

# 2N6249, 2N6250, & 2N6251



## NPN Darlington Power Silicon Transistor

Rev. V4

### Features

- Available in JAN, JANTX, JANTXV per MIL-PRF-19500/510
- TO-3 (TO-204AA) Package
- Suitable for High Voltage, High Current, High Speed Switching Applications



### Electrical Characteristics (T<sub>A</sub> = +25°C unless otherwise noted)

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Collector - Emitter Breakdown Voltage	I <sub>C</sub> = 200 mA dc, L = 42 mH, f = 30 - 60 GHz 2N6249 2N6250 2N6251	V <sub>(BR)CEO</sub>	V dc	—	200 275 350
Collector - Emitter Breakdown Voltage	I <sub>C</sub> = 200 mA dc, L = 42 mH, f = 30 - 60 GHz R <sub>BE</sub> = 50 Ω 2N6249 2N6250 2N6251	V <sub>(BR)CER</sub>	V dc	—	225 300 375
Emitter - Base Cutoff Current	V <sub>EB</sub> = 6 Vdc	I <sub>EBO</sub>	μA dc	—	100
Collector - Emitter Cutoff Current	V <sub>CE</sub> = 150 V dc, 2N6249 V <sub>CE</sub> = 225 V dc, 2N6250 V <sub>CE</sub> = 300 V dc, 2N6251	I <sub>CEO</sub>	mA dc	—	1.0
Collector - Emitter Cutoff Current	V <sub>CE</sub> = 225 V dc, V <sub>BE</sub> = -1.5 V dc, 2N6249 V <sub>CE</sub> = 300 V dc, V <sub>BE</sub> = -1.5 V dc, 2N6250 V <sub>CE</sub> = 375 V dc, V <sub>BE</sub> = -1.5 V dc, 2N6251	I <sub>CEX1</sub>	μA dc	—	10
Collector - Base Cutoff Current	V <sub>CE</sub> = 300 V dc, 2N6249 V <sub>CE</sub> = 375 V dc, 2N6250 V <sub>CE</sub> = 450 V dc, 2N6251	I <sub>CBO</sub>	mA dc	—	0.5
Forward Current Transfer Ratio	I <sub>C</sub> = 10 A dc, V <sub>CE</sub> = 3 Vdc 2N6249 2N6250 2N6251	h <sub>FE1</sub>	-	10 8 6	50 50 50
Collector - Emitter Sustaining Voltage	I <sub>C</sub> = 10 A dc, I <sub>B</sub> = 1.0 A dc, 2N6249 I <sub>C</sub> = 10 A dc, I <sub>B</sub> = 1.25 A dc, 2N6250 I <sub>C</sub> = 10 A dc, I <sub>B</sub> = 1.67 A dc, 2N6251	V <sub>CE(SAT)</sub>	V dc	—	1.5
Base - Emitter Saturation Voltage	I <sub>C</sub> = 10 A dc, I <sub>B</sub> = 1.0 A dc, 2N6249 I <sub>C</sub> = 10 A dc, I <sub>B</sub> = 1.25 A dc, 2N6250 I <sub>C</sub> = 10 A dc, I <sub>B</sub> = 1.67 A dc, 2N6251	V <sub>BE(SAT)</sub>	V dc	—	2.25

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### Electrical Characteristics ( $T_A = +25^\circ\text{C}$ unless otherwise noted)

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Collector - Emitter Cutoff Current	$T_A = +125^\circ\text{C}$ $V_{CE} = 225\text{ V dc}, V_{BE} = -1.5\text{ V dc}, 2\text{N}6249$ $V_{CE} = 300\text{ V dc}, V_{BE} = -1.5\text{ V dc}, 2\text{N}6250$ $V_{CE} = 375\text{ V dc}, V_{BE} = -1.5\text{ V dc}, 2\text{N}6251$	$I_{CEX2}$	$\mu\text{A dc}$	—	90
Forward - Current Transfer Ratio	$T_A = -55^\circ\text{C}$ $V_{CE} = 3\text{ V dc}, I_C = 10\text{ A dc}$ 2N6249 2N6250 2N6251	$h_{FE2}$	-	5 4 3	
<b>Dynamic Characteristics</b>					
Small-Signal Short-Circuit Forward Current Transfer Ratio	$I_C = 1\text{ A dc}, V_{CE} = 10\text{ Vdc}, f = 1\text{ MHz}$	$ h_{FE} $	-	2.5	15.0
Open Capacitance Open Circuit	$V_{CE} = 10\text{ Vdc}, I_C = 0, 100\text{ kHz} \leq f \leq 1\text{ MHz}$	$C_{obo}$	$\text{pF}$	—	500
<b>Switching Characteristics</b>					
Turn-On Time	$V_{CC} = 200\text{ Vdc}; I_C = 10\text{ A dc};$ $I_B = 1.0\text{ A dc}, 2\text{N}6249$ $I_B = 1.25\text{ A dc}, 2\text{N}6250$ $I_B = 1.67\text{ A dc}, 2\text{N}6251$	$t_{on}$	$\mu\text{s}$	—	2.0
Turn-Off Time	$V_{CC} = 200\text{ Vdc}; I_C = 10\text{ A dc};$ $I_B = 1.0\text{ A dc}, 2\text{N}6249$ $I_B = 1.25\text{ A dc}, 2\text{N}6250$ $I_B = 1.67\text{ A dc}, 2\text{N}6251$	$t_{off}$	$\mu\text{s}$	—	4.5
<b>Safe Operating Area</b>					
DC Tests:	$T_C = +25^\circ\text{C}, 1\text{ Cycle}, t = 1.0\text{ s}$ (see figure 12 of MIL-PRF-19500/371)				
Test 1:	$V_{CE} = 17.5\text{ Vdc}, I_C = 10\text{ A dc}$				
Test 2:	$V_{CE} = 30\text{ Vdc}, I_C = 5.8\text{ A dc}$				
Test 3:	$V_{CE} = 100\text{ Vdc}, I_C = 0.3\text{ A dc}$				
Test 4:	$V_{CE} = 200\text{ Vdc}, I_C = 0.13\text{ A dc}$ , (for 2N6249 only)				
Test 5:	$V_{CE} = 275\text{ Vdc}, I_C = 0.09\text{ A dc}$ , (for 2N6250 only)				
Test 6:	$V_{CE} = 350\text{ Vdc}, I_C = 0.065\text{ A dc}$ , (for 2N6251 only)				

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### Absolute Maximum Ratings

Ratings	Symbol	2N6249	2N6250	2N6251	Units
Collector - Emitter Voltage	$V_{CEO}$	200	275	350	V dc
Collector - Base Voltage	$V_{CBO}$	300	375	450	V dc
Emitter - Base Voltage	$V_{EBO}$	6			V dc
Collector Current	$I_C$	10			A dc
Base Current	$I_B$	5			A dc
Total Power Dissipation @ $T_A = +25^\circ\text{C}$ @ $T_C = +25^\circ\text{C}^1$	$P_T$	6 175			W
Operating & Storage Temperature Range	$T_J, T_{STG}$	-65 to +200			$^\circ\text{C}$

### Thermal Characteristics

Characteristics	Symbol	Max. Value
Thermal Resistance, Junction to Case <sup>2</sup>	$R_{\theta JC}$	1.0 $^\circ\text{C/W}$

- (1) For temperature-power derating curves, see figures 5 and 6 of MIL-PRF-19500/510  
(2) For thermal impedance curves, see figures 7, 8 and 9 of MIL-PRF-19500/510

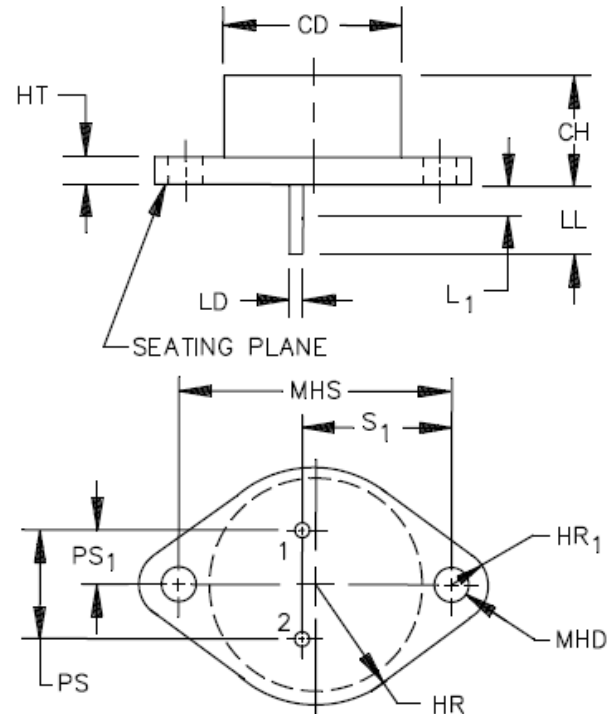
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### Outline Drawing (TO-3)

Ltr	Dimensions				Note
	Inches		Millimeters		
	Min	Max	Min	Max	
CD		.875		22.23	
CH	.250	.450	6.35	11.43	
HR	.495	.525	12.57	13.34	
HR <sub>1</sub>	.131	.188	3.33	4.78	
HT	.050	.135	1.27	3.43	
LD	.038	.053	0.97	1.35	3, 5
LL	.312	.500	7.92	12.70	3
L <sub>1</sub>		.050		1.27	5
MHD	.151	.161	3.84	4.09	
MHS	1.17 7	1.197	29.90	30.40	
PS	.420	.440	10.67	11.18	2
PS <sub>1</sub>	.205	.25	5.21	6.35	2, 3
S <sub>1</sub>	.665	.675	16.89	17.15	2



#### NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. These dimensions should be measured at points .050 (1.27 mm) to .055 (1.40 mm) below seating plane. When gage is not used, measurement will be made at seating plane.
3. Two leads.
4. Collector shall be electrically connected to the case.
5. LD applies between L<sub>1</sub> and LL maximum. Lead diameter shall not exceed twice LD within L<sub>1</sub>.
6. In accordance with ASME Y14.5M, diameters are equivalent to  $\phi$  symbology.
7. Terminal 1 is emitter; terminal 2 is base; case is collector.

FIGURE 1. Physical dimensions (similar to TO-3).

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