MOSFET – P-Channel, POWERTRENCH®

30 V

FDS6681Z

V_{DSS}	$R_{DS(on)}$ MAX	I_D MAX
–30 V	4.6 mΩ @ –10 V	–20 A
	6.5 mΩ @ –4.5 V	

General Description

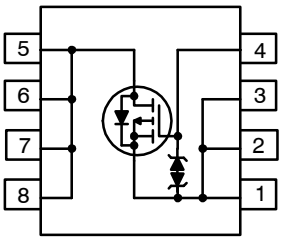
This P–Channel MOSFET is produced using **onsemi**'s advanced PowerTrench process that has been especially tailored to minimize the on–state resistance.

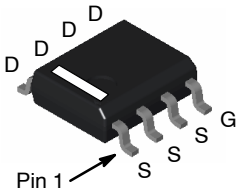
This device is well suited for Power Management and load switching applications common in Notebook Computers and Portable Battery Packs.

Features

- –20 A, –30 V
  - $R_{DS(ON)}$ = 4.6 mΩ @ V_{GS} = –10 V
  - $R_{DS(ON)}$ = 6.5 mΩ @ V_{GS} = –4.5 V
- Extended V_{GSS} Range (–25 V) for Battery Applications
- HBM ESD Protection Level of 8 kV Typical (Note 3)
- High Performance Trench Technology for Extremely Low $R_{DS(ON)}$
- High Power and Current Handling Capability
- Termination is Lead–free and RoHS Compliant
- This is a Pb–Free and Halide Free Device

P–Channel





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

Symbol	Parameter		Ratings	Unit
V_{DSS}	Drain–Source Voltage		–30	V
V_{GSS}	Gate–Source Voltage		±25	V
I_D	Drain Current	Continuous (Note 1a)	–20	A
		Pulsed	–105	
P_D	Power Dissipation for Single Operation	(Note 1a)	2.5	W
		(Note 1b)	1.2	
		(Note 1c)	1.0	
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)	50	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction–to–Case (Note 1)	25	°C/W

MARKING DIAGRAM

FDS6681Z = Specific Device Code
A = Assembly Site
L = Wafer Lot Number
YW = Assembly Start Week

ORDERING INFORMATION

Device	Package	Shipping†
FDS6681Z	SOIC8 (Pb–Free)	2500 / Tape & Reel

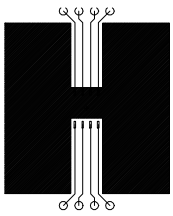
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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

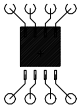
Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain−Source Breakdown Voltage	V_{GS} = 0 V, I_D = −250 μA	−30	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = −250 μA, Referenced to 25°C	–	−26	–	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = −24 V, V_{GS} = 0 V	–	–	−1	μA
I_{GSS}	Gate−Body Leakage	V_{GS} = ±25 V, V_{DS} = 0 V	–	–	±10	μA
ON CHARACTERISTICS (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = −250 μA	−1	−1.8	−3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = −250 μA, Referenced to 25°C	–	6	–	mV/°C
$R_{DS(on)}$	Static Drain−Source On−Resistance	V_{GS} = −10 V, I_D = −20 A	–	3.8	4.6	mΩ
		V_{GS} = −4.5 V, I_D = −17 A	–	5.2	6.5	
		V_{GS} = −10 V, I_D = −20 A, T_J = 125°C	–	5.0	6.3	
g_{FS}	Forward Transconductance	V_{DS} = −5 V, I_D = −20 A	–	79	–	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = −15 V, V_{GS} = 0 V, f = 1.0 MHz	–	7540	–	pF
C_{oss}	Output Capacitance		–	1400	–	pF
C_{rss}	Reverse Transfer Capacitance		–	1120	–	pF
SWITCHING CHARACTERISTICS (Note 2)						
$t_{d(on)}$	Turn−On Delay Time	V_{DD} = −15 V, I_D = −1 A, V_{GS} = −10 V, R_{GEN} = 6 Ω	–	20	35	ns
t_r	Turn−On Rise Time		–	9	18	ns
$t_{d(off)}$	Turn−Off Delay Time		–	660	1060	ns
t_f	Turn−Off Fall Time		–	380	610	ns
$Q_{g(TOT)}$	Total Gate Charge at V_{GS}= −10 V	V_{DS} = −15 V, I_D = −20 A	–	185	260	nC
$Q_{g(TOT)}$	Total Gate Charge at V_{GS}= −5 V		–	105	150	nC
Q_{gs}	Gate−Source Charge		–	26	–	nC
Q_{gd}	Gate−Drain Charge		–	47	–	nC
DRAIN−SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
I_S	Maximum Continuous Drain−Source Diode Forward Current		–	–	−2.1	A
V_{SD}	Drain−Source Diode Forward Voltage	V_{GS} = 0 V, I_S = −2.1 A (Note 2)	–	−0.7	−1.2	V
t_{RR}	Reverse Recovery Time	I_F = −20 A, dI_F/dt = 100 A/μs (Note 2)	–	125	–	ns
Q_{RR}	Reverse Recovery Charge		–	94	–	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.

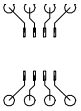
1. $R_{\theta JA}$ is the sum of the junction−to−case and case−to−ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 50°C/W (10 s)
62.5°C/W steady state when mounted on a 1in^2 pad of 2 oz copper.



b) 105°C/W when mounted on a .04 in^2 pad of 2 oz copper.



c) 125°C/W when mounted on a minimum pad.

Scale 1:1 on letter size paper

2. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%
3. The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

TYPICAL CHARACTERISTICS

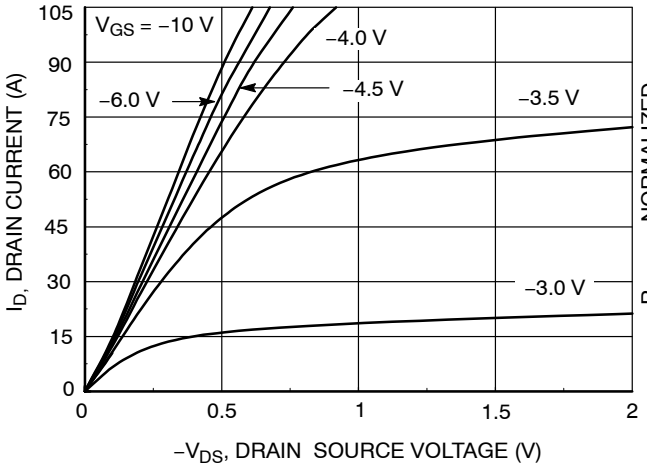


Figure 1. On−Region Characteristics

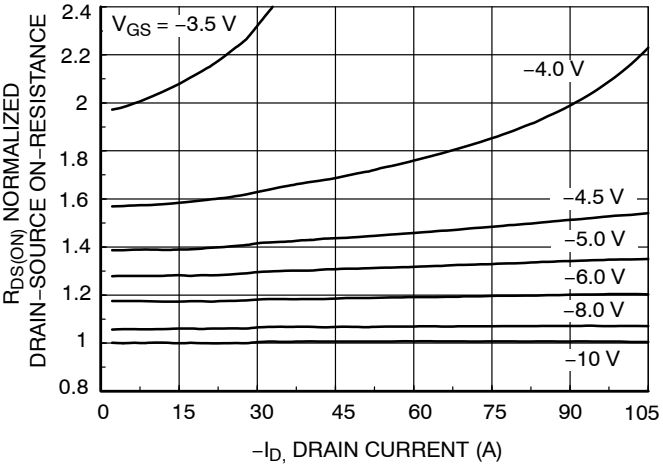


Figure 2. On−Resistance Variation with Drain Current and Gate Voltage

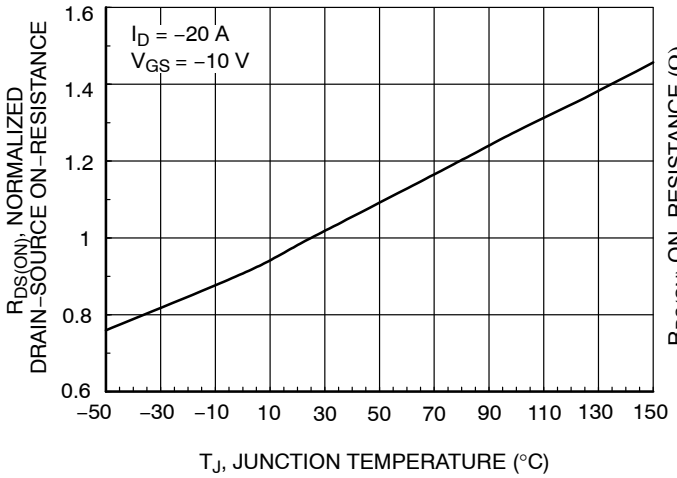


Figure 3. On−Resistance Variation with Temperature

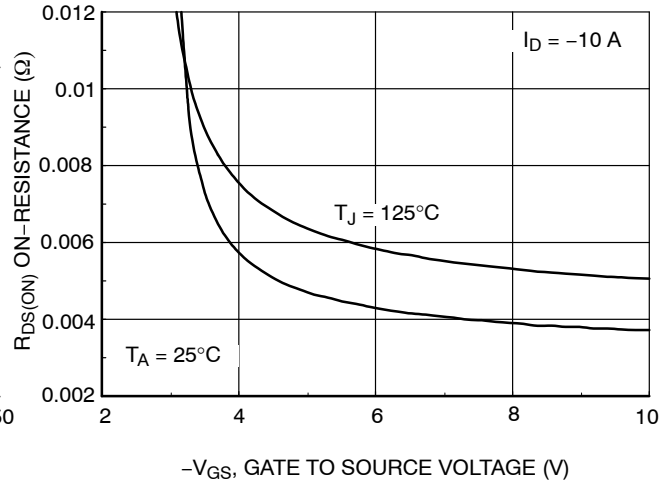


Figure 4. On−Resistance Variation with Gate−to−Source Voltage

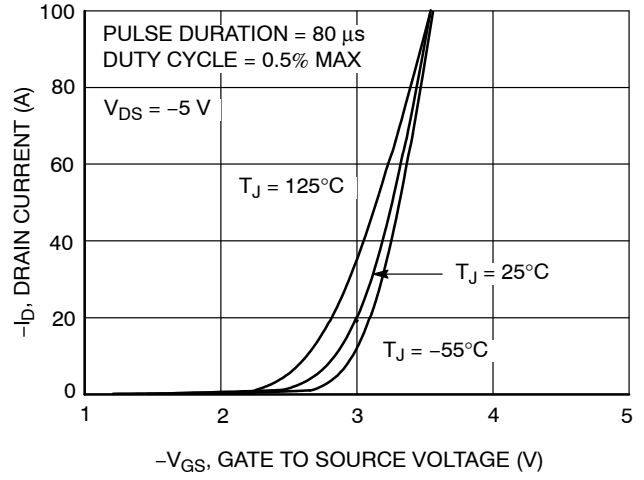


Figure 5. Transfer Characteristics

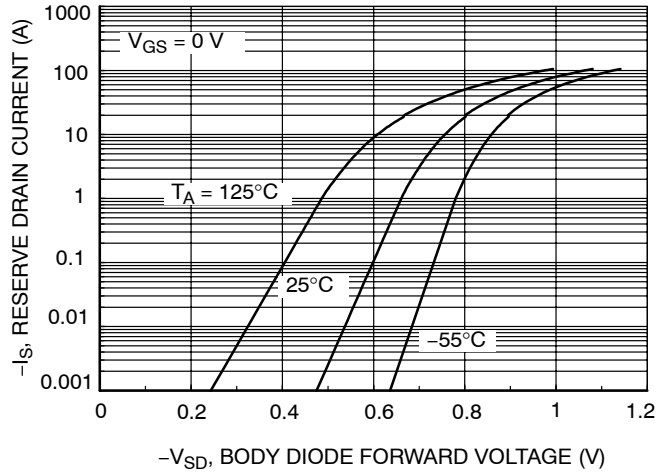


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

TYPICAL CHARACTERISTICS (continued)

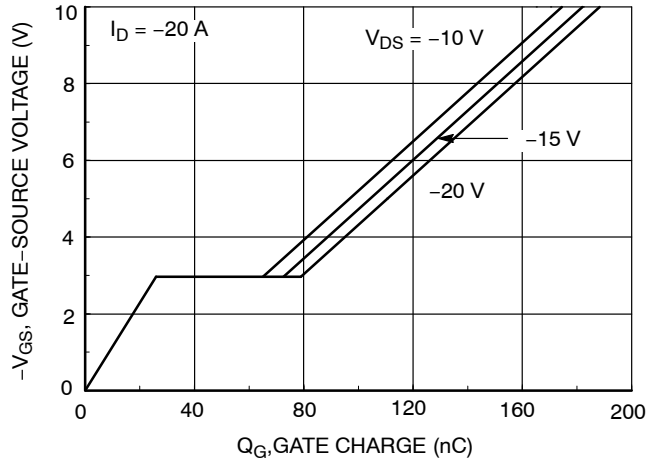


Figure 7. Gate Charge Characteristics

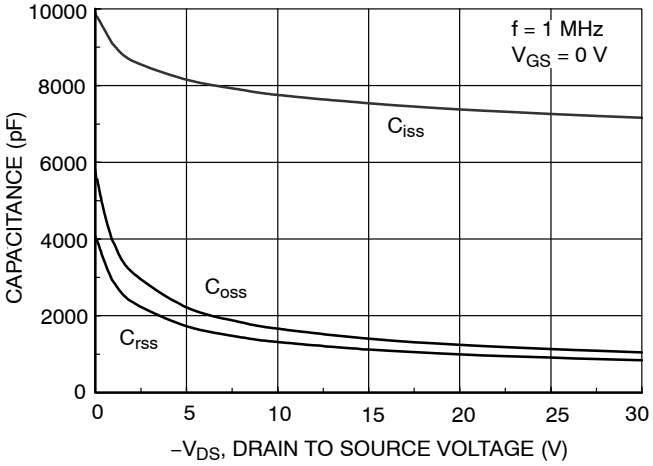


Figure 8. Capacitance Characteristics

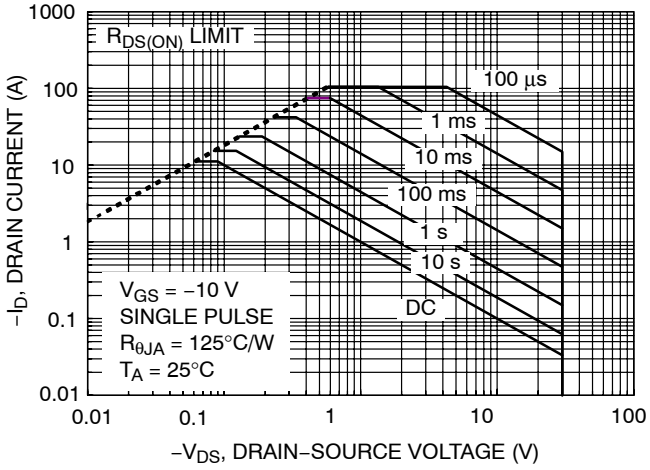


Figure 9. Maximum Safe Operating Area

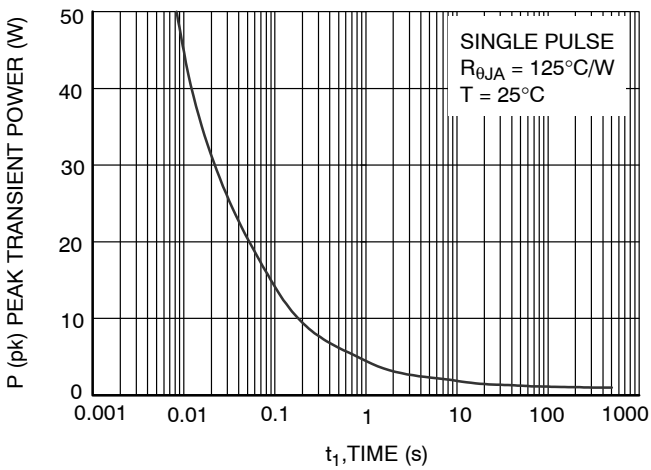


Figure 10. Single Pulse Maximum Power Dissipation

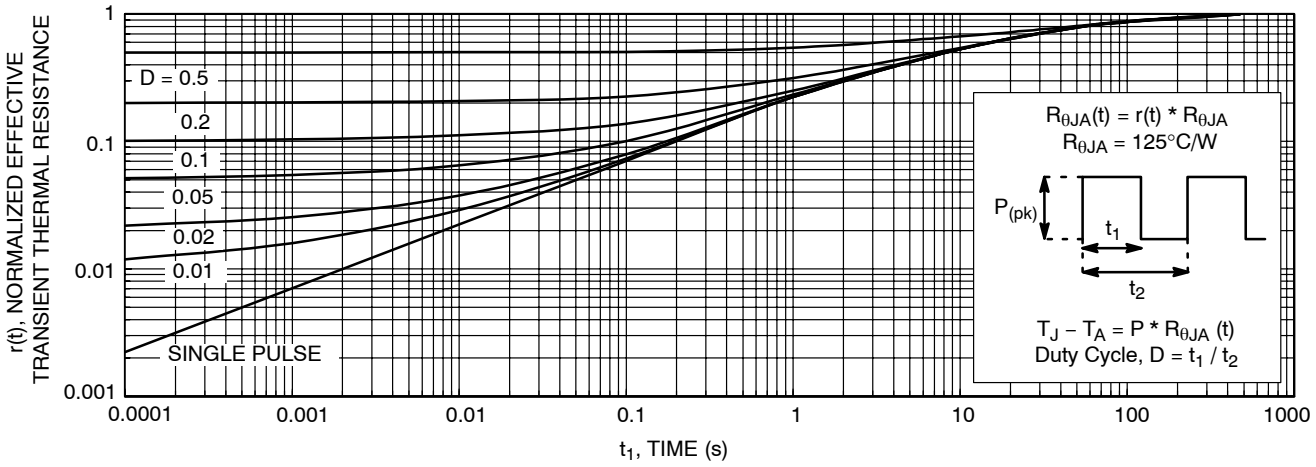


Figure 11. Transient Thermal Response Curve

Thermal characterization performed using the conditions described in Note 1c.
Transient thermal response will change depending on the circuit board design.

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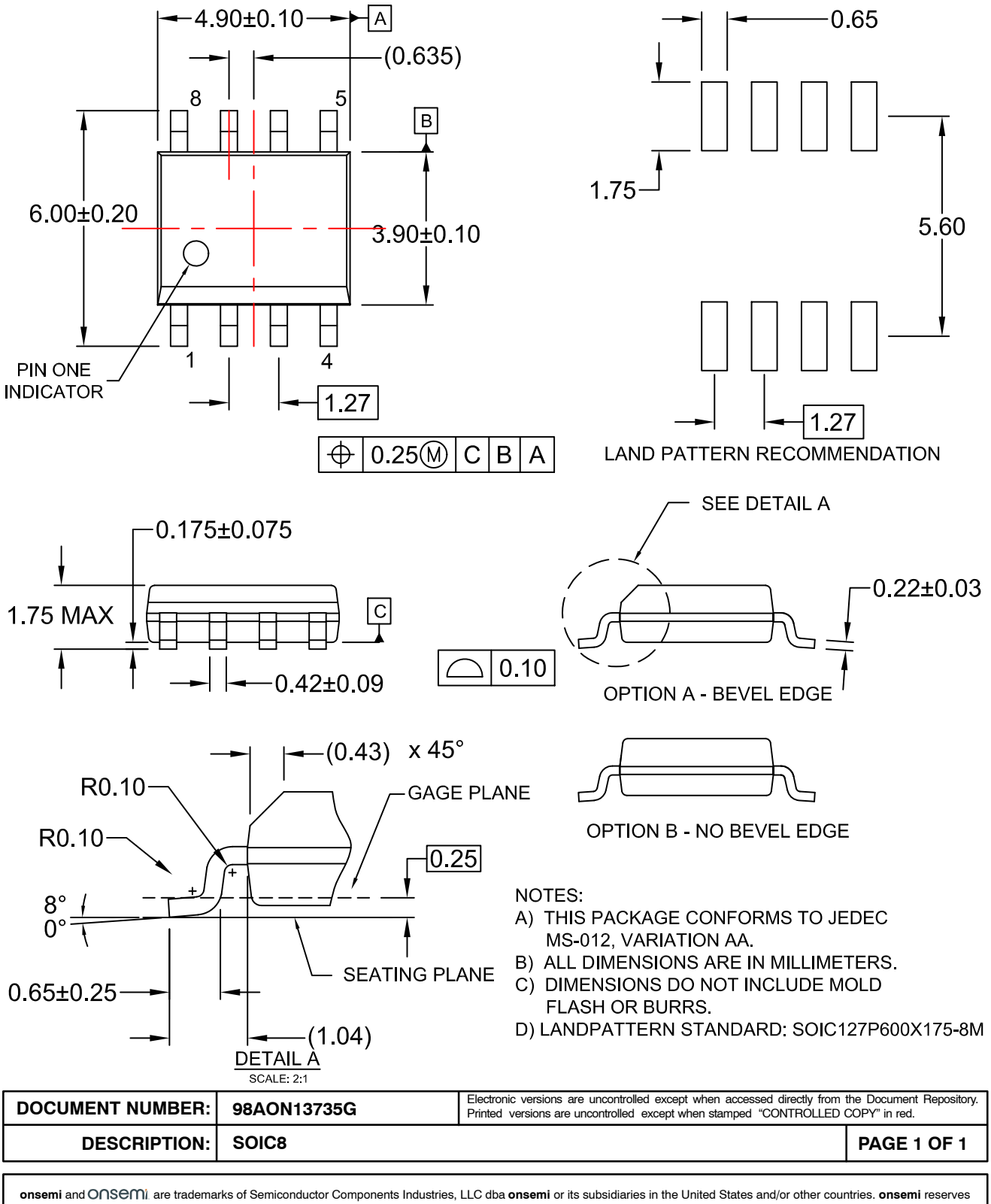

NOTES:
A) THIS PACKAGE CONFORMS TO JEDEC MS-012, VARIATION AA.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS.
D) LANDPATTERN STANDARD: SOIC127P600X175-8M

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