SGS-THOMSON MICROELECTRONICS

2N2904A-2N2905A 2N2906A-2N2907A

GENERAL PURPOSE AMPLIFIERS AND SWITCHES

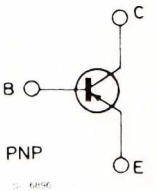
DESCRIPTION

The 2N2904A, 2N2905A, 2N2906A and 2N2907A are silicon planar epitaxial PNP transistors in Jedec TO-39 (for 2N2904A and 2N2905A) and in Jedec TO-18 (for 2N2906A and 2N2907A) metal cases. They are designed for high-speed saturated switching and general purpose applications.

2N2904A/2N2905A approved to CECC 50002-100, 2N2906A/2N2907A approved to CECC 50002-103 available on request.

TO-39 TO-18

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CBO}	Collector-base Voltage (I_E = 0)	– 60	V
V_{CEO}	Collector-emitter Voltage (I_B = 0)	– 60	V
V_{EBO}	Emitter-base Voltage (I_C = 0)	– 5	V
I_C	Collector Current	– 600	mA
P_{tot}	Total Power Dissipation at $T_{amb} \leq 25$ °C		
	for **2N2904A** and **2N2905A**	0.6	W
	for **2N2906A** and **2N2907A**	0.4	W
	at $T_{case} \leq 25$ °C		
	for **2N2904A** and **2N2905A**	3	W
	for **2N2906A** and **2N2907A**	1.8	W
T_{stg}, T_j	Storage and Junction Temperature	– 65 to 200	°C

THERMAL DATA

			2N2904A 2N2905A	2N2906A 2N2907A
$R_{th\ j\text{-}case}$	Thermal Resistance Junction-case	Max	58.3 °C/W	97.3 °C/W
$R_{th\ j\text{-}amb}$	Thermal Resistance Junction-ambient	Max	292 °C/W	437.5 °C/W

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector Cutoff Current (I_E = 0)	V_{CB} = – 50 V V_{CB} = – 50 V T_{amb} = 150 °C			– 10 – 10	nA μA
I_{CEX}	Collector Cutoff Current (V_{BE} = 0.5 V)	V_{CE} = – 30 V			– 50	nA
I_{BEX}	Base Cutoff Current (V_{BE} = 0.5 V)	V_{CE} = – 30 V			– 50	nA
$V_{(BR)\ CBO}$	Collector-base Breakdown Voltage (I_E = 0)	I_C = – 10 μA	– 60			V
$V_{(BR)\ CEO}$*	Collector-emitter Breakdown Voltage (I_B = 0)	I_C = – 10 mA	– 60			V
$V_{(BR)\ EBO}$	Emitter-base Breakdown Voltage (I_C = 0)	I_E = – 10 μA	– 5			V
$V_{CE\ (sat)}$*	Collector-emitter Saturation Voltage	I_C = – 150 mA I_B = – 15 mA I_C = – 500 mA I_B = – 50 mA			– 0.4 – 1.6	V V
$V_{BE\ (sat)}$*	Base-emitter Saturation Voltage	I_C = – 150 mA I_B = – 16 mA I_C = – 500 mA I_B = – 50 mA			– 1.3 – 2.6	V V
h_{FE}*	DC Current Gain	for **2N2904A** and **2N2906A** I_C = – 0.1 mA V_{CE} = – 10 V I_C = – 1 mA V_{CE} = – 10 V I_C = – 10 mA V_{CE} = – 10 V I_C = – 150 mA V_{CE} = – 10 V I_C = – 500 mA V_{CE} = – 10 V	 40 40 40 40 40		 120	
h_{FE}*	DC Current Gain	for **2N2905A** and **2N2907A** I_C = – 0.1 mA V_{CE} = – 10 V I_C = – 1 mA V_{CE} = – 10 V I_C = – 10 mA V_{CE} = – 10 V I_C = – 150 mA V_{CE} = – 10 V I_C = – 500 mA V_{CE} = – 10 V	 75 100 100 100 50		 300	
f_T	Transition Frequency	I_C = – 50 mA V_{CE} = – 20 V f = 100 MHz	200			MHz
C_{EBO}	Emitter-base Capacitance	I_C = 0 V_{EB} = – 2 V f = 1 MHz			30	pF
C_{CBO}	Collector-base Capacitance	I_E = 0 V_{CB} = – 10 V f = 1 MHz			8	pF
t_d **	Delay Time	I_C = – 150 mA V_{CC} = – 30 V I_{B1} = – 15 mA			10	ns
t_r **	Rise Time	I_C = – 150 mA V_{CC} = – 30 V I_{B1} = – 15 mA			40	ns
t_s **	Storage Time	I_C = – 150 mA V_{CC} = – 6 V I_{B1} = – I_{B2} = – 15 mA			80	ns

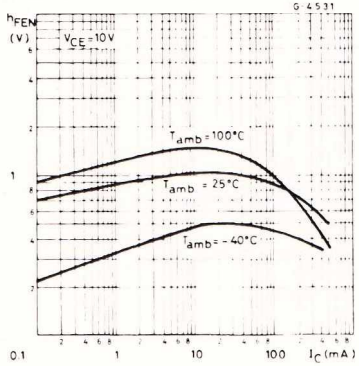
* Pulsed : pulse duration = 300 μs, duty cycle = 1.5 %.
** See test circuit.

ELECTRICAL CHARACTERISTICS (continued)

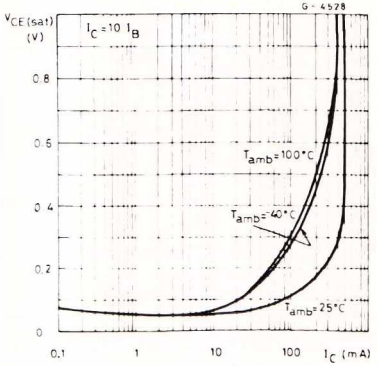
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_f **	Fall Time	$I_C = -150$ mA $V_{CC} = -6$ V $I_{B1} = -I_{B2} = -15$ mA			30	ns
t_{on} **	Turn-on Time	$I_C = -150$ mA $V_{CC} = -30$ V $I_{B1} = -15$ mA			45	ns
t_{off} **	Turn-off Time	$I_C = -150$ mA $V_{CC} = -6$ V $I_{B1} = -I_{B2} = -15$ mA			100	ns

* Pulsed : pulse duration = 300 µs, duty cycle = 1.5 %.
** see test circuit.

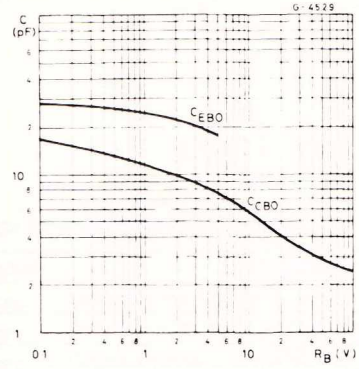
Normalized DC Current Gain.



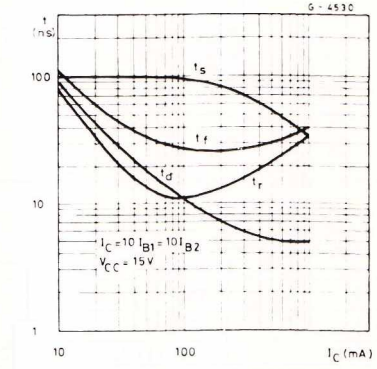
Collector-emitter Saturation Voltage.



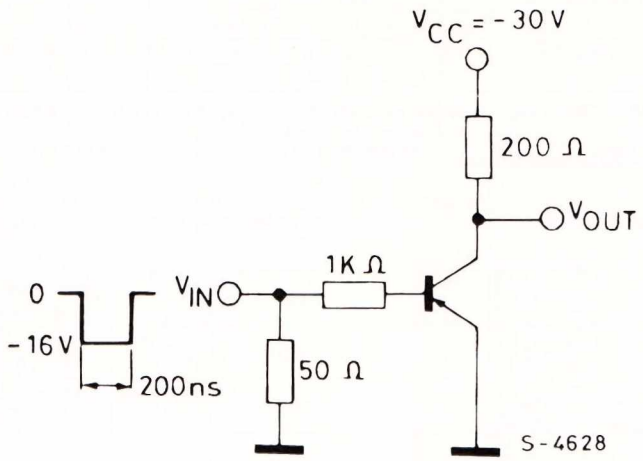
Collector-base and Emitter-base capacitances.



Switching Characteristics.



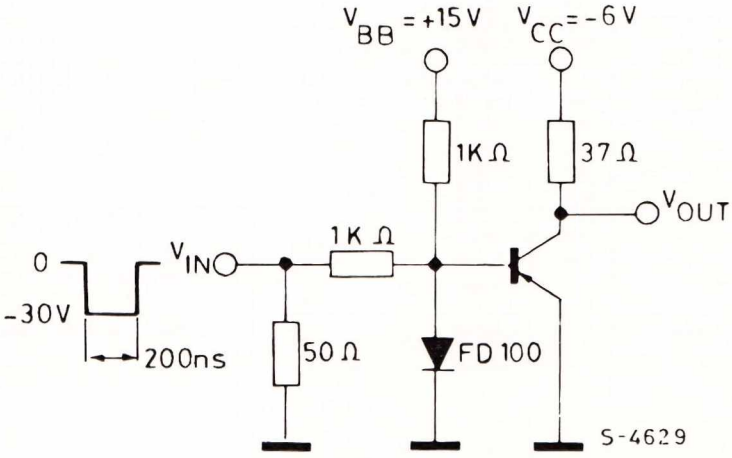
Test Circuit for t_{on}, t_r, t_d.



PULSE GENERATOR :
$t_r \leq 2.0$ ns
Frequency = 150 Hz
$Z_o = 50\ \Omega$

TO OSCILLOSCOPE :
$t_r < 5.0$ ns
$Z_{IN} > 10\ M\Omega$

Test Circuit for t_{off}, t_o, t_f.



PULSE GENERATOR :
$t_r \leq 2.0$ ns
Frequency = 150 Hz
$Z_o = 50\ \Omega$

TO OSCILLOSCOPE :
$t_r < 5.0$ ns
$Z_{IN} > 100\ M\Omega$