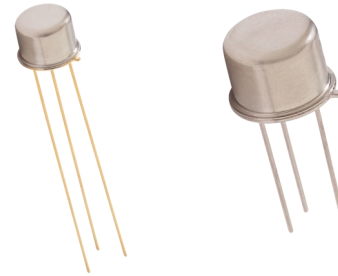


### Features

- Available in JAN, JANTX, JANTXV per MIL-PRF-19500/350
- TO-5 Package: 2N3867, 2N3868
- TO-39 Package: 2N3867S, 2N3868S
- Designed for High Speed Switching and Amplifier Applications



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

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Collector - Base Breakdown Voltage	V <sub>CB</sub> = -40V 2N3867, 2N3867S V <sub>CB</sub> = -60V 2N3868, 2N3868S	I <sub>CBO1</sub>	µA dc		-100
Collector - Emitter Breakdown Voltage	I <sub>C</sub> = -20 mA dc, 2N3867, 2N3867S I <sub>C</sub> = -20 mA dc, 2N3868, 2N3868S	V <sub>(BR)CEO</sub>	V dc	-40 -60	—
Collector - Emitter Cutoff Current	V <sub>EB</sub> = +2.0 V dc, V <sub>CE</sub> = -40 Vdc, 2N3867, 2N3867S V <sub>EB</sub> = +2.0 V dc, V <sub>CE</sub> = -60 Vdc, 2N3868, 2N3868S	I <sub>CEX1</sub>	µA dc	—	-1.0 -1.0
Emitter - Base Cutoff Current	V <sub>EB</sub> = -4.0 Vdc	I <sub>EBO1</sub>	µA dc	—	-100
Forward Current Transfer Ratio	V <sub>CE</sub> = -1.0 V dc, I <sub>C</sub> = -500 mA dc 2N3867, 2N3867S 2N3868, 2N3868S V <sub>CE</sub> = -2.0 Vdc, I <sub>C</sub> = -1.5 A dc 2N3867, 2N3867S 2N3868, 2N3868S V <sub>CE</sub> = -3.0 V dc, I <sub>C</sub> = -2.5 A dc 2N3867, 2N3867S 2N3868, 2N3868S V <sub>CE</sub> = -5.0 V dc, I <sub>C</sub> = -3.0 mA dc All Types	h <sub>FE</sub>	-	50 35 40 30 25 20 20	— — 200 150 — — —
Collector - Emitter Saturation Voltage	I <sub>C</sub> = -500 mA dc, I <sub>B</sub> = -50 mA dc I <sub>C</sub> = -1.5 A dc, I <sub>B</sub> = -150 mA dc I <sub>C</sub> = -2.5 A dc, I <sub>B</sub> = -250 mA dc	V <sub>CE(sat)1</sub> V <sub>CE(sat)2</sub> V <sub>CE(sat)3</sub>	V dc	—	-0.5 -0.75 -1.5
Base - Emitter Saturation Voltage	I <sub>C</sub> = -500 mA dc, I <sub>B</sub> = -50 mA dc I <sub>C</sub> = -1.5 A dc, I <sub>B</sub> = -150 mA dc I <sub>C</sub> = -2.5 A, I <sub>B</sub> = -250 mA dc	V <sub>BE(sat)1</sub> V <sub>BE(sat)2</sub> V <sub>BE(sat)3</sub>	V dc	-0.9	-1.0 -1.4 -2.0

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

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Collector - Emitter Cutoff Current	$T_A = +150^\circ\text{C}$ $V_{EB} = +2.0\text{ V dc}, V_{CE} = -40\text{ Vdc}$ , 2N3867, 2N3867S $V_{EB} = +2.0\text{ V dc}, V_{CE} = -60\text{ Vdc}$ , 2N3868, 2N3868S	$I_{CEX2}$	$\mu\text{A dc}$	—	-50 -50
Forward-Current Transfer Ratio	$T_A = -55^\circ\text{C}$ $V_{CE} = -1.0\text{ V dc}, I_C = -500\text{ mA dc}$ 2N3867, 2N3867S 2N3868, 2N3868S	$h_{FE5}$	V dc	25 17	
<b>Dynamic Characteristics</b>					
Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio	$V_{CE} = -5.0\text{ V dc}, I_C = -100\text{ mA dc}$ , $f = 20\text{ MHz}$	$ h_{fe} $	-	3	12
Open Circuit Output Capacitance	$V_{CB} = 10\text{ Vdc}, I_E = 0, 100\text{ kHz} \leq f \leq 1\text{ MHz}$	$C_{obo}$	pF	—	120
Input Capacitance	$V_{CB} = -3\text{ Vdc}, I_C = 0, 100\text{ kHz} \leq f \leq 1\text{ MHz}$	$C_{ibo}$	pF	—	800
<b>Switching Characteristics</b>					
Delay Time	$V_{CC} = -30\text{ V dc}, V_{EB} = 0, I_C = -1.5\text{ A dc}$ , $I_{B1} = -150\text{ mA dc}$	$t_d$	ns	—	35
Rise Time	$V_{CC} = -30\text{ V dc}, V_{EB} = 0\text{ V dc}$ , $I_C = -1.5\text{ A dc}, I_{B1} = -150\text{ mA dc}$	$t_r$	ns	—	65
Storage Time	$V_{CC} = -30\text{ V dc}, V_{EB} = 0\text{ V dc}$ , $I_C = -1.5\text{ A dc}, I_{B1} = I_{B2} = -150\text{ mA dc}$	$t_s$	ns	—	500
Fall Time	$V_{CC} = -30\text{ V dc}, V_{EB} = 0\text{ V dc}$ , $I_C = -1.5\text{ A dc}, I_{B1} = I_{B2} = -150\text{ mA dc}$	$t_f$	ns	—	100

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

Ratings	Symbol	Value
Collector - Emitter Voltage 2N3867, 2N3867S 2N3868, 2N3868S	$V_{CEO}$	-40 V dc -60 V dc
Collector - Base Voltage 2N3867, 2N3867S 2N3868, 2N3868S	$V_{CBO}$	-40 V dc -60 V dc
Emitter - Base Voltage	$V_{EBO}$	-4.0 V dc
Collector Current	$I_C$	-3.0 A dc
Total Power Dissipation @ $T_A = +25^\circ\text{C}$ <sup>(1)</sup> @ $T_C = +25^\circ\text{C}$ <sup>(2)</sup>	$P_T$	1.0 W 10 W
Operating & Storage Temperature Range	$T_J, T_{STG}$	$-65^\circ\text{C}$ to $+200^\circ\text{C}$

(1) For derating, see figures 5, 6, 7 and 8 of MIL-PRF-19500/350.

(2) For thermal curves, see figures 9, 10, 11 and 12 of MIL-PRF-19500/350.

### Thermal Characteristics

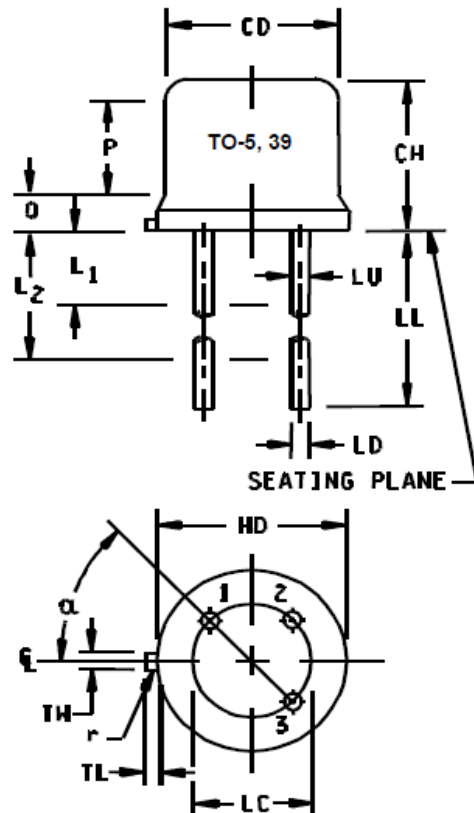
Characteristics	Symbol	Max. Value
Thermal Resistance, Junction to Case	$R_{\theta JC}$	$17.5^\circ\text{C/W}$

### Safe Operating Area

DC Tests:	$T_C = +25^\circ\text{C}$ , 1 Cycle, $t = 1.0$ s (see figure 15 of MIL-PRF-19500/350)
Test 1:	$V_{CE} = -3.33$ V dc, $I_C = -3$ A dc
Test 2:	$V_{CE} = -40$ V dc, $I_C = -160$ mA dc, 2N3867, 2N3867S
Test 3:	$V_{CE} = -60$ V dc, $I_C = -80$ mA dc, 2N3868, 2N3868S

### Outline Drawings (TO-5, TO-39)

Symbol	Dimensions				Note
	Inches		Millimeters		
CD	.305	.335	7.75	8.51	5, 6
CH	.240	.260	6.10	6.60	
HD	.335	.370	8.51	9.40	4, 5
LC	.200 TP		5.08 TP		7
LD	.016	.019	0.41	0.48	8, 9
LL	See note 8, 14				
LU	.016	.019	0.41	0.48	8, 9
L <sub>1</sub>		.050		1.27	8, 9
L <sub>2</sub>	.250		6.35		8, 9
P	.100		2.54		7
Q		.030		0.76	5
TL	.029	.045	0.74	1.14	3, 4
TW	.028	.034	0.71	0.86	3
r		.010		0.25	10
α	45° TP		45° TP		7
	1, 2, 10, 12, 13, 14				

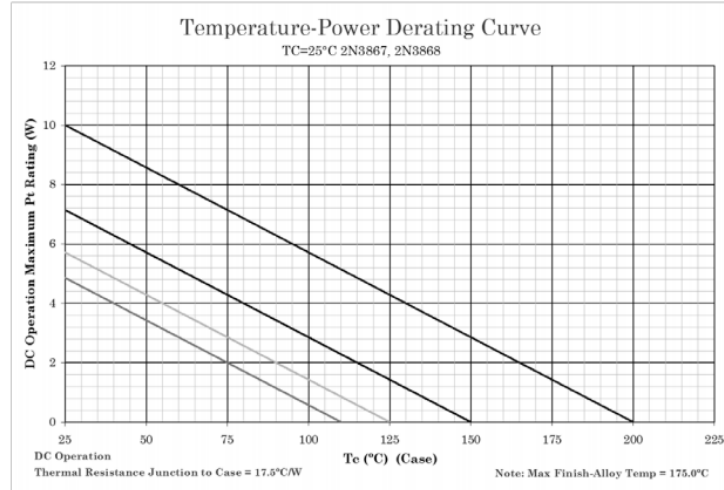


#### NOTES:

- Dimensions are in inches.
- Millimeters are given for general information only.
- Beyond r (radius) maximum, TW shall be held for a minimum length of .011 (0.28 mm).
- Dimension TL measured from maximum HD.
- Body contour optional within zone defined by HD, CD, and Q.
- CD shall not vary more than .010 inch (0.25 mm) in zone P. This zone is controlled for automatic handling.
- 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 or by gauging procedure.
- Dimension LU applies between L<sub>1</sub> and L<sub>2</sub>. Dimension LD applies between L<sub>2</sub> and LL minimum. Diameter is uncontrolled in and beyond LL minimum.
- All three leads.
- The collector shall be internally connected to the case.
- Dimension r (radius) applies to both inside corners of tab.
- In accordance with ASME Y14.5M, diameters are equivalent to  $\phi x$  symbology.
- Lead 1 = emitter, lead 2 = base, lead 3 = collector.
- For non-S-suffix devices (TO-5), dimension LL = 1.5 inches (38.10 mm) min. and 1.75 inches (44.45 mm) max. For S-suffix types (TO-39), dimension LL = .5 inch (12.70 mm) min. and .750 inch (19.05 mm) max.

FIGURE 1. Physical dimensions (similar to TO-5, TO-39).

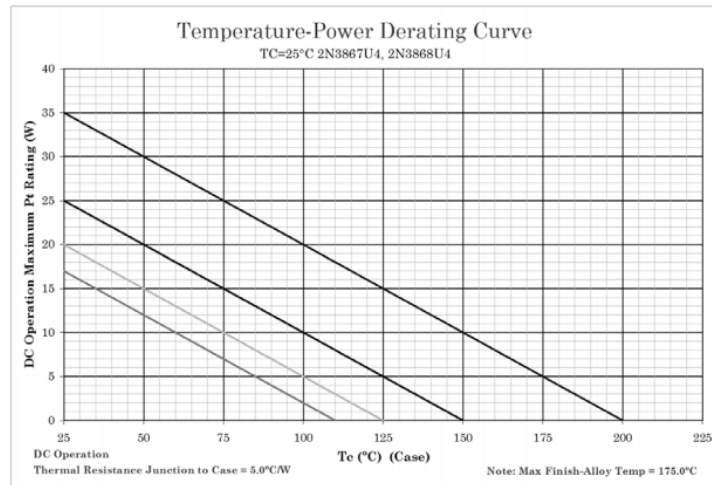
### Temperature-Power Derating Curves



**NOTES:**

1. 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 temperatures 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  $110^\circ\text{C}$  to show power rating where most users want to limit  $T_J$  in their application.

FIGURE 5. Derating for 2N3867, 2N3868 (TO-5, TO-39).

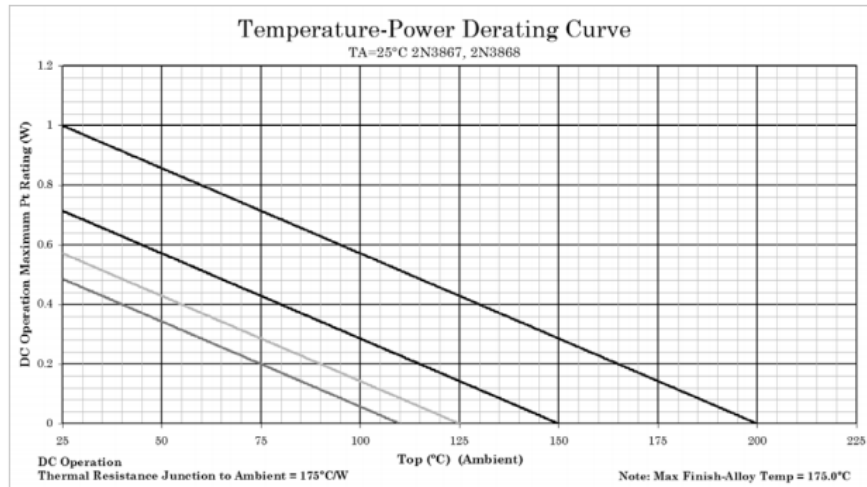


**NOTES:**

1. 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 temperatures 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  $110^\circ\text{C}$  to show power rating where most users want to limit  $T_J$  in their application.

FIGURE 6. Derating for 2N3867U4, 2N3868U4.

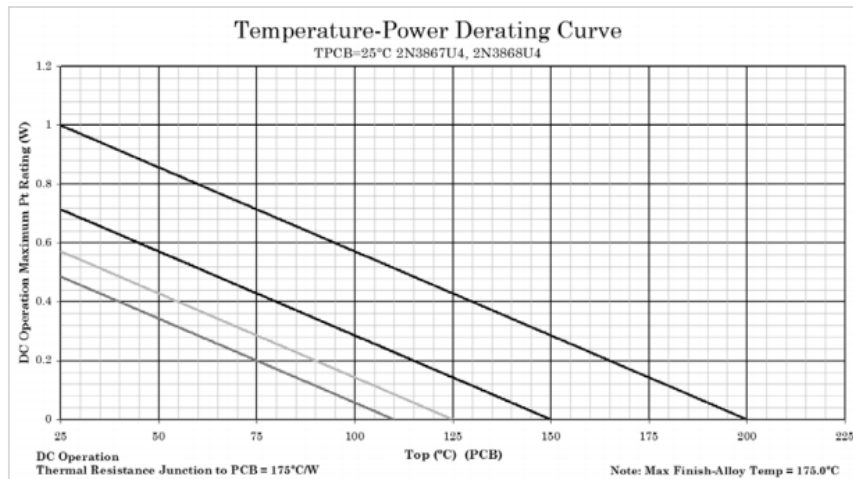
### Temperature-Power Derating Curves



**NOTES:**

1. 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 temperatures 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  $110^\circ\text{C}$  to show power rating where most users want to limit  $T_J$  in their application.

FIGURE 7. Derating for 2N3867, 2N3868.



**NOTES:**

1. 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 temperatures 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  $110^\circ\text{C}$  to show power rating where most users want to limit  $T_J$  in their application.

FIGURE 8. Derating for 2N3867U4, 2N3868U4.

## Thermal Impedance Curves

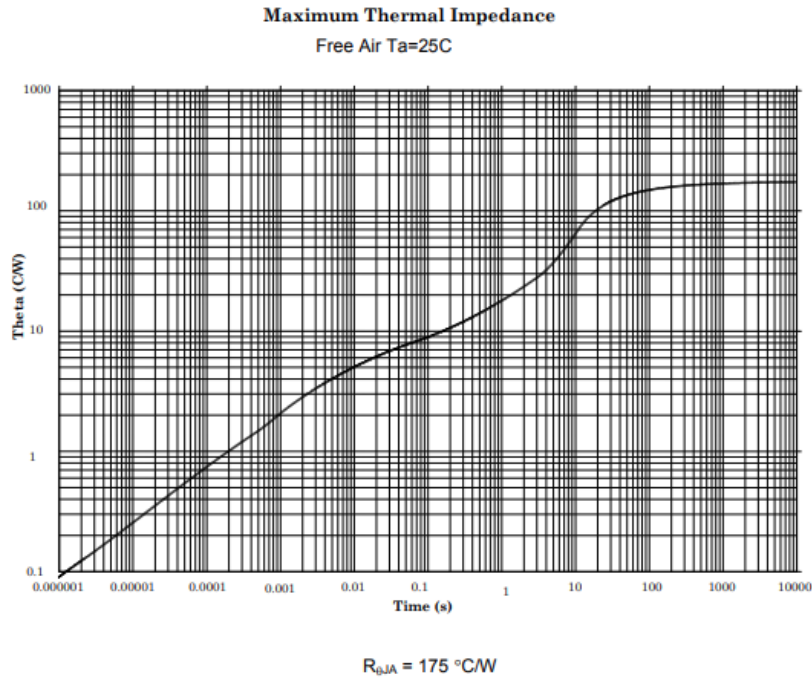


FIGURE 9. Thermal impedance for 2N3867 and 2N3868 (TO-5 and TO-39).

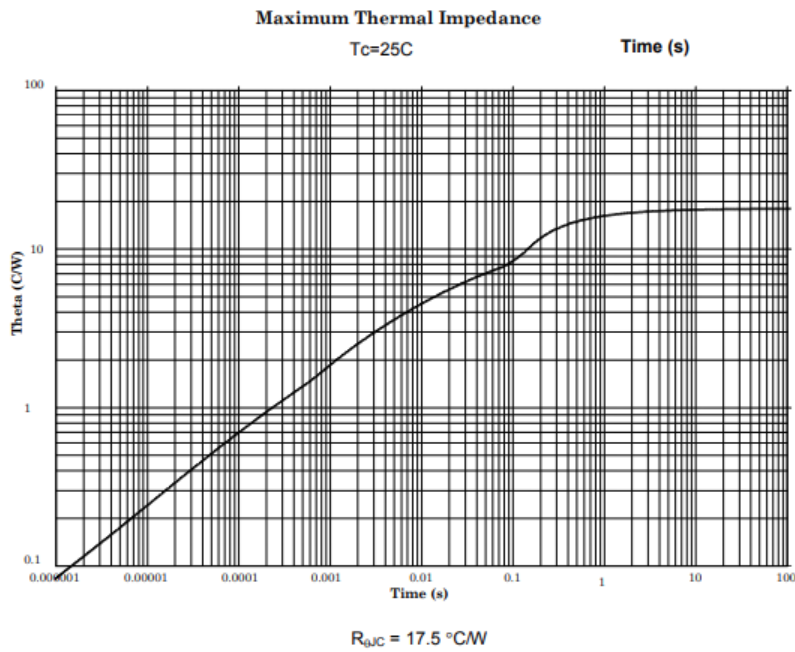


FIGURE 10. Thermal impedance for 2N3867 and 2N3868 (TO-5 and TO-39).



## Thermal Impedance Curves

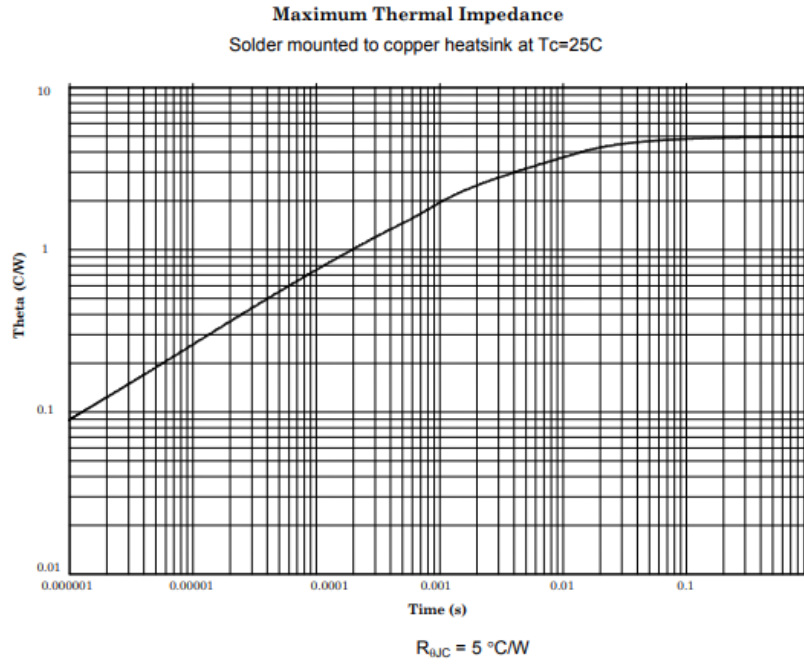


FIGURE 11. Thermal impedance for 2N3867U4, 2N3868U4.

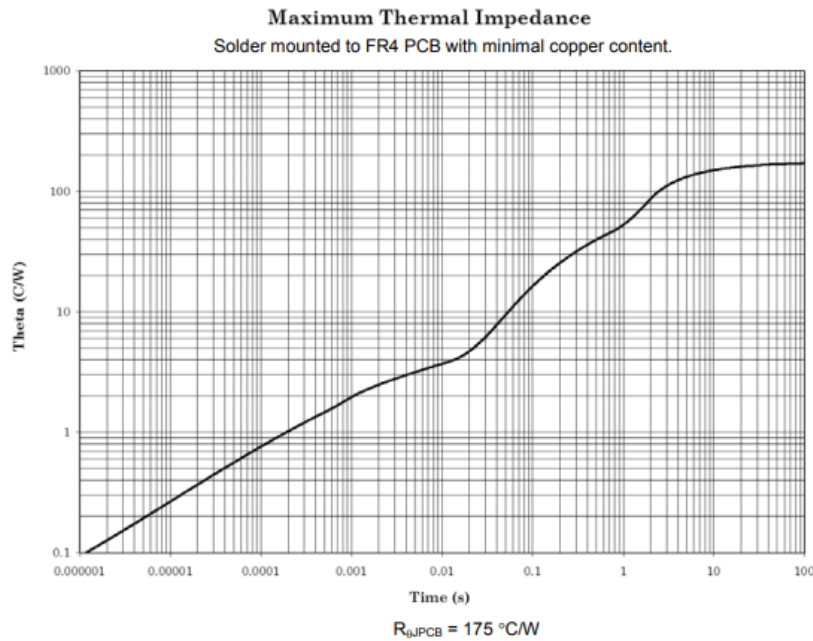


FIGURE 12. Thermal impedance for 2N3867U4, 2N3868U4.



**VPT COMPONENTS. ALL RIGHTS RESERVED.**

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 estoppel 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 CONTAINED WITHIN THESE MATERIALS. VPT COMPONENTS SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES 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.