

# FDMS8350LET40

## MOSFET N-Channel POWERTRENCH®

40 V, 300 A, 0.85 mΩ

### General Description

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

### Features

- Max  $R_{DS(on)}$  = 0.85 mΩ at  $V_{GS} = 10$  V,  $I_D = 47$  A
- Max  $R_{DS(on)}$  = 1.2 mΩ at  $V_{GS} = 4.5$  V,  $I_D = 38$  A
- Advanced Package and Silicon combination for Low  $r_{DS(on)}$  and High Efficiency
- MSL1 Robust Package Design
- 100% UIL Tested
- These Devices are Pb-Free and are RoHS Compliant

### Applications

- Primary DC-DC MOSFET
- Secondary Synchronous Rectifier
- Load Switch

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

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain to Source Voltage	40	V
$V_{GS}$	Gate to Source Voltage	±20	V
$I_D$	Drain Current:	300	A
	Continuous ( $T_C = 25^\circ\text{C}$ ) (Note 5)	212	
	Continuous $T_C = 100^\circ\text{C}$ (Note 5)		
	Continuous, $T_A = 25^\circ\text{C}$ (Note 1a)		
	Pulsed (Note 4)	49	
		1464	
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	1176	mJ
$P_D$	Power Dissipation:	125	W
	$T_C = 25^\circ\text{C}$		
	$T_A = 25^\circ\text{C}$ (Note 1a)	3.33	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +175	°C

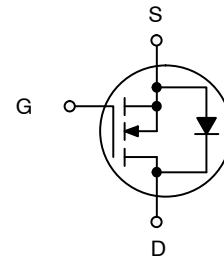
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



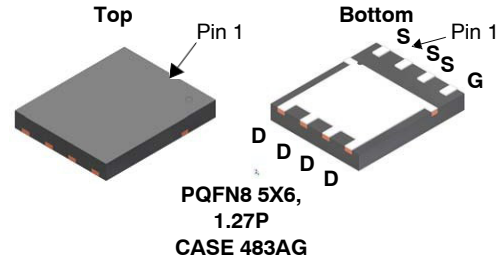
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$V_{DS}$	$R_{DS(on)}$ MAX	$I_D$ MAX
40 V	0.85 mΩ @ 10 V	47 A
	1.2 mΩ @ 4.5 V	



N-CHANNEL MOSFET



### MARKING DIAGRAM



$\$Y$  = ON Semiconductor Logo  
 $\&Z$  = Assembly Plant Code  
 $\&3$  = Data Code (Year & Week)  
 $\&K$  = Lot  
 FDMS8350LET40 = Specific Device Code

### ORDERING INFORMATION

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

# FDMS8350LET40

## 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)	45	

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

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{V}$	40			V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , referenced to $25^\circ\text{C}$		17		mV/°C
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 32 \text{V}, V_{GS} = 0 \text{V}$			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	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	1.0	1.8	3.0	V
$\Delta V_{GS(th)} / \Delta T_J$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , referenced to $25^\circ\text{C}$		-6		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{V}, I_D = 47 \text{A}$		0.68	0.85	m $\Omega$
		$V_{GS} = 4.5 \text{V}, I_D = 38 \text{A}$		0.96	1.2	
		$V_{GS} = 10 \text{V}, I_D = 47 \text{A}, T_J = 150^\circ\text{C}$		1.1	1.4	
$g_{FS}$	Forward Transconductance	$V_{DS} = 5 \text{V}, I_D = 47 \text{A}$		247		S

### DYNAMIC CHARACTERISTICS

$C_{iss}$	Input Capacitance	$V_{DS} = 20 \text{V}, V_{GS} = 0 \text{V}, f = 1 \text{MHz}$		11850	16590	pF
$C_{oss}$	Output Capacitance			3430	4805	pF
$C_{rss}$	Reverse Transfer Capacitance			69	100	pF
$R_g$	Gate Resistance		0.1	1.2	2.4	$\Omega$

### SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 20 \text{V}, I_D = 47 \text{A}, V_{GS} = 10 \text{V}, R_{GEN} = 6 \Omega$		32	51	ns
$t_r$	Rise Time			19	34	ns
$t_{d(off)}$	Turn-Off Delay Time			74	118	ns
$t_f$	Fall Time			15	27	ns
$Q_g$	Total Gate Charge	$V_{GS} = 0 \text{V to } 10 \text{V}$		156	219	nC
		$V_{GS} = 0 \text{V to } 4.5 \text{V}$		73	102	nC
$Q_{gs}$	Gate to Source Charge	$V_{DD} = 20 \text{V}, I_D = 47 \text{A}$		33		nC
$Q_{gd}$	Gate to Drain "Miller" Charge	$V_{DD} = 20 \text{V}, I_D = 47 \text{A}$		16		nC

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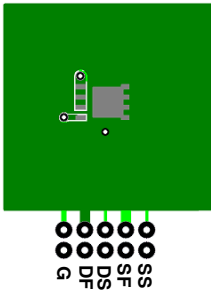
## ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
<b>DRAIN-SOURCE DIODE CHARACTERISTICS</b>						
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 2.1\text{ A}$ (Note 2)		0.7	1.2	V
		$V_{GS} = 0\text{ V}, I_S = 47\text{ A}$ (Note 2)		0.8	1.3	
$t_{rr}$	Reverse Recovery Time	$I_F = 47\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		81	129	ns
$Q_{rr}$	Reverse Recovery Charge			82	131	nC

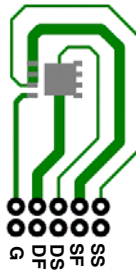
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1.  $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> 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.

### NOTES:



a)  $45^\circ\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



b)  $115^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper.

- Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0%.
- $E_{AS}$  of 1176 mJ is based on starting  $T_J = 25^\circ\text{C}$ ;  $L = 3\text{ mH}$ ,  $I_{AS} = 28\text{ A}$ ,  $V_{DD} = 40\text{ V}$ ,  $V_{GS} = 10\text{ V}$ . 100% test at  $L = 0.1\text{ mH}$ ,  $I_{AS} = 87\text{ A}$ .
- Pulsed  $I_d$  please refer to Fig 11 SOA graph for more details.
- Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

### ORDERING INFORMATION

Device	Marking	Package	Reel Size	Tape Width	Quantity
FDMS8350LET40	FDMS8350LET	Power 56	13"	12 mm	3000 units

TYPICAL CHARACTERISTICS

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

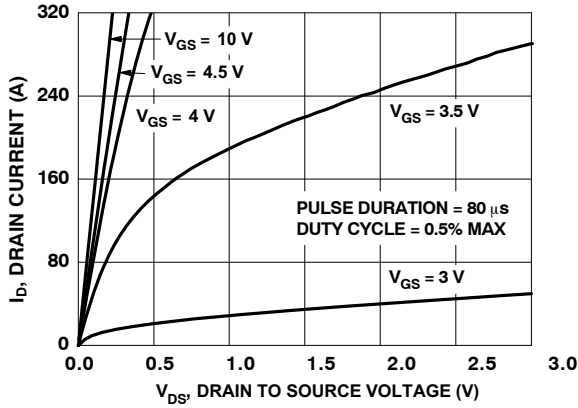


Figure 1. On-Region Characteristics

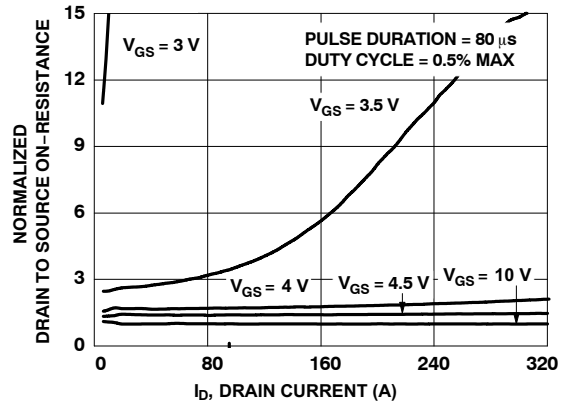


Figure 6. Normalized On-Resistance vs Drain Current and Gate Voltage

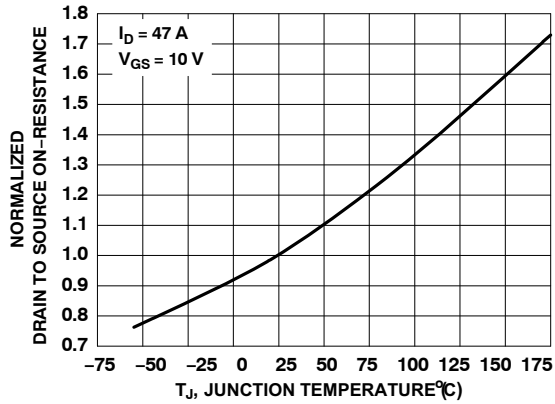


Figure 2. Normalized On-Resistance vs Junction Temperature

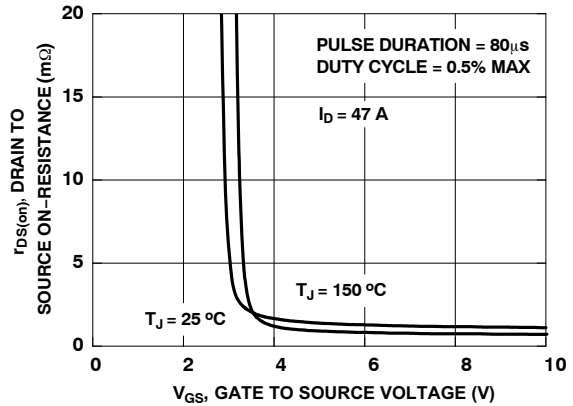


Figure 3. On-Resistance vs Gate to Source Voltage

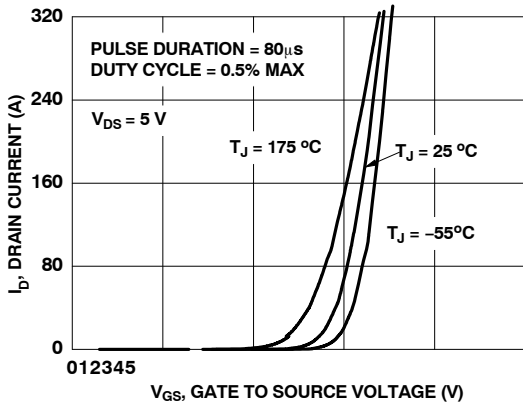


Figure 4. Transfer Characteristics

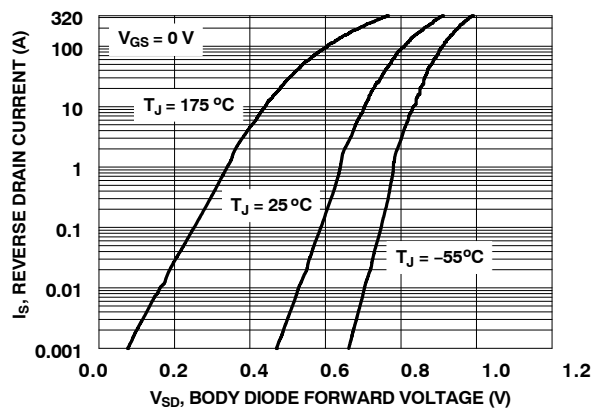


Figure 5. Source to Drain Diode Forward Voltage vs Source Current

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## TYPICAL CHARACTERISTICS

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

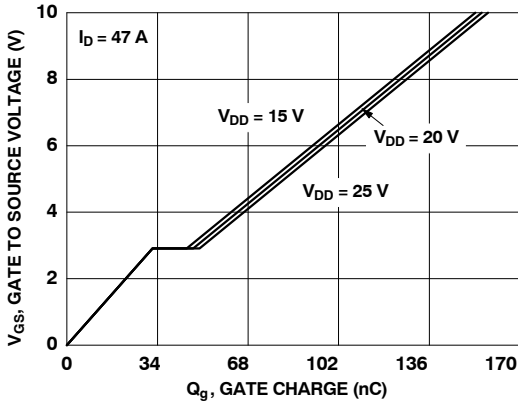


Figure 7. Gate Charge Characteristics

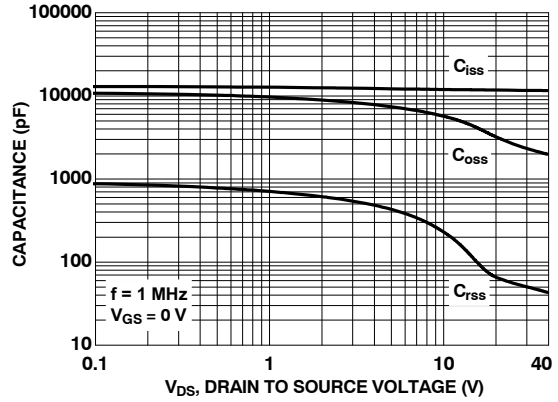


Figure 8. Capacitance vs Drain to Source Voltage

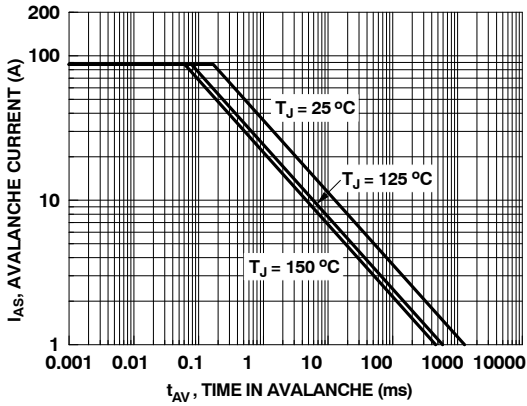


Figure 9. Unclamped Inductive Switching Capability

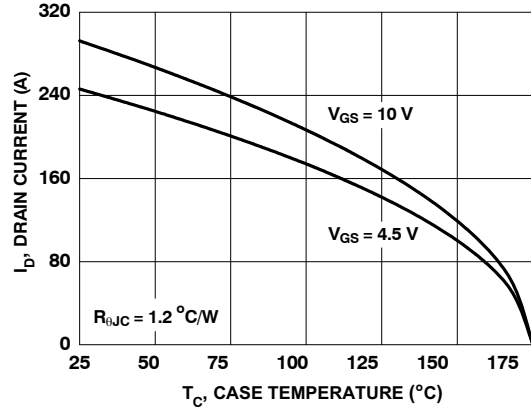


Figure 10. Maximum Continuous Drain Current vs Case Temperature

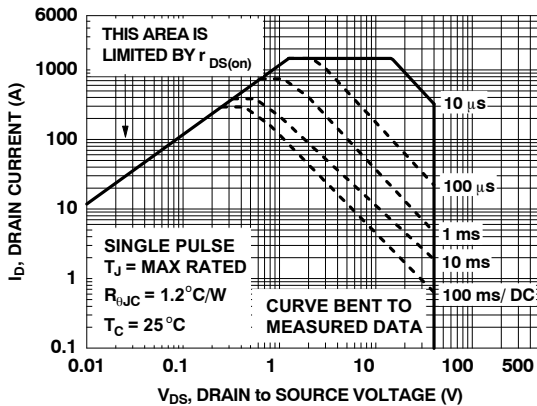


Figure 11. Forward Bias Safe Operating Area

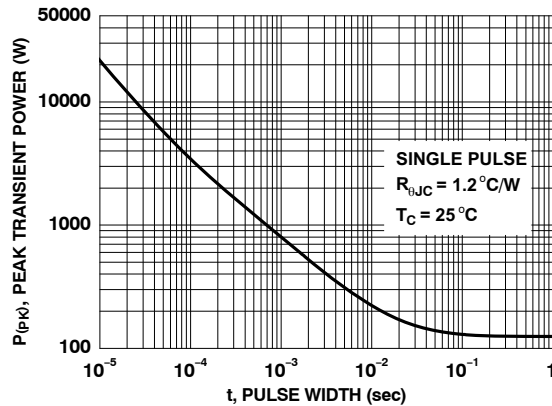


Figure 12. Single Pulse Maximum Power Dissipation

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## TYPICAL CHARACTERISTICS

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

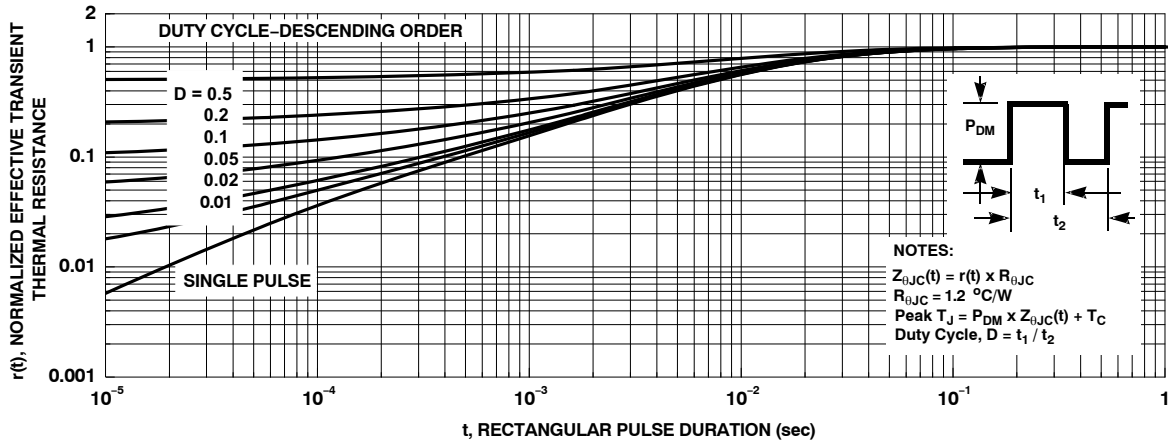
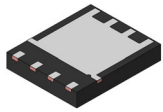


Figure 13. Junction-to-Case Transient Thermal Response Curve

# MECHANICAL CASE OUTLINE

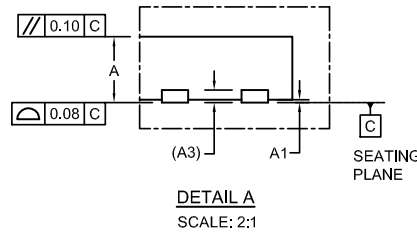
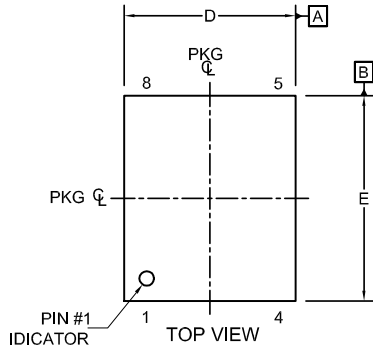
## PACKAGE DIMENSIONS

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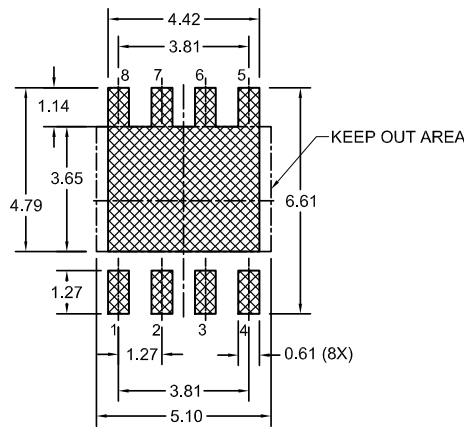
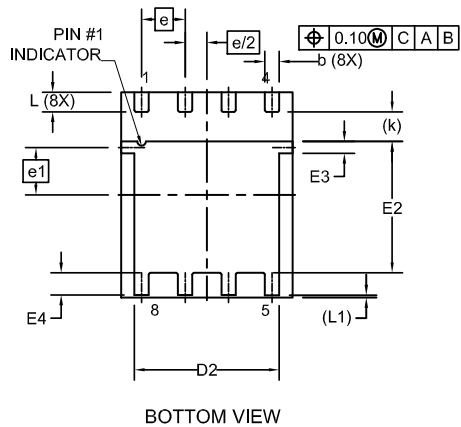
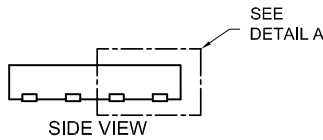
### PQFN8 5X6, 1.27P CASE 483AG ISSUE A

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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