

# MOSFET – N-Channel, Shielded Gate POWERTRENCH®

40 V, 141 A, 2.1 mΩ

## FDMC8360LET40

### General Description

This N-Channel MOSFET is produced using onsemi's advanced POWERTRENCH process that incorporates shielded gate technology. This process has been optimized for the on-state resistance and yet maintain superior switching performance.

### Features

- Shielded Gate MOSFET Technology
- Max  $R_{DS(on)}$  = 2.1 mΩ at  $V_{GS} = 10$  V,  $I_D = 27$  A
- Max  $R_{DS(on)}$  = 3.1 mΩ at  $V_{GS} = 4.5$  V,  $I_D = 22$  A
- High Performance Technology for Extremely Low  $R_{DS(on)}$
- Termination is Lead-Free
- 100% UIL Tested
- This Device is Pb-Free, Halide Free and is RoHS Compliant

### Application

- DC-DC Conversion

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

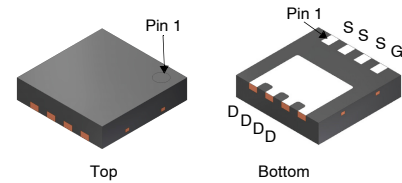
Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	40	V
$V_{GS}$	Gate to Source Voltage	±20	V
$I_D$	Drain Current		A
	-Continuous $T_C = 25^\circ\text{C}$ (Note 5)	141	
	-Continuous $T_C = 100^\circ\text{C}$ (Note 5)	100	
	-Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	27	
	-Pulsed (Note 4)	658	
EAS	Single Pulse Avalanche Energy (Note 3)	253	mJ
$P_D$	Power Dissipation $T_C = 25^\circ\text{C}$	75	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	2.8	
$T_J, T_{STG}$	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.

### THERMAL CHARACTERISTICS

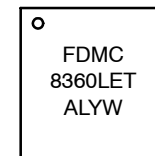
Symbol	Parameter	Ratings	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	2.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	53	°C/W

$V_{DS}$	$R_{DS(on)}$ MAX	$I_D$ MAX
40 V	2.1 mΩ @ 10 V	141 A
	3.1 mΩ @ 4.5 V	



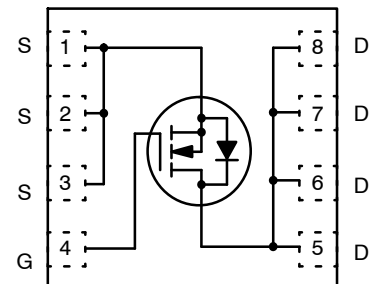
WDFN8 3.3x3.3, 0.65P  
CASE 483AW

### MARKING DIAGRAM



FDMC8360LET = Specific Device Code  
A = Assembly Site  
L = Wafer Lot Number  
YW = Assembly Start Week

### PIN ASSIGNMENT



N-Channel MOSFET

### ORDERING INFORMATION

Device	Package	Shipping†
FDMC8360LET40	WDFN8 (Pb-Free, Halide 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](#).

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## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
$\Delta BV_{DSS}$	Drain to Source Breakdown Voltage	I <sub>D</sub> = 250 $\mu$ A, V <sub>GS</sub> = 0 V	40	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 $\mu$ A, referenced to 25°C	-	20	-	mV/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 32 V, V <sub>GS</sub> = 0 V	-	-	1	$\mu$ A
I <sub>GSS</sub>	Gate to Source Leakage Current	V <sub>GS</sub> = $\pm$ 20 V, V <sub>DS</sub> = 0 V	-	-	$\pm$ 100	nA

## ON CHARACTERISTICS

V <sub>GS(th)</sub>	Gate to Source Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 $\mu$ A	1.0	1.7	3.0	V
$\Delta V_{GS(th)} / \Delta T_J$	Gate to Source Threshold Voltage Temperature Coefficient	I <sub>D</sub> = 250 $\mu$ A, referenced to 25°C	-	-6	-	mV/°C
R <sub>DS(on)</sub>	Static Drain to Source On Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 27 A	-	1.4	2.1	m $\Omega$
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 22 A	-	2.1	3.1	
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 27 A, T <sub>J</sub> = 150°C	-	2.3	3.5	
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 27 A	-	138	-	S

## DYNAMIC CHARACTERISTICS

C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, f = 1 MHz	-	3785	5300	pF
C <sub>oss</sub>	Output Capacitance		-	1220	1710	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	57	80	pF
R <sub>g</sub>	Gate Resistance		0.1	0.8	1.6	$\Omega$

## SWITCHING CHARACTERISTICS

t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 20 V, I <sub>D</sub> = 27 A, V <sub>GS</sub> = 10 V, R <sub>GEN</sub> = 6 $\Omega$	-	14	26	ns	
t <sub>r</sub>	Rise Time		-	8	16	ns	
t <sub>d(off)</sub>	Turn-Off Delay Time		-	35	57	ns	
t <sub>f</sub>	Fall Time		-	7	14	ns	
Q <sub>g(TOT)</sub>	Total Gate Charge	V <sub>GS</sub> = 0 V to 10 V	V <sub>DD</sub> = 20 V I <sub>D</sub> = 27 A	-	57	80	nC
Q <sub>g(TOT)</sub>	Total Gate Charge	V <sub>GS</sub> = 0 V to 4.5 V		-	27	38	nC
Q <sub>gs</sub>	Gate to Source Charge			-	9.9	-	nC
Q <sub>gd</sub>	Gate to Drain "Miller" Charge			-	8.1	-	nC

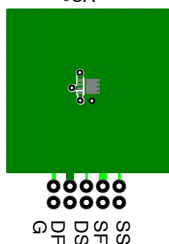
## DRAIN-SOURCE DIODE CHARACTERISTICS

V <sub>SD</sub>	Source to Drain Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 27 A (Note 2)	-	0.8	1.3	V
		V <sub>GS</sub> = 0 V, I <sub>S</sub> = 1.9 A (Note 2)	-	0.7	1.2	
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> = 27 A, di/dt = 100 A/ $\mu$ s	-	47	76	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	30	48	nC

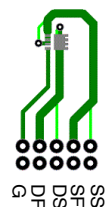
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

### NOTES:

- R<sub>θJA</sub> 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<sub>θJC</sub> is guaranteed by design while R<sub>θCA</sub> is determined by the user's board design.



a. 53°C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



b. 125°C/W when mounted on a minimum pad of 2 oz copper.

- Pulse Test: Pulse Width < 300  $\mu$ s, Duty cycle < 2.0 %.
- E<sub>AS</sub> of 253 mJ is based on starting T<sub>J</sub> = 25 °C, L = 3 mH, I<sub>AS</sub> = 13 A, V<sub>DD</sub> = 40 V, V<sub>GS</sub> = 10 V. 100% test at L = 0.1 mH, I<sub>AS</sub> = 42 A.
- Pulsed Id please refer to Figure 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.

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

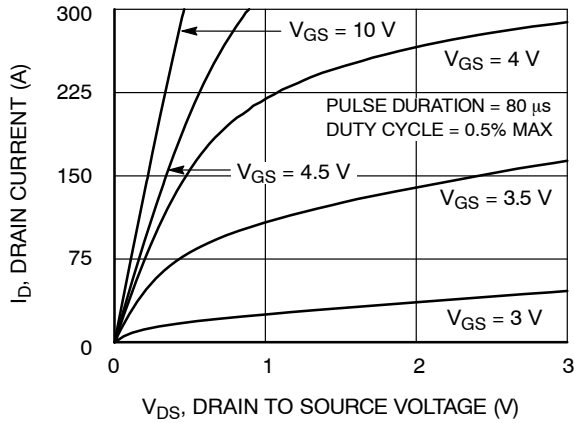


Figure 1. On Region Characteristics

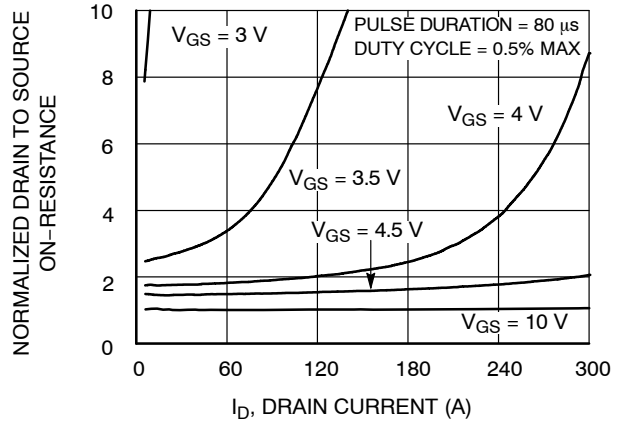


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

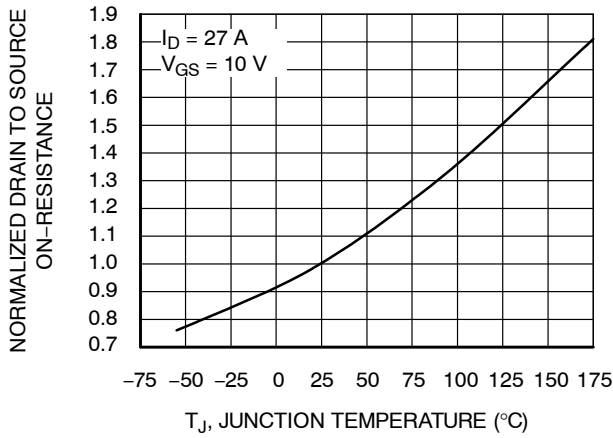


Figure 3. Normalized On Resistance vs. Junction Temperature

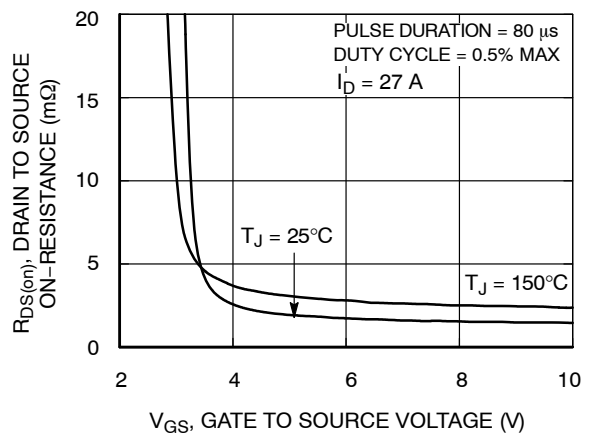


Figure 4. On-Resistance vs. Gate to Source Voltage

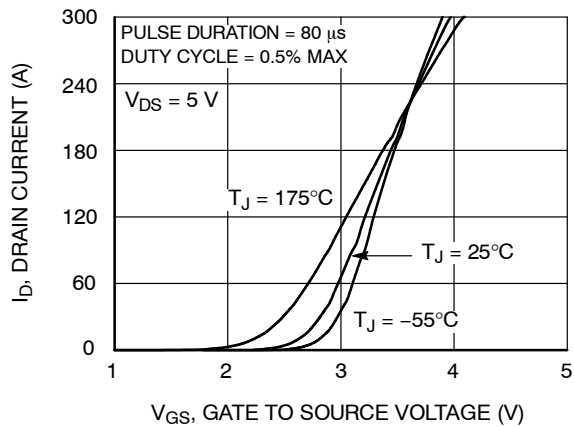


Figure 5. Transfer Characteristics

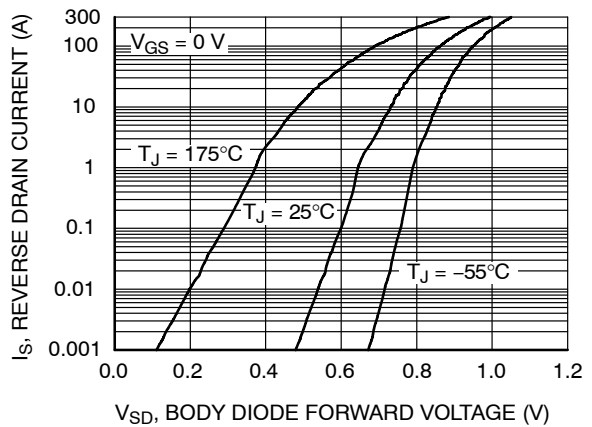
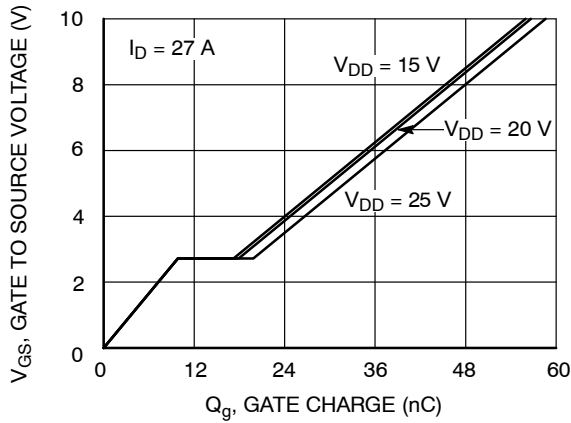


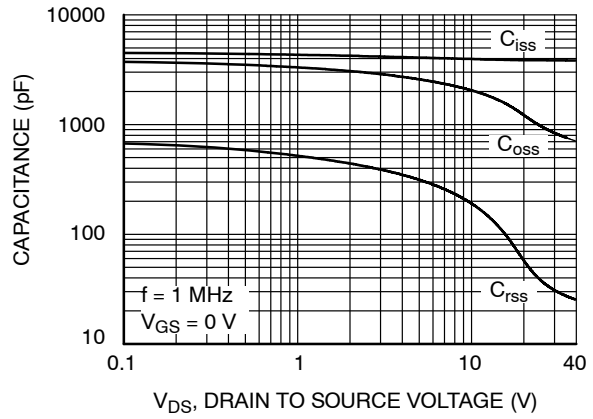
Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

# FDMC8360LET40

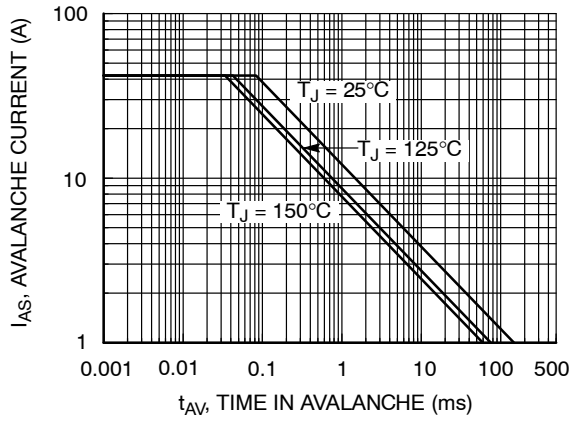
## TYPICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)



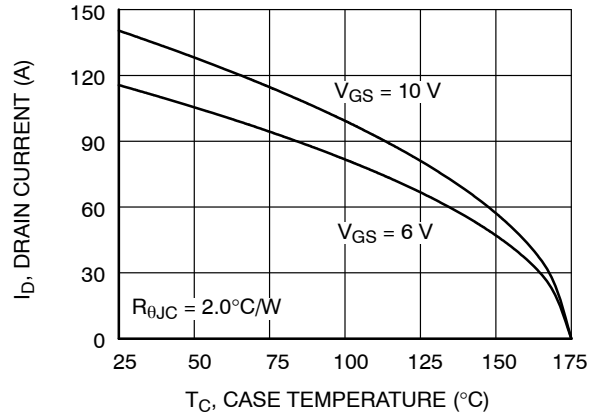
**Figure 7. Gate Charge Characteristics**



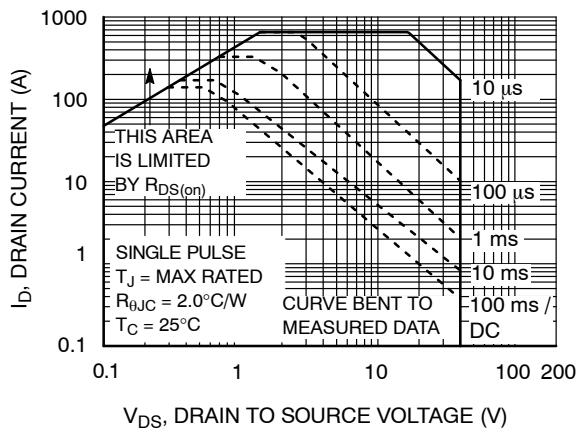
**Figure 8. Capacitance vs. Drain to Source Voltage**



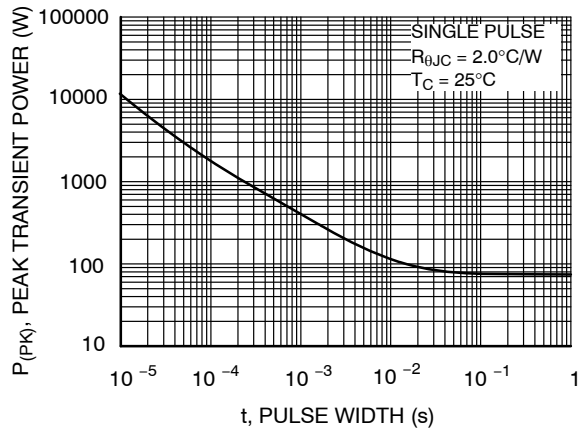
**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Maximum Continuous Drain Current vs. Case Temperature**



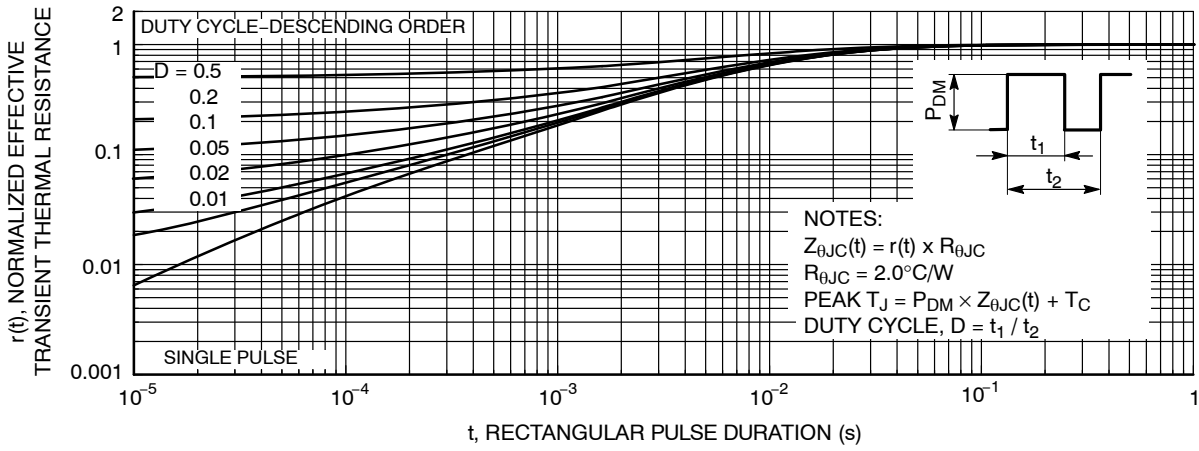
**Figure 11. Forward Bias Safe Operating Area**



**Figure 12. Single Pulse Maximum Power Dissipation**

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

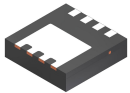


**Figure 13. Junction-to-Case Transient Thermal Response Curve**

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®

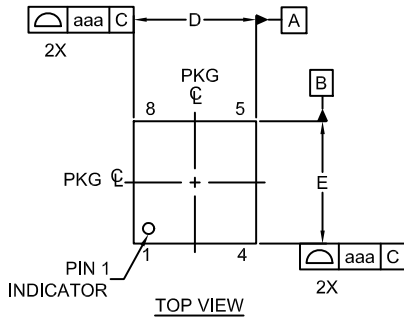


### WDFN8 3.3X3.3, 0.65P

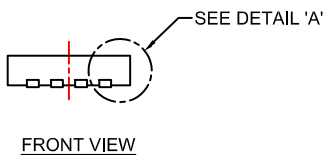
#### CASE 483AW

#### ISSUE A

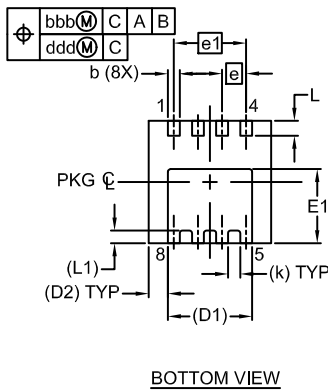
DATE 10 SEP 2019



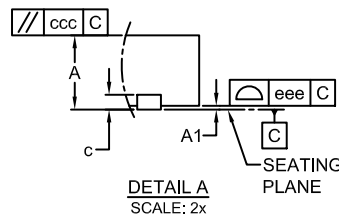
TOP VIEW



FRONT VIEW

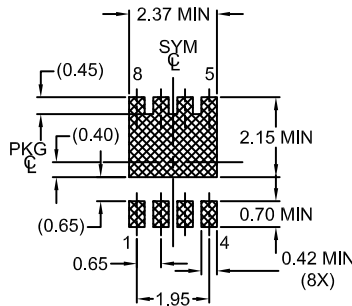


BOTTOM VIEW



DETAIL A  
SCALE: 2x

### 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.

### NOTES:

1. CONTROLLING DIMENSION: MILLIMETERS.
2. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
4. 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	0.70	0.75	0.80
A1	-	-	0.05
b	0.27	0.32	0.37
c	0.15	0.20	0.25
D	3.20	3.30	3.40
D1	2.27 REF		
D2	0.52 REF		
E	3.20	3.30	3.40
E1	1.85	1.95	2.05
e	0.65 BSC		
e1	1.95 BSC		
k	0.33 REF		
L	0.30	0.40	0.50
L1	0.34 REF		
aaa	0.10		
bbb	0.10		
ccc	0.10		
ddd	0.05		
eee	0.05		

### GENERIC MARKING DIAGRAM\*



XXXX = Specific Device Code  
 A = Assembly Location  
 Y = Year  
 WW = Work Week

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

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