

MOSFET – N-Channel, POWERTRENCH®

80 V, 130 A, 2.4 mΩ

FDMS86350

Description

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

Features

- Max $R_{DS(on)}$ = 2.4 mΩ at $V_{GS} = 10\text{ V}$, $I_D = 25\text{ A}$
- Max $R_{DS(on)}$ = 3.2 mΩ at $V_{GS} = 8\text{ V}$, $I_D = 22\text{ A}$
- Advanced Package and Silicon Combination for Low $R_{DS(on)}$ and High Efficiency
- MSL1 Robust Package Design
- 100% UIL Tested
- RoHS Compliant
- These Device is Halogen Free

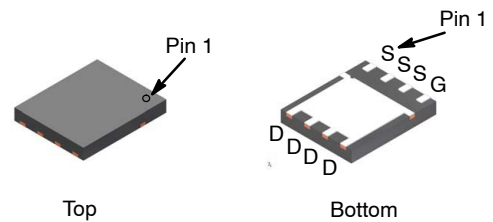
Applications

- Primary MOSFET
- Synchronous Rectifier
- Load Switch
- Motor Control Switch

MOSFET MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

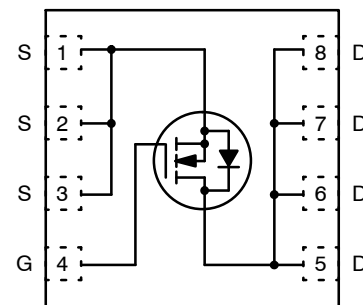
Symbol	Parameter	Ratings	Unit
V_{DS}	Drain to Source Voltage	80	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current – Continuous $T_C = 25^\circ\text{C}$ – Continuous $T_A = 25^\circ\text{C}$ (Note 1a) – Pulsed (Note 4)	130	A
		25	
		300	
E_{AS}	Single Pulse Avalanche Energy (Note 3)	864	mJ
P_D	Power Dissipation, $T_C = 25^\circ\text{C}$	156	W
	Power Dissipation, $T_A = 25^\circ\text{C}$ (Note 1a)	2.7	
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.

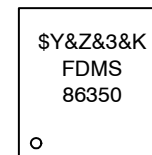


PQFN8 5X6, 1.27P
CASE 483AG

ELECTRICAL CONNECTION



MARKING DIAGRAM



- \$Y = Logo
- &Z = Assembly Location
- &3 = Date Code (Year and Week)
- &K = Lot Run Traceability Code
- FDMS = Specific Device Code
- 86350 = Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 3 of this data sheet.

FDMS86350

THERMAL CHARACTERISTICS

Symbol	Parameter	Rating	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.8	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	45	

ELECTRICAL CHARACTERISTICS $T_J = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}$, $V_{GS} = 0 \text{ V}$	80	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, referenced to 25°C	–	45	–	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 64 \text{ V}$, $V_{GS} = 0 \text{ V}$	–	–	1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20 \text{ V}$, $V_{DS} = 0 \text{ V}$	–	–	± 100	nA

ON CHARACTERISTICS

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250 \mu\text{A}$	2.5	3.8	4.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, referenced to 25°C	–	–12	–	mV/°C
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}$, $I_D = 25 \text{ A}$	–	2.0	2.4	m Ω
		$V_{GS} = 8 \text{ V}$, $I_D = 22 \text{ A}$	–	2.5	3.2	
		$V_{GS} = 10 \text{ V}$, $I_D = 25 \text{ A}$, $T_J = 125^\circ\text{C}$	–	3.1	3.8	
g_{FS}	Forward Transconductance	$V_{DS} = 5 \text{ V}$, $I_D = 25 \text{ A}$	–	70	–	S

DYNAMIC CHARACTERISTICS

C_{ISS}	Input Capacitance	$V_{DS} = 40 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$	–	8030	10680	pF
C_{OOS}	Output Capacitance		–	1370	1825	pF
C_{rss}	Reverse Transfer Capacitance		–	31	50	pF
R_g	Gate Resistance		0.1	1.1	3	Ω

SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 40 \text{ V}$, $I_D = 25 \text{ A}$, $V_{GS} = 10 \text{ V}$, $R_{GEN} = 6 \Omega$	–	50	80	ns	
t_r	Rise Time		–	34	55	ns	
$t_{d(off)}$	Turn-Off Delay Time		–	40	65	ns	
t_f	Fall Time		–	11	20	ns	
Q_g	Total Gate Charge	$V_{GS} = 0 \text{ V}$ to 10 V	$V_{DD} = 40 \text{ V}$, $I_D = 25 \text{ A}$	–	110	155	nC
Q_g	Total Gate Charge	$V_{GS} = 0 \text{ V}$ to 8 V		–	90	127	nC
Q_{gs}	Gate to Source Charge		–	46	–	nC	
Q_{gd}	Gate to Drain "Miller" Charge		–	23	–	nC	

DRAIN-SOURCE DIODE CHARACTERISTICS

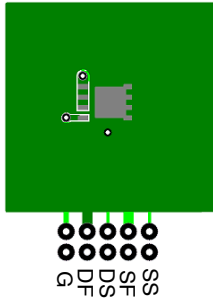
I_S	Diode Continuous Forward Current	$T_C = 25^\circ\text{C}$	–	–	130	A
$I_{S,pulse}$	Diode Pulse Current	$T_C = 25^\circ\text{C}$	–	–	300	A
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V}$, $I_S = 2.1 \text{ A}$ (Note 2)	–	0.71	1.2	V
		$V_{GS} = 0 \text{ V}$, $I_S = 25 \text{ A}$ (Note 2)	–	0.79	1.3	
t_{rr}	Reverse Recovery Time	$I_F = 25 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$	–	63	101	ns
Q_{rr}	Reverse Recovery Charge		–	62	100	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.

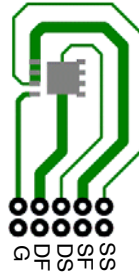
FDMS86350

NOTES:

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. 45°C/W when mounted on a 1 in² pad of 2 oz copper



b. 115°C/W when mounted on a minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.
3. E_{AS} of 864 mJ is based on starting $T_J = 25^\circ\text{C}$; $L = 3\text{ mH}$, $I_{AS} = 24\text{ A}$, $V_{DD} = 80\text{ V}$, $V_{GS} = 10\text{ V}$. 100% test at $L = 0.1\text{ mH}$, $I_{AS} = 74\text{ A}$.
4. Pulse Id limited by junction temperature, $t_d \leq 100\ \mu\text{s}$, please refer to SOA curve for more details.

PACKAGE MARKING AND ORDERING INFORMATION

ORDERING INFORMATION

Device Marking	Device	Package	Reel Size	Tape Width	Shipping [†]
FDMS86350	FDMS86350	PQFN8 (Power 56) (Halogen Free)	13"	12 mm	3000 / Tape and 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.

TYPICAL CHARACTERISTICS

($T_J = 25^\circ\text{C}$ unless otherwise noted)

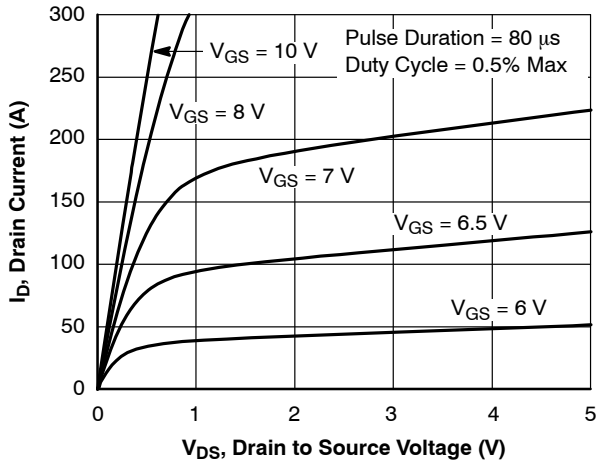


Figure 1. On-Region Characteristics

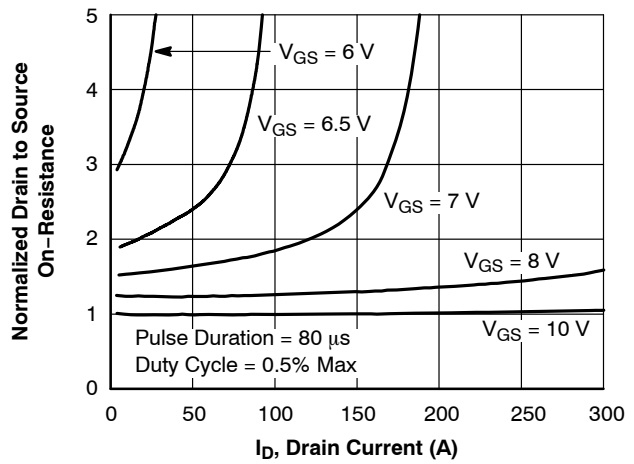


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

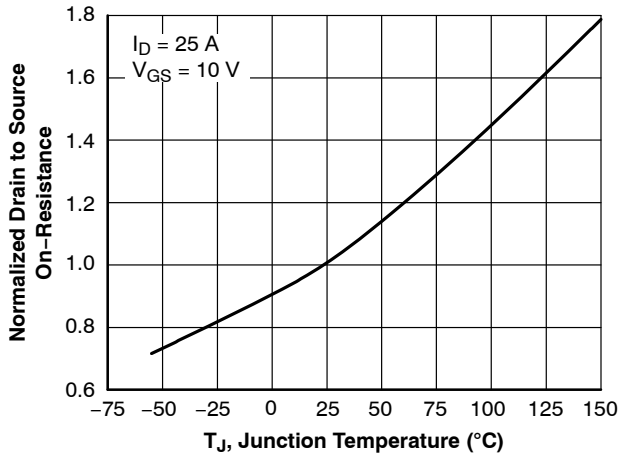


Figure 3. Normalized On-Resistance vs. Junction Temperature

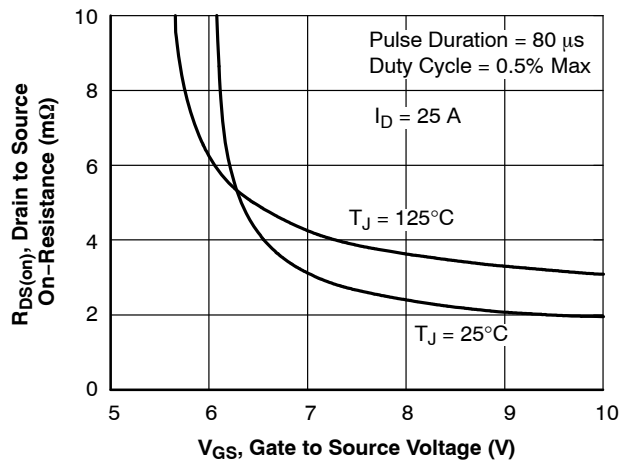


Figure 4. On-Resistance vs. Gate to Source Voltage

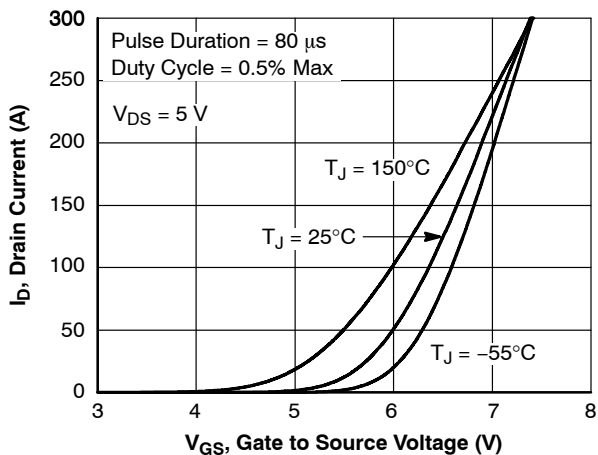


Figure 5. Transfer Characteristics

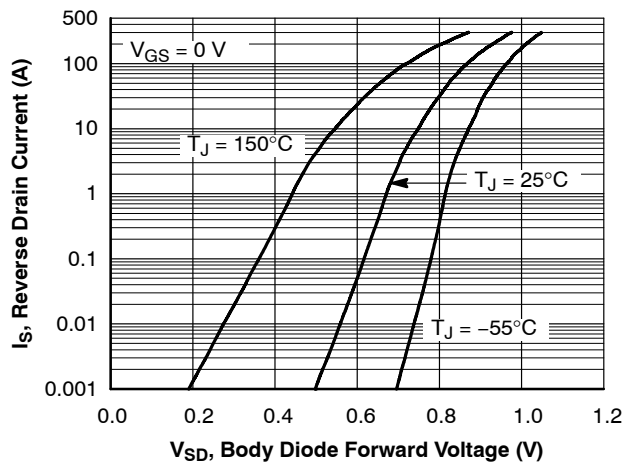


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS (continued)

($T_J = 25^\circ\text{C}$ unless otherwise noted)

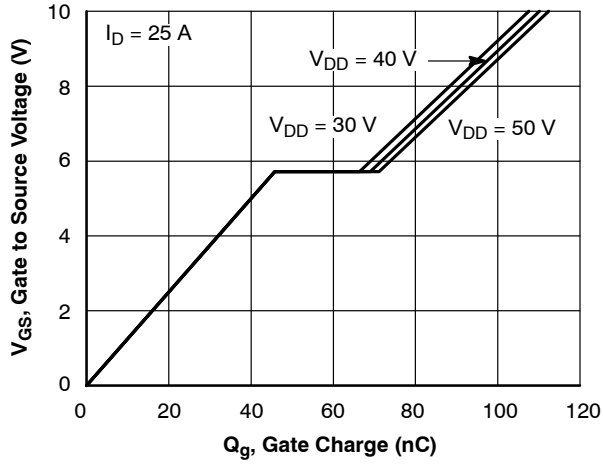


Figure 7. Gate Charge Characteristics

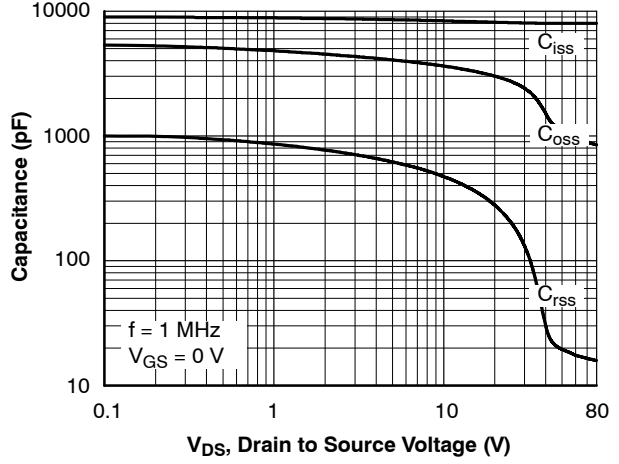


Figure 8. Capacitance vs. Drain to Source Voltage

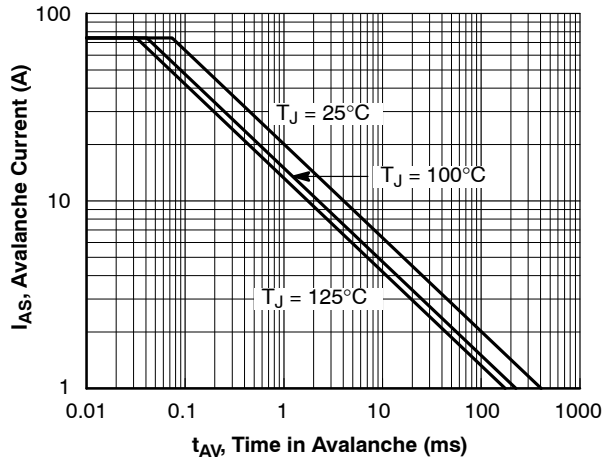


Figure 9. Unclamped Inductive Switching Capability

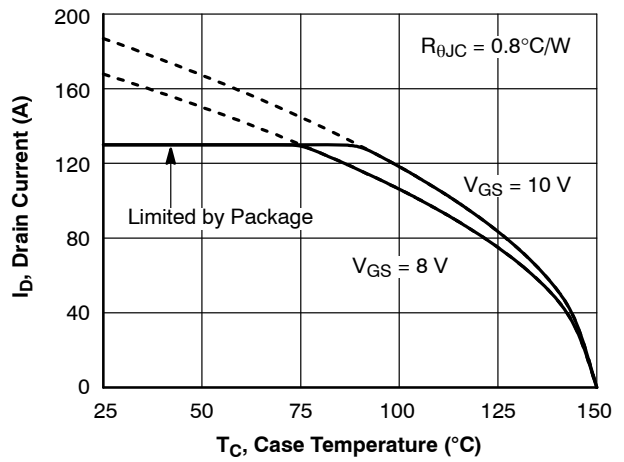


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

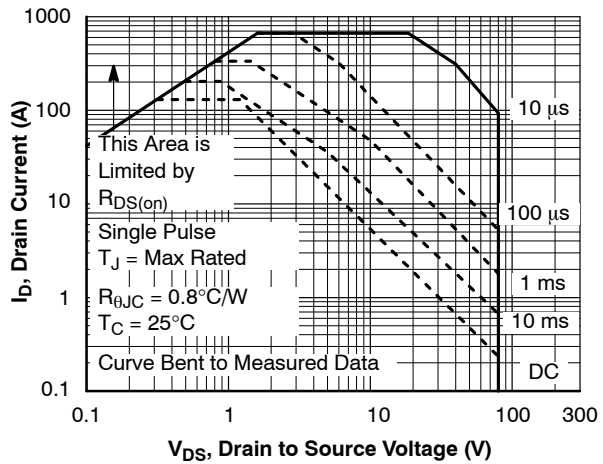


Figure 11. Forward Bias Safe Operating Area

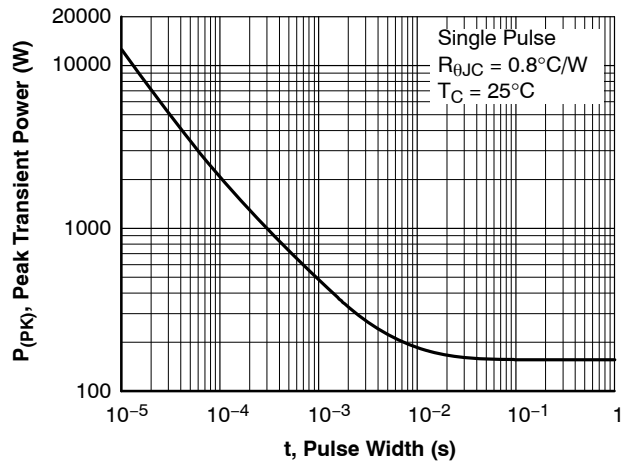


Figure 12. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS (continued)

($T_J = 25^\circ\text{C}$ unless otherwise noted)

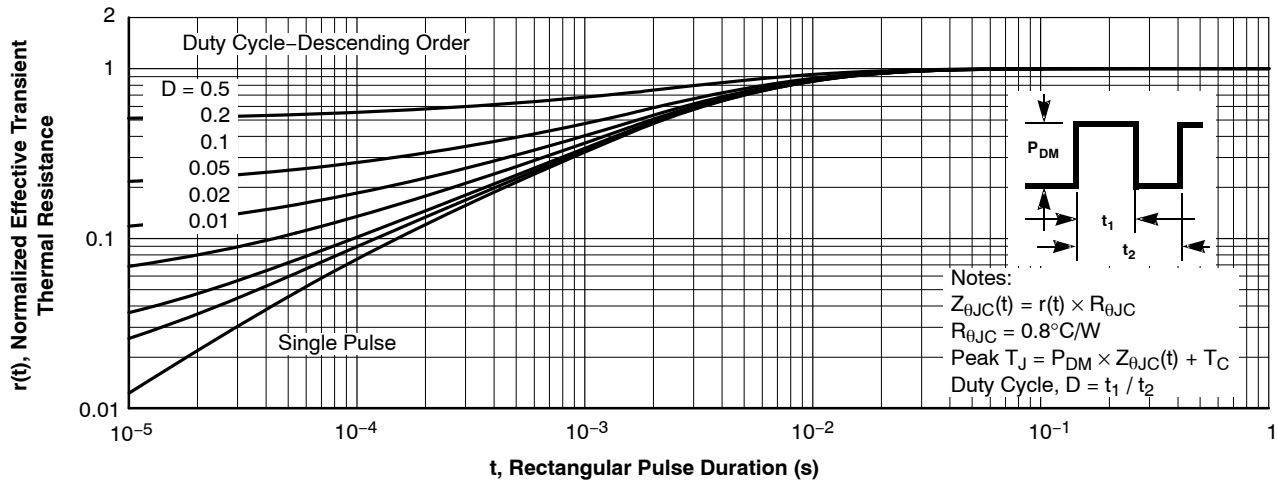
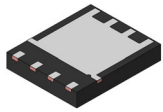


Figure 13. Junction-to-Case Transient Thermal Response Curve

MECHANICAL CASE OUTLINE

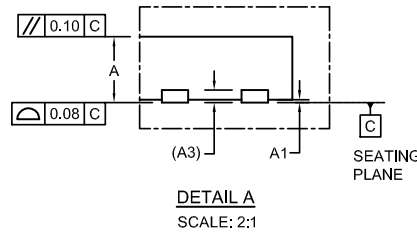
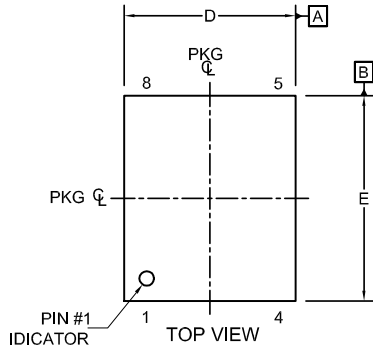
PACKAGE DIMENSIONS

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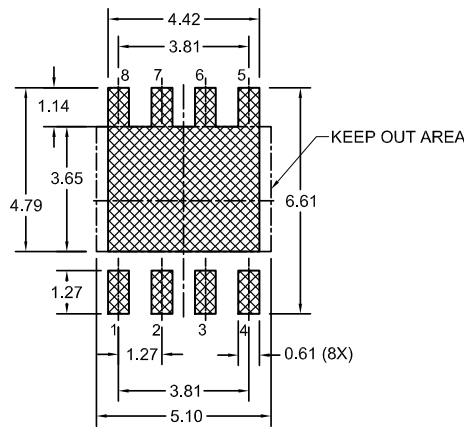
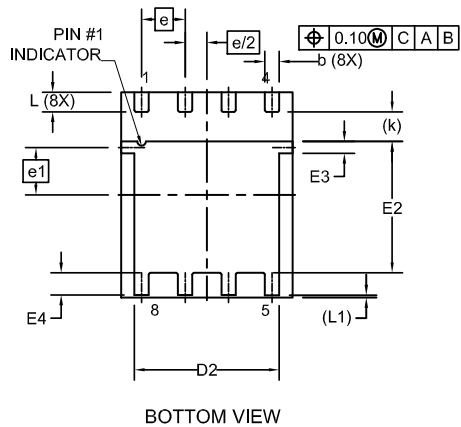
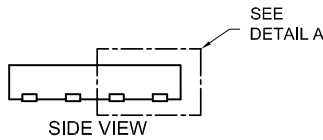
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DATE 25 JUN 2021



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.



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.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0.00	-	0.05
A3	0.20 REF		
b	0.37	0.42	0.47
D	4.90	5.00	5.10
D2	4.13	4.23	4.33
E	5.90	6.00	6.10
E2	3.74	3.84	3.94
E3	0.25	0.35	0.45
E4	0.60	0.70	0.80
e	1.27 BSC		
e/2	0.635 BSC		
e1	1.31 BSC		
k	0.86 REF		
L	0.47	0.57	0.67
L1	0.08REF		

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