

# MOSFET – N-Channel, POWERTRENCH®

**150 V, 1.6 A, 261 mΩ**

## FDN86246

### General Description

This N-Channel MOSFET is produced using onsemi's advanced POWERTRENCH process that has been optimized for  $r_{DS(on)}$ , switching performance and ruggedness.

### Features

- Max  $r_{DS(on)}$  = 261 mΩ at  $V_{GS} = 10\text{ V}$ ,  $I_D = 1.6\text{ A}$
- Max  $r_{DS(on)}$  = 359 mΩ at  $V_{GS} = 6\text{ V}$ ,  $I_D = 1.4\text{ A}$
- High Performance Trench Technology for Extremely Low  $r_{DS(on)}$
- High Power and Current Handling Capability in a Widely Used Surface Mount Package
- Fast Switching Speed
- 100% UIL Tested
- Pb-Free, Halide Free and RoHS Compliant

### Application

- PD Switch

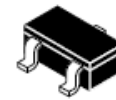
### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted.)

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-Source Voltage	150	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current – Continuous (Note 1a) – Pulsed	1.6 6	A
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	13	mJ
$P_D$	Maximum Power Dissipation (Note 1a) (Note 1b)	1.5 0.6	W
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	$-55$ to $+150$	$^\circ\text{C}$

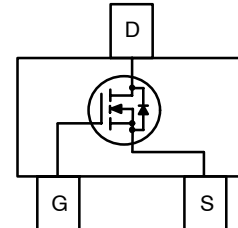
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted.)

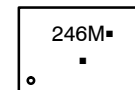
Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case (Note 1)	75	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	80	$^\circ\text{C/W}$



SOT-23/SUPERSOT™ -23, 3 LEAD,  
1.4x2.9  
CASE 527AG



### MARKING DIAGRAM



246 = Specific Device Code  
M = Month Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

Device	Package	Shipping†
FDN86246	SOT-23 (Pb-Free/ Halide Free)	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, [BRD8011/D](http://BRD8011/D).

**ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise noted.)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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**OFF CHARACTERISTICS**

$BV_{DSS}$	Drain–Source Breakdown Voltage	$I_D = 250\ \mu\text{A}$ , $V_{GS} = 0\ \text{V}$	150	–	–	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , referenced to $25^\circ\text{C}$	–	106	–	mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 120\ \text{V}$ , $V_{GS} = 0\ \text{V}$	–	–	1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\ \text{V}$ , $V_{DS} = 0\ \text{V}$	–	–	$\pm 100$	nA

**ON CHARACTERISTICS** (Note 2)

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\ \mu\text{A}$	2	3.4	4	V
$\Delta V_{GS(th)} / \Delta T_J$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , referenced to $25^\circ\text{C}$	–	–9	–	mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On–Resistance	$V_{GS} = 10\ \text{V}$ , $I_D = 1.6\ \text{A}$ $V_{GS} = 6\ \text{V}$ , $I_D = 1.4\ \text{A}$ $V_{GS} = 10\ \text{V}$ , $I_D = 1.6\ \text{A}$ , $T_J = 125^\circ\text{C}$	–	195 242 359	261 359 481	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\ \text{V}$ , $I_D = 1.6\ \text{A}$	–	4	–	S

**DYNAMIC CHARACTERISTICS**

$C_{iss}$	Input Capacitance	$V_{DS} = 75\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$	–	168	225	pF
$C_{oss}$	Output Capacitance		–	21	30	pF
$C_{rss}$	Reverse Transfer Capacitance		–	1.6	5	pF
$R_g$	Gate Resistance		–	0.9	–	$\Omega$

**SWITCHING CHARACTERISTICS**

$t_{d(on)}$	Turn–On Delay Time	$V_{DD} = 75\ \text{V}$ , $I_D = 1.6\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $R_{GEN} = 6\ \Omega$	–	4.5	10	ns
$t_r$	Rise Time		–	1.1	10	ns
$t_{d(off)}$	Turn–Off Delay Time		–	8	16	ns
$t_f$	Fall Time		–	2.9	10	ns
$Q_g$	Total Gate Charge	$V_{GS} = 0\ \text{V}$ to $10\ \text{V}$ , $V_{DD} = 75\ \text{V}$ , $I_D = 1.6\ \text{A}$	–	2.9	5	nC
$Q_g$	Total Gate Charge	$V_{GS} = 0\ \text{V}$ to $5\ \text{V}$ , $V_{DD} = 75\ \text{V}$ , $I_D = 1.6\ \text{A}$	–	1.6	3	nC
$Q_{gs}$	Gate to Source Gate Charge	$V_{DD} = 75\ \text{V}$ , $I_D = 1.6\ \text{A}$	–	0.9	–	nC
$Q_{gd}$	Gate to Drain “Miller” Charge		–	0.8	–	nC

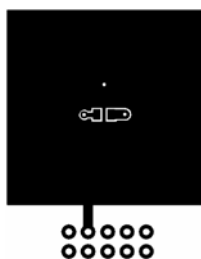
**DRAIN–SOURCE DIODE CHARACTERISTICS**

$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0\ \text{V}$ , $I_S = 1.6\ \text{A}$ (Note 2)	–	0.83	1.3	V
$t_{rr}$	Reverse Recovery Time	$I_F = 1.6\ \text{A}$ , $di/dt = 100\ \text{A}/\mu\text{s}$	–	44	70	ns
$Q_{rr}$	Reverse Recovery Charge		–	29	47	nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

**NOTES:**

- $R_{\theta JA}$  is the sum of the junction–to–case and case–to–ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



a)  $80^\circ\text{C}/\text{W}$  when mounted on a  $1\ \text{in}^2$  pad of 2 oz copper.



b)  $180^\circ\text{C}/\text{W}$  when mounted on a minimum pad.

- Pulse Test: Pulse Width  $< 300\ \mu\text{s}$ , Duty Cycle  $< 2.0\%$ .
- Starting  $T_J = 25^\circ\text{C}$ ; N–ch:  $L = 3\ \text{mH}$ ,  $I_{AS} = 3\ \text{A}$ ,  $V_{DD} = 150\ \text{V}$ ,  $V_{GS} = 10\ \text{V}$ .

## TYPICAL CHARACTERISTICS

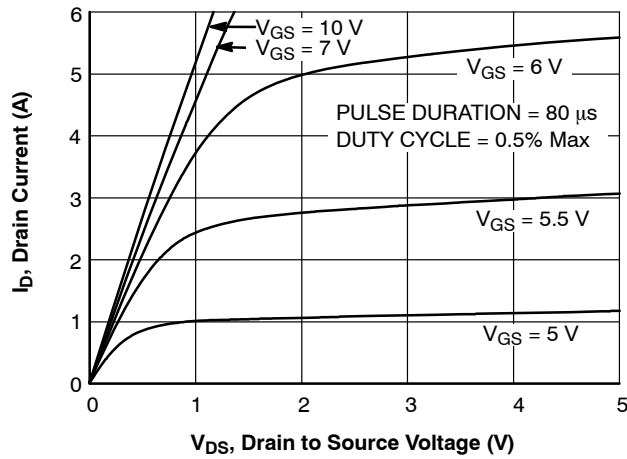
(T<sub>J</sub> = 25°C, unless otherwise noted)

Figure 1. On-Region Characteristics

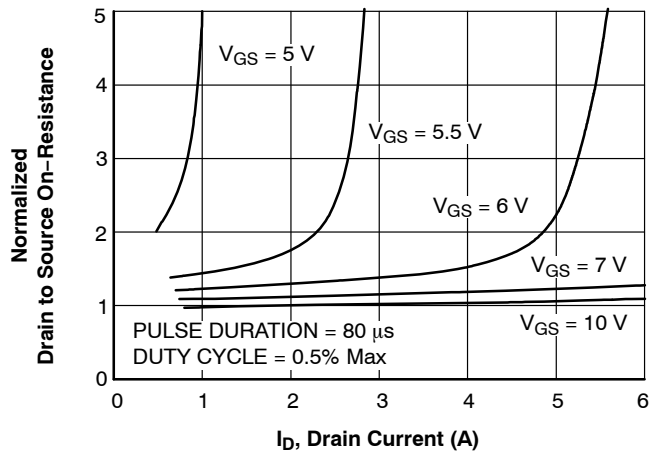


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

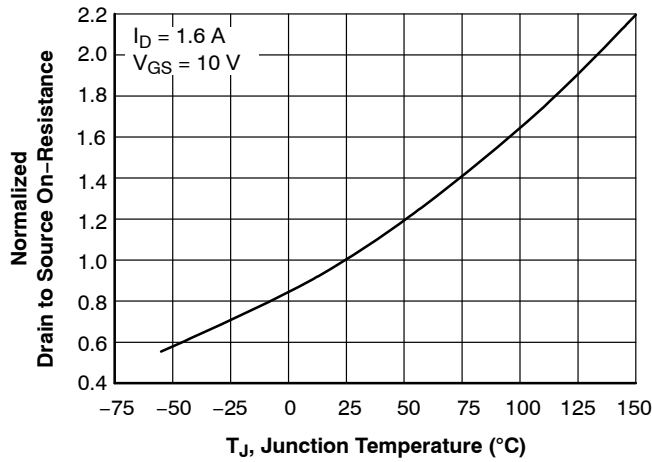


Figure 3. Normalized On-Resistance vs. Junction Temperature

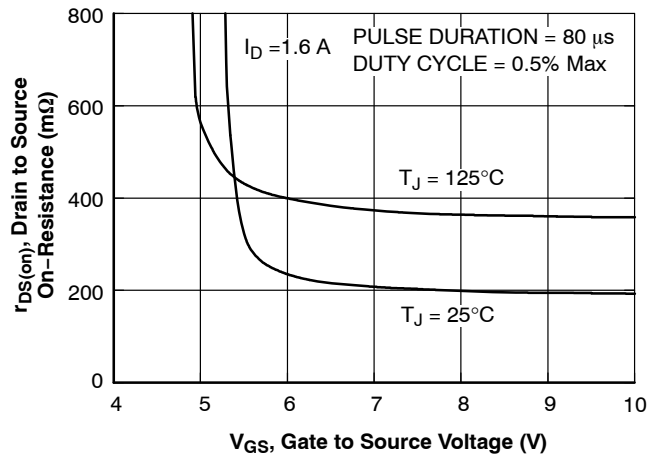


Figure 4. On-Resistance vs. Gate to Source Voltage

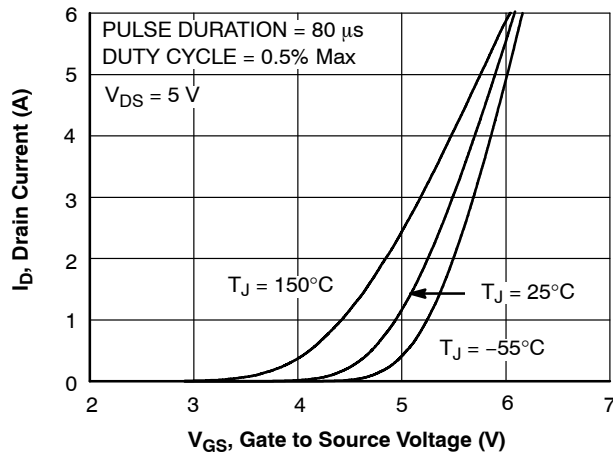


Figure 5. Transfer Characteristics

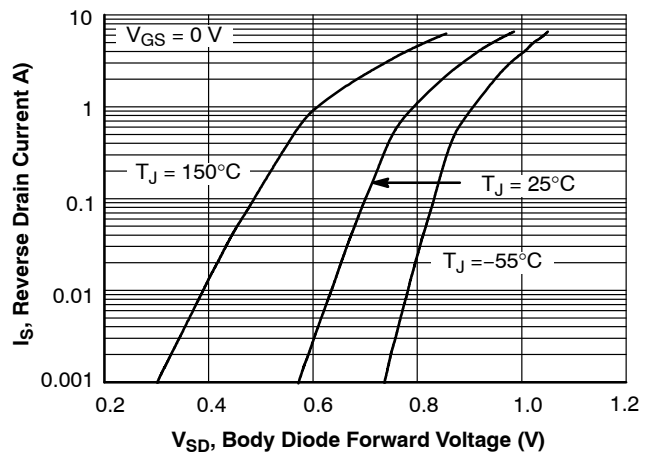


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS (CONTINUED)

( $T_J = 25^\circ\text{C}$ , unless otherwise noted)

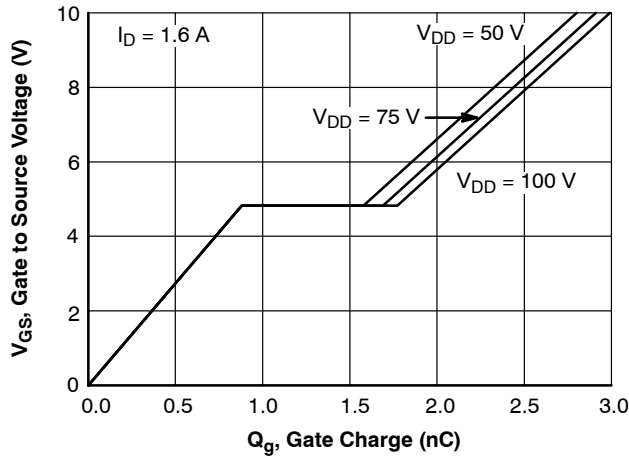


Figure 7. Gate Charge Characteristics

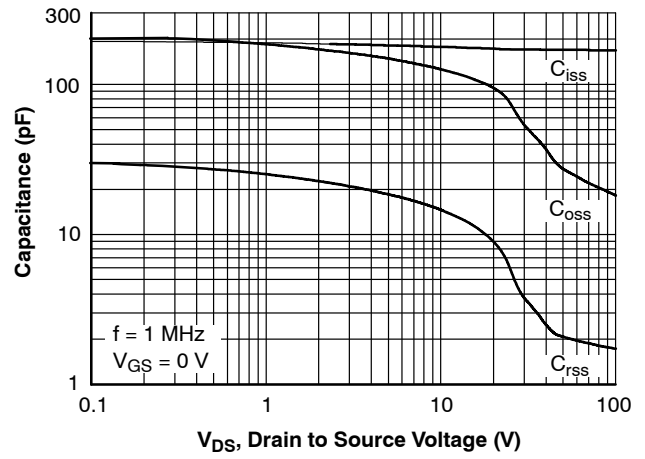


Figure 8. Capacitance vs. Drain to Source Voltage

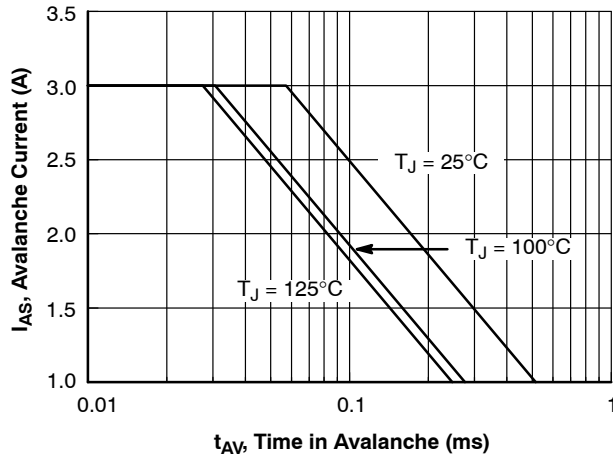


Figure 9. Unclamped Inductive Switching Capability

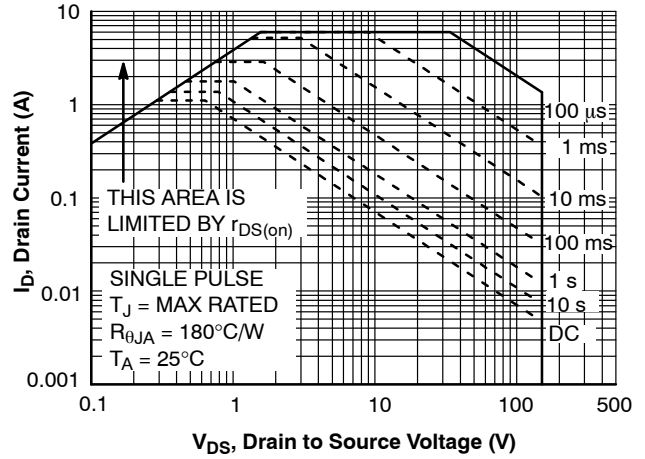


Figure 10. Forward Bias Safe Operating Area

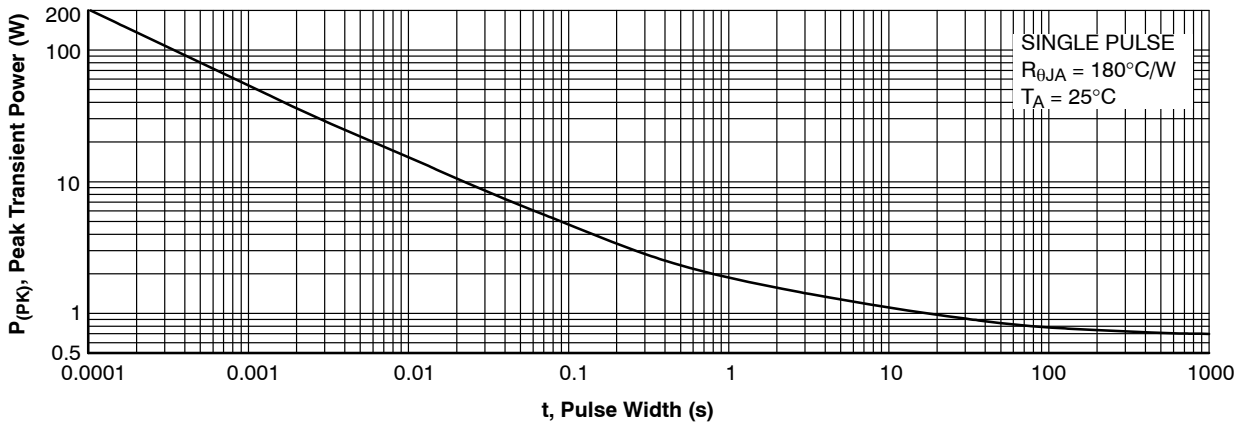


Figure 11. Single Pulse Maximum Power Dissipation

## TYPICAL CHARACTERISTICS (CONTINUED)

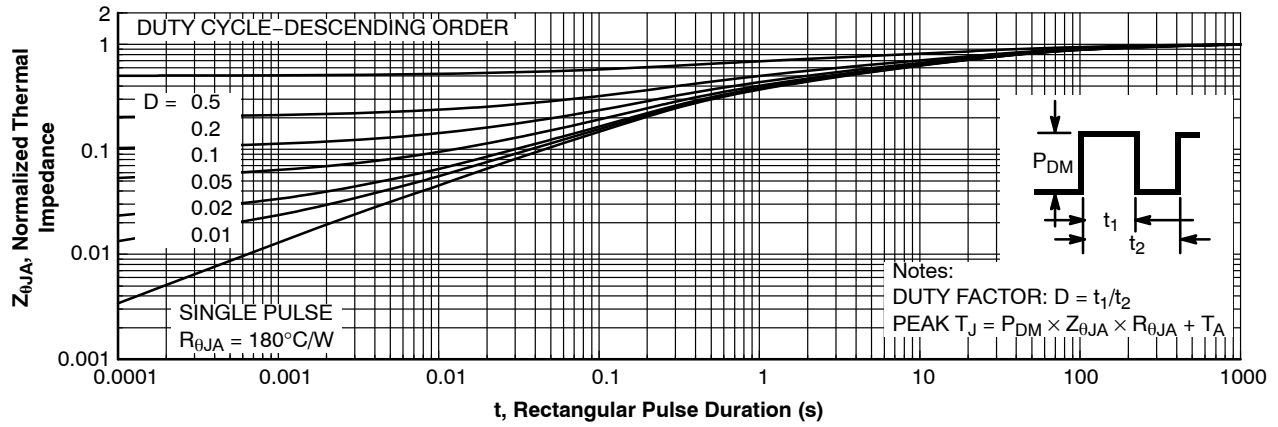
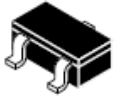
(T<sub>J</sub> = 25°C, unless otherwise noted)

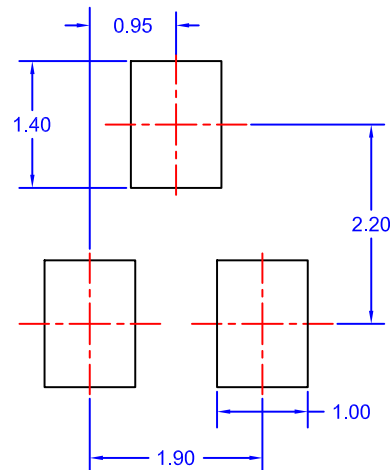
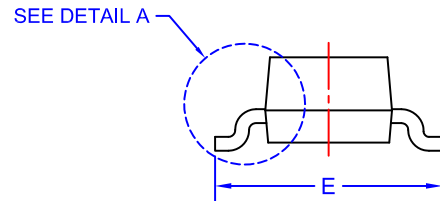
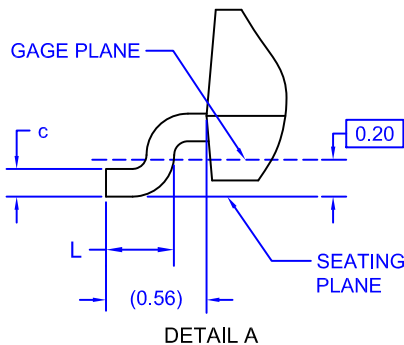
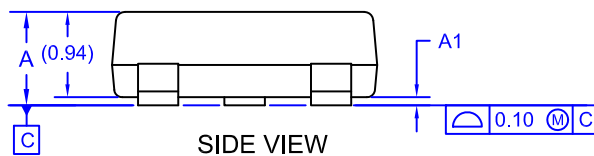
Figure 12. Junction-to-Ambient Transient Thermal Response Curve

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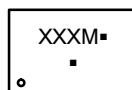
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**SOT-23/SUPERSOT™ –23, 3 LEAD, 1.4x2.9**  
**CASE 527AG**  
**ISSUE A**

DATE 09 DEC 2019


**LAND PATTERN RECOMMENDATION\***

\*FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

**GENERIC MARKING DIAGRAM\***


XXX = Specific Device Code  
M = Month Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

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