

MOSFET – N-Channel, POWERTRENCH®

30 V, 7 A, 23 mΩ

FDS8984, FDS8984-F40

General Description

This N-Channel MOSFET has been designed specifically to improve the overall efficiency of dc-dc converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $R_{DS(ON)}$ and fast switching speed.

Features

- Max $R_{DS(ON)} = 23\text{ m}\Omega @ V_{GS} = 10\text{ V}, I_D = 7\text{ A}$
- Max $R_{DS(ON)} = 30\text{ m}\Omega @ V_{GS} = 4.5\text{ V}, I_D = 6\text{ A}$
- Low Gate Charge
- 100% R_G Tested
- This Device is Pb-Free and Halogen Free

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

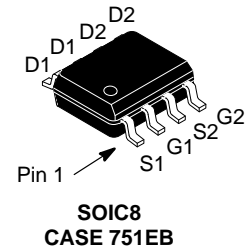
Symbol	Parameter	Ratings	Unit
V_{DS}	Drain to Source Voltage	30	V
V_{GS}	Gate to Source Voltage	± 20	V
I_D	Drain Current	- Continuous (Note 2a)	7
		- Pulsed	30
E_{AS}	Single Pulse Avalanche Energy (Note 3)	32	mJ
P_D	Power Dissipation for Single Operation	1.6	W
	Derate Above 25°C	13	mW/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature	-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.

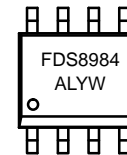
THERMAL CHARACTERISTICS

Symbol	Parameter	Ratings	Unit
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 2a)	78	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 2)	40	$^\circ\text{C}/\text{W}$

V_{DSS}	$R_{DS(ON)}\text{ MAX}$	$I_D\text{ MAX}$
30 V	23 mΩ @ $V_{GS} = 10\text{ V}$	7.0 A
	30 mΩ @ $V_{GS} = 4.5\text{ V}$	6.0 A

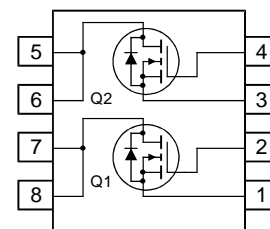


MARKING DIAGRAM



FDS8984	= Specific Device Code
A	= Assembly Site
L	= Wafer Lot Number
YW	= Assembly Start Week

PIN ASSIGNMENT



N-Channel MOSFET

ORDERING INFORMATION

Device	Package	Shipping†
FDS8984	SOIC8 (Pb-Free)	2500 / Tape & Reel

DISCONTINUED (Note 1)

FDS8984-F40	SOIC8 (Pb-Free)	2500 / Tape & Reel
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†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](#).

1. **DISCONTINUED:** This device is not recommended for new design. Please contact your onsemi representative for information. The most current information on this device may be available on [www.onsemi.com](#).

FDS8984, FDS8984-F40

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0\ \text{V}$	30	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C	–	23	–	$\text{mV}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24\ \text{V}$, $V_{GS} = 0\ \text{V}$ $V_{DS} = 24\ \text{V}$, $V_{GS} = 0\ \text{V}$, $T_J = 125^\circ\text{C}$	–	–	1 250	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\ \text{V}$, $V_{DS} = 0\ \text{V}$	–	–	± 100	nA

ON CHARACTERISTICS (Note 4)

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	1.2	1.7	2.5	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°C	–	–4.3	–	$\text{mV}/^\circ\text{C}$
$R_{DS(on)}$	Drain to Source On-Resistance	$V_{GS} = 10\ \text{V}$, $I_D = 7\ \text{A}$ $V_{GS} = 4.5\ \text{V}$, $I_D = 6\ \text{A}$ $V_{GS} = 10\ \text{V}$, $I_D = 7\ \text{A}$, $T_J = 125^\circ\text{C}$	–	19 24 26	23 30 32	$\text{m}\Omega$

DYNAMIC CHARACTERISTICS

C_{iss}	Input Capacitance	$V_{DS} = 15\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1.0\ \text{MHz}$	–	475	635	pF
C_{oss}	Output Capacitance		–	100	135	pF
C_{rss}	Reverse Transfer Capacitance		–	65	100	pF
R_G	Gate Resistance	$f = 1.0\ \text{MHz}$	–	0.9	1.6	Ω

SWITCHING CHARACTERISTICS (Note 4)

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\ \text{V}$, $I_D = 7\ \text{A}$, $V_{GS} = 10\ \text{V}$, $R_{GS} = 33\ \Omega$	–	5	10	ns
t_r	Rise Time		–	9	18	ns
$t_{d(off)}$	Turn-Off Delay Time		–	42	68	ns
t_f	Fall Time		–	21	34	ns
Q_g	Total Gate Charge	$V_{DS} = 15\ \text{V}$, $V_{GS} = 10\ \text{V}$, $I_D = 7\ \text{A}$	–	9.2	13	nC
Q_g	Total Gate Charge	$V_{DS} = 15\ \text{V}$, $V_{GS} = 5\ \text{V}$, $I_D = 7\ \text{A}$	–	5.0	7	nC
Q_{gs}	Gate to Source Gate Charge		–	1.5	–	nC
Q_{gd}	Gate to Drain "Miller" Charge		–	2.0	–	nC

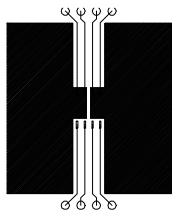
DRAIN-SOURCE DIODE CHARACTERISTICS

V_{SD}	Source to Drain Diode Voltage	$I_{SD} = 7\ \text{A}$	–	0.9	1.25	V
		$I_{SD} = 2.1\ \text{A}$	–	0.8	1.0	V
t_{rr}	Diode Reverse Recovery Time	$I_F = 7\ \text{A}$, $d_i/d_t = 100\ \text{A}/\mu\text{s}$	–	–	33	ns
Q_{rr}	Diode Reverse Recovery Charge		–	–	20	nC

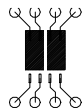
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

NOTES:

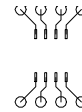
- $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a. $78^\circ\text{C}/\text{W}$ when mounted on a $0.5\ \text{in}^2$ pad of 2 oz copper



b. $125^\circ\text{C}/\text{W}$ when mounted on a $0.02\ \text{in}^2$ pad of 2 oz copper



c. $135^\circ\text{C}/\text{W}$ when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

- Starting $T_J = 25^\circ\text{C}$, $L = 1\ \text{mH}$, $I_{AS} = 8\ \text{A}$, $V_{DD} = 27\ \text{V}$, $V_{GS} = 10\ \text{V}$.
- Pulse Test: Pulse Width $< 300\ \mu\text{s}$, Duty Cycle $< 2.0\%$.

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

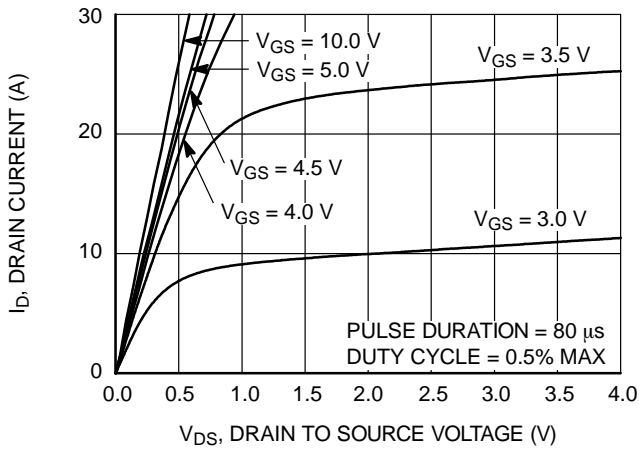


Figure 1. On Region Characteristics

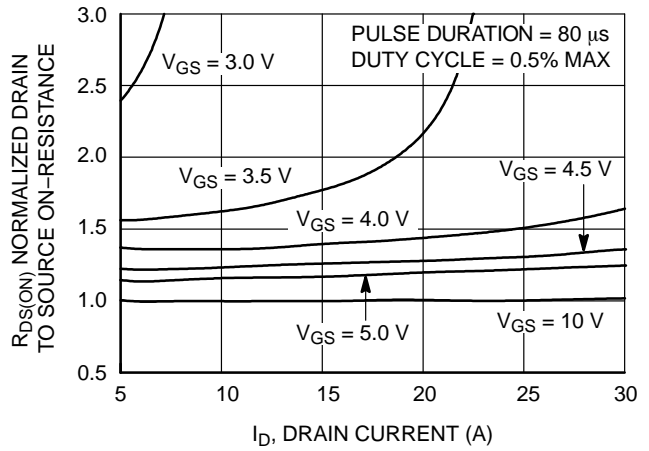


Figure 2. On-Resistance vs. Drain Current and Gate Voltage

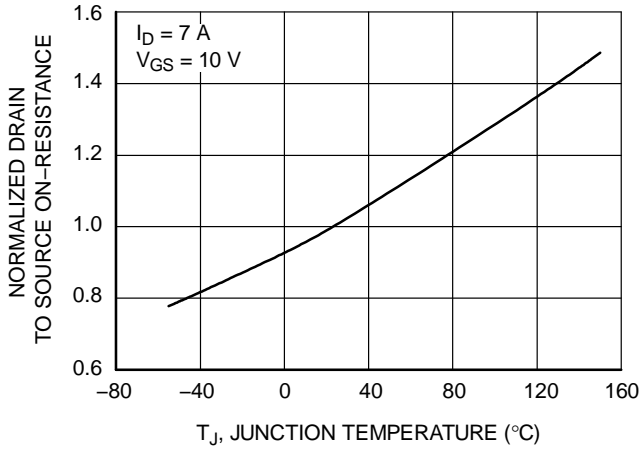


Figure 3. On-Resistance vs. Temperature

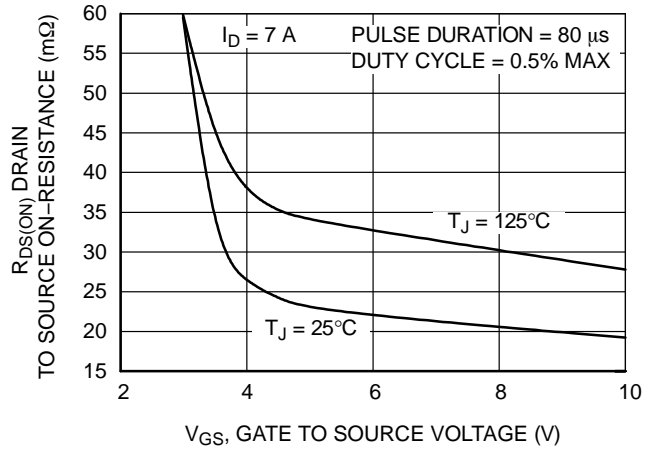


Figure 4. On-Resistance vs. Gate to Source Voltage

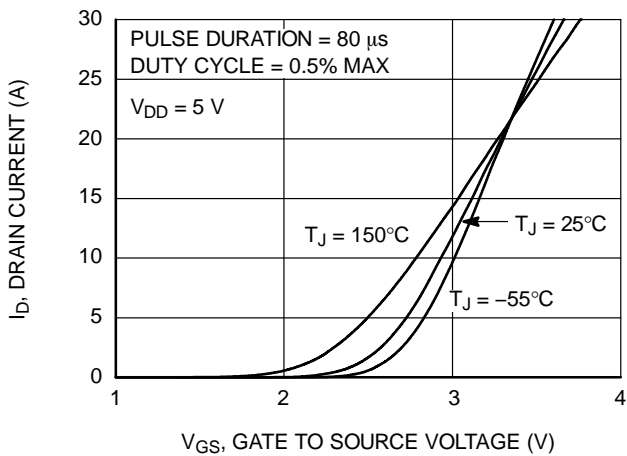


Figure 5. Transfer Characteristics

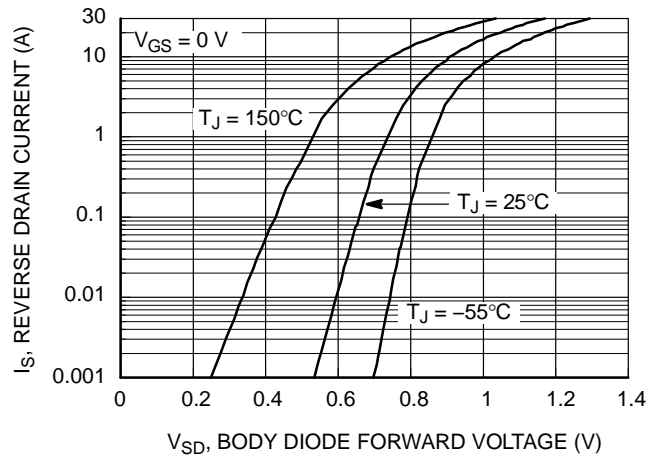


Figure 6. Source to Drain Forward Voltage vs. Source Current

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

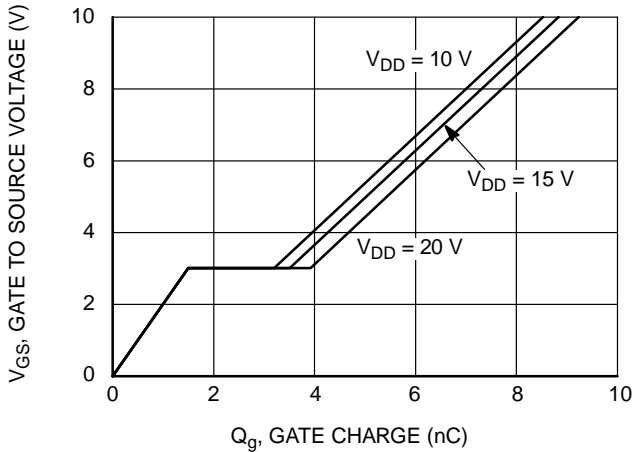


Figure 7. Gate Charge Characteristics

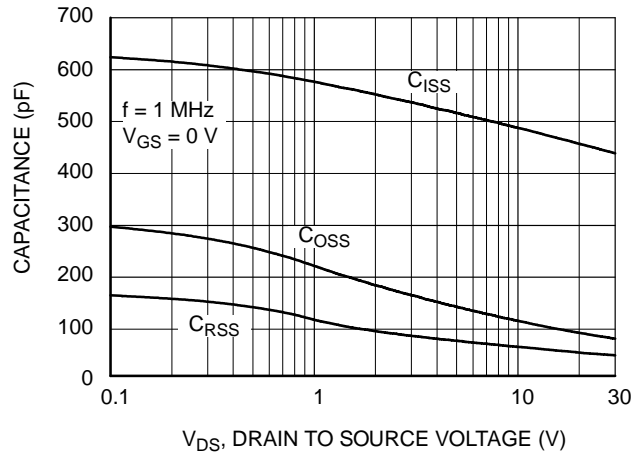


Figure 8. Capacitance vs. Drain to Source Voltage

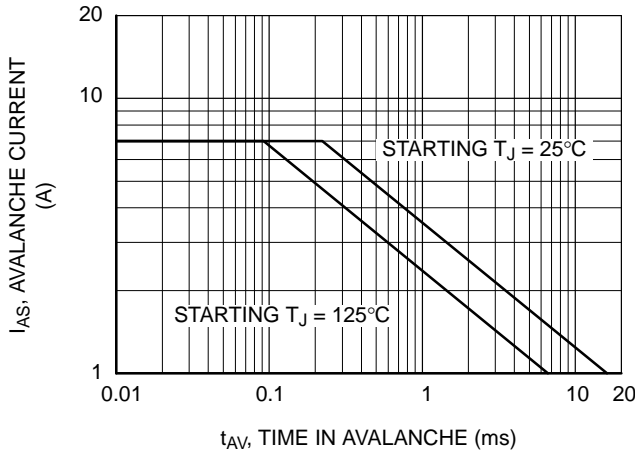


Figure 9. Unclamped Inductive Switching Capability

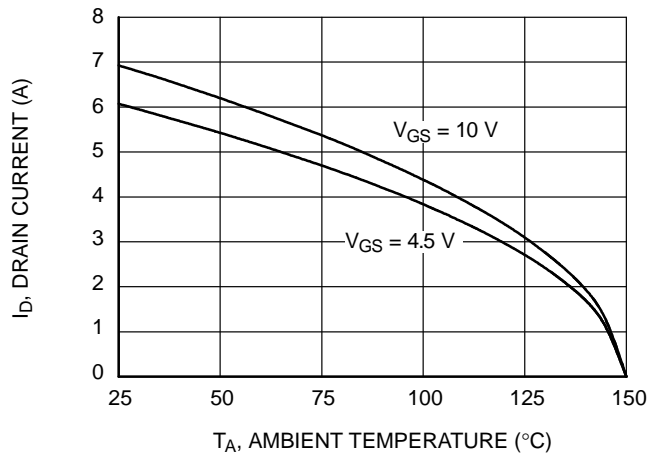


Figure 10. Maximum Continuous Drain Current vs. Ambient Temperature

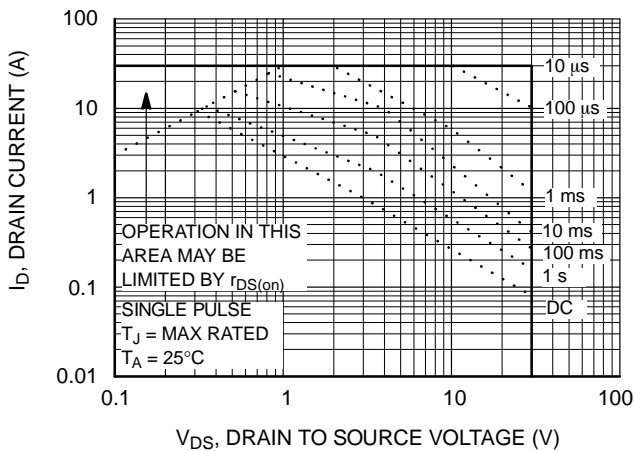


Figure 11. Forward Bias Safe Operating Area

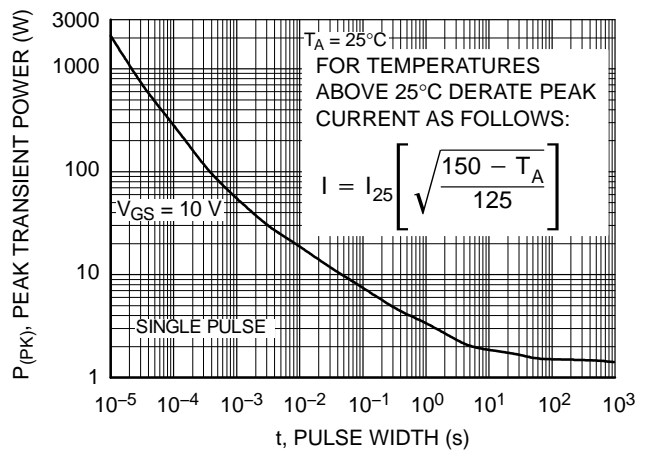


Figure 12. Single Pulse Maximum Power Dissipation

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

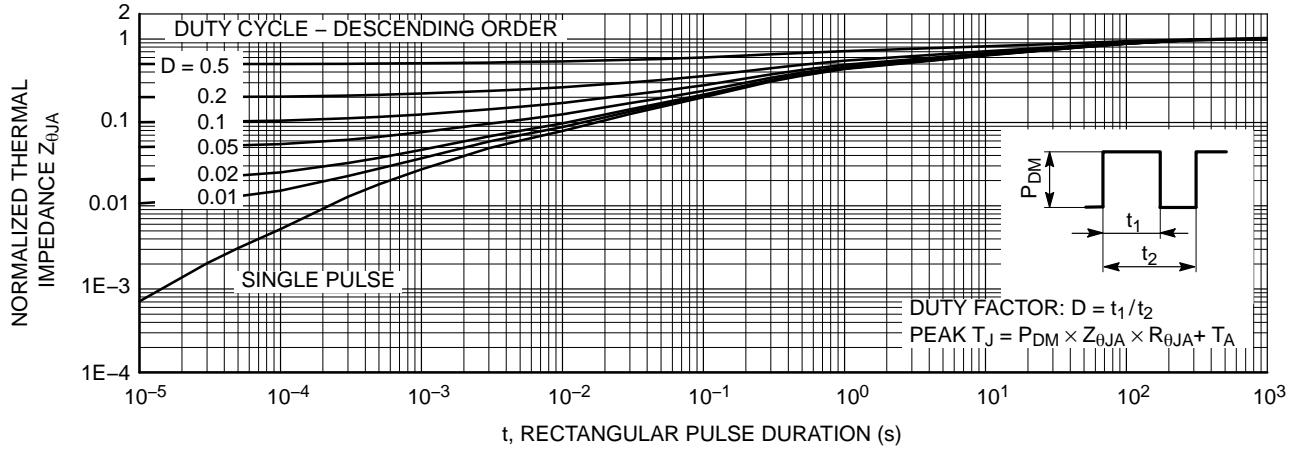
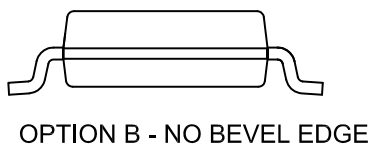
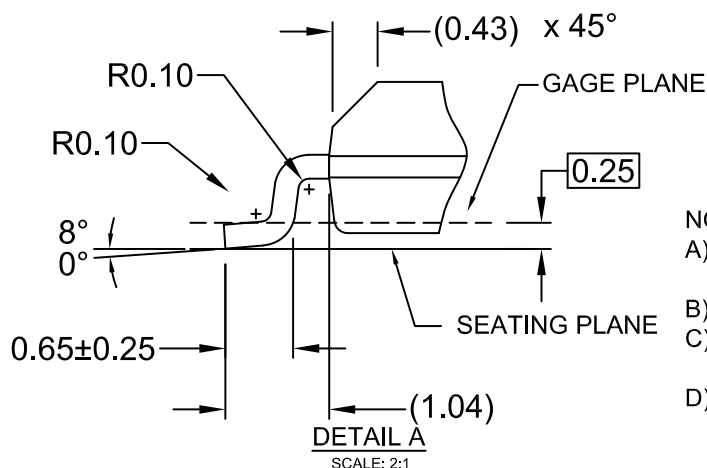
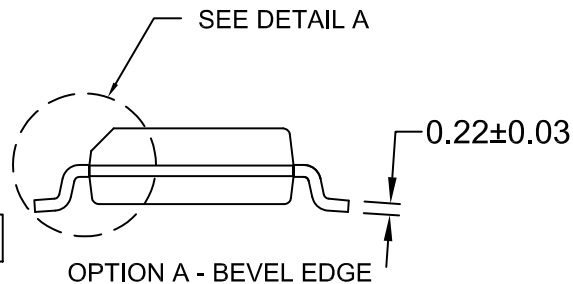
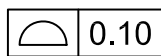
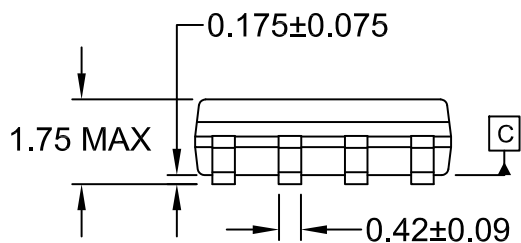
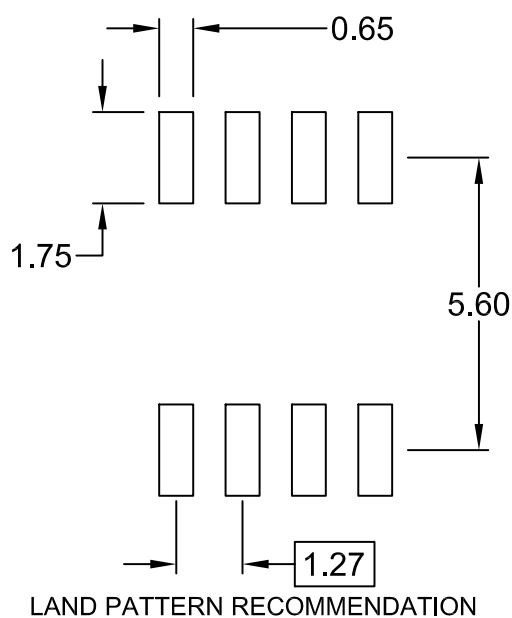
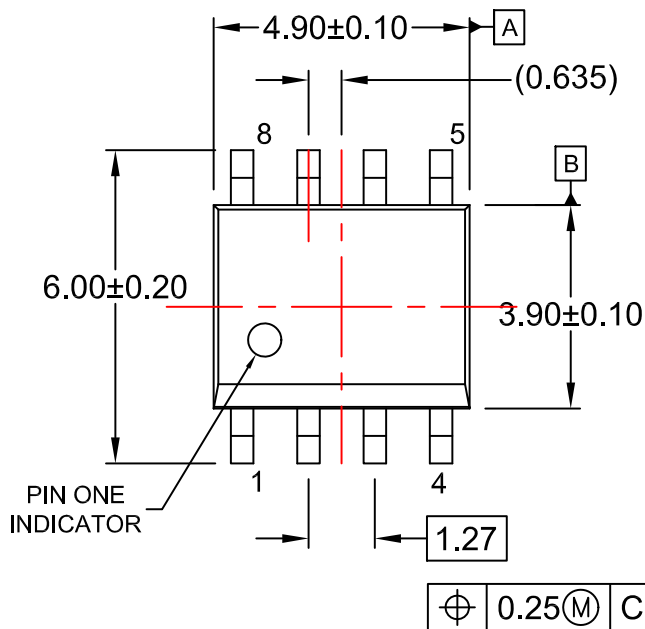


Figure 13. Transient Thermal Response Curve

SOIC8
CASE 751EB
ISSUE A

DATE 24 AUG 2017



- NOTES:
 A) THIS PACKAGE CONFORMS TO JEDEC MS-012, VARIATION AA.
 B) ALL DIMENSIONS ARE IN MILLIMETERS.
 C) DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS.
 D) LANDPATTERN STANDARD: SOIC127P600X175-8M

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