

2N6051 & 2N6052



PNP Darlington Power Silicon Transistors

Rev. V3

Features

- Available in JAN, JANTX, JANTXV per MIL-PRF-19500/501
- TO-3 (TO-204AA) Package
- Ideal for High Gain Amplifier and Switching Applications



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

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Collector - Emitter Breakdown Voltage	$I_C = -10 \text{ mA dc}$, 2N6051 $I_C = -10 \text{ mA dc}$, 2N6052	$V_{(BR)CEO}$	V dc	-80 -100	—
Collector - Emitter Cutoff Current	$V_{CE} = -40 \text{ V dc}$, 2N6051 $V_{CE} = -50 \text{ V dc}$, 2N6052	I_{CEO}	mA dc	—	-1
Collector - Emitter Cutoff Current	$V_{CE} = -80 \text{ V dc}$, $V_{BE} = +1.5 \text{ V dc}$, 2N6051 $V_{CE} = -100 \text{ V dc}$, $V_{BE} = +1.5 \text{ V dc}$, 2N6052	I_{CEX1}	mA dc	—	-0.1
Emitter - Base Cutoff Current	$V_{EB} = -5 \text{ Vdc}$	I_{EBO}	mA dc	—	-2
Forward Current Transfer Ratio	$V_{CE} = -3 \text{ V dc}$, $I_C = -1 \text{ A dc}$ $V_{CE} = -3 \text{ V dc}$, $I_C = -6 \text{ A dc}$ $V_{CE} = -3 \text{ V dc}$, $I_C = -12 \text{ A dc}$	h_{FE}	-	1,000 1,000 150	18,000
Collector - Emitter Saturation Voltage	$I_C = -12 \text{ A dc}$, $I_B = -120 \text{ mA dc}$ $I_C = -6 \text{ A dc}$, $I_B = -24 \text{ mA dc}$	$V_{CE(sat)1}$ $V_{CE(sat)2}$	V dc	—	-3.0 -2.0
Base - Emitter Saturation Voltage	$I_C = -12 \text{ A dc}$, $I_B = -120 \text{ mA dc}$	$V_{BE(sat)}$	V dc	—	-4.0
Base - Emitter Voltage (non-saturated)	$I_C = -6 \text{ A dc}$, $V_{CE} = -3 \text{ V dc}$	V_{BE}	V dc	—	-2.8
Collector - Emitter Cutoff Current	$T_A = +150^\circ\text{C}$ $V_{CE} = -80 \text{ V dc}$, $V_{BE} = +1.5 \text{ V dc}$, 2N6051 $V_{CE} = -100 \text{ V dc}$, $V_{BE} = +1.5 \text{ V dc}$, 2N6052	I_{CEX2}	mA dc	—	-5.0 -5.0
Forward Current Transfer Ratio	$T_A = -55^\circ\text{C}$ $V_{CE} = -3 \text{ V dc}$, $I_C = -6 \text{ A dc}$	h_{FE4}	-	300	
Dynamic Characteristics					
Magnitude of Small-Signal Short-Circuit Forward - Current Transfer Ratio	$V_{CE} = -3 \text{ V dc}$; $I_C = -5 \text{ A dc}$; $f = 1.0 \text{ MHz}$	$ h_{fe} $	-	10	250
Small-Signal Short-Circuit Forward Current Transfer Ratio	$V_{CE} = -3 \text{ V dc}$; $I_C = -5 \text{ A dc}$; $f = 1 \text{ kHz}$	h_{fe}	-	1000	
Output Capacitance	$V_{CB} = -10 \text{ V dc}$; $I_E = 0$; $100 \text{ kHz} \leq f \leq 1 \text{ MHz}$	C_{obo}	pF	—	300
Switching Characteristics					
Turn-On Time	$V_{CC} = -30 \text{ V dc}$; $I_C = -5 \text{ A dc}$; $I_{B1} = -20 \text{ mA dc}$	t_{on}	μs	—	2.0
Turn-Off Time	$V_{CC} = -30 \text{ V dc}$; $I_C = -5 \text{ A dc}$; $I_{B1} = I_{B2} = -20 \text{ mA dc}$	t_{off}	μs	—	10

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

Ratings	Symbol	Value
Collector - Emitter Voltage 2N6051 2N6052	V_{CEO}	-80 V dc -100 V dc
Collector - Base Voltage 2N6051 2N6052	V_{CBO}	-80 V dc -100 V dc
Emitter - Base Voltage	V_{EBO}	-5 V dc
Collector Current	I_C	-12 A dc
Base Current	I_B	-0.2 A dc
Total Power Dissipation ⁽¹⁾ @ $T_C = +25^\circ\text{C}$ @ $T_C = +100^\circ\text{C}$	P_T	150 W 75 W
Operating & Storage Temperature Range	T_J, T_{STG}	-55°C to $+175^\circ\text{C}$

(1) Derate linearly @ 1.00 W/ $^\circ\text{C}$ for $T_C > +25^\circ\text{C}$. (See figure 2 of MIL-PRF-19500/501).

Thermal Characteristics

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

Safe Operating Area

DC Tests:	$T_C = +25^\circ\text{C}, +10^\circ\text{C}, -0^\circ\text{C}, 1 \text{ Cycle}, t \geq 1\text{s}; 1 \text{ cycle}$
Test 1:	$V_{CE} = -12.5 \text{ V dc}, I_C = -12 \text{ A dc}$
Test 2:	$V_{CE} = -30 \text{ V dc}, I_C = -5 \text{ A dc}$
Test 3:	$V_{CE} = -70 \text{ V dc}, I_C = -200 \text{ mA dc}, 2\text{N}6051$ $V_{CE} = -90 \text{ V dc}, I_C = -155 \text{ mA dc}, 2\text{N}6052$

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Outline Drawing (TO-3)

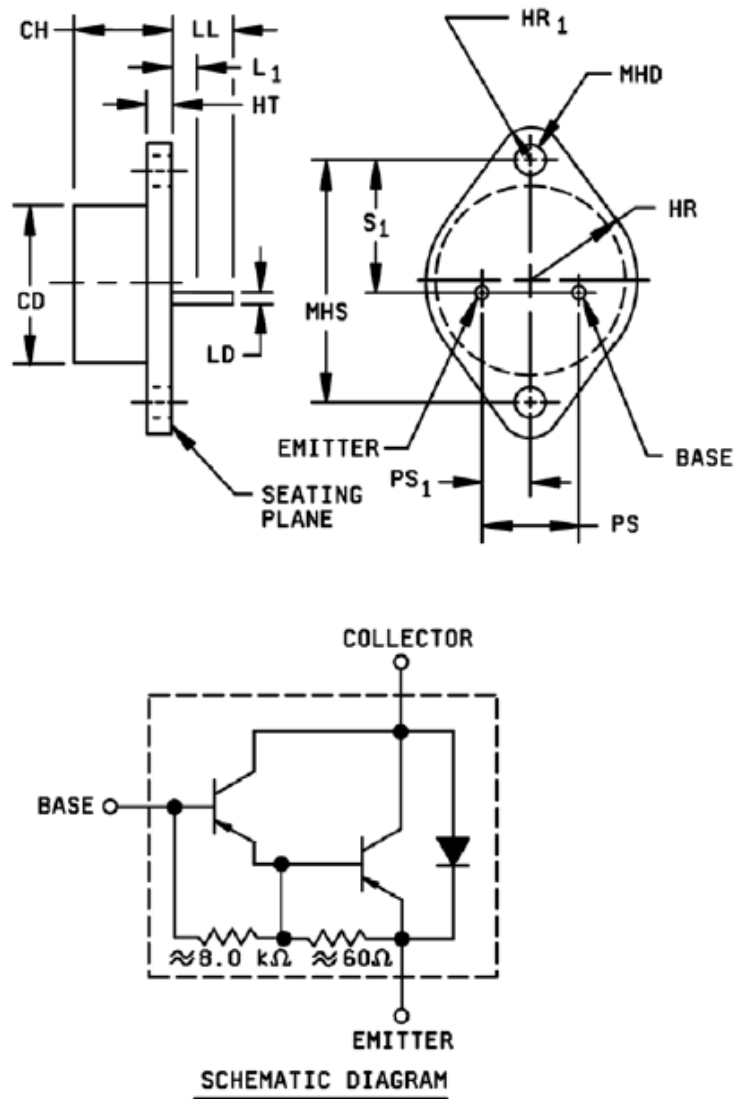


FIGURE 1. Physical dimensions (TO-3) and schematic circuit.

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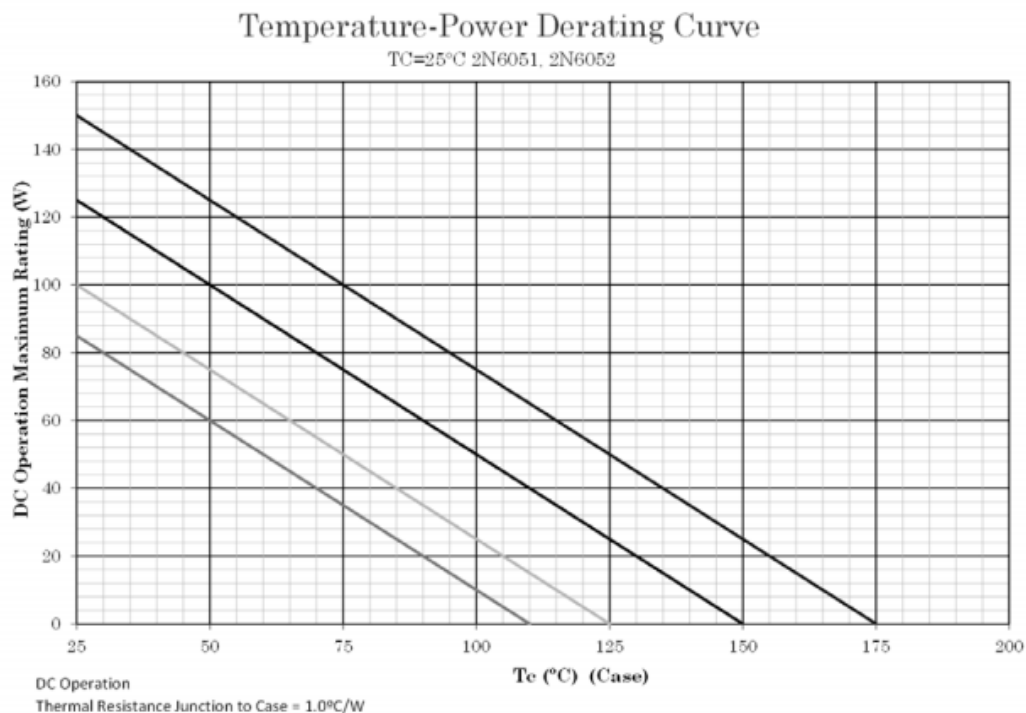
Outline Drawing (TO-3)

Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD		.875		22.23	3
CH	.250	.328	6.35	8.33	
HR	.495	.525	12.57	13.34	
HR ₁	.131	.188	3.33	4.78	6
HT	.060	.135	1.52	3.43	
LD	.038	.043	0.97	1.09	4, 5, 9
LL	.312	.500	7.92	12.70	4, 5, 9
L ₁		.050		1.27	5, 9
MHD	.151	.161	3.84	4.09	7
MHS	1.177	1.197	29.90	30.40	
PS	.420	.440	10.67	11.18	
PS ₁	.205	.225	5.21	5.72	5
S ₁	.655	.675	16.64	17.15	

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Body contour is optional within zone defined by CD.
4. These dimensions shall be measured at points .050 inch (1.27 mm) to .055 inch (1.40 mm) below seating plane. When gauge is not used, measurement shall be made at seating plane.
5. Both terminals.
6. At both ends.
7. Two holes.
8. The collector shall be electrically connected to the case.
9. LD applies between L₁ and LL. Lead diameter shall not exceed twice LD within L₁.
10. 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.
11. In accordance with ASME Y14.5M, diameters are equivalent to ϕ x symbology.

FIGURE 1. Physical dimensions (TO-3) and schematic circuit - Continued.



NOTES:

1. This is the true inverse of the worst case thermal resistance value. All devices are capable of operating at $\leq T_J$ specified on this curve. Any parallel line to this curve will intersect the appropriate power for the desired maximum T_J allowed.
2. Derate design curve constrained by the maximum junction temperature ($T_J \leq 175^\circ\text{C}$) and power rating specified. (See 1.3 herein.)
3. Derate design curve chosen at $T_J \leq 150^\circ\text{C}$, where the maximum temperature of electrical test is performed.
4. Derate design curve chosen at $T_J \leq 125^\circ\text{C}$, and 110°C to show power rating where most users want to limit T_J in their application.

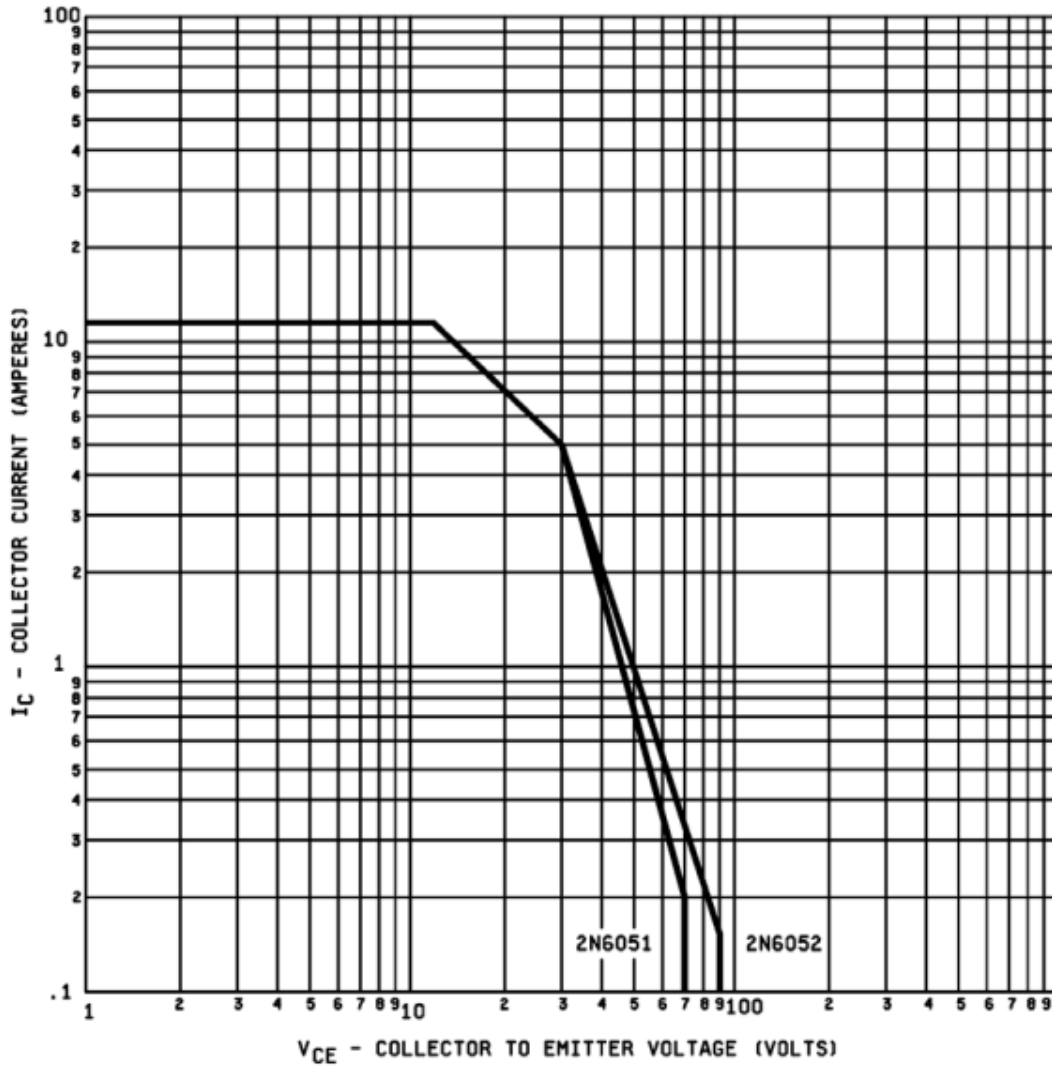
FIGURE 2. Temperature-power derating for 2N6051 AND 2N6052.

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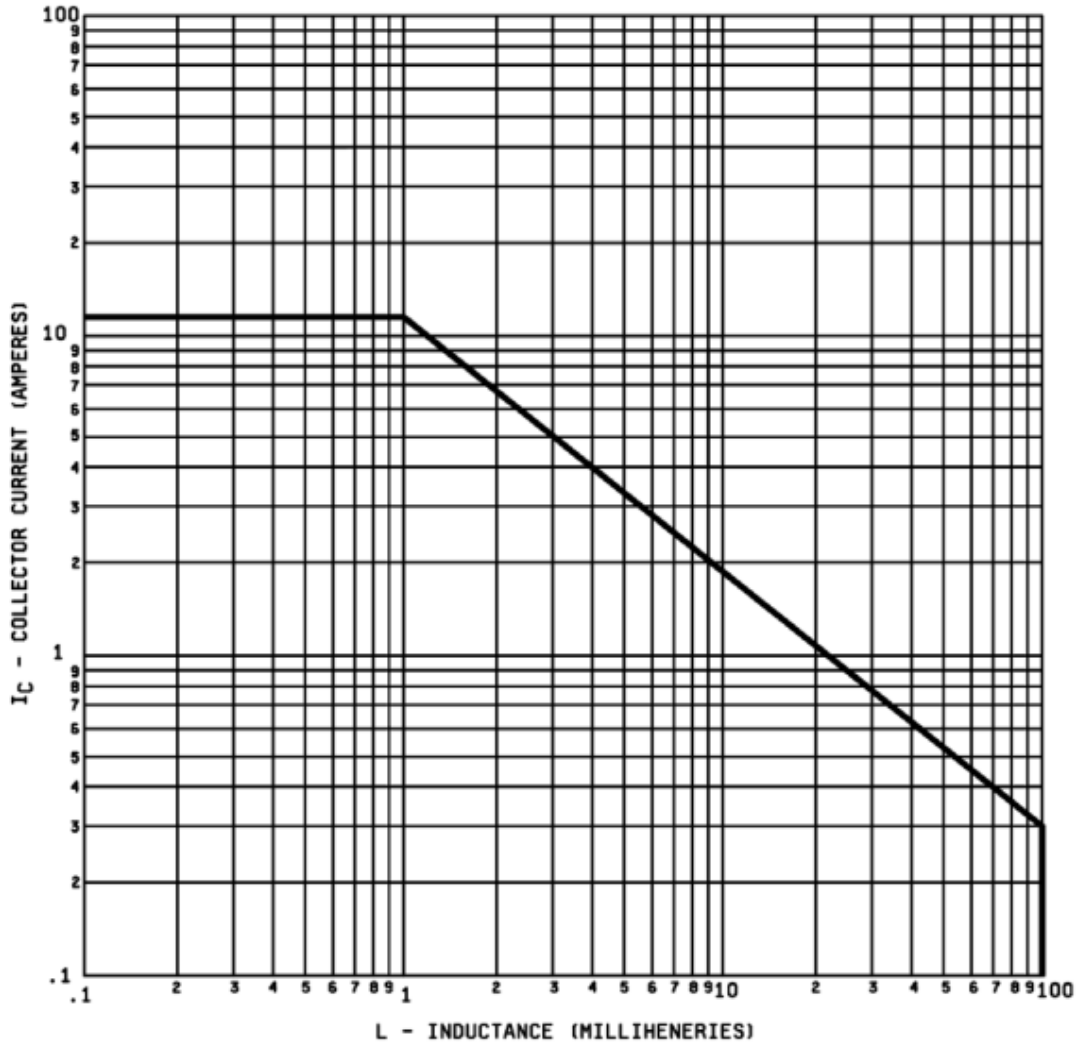


FIGURE 5. Safe operating area for switching between saturation and cutoff (unclamped inductive load).

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