FDMS6681Z

MOSFET – POWERTRENCH®, P-Channel

-30 V, -122 A, 3.2 mΩ

General Description

The FDMS6681Z has been designed to minimize losses in load switch applications. Advancements in both silicon and package technologies have been combined to offer the lowest $r_{DS(on)}$ and ESD protection.

Features

- Max $r_{DS(on)}$ = 3.2 mΩ at V_{GS} = −10 V, I_D = −21.1 A
- Max $r_{DS(on)}$ = 5.0 mΩ at V_{GS} = −4.5 V, I_D = −15.7 A
- Advanced Package and Silicon Combination for Low $r_{DS(on)}$
- HBM ESD Protection Level of 8 kV Typical (Note 3)
- MSL1 Robust Package Design
- RoHS Compliant

Applications

- Load Switch in Notebook and Server
- Notebook Battery Pack Power Management

MOSFET 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	±25	V
I_D	Drain Current – Continuous T_C = 25°C (Note 5)	−122	A
	– Continuous T_C = 100°C (Note 5)	−77	
	– Continuous T_A = 25°C (Note 1a)	−21.1	
	– Pulsed (Note 4)	−600	
P_D	Power dissipation T_C = 25°C	73	W
	Power dissipation T_A = 25°C (Note 1a)	2.5	
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	1.7	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	50	

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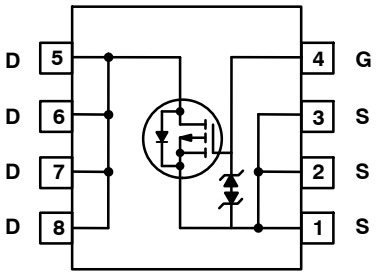
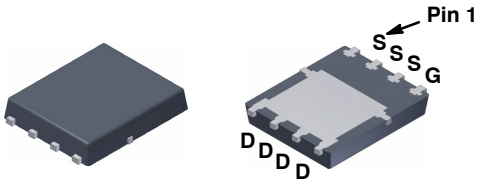
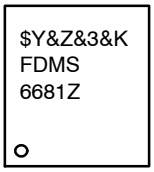




Top Bottom

Power 56 (PQFN8)
CASE 483AE

MARKING DIAGRAM



$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= Numeric Date Code
&K	= Lot Code
FDMS6681Z	= Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

PACKAGE MARKING AND ORDERING INFORMATION

Device Marking	Device	Package	Shipping†
FDMS6681Z	FDMS6681Z	Power 56	3000 Units/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.

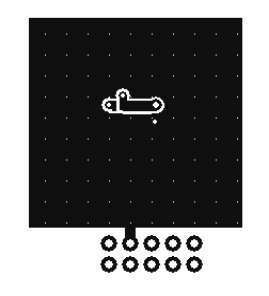
ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

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	−30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = −250 μA, referenced to 25°C		20		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = −24 V, V_{GS} = 0 V			−1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±25 V, V_{DS} = 0 V			±10	μA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = −250 μA	−1	−1.7	−3	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 = −22.1 A		2.7	3.2	mΩ
		V_{GS} = −4.5 V, I_D = −15.7 A		4.0	5.0	
		V_{GS} = −10 V, I_D = −22.1 A, T_J = 125°C		3.9	5.0	
g_{FS}	Forward Transconductance	V_{DD} = −10 V, I_D = −22.1 A		143		S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = −15 V, V_{GS} = 0 V, f = 1MHz		7803	10380	pF
C_{oss}	Output Capacitance			1540	2050	
C_{rss}	Reverse Transfer Capacitance			1345	2020	
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn – On Delay Time	V_{DD} = −15 V, I_D = −22.1 A, V_{GS} = −10 V, R_{GEN} = 6 Ω		15	24	ns
t_r	Rise Time			38	61	
$t_{d(off)}$	Turn – Off Delay Time			260	416	
t_f	Fall Time			197	316	
Q_g	Total Gate Charge	V_{GS} = 0 V to −10 V; V_{DD} = −15 V, i_D = −22.1 A		172	241	nC
Q_g	Total Gate Charge	V_{GS} = 0 V to −5 V; V_{DD} = −15 V, i_D = −22.1 A		97	136	
Q_{gs}	Gate to Source Charge	V_{DD} = −15 V, i_D = −22.1 A		22		
Q_{gd}	Gate to Drain “Miller” Charge	V_{DD} = −15 V, i_D = −22.1 A		46		
DRAIN−SOURCE DIODE CHARACTERISTICS						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = −2.1 A (Note 2)		0.68	1.2	V
		V_{GS} = 0 V, I_S = −22.1 A (Note 2)		0.79	1.25	
t_{rr}	Reverse Recovery Time	I_F = −22.1 A, di/dt = 100 A/μs		44	71	ns
Q_{rr}	Reverse Recovery Charge			39	63	nC

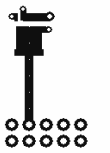
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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 × 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 of 2 oz copper.

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.
4. Pulsed I_D please refer to Figure 12 SOA graph for more details.
5. Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal electro−mechanical application board design.

TYPICAL CHARACTERISTICS T_J = 25°C unless otherwise noted

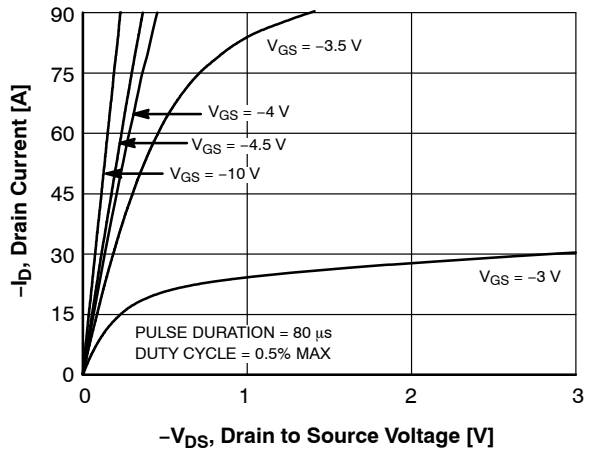


Figure 1. On Region Characteristics

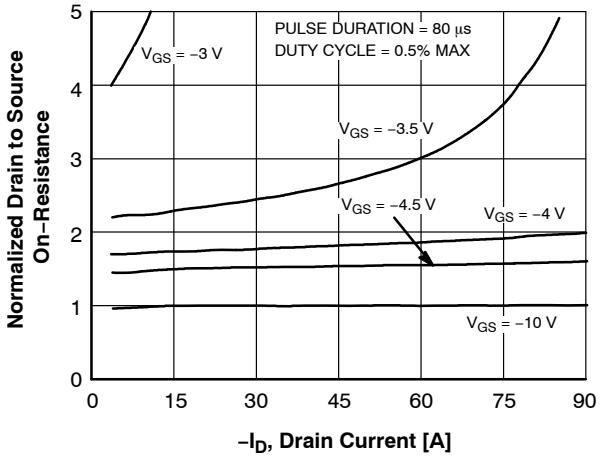


Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

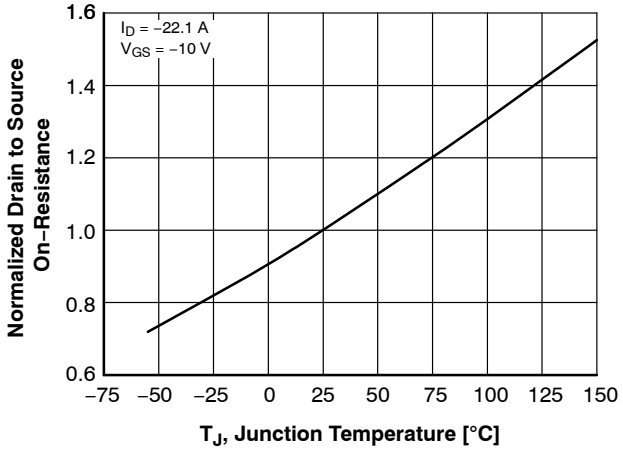


Figure 3. Normalized On Resistance vs. Junction Temperature

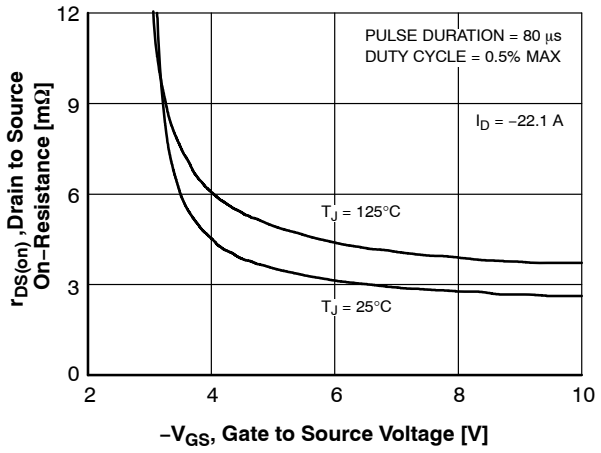


Figure 4. On−Resistance vs. Gate to Source Voltage

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

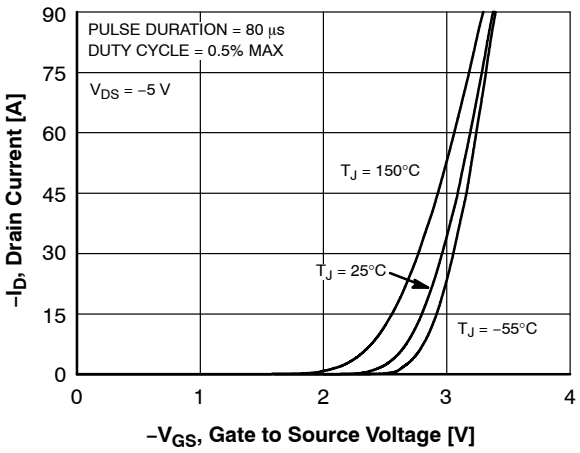


Figure 5. Transfer Characteristics

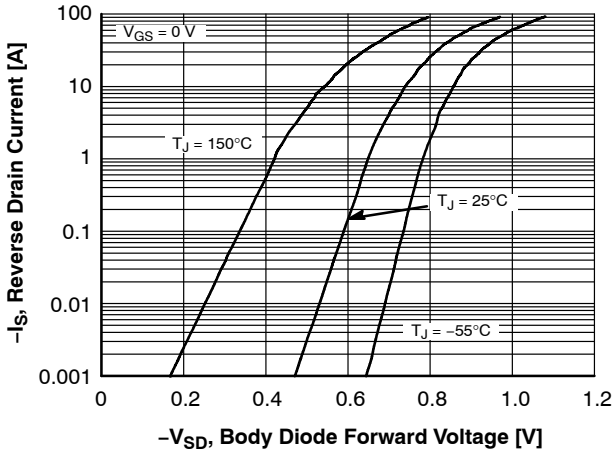


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

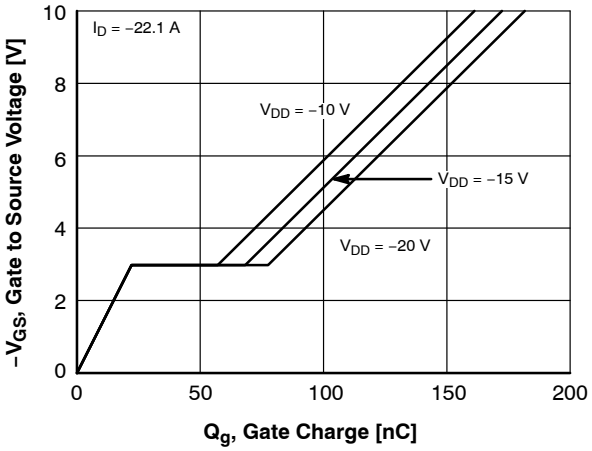


Figure 7. Gate Charge Characteristics

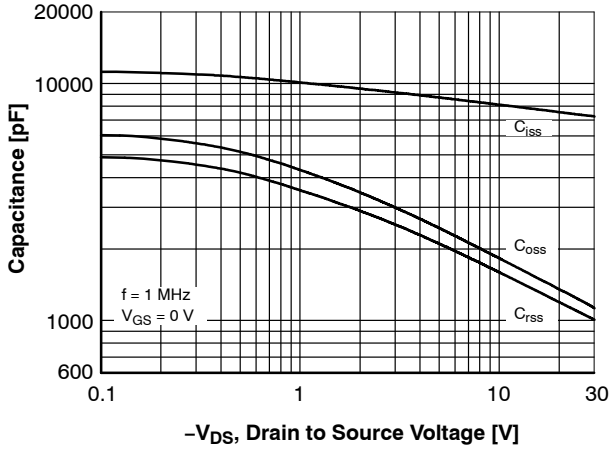


Figure 8. Capacitance vs. Drain to Source Voltage

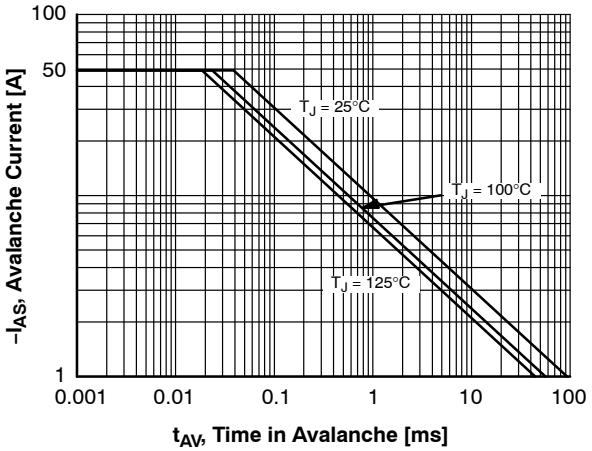


Figure 9. Unclamped Inductive Switching Capability

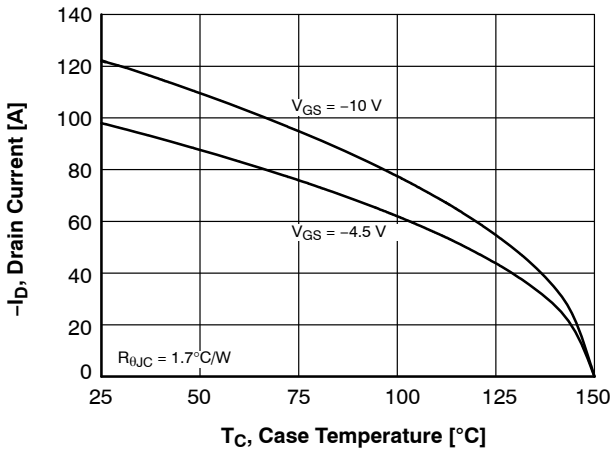


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

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

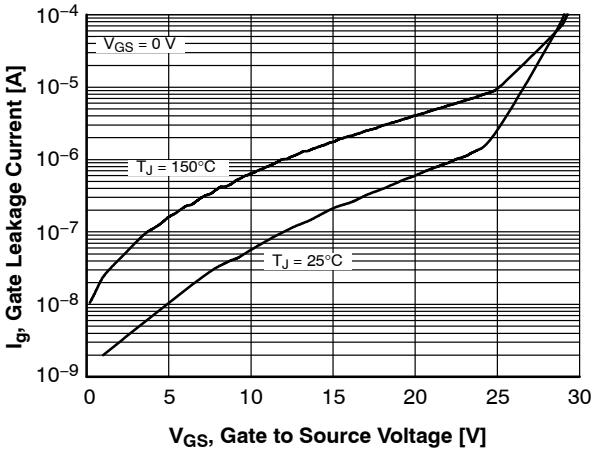


Figure 11. I_{gss} vs. V_{gss}

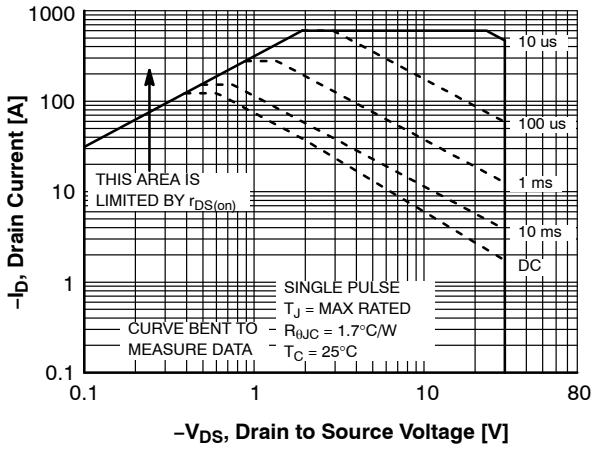


Figure 12. Forward Bias Safe Operating Area

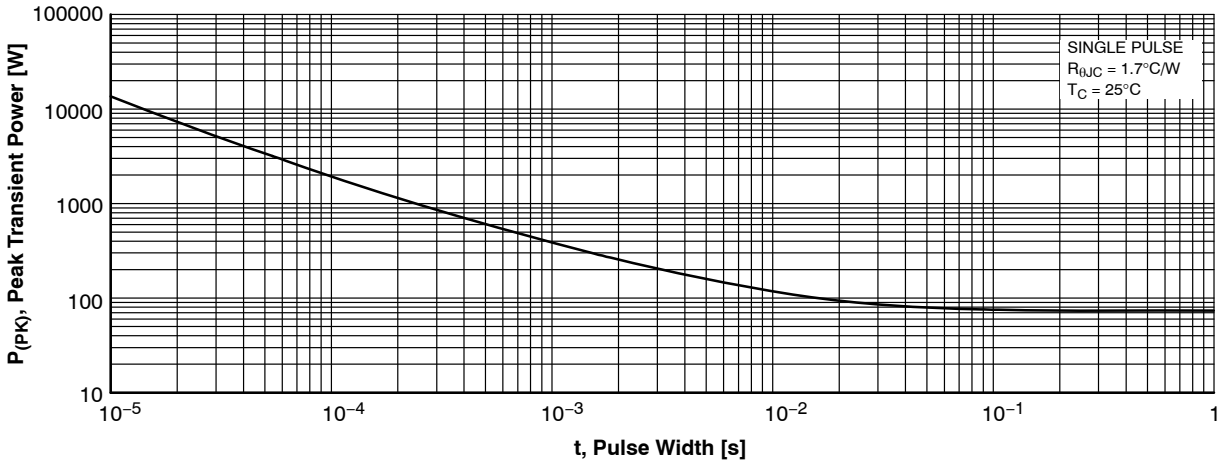


Figure 13. Single Pulse Maximum Power Dissipation

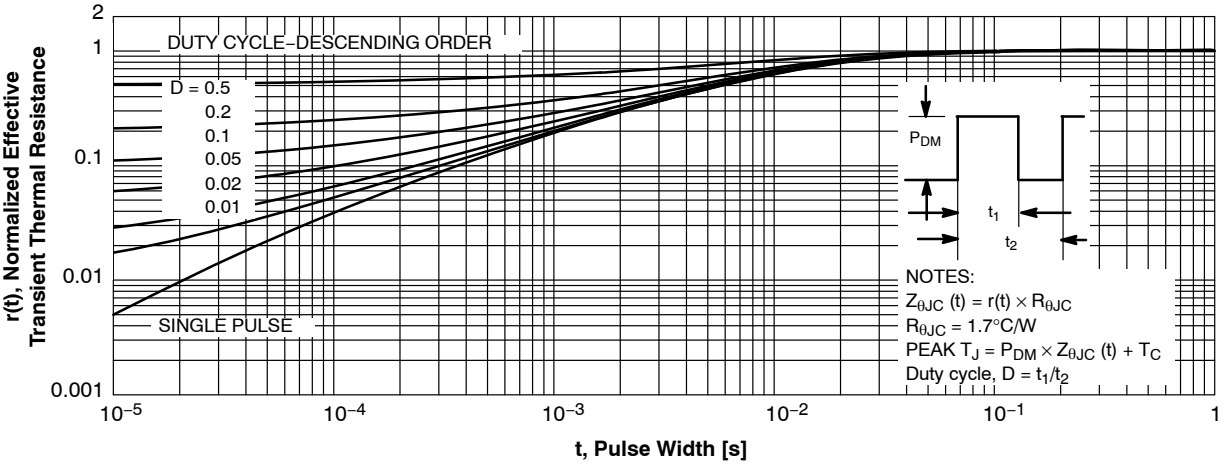
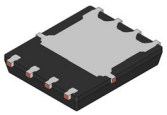


Figure 14. Transient Thermal Response Curve

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS



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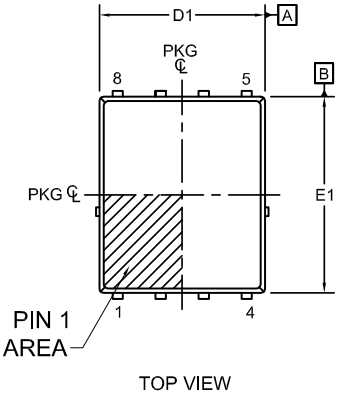
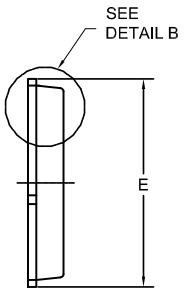
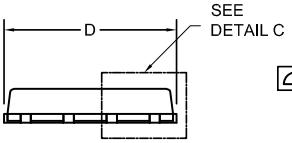


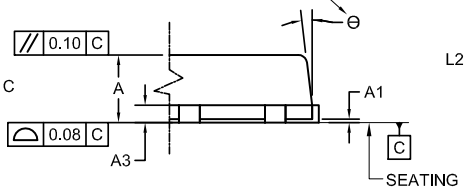
TOP VIEW



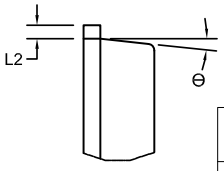
OPTIONAL DRAFT ANGLE MAY APPEAR ON FOUR SIDES OF THE PACKAGE



SIDE VIEW



DETAIL C
SCALE: 2:1

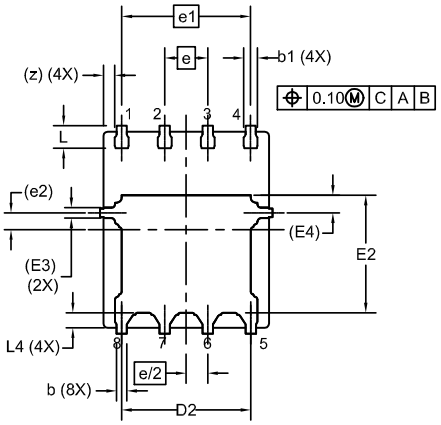


DETAIL B
SCALE: 2:1

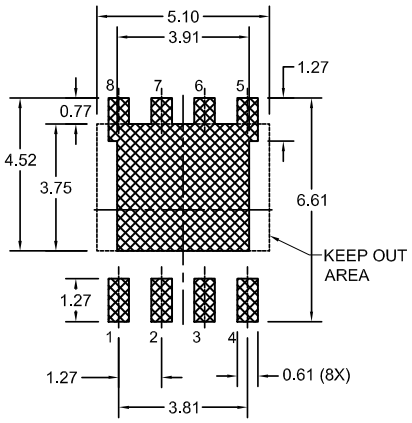
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. SEATING PLANE IS DEFINED BY THE TERMINALS. "A1" IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.
6. IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0.00	-	0.05
b	0.21	0.31	0.41
b1	0.31	0.41	0.51
A3	0.15	0.25	0.35
D	4.90	5.00	5.20
D1	4.80	4.90	5.00
D2	3.61	3.82	3.96
E	5.90	6.15	6.25
E1	5.70	5.80	5.90
E2	3.38	3.48	3.78
E3	0.30 REF		
E4	0.52 REF		
e	1.27 BSC		
e/2	0.635 BSC		
e1	3.81 BSC		
e2	0.50 REF		
L	0.51	0.66	0.76
L2	0.05	0.18	0.30
L4	0.34	0.44	0.54
z	0.34 REF		
Θ	0°	-	12°



BOTTOM VIEW



LAND PATTERN RECOMMENDATION

*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

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