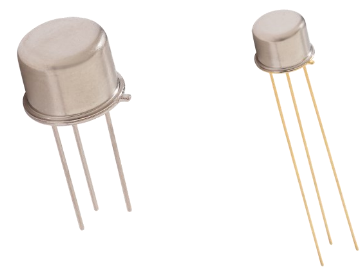
2N3019, 2N3019S

NPN Low Power Silicon Transistor

Rev. V2

Features

- JAN, JANTX, JANTXV, JANS and JANSR Qualified to MIL-PRF-19500/391
- Lightweight & Low Power
- Ideal for Space, Military, & Other High Reliability Applications
- Available in TO-5 and TO-39 packages



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

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Collector - Emitter Breakdown Voltage	I_C = 30 mA	$V_{(BR)CEO}$	V dc	80	—
Collector - Base Cutoff Current	V_{CB} = 140 V	I_{CBO1}	µA dc	—	10
Emitter - Base Cutoff Current	V_{EB} = 7 V	I_{EBO1}	µA dc	—	10
Collector - Emitter Cutoff Current	V_{CE} = 90 V	I_{CES1}	nA dc	—	10
Emitter - Base Cutoff Current	V_{EB} = 5 Vdc	I_{EBO2}	nA dc	—	10
Forward Current Transfer Ratio	V_{CE} = 10 V dc; I_C = 150 mA dc V_{CE} = 10 V dc; I_C = 0.1 mA dc V_{CE} = 10 V dc; I_C = 10 mA dc V_{CE} = 10 V dc; I_C = 500 mA dc V_{CE} = 10 V dc; I_C = 1 A dc	h_{FE1} h_{FE2} h_{FE3} h_{FE4} h_{FE5}	-	100 50 90 50 15	300 300 300
Collector - Emitter Saturation Voltage	I_C = 150 mA; I_B = 15 mA I_C = 500 mA; I_B = 50 mA	$V_{CE(SAT)1}$ $V_{CE(SAT)2}$	V dc	—	0.2 0.5
Base - Emitter Saturation Voltage	I_C = 150 mA; I_B = 15 mA	$V_{BE(SAT)}$	V dc	—	1.1
Collector - Emitter Cutoff Current	T_A = +150°C V_{CE} = 90 V	I_{CES2}	µA dc	—	5
Forward Current Transfer Ratio	T_A = -55°C V_{CE} = 10 V dc; I_C = 150 mA dc	h_{FE6}		40	

Safe Operating Area	
DC Tests:	T_C = +25°C; 1Cycle, t = 10 ms
Test 1:	V_{CE} = 10 V, I_C = 500 mA dc
Test 2:	V_{CE} = 40 V, I_C = 130 mA dc
Test 3:	V_{CE} = 80 V, I_C = 60 mA dc

For further information and support please visit:
info@vptcomponents.com

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Dynamic Characteristics					
Small-Signal Short-Circuit Forward -Current Transfer Ratio	V_{CE} = 5 V dc; I_C = 1 mA dc; f = 1 kHz	h_{FE}		80	400
Magnitude of Small-Signal Short-Circuit Forward Current Transfer Ratio	V_{CE} = 10 V dc; I_C = 50 mA dc; f = 20 MHz	$\|h_{FE}\|$		5	20
Input Capacitance (Output Open Circuited)	V_{EB} = 0.5 V dc; I_C = 0; 100 kHz ≤ f ≤ 1 MHz	C_{ibo}	pF	—	60
Open Circuit Output Capacitance	V_{CB} = 10 V dc; I_E = 0; 100 kHz ≤ f ≤ 1 MHz	C_{obo}	pF	—	12
Noise Figure	V_{CE} = 10 V dc; I_C = 100 µA dc; Rg = 1 kΩ; power bandwidth = 200 H_Z f = 1 kHz	NF	dB	—	4
Pulse Response	See Figure 21 of MIL-PRF-19500/391	$t_{on}+t_{off}$	ns		30

Absolute Maximum Ratings (T_A = +25^{o}C unless otherwise specified)

Ratings	Symbol	Value
Collector - Emitter Voltage	V_{CEO}	80 V dc
Collector - Base Voltage	V_{CBO}	140 V dc
Emitter - Base Voltage	V_{EBO}	7 V dc
Collector Current	I_C	1 A dc
Total Power Dissipation @ T_A = 25°C @ T_C = 25°C	P_T (1) (2)	0.8 W 5.0 W
Operating & Storage Temperature Range	T_J, T_{STG}	-65°C to +200°C

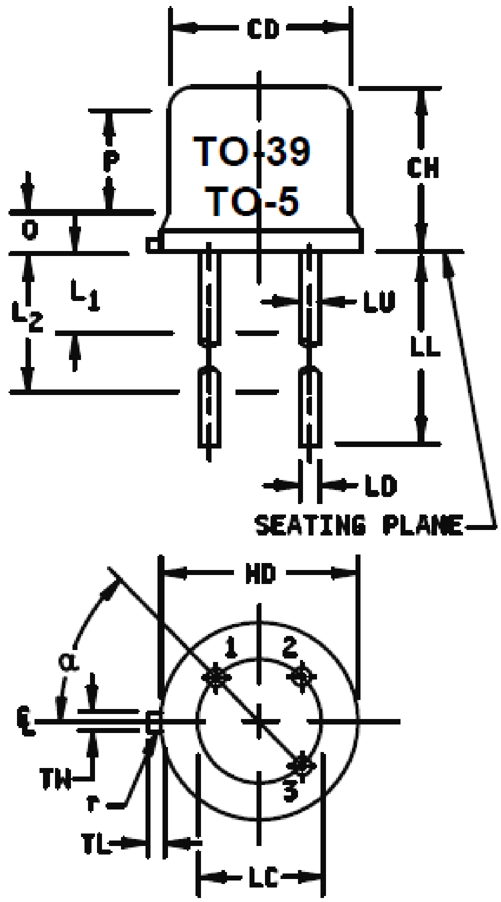
Thermal Characteristics

Characteristics	Symbol	Max. Value
Thermal Resistance, Junction to Case (2) (3)	$R_{\theta JC}$	30°C/W
Thermal Resistance, Junction to Ambient (2) (3)	$R_{\theta JA}$	195°C/W

(1) For derating, see figures 8, 9, 10, 11, 12 and 13 of MIL-PRF-19500/391
(2) See paragraph 3.3 of MIL-PRF-19500/391
(3) For thermal curves, see figures 14, 15, 16, 17, 18, 19 and 20 of MIL-PRF-19500/391

Outline Drawing (TO-5, TO-39)

Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.305	.335	7.75	8.51	
CH	.240	.260	6.10	6.60	
HD	.335	.370	8.51	9.40	
LC	.200 TP		5.08 TP		6
LD	.016	.021	0.41	0.53	7, 8
LL	1.50	1.750	38.10	40.45	7, 8, 12
LU	.016	.019	0.41	0.48	7, 8
L_1		.050		1.27	7, 8
L_2	.250		6.35		7, 8
Q		.050		1.27	5
TL	.029	.045	0.74	1.14	4
TW	.028	.034	0.71	0.86	3
r		.010		0.25	10
α	45° TP		45° TP		6
P	.100		2.54		

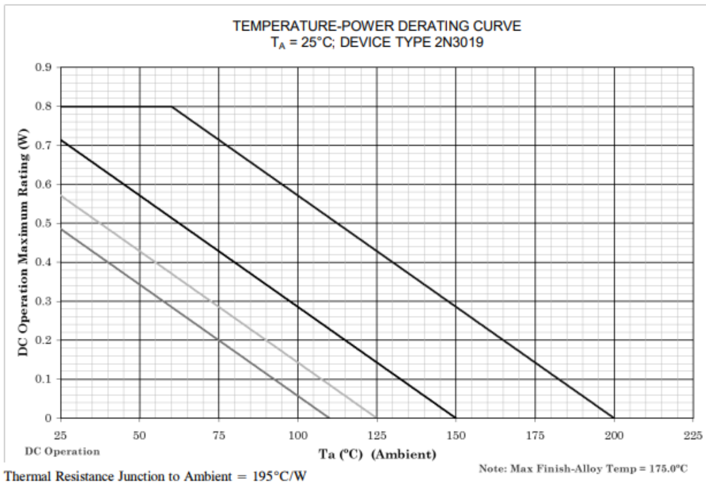


NOTES:

1. Dimension 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. 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.
7. Dimension LU applies between L_1 and L_2. Dimension LD applies between L_2 and minimum. Diameter is uncontrolled in L_1 and beyond LL minimum.
8. All three leads.
9. The collector shall be internally connected to the case.
10. Dimension r (radius) applies to both inside corners of tab.
11. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.
12. For "S" suffix devices, dimension LL is 0.500 (12.70 mm) minimum, 0.750 (19.05 mm) maximum.
13. Lead 1 = emitter, lead 2 = base, lead 3 = collector.

* FIGURE 1. Physical dimensions for device types 2N3019 (TO-5) and 2N3019S (TO-39).

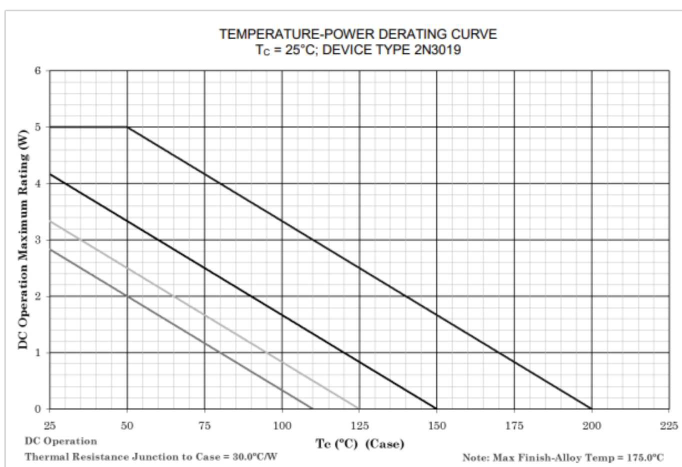
Temperature-Power Derating Curve



NOTES:

1. This is the true inverse of the worst case thermal resistance value. 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 temperatures 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 curve 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 8. Derating for 2N3019 ($R_{\theta JA}$) PCB (TO-5 and TO-39).

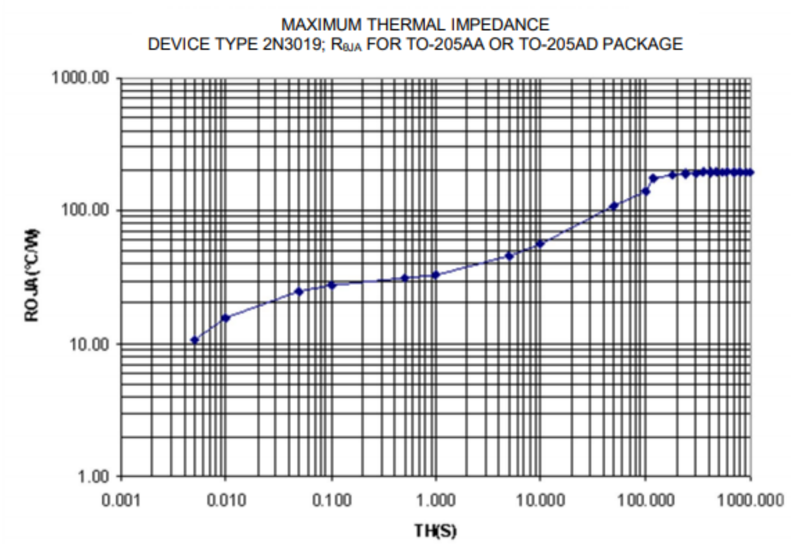


NOTES:

1. This is the true inverse of the worst case thermal resistance value. 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 temperatures 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 curve chosen at T_J ≤ +125°C, and +110°C to show power rating where most users want to limit T_J in their application.

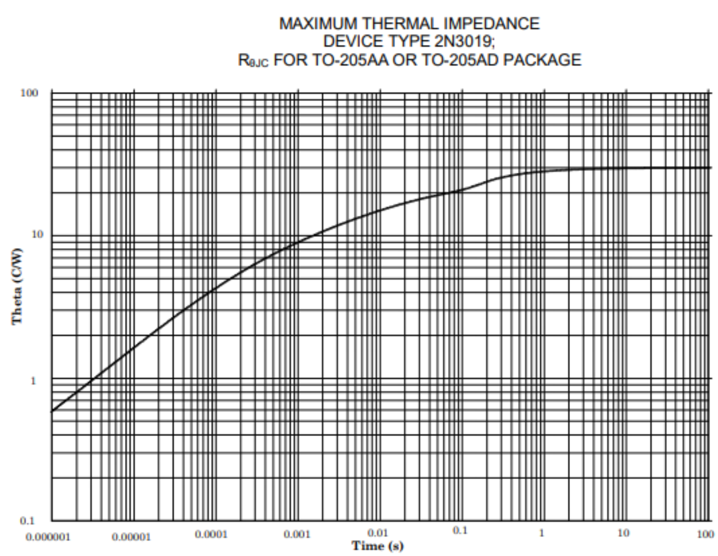
FIGURE 9. Derating for 2N3019 ($R_{\theta JC}$), base case mounted (TO-5 and TO-39).

Thermal Impedance Curve



$R_{\theta JA}$ = 195°C/W

FIGURE 14. Thermal impedance graph ($R_{\theta JA}$) for a 2N3019 in a TO-205AA or TO-205AD package.



$R_{\theta JC}$ = 30°C/W

FIGURE 15. Thermal impedance graph ($R_{\theta JC}$) for a 2N3019 in a TO-205AA or TO-205AD package.

Information in this document is provided in connection with VPT Components products. These materials are provided by VPT Components as a service to its customers and may be used for informational purposes only. Except as provided in VPT Components Terms and Conditions of Sale for such products or in any separate agreement related to this document, VPT Components assumes no liability whatsoever. VPT Components assumes no responsibility for errors or omissions in these materials. VPT Components may make changes to specifications and product descriptions at any time, without notice. VPT Components makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppels or otherwise, to any intellectual property rights is granted by this document.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF VPT COMPONENTS PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. VPT COMPONENTS FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CON-TAINED WITHIN THESE MATERIALS. VPT COMPONENTS SHALL NOT BE LIABLE FOR ANY SPECIAL, IN-DIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVE-NUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

VPT Components products are not intended for use in medical, lifesaving or life sustaining applications. VPT Components customers using or selling VPT Components products for use in such applications do so at their own risk and agree to fully indemnify VPT Components for any damages resulting from such improper use or sale.