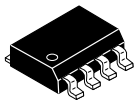
MOSFET – N-Channel, POWERTRENCH®

40 V, 18 A, 4.3 mΩ

FDS8638



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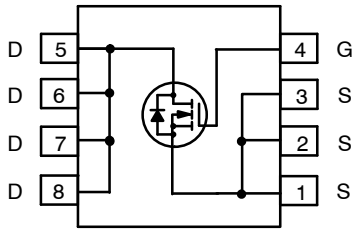


General Description

This N−Channel MOSFET is produced using **onsemi**'s advanced POWERTRENCH process that has been especially tailored to minimize the on−state resistance and yet maintain superior switching performance.

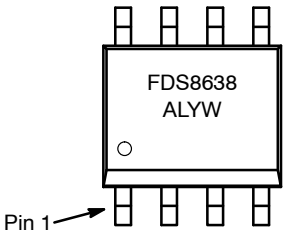
Features

- Max $R_{DS(on)}$ = 4.3 mΩ at V_{GS} = 10 V, I_D = 18 A
- Max $R_{DS(on)}$ = 5.4 mΩ at V_{GS} = 4.5 V, I_D = 16 A
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- 100% UIL Tested
- This Device is Pb−Free, Halide Free and is RoHS Compliant

Applications

- Synchronous Rectifier
- Load Switch

MARKING DIAGRAM



FDS8638 = Specific Device Code
A = Assembly Site
L = Wafer Lot Number
YW = Assembly Start Week

MOSFET MAXIMUM RATINGS

(T_A = 25°C unless otherwise noted)

Symbol	Parameter	Ratings	Unit
V_{DS}	Drain to Source Voltage	40	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current – Continuous – Pulsed	 18 100	A
E_{AS}	Single Pulse Avalanche Energy (Note 3)	541	mJ
P_D	Power Dissipation T_A = 25°C (Note 1a) T_A = 25°C (Note 1b)	 2.5 1	W
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	Ratings	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case (Note 1)	25	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	50	°C/W

ORDERING INFORMATION

Device	Package	Shipping†
FDS8638	SOIC8 (Pb−Free/ Halide 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.

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	I_D = 250 μA, V_{GS} = 0 V	40	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C	–	32	–	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 32 V, V_{GS} = 0 V	–	–	1	μA
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_{GS} = V_{DS}, I_D = 250 μA	1.0	1.9	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C	–	–7	–	mV/°C
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 18 A	–	3.3	4.3	mΩ
		V_{GS} = 4.5 V, I_D = 16 A	–	4.0	5.4	
		V_{GS} = 10 V, I_D = 18 A, T_J = 125°C	–	4.8	6.3	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 18 A	–	88	–	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz	–	4270	5680	pF
C_{oss}	Output Capacitance		–	1175	1560	
C_{rss}	Reverse Transfer Capacitance		–	120	180	
R_G	Gate Resistance		–	0.9	–	Ω
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 20 V, I_D = 18 A, V_{GS} = 10 V, R_{GEN} = 6 Ω	–	16	30	ns
t_r	Rise Time		–	6	13	
$t_{d(off)}$	Turn–Off Delay Time		–	39	63	
t_f	Fall Time		–	5	10	
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 10 V, V_{DD} = 20 V, I_D = 18 A	–	61	86	nC
		V_{GS} = 0 V to 4.5 V, V_{DD} = 20 V, I_D = 18 A	–	27	39	
Q_{gs}	Gate to Source Charge	V_{DD} = 20 V, I_D = 18 A	–	12	–	nC
Q_{gd}	Gate to Drain “Miller” Charge		–	7.2	–	
DRAIN–SOURCE DIODE CHARACTERISTICS						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 18 A (Note 2)	–	0.81	1.3	V
		V_{GS} = 0 V, I_S = 2.1 A (Note 2)	–	0.71	1.2	
t_{rr}	Reverse Recovery Time	I_F = 18 A, di/dt = 100 A/μs	–	51	82	ns
Q_{rr}	Reverse Recovery Charge		–	30	49	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 determined with the device mounted on a 1 in^2 pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR–4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user’s board design.

a) 50°C/W when mounted on a 1 in^2 pad of 2 oz. copper.

b) 125°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 = 3 mH, I_{AS} = 19 A, V_{DD} = 40 V, V_{GS} = 10 V

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

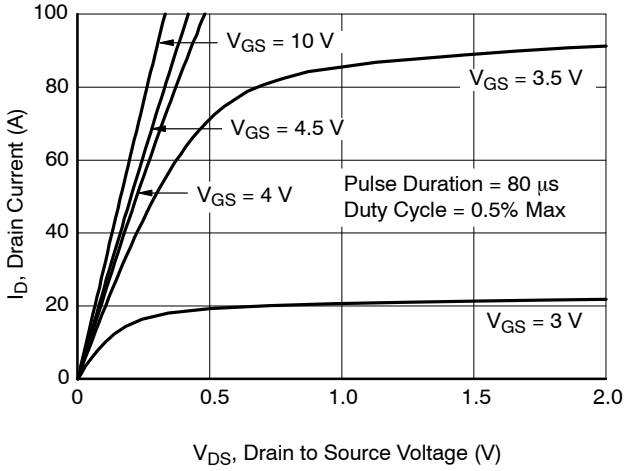


Figure 1. On Region Characteristics

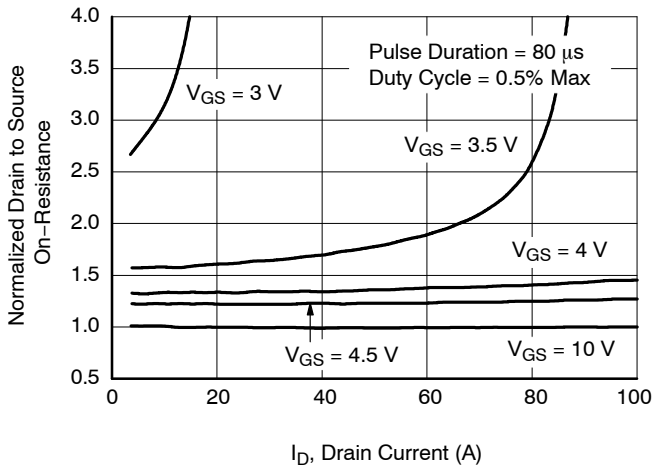


Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

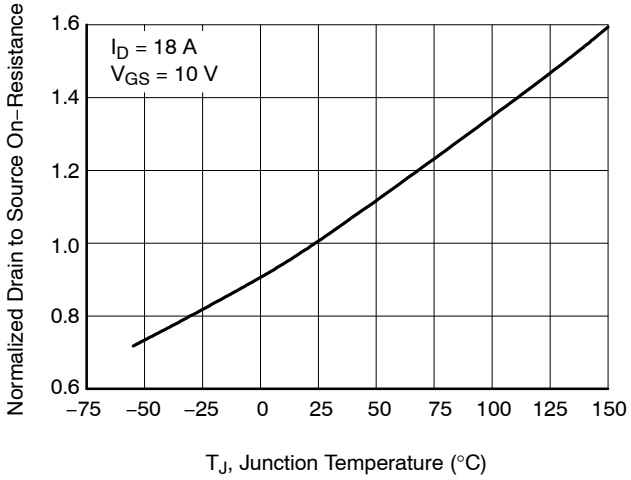


Figure 3. Normalized On Resistance vs. Junction Temperature

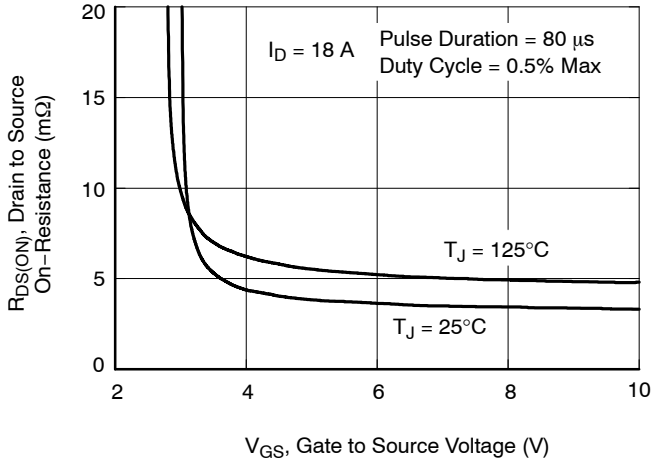


Figure 4. On−Resistance vs. Gate to Source Voltage

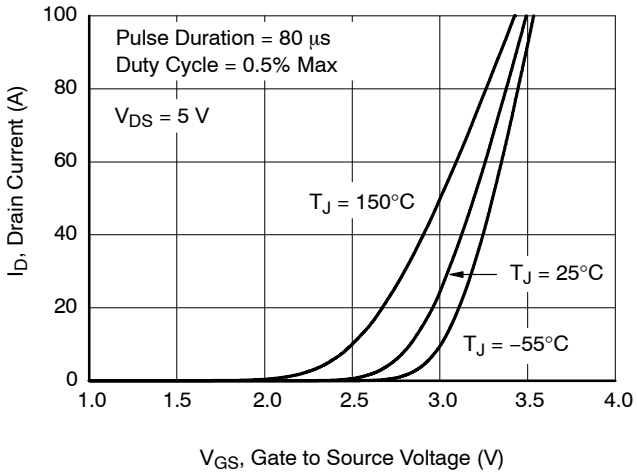


Figure 5. Transfer Characteristics

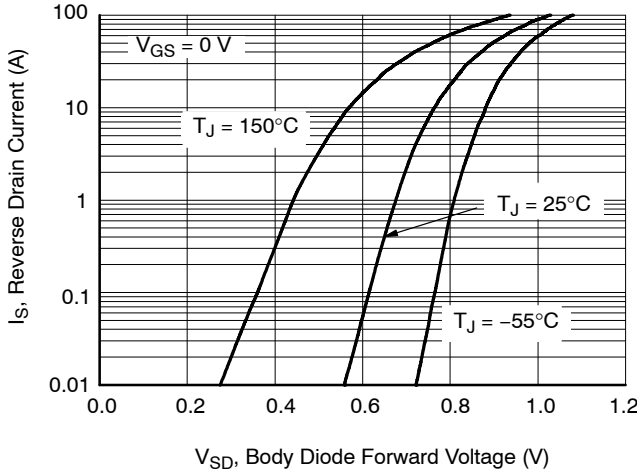


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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

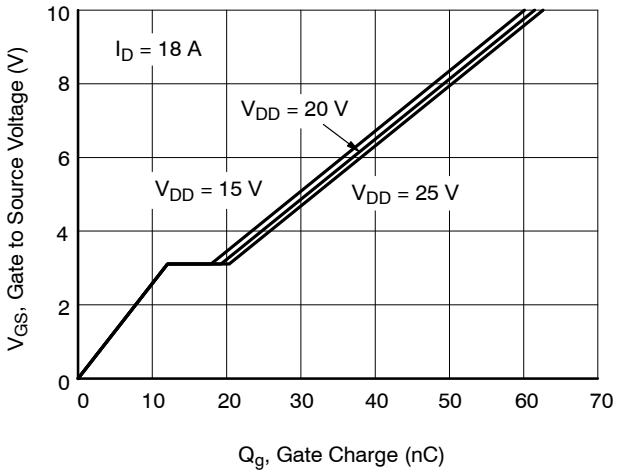


Figure 7. Gate Charge Characteristics

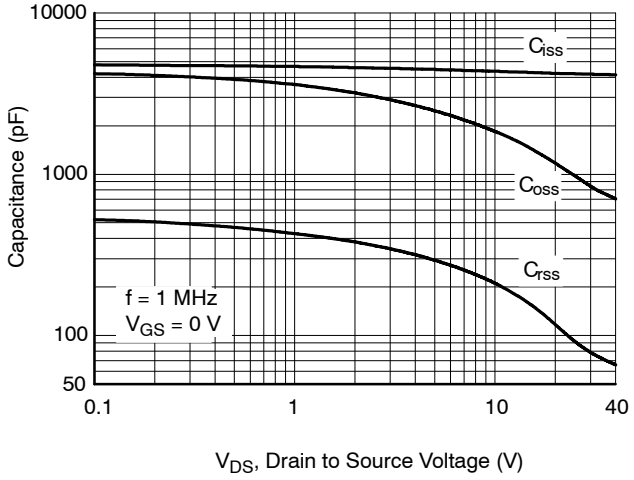


Figure 8. Capacitance vs. Drain to Source Voltage

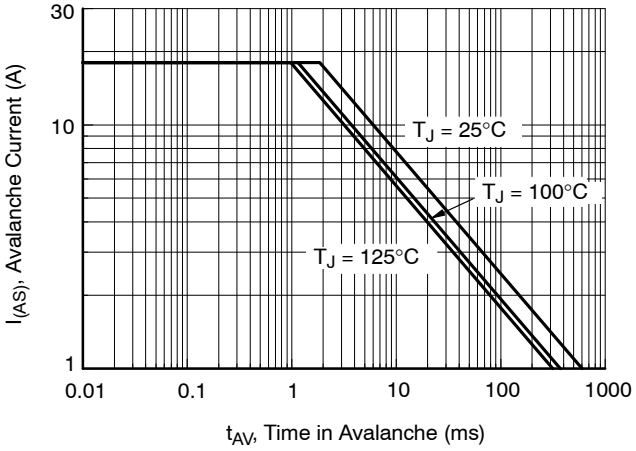


Figure 9. Unclamped Inductive Switching Capability

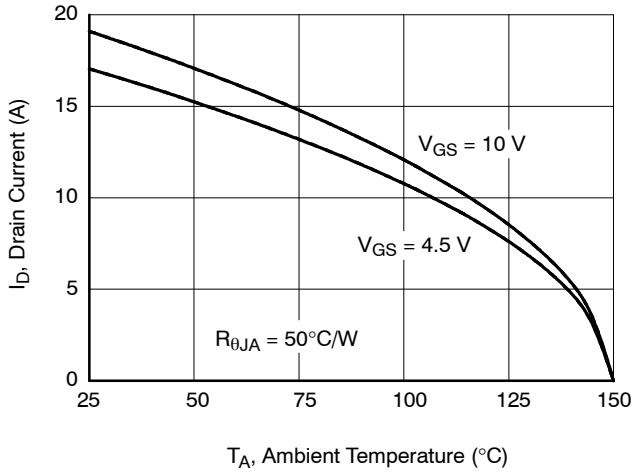


Figure 10. Maximum Continuous Drain Current vs. Ambient Temperature

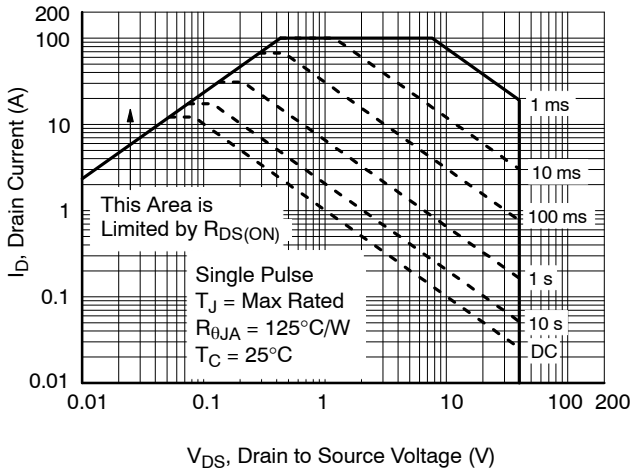


Figure 11. Forward Bias Safe Operating Area

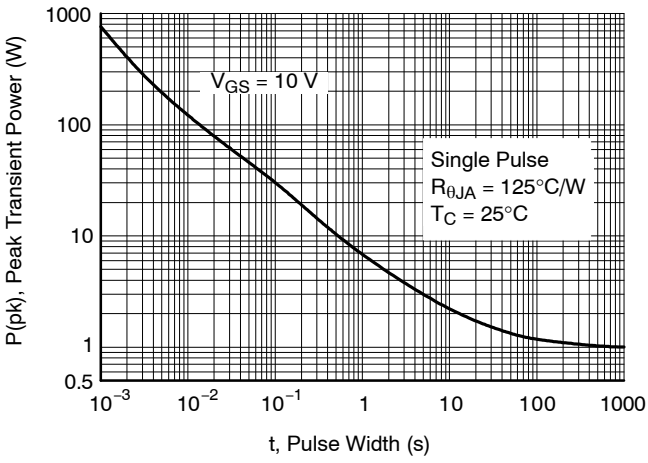


Figure 12. Single Pulse Maximum Power Dissipation

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

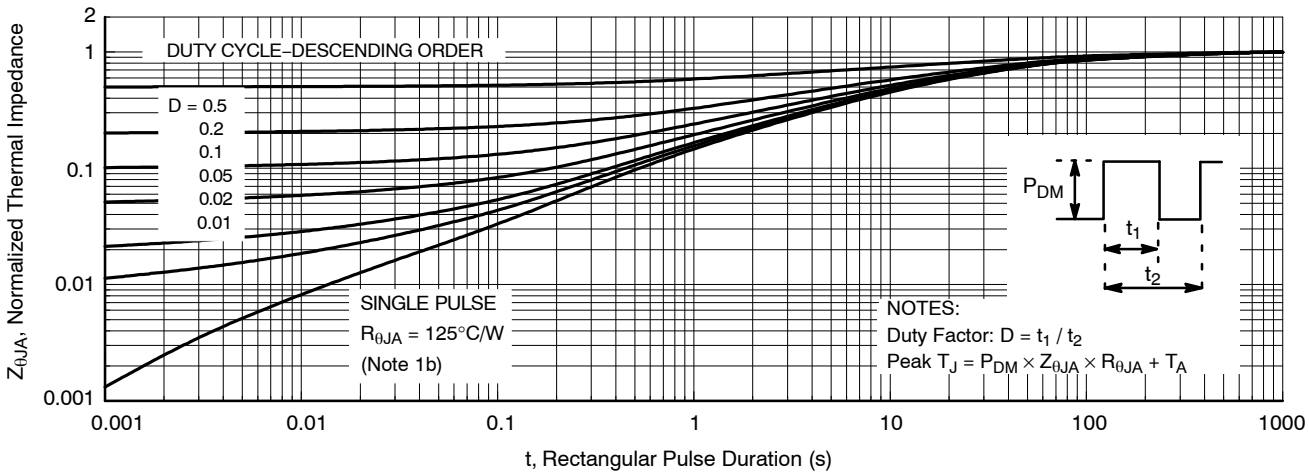


Figure 13. Junction−to−Ambient Transient Thermal Response Curve

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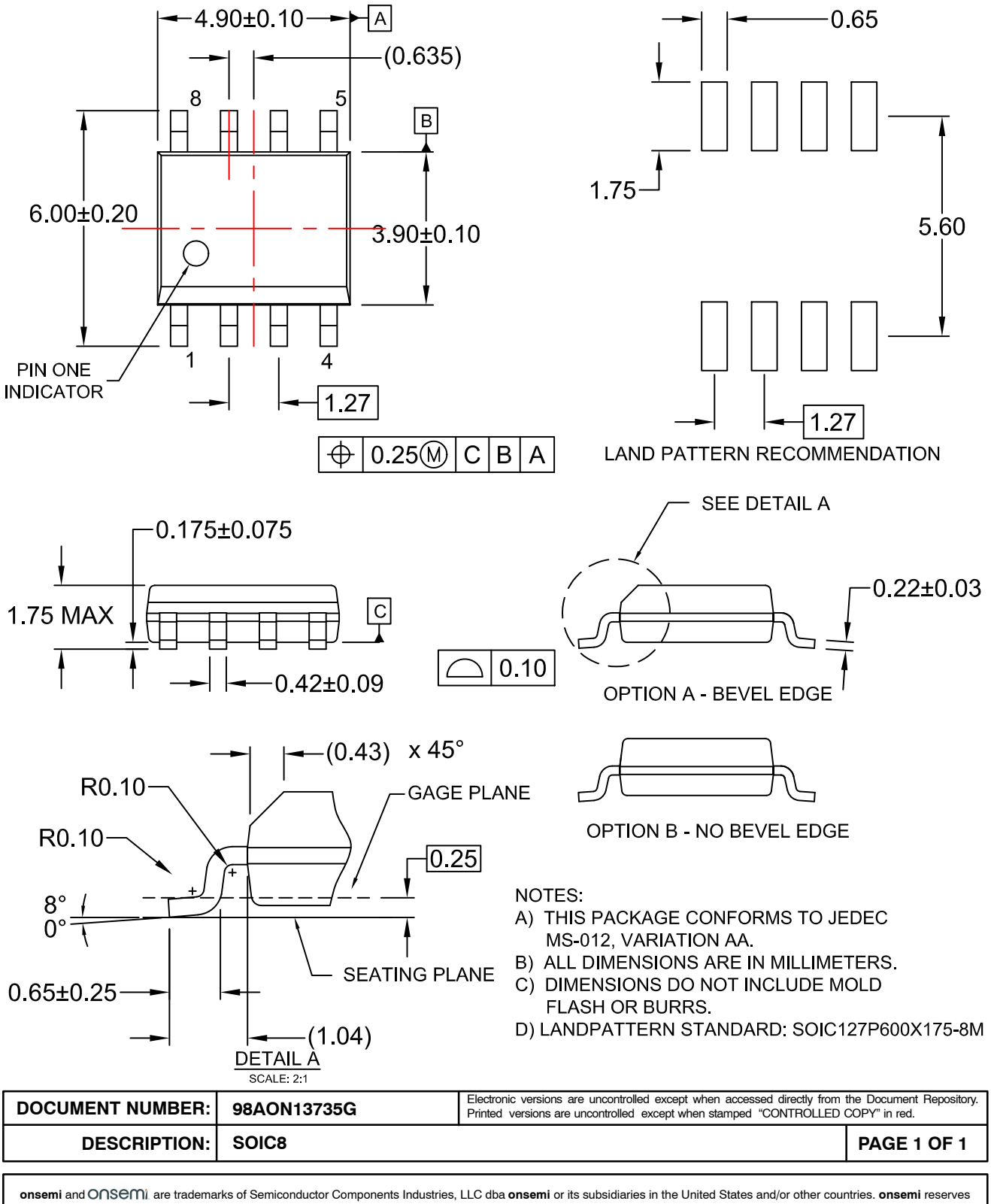

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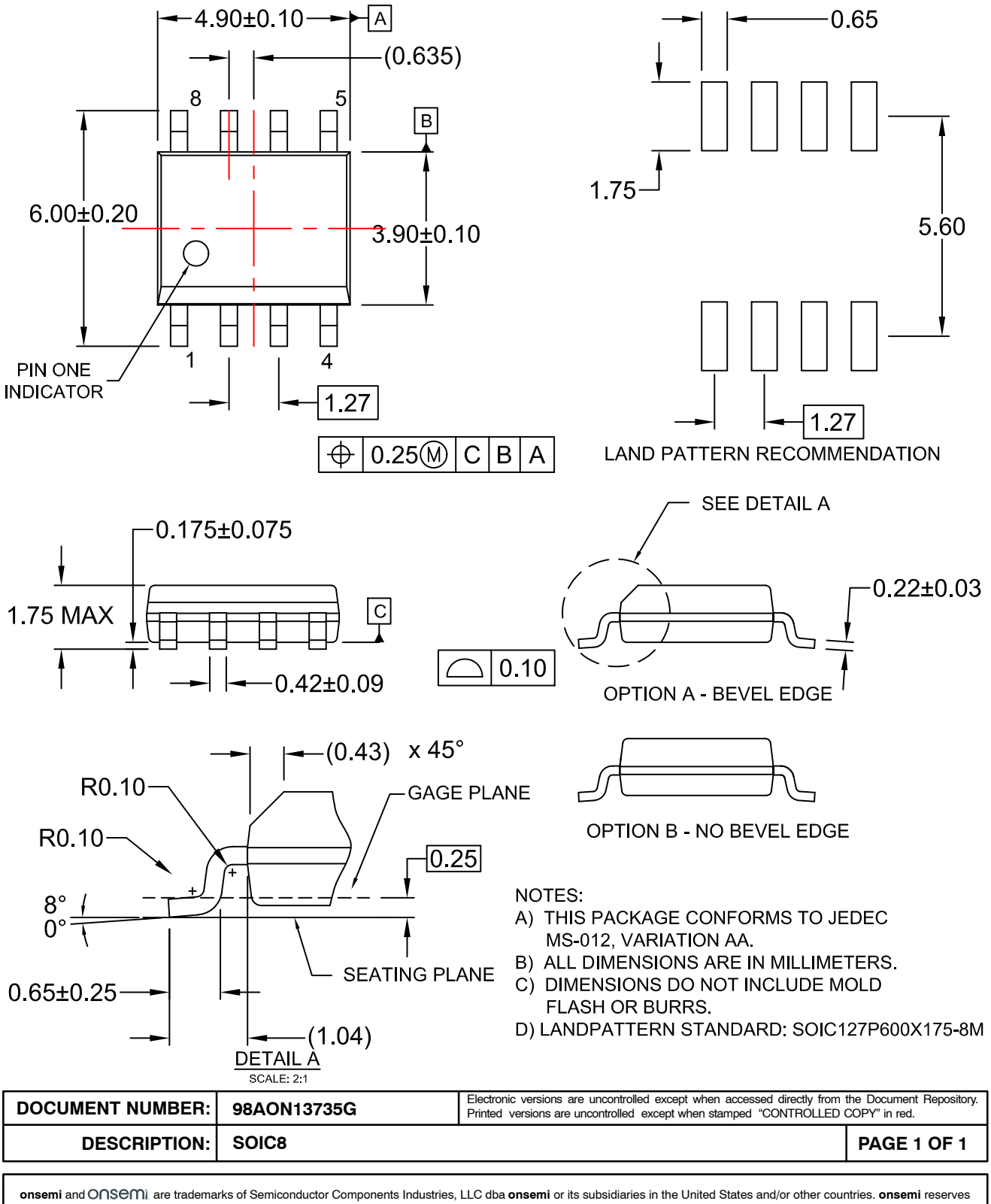

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