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FDB0300N1007L N-Channel PowerTrench<sup>®</sup> MOSFET

# FDB0300N1007L

## N-Channel PowerTrench<sup>®</sup> MOSFET

100 V, 200 A, 3 mΩ

### Features

- Max  $r_{DS(on)}$  = 3 mΩ at  $V_{GS} = 10$  V,  $I_D = 26$  A
- Max  $r_{DS(on)}$  = 4.5 mΩ at  $V_{GS} = 6$  V,  $I_D = 20$  A
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

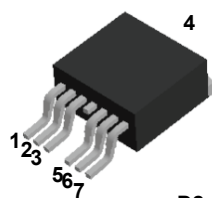


### General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advance PowerTrench<sup>®</sup> process that has been especially tailored to minimize the on-state resistance while maintaining superior ruggedness and switching performance for industrial applications.

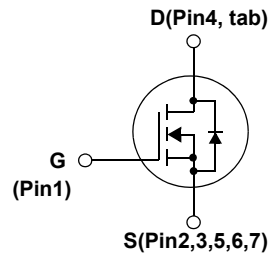
### Applications

- Industrial Motor Drive
- Industrial Power Supply
- Industrial Automation
- Battery Operated tools
- Battery Protection
- Solar Inverters
- UPS and Energy Inverters
- Energy Storage
- Load Switch



1. Gate
2. Source/Kelvin Sense
3. Source/Kelvin Sense
4. Drain
5. Source
6. Source
7. Source

D2-PAK  
(TO263)



### MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Conditions	Rated Value	Units
$V_{DS}$	Drain to Source Voltage		100	V
$V_{GS}$	Gate to Source Voltage		$\pm 20$	V
$I_D$	Drain Current	-Continuous $T_C = 25^\circ\text{C}$ (Note 5)	200	A
		-Continuous $T_C = 100^\circ\text{C}$ (Note 5)	140	
		-Pulsed (Note 4)	1090	
$E_{AS}$	Single Pulse Avalanche Energy	(Note 3)	843	mJ
$P_D$	Power Dissipation	$T_C = 25^\circ\text{C}$	250	W
	Power Dissipation	$T_A = 25^\circ\text{C}$ (Note 1a)	3.8	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range		-55 to +175	$^\circ\text{C}$

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Note 1)	0.6	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	40	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDB0300N1007L	FDB0300N1007L	D2-PAK-7L	330 mm	24 mm	800 units

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
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### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\ \mu\text{A}, V_{GS} = 0\ \text{V}$	100			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , referenced to $25^\circ\text{C}$		57		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 80\ \text{V}, V_{GS} = 0\ \text{V}$			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	2.7	4	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , referenced to $25^\circ\text{C}$		-12		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ \text{V}, I_D = 26\ \text{A}$		2.4	3	m $\Omega$
		$V_{GS} = 6\ \text{V}, I_D = 20\ \text{A}$		3.4	4.5	
		$V_{GS} = 10\ \text{V}, I_D = 26\ \text{A}, T_J = 150^\circ\text{C}$		4.9	11	
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\ \text{V}, I_D = 26\ \text{A}$		85		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 50\ \text{V}, V_{GS} = 0\ \text{V}, f = 1\ \text{MHz}$		5925	8295	pF
$C_{oss}$	Output Capacitance			1220	1710	pF
$C_{rss}$	Reverse Transfer Capacitance			42	60	pF
$R_g$	Gate Resistance			2.7		$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\ \text{V}, I_D = 26\ \text{A}, V_{GS} = 10\ \text{V}, R_{GEN} = 6\ \Omega$		28	45	ns	
$t_r$	Rise Time			29	46	ns	
$t_{d(off)}$	Turn-Off Delay Time			52	83	ns	
$t_f$	Fall Time			18	32	ns	
$Q_g$	Total Gate Charge		$V_{GS} = 0\ \text{V to } 10\ \text{V}$		81	113	nC
$Q_g$	Total Gate Charge	$V_{GS} = 0\ \text{V to } 5\ \text{V}$	$V_{DD} = 50\ \text{V}, I_D = 26\ \text{A}$		44	62	
$Q_{gs}$	Gate to Source Gate Charge				24		nC
$Q_{gd}$	Gate to Drain "Miller" Charge				16		nC

### Drain-Source Diode Characteristics

$I_S$	Maximum Continuous Drain to Source Diode Forward Current			200	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current			1090	A	
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\ \text{V}, I_S = 26\ \text{A}$ (Note 2)		0.8	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 26\ \text{A}, di/dt = 100\ \text{A}/\mu\text{s}$		84	134	ns
$Q_{rr}$	Reverse Recovery Charge			128	205	nC

#### Notes:

1.  $R_{\theta JA}$  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)  $40^\circ\text{C}/\text{W}$  when mounted on a  $1\ \text{in}^2$  pad of 2 oz. copper.
- b)  $62.5^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz. copper.

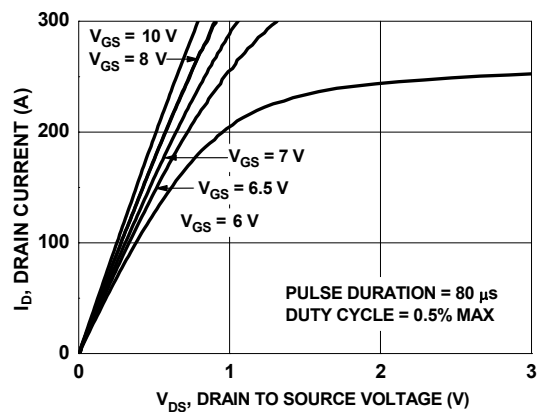
2. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0 %.

3.  $E_{AS}$  of 843 mJ is based on starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.3\ \text{mH}$ ,  $I_{AS} = 75\ \text{A}$ ,  $V_{DD} = 90\ \text{V}$ ,  $V_{GS} = 10\ \text{V}$ . 100% test at  $L = 0.1\ \text{mH}$ ,  $I_{AS} = 108\ \text{A}$ .

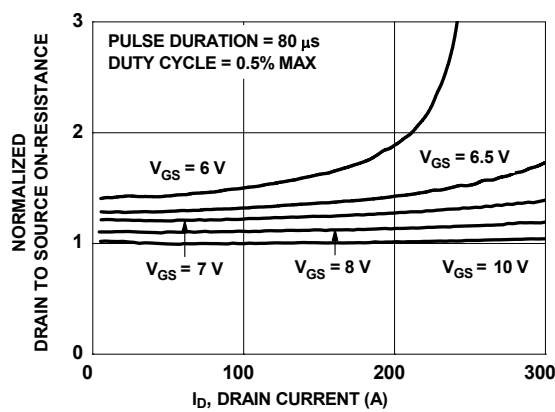
4. Pulsed  $I_d$  please refer to Figure "Forward Bias Safe Operating Area" for more details.

5. Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

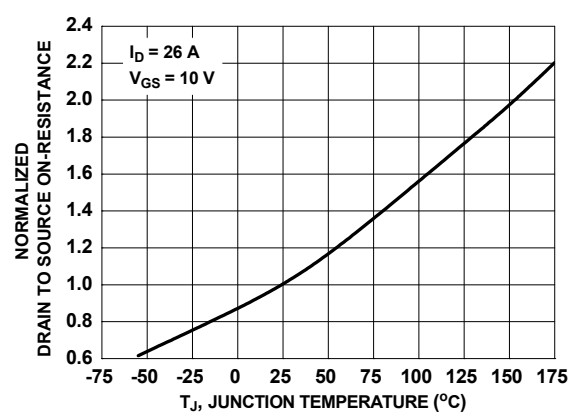
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted.



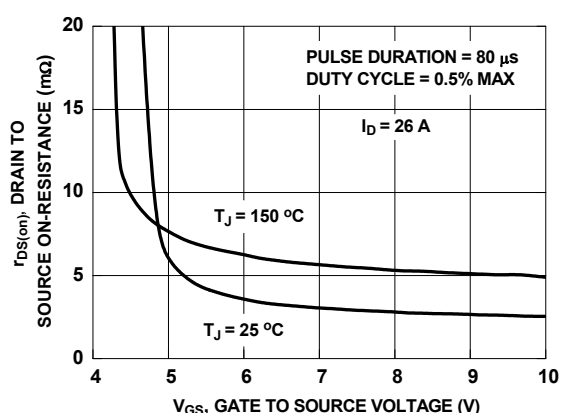
**Figure 1. On Region Characteristics**



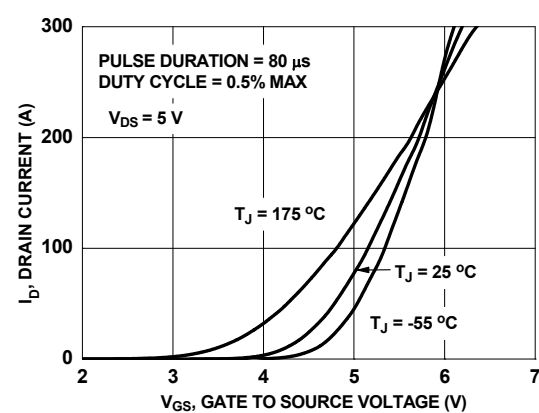
**Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage**



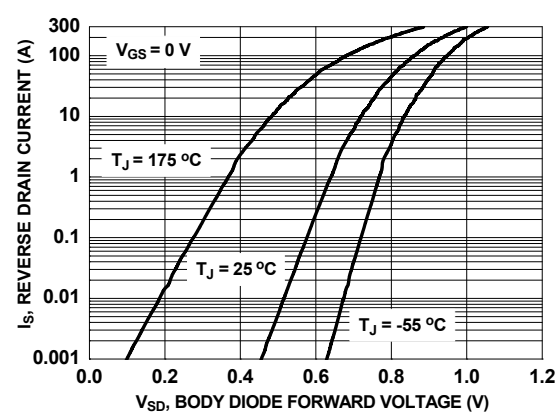
**Figure 3. Normalized On Resistance vs. Junction Temperature**



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

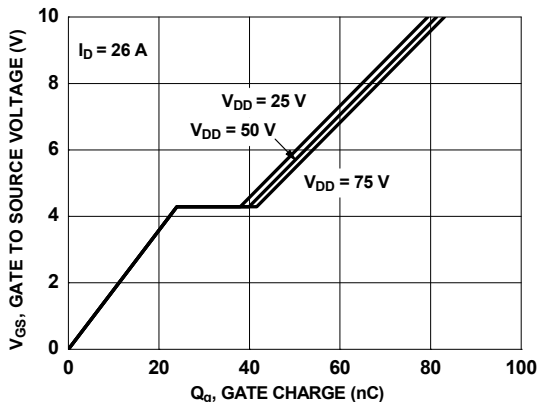


**Figure 5. Transfer Characteristics**

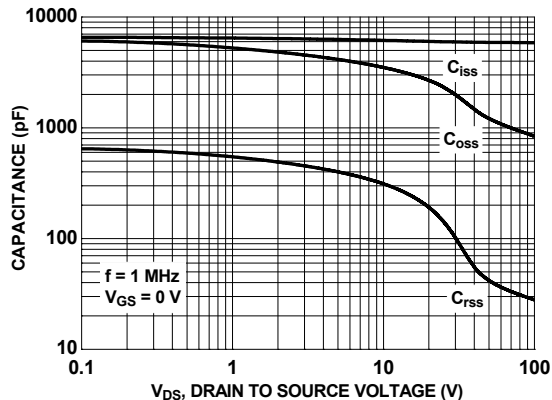


**Figure 6. Source to Drain Diode Forward Voltage vs. Source Current**

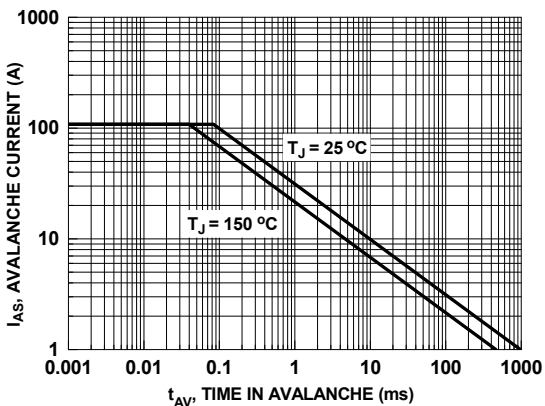
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted.



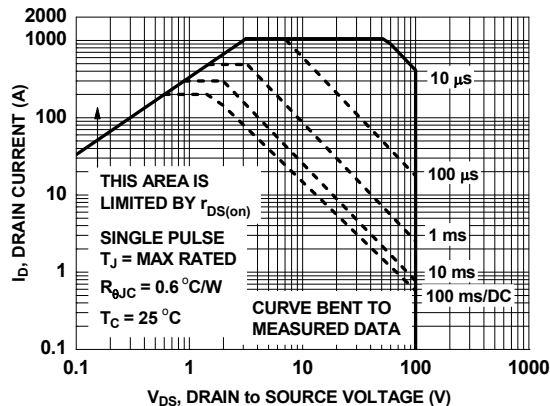
**Figure 7. Gate Charge Characteristics**



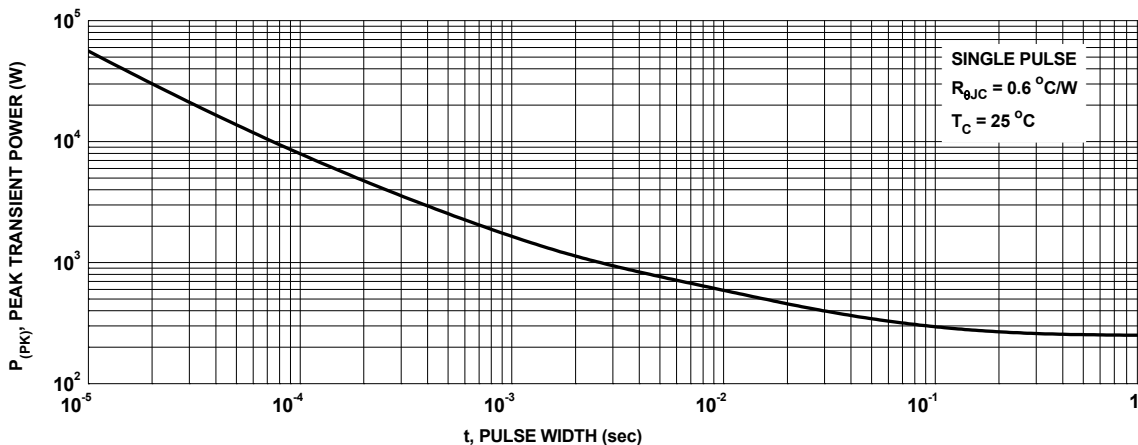
**Figure 8. Capacitance vs. Drain to Source Voltage**



**Figure 9. Unclamped Inductive Switching Capability**

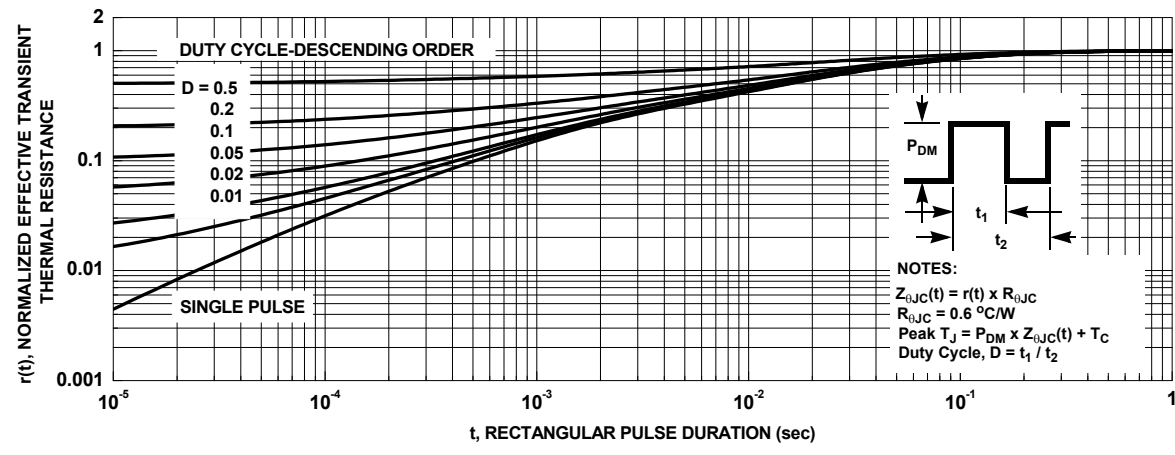


**Figure 10. Forward Bias Safe Operating Area**

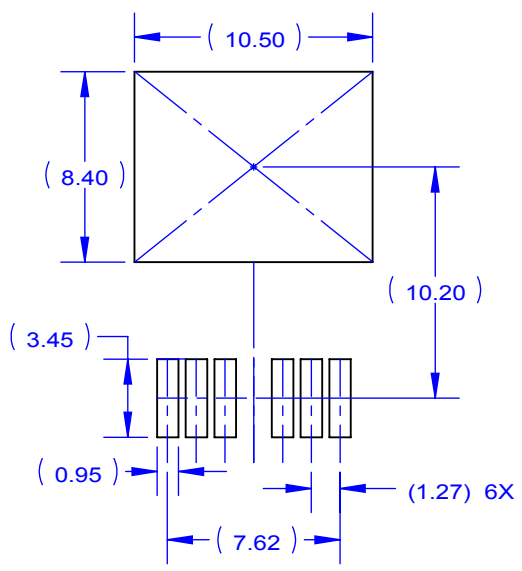
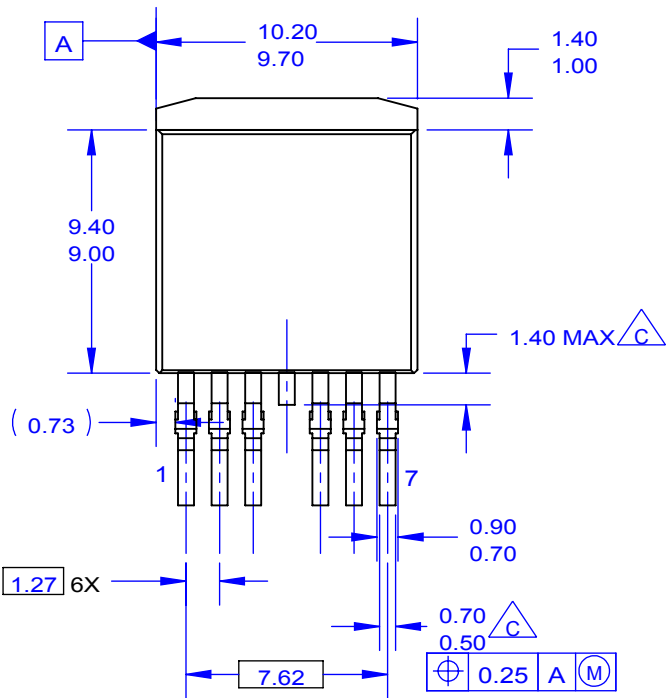


**Figure 11. Single Pulse Maximum Power Dissipation**

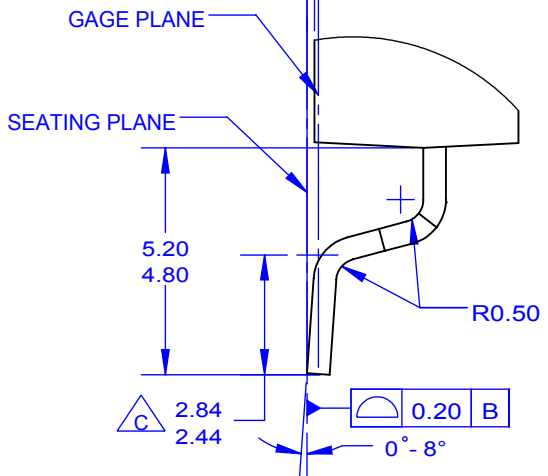
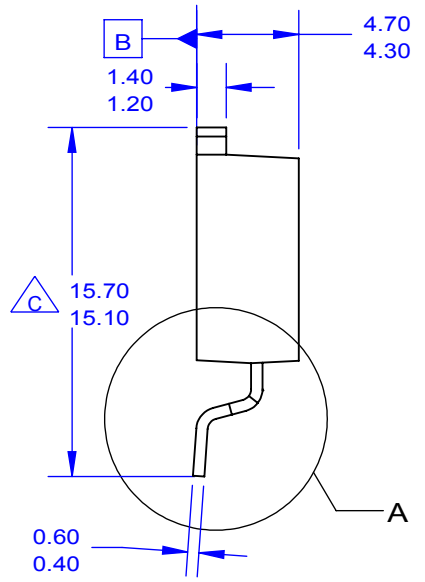
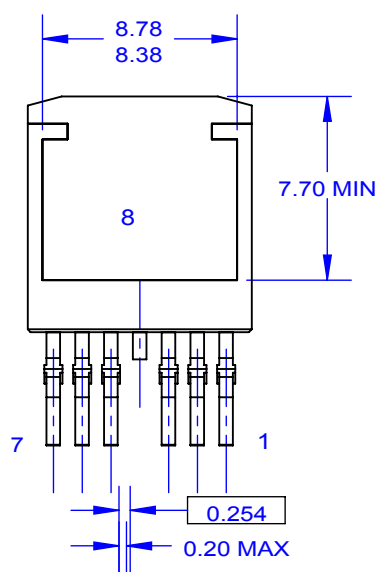
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted.



**Figure 12. Junction-to-Case Transient Thermal Response Curve**



LAND PATTERN RECOMMENDATION



DETAIL A  
SCALE 2:1

NOTES:

- A. PACKAGE CONFORMS TO JEDEC TO-263 VARIATION CB EXCEPT WHERE NOTED.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. OUT OF JEDEC STANDARD VALUE.
- D. DIMENSION AND TOLERANCE AS PER ASME Y14.5-1994.
- E. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- F. LAND PATTERN RECOMMENDATION PER IPC TO127P1524X465-8N.
- G. DRAWING FILE NAME: TO263A07REV5.

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