2N3715 & 2N3716

NPN High Power Silicon Transistor

Rev. V3

Features

- Available in JAN, JANTX, JANTXV per MIL-PRF-19500/408
- TO-3 (TO-204AA) Package
- Designed for Medium Speed Switching and Amplifier Applications

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

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Off Characteristics					
Collector - Emitter Breakdown Voltage	I_C = 10 mA dc, 2N3715 I_C = 10 mA dc, 2N3716	$V_{(BR)CEO}$	V dc	60 80	—
Collector - Base Cutoff Current	V_{CE} = 60 V dc, 2N3715 V_{CE} = 80 V dc, 2N3716	I_{CEO}	µA dc	—	10 10
Emitter - Base Cutoff Current	V_{EB} = 7 Vdc	I_{EBO}	mA dc	—	1
Collector - Emitter Cutoff Current	V_{CE} = 60 V dc, V_{BE} = 1.5 V dc, 2N3715 V_{CE} = 80 V dc, V_{BE} = 1.5 V dc, 2N3716	I_{CEX1}	µA dc	—	10 10
Collector - Emitter Cutoff Current	V_{CE} = 50 V dc, 2N3715 V_{CE} = 70 V dc, 2N3716	I_{CEO}	µA dc	—	10 10
On Characteristics[1]					
Forward Current Transfer Ratio	I_C = 1 A dc, V_{CE} = 2 V dc I_C = 3 A dc, V_{CE} = 2 V dc I_C = 5 A dc, V_{CE} = 2 V dc I_C = 10 A dc, V_{CE} = 4 V dc	h_{FE}	-	50 30 10 5	150 120 — —
Collector - Emitter Saturation Voltage	I_C = 5 A dc, I_B = 0.5 A dc I_C = 10 A dc, I_B = 2.0 A dc	$V_{CE(SAT)1}$ $V_{CE(SAT)2}$	Vdc	—	1.0 2.5
Emitter - Base Saturation Voltage	I_C = 5 A dc, I_B = 0.5 V dc I_C = 10 A dc, I_B = 2.0 V dc	$V_{BE(SAT)1}$ $V_{BE(SAT)2}$	Vdc	—	1.5 3.0
Dynamic Characteristics					
Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio	I_C = 4 A dc, V_{CE}= 4 Vdc, f = 100 kHz	$\lvert h_{fe} \rvert$		4	20
Small-Signal Short-Circuit Forward Current Transfer Ratio	I_C = 0.5 A dc, V_{CE}= 10 Vdc, f = 1 kHz	H_{FE}		30	300
Output Capacitance	V_{CB} = 10 Vdc, I_E = 0, 100 kHz ≤ f ≤ 1 MHz	C_{obo}	pF	—	500

1. Pulse Test: Pulse Width = 300 µs, Duty Cycle ≤2.0%.

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Parameter	Test Conditions	Symbol	Units	Min.	Max.
Collector - Base Cutoff Current	T_A = +150°C V_{CE} = 50 V dc, 2N3715 V_{CE} = 70 V dc, 2N3716	I_{CES2}	µA dc	—	5.0 5.0
Forward—Current Transfer Ratio	T_A = -55°C	h_{FE5}		12	

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

Ratings	Symbol	Value
Collector - Emitter Voltage 2N3715 2N3716	V_{CEO}	 60 Vdc 80 Vdc
Collector - Base Voltage 2N3715 2N3716	V_{CBO}	 80 Vdc 100 Vdc
Emitter - Base Voltage	V_{EBO}	7 Vdc
Base Current	I_B	4 Vdc
Collector Current	I_C	10 Adc
Total Power Dissipation @ T_A = 25°C[2] @ T_A = 25°C	P_T	 5 W 117 W
Operating & Storage Temperature Range	T_J, T_{STG}	-65°C to +200°C

Thermal Characteristics

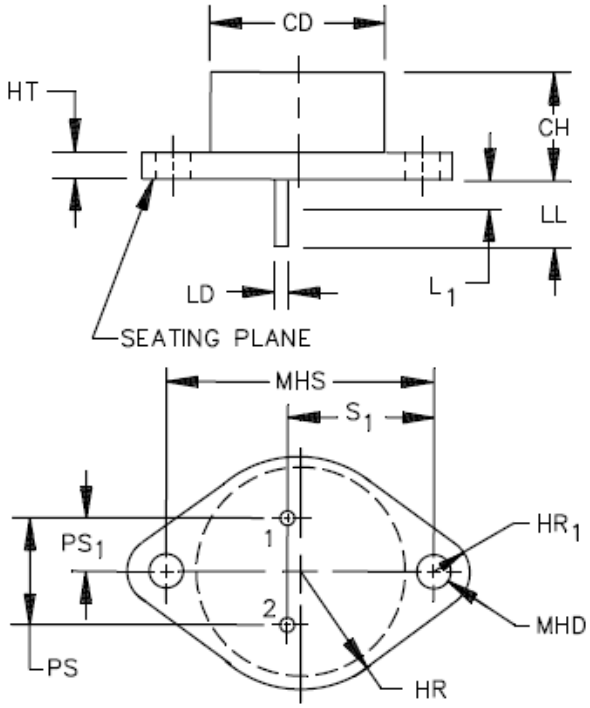
Characteristics	Symbol	Max. Value
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.5°C/W

(1) Derate linearly 28.57 mW/°C above T_A = +25°C
(2) See figure 2 of MIL-PRF-19500/408 for temperature-power derating curves.
(3) See figure 3 of MIL-PRF-19500/408 for transient thermal impedance graph.

Safe Operating Area	
DC Tests:	T_C = +25 °C, I Cycle, t = 1.0 s
Test 1:	V_{CE} = 15 Vdc, I_C = 10 A dc
Test 2:	V_{CE} = 40 Vdc, I_C = 3.75 A dc
Test 3:	V_{CE} = 55 Vdc, I_C = 0.9 A dc, 2N3715 V_{CE} = 65 Vdc, I_C = 0.9 A dc, 2N3716

Outline Drawing (TO-3)

Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD		.875		22.23	3
CH	.250	.450	6.35	11.43	
HR	.495	.525	12.57	13.34	
HR_1	.131	.188	3.33	4.78	4
HT	.060	.135	1.52	3.43	
L_1		.050		1.27	5, 6
LD	.038	.043	0.97	1.09	5, 6
LL	.312	.500	7.92	12.70	5
MHD	.151	.165	3.84	4.19	4
MHS	1.177	1.197	29.90	30.40	
PS	.420	.440	10.67	11.18	7
PS_1	.205	.225	5.21	5.72	7
S_1	.655	.675	16.64	17.15	7

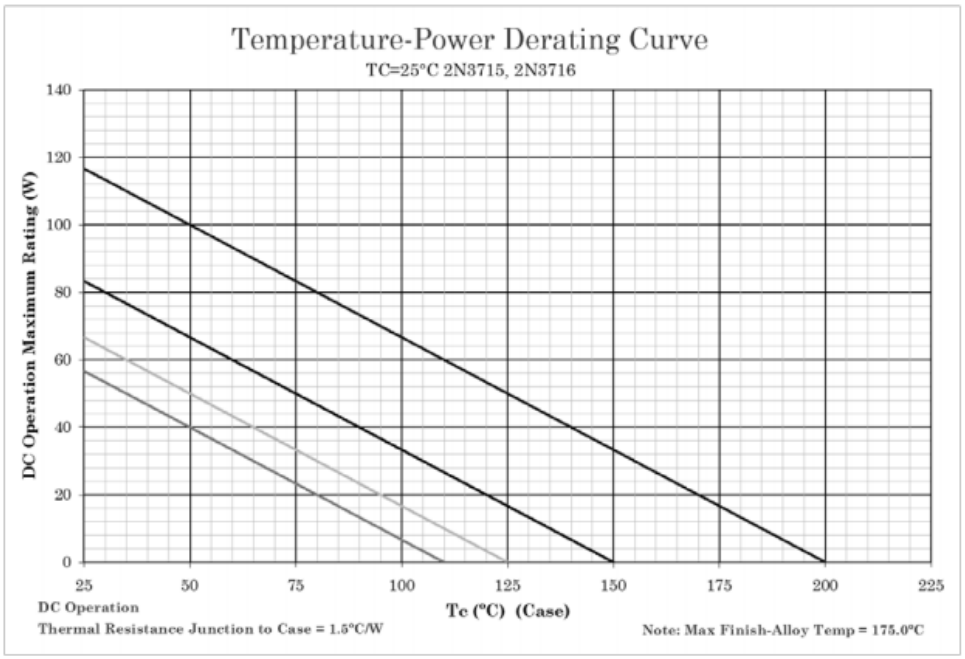


NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Terminal 1 is the emitter; terminal 2 is the base; and the collector shall be electrically connected to the case.
3. Body contour is optional within zone defined by dimension CD.
4. Applies to both ends.
5. Applies to both terminals.
6. Dimension LD applies between dimension L_1 and LL. Lead diameter shall not exceed twice dimension LD within dimension L_1. Diameter is uncontrolled in dimension L_1.
7. These dimensions shall be measured at points .050 inch (1.27 mm) to .055 inch (1.4 mm) below the seating plane. When gauge is not used, measurement will be made at the seating plane.
8. 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.
9. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 1. Physical dimensions TO–204AA (formerly TO–3).

Temperature-Power Derating Curve

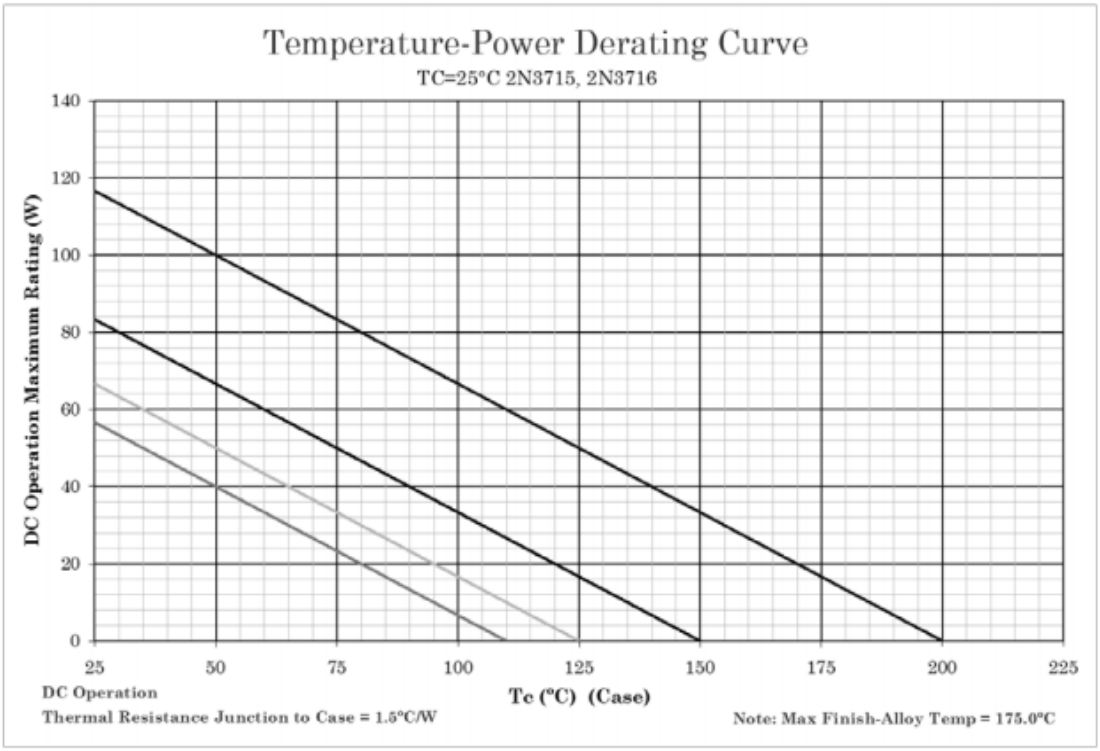


NOTES:

1. All devices are capable of operating at ≤ 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 ≤ +200°C) and power rating specified. (See 1.3 herein.)
3. Derate design curve chosen at T_J ≤ +150°C, where the maximum temperature of electrical test is performed.
4. Derate design curves, chosen at T_J ≤ +125°C and 110°C to show power rating where most users want to limit T_J in their application.

FIGURE 2. Temperature-power derating graphs for device types 2N3715 and 2N3716.

Temperature-Power Derating Curve



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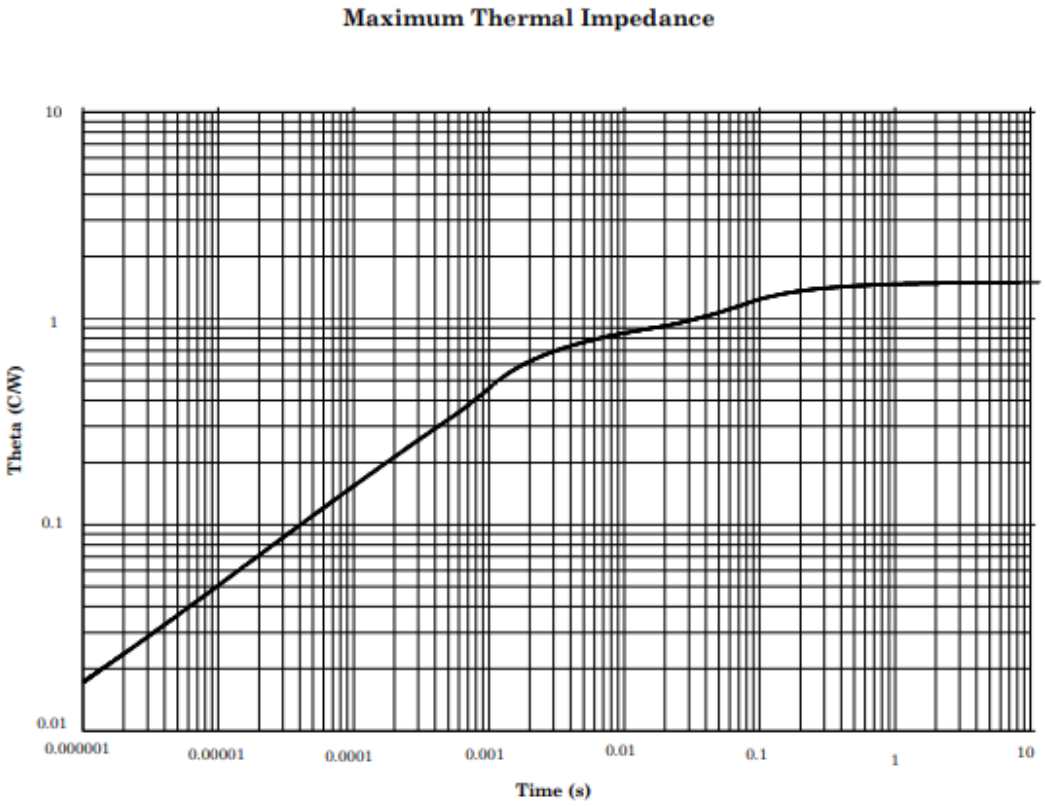
Thermal Impedance Curve



T_C = +25C. Thermal resistance = 1.5°C/W.

FIGURE 3. Transient thermal impedance graph for device types 2N3715 and 2N3716.