New Jersey Semi-Conductor Products, Inc.

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2N5943

The RF Line

NPN SILICON HIGH-FREQUENCY TRANSISTOR

. . . designed specifically for broadband applications requiring low cross-modulation distortion and low-noise figure. Characterized for use in CATV applications.

- Low Noise Figure – @ f = 200 MHz
  NF (Narrowband) = 3.4 dB (Typ)
  NF (Broadband) = 6.8 dB (Typ)
- High Current-Gain – Bandwidth Product –
  f_T = 1200 MHz (Min) @ I_C = 50 mAdc
- Completely Characterized with s and y-Parameters

1.2 GHz – 50 mAdc

NPN SILICON HIGH-FREQUENCY TRANSISTOR

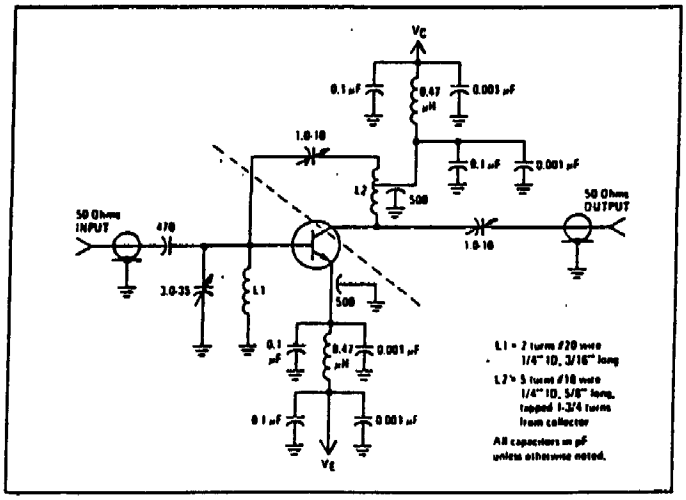
NPN SILICON

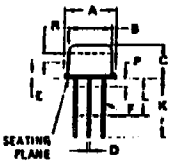
***MAXIMUM RATINGS**

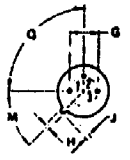
Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	30	Vdc
Collector-Base Voltage	V_{CBO}	40	Vdc
Emitter-Base Voltage	V_{EBO}	3.5	Vdc
Collector Current – Continuous	I_C	400	mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	1.0 5.7	Watt mW/°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	3.5 0.02	Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200	°C

*Indicates JEDEC Registered Data.

FIGURE 1 – NARROW-BAND TEST CIRCUIT







STYLE 1
PIN 1. EMITTER
2. BASE
3. COLLECTOR

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	8.89	9.40	0.350	0.370
B	8.00	8.51	0.315	0.335
C	6.10	6.60	0.240	0.260
D	0.406	0.533	0.016	0.021
E	0.229	3.18	0.009	0.125
F	0.406	0.483	0.016	0.019
G	4.83	5.33	0.190	0.210
H	0.711	0.864	0.028	0.034
J	0.737	1.02	0.029	0.040
K	12.70	-	0.500	-
L	6.35	-	0.250	-
M	45° NOM		45° NOM	
P	-	1.27	-	0.050
Q	90° NOM		90° NOM	
R	2.54	-	0.100	-

All JEDEC dimensions and notes apply.

TO-39

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***ELECTRICAL CHARACTERISTICS** (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 5.0 mAdc, I_B = 0)	$V_{(BR)CEO}$	30	–	–	Vdc
Collector-Base Breakdown Voltage (I_C = 100 μAdc, I_E = 0)	$V_{(BR)CBO}$	40	–	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 100 μAdc, I_C = 0)	$V_{(BR)EBO}$	3.5	–	–	Vdc
Collector Cutoff Current (V_{CE} = 20 Vdc, I_B = 0)	I_{CEO}	–	–	50	μAdc
Collector Cutoff Current (V_{CB} = 15 Vdc, I_E = 0)	I_{CBO}	–	–	10	μAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 50 mAdc, V_{CE} = 15 Vdc)	h_{FE}	25	–	300	–
Collector-Emitter Saturation Voltage (I_C = 100 mAdc, I_B = 10 mAdc)	$V_{CE(sat)}$	–	0.15	0.2	Vdc
Base-Emitter Saturation Voltage (I_C = 100 mAdc, I_B = 10 mAdc)	$V_{BE(sat)}$	–	0.88	1.0	Vdc
DYNAMIC CHARACTERISTICS					
Current-Gain – Bandwidth Product (Figure 2)	f_T				MHz
(I_C = 25 mAdc, V_{CE} = 15 Vdc, f = 200 MHz)		1000	1350	–	
(I_C = 50 mAdc, V_{CE} = 15 Vdc, f = 200 MHz)		1200	1550	2400	
(I_C = 100 mAdc, V_{CE} = 15 Vdc, f = 200 MHz)		1000	1425	–	
Collector-Base Capacitance (Figure 5) (V_{CB} = 30 Vdc, I_E = 0, f = 100 kHz)	C_{cb}	1.0	1.6	2.5	pF
Emitter-Base Capacitance (Figure 5) (V_{EB} = 0.5 Vdc, I_C = 0, f = 100 kHz)	C_{eb}	–	8.4	15	pF
Small-Signal Current Gain (I_C = 50 mAdc, V_{CE} = 15 Vdc, f = 1.0 kHz)	h_{fe}	25	–	350	–
Collector-Base Time Constant (I_E = 50 mAdc, V_{CB} = 15 Vdc, f = 31.8 MHz)	$r_b'C_c$	2.0	5.5	20	ps
Noise Figure	NF				dB
(I_C = 30 mAdc, V_{CE} = 15 Vdc, f = 200 MHz) (Figure 1)		–	3.4	–	
(I_C = 35 mAdc, V_{CE} = 15 Vdc, f = 200 MHz) (Figures 6, 11, 14) (1)		–	6.8	8.0	
FUNCTIONAL TEST					
Common-Emitter Amplifier Power Gain	G_{pe}				dB
(I_C = 10 mAdc, V_{CE} = 15 Vdc, f = 200 MHz) (Figure 1)		–	11.4	–	
(I_C = 50 mAdc, V_{CE} = 15 Vdc, f = 250 MHz) (Figure 6)		7.0	7.6	–	
Intermodulation Distortion (Figure 7) (I_C = 50 mAdc, V_{CE} = 15 Vdc, V_{out} = +50 dBmV)	IM	–	–	-50	dB
Cross Modulation Distortion (Figure 8)	XM				dB
(I_C = 50 mAdc, V_{CE} = 15 Vdc, V_{out} = +40 dBmV)		–	-67	–	
(I_C = 50 mAdc, V_{CE} = 15 Vdc, V_{out} = +50 dBmV)		–	-45	-42	

*Indicates JEDEC Registered Data.
(1) Includes noise figure of post-amplifier and matching pad.