5551 for graphs

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-Base Breakdown Voltage	BV_{CBO}	I_C=100μA, I_E=0	160			V
* Collector-Emitter Breakdown Voltage	BV_{CEO}	I_C=1mA, I_B=0	140			V
Emitter-Base Breakdown Voltage	BV_{EBO}	I_E=10μA, I_C=0	6			V
Collector Cut-off Current	I_{CBO}	V_{CB}=100V, I_E=0			100	nA
Emitter Cut-off Current	I_{EBO}	V_{EB}= 4V, I_C=0			50	nA
* DC Current Gain	h_{FE}	I_C=1mA, V_{CE}=5V	60			
		I_C=10mA, V_{CE}=5V	60		250	
		I_C=50mA, V_{CE}=5V	20			
* Collector-Emitter Saturation Voltage	V_{CE} (sat)	I_C=10mA, I_B=1mA			0.15	V
		I_C=50mA, I_B=5mA			0.25	V
* Base-Emitter Saturation Voltage	V_{BE} (on)	I_C=10mA, I_B=1mA			1	V
		I_C=50mA, I_B=5mA			1.2	V
Current Gain Bandwidth Product	f_T	I_C=10mA, V_{CE}=10V	100		300	MHz
Output Capacitance	C_{OB}	V_{CB}=10V, I_E=0 f=1MHz			6	pF
Noise Figure	NF	I_C=250μA, V_{CE}=5V R_S=1KΩ f=10Hz to 15.7KHz			10	dB

* Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%

FAIRCHILD SEMICONDUCTOR TM

©1999 Fairchild Semiconductor Corporation

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™
CoolFET™
CROSSVOLT™
E^2CMOS^{TM}
FACT™
FACT Quiet Series™
FAST®
FASTr™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
POP™
PowerTrench™
QS™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
TinyLogic™
UHC™
VCX™

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.
As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

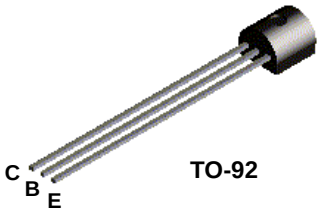
Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

FAIRCHILD SEMICONDUCTOR™

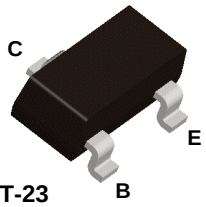
Discrete POWER & Signal Technologies

2N5551



TO-92

MMBT5551



SOT-23
Mark: 3S

NPN General Purpose Amplifier

This device is designed for general purpose high voltage amplifiers and gas discharge display driving. Sourced from Process 16.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	160	V
V_{CBO}	Collector-Base Voltage	180	V
V_{EBO}	Emitter-Base Voltage	6.0	V
I_C	Collector Current - Continuous	200	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N5551	*MMBT5551	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	350 2.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	°C/W

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

© 1997 Fairchild Semiconductor Corporation

NPN General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Sustaining Voltage*	I_C = 1.0 mA, I_B = 0	160		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 100 µA, I_E = 0	180		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	6.0		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 120 V, I_E = 0, V_{CB} = 120 V, I_E = 0, T_A = 100°C		50 50	nA µA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 4.0 V, I_C = 0		50	nA
ON CHARACTERISTICS					
h_{FE}	DC Current Gain	I_C = 1.0 mA, V_{CE} = 5.0 V I_C = 10 mA, V_{CE} = 5.0 V I_C = 50 mA, V_{CE} = 5.0 V	80 80 30	 250 	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA		0.15 0.20	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA		1.0 1.0	V V
SMALL SIGNAL CHARACTERISTICS					
f_T	Current Gain - Bandwidth Product	I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz	100	300	MHz
C_{obo}	Output Capacitance	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz		6.0	pF
C_{ibo}	Input Capacitance	V_{BE} = 0.5 V, I_C = 0, f = 1.0 MHz		20	pF
h_{fe}	Small-Signal Current Gain	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz	50	250	
NF	Noise Figure	I_C = 250 µA, V_{CE} = 5.0 V, R_S=1.0 kΩ, f=10 Hz to 15.7 kHz		8.0	dB

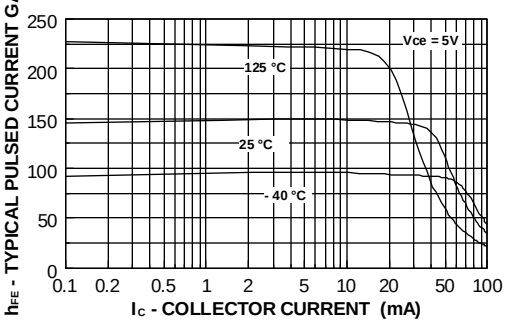
*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

Spice Model

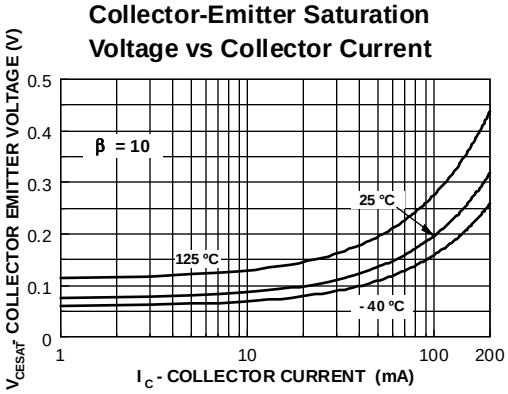
NPN (Is=2.511f Xti=3 Eg=1.11 Vaf=100 Bf=242.6 Ne=1.249 Ise=2.511f Ikf=.3458 Xtb=1.5 Br=3.197 Nc=2 Isc=0 Ikr=0 Rc=1 Cjc=4.883p Mjc=.3047 Vjc=.75 Fc=.5 Cje=18.79p Mje=.3416 Vje=.75 Tr=1.202n Tf=560p Itf=50m Vtf=5 Xtf=8 Rb=10)

Typical Characteristics

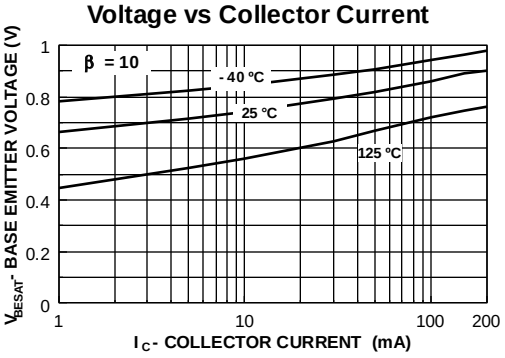
Typical Pulsed Current Gain vs Collector Current



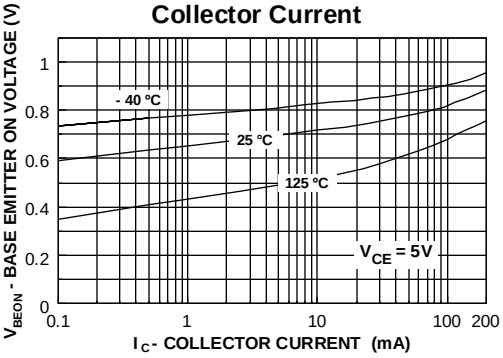
Collector-Emitter Saturation Voltage vs Collector Current



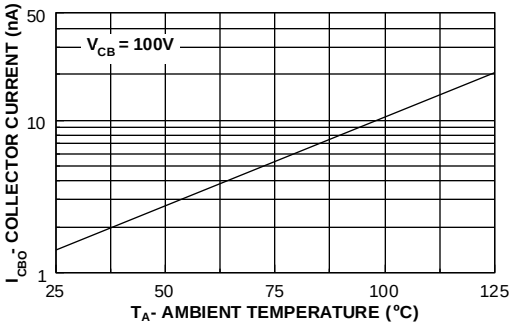
Base-Emitter Saturation Voltage vs Collector Current



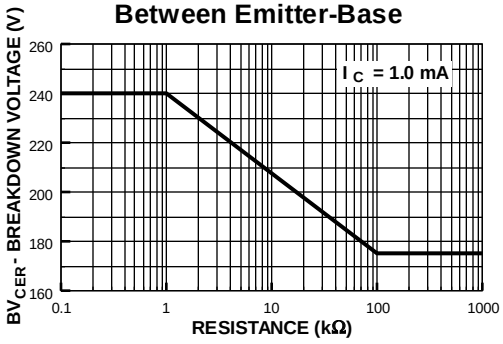
Base Emitter ON Voltage vs Collector Current



Collector-Cutoff Current vs. Ambient Temperature

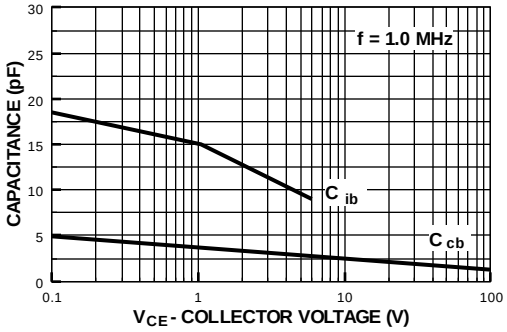


Collector-Emitter Breakdown Voltage with Resistance Between Emitter-Base

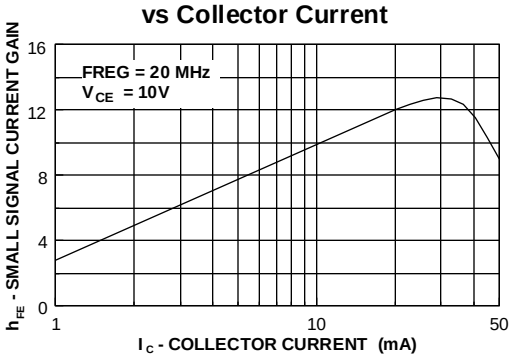


Typical Characteristics (continued)

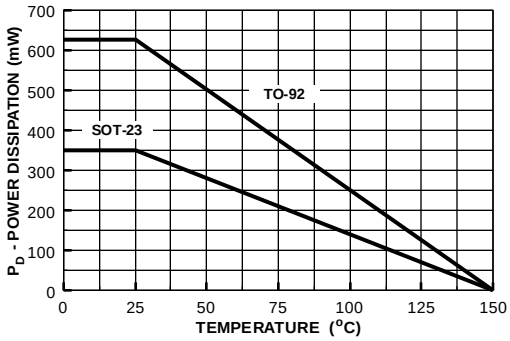
Input and Output Capacitance vs Reverse Voltage



Small Signal Current Gain vs Collector Current



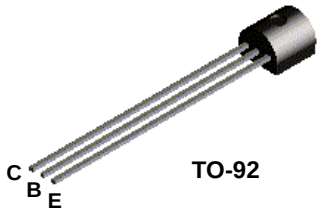
Power Dissipation vs Ambient Temperature



FAIRCHILD SEMICONDUCTOR TM

Discrete POWER & Signal Technologies

2N5769



TO-92

NPN Switching Transistor

This device is designed for high speed saturated switching applications at currents to 100 mA. Sourced from Process 21. See PN2369A for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	15	V
V_{CBO}	Collector-Base Voltage	40	V
V_{EBO}	Emitter-Base Voltage	4.5	V
I_C	Collector Current - Continuous	200	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N5769	
P_D	Total Device Dissipation Derate above 25°C	350 2.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	125	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	357	°C/W

© 1997 Fairchild Semiconductor Corporation

NPN Switching Transistor
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

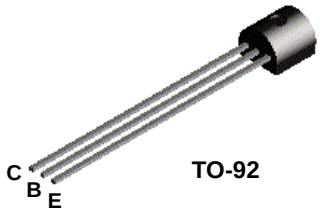
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 10 mA, I_B = 0	15		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 µA, I_E = 0	40		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	4.5		V
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	I_C = 10 µA, I_B = 0	40		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 20 V, I_E = 0 V_{CB} = 20 V, I_E = 0, T_A = 125 °C		0.4 30	µA µA
I_{CES}	Collector Cutoff Current	V_{CE} = 20 V, I_B = 0		0.4	µA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 4.5 V, I_C = 0		1.0	µA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	I_C = 10 mA, V_{CE} = 0.35 V I_C = 10 mA, V_{CE} = 0.35 V T_A = - 55 °C I_C = 30 mA, V_{CE} = 0.40 V I_C = 100 mA, V_{CE} = 1.0 V	40 20 30 20	120	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA I_C = 10 mA, I_B = 1.0 mA T_A = 125 °C I_C = 30 mA, I_B = 3.0 mA I_C = 100 mA, I_B = 10 mA		0.2 0.3 0.25 0.5	V V V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA I_C = 10 mA, I_B = 1.0 mA T_A = 125 °C I_C = 10 mA, I_B = 1.0 mA T_A = - 55 °C I_C = 30 mA, I_B = 3.0 mA I_C = 100 mA, I_B = 10 mA	0.7 0.59 0.59	0.85 1.02 1.02 1.15 1.6	V V V V V
SMALL SIGNAL CHARACTERISTICS					
C_{cb}	Collector-Base Capacitance	V_{CB} = 5.0 V, f = 1.0 MHz		4.0	pF
h_{fe}	Small-Signal Current Gain	I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz	5.0		
SWITCHING CHARACTERISTICS					
t_{on}	Turn-on Time	I_C = 10 mA,		12	ns
t_{off}	Turn-off Time	I_{B1} = 3.0 mA, I_{B2} = 1.5 mA		18	ns
t_s	Storage Time	I_C = I_{B1} = I_{B2} = 10 mA		13	ns

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD SEMICONDUCTOR™

Discrete POWER & Signal Technologies

2N5770



TO-92

NPN RF Transistor

This device is designed for use as RF amplifiers, oscillators and multipliers with collector currents in the 1.0 mA to 30 mA range. Sourced from Process 43. See PN918 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	15	V
V_{CBO}	Collector-Base Voltage	30	V
V_{EBO}	Emitter-Base Voltage	4.5	V
I_C	Collector Current - Continuous	50	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N5770	
P_D	Total Device Dissipation Derate above 25°C	350 2.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	125	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	357	°C/W

© 1997 Fairchild Semiconductor Corporation

NPN RF Transistor
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

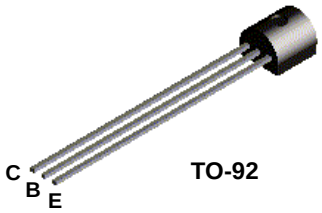
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 3.0 mA, I_B = 0	15		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 1.0 µA, I_E = 0	30		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	4.5		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 15 V, I_E = 0 V_{CB} = 15 V, I_E = 0, T_A = 150 °C		10 1.0	nA µA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 3.0 V, I_C = 0 V_{EB} = 2.0 V, I_C = 0		10 1.0	µA µA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 1.0 V, I_C = 3.0 mA V_{CE} = 10 V, I_C = 8.0 mA	20 50	 200	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA		0.4	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 10 mA, I_B = 1.0 mA		1.0	V
SMALL SIGNAL CHARACTERISTICS					
NF	Noise Figure	I_C = 1.0 mA, V_{CE} = 8.0 V, f = 60 MHz, Rg = 400 Ω		6.0	dB
C_{cb}	Collector-Base Capacitance	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz	0.7	1.1	pF
C_{ib}	Input Capacitance	V_{EB} = 0.5 V		2.0	pF
h_{fe}	Small-Signal Current Gain	I_C = 8.0 mA, V_{CE} = 10 V, f = 100 MHz I_C = 8.0 mA, V_{CE} = 10 V, f = 1.0 kHz	 9.0 40	 18 240	
rb'C_C	Collector-Base Time Constant	I_E = 8.0 mA, V_{CB} = 10 V, f = 79.8 MHz	3.0	20	pS
FUNCTIONAL TEST					
G_{pe}	Amplifier Power Gain	I_C = 6.0 mA, V_{CB} = 12 V, f = 200 MHz	15		dB
P_O	Power Output	V_{CC} = 15 V, I_C = 8.0 mA, f = 500 MHz	30		mW
η	Collector Efficiency		25		%

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD SEMICONDUCTOR TM

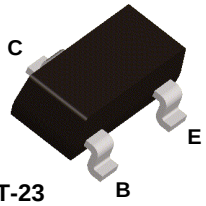
Discrete POWER & Signal Technologies

2N5771



TO-92

MMBT5771



SOT-23
Mark: 3R

PNP Switching Transistor

This device is designed for very high speed saturate switching at collector currents to 100 mA. Sourced from Process 65. See PN4258 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	15	V
V_{CBO}	Collector-Base Voltage	15	V
V_{EBO}	Emitter-Base Voltage	4.5	V
I_C	Collector Current - Continuous	200	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N5771	*MMBT5771	
P_D	Total Device Dissipation Derate above 25°C	350 2.8	225 1.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	125		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	357	556	°C/W

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

© 1997 Fairchild Semiconductor Corporation

PNP Switching Transistor
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

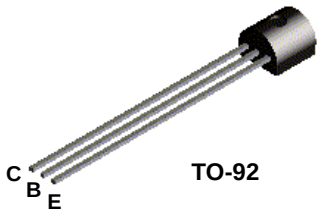
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 3.0 mA, I_B = 0	15		V
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	I_C = 100 µA, V_{BE} = 0	15		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 100 µA, I_E = 0	15		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 100 µA, I_C = 0	4.5		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 8.0 V, I_E = 0		10	nA
I_{CES}	Collector Cutoff Current	V_{CE} = 8.0 V, V_{BE} = 0 V_{CE} = 8.0 V, V_{BE} = 0, T_A= 125°C		10 5.0	nA µA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 4.5 V, I_C = 0		1.0	µA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	I_C = 1.0 mA, V_{CE} = 0.5 V I_C = 10 mA, V_{CE} = 0.3 V I_C = 10mA,V_{CE} = 0.3V,T_A = -55°C I_C = 50 mA, V_{CE} = 1.0 V	35 50 20 40	 120 	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 1.0 mA, I_B = 0.1 mA I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA		0.15 0.18 0.6	V V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 1.0 mA, I_B = 0.1 mA I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA	 0.75 	0.8 0.95 1.5	V V V
SMALL SIGNAL CHARACTERISTICS					
C_{cb}	Collector-Base Capacitance	V_{CB} = 5.0 V, I_E = 0, f = 140 kHz		3.0	pF
C_{eb}	Emitter-Base Capacitance	V_{BE} = 0.5 V, I_C = 0, f = 140 kHz		3.5	pF
h_{fe}	Small-Signal Current Gain	I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz	8.5		MHz
SWITCHING CHARACTERISTICS					
t_s	Storage Time	I_C = 10 mA, V_{CC} = 1.5 V, I_{B1} = I_{B2} = 1.0 mA		20	ns
t_{on}	Turn-On Time	I_C = 10 mA, V_{CC} = 1.5 V, I_B = 1.0 mA		15	ns
t_{off}	Turn-Off Time	I_C = 10 mA, V_{CC} = 1.5 V, I_{B1} = I_{B2} = 1.0 mA		20	ns

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

Discrete POWER & Signal Technologies

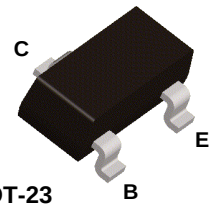
N

2N6427



TO-92

MMBT6427



SOT-23
Mark: 1V

NPN Darlington Transistor

This device is designed for applications requiring extremely high current gain at collector currents to 1.0 A. Sourced from Process 05. See MPSA14 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	40	V
V_{CBO}	Collector-Base Voltage	40	V
V_{EBO}	Emitter-Base Voltage	12	V
I_C	Collector Current - Continuous	1.2	A
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N6427	*MMBT6427	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	350 2.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	°C/W

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

NPN Darlington Transistor
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

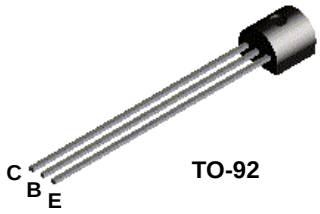
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 10 mA, I_B = 0	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 100 µA, I_E = 0	40		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	12		V
I_{CEO}	Collector Cutoff Current	V_{CE} = 25 V, I_B = 0		1.0	µA
I_{CBO}	Collector Cutoff Current	V_{CB} = 30 V, I_E = 0		50	nA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 10 V, I_C = 0		50	nA
ON CHARACTERISTICS					
h_{FE}	DC Current Gain*	I_C = 10 mA, V_{CE} = 5.0 V I_C = 100 mA, V_{CE} = 5.0 V I_C = 500 mA, V_{CE} = 5.0 V	10,000 20,000 14,000	100,000 200,000 140,000	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 50 mA, I_B = 0.5 mA I_C = 500 mA, I_B = 0.5 mA		1.2 1.5	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 500 mA, I_B = 0.5 mA		2.0	V
$V_{BE(on)}$	Base-Emitter On Voltage	I_C = 50 mA, V_{CE} = 5.0 mA		1.75	V
SMALL SIGNAL CHARACTERISTICS					
C_{obo}	Output Capacitance	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz		7.0	pF
C_{ibo}	Input Capcitance	V_{BE} = 1.0 V, I_C = 0, f = 1.0 MHz		15	pF

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD SEMICONDUCTOR TM

Discrete POWER & Signal Technologies

2N5830



TO-92

NPN General Purpose Amplifier

This device is designed for general purpose high voltage amplifiers and gas discharge display driving. Sourced from Process 16. See 2N5551 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	100	V
V_{CBO}	Collector-Base Voltage	120	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	200	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N5830	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

NPN General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

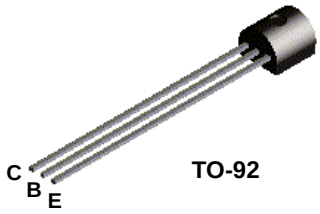
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 1.0 mA, I_B = 0	100		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 100 µA, I_E = 0	120		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	5.0		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 100 V, I_E = 0 V_{CB} = 100 V, I_E = 0, T_A = 100 °C		50 25	nA µA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 4.0 V, I_C = 0		50	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 5.0 V, I_C = 1.0 mA V_{CE} = 5.0 V, I_C = 10 mA V_{CE} = 5.0 V, I_C = 50 mA	60 80 80	 500 	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 1.0 mA, I_B = 0.1 mA I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA		0.15 0.2 0.25	V V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 1.0 mA, I_B = 0.1 mA I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA		0.8 1.0 1.0	V V V
$V_{BE(on)}$	Base-Emitter On Voltage	V_{CE} = 5.0 V, I_C = 1.0 mA		0.8	V
SMALL SIGNAL CHARACTERISTICS					
C_{cb}	Output Capacitance	V_{CB} = 10 V, f = 1.0 MHz		4.0	pF
h_{fe}	Small-Signal Current Gain	I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz	1.0	5.0	
h_{ie}	Input Impedance	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz		6.0	KΩ
h_{oe}	Output Admittance			40	µmho
h_{fe}	Small-Signal Current Gain		60		

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD SEMICONDUCTOR TM

Discrete POWER & Signal Technologies

2N5961



TO-92

NPN General Purpose Amplifier

This device is designed for use as low noise, high gain, general purpose amplifiers requiring collector currents to 50 mA. Sourced from Process 07. See 2N5088 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Val60ue	Units
V_{CEO}	Collector-Emitter Voltage	60	V
V_{CBO}	Collector-Base Voltage	60	V
V_{EBO}	Emitter-Base Voltage	8.0	V
I_C	Collector Current - Continuous	100	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N5961	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

NPN General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

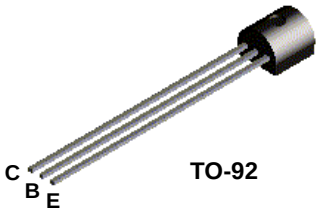
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 5.0 mA, I_B = 0	60		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 µA, I_E = 0	60		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	8.0		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 45 V, I_E = 0 V_{CB} = 45 V, I_E = 0, T_A = 65 °C		2.0 50	nA nA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 5.0 V, I_C = 0		1.0	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 5.0 V, I_C = 10 µA V_{CE} = 5.0 V, I_C = 100 µA V_{CE} = 5.0 V, I_C = 1.0 mA V_{CE} = 5.0 V, I_C = 10 mA	100 120 135 150	 700	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 10 mA, I_B = 0.5 mA I_C = 10 mA, I_B =1.0 mA		0.2 0.2	V V
$V_{BE(on)}$	Base-Emitter On Voltage	V_{CE} = 5.0 V, I_C = 1.0 mA	0.5	0.7	V
SMALL SIGNAL CHARACTERISTICS					
C_{cb}	Collector-Base Capacitance	V_{CB} = 5.0 V, f = 1.0 MHz		4.0	pF
C_{eb}	Emitter-Base Capacitance	V_{EB} = 0.5 V, f = 1.0 MHz		6.0	pF
h_{fe}	Small-Signal Current Gain	I_C = 10 mA, V_{CE} = 5.0 V, f = 1.0 kHz I_C = 10 mA, V_{CE} = 5.0 V, f = 100 MHz	150 1.0	1000	
NF	Noise Figure	V_{CE} = 5.0 V, I_C = 10 µA, R_S = 10 kΩ, f = 1.0 kHz, B_W = 400 Hz V_{CE} = 5.0 V, I_C = 10 µA, R_S = 10 kΩ, f = 10 Hz - 10 kHz B_W = 15.7 kHz V_{CE} = 5.0 V, I_C = 100 µA, R_S = 1.0 kΩ, f = 1.0 kHz B_W = 400 Hz		3.0 dB 3.0 dB 6.0 dB	

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

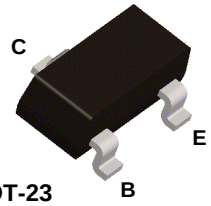
FAIRCHILD SEMICONDUCTOR TM

Discrete POWER & Signal Technologies

2N5962 MMBT5962



TO-92



SOT-23
Mark: 117

NPN General Purpose Amplifier

This device is designed for use as low noise, high gain, general purpose amplifiers requiring collector currents to 50 mA. Sourced from Process 07. See 2N5088 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	45	V
V_{CBO}	Collector-Base Voltage	45	V
V_{EBO}	Emitter-Base Voltage	8.0	V
I_C	Collector Current - Continuous	100	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N5962	*MMBT5962	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	350 2.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	°C/W

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

© 1997 Fairchild Semiconductor Corporation

NPN General Purpose Amplifier
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 5.0 mA, I_B = 0	45		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 µA, I_E = 0	45		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	8.0		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 30 V, I_E = 0 V_{CB} = 30 V, I_E = 0, T_A = 65 °C		2.0 50	nA nA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 5.0 V, I_C = 0		1.0	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 5.0 V, I_C = 10 µA V_{CE} = 5.0 V, I_C = 100 µA V_{CE} = 5.0 V, I_C = 1.0 mA V_{CE} = 5.0 V, I_C = 10 mA	450 500 550 600	 1400	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 10 mA, I_B = 0.5 mA		0.2	V
$V_{BE(on)}$	Base-Emitter On Voltage	V_{CE} = 5.0 V, I_C = 1.0 mA	0.5	0.7	V
SMALL SIGNAL CHARACTERISTICS					
C_{cb}	Collector-Base Capacitance	V_{CB} = 5.0 V		4.0	pF
C_{eb}	Emitter-Base Capacitance	V_{EB} = 0.5 V		6.0	pF
h_{fe}	Small-Signal Current Gain	I_C = 10 mA, V_{CE} = 5.0 V, f = 1.0 kHz I_C = 10 mA, V_{CE} = 5.0 V, f = 100 MHz	600 1.0	200	
NF	Noise Figure	V_{CE} = 5.0 V, I_C = 10 µA, R_S = 10 kΩ, f = 1.0 kHz, B_W = 400 Hz		3.0	dB
		V_{CE} = 5.0 V, I_C = 100 µA, R_S = 1.0 kΩ, f = 1.0 kHz, B_W = 400 Hz		6.0	dB
		V_{CE} = 5.0 V, I_C = 100 µA, R_S = 10 kΩ, f = 1.0 kHz, B_W = 400 Hz		4.0	dB
		V_{CE} = 5.0 V, I_C = 100 µA, R_S = 100 kΩ, f = 1.0 kHz, B_W = 400 Hz		8.0	dB
		V_{CE} = 5.0 V, I_C = 10 µA, R_S = 10 kΩ, f = 10 Hz -10 kHz B_W = 15.7 kHz		3.0	dB

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD SEMICONDUCTOR™

DISCRETE POWER & SIGNAL TECHNOLOGIES

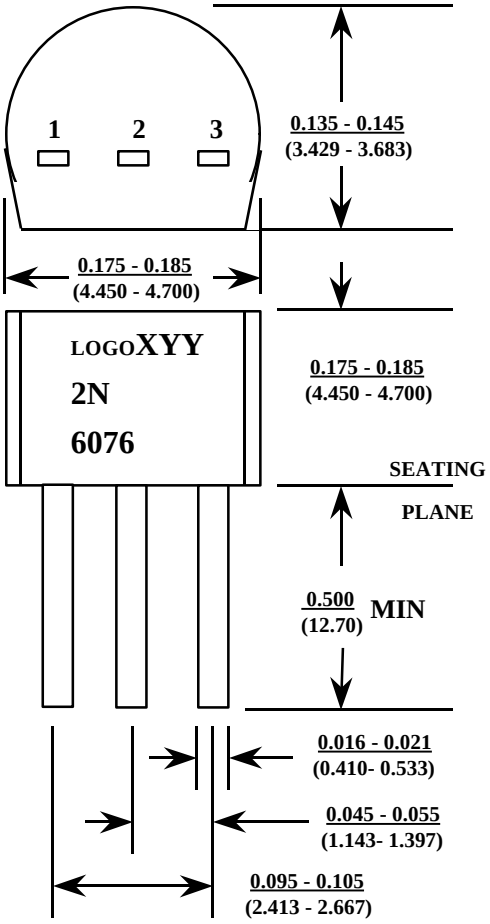
2N6076

SILICON PNP SMALL SIGNAL TRANSISTOR

BVCEO . . . . 25 V (Min)

hFE . . . . 100 (Min) @ VCE = 10 V, IC = 10 mA

1	2	3
B	C	E



ABSOLUTE MAXIMUM RATINGS (NOTE 1)

TEMPERATURES

Storage Temperature	-55 Degrees C to	150 Degrees C
Operating Junction Temperature		150 Degrees C

POWER DISSIPATION (NOTES 2 & 3)

Total Device Dissipation at TA = 25 Deg C	625 mW

VOLTAGES & CURRENT

VCEO	Collector to Emitter	25 V
VCBO	Collector to Base	25 V
VEBO	Emitter to Base	5 V
IC	Collector Current	500 mA

ELECTRICAL CHARACTERISTICS (25 Degrees C Ambient Temperature unless otherwise stated)

SYM	CHARACTERISTICS	MIN	MAX	UNITS	TEST CONDITIONS
BVCBO	Collector to Base Voltage	25		V	IC = 100 uA
BVCEO	Collector to Emitter Voltage	25		V	IC = 10 mA
BVEBO	Emitter to Base Voltage	5		V	IE = 10 uA
ICBO	Collector Cutoff Current		100	nA	VCB = 25 V
			10	uA	VCB = 25 V , T=+100°C
ICES	Collector Cutoff Current		100	nA	VCE = 25 V
IEBO	Emitter Cutoff Current		100	uA	VEB = 3.0 V
hFE	DC Current Gain	100	500		VCE = 10 V IC = 10 mA
VCE(sat)	Collector-Emitter Saturation Voltage		0.25	V	IC = 10mA IB = 1.0mA
VBE(sat)	Base-Emitter Saturation Voltage		0.8	V	IC = 10mA IB = 1.0mA
VBE(on)	Base -Emitter On Voltage	0.5	1.2	V	VCE = 10 V IC = 10mA

©1998 Fairchild Semiconductor Corporation

2N6076

SILICON PNP SMALL SIGNAL TRANSISTOR

ELECTRICAL CHARACTERISTICS Con't (25 Degrees C Ambient Temperature unless otherwise stated)

SYM	CHARACTERISTICS	MIN	MAX	UNITS	TEST CONDITIONS
C_{cb}	Output Capacitance	1	13	pF	V_{CB} = 10 V, f = 1 MHz
hfe	Small Signal Current Gain	100	750		V_{CE} = 10 V, I_C=10 mA, f =1KHz

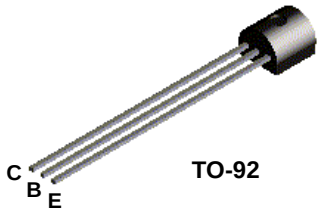
NOTES:

1. These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings are based on a maximum junction temperature of 150 degrees C.

FAIRCHILD SEMICONDUCTOR TM

Discrete POWER & Signal Technologies

2N6426



TO-92

NPN Darlington Transistor

This device is designed for applications requiring extremely high current gain at currents to 1.0 A. Sourced from Process 05. See MPSA14 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	40	V
V_{CBO}	Collector-Base Voltage	40	V
V_{EBO}	Emitter-Base Voltage	12	V
I_C	Collector Current - Continuous	1.2	A
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max	Units
		2N6426	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

© 1997 Fairchild Semiconductor Corporation

NPN Darlington Transistor
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

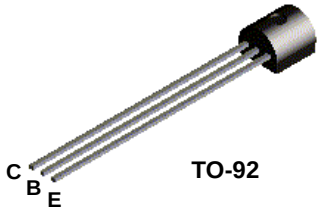
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 10 mA, I_B = 0	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 100 µA, I_E = 0	40		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	12		V
I_{CBO}	Collector Cutoff Current	V_{CB} = 30 V, I_E = 0		50	nA
I_{CEO}	Collector Cutoff Current	V_{CE} = 25 V, I_B = 0		1.0	µA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 10 V, I_C = 0		50	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	V_{CE} = 5.0 V, I_C = 10 mA V_{CE} = 5.0 V, I_C = 100 mA V_{CE} = 5.0 V, I_C = 500 mA	20,000 30,000 20,000	200,000 300,000 200,000	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 50 mA, I_B = 0.5 mA I_C = 500 mA, I_B = 0.5 mA		1.2 1.5	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 500 mA, I_B = 0.5 mA		2.0	V
$V_{BE(on)}$	Base-Emitter On Voltage	I_C = 50 mA, V_{CE} = 5.0 V		1.75	V
SMALL SIGNAL CHARACTERISTICS					
C_{ob}	Output Capacitance	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz		7.0	pF
C_{ib}	Input Capacitance	V_{EB} = 1.0 V, I_C = 0, f = 1.0 MHz		15	pF
h_{fe}	Small-Signal Current Gain	I_C = 10 mA, V_{CE} = 5.0 V, f = 1.0 kHz	20,000		
h_{ie}	Input Impedance	I_C = 10 mA, V_{CE} = 5.0 V, f = 1.0 kHz	100	2,000	kΩ
h_{oe}	Output Admittance			1,000	µmho
NF	Noise Figure	I_C = 1.0 mA, V_{CE} = 5.0 V, R_S = 100 kΩ, f = 10 kHz to 15.7 kHz		10	dB

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

FAIRCHILD SEMICONDUCTOR TM

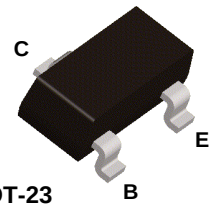
Discrete POWER & Signal Technologies

2N6427



TO-92

MMBT6427



SOT-23
Mark: 1V

NPN Darlington Transistor

This device is designed for applications requiring extremely high current gain at collector currents to 1.0 A. Sourced from Process 05. See MPSA14 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	40	V
V_{CBO}	Collector-Base Voltage	40	V
V_{EBO}	Emitter-Base Voltage	12	V
I_C	Collector Current - Continuous	1.2	A
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N6427	*MMBT6427	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	350 2.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	°C/W

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

© 1997 Fairchild Semiconductor Corporation

NPN Darlington Transistor
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 10 mA, I_B = 0	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 100 µA, I_E = 0	40		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	12		V
I_{CEO}	Collector Cutoff Current	V_{CE} = 25 V, I_B = 0		1.0	µA
I_{CBO}	Collector Cutoff Current	V_{CB} = 30 V, I_E = 0		50	nA
I_{EBO}	Emitter Cutoff Current	V_{EB} = 10 V, I_C = 0		50	nA
ON CHARACTERISTICS					
h_{FE}	DC Current Gain*	I_C = 10 mA, V_{CE} = 5.0 V I_C = 100 mA, V_{CE} = 5.0 V I_C = 500 mA, V_{CE} = 5.0 V	10,000 20,000 14,000	100,000 200,000 140,000	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 50 mA, I_B = 0.5 mA I_C = 500 mA, I_B = 0.5 mA		1.2 1.5	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 500 mA, I_B = 0.5 mA		2.0	V
$V_{BE(on)}$	Base-Emitter On Voltage	I_C = 50 mA, V_{CE} = 5.0 mA		1.75	V
SMALL SIGNAL CHARACTERISTICS					
C_{obo}	Output Capacitance	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz		7.0	pF
C_{ibo}	Input Capcitance	V_{BE} = 1.0 V, I_C = 0, f = 1.0 MHz		15	pF

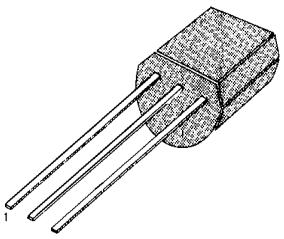
*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

2N6428/6428A NPN EPITAXIAL SILICON TRANSISTOR

AMPLIFIER TRANSISTOR

- Collector-Emitter Voltage: V_{CEO}= 50V
- Collector Dissipation: P_C (max)=625mW

TO-92



1.Emitter 2. Base 3. Collector

ABSOLUTE MAXIMUM RATINGS (T_A=25℃)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V_{CBO}	60	V
Collector-Emitter Voltage	V_{CEO}	50	V
Emitter-Base Voltage	V_{EBO}	6	V
Collector Current	I_C	200	mA
Collector Dissipation	P_C	625	mW
Junction Temperature	T_J	150	℃
Storage Temperature	T_{STG}	-55 ~ 150	℃

- Refer to 2N5088 for graphs

ELECTRICAL CHARACTERISTICS (T_A=25℃)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-Base Breakdown Voltage	BV_{CBO}	I_C=100㎂, I_E=0	60			V
★Collector-Emitter Breakdown Voltage	BV_{CEO}	I_C=1mA, I_B=0	50			V
Collector Cut-off Current	I_{CBO}	V_{CB}=30V, I_E=0			10	nA
Collector Cut-off Current	I_{CEO}	V_{CE}=30V, I_B=0			25	nA
Base Cut-off Current	I_{EBO}	V_{BE}=5V, I_C=0			10	
★DC Current Gain	h_{FE}	V_{CE}=5V, I_C=10㎂	250			
		V_{CE}=5V, I_C=100㎂	250		650	
		V_{CE}=5V, I_C=1mA	250			
		V_{CE}=5V, I_B=10mA	250			
★Collector-Emitter Saturation Voltage	V_{CE} (sat)	I_C=10mA, I_B=0.5mA			0.2	V
		I_C=100mA, I_B=5mA			0.6	V
Base-Emitter On Voltage	V_{BE} (on)	I_C=1mA, V_{CE}=5V	0.56		0.66	V
Output Capacitance	C_{OB}	V_{CB}=10V, I_E=0 f=1MHz			3	pF
Current Gain Bandwidth Product	f_T	V_{CE}=5V, I_C=1mA	100		700	MHz
Noise Figure/Noise Voltage Level	NF/NV	V_{CE}=5V, I_C=100㎂				
		(1) R_S=10kΩ, B_W=1Hz f=100Hz				
:2N6428					3/18.1	dB/nV
2N6428A					2/16.2	dB/nV
		(2) R_S=50kΩ, B_W=15.7Hz f=10Hz-10KHz				
:2N6428					6/5.7	dB/nV
2N6428A					4/4.6	dB/nV
		(1) R_S=500Ω, B_W=1Hz f=10Hz				
:2N6428					3.5/4.3	dB/nV
2N6428A					3/4.1	dB/nV

FAIRCHILD SEMICONDUCTOR™

©1999 Fairchild Semiconductor Corporation

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™
CoolFET™
CROSSVOLT™
E^2CMOS^{TM}
FACT™
FACT Quiet Series™
FAST®
FASTr™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
POP™
PowerTrench™
QS™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
TinyLogic™
UHC™
VCX™

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.
As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

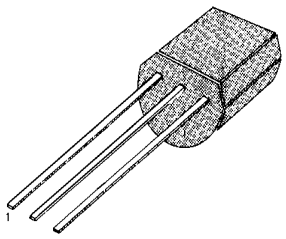
Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

2N6428/6428A NPN EPITAXIAL SILICON TRANSISTOR

AMPLIFIER TRANSISTOR

- Collector-Emitter Voltage: V_{CEO}= 50V
- Collector Dissipation: P_C (max)=625mW

TO-92



1.Emitter 2. Base 3. Collector

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V_{CBO}	60	V
Collector-Emitter Voltage	V_{CEO}	50	V
Emitter-Base Voltage	V_{EBO}	6	V
Collector Current	I_C	200	mA
Collector Dissipation	P_C	625	mW
Junction Temperature	T_J	150	°C
Storage Temperature	T_{STG}	-55 ~ 150	°C

- Refer to 2N5088 for graphs

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-Base Breakdown Voltage	BV_{CBO}	I_C=100μA, I_E=0	60			V
* Collector-Emitter Breakdown Voltage	BV_{CEO}	I_C=1mA, I_B=0	50			V
Collector Cut-off Current	I_{CBO}	V_{CB}=30V, I_E=0			10	nA
Collector Cut-off Current	I_{CEO}	V_{CE}=30V, I_B=0			25	nA
Base Cut-off Current	I_{EBO}	V_{BE}=5V, I_C=0			10	
* DC Current Gain	h_{FE}	V_{CE}=5V, I_C=10μA	250			
		V_{CE}=5V, I_C=100μA	250		650	
		V_{CE}=5V, I_C=1mA	250			
		V_{CE}=5V, I_B=10mA	250			
* Collector-Emitter Saturation Voltage	V_{CE} (sat)	I_C=10mA, I_B=0.5mA			0.2	V
		I_C=100mA, I_B=5mA			0.6	V
Base-Emitter On Voltage	V_{BE} (on)	I_C=1mA, V_{CE}=5V	0.56		0.66	V
Output Capacitance	C_{OB}	V_{CB}=10V, I_E=0 f=1MHz			3	pF
Current Gain Bandwidth Product	f_T	V_{CE}=5V, I_C=1mA	100		700	MHz
Noise Figure/Noise Voltage Level	NF/NV	V_{CE}=5V, I_C=100μA (1) R_S=10KΩ, B_W=1Hz f=100Hz				
: 2N6428					3/18.1	dB/nV
: 2N6428A					2/16.2	dB/nV
		(2) R_S=50KΩ, B_W=15.7Hz f=10Hz-10KHz				
: 2N6428					6/5.7	dB/nV
: 2N6428A					4/4.6	dB/nV
		(1) R_S=500Ω, B_W=1Hz f=10Hz				
: 2N6428					3.5/4.3	dB/nV
: 2N6428A					3/4.1	dB/nV

FAIRCHILD SEMICONDUCTOR TM

©1999 Fairchild Semiconductor Corporation

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™
CoolFET™
CROSSVOLT™
E^2CMOS^{TM}
FACT™
FACT Quiet Series™
FAST®
FASTr™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
POP™
PowerTrench™
QS™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
TinyLogic™

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.
As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

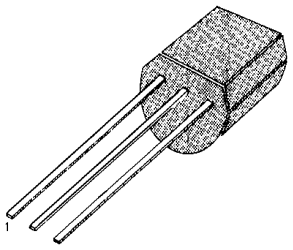
Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

2N6515 NPN EPITAXIAL SILICON TRANSISTOR

HIGH VOLTAGE TRANSISTOR

- Collector-Emitter Voltage: V_{CEO}= 250V
- Collector Dissipation: P_C (max)=625mW

TO-92



1.Emitter 2. Base 3. Collector

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V_{CBO}	250	V
Collector-Emitter Voltage	V_{CEO}	250	V
Emitter-Base Voltage	V_{EBO}	6	V
Collector Current	I_C	500	mA
Collector Dissipation	P_C	625	mW
Junction Temperature	T_J	150	°C
Storage Temperature	T_{STG}	-55 ~ 150	°C

ELECTRICAL CHARACTERISTICS (T_A=25°C)

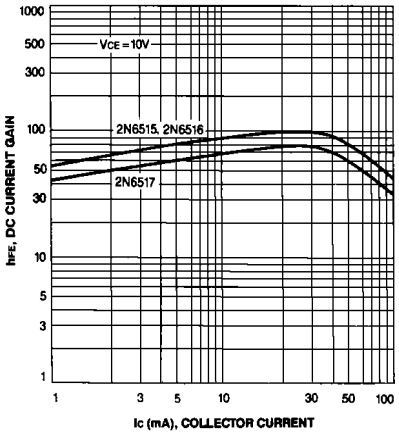
Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-Emitter Breakdown Voltage	BV_{CEO}	I_C=1mA, I_B=0	250			V
* Collector-Base Breakdown Voltage	BV_{CBO}	I_C=100μA, I_E=0	250			V
Emitter-Base Breakdown Voltage	BV_{EBO}	I_E=10μA, I_C=0	6			V
Collector Cut-off Current	I_{CBO}	V_{CB}=150V, I_E=0			50	nA
Emitter Cut-off Current	I_{EBO}	V_{BE}=5V, I_C=0			50	nA
* DC Current Gain	h_{FE}	I_C=1mA, V_{CE}=10V	35			
		I_C=10mA, V_{CE}=10V	50			
		I_C=30mA, V_{CE}=10V	50		300	
		I_C=50mA, V_{CE}=10V	45		220	
		I_C=100mA, V_{CE}=10V	25			
Collector-Emitter Saturation Voltage	V_{CE} (sat)	I_C=10mA, I_B=1mA			0.3	V
		I_C=20mA, I_B=2mA			0.35	V
		I_C=30mA, I_B=3mA			0.5	V
		I_C=50mA, I_B=5mA			1	V
Base-Emitter Saturation Voltage	V_{BE} (sat)	I_C=10mA, I_B=1mA			0.75	V
		I_C=20mA, I_B=2mA			0.85	V
		I_C=30mA, I_B=3mA			0.9	V
Collector-Base Capacitance	C_{OB}	V_{CB}=20V, I_E=0 f=1MHz			6	pF
Current Gain Bandwidth Product	f_T	I_C=10mA, V_{CE}=20V	40		200	MHz
Base Emitter On Voltage	V_{BE}(on)	I_C=100mA, V_{CE}=10V			2	V

* Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%

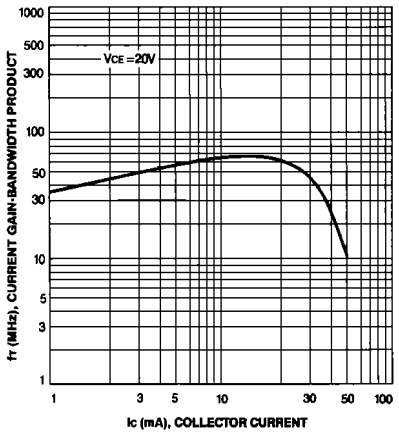
FAIRCHILD SEMICONDUCTOR TM

©1999 Fairchild Semiconductor Corporation

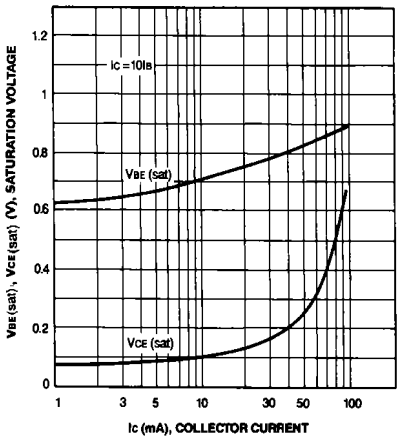
DC CURRENT GAIN



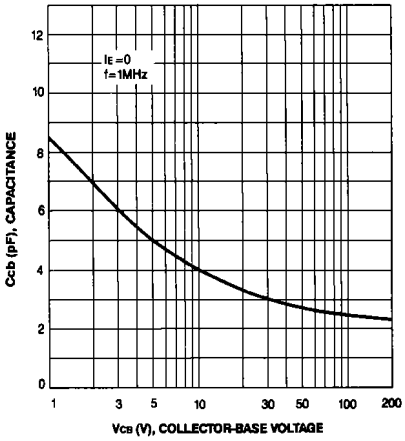
CURRENT GAIN BANDWIDTH PRODUCT



COLLECTOR EMITTER SATURATION VOLTAGE
BASE EMITTER SATURATION VOLTAGE



COLLECTOR-BASE CAPACITANCE



FAIRCHILD
SEMICONDUCTOR TM

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™
CoolFET™
CROSSVOLT™
E^2CMOS^{TM}
FACT™
FACT Quiet Series™
FAST®
FASTr™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
POP™
PowerTrench™
QS™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
TinyLogic™

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.
As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

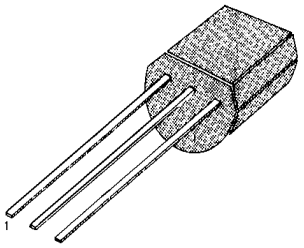
Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

2N6516 NPN EPITAXIAL SILICON TRANSISTOR

HIGH VOLTAGE TRANSISTOR

- Collector-Emitter Voltage: V_{CEO}=300V
- Collector Dissipation: P_C (max)=625mW

TO-92



1.Emitter 2. Base 3. Collector

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V_{CBO}	300	V
Collector-Emitter Voltage	V_{CEO}	300	V
Emitter-Base Voltage	V_{EBO}	6	V
Collector Current	I_C	500	mA
Collector Dissipation	P_C	625	mW
Junction Temperature	T_J	150	°C
Storage Temperature	T_{STG}	-55 ~ 150	°C

- Refer to 2N6515 for graphs

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-Emitter Breakdown Voltage	BV_{CEO}	I_C=1mA, I_B=0	300			V
* Collector-Base Breakdown Voltage	BV_{CBO}	I_C=100μA, I_E=0	300			V
Emitter-Base Breakdown Voltage	BV_{EBO}	I_E=10μA, I_C=0	6			V
Collector Cut-off Current	I_{CBO}	V_{CB}=200V, I_E=0			50	nA
Emitter Cut-off Current	I_{EBO}	V_{BE}=5V, I_C=0			50	nA
* DC Current Gain	h_{FE}	I_C=1mA, V_{CE}=10V	30			
		I_C=10mA, V_{CE}=10V	45			
		I_C=30mA, V_{CE}=10V	45		270	
		I_C=50mA, V_{CE}=10V	40		200	
		I_C=100mA, V_{CE}=10V	20			
Collector-Emitter Saturation Voltage	V_{CE} (sat)	I_C=10mA, I_B=1mA			0.3	V
		I_C=20mA, I_B=2mA			0.35	V
		I_C=30mA, I_B=3mA			0.5	V
		I_C=50mA, I_B=5mA			1	V
Base-Emitter Saturation Voltage	V_{BE} (sat)	I_C=10mA, I_B=1mA			0.75	
		I_C=20mA, I_B=2mA			0.85	
		I_C=30mA, I_B=3mA			0.9	
Collector-Base Capacitance	C_{OB}	V_{CB}=20V, I_E=0 f=1MHz			6	pF
Current Gain Bandwidth Product	f_T	I_C=10mA, V_{CE}=20V	40		200	MHz
Base Emitter On Voltage	V_{BE}(on)	I_C=100mA, V_{CE}=10V			2	V

* Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%

FAIRCHILD SEMICONDUCTOR TM
©1999 Fairchild Semiconductor Corporation

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™
CoolFET™
CROSSVOLT™
E^2CMOS^{TM}
FACT™
FACT Quiet Series™
FAST®
FASTr™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
POP™
PowerTrench™
QS™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
TinyLogic™

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.
As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

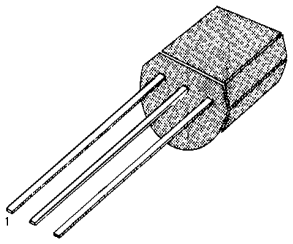
Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

2N6517 NPN EPITAXIAL SILICON TRANSISTOR

HIGH VOLTAGE TRANSISTOR

- Collector-Emitter Voltage: V_{CEO}=350V
- Collector Dissipation: P_C (max)=625mW

TO-92



1.Emitter 2. Base 3. Collector

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V_{CBO}	350	V
Collector-Emitter Voltage	V_{CEO}	350	V
Emitter-Base Voltage	V_{EBO}	6	V
Collector Current	I_C	500	mA
Collector Dissipation	P_C	625	mW
Junction Temperature	T_J	150	°C
Storage Temperature	T_{STG}	-55 ~ 150	°C

- Refer to 2N6515 for graphs

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
* Collector-Emitter Breakdown Voltage	BV_{CEO}	I_C=1mA, I_B=0	350			V
Collector-Base Breakdown Voltage	BV_{CBO}	I_C=100μA, I_E=0	350			V
Emitter-Base Breakdown Voltage	BV_{EBO}	I_E=10μA, I_C=0	6			V
Collector Cut-off Current	I_{CBO}	V_{CB}=250V, I_E=0			50	nA
Emitter Cut-off Current	I_{EBO}	V_{EB}=5V, I_C=0			50	nA
* DC Current Gain	h_{FE}	I_C=1mA, V_{CE}=10V	20			
		I_C=10mA, V_{CE}=10V	30			
		I_C=30mA, V_{CE}=10V	30		200	
		I_C=50mA, V_{CE}=10V	20		200	
		I_C=100mA, V_{CE}=10V	15			
Collector-Emitter Saturation Voltage	V_{CE} (sat)	I_C=10mA, I_B=1mA			0.3	V
		I_C=20mA, I_B=2mA			0.35	V
		I_C=30mA, I_B=3mA			0.5	V
		I_C=50mA, I_B=5mA			1	V
Base-Emitter Saturation Voltage	V_{BE} (sat)	I_C=10mA, I_B=1mA			0.75	V
		I_C=20mA, I_B=2mA			0.85	V
		I_C=30mA, I_B=3mA			0.9	V
Collector-Base Capacitance	C_{CB}	V_{CB}=20V, I_E=0 f=1MHz			6	pF
* Current Gain Bandwidth Product	f_T	I_C=10mA, V_{CE}=20V	40		200	MHz
Base Emitter On Voltage	V_{BE}(on)	I_C=100mA, V_{CE}=10V			2	V

* Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%

FAIRCHILD SEMICONDUCTOR TM

©1999 Fairchild Semiconductor Corporation

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™
CoolFET™
CROSSVOLT™
E^2CMOS^{TM}
FACT™
FACT Quiet Series™
FAST®
FASTr™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
POP™
PowerTrench™
QS™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
TinyLogic™

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.
As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

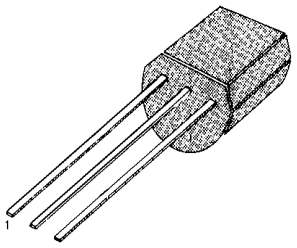
Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

2N6518 PNP EPITAXIAL SILICON TRANSISTOR

HIGH VOLTAGE TRANSISTOR

TO-92



1.Emitter 2. Base 3. Collector

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V_{CBO}	-250	V
Collector-Emitter Voltage	V_{CEO}	-250	V
Emitter-Base Voltage	V_{EBO}	-5	V
Collector Current	I_C	-500	mA
Base Current	P_C	-250	mW
Collector Dissipation		0.625	W
Derate above 25°C		5	mW/°C
Junction Temperature	T_J	150	°C
Storage Temperature	T_{STG}	-55 ~ 150	°C

• Refer to 2N6520 for graphs

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
* Collector-Base Breakdown Voltage	BV_{CBO}	I_C= -100μA, I_E=0	-250		V
Collector-Emitter Breakdown Voltage	BV_{CEO}	I_C= -1mA, I_B=0	-250		V
Emitter-Base Breakdown Voltage	BV_{EBO}	I_E= -10μA, I_C=0	-5		V
Collector Cut-off Current	I_{CBO}	V_{CB}= -150V, I_E=0		-50	nA
Emitter Cut-off Current	I_{EBO}	V_{EB}= -4V, I_C=0		-50	nA
* DC Current Gain	h_{FE}	V_{CE}= -10V, I_C= -1mA	35		
		V_{CE}= -10V, I_C= -10mA	50		
		V_{CE}= -10V, I_C= -30mA	50	300	
		V_{CE}= -10V, I_C= -50mA	45	220	
		V_{CE}= -10V, I_C= -100mA	25		
Collector-Emitter Saturation Voltage	V_{CE} (sat)	I_C= -10mA, I_B= -1mA		-0.30	V
		I_C= -20mA, I_B= -2mA		-0.35	V
		I_C= -30mA, I_B= -3mA		-0.50	V
		I_C= -50mA, I_B= -5mA		-1	V
Base-Emitter Saturation Voltage	V_{BE} (sat)	I_C= -10mA, I_B= -1mA		-0.75	V
		I_C= -20mA, I_B= -2mA		-0.85	V
		I_C= -30mA, I_B= -3mA		-0.90	V
Collector-Emitter Capacitance	V_{BE} (on)	V_{CE}= -10V, I_C= -100mA		-2	V
* Current Gain Bandwidth Product	f_T	V_{CE}= -20V, I_C= -10mA	40	200	MHz
Collector-Base Capacitance	C_{CB}	V_{CB}= -20V, I_E=0, f=1MHz		6	pF
Emitter-Base Capacitance	C_{EB}	V_{EB}= -0.5V, I_C=0, f=1MHz		100	pF
Turn On Time	T_{ON}	V_{BE} (off)= -2V, V_{CC}= -100V I_C= -50mA, I_B1= -10mA		200	ns
Turn Off Time	T_{OFF}	V_{CC}= -100V, I_C= -50mA I_B1=I_B2=10mA		3.5	ns

* Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%

Rev. B

FAIRCHILD SEMICONDUCTOR TM

©1999 Fairchild Semiconductor Corporation

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™
CoolFET™
CROSSVOLT™
E^2CMOS^{TM}
FACT™
FACT Quiet Series™
FAST®
FASTr™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
POP™
PowerTrench™
QS™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
TinyLogic™

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.
As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

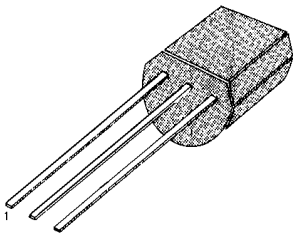
Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

2N6519 PNP EPITAXIAL SILICON TRANSISTOR

HIGH VOLTAGE TRANSISTOR

TO-92



1.Emitter 2. Base 3. Collector

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V_{CBO}	-300	V
Collector-Emitter Voltage	V_{CEO}	-300	V
Emitter-Base Voltage	V_{EBO}	-5	V
Collector Current	I_C	-500	mA
Base Current	I_B	-250	mA
Collector Dissipation	P_C	0.625	W
Derate above 25°C		5	mW/°C
Junction Temperature	T_J	150	°C
Storage Temperature	T_{STG}	-55 ~ 150	°C

• Refer to 2N6520 for graphs

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Base Breakdown Voltage	BV_{CBO}	I_C= -100μA, I_E=0	-300		V
* Collector-Emitter Breakdown Voltage	BV_{CEO}	I_C= -1mA, I_B=0	-300		V
Emitter-Base Breakdown Voltage	BV_{EBO}	I_E= -10μA, I_C=0	-5		V
Collector Cut-off Current	I_{CBO}	V_{CB}= -200V, I_E=0		-50	nA
Emitter Cut-off Current	I_{EBO}	V_{EB}= -4V, I_C=0		-50	nA
* DC Current Gain	h_{FE}	V_{CE}= -10V, I_C= -1mA	30		
		V_{CE}= -10V, I_C= -10mA	45		
		V_{CE}= -10V, I_C= -30mA	45	270	
		V_{CE}= -10V, I_C= -50mA	40	200	
		V_{CE}= -10V, I_C= -100mA	20		
Collector-Emitter Saturation Voltage	V_{CE} (sat)	I_C= -10mA, I_B= -1mA		-0.30	V
		I_C= -20mA, I_B= -2mA		-0.35	V
		I_C= -30mA, I_B= -3mA		-0.50	V
		I_C= -50mA, I_B= -5mA		-1	V
Base-Emitter Saturation Voltage	V_{BE} (sat)	I_C= -10mA, I_B= -1mA		-0.75	V
		I_C= -20mA, I_B= -2mA		-0.85	V
		I_C= -30mA, I_B= -3mA		-0.90	V
Base Emitter On Voltage	V_{BE} (on)	V_{CE}= -10V, I_C= -100mA		-2	V
* Current Gain Bandwidth Product	f_T	V_{CE}= -20V, I_C= -10mA	40	200	MHz
Collector-Base Capacitance	C_{CB}	V_{CB}= -20V, I_E=0, f=1MHz		6	pF
Emitter-Base Capacitance	C_{EB}	V_{EB}= -0.5V, I_C=0, f=1MHz		100	pF
Turn On Time	T_{ON}	V_{BE} (off)= -2V, V_{CC}= -100V I_C= -50mA, I_B1= -10mA		200	ns
Turn Off Time	T_{OFF}	V_{CC}= -100V, I_C= -50mA I_B1=I_B2=10mA		3.5	ns

* Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%

Rev. B

FAIRCHILD SEMICONDUCTOR TM

©1999 Fairchild Semiconductor Corporation

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™
CoolFET™
CROSSVOLT™
E^2CMOS^{TM}
FACT™
FACT Quiet Series™
FAST®
FASTr™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
POP™
PowerTrench™
QS™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
TinyLogic™

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.
As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

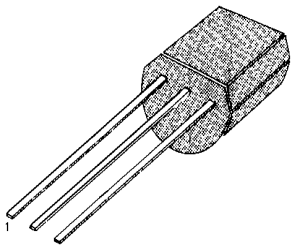
Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

2N6520 PNP EPITAXIAL SILICON TRANSISTOR

HIGH VOLTAGE TRANSISTOR

TO-92



1.Emitter 2. Base 3. Collector

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V_{CBO}	-350	V
Collector-Emitter Voltage	V_{CEO}	-350	V
Emitter-Base Voltage	V_{EBO}	-5	V
Collector Current	I_C	-500	mA
Base Current	I_B	-250	mA
Collector Dissipation	P_C	0.625	W
Derate above 25		5	mW/°C
Junction Temperature	T_J	50	°C
Storage Temperature	T_{STG}	-55 ~ 150	°C

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Characteristic	Symbol	Test Conditions	Min	Max	Unit
Collector-Base Breakdown Voltage	BV_{CBO}	I_C= -100μA, I_E=0	-350		V
* Collector-Emitter Breakdown Voltage	BV_{CEO}	I_C= -1mA, I_B=0	-350		V
Emitter-Base Breakdown Voltage	BV_{EBO}	I_E= -10μA, I_C=0	-5		V
Collector Cut-off Current	I_{CBO}	V_{CB}= -250V, I_E=0		-50	nA
Emitter Cut-off Current	I_{EBO}	V_{EB}= -4V, I_C=0		-50	nA
* DC Current Gain	h_{FE}	V_{CE}= -10V, I_C= -1mA	20		
		V_{CE}= -10V, I_C= -10mA	30		
		V_{CE}= -10V, I_C= -30mA	30	200	
		V_{CE}= -10V, I_C= -50mA	20	200	
		V_{CE}= -10V, I_C= -100mA	15		
Collector-Emitter Saturation Voltage	V_{CE} (sat)	I_C= -10mA, I_B= -1mA		-0.30	V
		I_C= -20mA, I_B= -2mA		-0.35	V
		I_C= -30mA, I_B= -3mA		-0.50	V
		I_C= -50mA, I_B= -5mA		-1	V
Base-Emitter Saturation Voltage	V_{BE} (sat)	I_C= -10mA, I_B= -1mA		-0.75	V
		I_C= -20mA, I_B= -2mA		-0.85	V
		I_C= -30mA, I_B= -3mA		-0.90	V
Base-Emitter On Voltage	V_{BE} (on)	V_{CE}= -10V, I_C= -100mA		-2	V
* Current Gain Bandwidth Product	f_T	V_{CE}= -20V, I_C= -10mA	40	200	MHz
Collector-Base Capacitance	C_{CB}	V_{CB}= -20V, I_E=0, f=1MHz		6	pF
Emitter-Base Capacitance	C_{EB}	V_{EB}= -0.5V, I_C=0, f=1MHz		100	pF
Turn On Time	T_{ON}	V_{BE} (off)= -2V, V_{CC}= -100V I_C= -50mA, I_B1= -10mA		200	ns
Turn Off Time	T_{OFF}	V_{CC}= -100V, I_C= -50mA I_B1=I_B2=10mA		3.5	ns

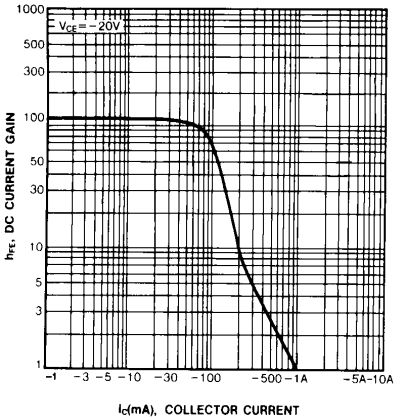
* Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%

Rev. B

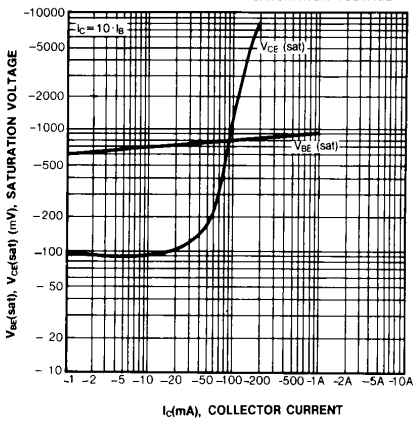
FAIRCHILD SEMICONDUCTOR TM

©1999 Fairchild Semiconductor Corporation

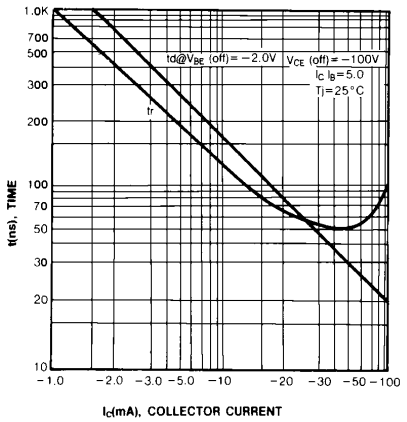
DC CURRENT GAIN



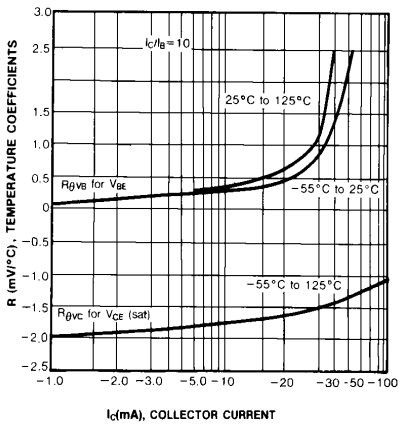
BASE EMITTER SATURATION VOLTAGE
COLLECTOR - EMITTER SATURATION VOLTAGE



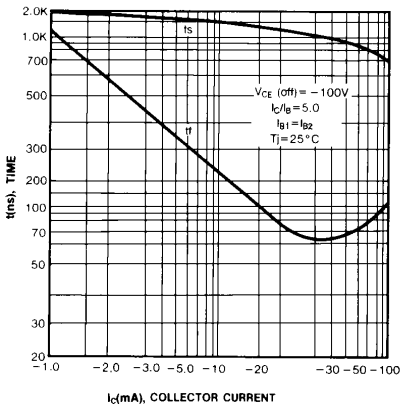
TURN-ON TIME



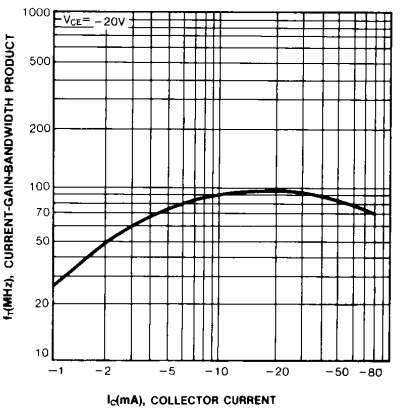
TEMPERATURE COEFFICIENTS



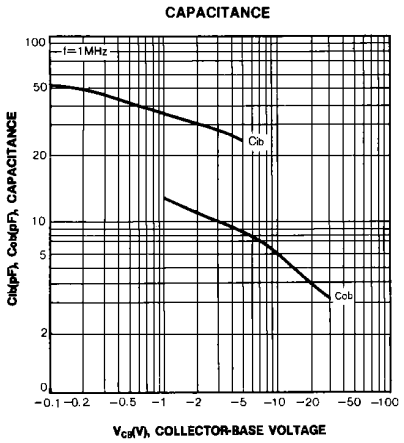
TURN-OFF TIME



CURRENT GAIN-BANDWIDTH PRODUCT



FAIRCHILD
SEMICONDUCTOR TM


CAPACITANCE
f=1MHz
Cib
Cob
100
50
20
10
5
2
0
−0.1 −0.2 −0.5 −1 −2 −5 −10 −20 −50 −100
Cib(pF), Cob(pF), CAPACITANCE
VCB(V), COLLECTOR-BASE VOLTAGE

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™
CoolFET™
CROSSVOLT™
E^2CMOS^{TM}
FACT™
FACT Quiet Series™
FAST®
FASTr™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
POP™
PowerTrench™
QS™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
TinyLogic™

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.
As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

FAIRCHILD
SEMICONDUCTOR TM

November 1995

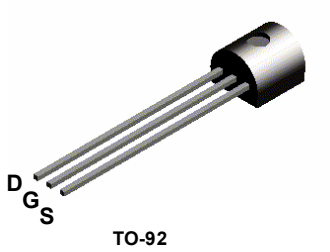
2N7000 / 2N7002 / NDS7002A
N-Channel Enhancement Mode Field Effect Transistor

General Description

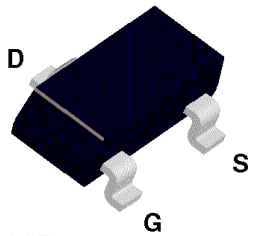
These N-Channel enhancement mode field effect transistors are produced using Fairchild's proprietary, high cell density, DMOS technology. These products have been designed to minimize on-state resistance while provide rugged, reliable, and fast switching performance. They can be used in most applications requiring up to 400mA DC and can deliver pulsed currents up to 2A. These products are particularly suited for low voltage, low current applications such as small servo motor control, power MOSFET gate drivers, and other switching applications.

Features

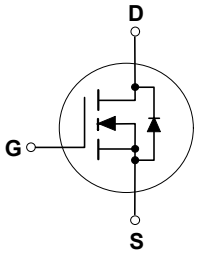
- High density cell design for low $R_{DS(ON)}$.
- Voltage controlled small signal switch.
- Rugged and reliable.
- High saturation current capability.



TO-92



SOT-23



Absolute Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter	2N7000	2N7002	NDS7002A	Units
V_{DSS}	Drain-Source Voltage	60			V
V_{DGR}	Drain-Gate Voltage ($R_{GS} \leq 1$ MΩ)	60			V
V_{GSS}	Gate-Source Voltage - Continuous	±20			V
	- Non Repetitive (tp < 50µs)	±40			
I_D	Maximum Drain Current - Continuous	200	115	280	mA
	- Pulsed	500	800	1500	
P_D	Maximum Power Dissipation	400	200	300	mW
	Derated above 25°C	3.2	1.6	2.4	mW/°C
T_J,T_{STG}	Operating and Storage Temperature Range	-55 to 150		-65 to 150	°C
T_L	Maximum Lead Temperature for Soldering Purposes, 1/16" from Case for 10 Seconds	300			°C
THERMAL CHARACTERISTICS					
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	312.5	625	417	°C/W

© 1997 Fairchild Semiconductor Corporation

Electrical Characteristics T_A = 25°C unless otherwise noted

Symbol	Parameter	Conditions	Type	Min	Typ	Max	Units
OFF CHARACTERISTICS							
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 10 µA	All	60			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 48 V, V_{GS} = 0 V	2N7000			1	µA
		T_J=125°C				1	mA
		V_{DS} = 60 V, V_{GS} = 0 V	2N7002 NDS7002A			1	µA
		T_J=125°C				0.5	mA
I_{GSSF}	Gate - Body Leakage, Forward	V_{GS} = 15 V, V_{DS} = 0 V	2N7000			10	nA
		V_{GS} = 20 V, V_{DS} = 0 V	2N7002 NDS7002A			100	nA
I_{GSSR}	Gate - Body Leakage, Reverse	V_{GS} = -15 V, V_{DS} = 0 V	2N7000			-10	nA
		V_{GS} = -20 V, V_{DS} = 0 V	2N7002 NDS7002A			-100	nA
ON CHARACTERISTICS (Note 1)							
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 1 mA	2N7000	0.8	2.1	3	V
		V_{DS} = V_{GS}, I_D = 250 µA	2N7002 NDS7002A	1	2.1	2.5	
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 500 mA	2N7000		1.2	5	Ω
		T_J =125°C			1.9	9	
		V_{GS} = 4.5 V, I_D = 75 mA			1.8	5.3	
		V_{GS} = 10 V, I_D = 500 mA	2N7002		1.2	7.5	
		T_J =100°C			1.7	13.5	
		V_{GS} = 5.0 V, I_D = 50 mA			1.7	7.5	
		T_J =100C			2.4	13.5	
		V_{GS} = 10 V, I_D = 500 mA	NDS7002A		1.2	2	
		T_J =125°C			2	3.5	
		V_{GS} = 5.0 V, I_D = 50 mA			1.7	3	
		T_J =125°C			2.8	5	
$V_{DS(ON)}$	Drain-Source On-Voltage	V_{GS} = 10 V, I_D = 500 mA	2N7000		0.6	2.5	V
		V_{GS} = 4.5 V, I_D = 75 mA			0.14	0.4	
		V_{GS} = 10 V, I_D = 500mA	2N7002		0.6	3.75	
		V_{GS} = 5.0 V, I_D = 50 mA			0.09	1.5	
		V_{GS} = 10 V, I_D = 500mA	NDS7002A		0.6	1	
		V_{GS} = 5.0 V, I_D = 50 mA			0.09	0.15	

Electrical Characteristics T_A = 25°C unless otherwise noted

Symbol	Parameter	Conditions	Type	Min	Typ	Max	Units
ON CHARACTERISTICS Continued (Note 1)							
$I_{D(ON)}$	On-State Drain Current	V_{GS} = 4.5 V, V_{DS} = 10 V	2N7000	75	600		mA
		V_{GS} = 10 V, $V_{DS} \geq 2\ V_{DS(on)}$	2N7002	500	2700		
		V_{GS} = 10 V, $V_{DS} \geq 2\ V_{DS(on)}$	NDS7002A	500	2700		
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 200 mA	2N7000	100	320		mS
		$V_{DS} \geq 2\ V_{DS(on)}$, I_D = 200 mA	2N7002	80	320		
		$V_{DS} \geq 2\ V_{DS(on)}$, I_D = 200 mA	NDS7002A	80	320		
DYNAMIC CHARACTERISTICS							
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	All		20	50	pF
C_{oss}	Output Capacitance		All		11	25	pF
C_{rss}	Reverse Transfer Capacitance		All		4	5	pF
t_{on}	Turn-On Time	V_{DD} = 15 V, R_L = 25 Ω, I_D = 500 mA, V_{GS} = 10 V, R_{GEN} = 25	2N7000			10	ns
		V_{DD} = 30 V, R_L = 150 Ω, I_D = 200 mA, V_{GS} = 10 V, R_{GEN} = 25 Ω	2N700 NDS7002A			20	
t_{off}	Turn-Off Time	V_{DD} = 15 V, R_L = 25 Ω, I_D = 500 mA, V_{GS} = 10 V, R_{GEN} = 25	2N7000			10	ns
		V_{DD} = 30 V, R_L = 150 Ω, I_D = 200 mA, V_{GS} = 10 V, R_{GEN} = 25 Ω	2N700 NDS7002A			20	
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
I_S	Maximum Continuous Drain-Source Diode Forward Current		2N7002			115	mA
			NDS7002A			280	
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		2N7002			0.8	A
			NDS7002A			1.5	
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 115 mA (Note 1)	2N7002		0.88	1.5	V
		V_{GS} = 0 V, I_S = 400 mA (Note 1)	NDS7002A		0.88	1.2	

Note:
1. Pulse Test: Pulse Width ≤ 300µs, Duty Cycle ≤ 2.0%.

Typical Electrical Characteristics

2N7000 / 2N7002 / NDS7002A

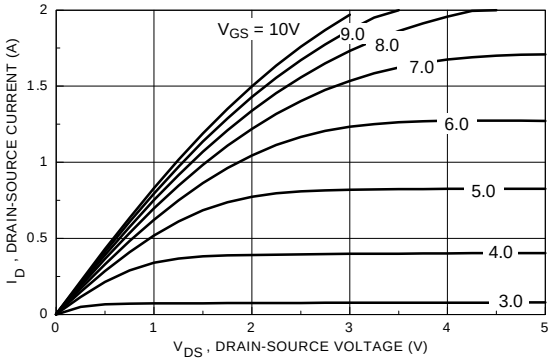


Figure 1. On-Region Characteristics

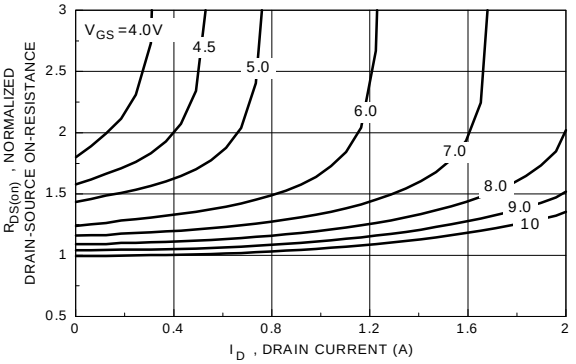


Figure 2. On-Resistance Variation with Gate Voltage and Drain Current

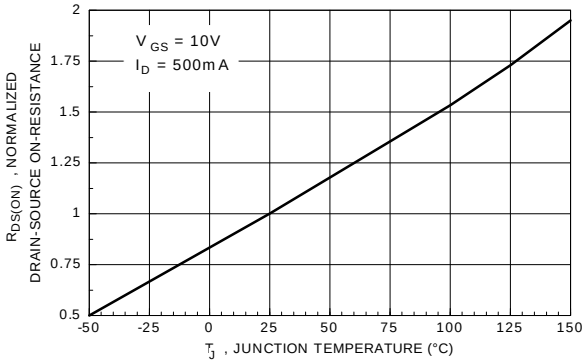


Figure 3. On-Resistance Variation with Temperature

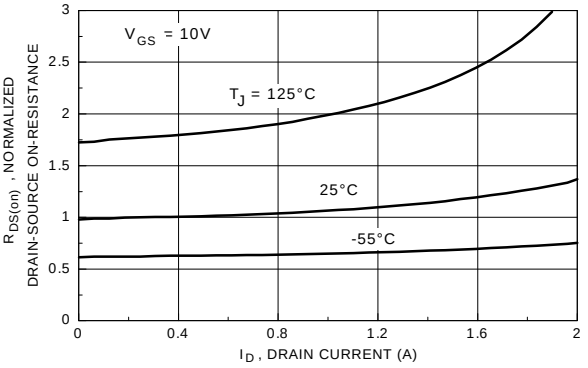


Figure 4. On-Resistance Variation with Drain Current and Temperature

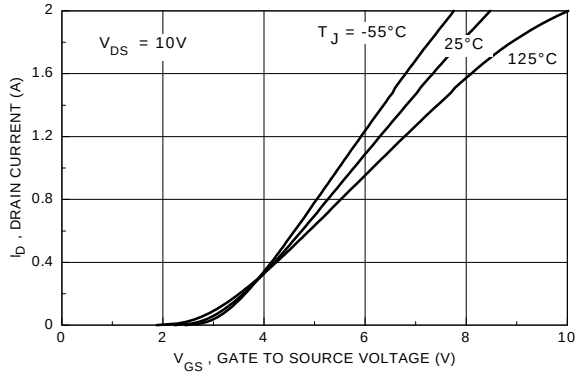


Figure 5. Transfer Characteristics

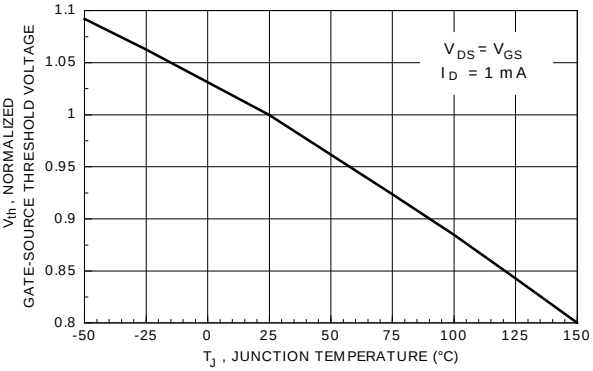


Figure 6. Gate Threshold Variation with Temperature

Typical Electrical Characteristics (continued)

2N7000 / 2N7002 /NDS7002A

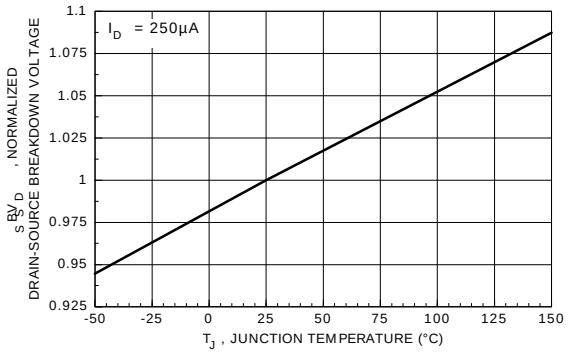


Figure 7. Breakdown Voltage Variation with Temperature

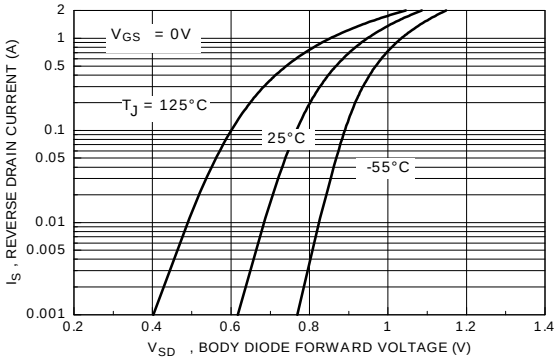


Figure 8. Body Diode Forward Voltage Variation with Current and Temperature

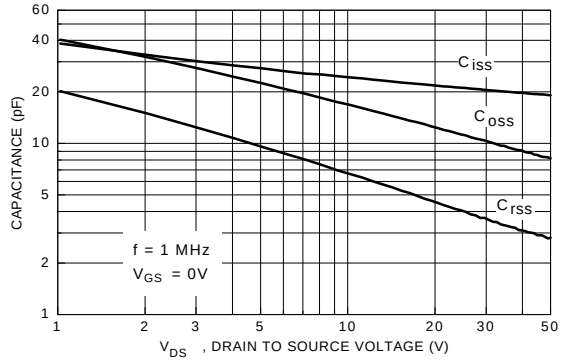


Figure 9. Capacitance Characteristics

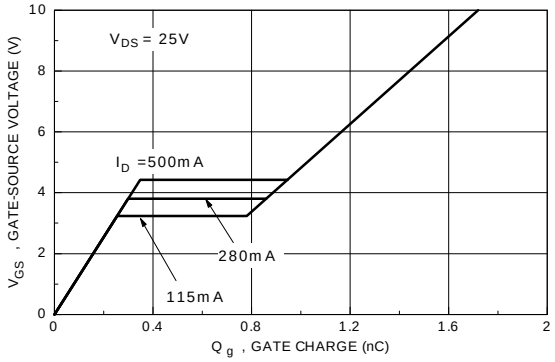


Figure 10. Gate Charge Characteristics

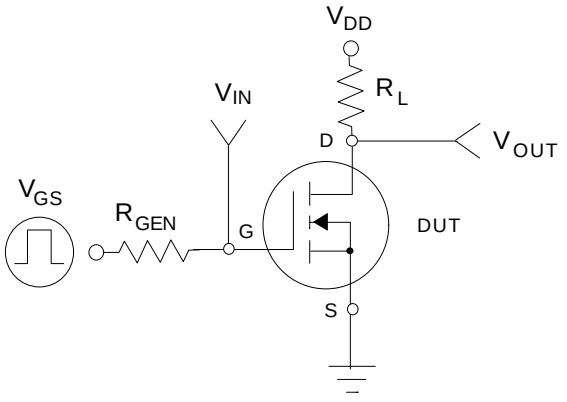


Figure 11. Switching Test Circuit

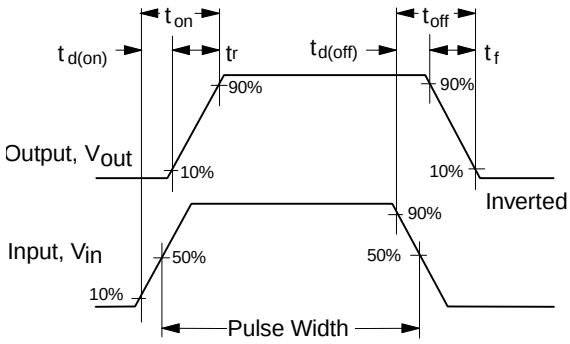


Figure 12. Switching Waveforms

Typical Electrical Characteristics (continued)

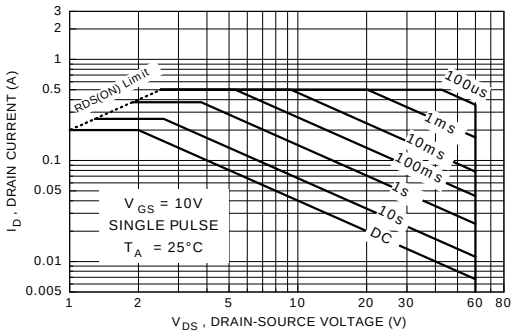


Figure 13. 2N7000 Maximum Safe Operating Area

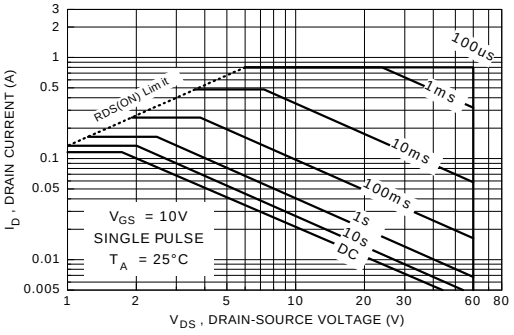


Figure 14. 2N7002 Maximum Safe Operating Area

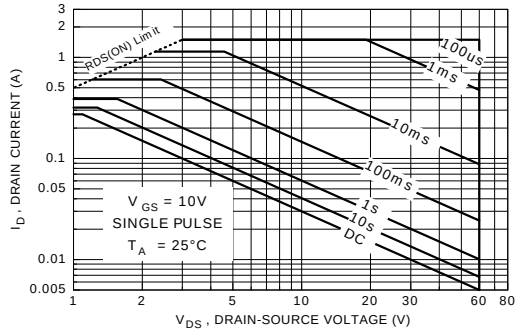


Figure 15. NDS7000A Maximum Safe Operating Area

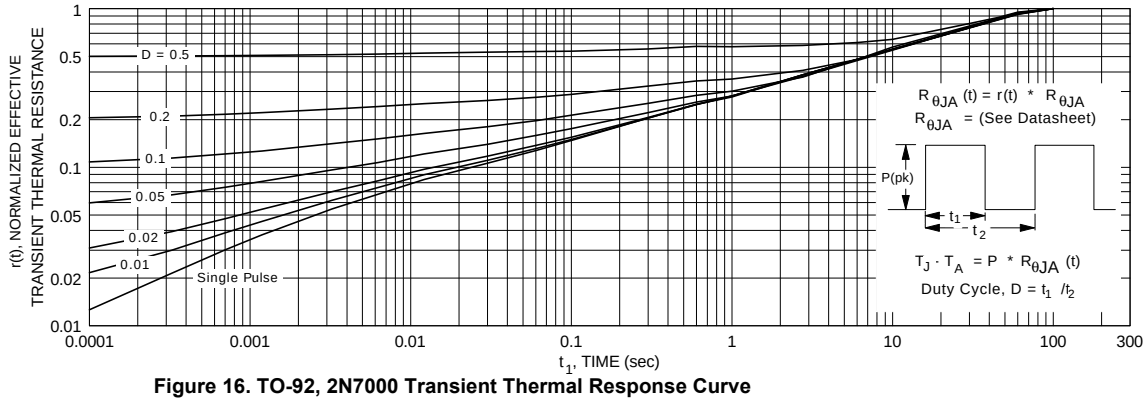


Figure 16. TO-92, 2N7000 Transient Thermal Response Curve

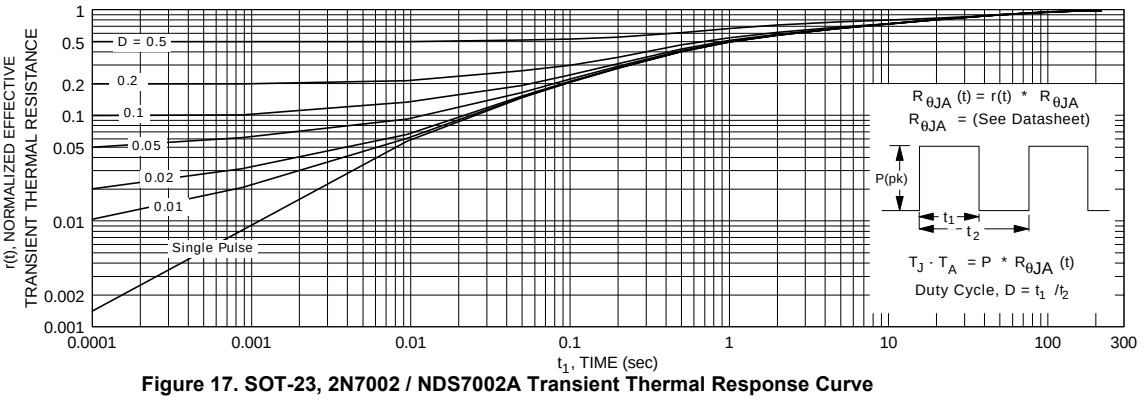


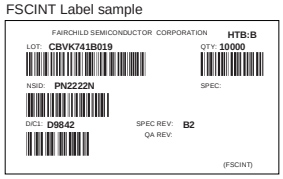
Figure 17. SOT-23, 2N7002 / NDS7002A Transient Thermal Response Curve

TO-92 Tape and Reel Data and Package Dimensions

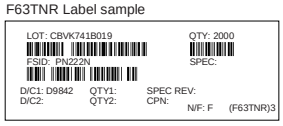
FAIRCHILD SEMICONDUCTOR™

TO-92 Packaging
Configuration: Figure 1.0

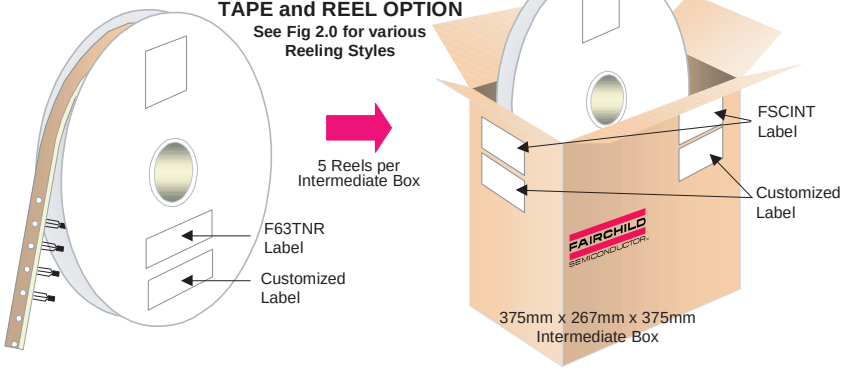
FSCINT Label sample



F63TNR Label sample



TAPE and REEL OPTION
See Fig 2.0 for various Reeling Styles

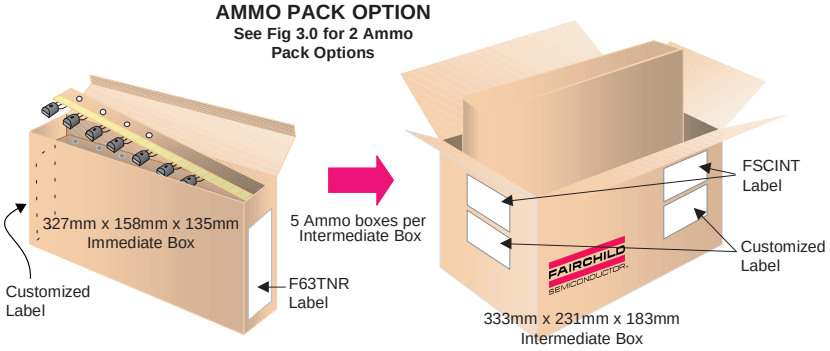


TO-92 TNR/AMMO PACKING INFROMATION

Packing	Style	Quantity	EOL code
Reel	A	2,000	D26Z
	E	2,000	D27Z
Ammo	M	2,000	D74Z
	P	2,000	D75Z

Unit weight = 0.22 gm
Reel weight with components = 1.04 kg
Ammo weight with components = 1.02 kg
Max quantity per intermediate box = 10,000 units

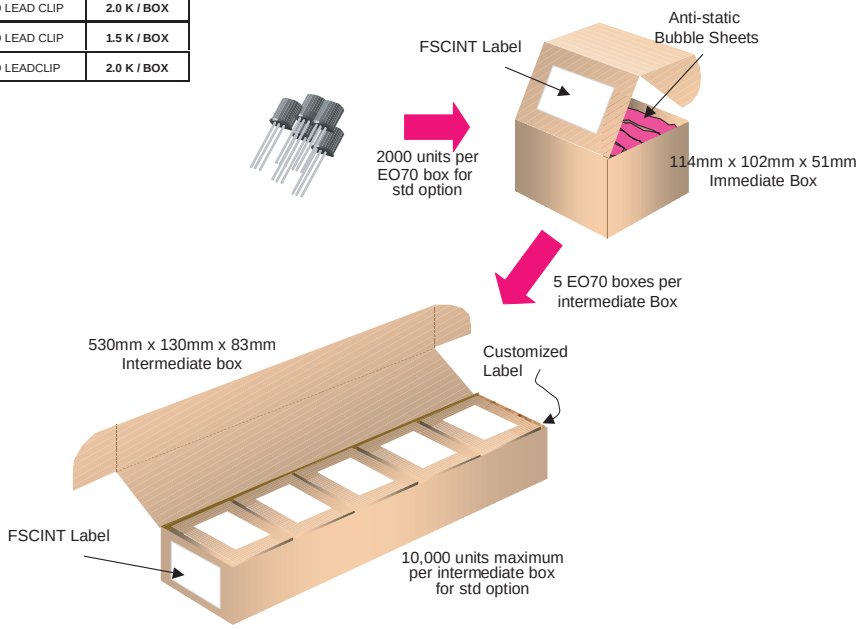
AMMO PACK OPTION
See Fig 3.0 for 2 Ammo Pack Options



(TO-92) BULK PACKING INFORMATION

EOL CODE	DESCRIPTION	LEADCLIP DIMENSION	QUANTITY
J18Z	TO-18 OPTION STD	NO LEAD CLIP	2.0 K / BOX
J05Z	TO-5 OPTION STD	NO LEAD CLIP	1.5 K / BOX
NO EOL CODE	TO-92 STANDARD STRAIGHT	NO LEADCLIP	2.0 K / BOX

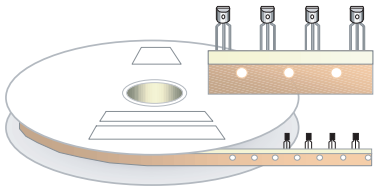
BULK OPTION
See Bulk Packing Information table



TO-92 Tape and Reel Data and Package Dimensions, continued

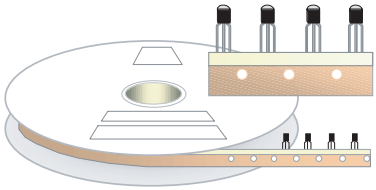
TO-92 Reeling Style
Configuration: Figure 2.0

Machine Option “A” (H)



Style “A”, D26Z, D70Z (s/h)

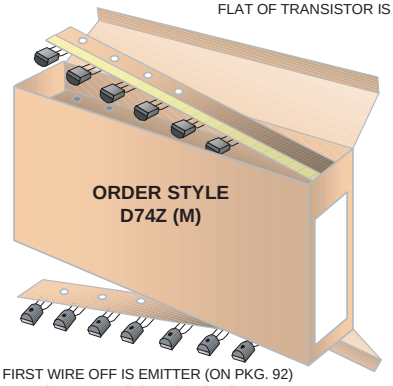
Machine Option “E” (J)



Style “E”, D27Z, D71Z (s/h)

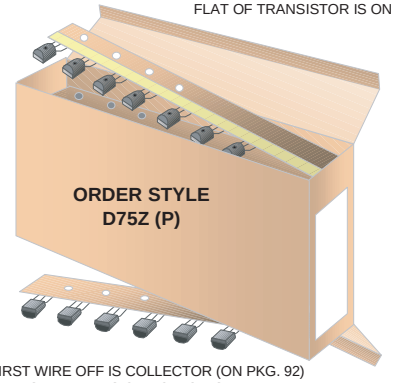
TO-92 Radial Ammo Packaging
Configuration: Figure 3.0

FIRST WIRE OFF IS COLLECTOR
ADHESIVE TAPE IS ON THE TOP SIDE
FLAT OF TRANSISTOR IS ON TOP



FIRST WIRE OFF IS EMITTER (ON PKG. 92)
ADHESIVE TAPE IS ON BOTTOM SIDE
FLAT OF TRANSISTOR IS ON BOTTOM

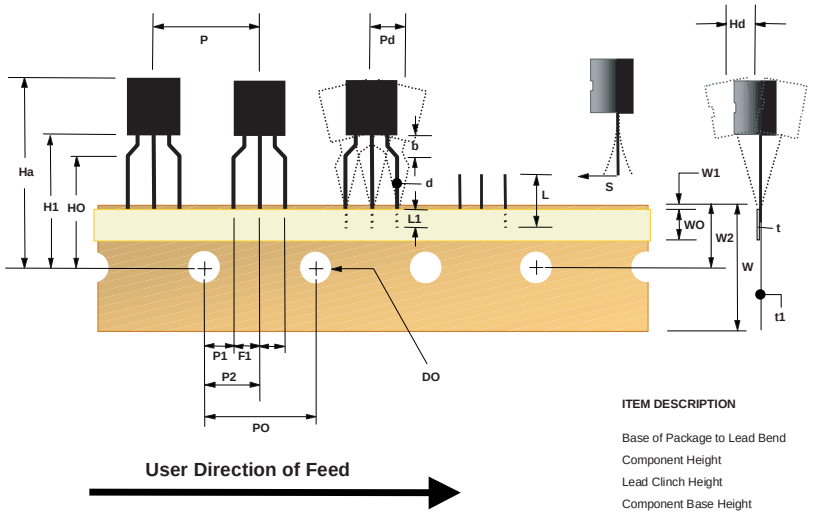
FIRST WIRE OFF IS EMITTER
ADHESIVE TAPE IS ON THE TOP SIDE
FLAT OF TRANSISTOR IS ON BOTTOM



FIRST WIRE OFF IS COLLECTOR (ON PKG. 92)
ADHESIVE TAPE IS ON BOTTOM SIDE
FLAT OF TRANSISTOR IS ON TOP

TO-92 Tape and Reel Data and Package Dimensions, continued

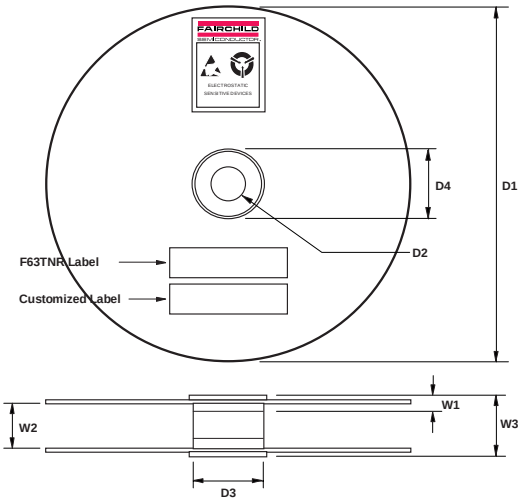
TO-92 Tape and Reel Taping
Dimension Configuration: Figure 4.0



ITEM DESCRIPTION	SYMBOL	DIMENSION
Base of Package to Lead Bend	b	0.098 (max)
Component Height	Ha	0.928 (+/- 0.025)
Lead Clinch Height	HO	0.630 (+/- 0.020)
Component Base Height	H1	0.748 (+/- 0.020)
Component Alignment (side/side)	Pd	0.040 (max)
Component Alignment (front/back)	Hd	0.031 (max)
Component Pitch	P	0.500 (+/- 0.020)
Feed Hole Pitch	PO	0.500 (+/- 0.008)
Hole Center to First Lead	P1	0.150 (+0.009, -0.010)
Hole Center to Component Center	P2	0.247 (+/- 0.007)
Lead Spread	F1/F2	0.104 (+/- 0 .010)
Lead Thickness	d	0.018 (+0.002, -0.003)
Cut Lead Length	L	0.429 (max)
Taped Lead Length	L1	0.209 (+0.051, -0.052)
Taped Lead Thickness	t	0.032 (+/- 0.006)
Carrier Tape Thickness	t1	0.021 (+/- 0.006)
Carrier Tape Width	W	0.708 (+0.020, -0.019)
Hold - down Tape Width	WO	0.236 (+/- 0.012)
Hold - down Tape position	W1	0.035 (max)
Feed Hole Position	W2	0.360 (+/- 0.025)
Sprocket Hole Diameter	DO	0.157 (+0.008, -0.007)
Lead Spring Out	S	0.004 (max)

Note : All dimensions are in inches.

TO-92 Reel
Configuration: Figure 5.0

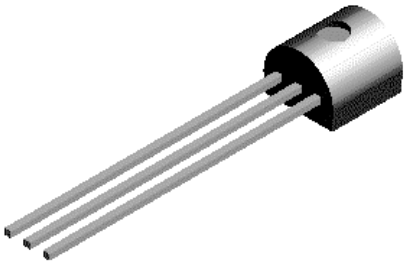


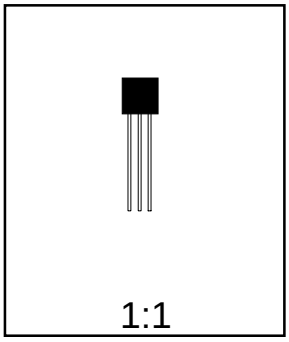
ITEM DESCRIPTION	SYSMBOL	MINIMUM	MAXIMUM
Reel Diameter	D1	13.975	14.025
Arbor Hole Diameter (Standard)	D2	1.160	1.200
(Small Hole)	D2	0.650	0.700
Core Diameter	D3	3.100	3.300
Hub Recess Inner Diameter	D4	2.700	3.100
Hub Recess Depth	W1	0.370	0.570
Flange to Flange Inner Width	W2	1.630	1.690
Hub to Hub Center Width	W3		2.090

Note: All dimensions are inches

TO-92 Tape and Reel Data and Package Dimensions

TO-92 (FS PKG Code 92, 94, 96)





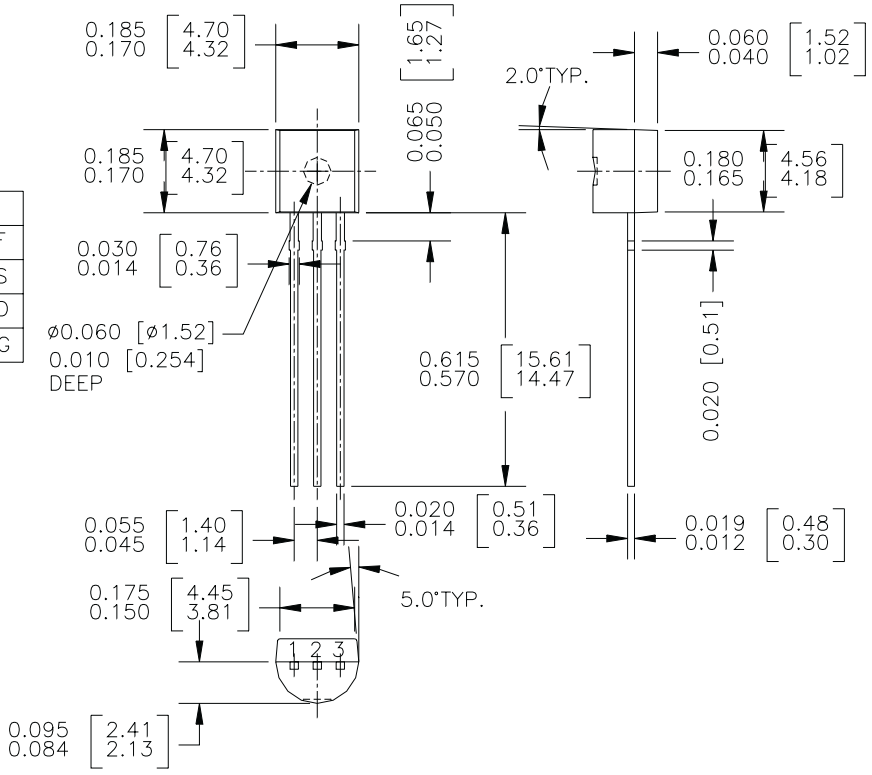
Scale 1:1 on letter size paper

Dimensions shown below are in:
inches [millimeters]

Part Weight per unit (gram): 0.1977

TO−92 (92,94,96)

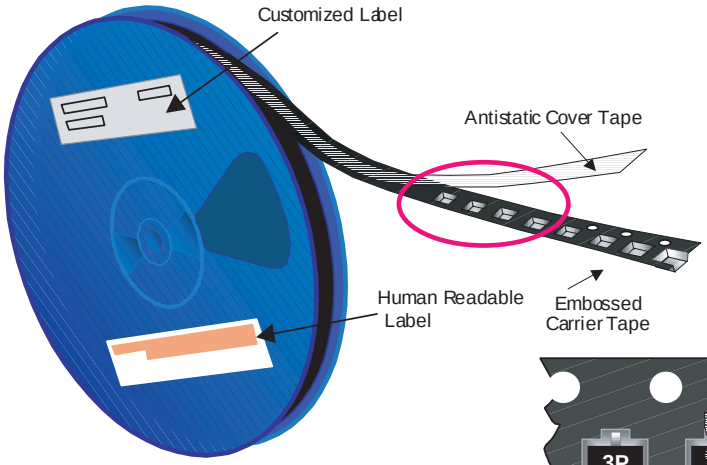
PIN	92		94		96	
	B	F	B	F	B	F
1	E	D	E	D	B	S
2	B	S	C	G	E	D
3	C	G	B	S	C	G



SOT-23 Tape and Reel Data and Package Dimensions

FAIRCHILD SEMICONDUCTOR™

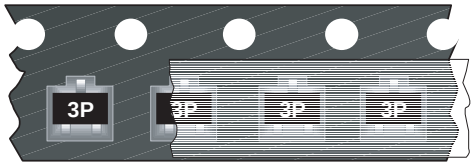
SOT-23 Packaging Configuration: Figure 10



Packaging Description:

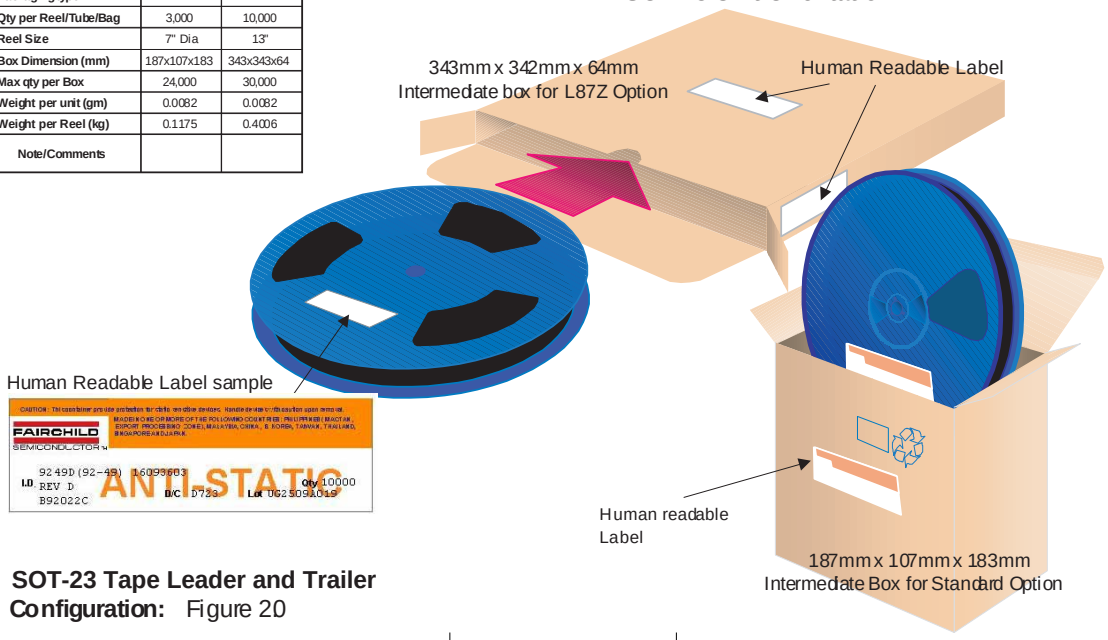
SOT-23 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000 units per 7" or 177cm diameter reel. The reels are dark blue in color and is made of polystyrene plastic (anti-static coated). Other option comes in 10,000 units per 13" or 330cm diameter reel. This and some other options are described in the Packaging Information table.

These full reels are individually labeled and placed inside a standard intermediate made of recyclable corrugated brown paper with a Fairchild logo printing. One pizza box contains eight reels maximum. And these intermediate boxes are placed inside a labeled shipping box which comes in different sizes depending on the number of parts shipped.

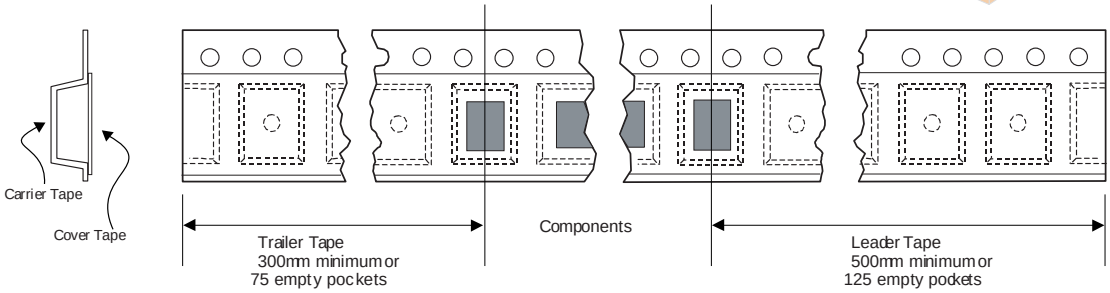


SOT-23 Packaging Information		
Packaging Option	Standard (no flow code)	D87Z
Packaging type	TNR	TNR
Qty per Reel/Tube/Bag	3,000	10,000
Reel Size	7" Dia	13"
Box Dimension (mm)	187x107x183	343x343x64
Max qty per Box	24,000	30,000
Weight per unit (gm)	0.0082	0.0082
Weight per Reel (kg)	0.1175	0.4006
Note/Comments		

SOT-23 Unit Orientation

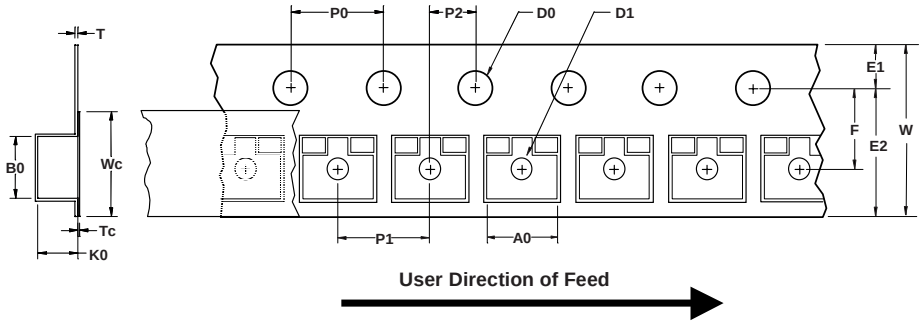


SOT-23 Tape Leader and Trailer Configuration: Figure 20



SOT-23 Tape and Reel Data and Package Dimensions, continued

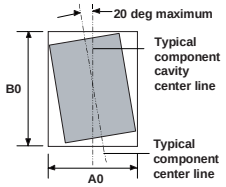
SOT-23 Embossed Carrier Tape
Configuration: Figure 3.0



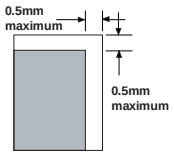
Dimensions are in millimeter														
Pkg type	**A0**	**B0**	**W**	**D0**	**D1**	**E1**	**E2**	**F**	**P1**	**P0**	**K0**	**T**	**Wc**	**Tc**
SOT-23 (8mm)	3.15 +/-0.10	2.77 +/-0.10	8.0 +/-0.3	1.55 +/-0.05	1.125 +/-0.125	1.75 +/-0.10	6.25 min	3.50 +/-0.05	4.0 +/-0.1	4.0 +/-0.1	1.30 +/-0.10	0.228 +/-0.013	5.2 +/-0.3	0.06 +/-0.02

Notes: A0, B0, and K0 dimensions are determined with respect to the EIA/Jedec RS-481 rotational and lateral movement requirements (see sketches A, B, and C).

Sketch A (Side or Front Sectional View)
Component Rotation

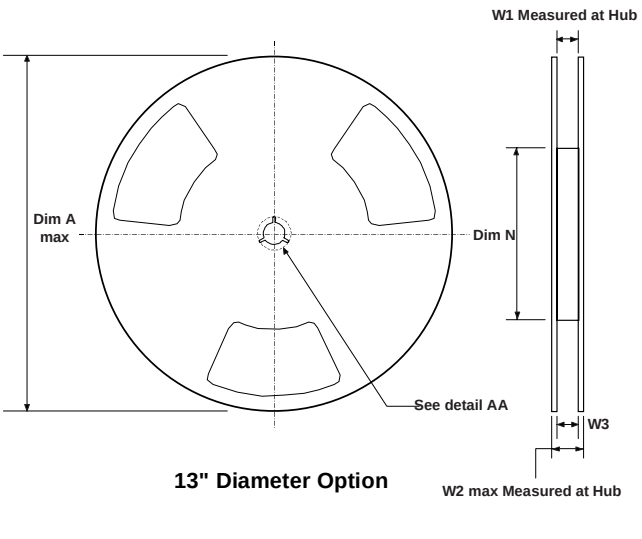


Sketch B (Top View)
Component Rotation

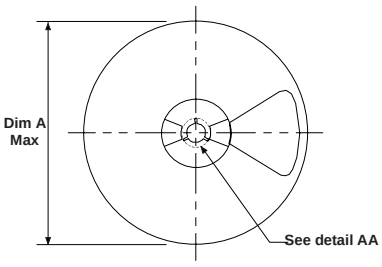


Sketch C (Top View)
Component lateral movement

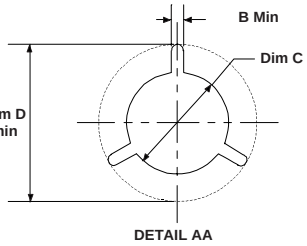
SOT-23 Reel Configuration: Figure 4.0



13" Diameter Option



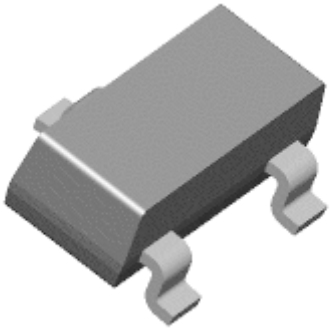
7" Diameter Option

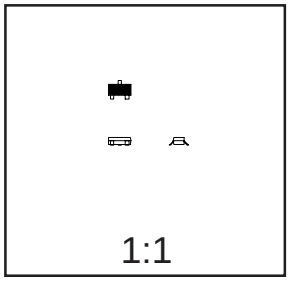


Dimensions are in inches and millimeters									
Tape Size	**Reel Option**	**Dim A**	**Dim B**	**Dim C**	**Dim D**	**Dim N**	**Dim W1**	**Dim W2**	**Dim W3 (LSL-USL)**
8mm	7" Dia	7.00 177.8	0.059 1.5	512 +0.020/-0.008 13 +0.5/-0.2	0.795 20.2	2.165 55	0.331 +0.059/-0.000 8.4 +1.5/0	0.567 14.4	0.311 – 0.429 7.9 – 10.9
8mm	13" Dia	13.00 330	0.059 1.5	512 +0.020/-0.008 13 +0.5/-0.2	0.795 20.2	4.00 100	0.331 +0.059/-0.000 8.4 +1.5/0	0.567 14.4	0.311 – 0.429 7.9 – 10.9

SOT-23 Tape and Reel Data and Package Dimensions, continued

SOT-23 (FS PKG Code 49)

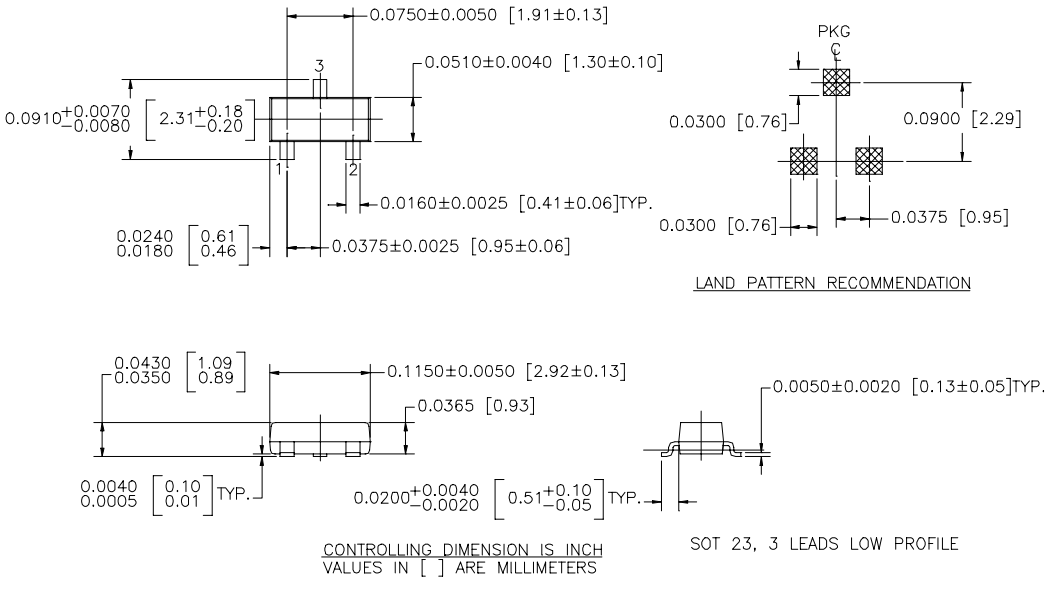




Scale 1:1 on letter size paper

Dimensions shown below are in:
inches [millimeters]

Part Weight per unit (gram): 0.0082



NOTE : UNLESS OTHERWISE SPECIFIED

1. STANDARD LEAD FINISH 150 MICROINCHES / 3.81 MICROMETERS MINIMUM TIN / LEAD (SOLDER) ON ALLOY 42
2. REFERENCE JEDEC REGISTRATION TO−236, VARIATION AB, ISSUE G, DATED JUL 1993

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™
CoolFET™
CROSSVOLT™
E^2CMOS^{TM}
FACT™
FACT Quiet Series™
FAST®
FASTr™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
POP™
PowerTrench®
QFET™
QS™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SyncFET™
TinyLogic™
UHC™
VCX™

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.
As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

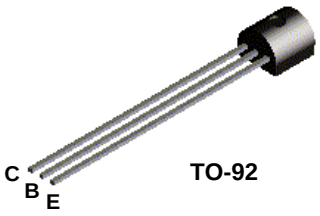
Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

FAIRCHILD SEMICONDUCTOR TM

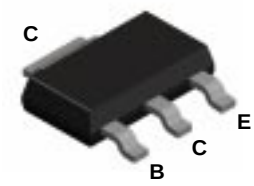
Discrete POWER & Signal Technologies

2N7052 2N7053 NZT7053



TO-92

TO-226



SOT-223

NPN Darlington Transistor

This device is designed for applications requiring extremely high gain at collector currents to 1.0 A and high breakdown voltage. Sourced from Process 06.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	100	V
V_{CBO}	Collector-Base Voltage	100	V
V_{EBO}	Emitter-Base Voltage	12	V
I_C	Collector Current - Continuous	1.5	A
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max			Units
		2N7052	2N7053	*NZT7053	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	1,000 8.0	1,000 8.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	125		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	50	125	°C/W

*Device mounted on FR-4 PCB 36 mm X 18 mm X 1.5 mm; mounting pad for the collector lead min. 6 cm^2.

ã 1997 Fairchild Semiconductor Corporation

NPN Darlington Transistor
(continued)

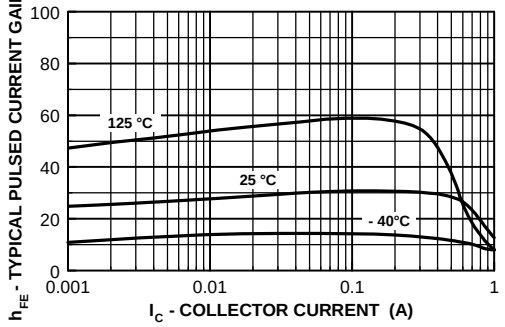
Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 1.0 mA, I_B = 0	100		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 100 µA, I_E = 0	100		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 1.0 mA, I_C = 0	12		V
I_{CBO}	Collector-Cutoff Current	V_{CB} = 80 V, I_E = 0		0.1	µA
I_{CES}	Collector-Cutoff Current	V_{CE} = 80 V, I_E = 0		0.2	µA
I_{EBO}	Emitter-Cutoff Current	V_{EB} = 7.0 V, I_C = 0		0.1	µA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	I_C = 100 mA, V_{CE} = 5.0 V I_C = 1.0 A, V_{CE} = 5.0 V	10,000 1,000	 20,000	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 100 mA, I_B = 0.1 mA		1.5	V
$V_{BE(on)}$	Base-Emitter On Voltage	I_C = 100 mA, V_{BE} = 5.0 V		2.0	V
SMALL SIGNAL CHARACTERISTICS					
F_T	Transition Frequency	I_C = 100 mA, V_{CE} = 5.0 V,	200		MHz
C_{cb}	Collector-Base Capacitance	V_{CB} = 10 V,f = 1.0 MHz **2N7052** **2N7053**		10 8.0	pF

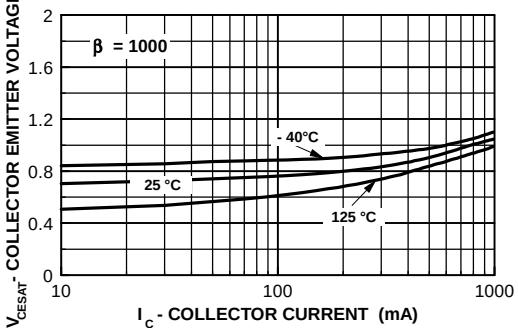
*Pulse Test: Pulse Width £ 300 ms, Duty Cycle £ 1.0%

Typical Characteristics

Typical Pulsed Current Gain vs Collector Current



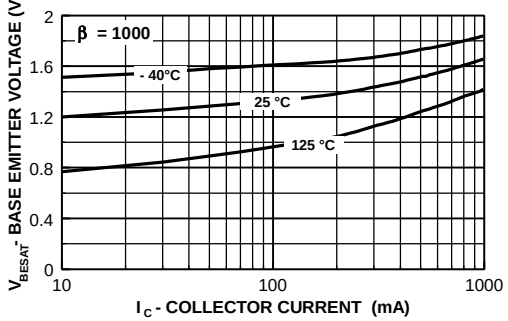
Collector-Emitter Saturation Voltage vs Collector Current



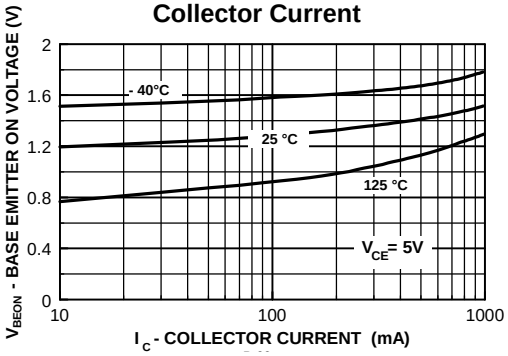
NPN Darlington Transistor
(continued)

Typical Characteristics (continued)

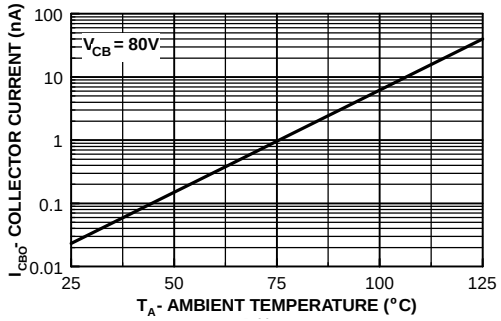
Base-Emitter Saturation Voltage vs Collector Current



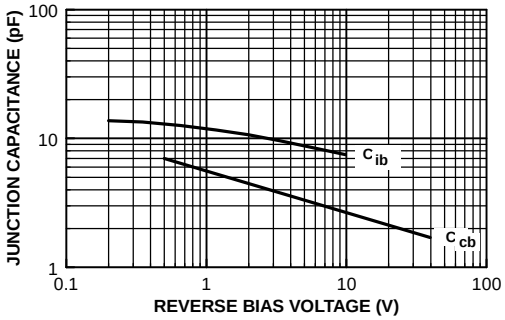
Base Emitter ON Voltage vs Collector Current



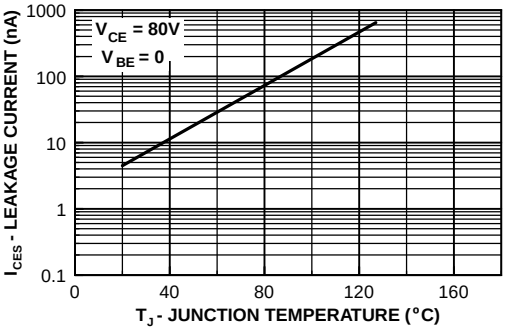
Collector-Cutoff Current vs. Ambient Temperature



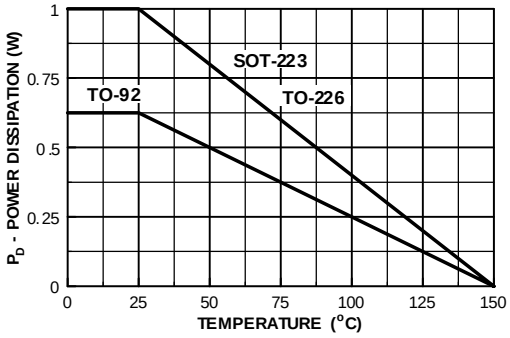
Junction Capacitance vs Reverse Bias Voltage



Typical Collector-Emitter Leakage Current vs Temperature



Power Dissipation vs Ambient Temperature



TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™
CoolFET™
CROSSVOLT™
E^2CMOS^{TM}
FACT™
FACT Quiet Series™
FAST®
FASTr™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
POP™
PowerTrench™
QS™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
TinyLogic™

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.
As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.