

# 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

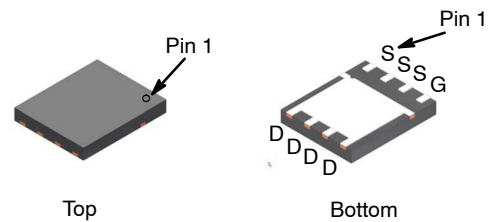
### Applications

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

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

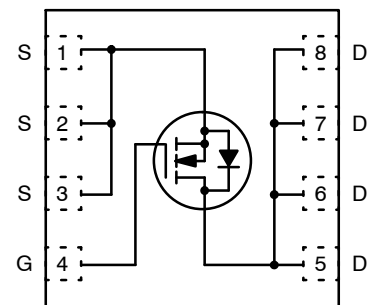
Symbol	Parameter	Ratings	Unit
$V_{DS}$	Drain to Source Voltage	80	V
$V_{GS}$	Gate to Source Voltage	±20	V
$I_D$	Drain Current		A
	– Continuous $T_C = 25^\circ\text{C}$	130	
	– Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	25	
	– Pulsed (Note 4)	300	
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	864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

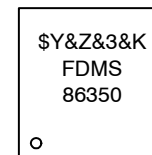


PQFN8 5X6, 1.27P  
CASE 483AG

### 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
<b>OFF CHARACTERISTICS</b>						
$BV_{DSS}$	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 $25^\circ\text{C}$	–	45	–	mV/°C
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 64 \text{ V}$ , $V_{GS} = 0 \text{ V}$	–	–	1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20 \text{ V}$ , $V_{DS} = 0 \text{ V}$	–	–	$\pm 100$	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 $25^\circ\text{C}$	–	–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 $\Omega$
		$V_{GS} = 8 \text{ V}$ , $I_D = 22 \text{ A}$	–	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	$\Omega$

## 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 $10 \text{ V}$	$V_{DD} = 40 \text{ V}$ , $I_D = 25 \text{ A}$	–	110	155	nC
$Q_g$	Total Gate Charge	$V_{GS} = 0 \text{ V}$ to $8 \text{ V}$		–	90	127	nC
$Q_{gs}$	Gate to Source Charge		–	46	–	nC	
$Q_{gd}$	Gate to Drain "Miller" Charge		–	23	–	nC	

## DRAIN-SOURCE DIODE CHARACTERISTICS

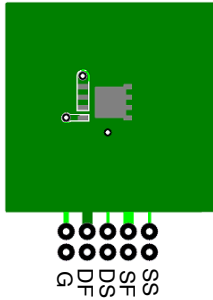
$I_S$	Diode Continuous Forward Current	$T_C = 25^\circ\text{C}$	–	–	130	A
$I_{S,pulse}$	Diode Pulse Current	$T_C = 25^\circ\text{C}$	–	–	300	A
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V}$ , $I_S = 2.1 \text{ A}$ (Note 2)	–	0.71	1.2	V
		$V_{GS} = 0 \text{ V}$ , $I_S = 25 \text{ A}$ (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.

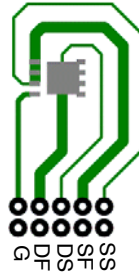
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**NOTES:**

1.  $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> 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 in<sup>2</sup> 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  $\mu$ s, Duty cycle < 2.0%.
3.  $E_{AS}$  of 864 mJ is based on starting  $T_J = 25^\circ\text{C}$ ;  $L = 3$  mH,  $I_{AS} = 24$  A,  $V_{DD} = 80$  V,  $V_{GS} = 10$  V. 100% test at  $L = 0.1$  mH,  $I_{AS} = 74$  A.
4. Pulse Id limited by junction temperature,  $t_d \leq 100$   $\mu$ 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 <sup>†</sup>
FDMS86350	FDMS86350	PQFN8 (Power 56) (Halogen Free)	13"	12 mm	3000 / Tape and Reel

<sup>†</sup>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)

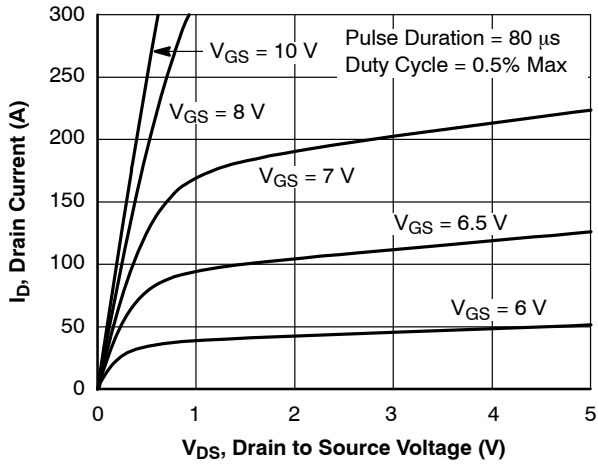


Figure 1. On-Region Characteristics

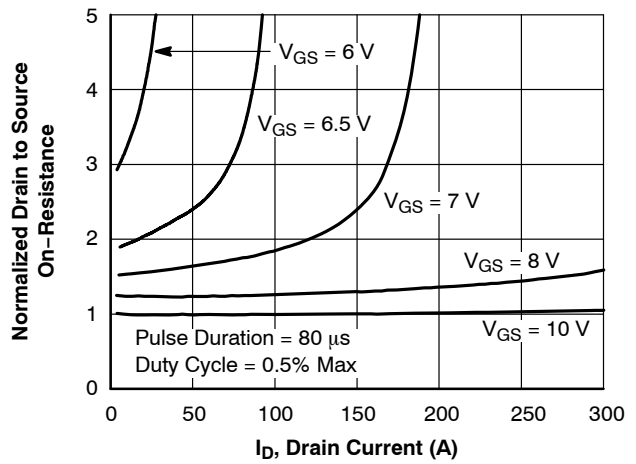


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

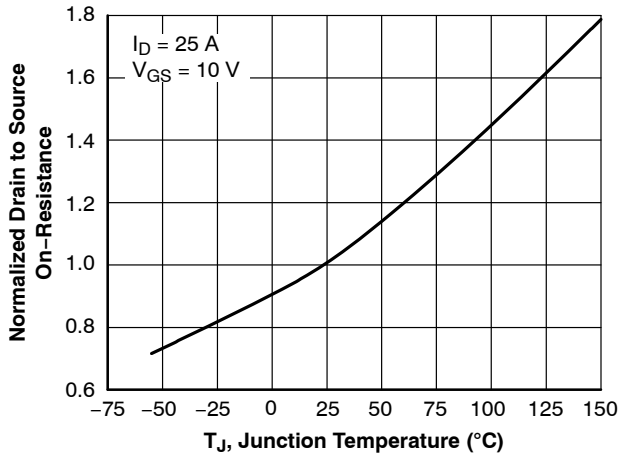


Figure 3. Normalized On-Resistance vs. Junction Temperature

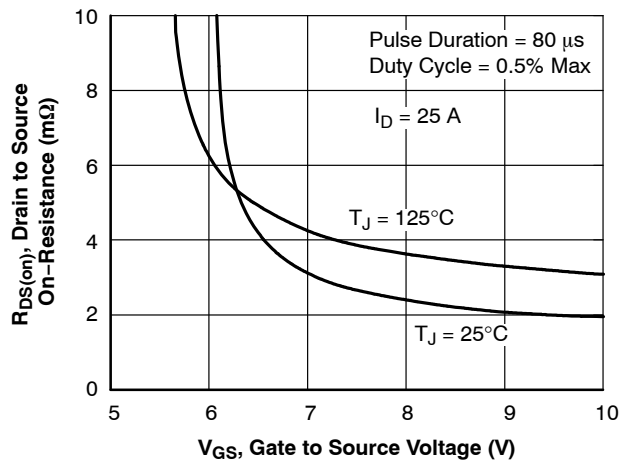


Figure 4. On-Resistance vs. Gate to Source Voltage

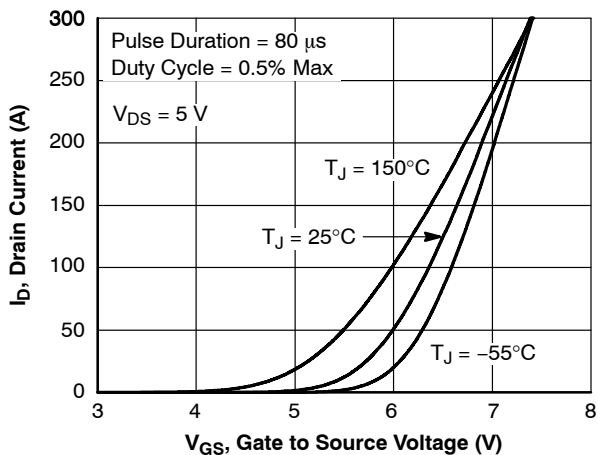


Figure 5. Transfer Characteristics

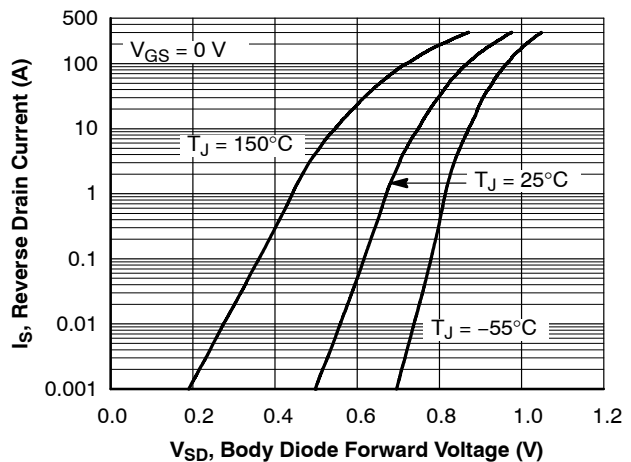


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS (continued)

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

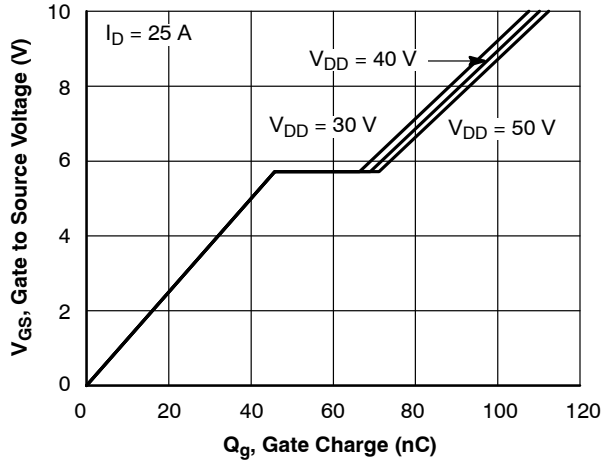


Figure 7. Gate Charge Characteristics

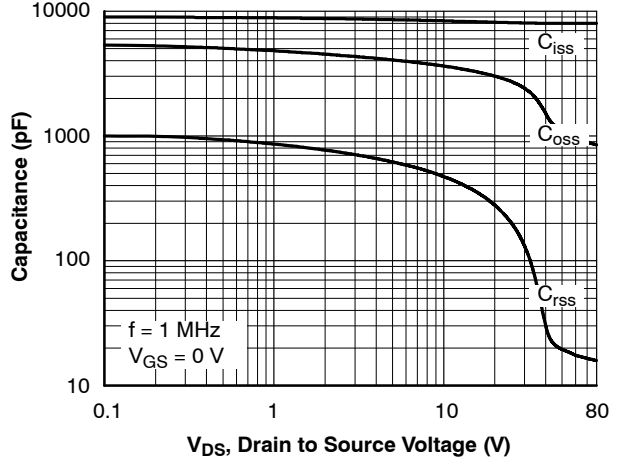


Figure 8. Capacitance vs. Drain to Source Voltage

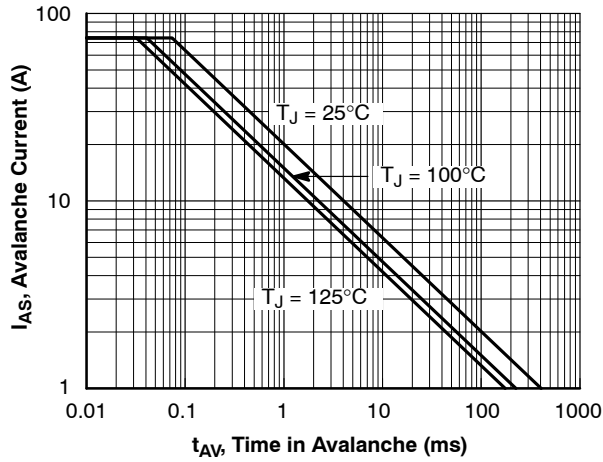


Figure 9. Unclamped Inductive Switching Capability

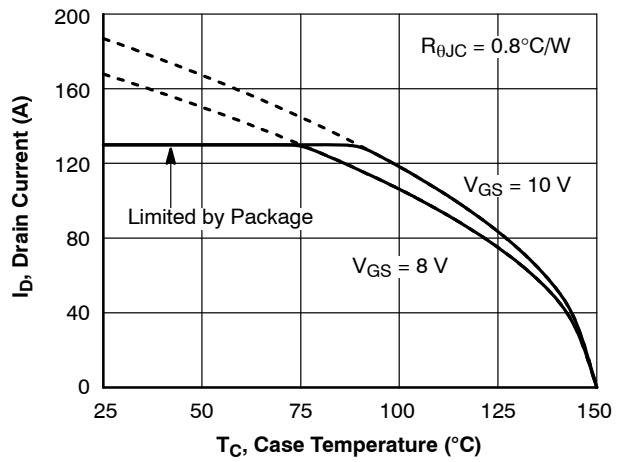


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

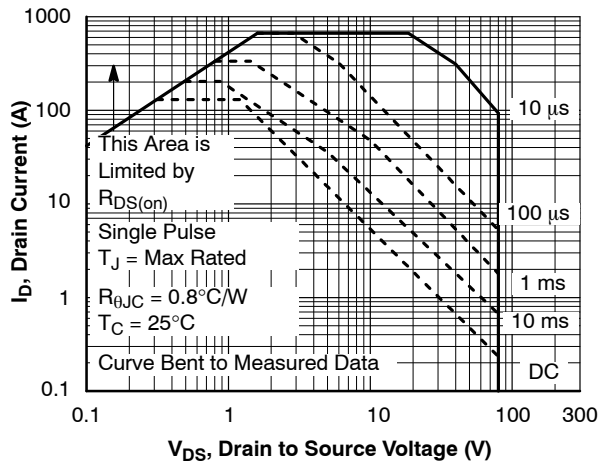


Figure 11. Forward Bias Safe Operating Area

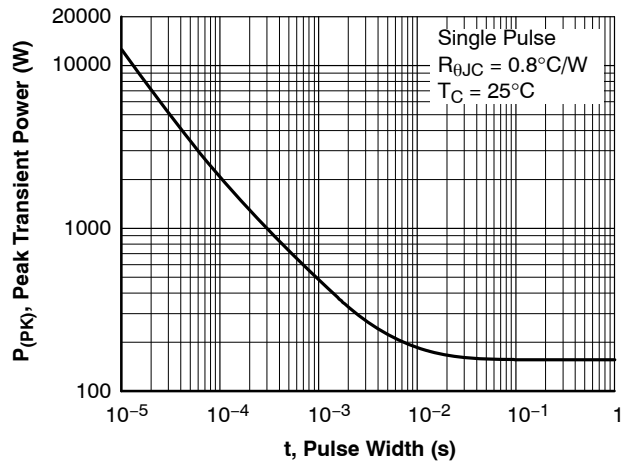


Figure 12. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS (continued)

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

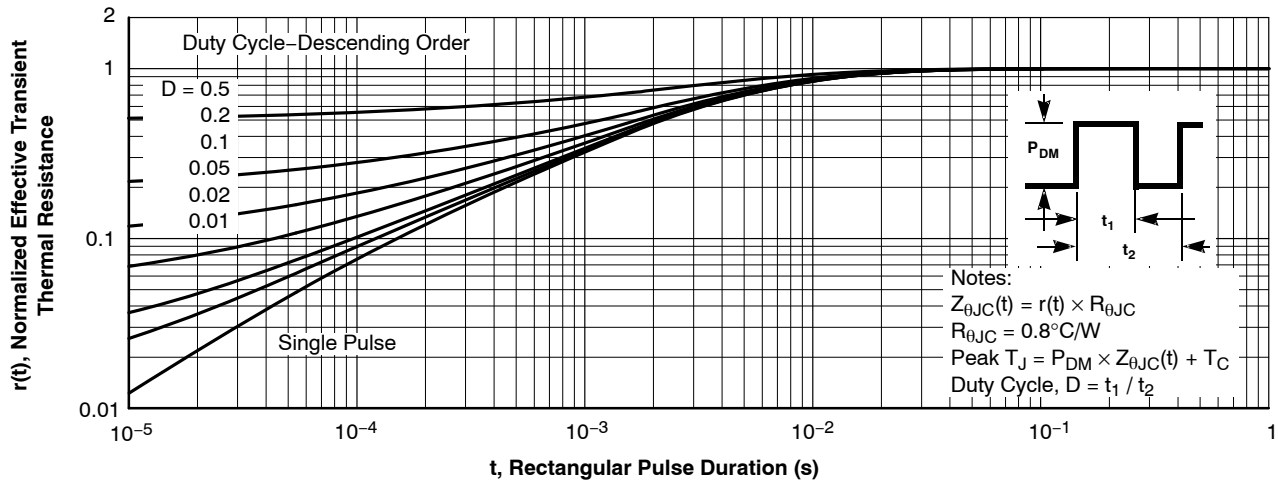
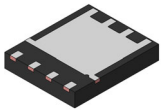
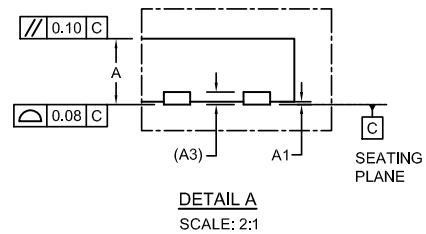
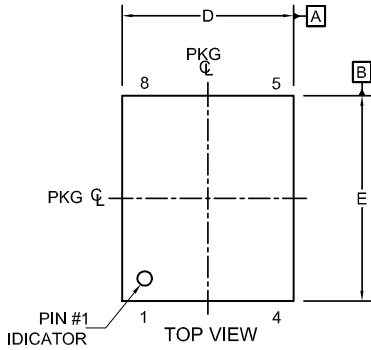


Figure 13. Junction-to-Case Transient Thermal Response Curve



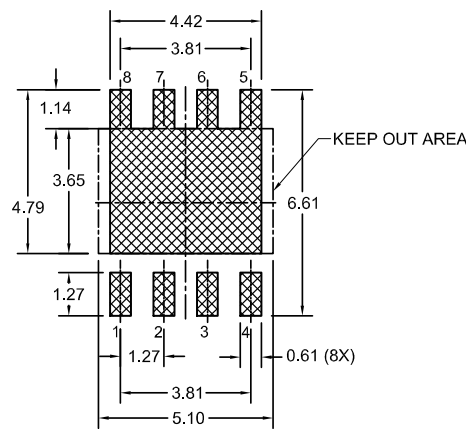
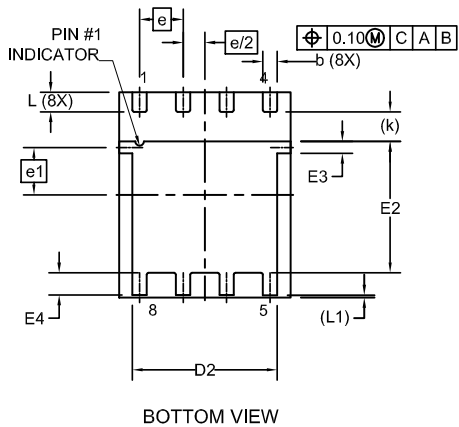
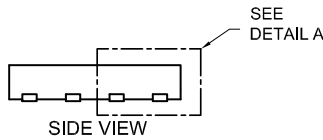
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ISSUE A

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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