2N5152, 2N5152L,2N5154, 2N5154L

NPN Power Silicon Transistor

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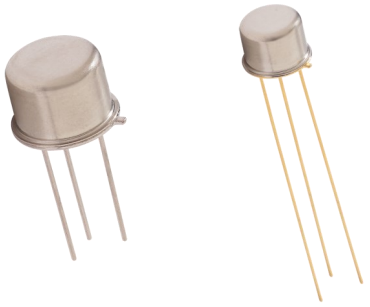
Features

- Available in commercial, JAN, JANTX, JANTXV, JANS and JANSR 100K rads (Si) per MIL-PRF-19500/544
- TO-5 Package: 2N5151L, 2N5153L
- TO-39 Package: 2N5151, 2N5153
- Ideal for High Current Switching Applications



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

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Collector - Emitter Breakdown Voltage	I_C = 100 mA dc, I_B = 0	$V_{(BR)CEO}$	V dc	80	—
Emitter - Base Cutoff Current	V_{EB} = 4.0 Vdc, I_C = 0 V_{EB} = 5.5 Vdc, I_C = 0	I_{EBO1} I_{EBO2}	µA dc mA dc	—	1.0 1.0
Collector - Emitter Cutoff Current	V_{CE} = 60 V dc, V_{BE} = 0 V_{CE} = 100 V dc, V_{BE} = 0	I_{CES1} I_{CES2}	µA dc mA dc	—	1.0 1.0
Collector - Emitter Cutoff Current	V_{CE} = 40 Vdc, I_B = 0	I_{CEO}	µA dc	—	50
Forward Current Transfer Ratio	I_C = 50 mA dc, V_{CE} = 5.0 Vdc 2N5152, 2N5152L 2N5154, 2N5154L I_C = 2.5 A dc, V_{CE} = 5.0 Vdc 2N5152, 2N5152L 2N5154, 2N5154L I_C = 5.0 A dc, V_{CE} = 5.0 Vdc 2N5152, 2N5152L 2N5154, 2N5154L	h_{FE1} h_{FE2} h_{FE3}	-	20 50 30 70 20 40	 90 200
Collector - Emitter Saturation Voltage	I_C = 2.5 Adc, I_B = 250 mAdc I_C = 5.0 Adc, I_B = 500 mAdc	$V_{CE(SAT)1}$ $V_{CE(SAT)2}$	V dc	—	0.75 1.50
Base - Emitter Voltage (nonsaturated)	I_C = 2.5 A dc, V_{CE}= 5.0 Vdc	V_{BE}	V dc	—	1.45
Emitter - Base Saturation Voltage	I_C = 2.5 A dc, I_B = 250 mA dc I_C = 5.0 A dc, I_B = 500 mA dc	$V_{BE(SAT)1}$ $V_{BE(SAT)2}$	V dc	—	1.45 2.20
Collector-Emitter Cutoff Current	T_C= +150°C V_{CE} = 60 V dc, V_{BE} = -2 V dc	I_{CEX}	µA dc	—	25
Forward-Current Transfer Ratio	T_C = -55°C V_{CE} = 5 V dc, I_C = 2.5 A dc 2N5152, 2N5152L 2N5154, 2N5154L	h_{FE4}		15 25	

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

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Dynamic Characteristics					
Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio	I_C = 500 mA dc, V_{CE} = 5.0 Vdc, f = 10 MHz 2N5152, 2N5152L 2N5154, 2N5154L	$\lvert h_{fe} \rvert$	-	6 7	—
Common-Emitter, Small-Signal, Short-Circuit, Forward-Current Transfer Ratio	I_C = 100 mA dc, V_{CE} = 5.0 Vdc, f = 1 kHz 2N5152, 2N5152L 2N5154, 2N5154L	h_{FE}	-	20 50	—
Open-Circuit Output Capacitance	V_{CB} = 10 Vdc, I_E = 0, f = 1 MHz	C_{obo}	pF	—	250
Parameter	**Test Conditions**	**Symbol**	**Units**	**Min.**	**Max.**
Switching Characteristics					
Turn-On Time	I_C = 5 A dc; I_{B1} = 500 mA dc, R_L = 6 Ω, I_{B2} = -500 mA dc, $V_{BE(off)}$ = 3.7 Vdc	t_{on}	µs	—	0.5
Storage Time		t_s	µs	—	1.4
Fall Time		t_f	µs	—	0.5
Turn-Off Time		t_{off}	µs	—	1.5
Safe Operating Area					

DC Tests: T_C = +25°C, I Cycle, t_p = 1 s

Test 1: V_{CE} = 5 V dc, I_C = 2 A dc

Test 2: V_{CE} = 32 V dc, I_C = 310 mA dc

Test 3: V_{CE} = 80 V dc, I_C = 12.5 mA dc

(Unclamped inductive) T_C = +25°C, R_{BB1} = 10Ω
R_{BB2} = 100Ω, L = 0.3 mH
RL = 0.1Ω, V_{CC} = 10 V dc
V_{BB1} = 10 V dc, V_{BB2} = 4 V dc
I_{CM} = 10 A dc (see figure 15 of MIL-PRF-19500/544)

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Absolute Maximum Ratings (T_A = +25°C unless otherwise specified)

Ratings	Symbol	Value
Collector - Emitter Voltage	V_{CEO}	80 V dc
Collector - Base Voltage	V_{CBO}	100 V dc
Emitter - Base Voltage	V_{EBO}	5.5 V dc
Collector Current	I_C	2 A dc 10 A dc (1)
Total Power Dissipation @ T_A = 25°C @ T_C = 25°C	P_T	1 W 10 W
Reverse Pulse Energy (2)		15 mJ
Operating & Storage Temperature Range	T_J, T_{stg}	-65°C to +200°C

Thermal Characteristics

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

1. This value applies for PW ≤ 8.3 ms, duty cycle ≤ 1%.
2. This rating is based on the capability of the transistors to operate safely in the unclamped inductive load energy test circuit.
3. For thermal impedance curves see figures 10, 11, and 12 of MIL-PRF-19500/544
4. For thermal impedance curves, see figures 10, 11, and 12 of MIL-PRF-19500/544

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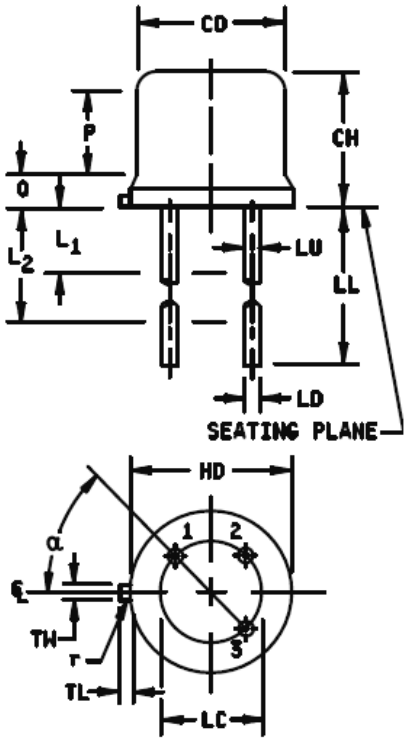
Outline Drawings (TO-5, TO-39)

Symbol	Dimensions				Note
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.305	.335	7.75	8.51	6
CH	.240	.260	6.10	6.60	
HD	.335	.370	8.51	9.40	
LC	.200 TP		5.08 TP		7
LD	.016	.019	0.41	0.48	8,9
LL	See note 14				
LU	.016	.019	0.41	0.48	8,9
L_1		.050		1.27	8,9
L_2	.250		6.35		8,9
P	.100		2.54		7
Q		.030		0.76	5
TL	.029	.045	0.74	1.14	3,4
TW	.028	.034	0.71	0.86	3
r		.010		0.25	10
α	45° TP		45° TP		7
1, 2, 10, 12, 13, 14					



NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Beyond r (radius) maximum, TW 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. CD shall not vary more than .010 inch (0.25 mm) in zone P. This zone is controlled for automatic handling.
7. 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. The device may be measured by direct methods or by gauging procedure.
8. Dimension LU applies between L_1 and L_2. Dimension LD applies between L_2 and LL minimum. Diameter is uncontrolled in and beyond LL minimum.
9. All three leads.
10. The collector shall be internally connected to the case.
11. Dimension r (radius) applies to both inside corners of tab.
12. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.
13. Lead 1 = emitter, lead 2 = base, lead 3 = collector.
14. For L-suffix devices (TO-5), dimension LL = 1.5 inches (38.10 mm) min. and 1.75 inches (44.45 mm) max. For no suffix types (TO-39), dimension LL = .5 inch (12.70 mm) min. and .750 inch (19.05 mm) max.

FIGURE 1. Physical dimensions (similar to TO-5 and TO-39).