MOSFET – N-Channel, POWERTRENCH®

30 V, 7 A, 23 mΩ

FDS8984, FDS8984-F40

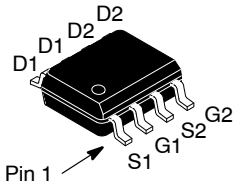
V_{DSS}	$R_{DS(ON)}$ MAX	I_D MAX
30 V	23 mΩ @ V_{GS} = 10 V	7.0 A
	30 mΩ @ V_{GS} = 4.5 V	6.0 A

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



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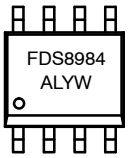
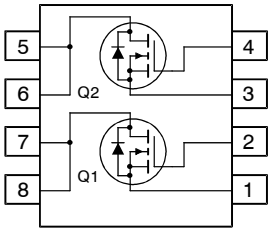
MARKING DIAGRAM



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

PIN ASSIGNMENT



N−Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_A = 25°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 1a)	7	A
		− Pulsed	30	
E_{AS}	Single Pulse Avalanche Energy (Note 2)		32	mJ
P_D	Power Dissipation for Single Operation		1.6	W
	Derate Above 25°C		13	mW/°C
T_J, T_{STG}	Operating and Storage Temperature		−55 to +150	°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 1a)	78	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction−to−Case (Note 1)	40	°C/W

ORDERING INFORMATION

Device	Package	Shipping†
FDS8984	SOIC8 (Pb−Free)	2500 / Tape & Reel
FDS8984−F40	SOIC8 (Pb−Free)	2500 / 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.

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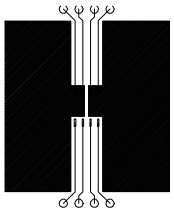
ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	30	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	–	23	–	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V V_{DS} = 24 V, V_{GS} = 0 V, T_J = 125°C	– –	– –	1 250	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V	–	–	±100	nA
ON CHARACTERISTICS (Note 3)						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 μA	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 μA, Referenced to 25°C	–	−4.3	–	mV/°C
$R_{DS(on)}$	Drain to Source On−Resistance	V_{GS} = 10 V, I_D = 7 A V_{GS} = 4.5 V, I_D = 6 A V_{GS} = 10 V, I_D = 7 A, T_J = 125°C	– – –	19 24 26	23 30 32	mΩ
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1.0 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 MHz	–	0.9	1.6	Ω
SWITCHING CHARACTERISTICS (Note 3)						
$t_{d(on)}$	Turn−On Delay Time	V_{DD} = 15 V, I_D = 7 A, V_{GS} = 10 V, R_{GS} = 33 Ω	–	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 V, V_{GS} = 10 V, I_D = 7 A	–	9.2	13	nC
Q_g	Total Gate Charge	V_{DS} = 15 V, V_{GS} = 5 V, I_D = 7 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 A	–	0.9	1.25	V
		I_{SD} = 2.1 A	–	0.8	1.0	V
t_{rr}	Diode Reverse Recovery Time	I_F = 7 A, $d_i/_{dt}$ = 100 A/μs	–	–	33	ns
Q_{rr}	Diode Reverse Recovery Charge		–	–	20	nC

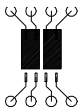
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

NOTES:

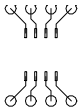
1. $R_{\theta JA}$ is the sum of the junction−to−case and case−to−ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user’s board design.



a. 78°C/W when mounted on a 0.5 in^2 pad of 2 oz copper



b. 125°C/W when mounted on a 0.02 in^2 pad of 2 oz copper



c. 135°C/W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

2. Starting T_J = 25°C, L = 1 mH, I_{AS} = 8 A, V_{DD} = 27 V, V_{GS} = 10 V.
3. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%.

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TYPICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

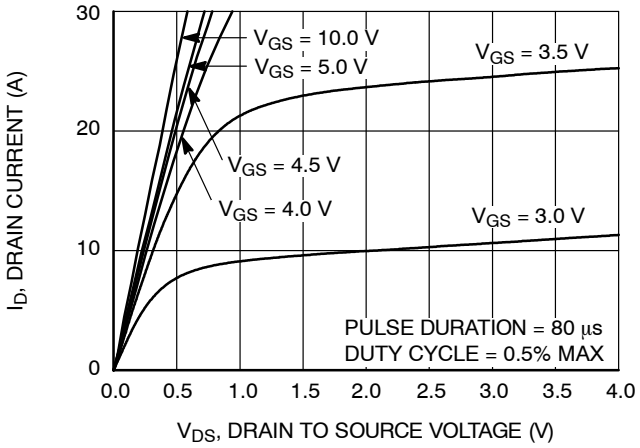

Figure 1. On Region Characteristics

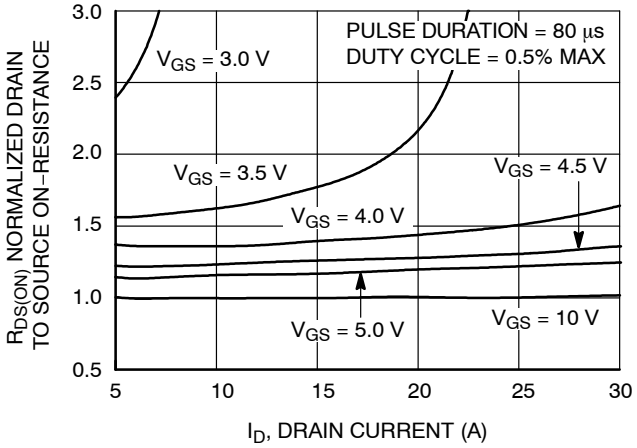

Figure 2. On−Resistance vs. Drain Current and Gate Voltage

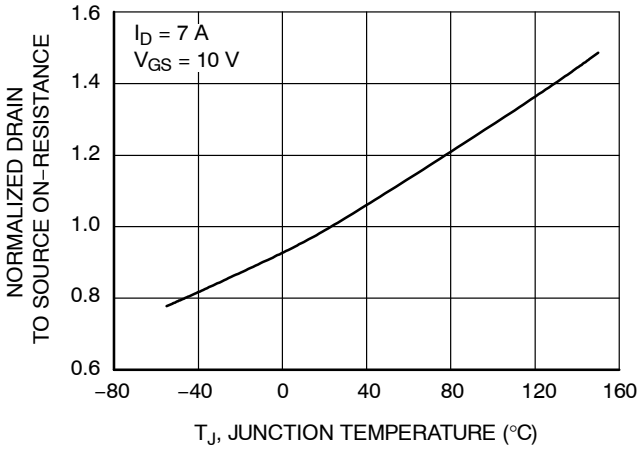

Figure 3. On−Resistance vs. Temperature

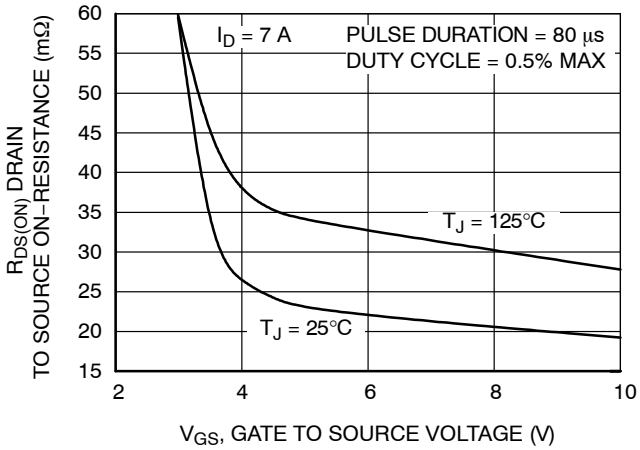

Figure 4. On−Resistance vs. Gate to Source Voltage

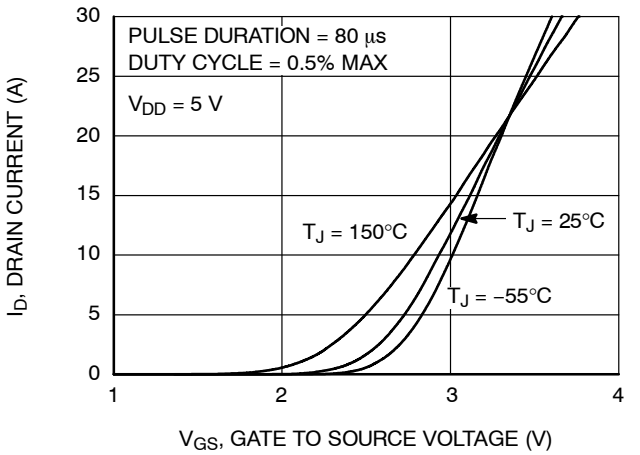

Figure 5. Transfer Characteristics

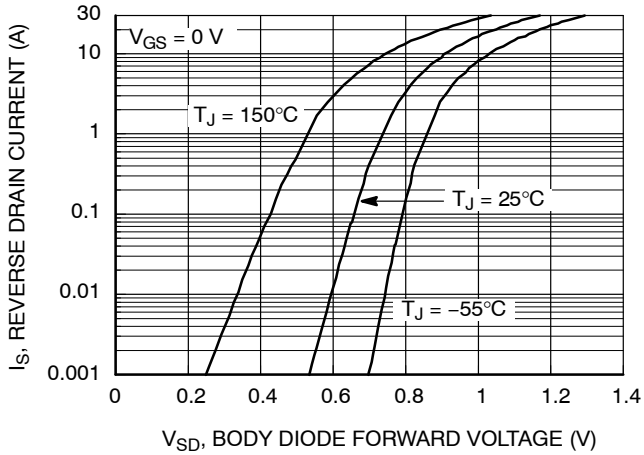

Figure 6. Source to Drain Forward Voltage vs. Source Current

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TYPICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (continued)

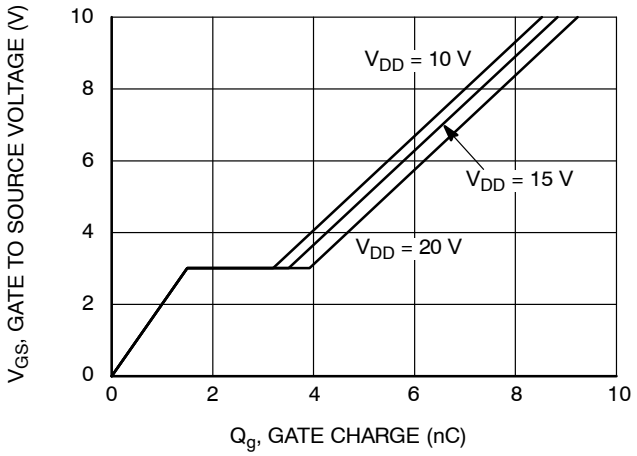

Figure 7. Gate Charge Characteristics

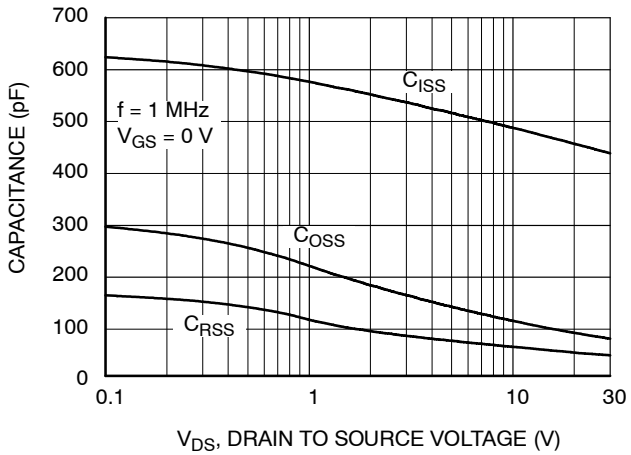

Figure 8. Capacitance vs. Drain to Source Voltage

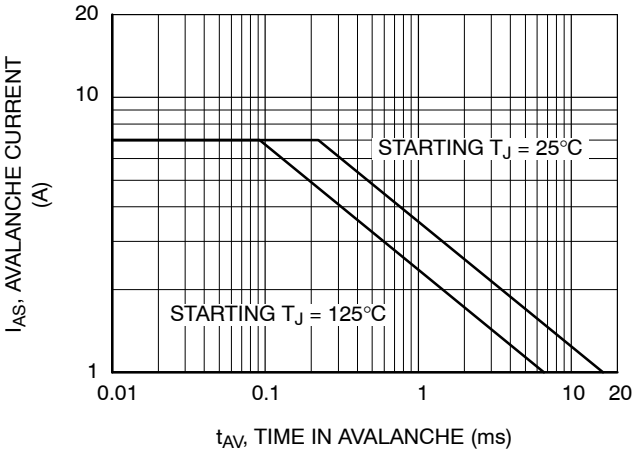

Figure 9. Unclamped Inductive Switching Capability

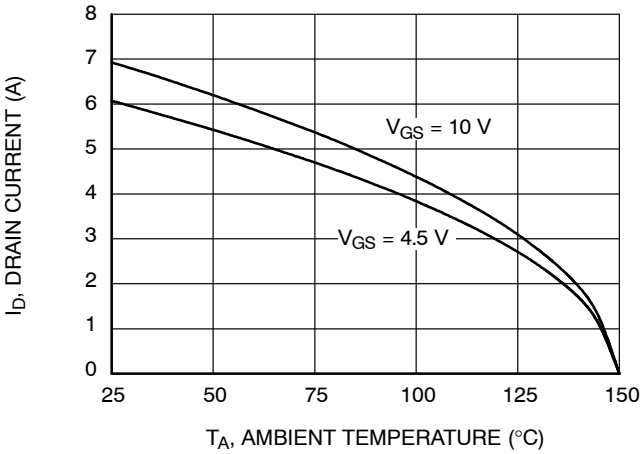

Figure 10. Maximum Continuous Drain Current vs. Ambient Temperature

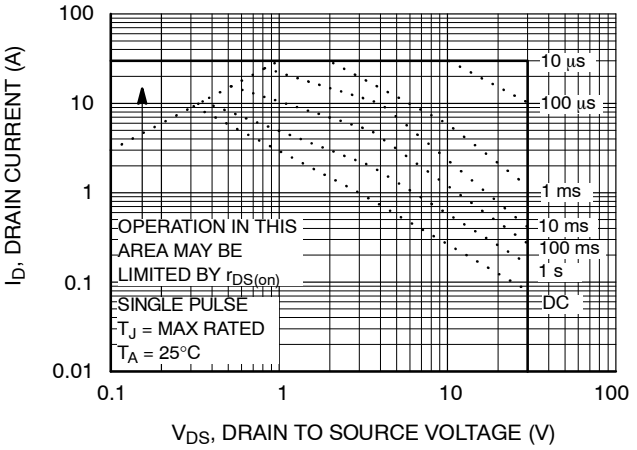

Figure 11. Forward Bias Safe Operating Area

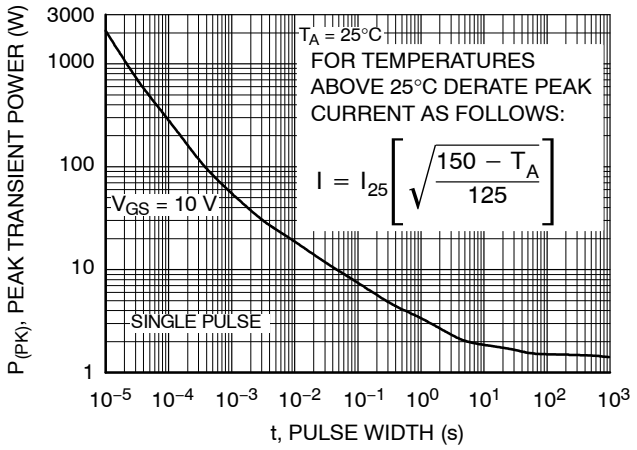

Figure 12. Single Pulse Maximum Power Dissipation

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TYPICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (continued)

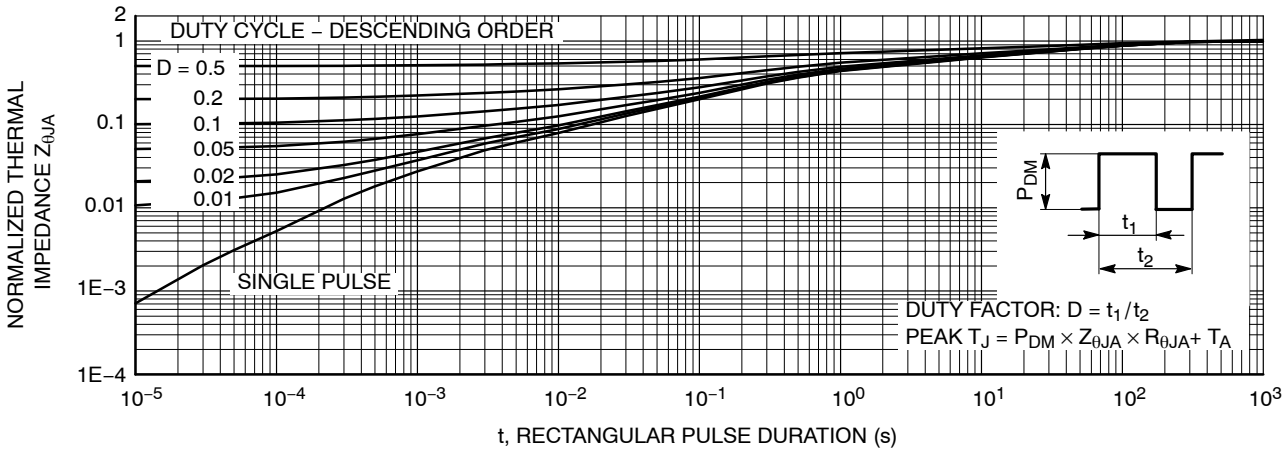

Figure 13. Transient Thermal Response Curve

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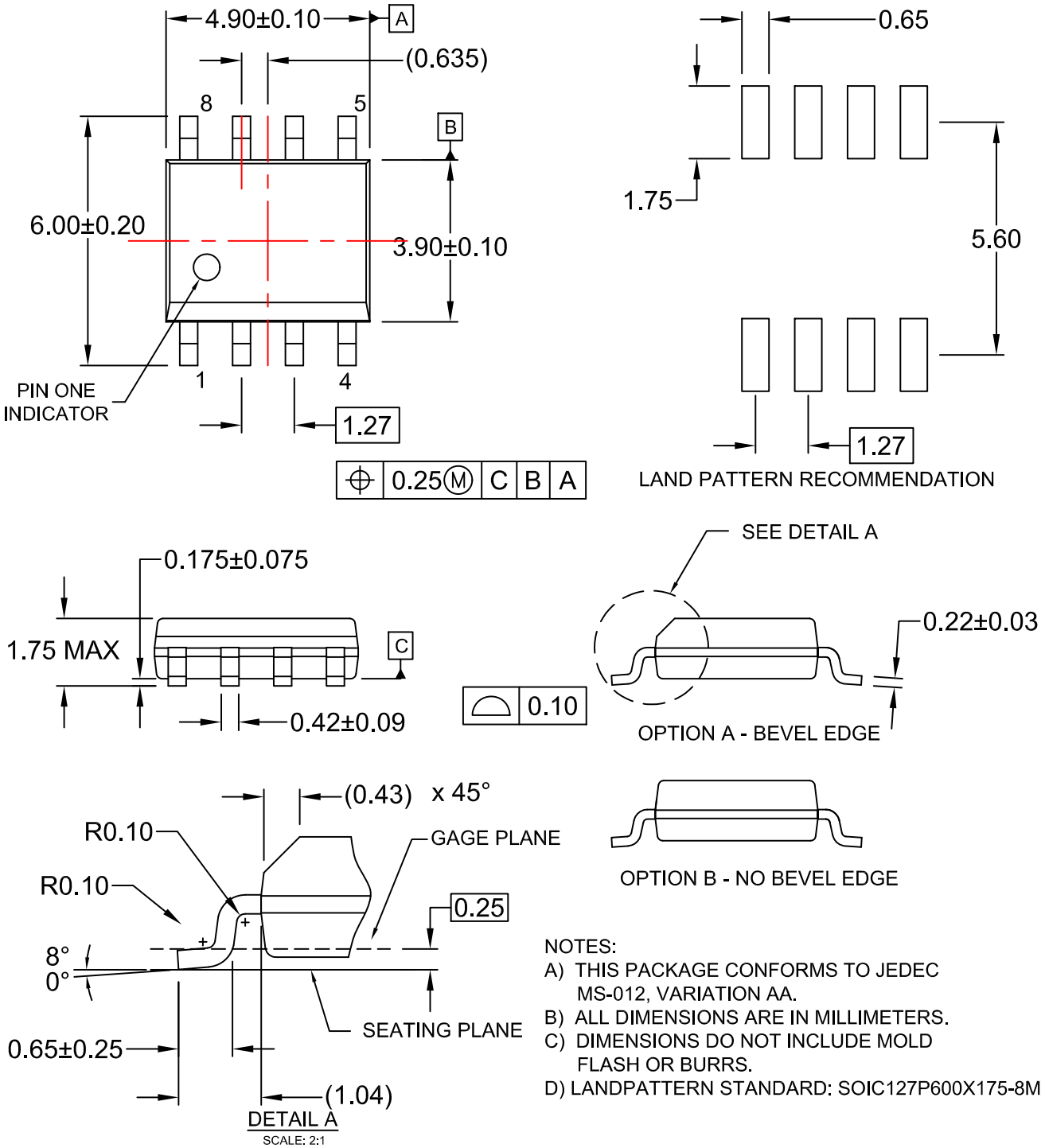

NOTES:
A) THIS PACKAGE CONFORMS TO JEDEC MS-012, VARIATION AA.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS.
D) LANDPATTERN STANDARD: SOIC127P600X175-8M

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