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2N3947

NPN SMALL SIGNAL GENERAL PURPOSE AMPLIFIER AND SWITCH

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N3947 MIN.	2N3947 MAX.	UNITS	TEST CONDITIONS
BV_{CBO}	Collector to Base Breakdown Voltage	60		V	I_C = 10 μA, I_E = 0
BV_{CEO}	Collector to Emitter Breakdown Voltage (Note 4)	40		V	I_C = 10 mA, I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		V	I_E = 10 μA, I_C = 0
I_{CEX}	Collector Cutoff Current		10	nA	V_{CE} = 40 V, V_{EB} = 3.0 V
			15	μA	V_{CE} 40 V, V_{EB} = 3.0 V, T_A = 150 C
I_{BL}	Base Cutoff Current		25	nA	V_{CE} = 40 V, V_{EB} = 3.0 V
h_{FE}	DC Current Gain (Note 4)	60			I_C = 0.1 mA, V_{CE} = 1.0 V
		90			I_C = 1.0 mA, V_{CE} = 1.0 V
		100	300		I_C = 10 mA, V_{CE} = 1.0 V
		40			I_C = 50 mA, V_{CE} = 1.0 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 4)		0.2	V	I_C = 10 mA, I_B = 1.0 mA
			0.3	V	I_C = 50 mA, I_B = 5.0 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 4)	0.6	0.9	V	I_C = 10 mA, I_B = 1.0 mA
			1.0	V	I_C = 50 mA, I_B = 5.0 mA
h_{fe}	Current Gain Bandwidth Product	3.0			I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz
C_{ob}	Output Capacitance		4.0	pF	I_E = 0, V_{CB} = 10 V, f = 100 kHz
C_{ib}	Input Capacitance		8.0	pF	V_{EB} = 1.0 V, I_C = 0, f = 100 kHz
h_{ie}	Input Impedance	2.0	12	kΩ	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{re}	Voltage Feedback Ratio		20	$x10^{-4}$	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{fe}	Small Signal Current Gain	100	700		I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{oe}	Output Admittance	5.0	50	μmhos	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz
NF	Noise Figure		5.0	dB	I_C = 100 μA, V_{CE} = 5.0 V, R_G = 1.0 kΩ f = 10 Hz to 15.7 kHz

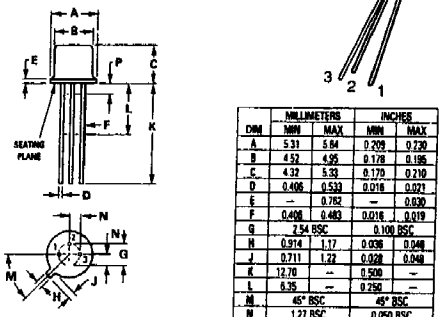
Additional Electrical Characteristics on following page.

ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted) (Cont'd)

SYMBOL	CHARACTERISTIC	2N3947 MIN.	2N3947 MAX.	UNITS	TEST CONDITIONS
t_d	Delay Time (see test circuit no. 526)		35	ns	V_{CC} = 3.0 V, $V_{BE(OFF)}$ = 0.5 V, I_C = 10 mA, I_{B1} = 1.0 mA
t_r	Rise Time (see test circuit no. 526)		300	ns	V_{CC} = 3.0 V, $V_{BE(OFF)}$ = 0.5 V, I_C = 10 mA, I_{B1} = 1.0 mA
t_s	Storage Time (see test circuit no. 527)		375	ns	V_{CC} = 3.0 V, I_C = 10 mA, I_{B1} = I_{B2} = 1.0 mA
t_f	Fall Time (see test circuit no. 527)		75	ns	V_{CC} = 3.0 V, I_C = 10 mA, I_{B1} = I_{B2} = 1.0 mA
$r_b'C_c$	Collector to Base Time Constant		200	ps	I_C = 10 mA, V_{CE} = 20 V, f = 31.8 MHz

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on application involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 200°C and junction to ambient thermal resistance of 486°C/W (derating factor of 2.06 mW/°C); junction to case thermal resistance of 146°C/W (derating factor of 6.9 mW/°C).
4. Pulse conditions: length = 300 μs; duty cycle = 2%.

(TO-18) **METAL**



DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	5.31	5.84	0.209	0.230
B	4.52	4.95	0.178	0.195
C	4.32	5.33	0.170	0.210
D	0.406	0.533	0.016	0.021
E	—	0.762	—	0.030
F	0.406	0.483	0.016	0.019
G	2.54 BSC		0.100 BSC	
H	0.914	1.17	0.036	0.046
J	0.711	1.22	0.028	0.048
K	12.70	—	0.500	—
L	6.35	—	0.250	—
M	45° BSC		45° BSC	
N	1.27 BSC		0.050 BSC	
P	—	1.27	—	0.050

All JEDEC notes and dimensions apply.