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March 2015

FDD86102LZ

N-Channel Shielded Gate PowerTrench[®] MOSFET

100 V, 35 A, 22.5 mΩ

Features

- Shielded Gate MOSFET Technology
- Max $r_{DS(on)}$ = 22.5 mΩ at $V_{GS} = 10$ V, $I_D = 8$ A
- Max $r_{DS(on)}$ = 31 mΩ at $V_{GS} = 4.5$ V, $I_D = 7$ A
- HBM ESD protection level > 6 kV typical (Note 4)
- Very low Qg and Qgd compared to competing trench technologies
- Fast switching speed
- 100% UIL tested
- RoHS Compliant

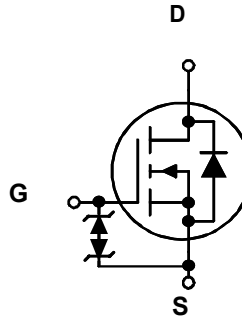
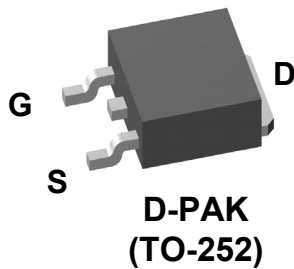


General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench[®] process that incorporates Shielded Gate technology. This process has been optimized for the on-state resistance and switching loss. G-S zener has been added to enhance ESD voltage level.

Applications

- DC - DC Conversion
- Inverter
- Synchronous Rectifier



MOSFET Maximum Ratings $T_C = 25$ °C unless otherwise noted

Symbol	Parameter	Rated	Units
V_{DS}	Drain to Source Voltage	100	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current -Continuous $T_C = 25$ °C	35	A
	-Continuous $T_A = 25$ °C (Note 1a)	8	
	-Pulsed	40	
E_{AS}	Single Pulse Avalanche Energy (Note 3)	84	mJ
P_D	Power Dissipation $T_C = 25$ °C	54	W
	Power Dissipation $T_A = 25$ °C (Note 1a)	3.1	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	2.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	40	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDD86102LZ	FDD86102LZ	D-PAK(TO-252)	13 "	16 mm	2500 units

FDD86102LZ N-Channel Shielded Gate PowerTrench[®] MOSFET

Electrical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\text{ }\mu\text{A}, V_{GS} = 0\text{ V}$	100			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$		69		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 80\text{ V}, V_{GS} = 0\text{ V}$			1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$			± 10	μA

On Characteristics (Note 2)

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	1.0	1.5	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$		-6		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 8\text{ A}$		17.8	22.5	m Ω
		$V_{GS} = 4.5\text{ V}, I_D = 7\text{ A}$		23.2	31	
		$V_{GS} = 10\text{ V}, I_D = 8\text{ A}, T_J = 125\text{ }^\circ\text{C}$		31.1	40	
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{ V}, I_D = 8\text{ A}$		31		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 50\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}$		1157	1540	pF
C_{oss}	Output Capacitance			181	245	pF
C_{rss}	Reverse Transfer Capacitance			7.7	15	pF
R_g	Gate Resistance			0.6		Ω

Switching Characteristics

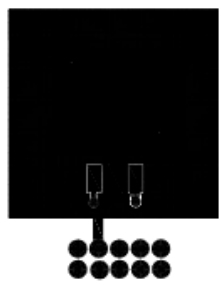
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\text{ V}, I_D = 8\text{ A},$ $V_{GS} = 10\text{ V}, R_{GEN} = 6\text{ }\Omega$		6.6	14	ns
t_r	Rise Time			2.3	10	ns
$t_{d(off)}$	Turn-Off Delay Time			20	32	ns
t_f	Fall Time			2.3	10	ns
Q_g	Total Gate Charge		$V_{GS} = 0\text{ V to } 10\text{ V}$		18	26
Q_g	Total Gate Charge	$V_{GS} = 0\text{ V to } 4.5\text{ V}$	$V_{DD} = 50\text{ V},$ $I_D = 8\text{ A}$	8.7	13	nC
Q_{gs}	Gate to Source Gate Charge			2.7		nC
Q_{gd}	Gate to Drain "Miller" Charge			2.4		nC

Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 8\text{ A}$ (Note 2)		0.82	1.3	V
		$V_{GS} = 0\text{ V}, I_S = 2.6\text{ A}$ (Note 2)		0.75	1.2	
t_{rr}	Reverse Recovery Time	$I_F = 8\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		43	70	ns
Q_{rr}	Reverse Recovery Charge			43	70	nC

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 $R_{\theta JA}$ is determined by the user's board design.



a. 40 $^\circ\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copper.



b. 96 $^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper.

- Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0%.
- Starting $T_J = 25\text{ }^\circ\text{C}$, L = 1 mH, $I_{AS} = 13\text{ A}$, $V_{DD} = 90\text{ V}$, $V_{GS} = 10\text{ V}$.
- The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

Typical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

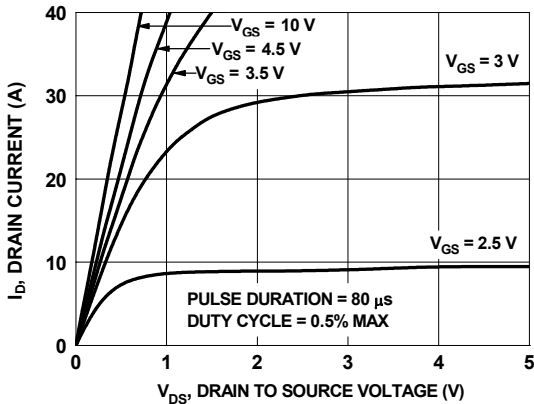


Figure 1. On-Region Characteristics

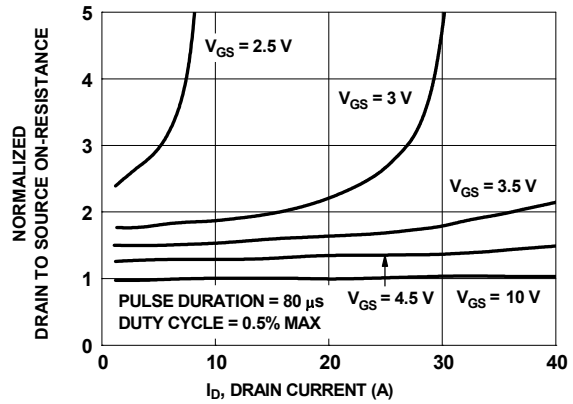


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

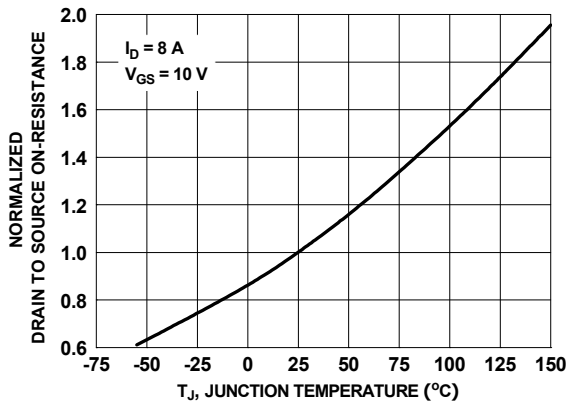


Figure 3. Normalized On-Resistance vs Junction Temperature

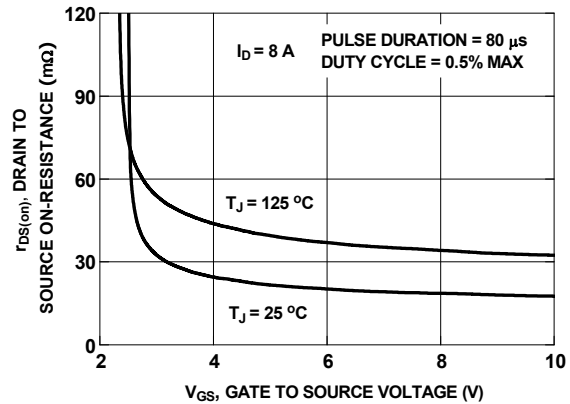


Figure 4. On-Resistance vs Gate to Source Voltage

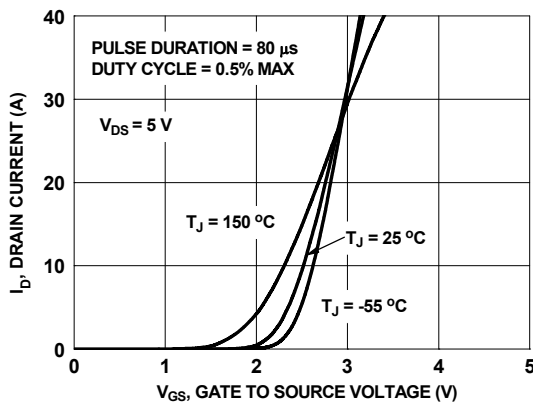


Figure 5. Transfer Characteristics

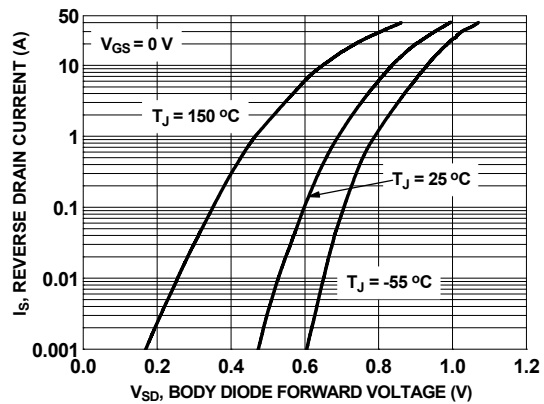


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

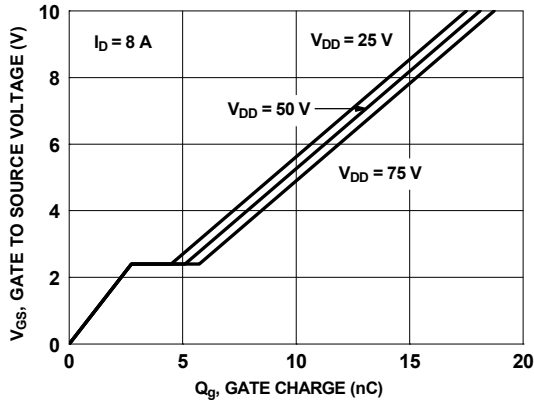


Figure 7. Gate Charge Characteristics

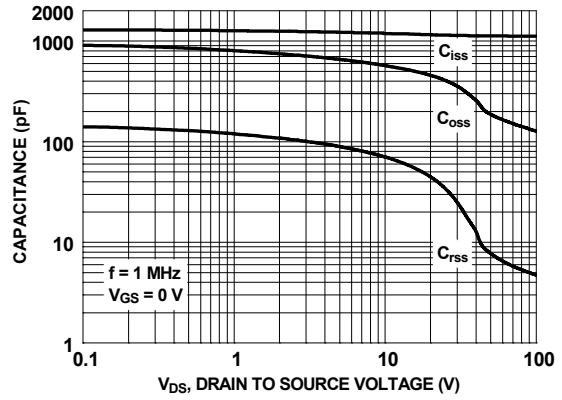


Figure 8. Capacitance vs Drain to Source Voltage

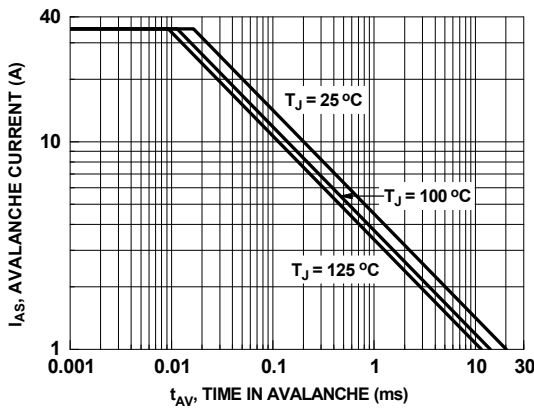


Figure 9. Unclamped Inductive Switching Capability

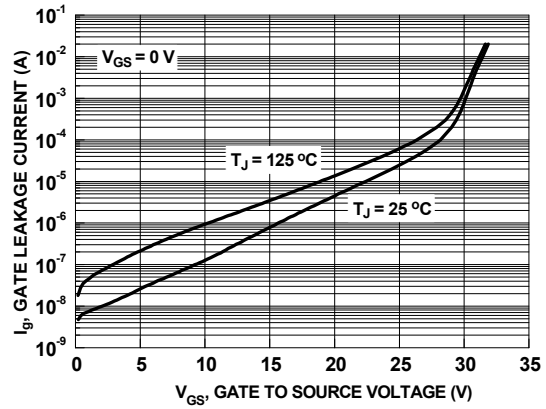


Figure 10. Gate Leakage Current vs Gate to Source Voltage

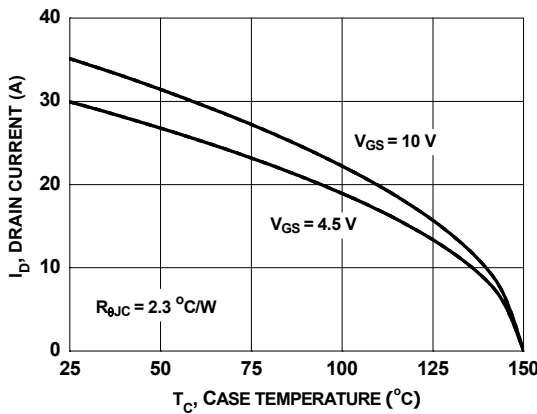


Figure 11. Maximum Continuous Drain Current vs Case Temperature

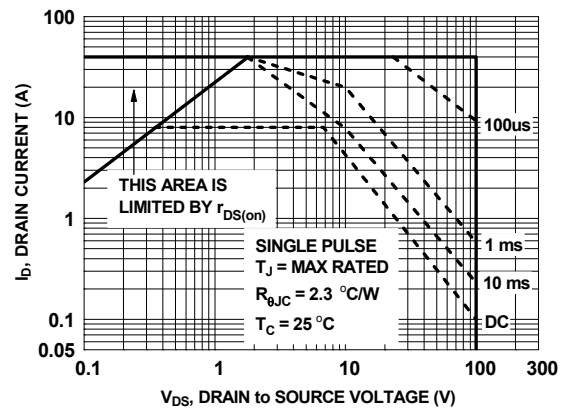


Figure 12. Forward Bias Safe Operating Area

Typical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

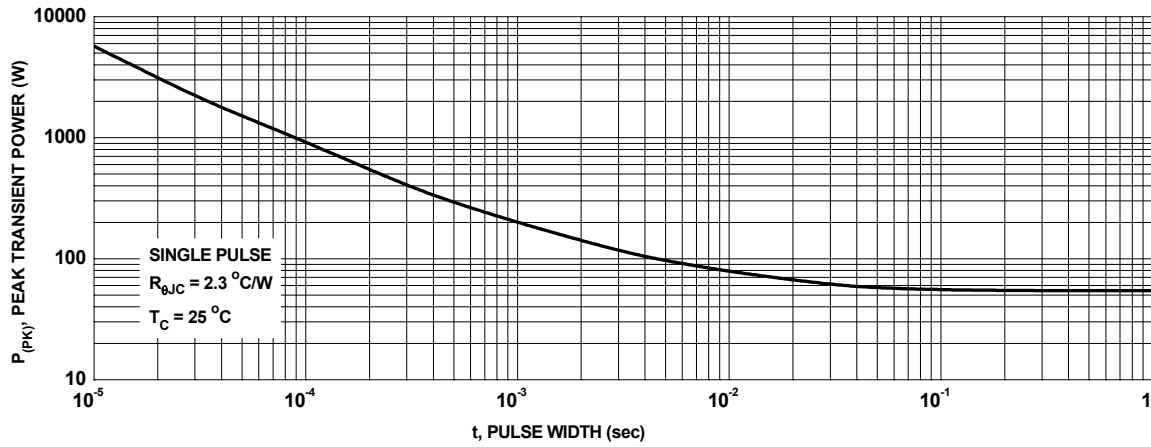


Figure 13. Single Pulse Maximum Power Dissipation

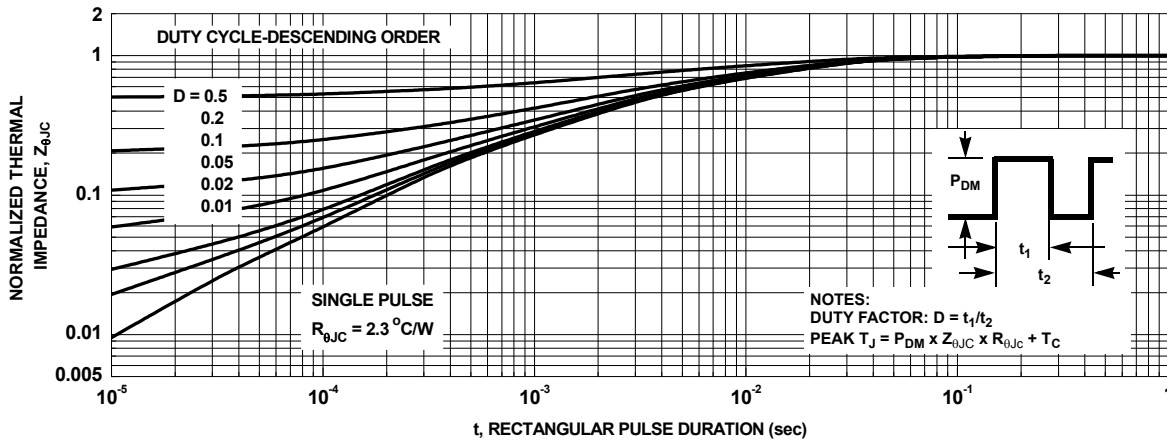
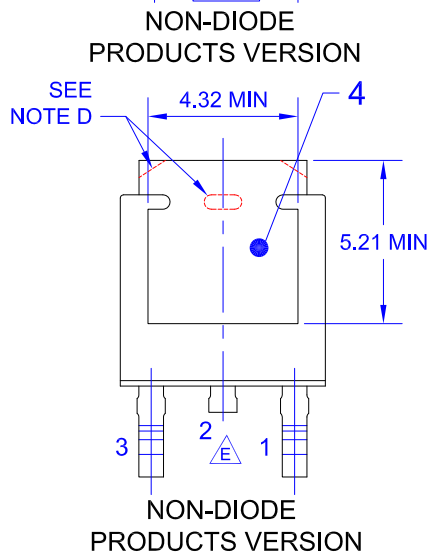
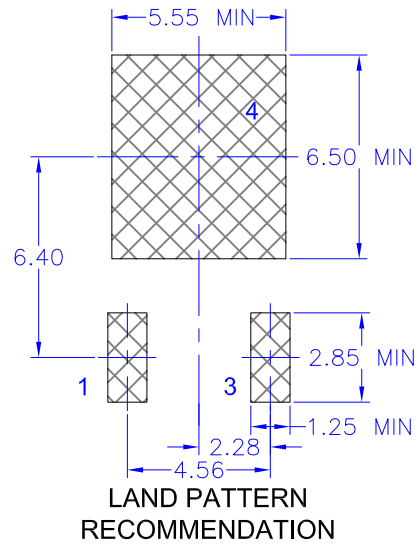
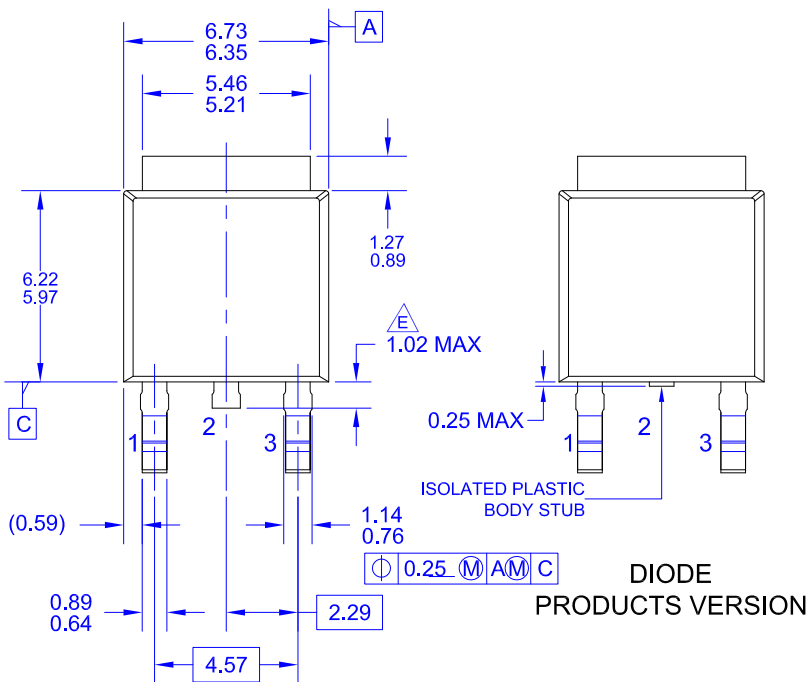
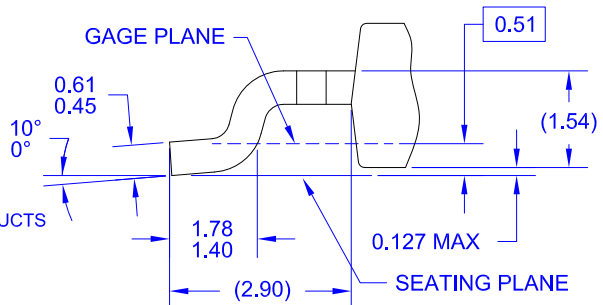


Figure 14. Junction-to-Case Transient Thermal Response Curve



NOTES: UNLESS OTHERWISE SPECIFIED

- A) THIS PACKAGE CONFORMS TO JEDEC, TO-252, ISSUE C, VARIATION AA.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
- D) SUPPLIER DEPENDENT MOLD LOCKING HOLES OR CHAMFERED CORNERS OR EDGE PROTRUSION.
- E) TRIMMED METAL CENTER LEAD IS PRESENT ON FOR NON-DIODE PRODUCTS
- F) DIMENSIONS ARE EXCLUSIVE OF BURS, MOLD FLASH AND TIE BAR EXTRUSIONS.
- G) LAND PATTERN RECOMMENDATION IS BASED ON IPC7351A STD TO228P991X239-3N.
- H) DRAWING NUMBER AND REVISION: MKT-TO252A03REV11



DETAIL A
(ROTATED -90°)
SCALE: 12X



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