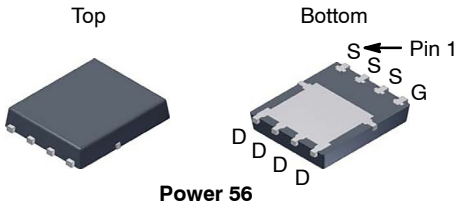
MOSFET – P-Channel, POWERTRENCH®

-100 V, -50 A, 22 mΩ

FDMS86163P

BV_{DSS}	$R_{DS(ON)}$ MAX	I_D MAX
−100 V	22 mΩ @ −10 V	−50 A



Power 56
PQFN8
CASE 483AE

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 and yet maintain superior switching performance.

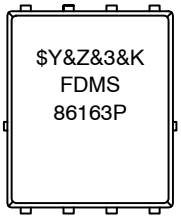
Features

- Max $r_{DS(on)}$ = 22 mΩ at V_{GS} = −10 V, I_D = −7.9 A
- Max $r_{DS(on)}$ = 30 mΩ at V_{GS} = −6 V, I_D = −5.9 A
- Very Low RDS−on Mid Voltage P−Channel Silicon Technology Optimised for Low Qg
- This Product is Optimised for Fast Switching Applications As Well As Load Switch Applications
- 100% UIL Tested
- This Device is Pb−Free, Halogen Free/BFR Free and is RoHS Compliant

Applications

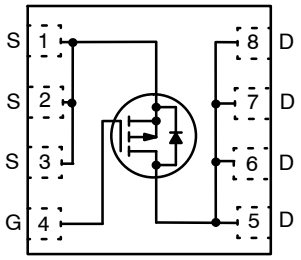
- Active Clamp Switch
- Load Switch

MARKING DIAGRAM



$Y = **onsemi** Logo
&Z = Assembly Location
&3 = 3−Digit Date Code
&K = Lot Code
FDMS86163P = Specific Device Code

PIN CONNECTION



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

Parameter	Parameter	Symbol	Value	Unit
Drain−to−Source Voltage		V_{DS}	−100	V
Gate−to−Source Voltage		V_{GS}	±25	V
Drain Current −Continuous T_C = 25°C −Continuous T_A = 25°C (Note 1a) −Pulsed (Note 4)		I_D	−50 −7.9 −100	A
Single Pulse Avalanche Energy (Note 3)		E_{AS}	486	mJ
Power Dissipation	T_C = 25°C T_A = 25°C (Note1a)	P_D	104 2.5	W
Operating and Storage Junction Temperature Range		T_J, T_{STG}	−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.

ORDERING INFORMATION

Device	Package	Shipping†
FDMS86163P	PQFN−8 (Pb−Free)	3000 / 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.

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.2	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient (Note 1a)	50	

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

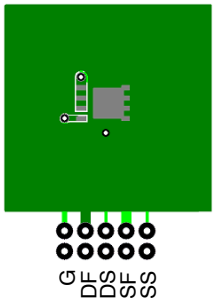
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
B_{VDSS}	Drain to Source Breakdown Voltage	I_D = −250 μA, V_{GS} = 0 V	−100	–	–	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	I_D = −250 μA, Referenced to 25°C	–	−59	–	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = −80 V, V_{GS} = 0 V	–	–	−1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±25 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	−2	−2.8	−4	V
$\Delta V_{GS(th)}/\Delta T_J$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = −250 μA, Referenced to 25°C	–	6.2	–	mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = −10 V, I_D = −7.9 A	–	17.8	22	mΩ
		V_{GS} = −6 V, I_D = −5.9 A	–	21.3	30	
		V_{GS} = −10 V, I_D = −7.9 A, T_J = 125°C	–	29	36	
g_{FS}	Forward Transconductance	V_{DS} = −10 V, I_D = −7.9 A	–	29	–	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = −50 V, V_{GS} = 0 V, f = 1 MHz	–	3070	4085	pF
C_{oss}	Output Capacitance		–	501	670	
C_{rss}	Reverse Transfer Capacitance		–	21	35	
R_g	Gate Resistance		0.1	2.6	5.3	Ω
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn−On Delay	V_{DD} = −50 V, I_D = −7.9 A, V_{GS} = −10 V, R_{GEN} = 6 Ω	–	17	30	ns
t_r	Rise Time		–	8.8	18	
$t_{d(off)}$	Turn−Off Delay		–	33	53	
t_f	Fall Time		–	6.9	14	
Q_g	Total Gate Charge	V_{GS} = 0 V to −10 V; V_{DD} = −50 V, I_D = −7.9 A	–	42	59	nC
Q_g	Total Gate Charge	V_{GS} = 0 V to −6 V; V_{DD} = −50 V, I_D = −7.9 A	–	26	37	
Q_{gs}	Gate to Source Gate Charge	V_{DD} = −50 V, I_D = −7.9 A	–	11.8	–	
Q_{gd}	Gate to Drain “Miller” Charge		–	7.1	–	

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified) (continued)

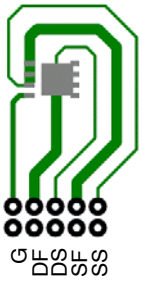
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
DRAIN−SOURCE DIODE CHARACTERISTICS						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = −7.9 A (Note 2)	–	−0.81	−1.3	V
		V_{GS} = 0 V, I_S = −2 A (Note 2)	–	−0.75	−1.2	
t_{rr}	Reverse Recovery Time	I_F = −7.9 A, di/dt = 100 A/μs	–	63	102	ns
Q_{rr}	Reverse Recovery Charge		–	132	210	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 determined with the device mounted on a 1 in2 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) 50°C/W when mounted on a minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.
3. Starting T_J = 25°C; P−ch: L = 3 mH, I_{AS} = −18 A, V_{DD} = −100 V, V_{GS} = −10 V. 100% test at L = 0.1 mH, I_{AS} = −58 A.
4. Pulse Id refers to Figure 11. Forward Bias Safe Operation Area.

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

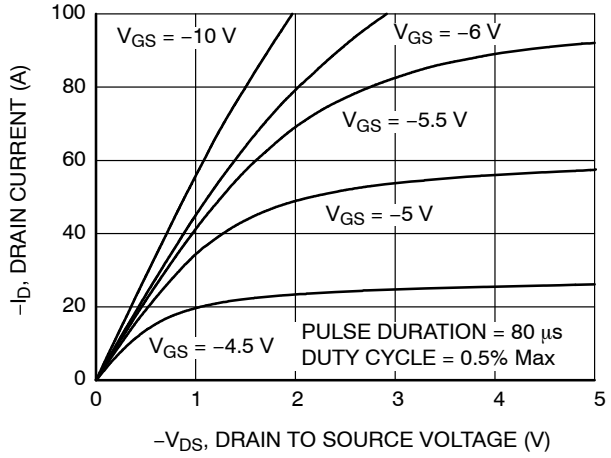


Figure 1. On Region Characteristics

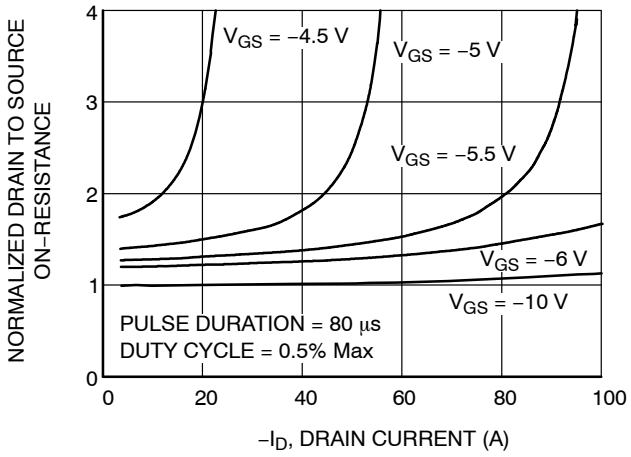


Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

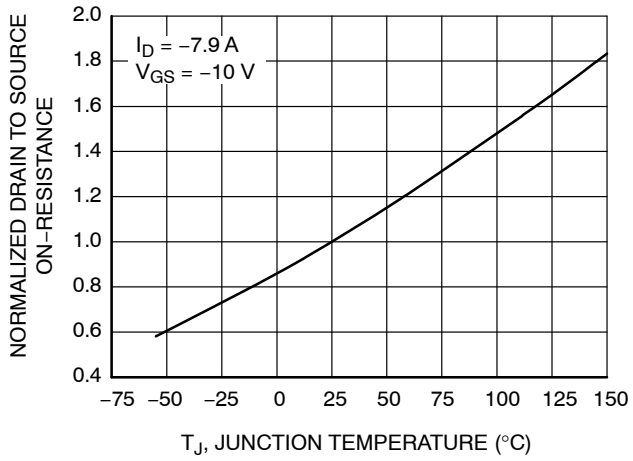


Figure 3. Normalized On Resistance vs. Junction Temperature

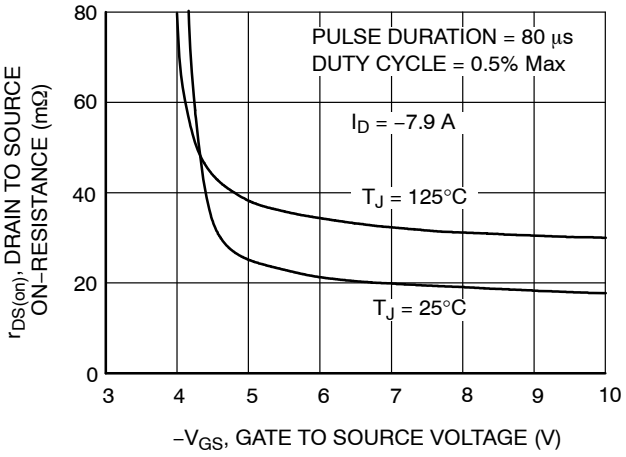


Figure 4. On−Resistance vs. Gate to Source Voltage

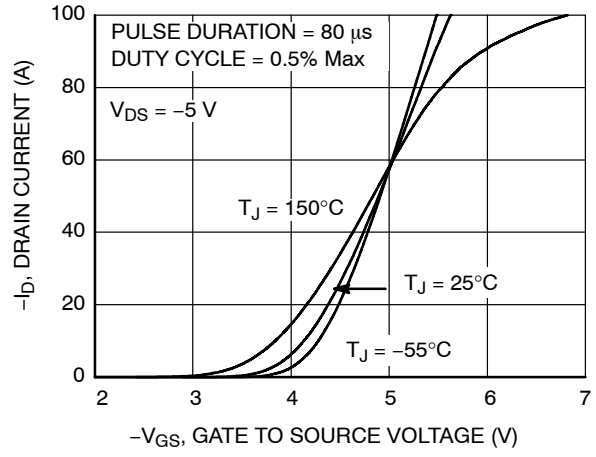


Figure 5. Transfer Characteristics

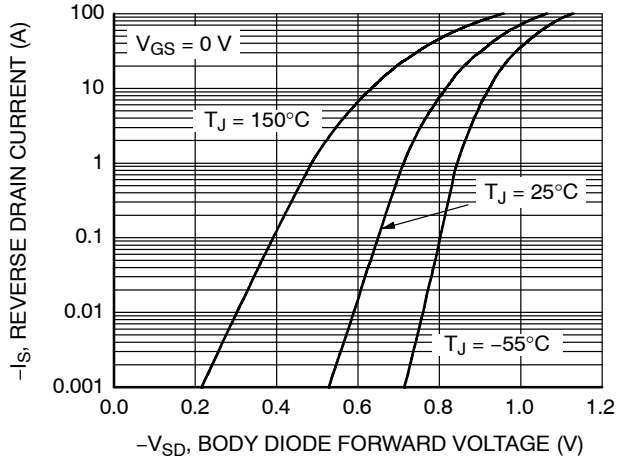


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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

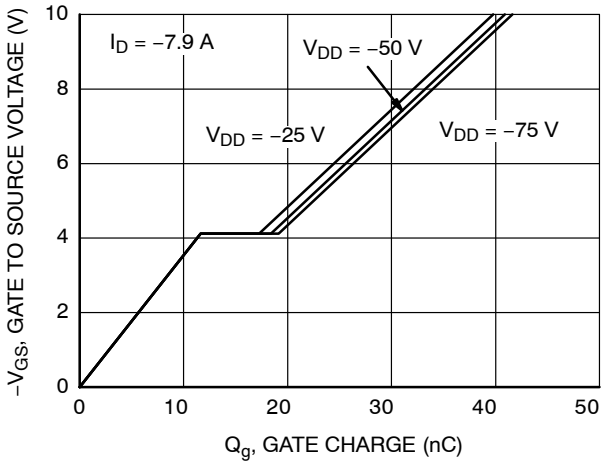


Figure 7. Gate Charge Characteristics

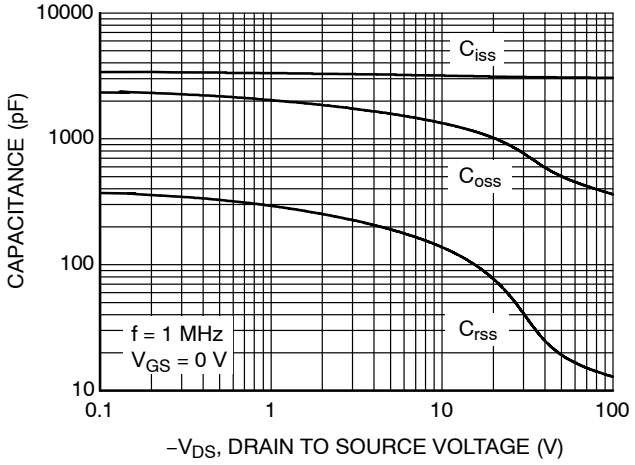


Figure 8. Capacitance vs. Drain to Source Voltage

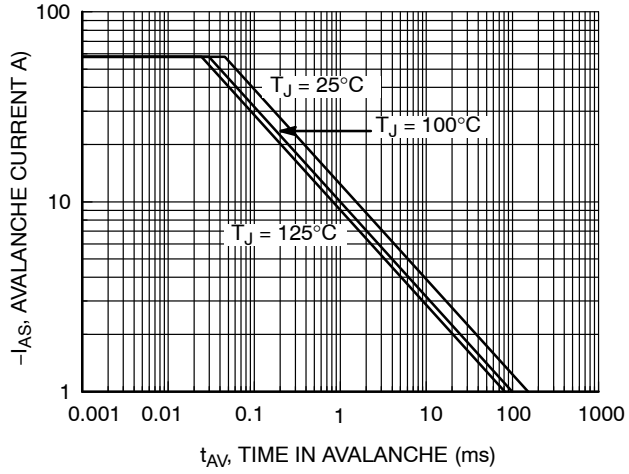


Figure 9. Unclamped Inductive Switching Capability

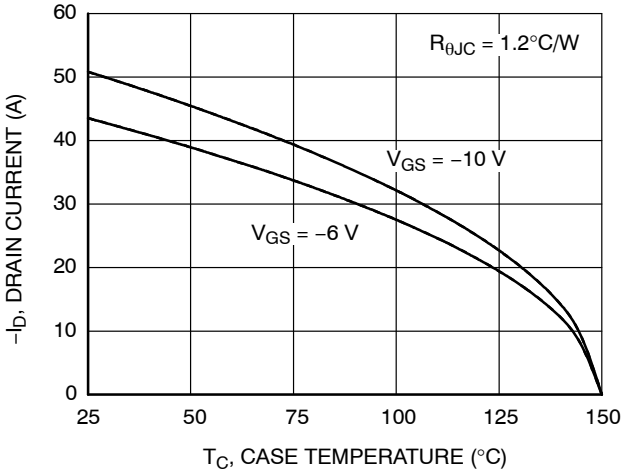


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

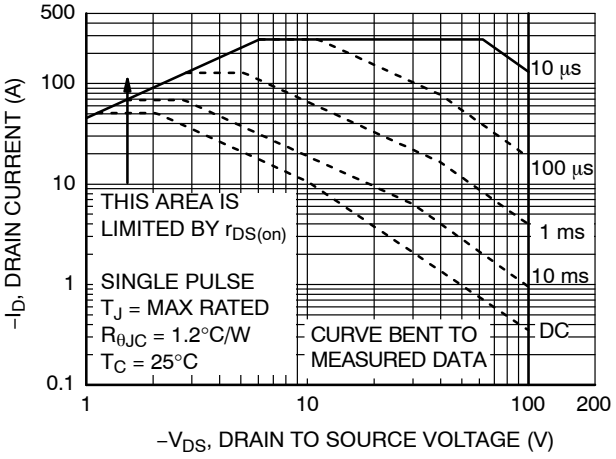


Figure 11. Forward Bias Safe Operating Area

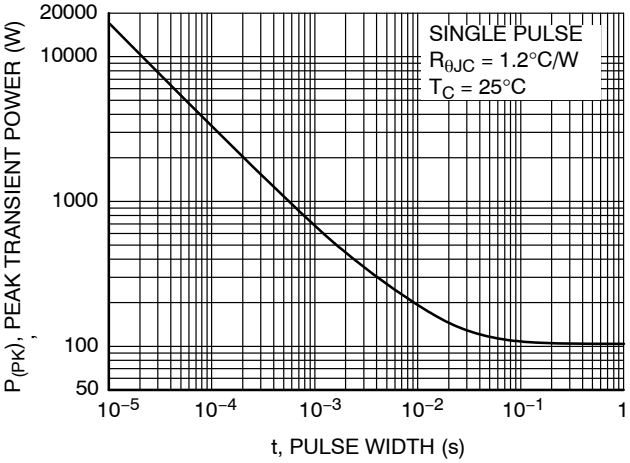


Figure 12. Single Pulse Maximum Power Dissipation

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

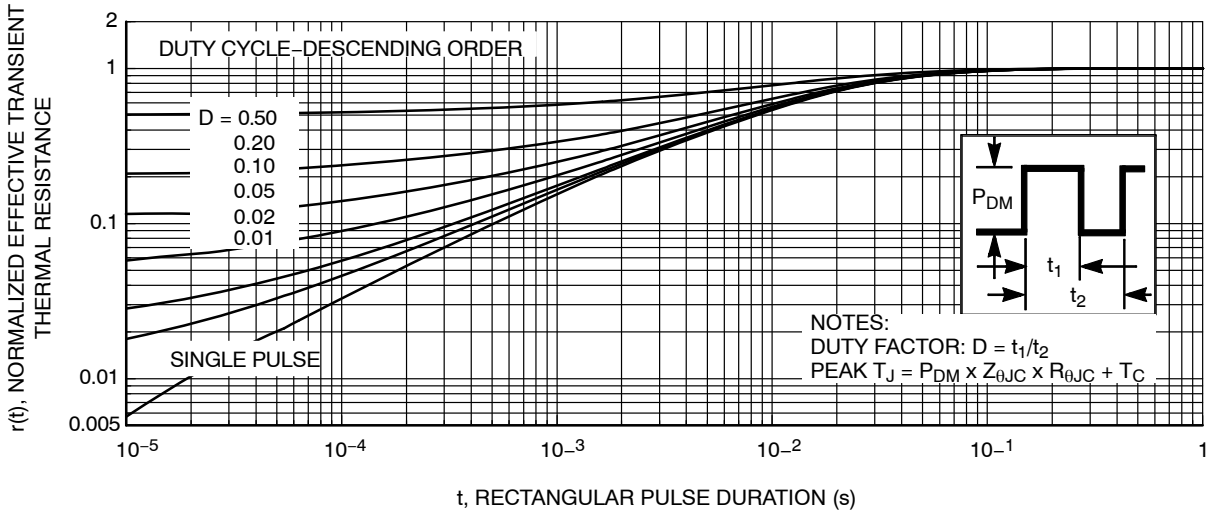
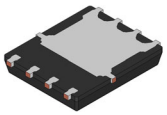


Figure 13. Junction−to−Case Transient Thermal Response Curve

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS



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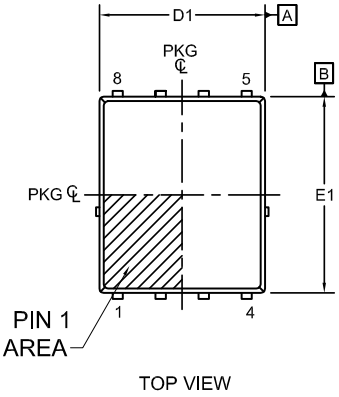
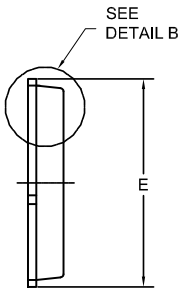
CASE 483AE
ISSUE C

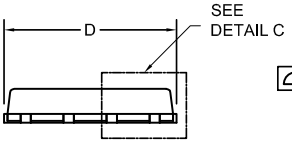
DATE 21 JAN 2022



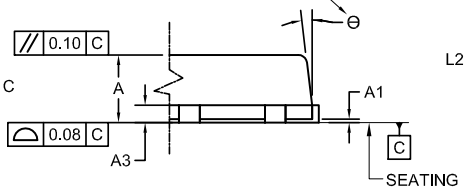
TOP VIEW



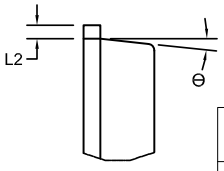
OPTIONAL DRAFT ANGLE MAY APPEAR ON FOUR SIDES OF THE PACKAGE



SIDE VIEW



DETAIL C
SCALE: 2:1

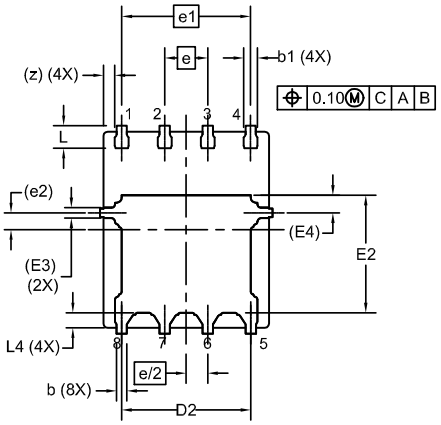


DETAIL B
SCALE: 2:1

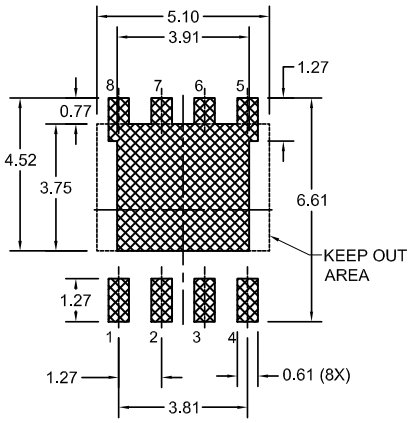
NOTES:

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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