2N4150, 2N4150S

NPN Power Silicon Transistor

Rev. V4

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	$\lvert h_{fe} \rvert$	-	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

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

Absolute Maximum Ratings (T_A = +25°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°C (1) @ T_A = +25°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

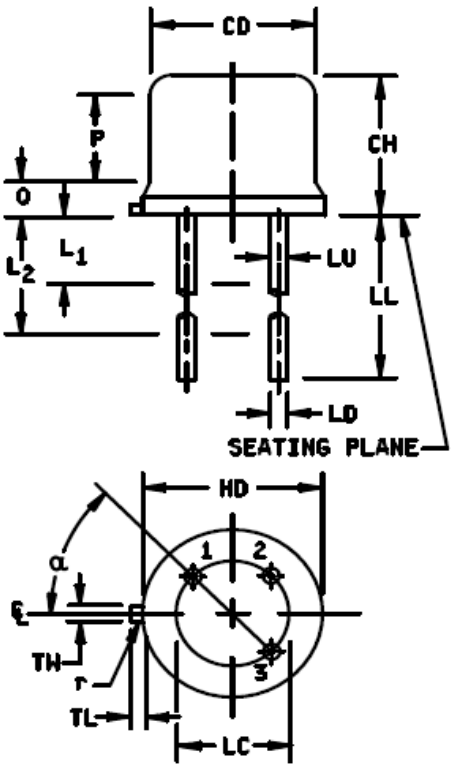
(1) For derating see figure 6 of MIL-PRF-19500/394
(2) For derating see figure 7 of MIL-PRF-19500/394
(3) For thermal impedance curve see figure 8 of MIL-PRF-19500/394
(4) For thermal impedance curve see figure 9 of MIL-PRF-19500/394

Safe Operating Area	
DC Tests:	T_C = +25°C, I Cycle, t = 1.0 s
Test 1:	V_{CE} = 40.0 Vdc, I_C = 0.22 A dc
Test 2:	V_{CE} = 70 Vdc, I_C = 90 mA dc

Outline Drawings: (TO-5)

MIL-PRF-19500/394P

Dimensions					
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:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Beyond r (radius) maximum, TH shall be held for a minimum length of .011 (0.28 mm).
4. Dimension TL measured from maximum HD.
5. Body contour optional within zone defined by HD, CD, and Q.
6. 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.
7. Dimension LU applies between L_1 and L_2. Dimension LD applies between L_2 and LL minimum. Diameter is uncontrolled in L_1 and beyond LL minimum.
8. All three leads.
9. The collector shall be internally connected to the case.
10. Dimension r (radius) applies to both inside corners of tab.
11. For 2N4150, 2N5237, and 2N5238 dimension LL shall be 1.5 inches (38.1 mm) minimum and 1.75 inches (44.4 mm) maximum.
12. For 2N4150S, 2N5237S, and 2N5238S, dimension LL shall be .5 inch (12.7 mm) minimum and .75 inch (19.0 mm) maximum.
13. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.
14. Lead 1 = emitter, lead 2 = base, lead 3 = collector.

FIGURE 1. Physical dimensions (TO-5).