

# 2N4399 & 2N5745



## PNP High Power Silicon Transistors

Rev. V3

### Features

- Available in JAN, JANTX, and JANTXV per MIL-PRF-19500/433
- TO-3 (TO-204AA) Package
- Designed for Use in High Reliability Power Amplifier and Switching Circuit Applications



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

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Collector - Base Breakdown Voltage	$I_C = -200 \text{ mA dc}$	$V_{(BR)CEO}$	V dc	-60 -80	—
Forward Current Transfer Ratio	$V_{CE} = -2 \text{ Vdc}; I_C = -1.0 \text{ A dc}$	$h_{FE1}$	-	40	425
Forward Current Transfer Ratio	$V_{CE} = -2 \text{ V dc}; I_C = -15 \text{ A dc}, 2\text{N}4399$ $V_{CE} = -2 \text{ V dc}; I_C = -10 \text{ A dc}, 2\text{N}5745$	$h_{FE2}$	-	15 15	60 60
Forward Current Transfer Ratio	$V_{CE} = -5 \text{ V dc}; I_C = -30 \text{ A dc}, 2\text{N}4399$ $V_{CE} = -5 \text{ V dc}; I_C = -20 \text{ A dc}, 2\text{N}5745$	$h_{FE3}$	-	5 5	
Collector - Emitter Saturation Voltage	$I_C = -10 \text{ A dc}; I_B = -1 \text{ A dc}$ 2N4399 2N5745	$V_{CE(SAT)1}$	V dc	—	-0.75 -1.0
Collector - Emitter Saturation Voltage	$I_C = -5.0 \text{ A dc}; I_B = -0.5 \text{ A dc}$	$V_{CE(SAT)2}$	V dc	—	-0.55
Base - Emitter Voltage	$I_C = -15 \text{ A dc}; I_B = -1.5 \text{ A dc}$ 2N4399 2N5745	$V_{BE(SAT)1}$	V dc	—	-1.8 -2.0
Base - Emitter Voltage	$I_C = -10 \text{ A dc}; I_B = -1.0 \text{ A dc};$	$V_{BE(SAT)2}$	V dc	—	-1.7

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### Electrical Characteristics

Parameter	Test Conditions	Symbol	Units	Min.	Max.
<b>Off Characteristics</b>					
Collector - Emitter Cutoff Current	$V_{CE} = -60 \text{ Vdc}$ , 2N4399 $V_{CE} = -80 \text{ Vdc}$ , 2N5745	$I_{CEO}$	$\mu\text{A dc}$	—	-100
Collector - Emitter Cutoff Current	$V_{CE} = -60 \text{ V dc}$ ; $V_{BE} = +1.5 \text{ V dc}$ , 2N4399 $V_{CE} = -80 \text{ V dc}$ ; $V_{BE} = +1.5 \text{ V dc}$ , 2N5745	$I_{CEX1}$	$\mu\text{A dc}$	—	-5.0
Collector - Emitter Cutoff Current	$T_A = +150^\circ\text{C}$ $V_{CE} = -60 \text{ V dc}$ ; $V_{BE} = +1.5 \text{ V dc}$ , 2N4399 $V_{CE} = -80 \text{ V dc}$ ; $V_{BE} = +1.5 \text{ V dc}$ , 2N5745	$I_{CEX2}$	$\text{mA dc}$	—	-10
Forward Current Transfer Ratio	$T_A = -55^\circ\text{C}$ $V_{CE} = -2 \text{ V dc}$ ; $I_C = -15 \text{ A dc}$ 2N4399 $V_{CE} = -2 \text{ V dc}$ ; $I_C = -10 \text{ A dc}$ 2N5745	$h_{FE4}$	-	7	
Collector - Base Cutoff Current	$V_{EB} = -5 \text{ Vdc}$	$I_{EBO}$	$\mu\text{A dc}$	—	-5.0
<b>Dynamic Characteristics</b>					
Magnitude of Common Small-Signal Short-Circuit Forward Current Transfer Ratio	$V_{CE} = -10 \text{ Vdc}$ ; $I_C = -1.0 \text{ A dc}$ ; $f = 1 \text{ MHz}$	$ h_{fe} $	-	4	40
Small-Signal Short-Circuit Forward Current Transfer Ratio	$V_{CE} = -10 \text{ Vdc}$ ; $I_C = -1.0 \text{ A dc}$ ; $f = 1.0 \text{ kHz}$	$h_{fe}$	-	40	425
Output Capacitance	$V_{CB} = -10 \text{ V dc}$ ; $I_E = 0$ ; $100 \text{ kHz} \leq f \leq 1 \text{ MHz}$	$C_{obo}$	$\text{pF}$	—	1000
<b>Switching Characteristics</b>					
Turn-On Time	See Figure 2 of MIL-PRF-19500/433	$t_{on}$	$\mu\text{s}$	—	1.2
Turn-Off Time	See Figure 2 of MIL-PRF-19500/433	$t_{off}$	$\mu\text{s}$	—	2.5

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

Ratings	Symbol	Value
Collector - Emitter Voltage 2N4399 2N5745	$V_{CEO}$	-60 V dc -80 Vdc
Collector - Base Voltage 2N4399 2N5745	$V_{CBO}$	-60 V dc -80 V dc
Emitter - Base Voltage	$V_{EBO}$	-5.0 V dc
Collector Current 2N4399 2N5745	$I_C$	-30 A dc -20 A dc
Base Current	$I_B$	-7.5 A dc
Total Power Dissipation @ $T_A = +25^\circ\text{C}^1$ @ $T_C = +100^\circ\text{C}^2$	$P_T$	5 W 115 W
Operating & Storage Temperature Range	$T_J, T_{STG}$	-55°C to +200°C

1. Derate linearly @ 28.57 mW/°C above  $T_A = +25^\circ\text{C}$ .
2. Derate linearly @ 1.15 W/°C above  $T_C = +100^\circ\text{C}$ .

### Thermal Characteristics

Characteristics	Symbol	Max. Value
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.875°C/W
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	35°C/W

### Safe Operating Area

DC Tests:	$T_C = +25^\circ\text{C}$ , 1 Cycle, $t = 1\text{ s}$ ; 1 cycle
Test 1:	$V_{CE} = -6.67\text{ V dc}$ ; $I_C = -30\text{ A dc}$ 2N4399
Test 1:	$V_{CE} = -10\text{ V dc}$ ; $I_C = -20\text{ A dc}$ 2N5745
Test 2:	$V_{CE} = -20\text{ V dc}$ ; $I_C = -10\text{ A dc}$ Both
Test 3:	$V_{CE} = -40\text{ V dc}$ ; $I_C = -3\text{ A dc}$ Both
Test 4:	$V_{CE} = -50\text{ V dc}$ ; $I_C = -600\text{ mA dc}$ 2N4399
Test 4:	$V_{CE} = -60\text{ V dc}$ ; $I_C = -600\text{ mA dc}$ 2N5745

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### Outline Drawing (TO-3)

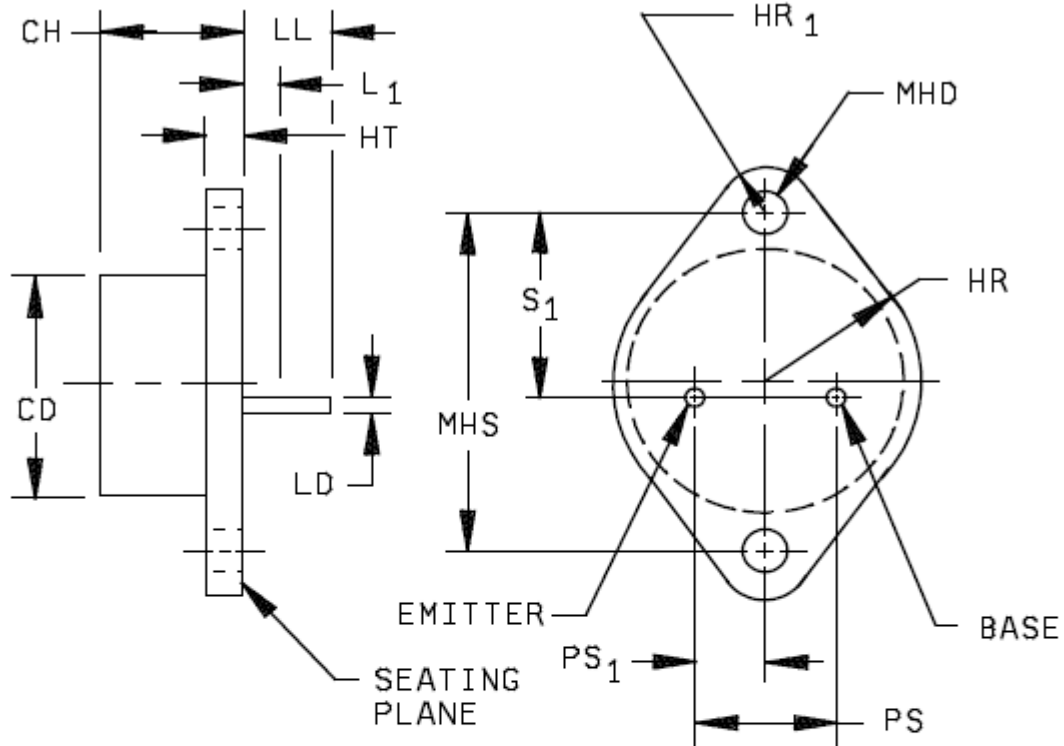


FIGURE 1. Physical dimensions (TO-3).

### Dimensions (TO-3)

Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD		.875		22.23	
CH	.270	.380	6.86	9.65	
HT	.060	.135	1.52	3.43	
HR	.495	.525	12.57	13.34	
HR <sub>1</sub>	.131	.188	3.33	4.78	
LD	.038	.043	0.97	1.09	5
LL	.312	.500	7.92	12.70	5
L <sub>1</sub>		.050		1.27	5
MHD	.151	.161	3.84	4.09	
MHS	1.177	1.197	29.90	30.40	
PS	.420	.440	10.67	11.18	2, 3
PS <sub>1</sub>	.205	.225	5.21	5.72	2, 3
S <sub>1</sub>	.655	.675	16.64	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 inch (1.27 mm) to .055 inch (1.40 mm) below seating plane. When gauge is not used, measurement will be made at the seating plane.
3. The seating plane of the header shall be flat within .001 inch (0.03 mm) concave to .004 inch (0.10 mm) convex inside a .930 inch (23.62 mm) diameter circle on the center of the header and flat within .001 inch (0.03 mm) concave to .006 inch (0.15 mm) convex overall.
4. Collector shall be electrically connected to the case.
5. LD applies between L<sub>1</sub> and LL. Lead diameter shall not exceed twice LD within L<sub>1</sub>
6. In accordance with ASME Y14.5M, diameters are equivalent to  $\phi x$  symbology.

FIGURE 1. Physical dimensions (TO-3) - Continued.

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