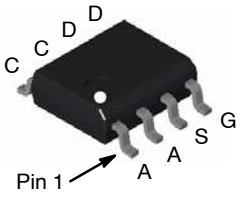
FDFS6N548

Integrated N-Channel POWERTRENCH® MOSFET and Schottky Diode

ON Semiconductor®

www.onsemi.com



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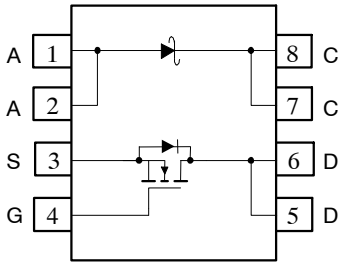


ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

Description

The FDFS6N548 combines the exceptional performance of ON Semiconductor's PowerTrench MOSFET technology with a very low forward voltage drop Schottky barrier rectifier in an SO−8 package.

This device is designed specifically as a single package solution for DC to DC converters. It features a fast switching, low gate charge MOSFET with very low on−state resistance. The independently connected Schottky diode allows its use in a variety of DC/DC converter topologies.

Features

- Max $r_{DS(on)}$ = 23 mΩ at V_{GS} = 10 V, I_D = 7 A
- Max $r_{DS(on)}$ = 30 mΩ at V_{GS} = 4.5 V, I_D = 6 A
- V_F < 0.45 V @ 2 A
  V_F < 0.28 V @ 100 mA
- Schottky and MOSFET Incorporated into Single Power Surface Mount SO−8 Package
- Electrically Independent Schottky and MOSFET Pinout for Design Flexibility
- Low Miller Charge

Application

- DC/DC Conversion

MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Symbol	Parameter		Value	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	
P_D	Power Dissipation	Dual Operation	2	W
		Single Operation (Note 1a)	1.6	
E_{AS}	Drain−Source Avalanche Energy (Note 3)		12	mJ
V_{RRM}	Schottky Repetitive Peak Reverse Voltage		30	V
I_O	Schottky Average Forward Current (Note 1a)		2	A
T_J, T_{STG}	Operating and Storage Junction Temperature Range		−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

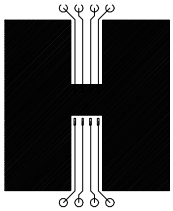
Symbol	Parameter	Value	Unit
$R_{\theta JA}$	Thermal Resistance, Junction−to−Ambient (Note 1a)	78	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction−to−Case (Note 1)	40	°C/W

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

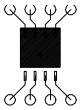
Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
BV_{DSS}	Drain–to–Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA		30			V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C			22		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS} = 0 V, V_{DS} = 24 V				1	μA
		V_{GS} = 0 V, V_{DS} = 24 V, T_J = 125°C				250	
I_{GSS}	Gate–to–Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V				±100	nA
ON CHARACTERISTICS							
$V_{GS(th)}$	Gate–to–Source Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 μA		1.2	1.8	2.5	V
$\Delta V_{GS(th)}/\Delta T_J$	Gate–to–Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C			–5		mV/°C
$R_{DS(on)}$	Drain–to–Source On–Resistance	V_{GS} = 10 V, I_D = 7 A			19	23	mΩ
		V_{GS} = 4.5 V, I_D = 6 A			23	30	
		V_{GS} = 10 V, I_D = 7 A, T_J = 125°C			26	31	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 7 A			20		S
DYNAMIC CHARACTERISTICS							
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz			525	700	pF
C_{oss}	Output Capacitance				100	133	pF
C_{rss}	Reverse Transfer Capacitance				65	100	pF
R_g	Gate Resistance	f = 1 MHz			0.8		Ω
SWITCHING CHARACTERISTICS							
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 15 V, I_D = 7 A, V_{GS} = 10 V, R_{GEN} = 6 Ω			6	12	ns
t_r	Rise Time				2	10	ns
$t_{d(off)}$	Turn–Off Delay Time				14	25	ns
t_f	Fall Time				2	10	ns
$Q_{g(TOT)}$	Total Gate Charge at 10 V	V_{DS} = 15 V, I_D = 7 A, V_{GS} = 10 V			9	13	nC
Q_{gs}	Gate–to–Source Gate Charge				1.5		nC
Q_{gd}	Gate–to–Drain “Miller” Charge				2		nC
DRAIN–SOURCE DIODE CHARACTERISTICS							
V_{SD}	Source–to–Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 7 A (Note 2)			0.90	1.25	V
t_{rr}	Reverse Recovery Time	I_F = 7 A, di/dt = 100 A/μs			23	35	ns
Q_{rr}	Reverse Recovery Charge				14	21	nC
SCHOTTKY DIODE CHARACTERISTICS							
V_R	Reverse Breakdown Voltage	I_R = –1 mA		–30			V
I_R	Reverse Leakage	V_R = –10 V	T_J = 25°C		–39	–250	μA
			T_J = 125°C		–18		mA
V_F	Forward Voltage	I_F = 100 mA	T_J = 25°C		225	280	mV
			T_J = 125°C		140		
		I_F = 2 A	T_J = 25°C		364	450	
			T_J = 125°C		290		

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.

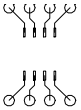
1. $R_{\theta JA}$ is the sum of the junction−to−case and case−to−ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



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

2. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%.
3. Starting T_J = 25°C, L = 1 mH, I_{AS} = 5.0 A, V_{DD} = 27 V, V_{GS} = 10 V.

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

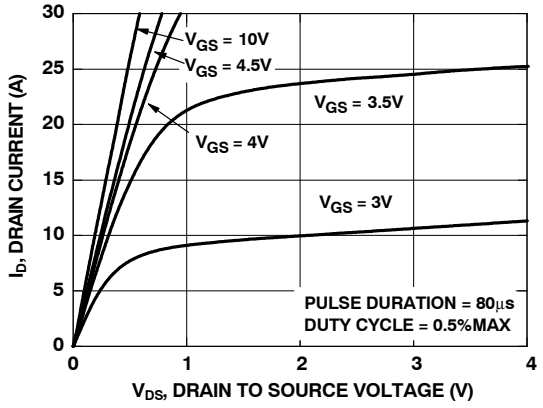


Figure 1. On Region Characteristics

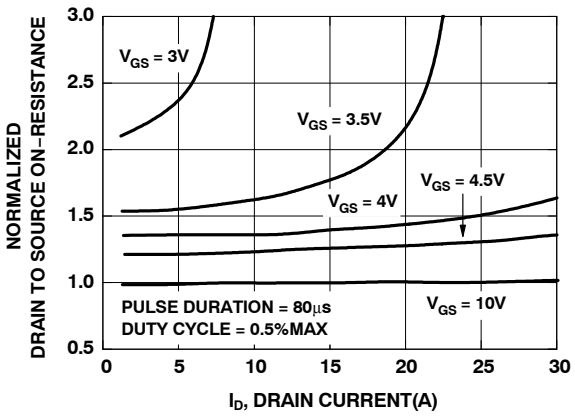


Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

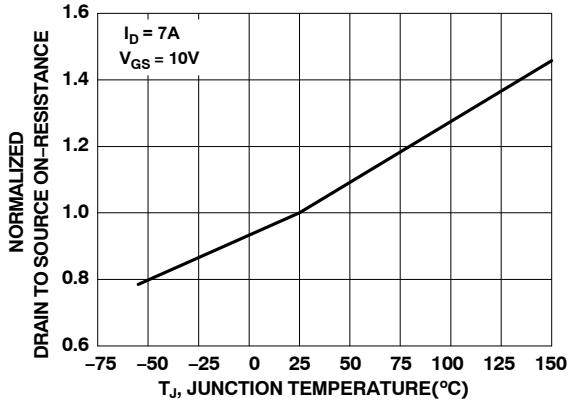


Figure 3. Normalized On−Resistance vs. Junction Temperature

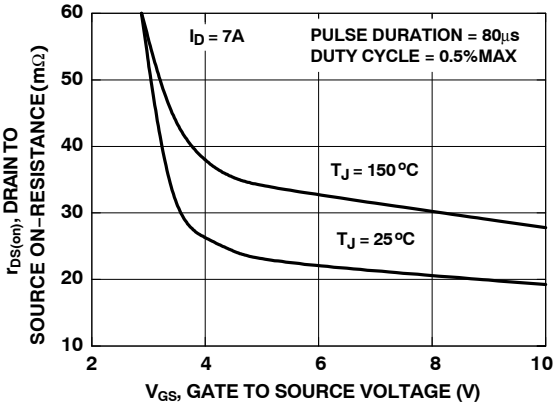


Figure 4. On−Resistance vs. Gate−to−Source Voltage

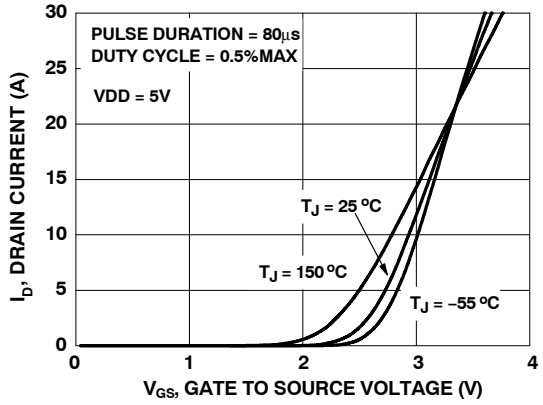


Figure 5. Transfer Characteristics

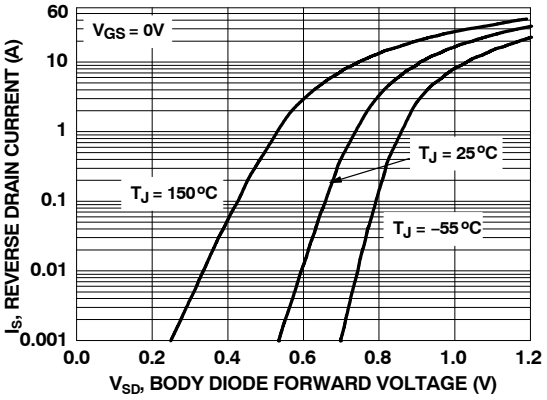


Figure 6. Source−to−Drain Diode Forward Voltage vs. Source Current

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

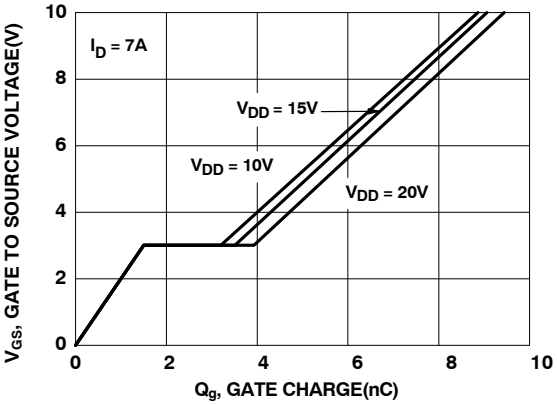


Figure 7. Gate Charge Characteristics

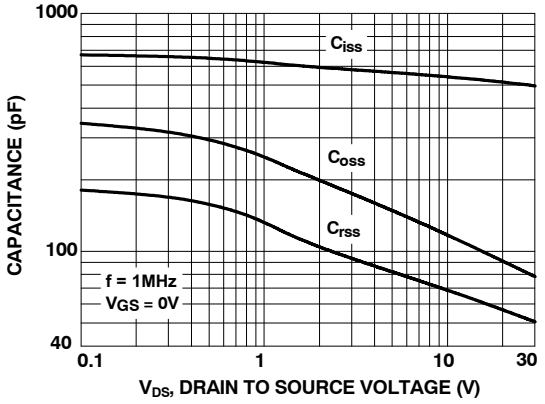


Figure 8. Capacitance vs. Drain−to−Source Voltage

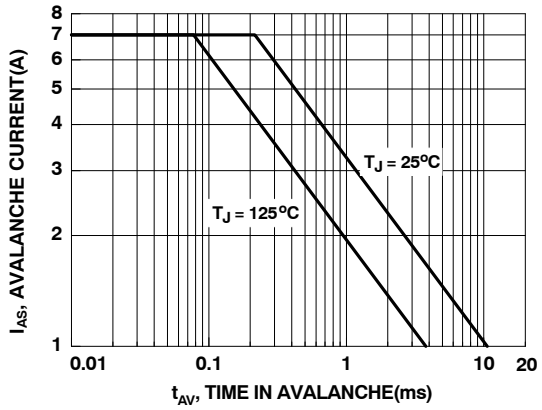


Figure 9. Unclamped Inductive Switching Capability

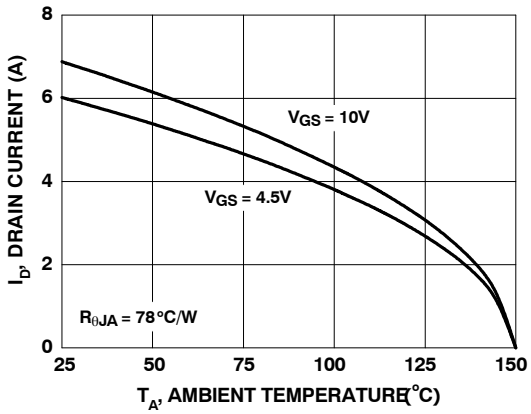


Figure 10. Maximum Continuous Drain Current vs. Ambient Temperature

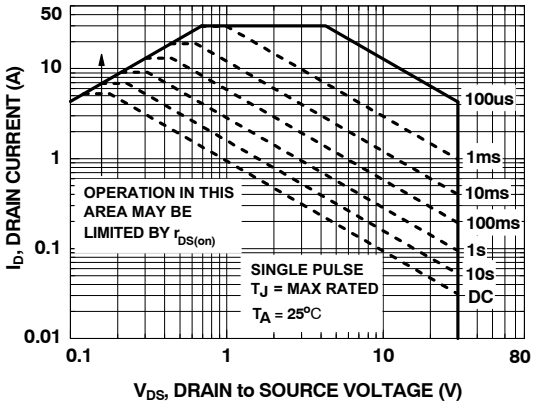


Figure 11. Forward Bias Safe Operating Area

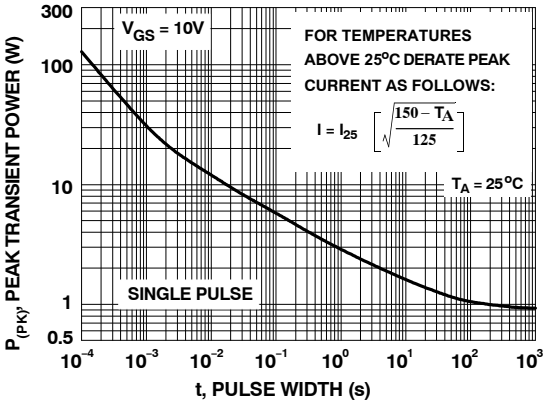


Figure 12. Single Pulse Maximum Power Dissipation

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

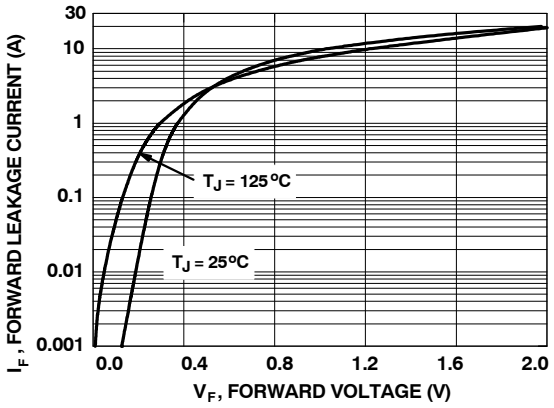


Figure 13. Schottky Diode Forward Characteristics

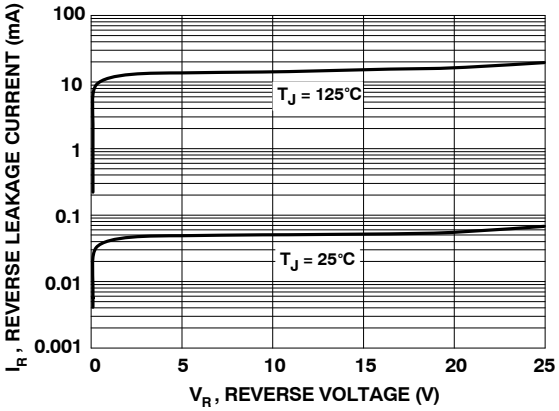


Figure 14. Schottky Diode Reverse Characteristics

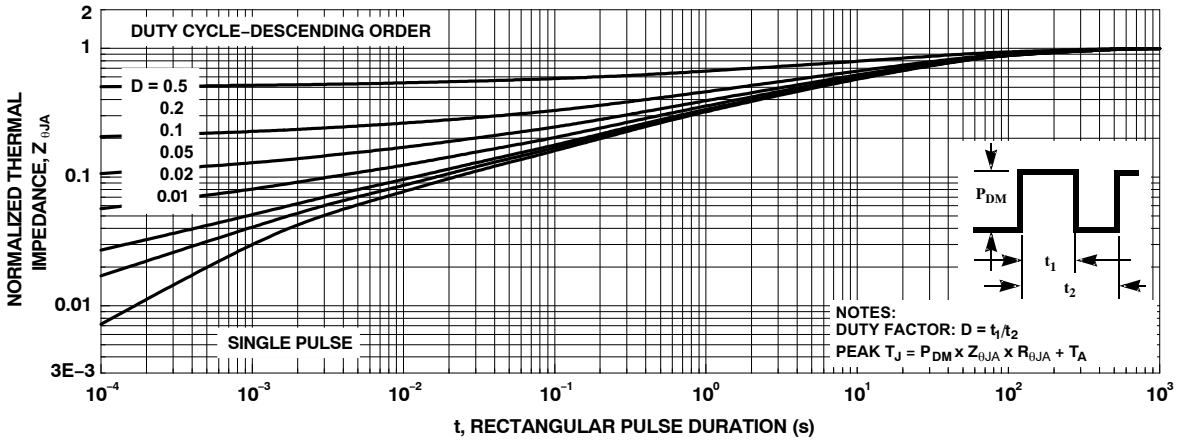


Figure 15. Transient Thermal Response Curve

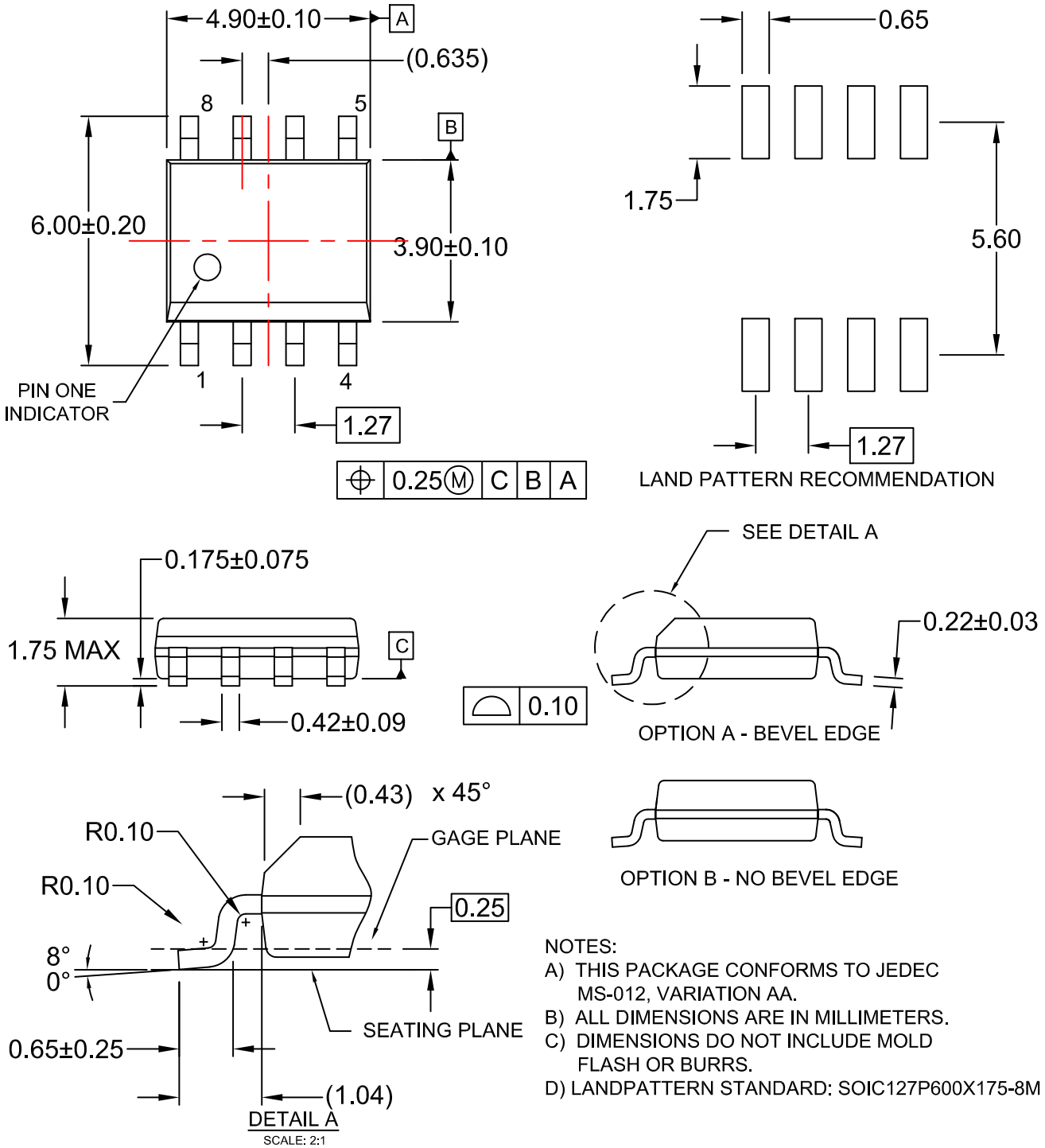
PACKAGE MARKING AND ORDERING INFORMATION

Device Marking	Device	Package	Reel Size	Tape Width	Shipping†
FDFS6N548	FDFS6N548	SO−8	330 mm	12 mm	2500 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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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