

FDMS86569

MOSFET – N-Channel, POWERTRENCH®

60 V, 65 A, 5.6 mΩ

Features

- Typical $R_{DS(on)}$ = 4.3 mΩ at $V_{GS} = 10$ V, $I_D = 65$ A
- Typical $Q_{g(tot)}$ = 36 nC at $V_{GS} = 10$ V, $I_D = 65$ A
- UIS Capability
- This Device is Pb-Free and is RoHS Compliant

Applications

- Primary Switch for 12 V Systems

MOSFET MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ Unless Otherwise Noted)

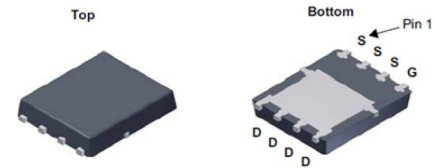
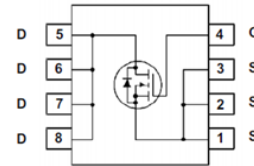
Symbol	Parameter	Ratings	Units
V_{DS}	Drain-to-Source Voltage	60	V
V_{GS}	Gate-to-Source Voltage	± 20	V
I_D	Drain Current - Continuous ($V_{GS} = 10$) (Note 1) $T_C = 25^\circ\text{C}$	65	A
	Pulsed Drain Current $T_C = 25^\circ\text{C}$	See Figure 4	
EAS	Single Pulse Avalanche Energy (Note 2)	41	mJ
P_D	Power Dissipation	100	W
	Derate Above 25°C	0.67	
T_J, T_{STG}	Operating and Storage Temperature	-55 to $+175$	$^\circ\text{C}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.5	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Maximum Thermal Resistance, Junction to Ambient (Note 3)	50	$^\circ\text{C}/\text{W}$

1. Current is limited by bondwire configuration.
2. Starting $T_J = 25^\circ\text{C}$, $L = 30 \mu\text{H}$, $I_{AS} = 52$ A, $V_{DD} = 60$ V during inductor charging and $V_{DD} = 0$ V during time in avalanche.
3. $R_{\theta JA}$ 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 $R_{\theta JA}$ is determined by the board design. The maximum rating presented here is based on mounting on a 1 in² pad of 2oz copper.



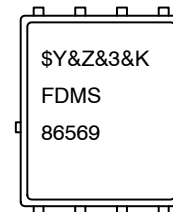
ON Semiconductor®

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PQFN8 5x6, 1.27P
CASE 483BJ
Power 56

MARKING DIAGRAM



- \$Y = ON Semiconductor Logo
- &Z = Assembly Plant Code
- &3 = Numeric Date Code
- &K = Lot Code
- FDMS86569 = Specific Device Code

ORDERING INFORMATION

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

FDMS86569

PACKAGE MARKING AND ORDERING INFORMATION

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS86569	FDMS86569	Power 56	13"	12 mm	3000 Units

ELECTRICAL CHARACTERISTICS $T_J = 25^\circ\text{C}$ Unless Otherwise Noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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OFF CHARACTERISTICS

B_{VDSS}	Drain-to-Source Breakdown Voltage	$I_D = 250 \mu\text{A}$, $V_{GS} = 0 \text{ V}$	60	-	-	V	
I_{DSS}	Drain-to-Source Leakage Current	$V_{DS} = 60 \text{ V}$, $V_{GS} = 0 \text{ V}$	$T_J = 25^\circ\text{C}$	-	-	1	μA
			$T_J = 175^\circ\text{C}$ (Note 4)	-	-	1	mA
I_{GSS}	Gate-to-Source Leakage Current	$V_{GS} = \pm 20 \text{ V}$	-	-	± 100	nA	

ON CHARACTERISTICS

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250 \mu\text{A}$	2.0	2.8	4.0	V	
$R_{DS(on)}$	Drain to Source On Resistance	$I_D = 65 \text{ A}$, $V_{GS} = 10 \text{ V}$	$T_J = 25^\circ\text{C}$	-	4.3	5.6	$\text{m}\Omega$
			$T_J = 175^\circ\text{C}$ (Note 4)	-	8.3	10.8	$\text{m}\Omega$

DYNAMIC CHARACTERISTICS

C_{iss}	Input Capacitance	$V_{DS} = 30 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$	-	2560	-	pF
C_{oss}	Output Capacitance		-	740	-	pF
C_{rss}	Reverse Transfer Capacitance		-	40	-	pF
R_g	Gate Resistance	$V_{GS} = 0.5 \text{ V}$, $f = 1 \text{ MHz}$	-	2.0	-	Ω
$Q_{g(ToT)}$	Total Gate Charge	$V_{GS} = 0$ to 10 V	-	36	54	nC
$Q_{g(th)}$	Threshold Gate Charge	$V_{GS} = 0$ to 2 V				
Q_{gs}	Gate-to-Source Gate Charge	$V_{DD} = 30 \text{ V}$ $I_D = 65 \text{ A}$	-	14	-	nC
Q_{gd}	Gate-to-Drain "Miller" Charge		-	7	-	nC

SWITCHING CHARACTERISTICS

t_{on}	Turn-On Time	$V_{DD} = 30 \text{ V}$, $I_D = 65 \text{ A}$, $V_{GS} = 10 \text{ V}$, $R_{GEN} = 6 \Omega$	-	-	36	ns
$t_{d(on)}$	Turn-On Delay		-	16	-	ns
t_r	Rise Time		-	11	-	ns
$t_{d(off)}$	Turn-Off Delay		-	23	-	ns
t_f	Fall Time		-	8	-	ns
t_{off}	Turn-Off Time		-	-	41	ns

DRAIN-SOURCE DIODE CHARACTERISTICS

V_{SD}	Source-to-Drain Diode Voltage	$I_{SD} = 65 \text{ A}$, $V_{GS} = 0 \text{ V}$	-	-	1.25	V
		$I_{SD} = 32.5 \text{ A}$, $V_{GS} = 0 \text{ V}$	-	-	1.2	V
t_{rr}	Reverse-Recovery Time	$V_{DD} = 48 \text{ V}$, $I_F = 65 \text{ A}$, $di_{SD}/dt = 100 \text{ A}/\mu\text{s}$	-	55	72	ns
Q_{rr}	Reverse-Recovery Charge		-	45	59	nC

4. The maximum value is specified by design at $T_J = 175^\circ\text{C}$. Product is not tested to this condition in production.

TYPICAL CHARACTERISTICS

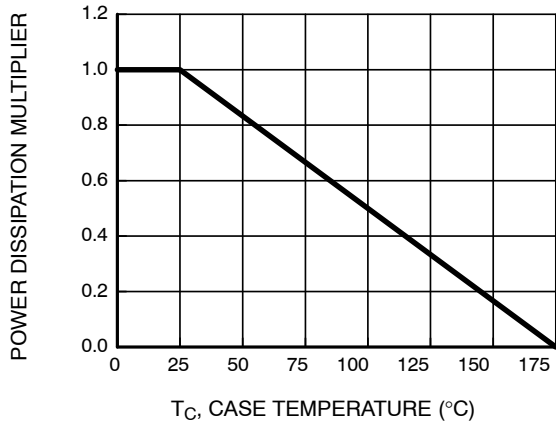


Figure 1. Normalized Power Dissipation vs. Case Temperature

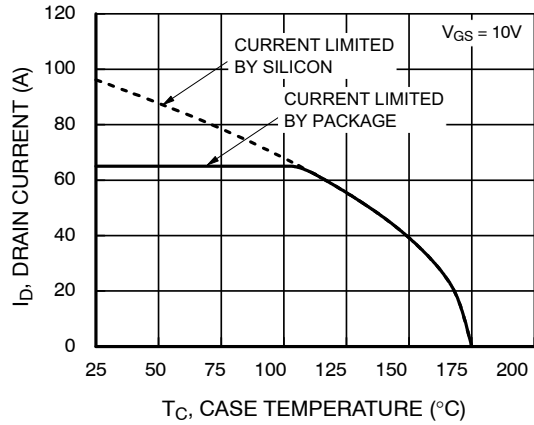


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

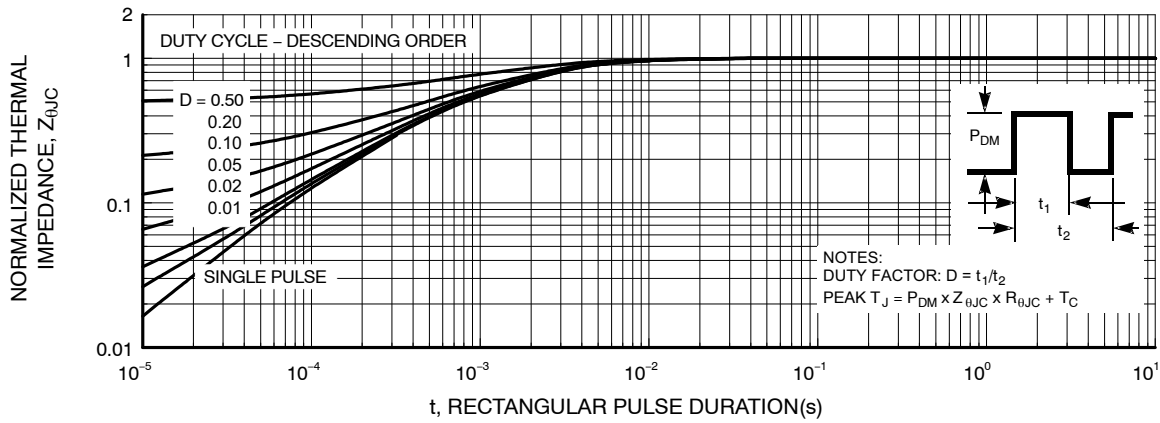


Figure 3. Normalized Maximum Transient Thermal Impedance

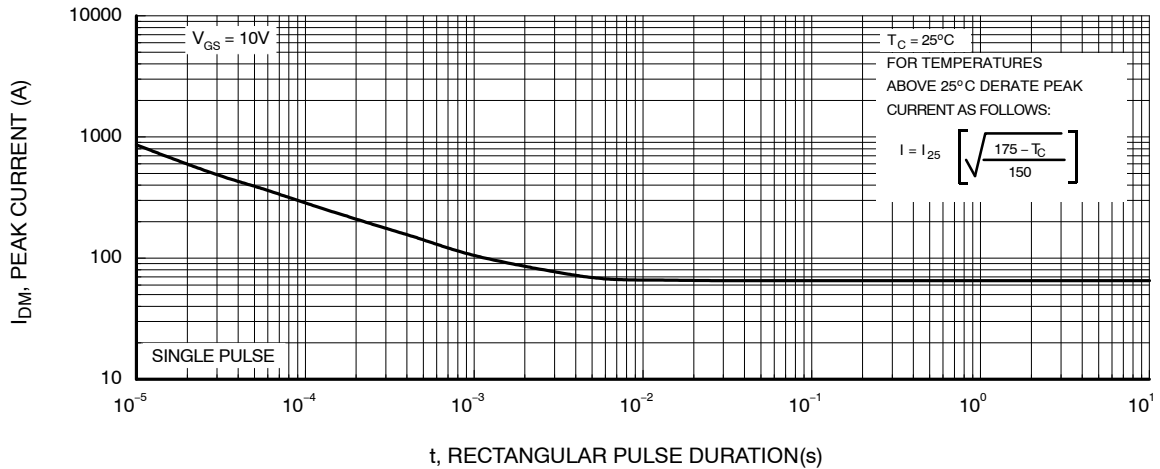


Figure 4. Peak Current Capability

TYPICAL CHARACTERISTICS (continued)

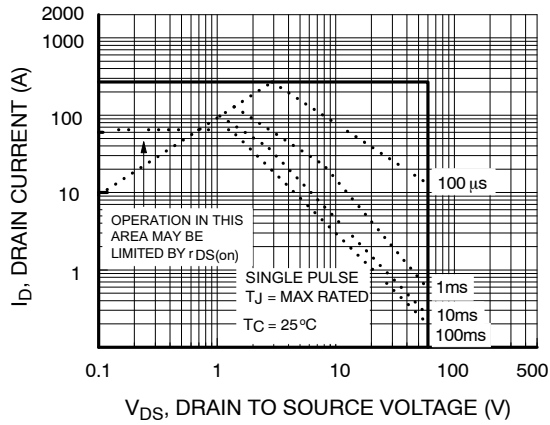
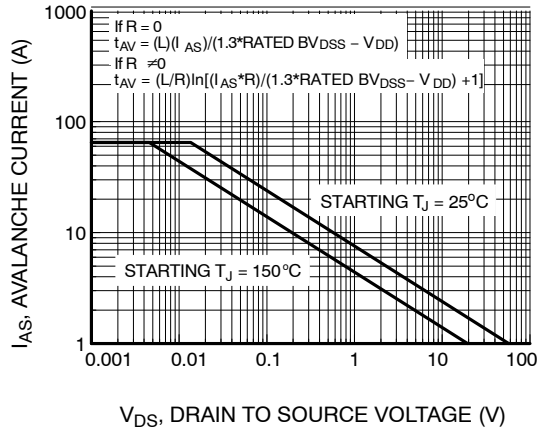


Figure 5. Forward Bias Safe Operating Area



NOTE:
Refer to ON Semiconductor Application Notes AN7514 and AN7515.

Figure 6. Unclamped Inductive Switching Capability

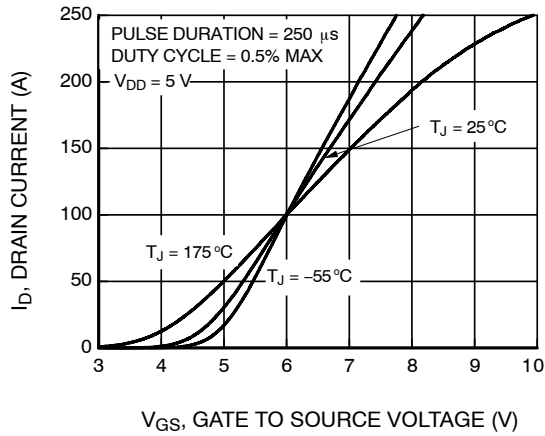


Figure 7. Transfer Characteristics

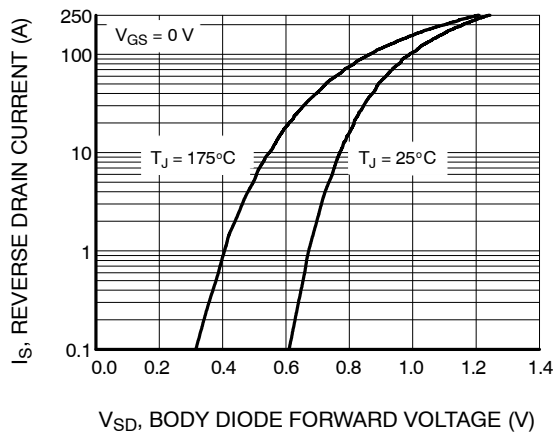


Figure 8. Forward Diode Characteristics

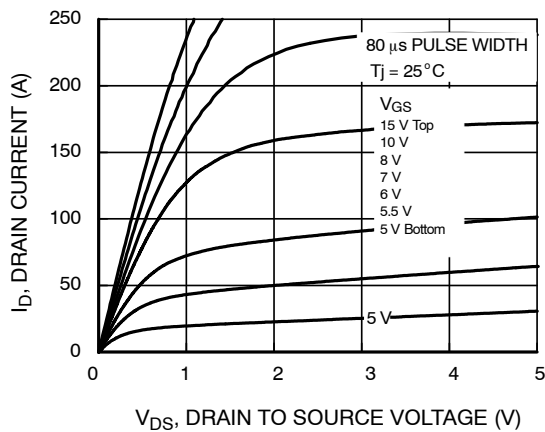


Figure 9. Saturation Characteristics

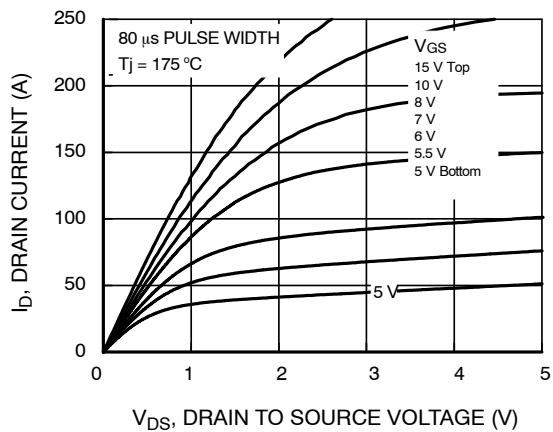


Figure 10. Saturation Characteristics

TYPICAL CHARACTERISTICS (continued)

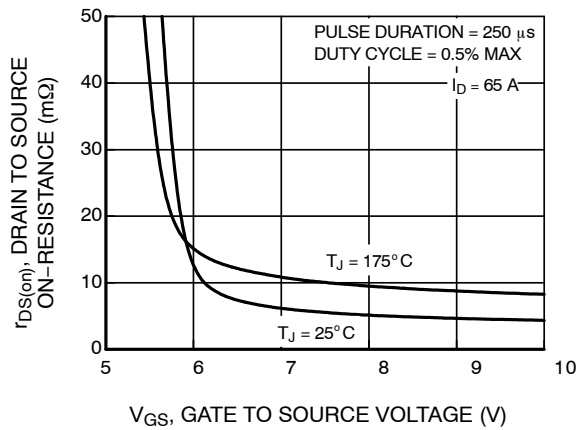


Figure 11. $R_{DS(on)}$ vs. Gate Voltage

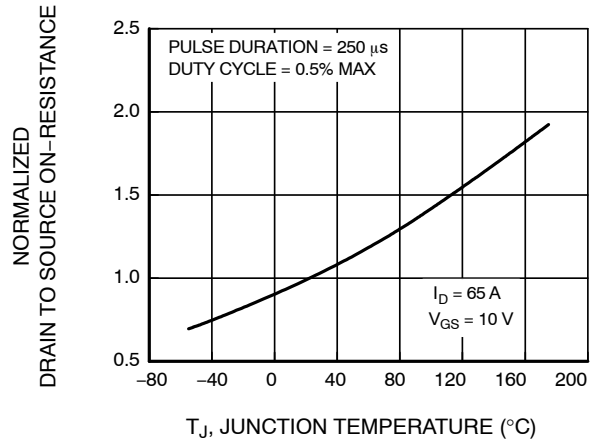


Figure 12. Normalized $R_{DS(on)}$ vs. Junction Temperature

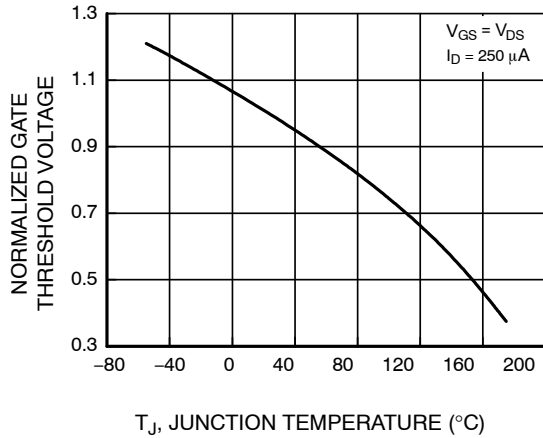


Figure 13. Normalized Gate Threshold Voltage vs. Temperature

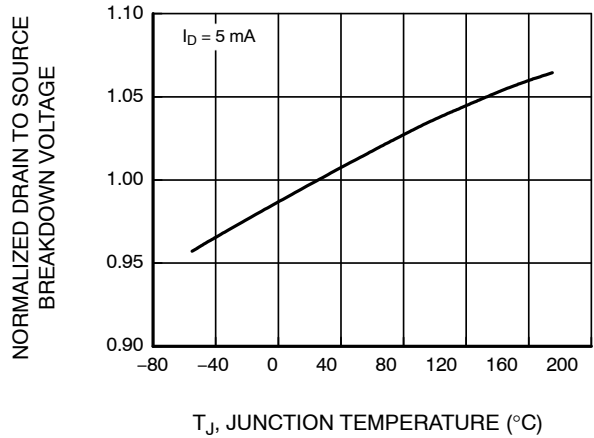


Figure 14. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

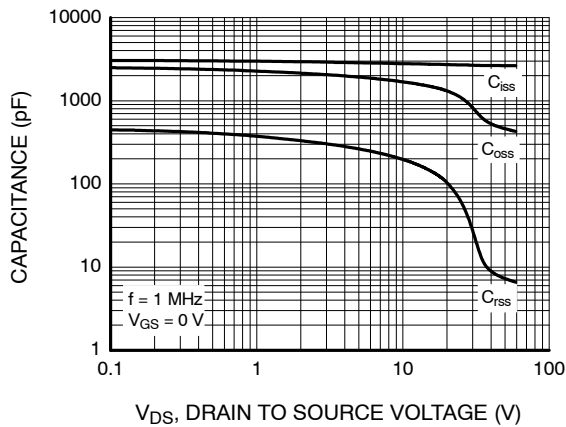


Figure 15. Capacitance vs. Drain to Source Voltage

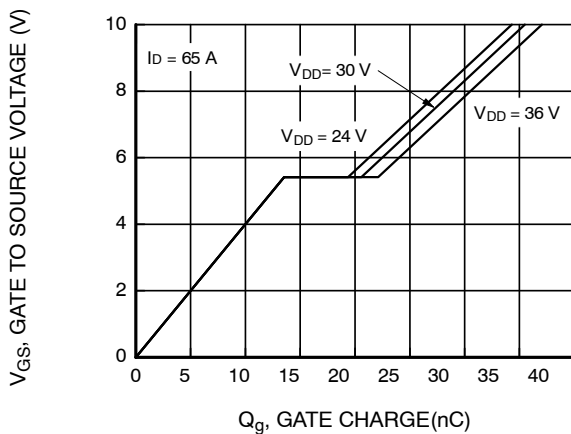
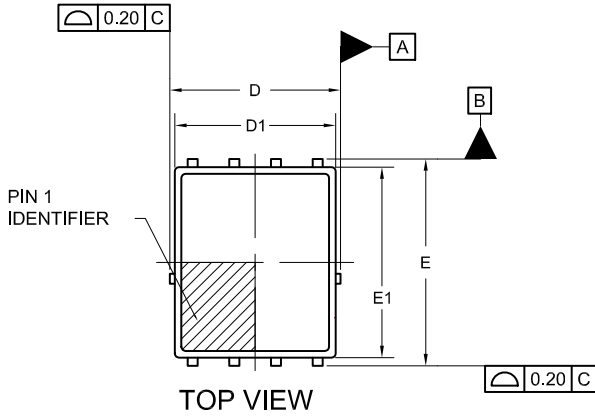


Figure 16. Gate Charge vs. Gate to Source Voltage

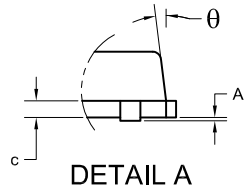
PACKAGE DIMENSIONS

PQFN8 5X6, 1.27P
CASE 483BJ
ISSUE C

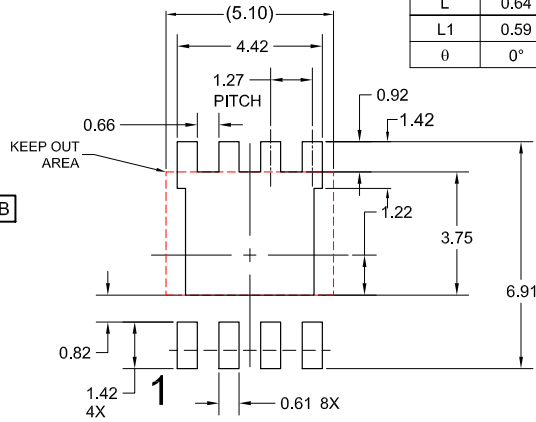
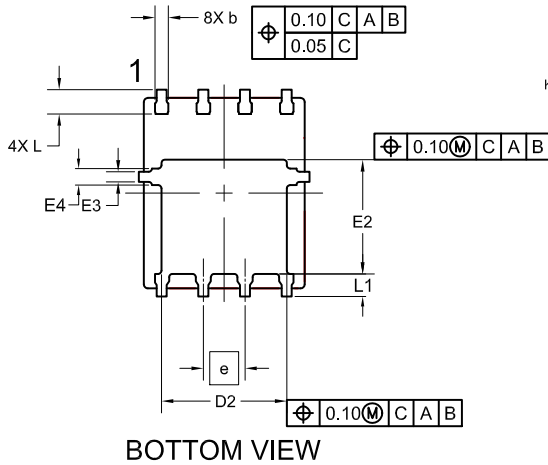
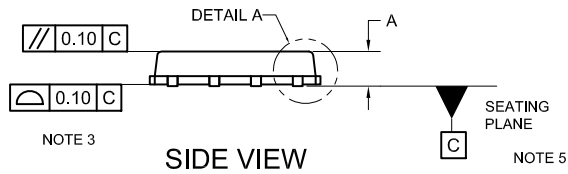


NOTES:

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.




DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0.00	0.025	0.05
b	0.31	0.41	0.51
c	0.23	0.28	0.33
D	4.90	5.00	5.10
D1	4.80	4.90	5.00
D2	3.72	3.82	3.92
E	6.20	6.30	6.40
E1	5.70	5.80	5.90
E2	3.38	3.48	3.58
E3	0.30		
E4	0.50		
e	1.27 BSC		
L	0.64	0.74	0.84
L1	0.59	0.69	0.79
θ	0°	—	12°



RECOMMENDED MOUNTING FOOTPRINT

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