

Features

- Available in commercial, JAN, JANTX, JANTXV, JANS and JANSR 100K rads (Si) per MIL-PRF-19500/394
- Radiation Tolerant Levels M, D, P, L and R
- TO-5 Package
- Designed for Use in High Current Switching Applications
- Ideal for Converters, Inverters and Wide Band Amplifiers

**Electrical Characteristics (T_A = +25°C unless otherwise noted)**

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Collector - Emitter Breakdown Voltage	I _C = 100 mA dc	V _{(BR)CEO}	V dc	70	—
Emitter - Base Cutoff Current	V _{EB} = 7.0 Vdc V _{EB} = 5.0 Vdc	I _{EBO1} I _{EBO2}	μA dc	—	10 0.1
Collector - Emitter Cutoff Current	V _{BE} = -0.5 Vdc, V _{CE} = 60 V dc	I _{CEX1}	μA dc	—	10
Collector - Emitter Cutoff Current	V _{CE} = 60 V dc	I _{CEO}	μA dc	—	10
Collector - Base Cutoff Current	V _{CB} = 100 V dc V _{CB} = 80 V dc	I _{CBO1} I _{CBO2}	μA dc	—	10 0.1
Collector - Base Cutoff Current	I _C = 1.0 A dc, V _{CE} = 5.0 V dc I _C = 5.0 A dc, V _{CE} = 5.0 V dc I _C = 10.0 A dc, V _{CE} = 5.0 V dc	h _{FE}	V dc	50 40 10	200 120 —
Collector-Emitter Saturation Voltage	I _C = 5.0 A dc, I _B = 0.5 A dc I _C = 10.0 A dc, I _B = 1.0 A dc	V _{CE(sat)1} V _{CE(sat)2}	V dc	—	0.6 2.5
Base-Emitter Saturation Voltage	I _C = 5.0 A dc, I _B = 0.5 A dc I _C = 10.0 A dc, I _B = 1.0 A dc	V _{BE(sat)1} V _{BE(sat)2}	V dc	—	1.5 2.5
Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio	I _C = 0.2 A dc, V _{CE} = 10.0 Vdc, f = 10 MHz	h _{fe}	-	1.5	7.5
Output Capacitance	V _{CB} = 10 Vdc, I _E = 0, 100 kHz ≤ f ≤ 1 MHz	C _{obo}	pF	—	350
Switching Characteristics					
Delay Time	V _{CC} = 20 V dc, V _{BB} = 5.0 V dc, I _C = 5.0 A dc, I _{B1} = 0.5 A dc	t _d	ns	—	50
Rise Time		t _r	ns	—	500
Storage Time		t _s	μs	—	1.5
Fall Time		t _f	ns	—	500

NPN Power Silicon Transistor

Rev. V4

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Collector - Emitter Cutoff Current	$T_A = +150^\circ\text{C}$ $V_{BE} = -0.5 \text{ Vdc}$, $V_{CE} = 60 \text{ V dc}$	I_{CEX2}	$\mu\text{A dc}$	—	100
Forward - Current Transfer Ratio	$T_A = -55^\circ\text{C}$ $V_{CE} = 5 \text{ V dc}$, $I_C = 5 \text{ A dc}$	h_{FE4}		20	

Absolute Maximum Ratings ($T_A = +25^\circ\text{C}$ unless otherwise noted)

Ratings	Symbol	Value
Collector - Emitter Voltage	V_{CEO}	70 Vdc
Collector - Base Voltage	V_{CBO}	100 Vdc
Emitter - Base Voltage	V_{EBO}	10 Vdc
Collector Current	I_C	10 Adc
Total Power Dissipation @ $T_C = +25^\circ\text{C}$ ⁽¹⁾ @ $T_A = +25^\circ\text{C}$ ⁽²⁾	P_T	15 W 1.0 W
Operating & Storage Temperature Range	T_J, T_{STG}	-65°C to +200°C

Thermal Characteristics

Characteristics	Symbol	Max. Value
Thermal Resistance Junction to Ambient ⁽³⁾ Junction to Case ⁽⁴⁾	$R_{\theta JA}$ $R_{\theta JC}$	175°C/W 10°C/W

(1) For derating see figure 6 of MIL-PRF-19500/394

(2) For derating see figure 7 of MIL-PRF-19500/394

(3) For thermal impedance curve see figure 8 of MIL-PRF-19500/394

(4) For thermal impedance curve see figure 9 of MIL-PRF-19500/394

Safe Operating Area

DC Tests: $T_C = +25^\circ\text{C}$, 1 Cycle, $t = 1.0 \text{ s}$
 Test 1: $V_{CE} = 40.0 \text{ Vdc}$, $I_C = 0.22 \text{ A dc}$
 Test 2: $V_{CE} = 70 \text{ Vdc}$, $I_C = 90 \text{ mA dc}$

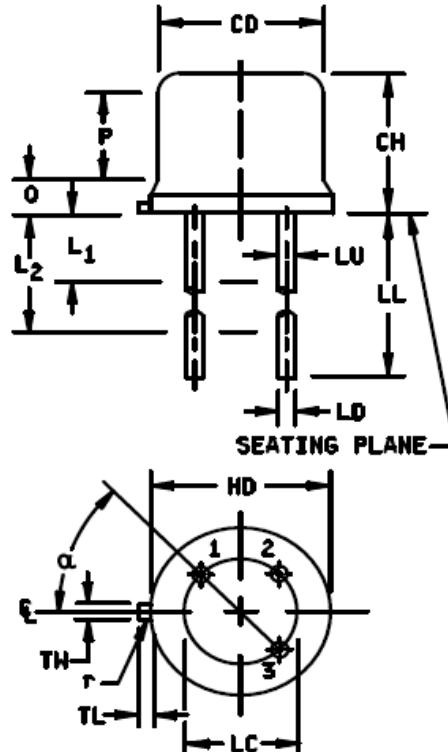
Outline Drawings: (TO-5)

MIL-PRF-19500/394P

Symbol	Inches		Millimeters		Notes
	Min	Max	Min	Max	
CD	.305	.335	7.75	8.51	
CH	.240	.260	6.10	6.60	
HD	.335	.370	8.51	9.40	
LC	.200 TP		5.08 TP		6
LD	.016	.021	0.41	0.53	7, 8
LL	See notes				7, 8, 11,12
LU	.016	.019	0.41	0.48	7, 8
L ₁		.050		1.27	7, 8
L ₂	.250		6.35		7, 8
P	.100		2.54		5
Q		.050		1.27	4
r		.010		0.25	10
TL	.029	.045	0.74	1.14	3
TW	.028	.034	0.71	0.86	2
α	45°TP		45°TP		6

NOTES:

- Dimensions are in inches.
- Millimeters are given for general information only.
- Beyond r (radius) maximum, TH shall be held for a minimum length of .011 (0.28 mm).
- Dimension TL measured from maximum HD.
- Body contour optional within zone defined by HD, CD, and Q.
- Leads at gauge plane .054 +.001 -.000 inch (1.37 +0.03 -0.00 mm) below seating plane shall be within .007 inch (0.18 mm) radius of true position (TP) at maximum material condition (MMC) relative to tab at MMC.
- Dimension LU applies between L₁ and L₂. Dimension LD applies between L₂ and LL minimum. Diameter is uncontrolled in L₁ and beyond LL minimum.
- All three leads.
- The collector shall be internally connected to the case.
- Dimension r (radius) applies to both inside corners of tab.
- For 2N4150, 2N5237, and 2N5238 dimension LL shall be 1.5 inches (38.1 mm) minimum and 1.75 inches (44.4 mm) maximum.
- For 2N4150S, 2N5237S, and 2N5238S, dimension LL shall be .5 inch (12.7 mm) minimum and .75 inch (19.0 mm) maximum.
- In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.
- Lead 1 = emitter, lead 2 = base, lead 3 = collector.

FIGURE 1. Physical dimensions (TO-5).

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