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October 2014

# FDMS86102LZ

## N-Channel Shielded Gate PowerTrench<sup>®</sup> MOSFET

100 V, 22 A, 25 mΩ

### Features

- Shielded Gate MOSFET Technology
- Max  $r_{DS(on)} = 25\text{ m}\Omega$  at  $V_{GS} = 10\text{ V}$ ,  $I_D = 7\text{ A}$
- Max  $r_{DS(on)} = 37\text{ m}\Omega$  at  $V_{GS} = 4.5\text{ V}$ ,  $I_D = 5.8\text{ A}$
- HBM ESD protection level > 6 kV typical (Note 4)
- 100% UIL Tested
- RoHS Compliant

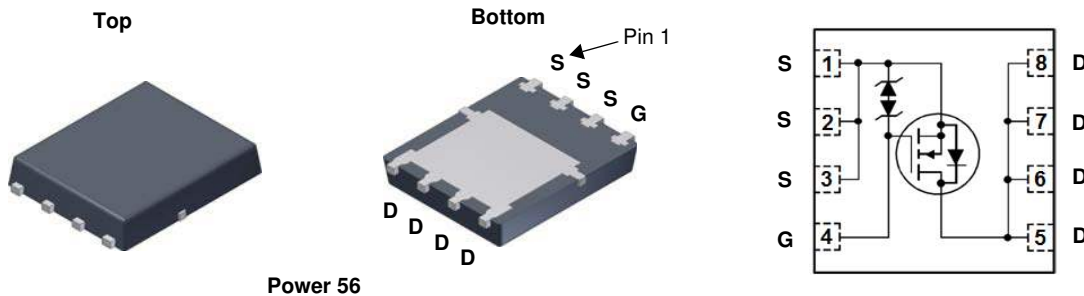


### General Description

This N-Channel logic Level MOSFETs are produced using Fairchild Semiconductor's advanced PowerTrench<sup>®</sup> process that incorporates Shielded Gate technology. This process has been optimized for the on-state resistance and yet maintain superior switching performance. G-S zener has been added to enhance ESD voltage level.

### Applications

- DC - DC Conversion
- Inverter
- Synchronous Rectifier



### MOSFET Maximum Ratings $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	100	V
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current -Continuous $T_C = 25\text{ }^\circ\text{C}$	22	A
	-Continuous $T_A = 25\text{ }^\circ\text{C}$ (Note 1a)	7	
	-Pulsed	40	
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	84	mJ
$P_D$	Power Dissipation $T_C = 25\text{ }^\circ\text{C}$	69	W
	Power Dissipation $T_A = 25\text{ }^\circ\text{C}$ (Note 1a)	2.5	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.8	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	50	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS86102Z	FDMS86102LZ	Power 56	13"	12 mm	3000 units

FDMS86102LZ N-Channel Shielded Gate PowerTrench<sup>®</sup> MOSFET

## Electrical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$	100			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		70		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 80\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0\text{ V}$			$\pm 10$	$\mu\text{A}$

### On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\text{ }\mu\text{A}$	1.0	1.5	2.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		-6		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$ , $I_D = 7\text{ A}$		18.6	25	m $\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 5.8\text{ A}$		23.5	37	
		$V_{GS} = 10\text{ V}$ , $I_D = 7\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$		31.2	42	
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\text{ V}$ , $I_D = 7\text{ A}$		26		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 50\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$		979	1305	pF
$C_{oss}$	Output Capacitance			175	235	pF
$C_{riss}$	Reverse Transfer Capacitance			8.9	15	pF
$R_g$	Gate Resistance			0.9		$\Omega$

### Switching Characteristics

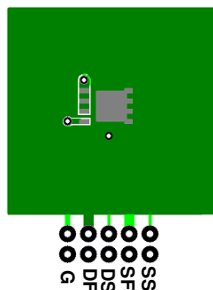
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\text{ V}$ , $I_D = 7\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$		6.7	14	ns
$t_r$	Rise Time			2.6	10	ns
$t_{d(off)}$	Turn-Off Delay Time			19	35	ns
$t_f$	Fall Time			2.5	10	ns
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to }10\text{ V}$	$V_{DD} = 50\text{ V}$ , $I_D = 7\text{ A}$	16	22	nC
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to }4.5\text{ V}$		7.8	11	nC
$Q_{gs}$	Total Gate Charge			2.4		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			2.6		nC

### Drain-Source Diode Characteristics

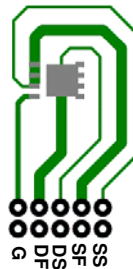
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = 7\text{ A}$ (Note 2)	0.81	1.3	V
		$V_{GS} = 0\text{ V}$ , $I_S = 2\text{ A}$ (Note 2)	0.72	1.2	
$t_{rr}$	Reverse Recovery Time	$I_F = 7\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$	35	57	ns
$Q_{rr}$	Reverse Recovery Charge		25	40	nC

#### NOTES:

- $R_{\theta JA}$  is determined with the device mounted on a  $1\text{ in}^2$  pad 2 oz copper pad on a  $1.5 \times 1.5\text{ in.}$  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.  $50\text{ }^\circ\text{C/W}$  when mounted on a  $1\text{ in}^2$  pad of 2 oz copper



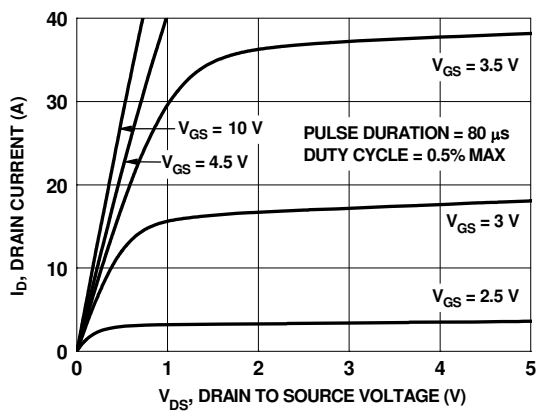
b.  $125\text{ }^\circ\text{C/W}$  when mounted on a minimum pad of 2 oz copper

- Pulse Test: Pulse Width <  $300\text{ }\mu\text{s}$ , Duty cycle < 2.0%.

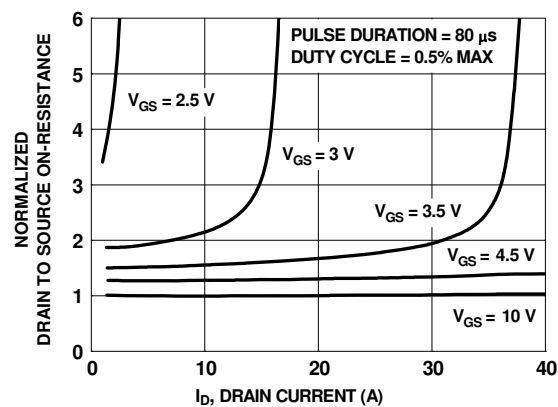
- Starting  $T_J = 25\text{ }^\circ\text{C}$ ; N-ch:  $L = 1\text{ mH}$ ,  $I_{AS} = 13\text{ A}$ ,  $V_{DD} = 90\text{ V}$ ,  $V_{GS} = 10\text{ V}$ .

- The diode connected between gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

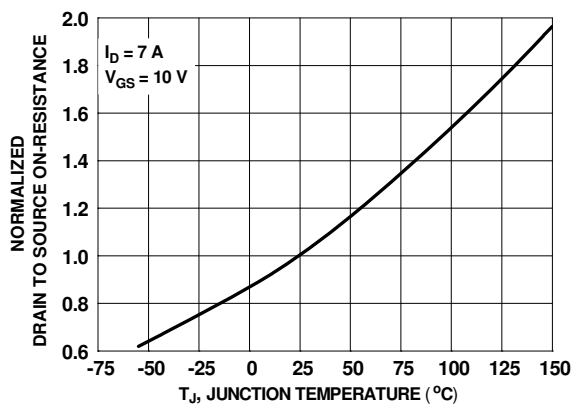
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



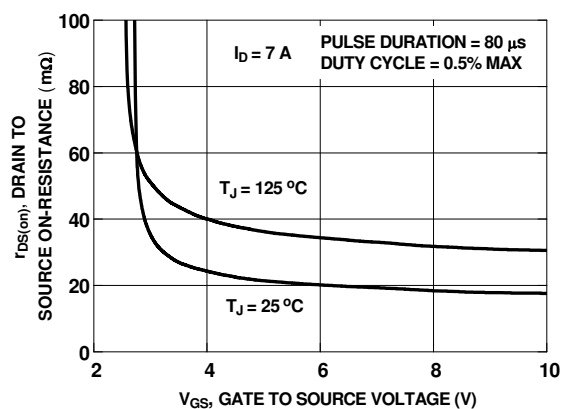
**Figure 1. On-Region Characteristics**



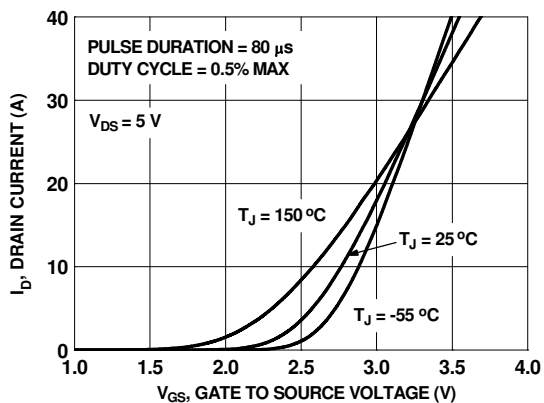
**Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage**



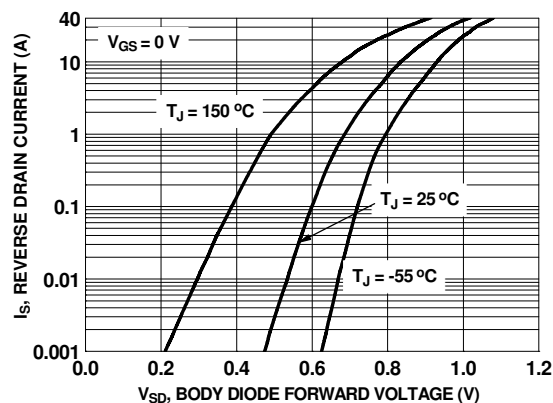
**Figure 3. Normalized On-Resistance vs Junction Temperature**



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

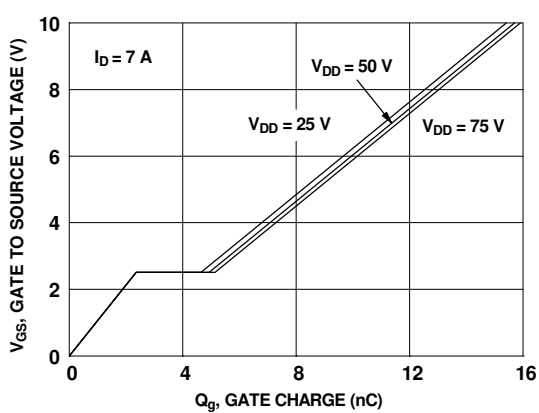


**Figure 5. Transfer Characteristics**

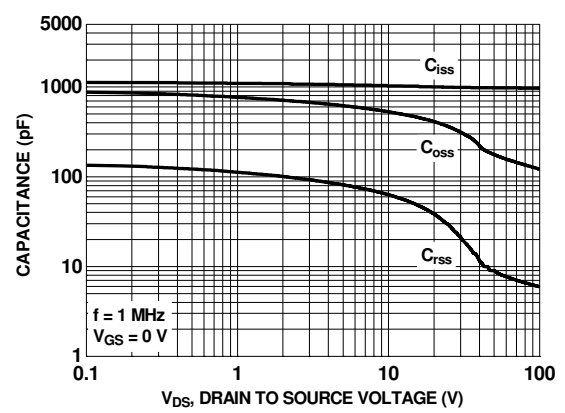


**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**

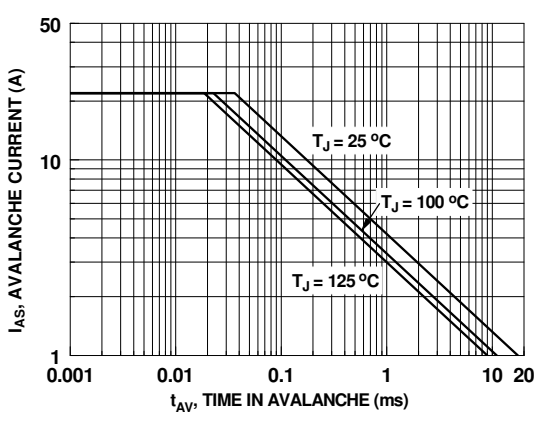
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



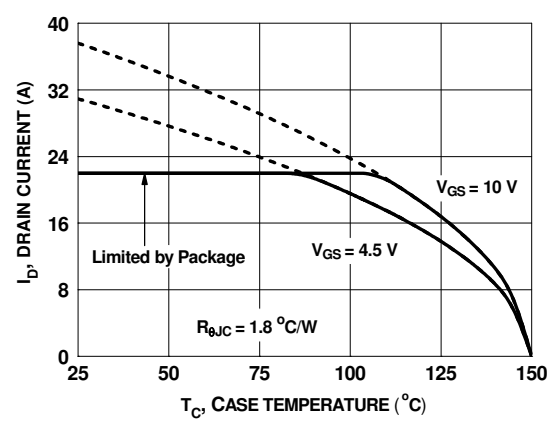
**Figure 7. Gate Charge Characteristics**



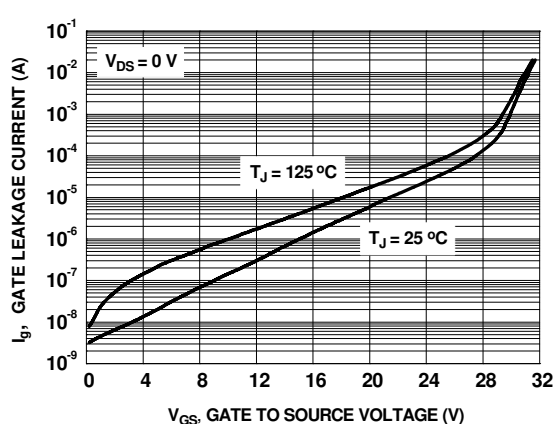
**Figure 8. Capacitance vs Drain to Source Voltage**



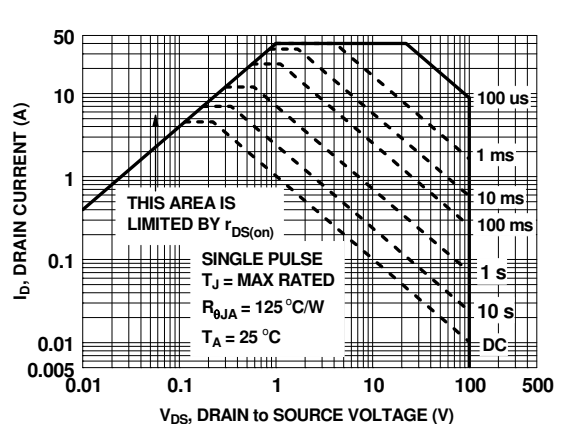
**Figure 9. Unclamped Inductive Switching Capability**



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

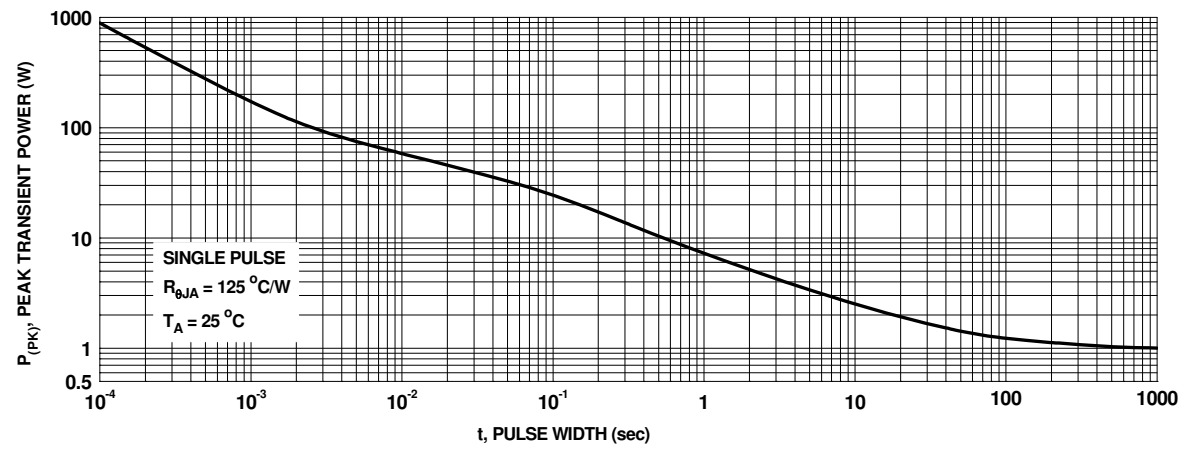


**Figure 11. Gate Leakage Current vs Gate to Source Voltage**

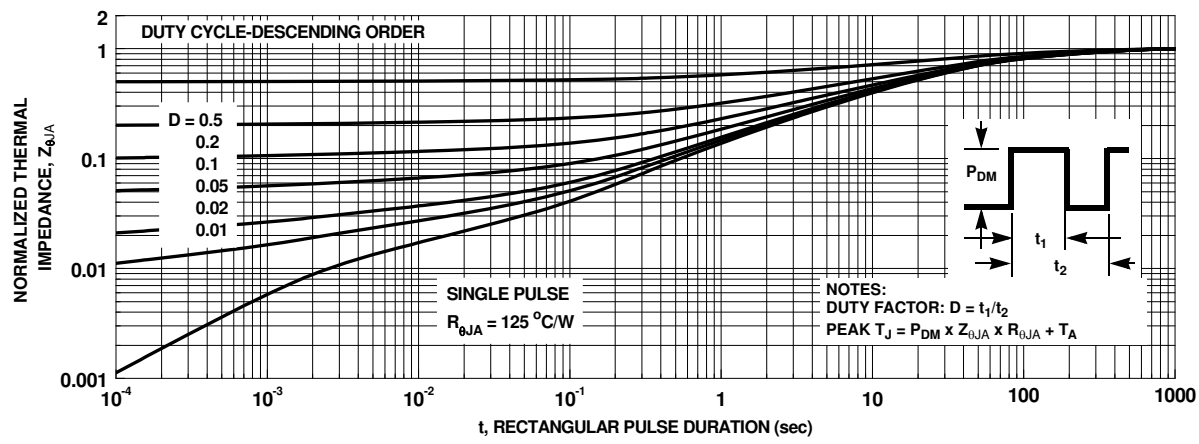


**Figure 12. Forward Bias Safe Operating Area**

**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted

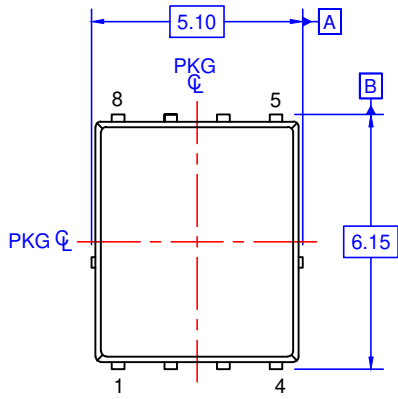


**Figure 13. Single Pulse Maximum Power Dissipation**

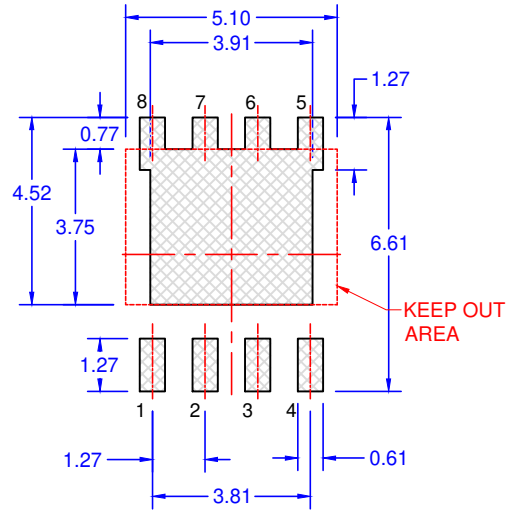
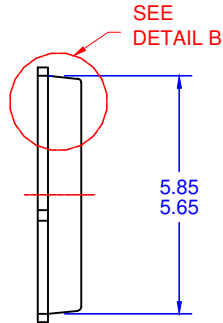


**Figure 14. Junction-to-Ambient Transient Thermal Response Curve**

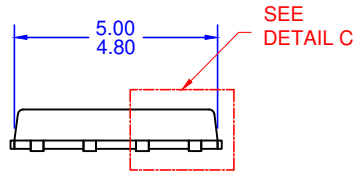
PQFN8 5X6, 1.27P  
CASE 483AE  
ISSUE A



TOP VIEW

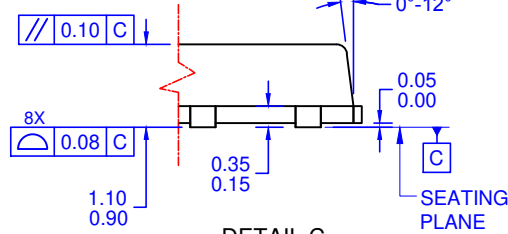


LAND PATTERN RECOMMENDATION

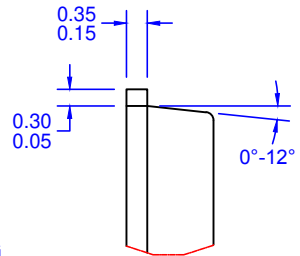


SIDE VIEW

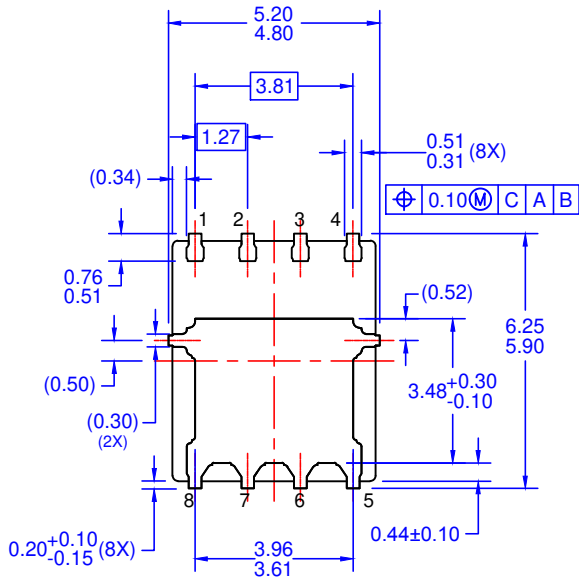
OPTIONAL DRAFT ANGLE MAY APPEAR ON FOUR SIDES OF THE PACKAGE



DETAIL C  
SCALE: 2:1



DETAIL B  
SCALE: 2:1



BOTTOM VIEW

NOTES: UNLESS OTHERWISE SPECIFIED

- A. PACKAGE STANDARD REFERENCE: JEDEC MO-240, ISSUE A, VAR. AA.
- B. DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
- E. IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.

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