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# FDMS86163P

## P-Channel PowerTrench<sup>®</sup> MOSFET

-100 V, -50 A, 22 mΩ

### Features

- Max  $r_{DS(on)}$  = 22 mΩ at  $V_{GS} = -10$  V,  $I_D = -7.9$  A
- Max  $r_{DS(on)}$  = 30 mΩ at  $V_{GS} = -6$  V,  $I_D = -5.9$  A
- Very low RDS-on mid voltage P-channel silicon technology optimised for low Qg
- This product is optimised for fast switching applications as well as load switch applications
- 100% UIL tested
- RoHS Compliant

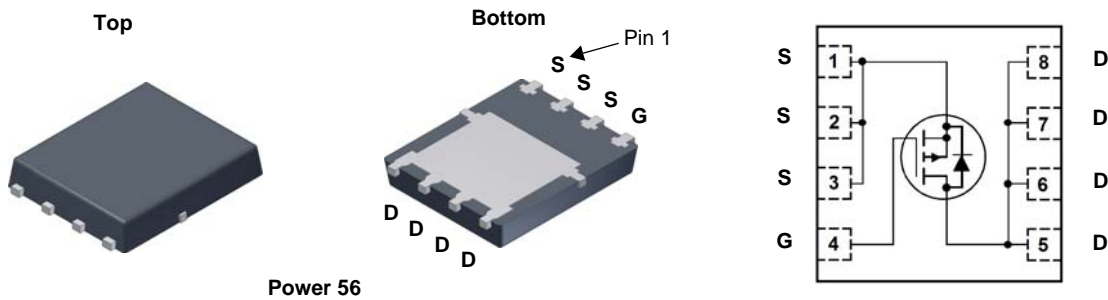


### General Description

This P-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench<sup>®</sup> process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

### Applications

- Active Clamp Switch
- Load Switch



### MOSFET Maximum Ratings $T_A = 25$ °C unless otherwise noted

Symbol	Parameter	Rated	Units
$V_{DS}$	Drain to Source Voltage	-100	V
$V_{GS}$	Gate to Source Voltage	±25	V
$I_D$	Drain Current -Continuous	$T_C = 25$ °C	A
	-Continuous	$T_A = 25$ °C (Note 1a)	
	-Pulsed	(Note 4)	
$E_{AS}$	Single Pulse Avalanche Energy	(Note 3)	mJ
$P_D$	Power Dissipation	$T_C = 25$ °C	W
	Power Dissipation	$T_A = 25$ °C (Note 1a)	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	°C

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.2	°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
FDMS86163P	FDMS86163P	Power 56	13 "	12 mm	3000 units

## 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 $25\text{ }^\circ\text{C}$		-59		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	$V_{GS} = \pm 25\text{ V}, V_{DS} = 0\text{ V}$			$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = -250\text{ }\mu\text{A}$	-2	-2.8	-4	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 $25\text{ }^\circ\text{C}$		6.2		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = -10\text{ V}, I_D = -7.9\text{ A}$		17.8	22	m $\Omega$
		$V_{GS} = -6\text{ V}, I_D = -5.9\text{ A}$		21.3	30	
		$V_{GS} = -10\text{ V}, I_D = -7.9\text{ A}, T_J = 125\text{ }^\circ\text{C}$		29	36	
$g_{FS}$	Forward Transconductance	$V_{DS} = -10\text{ V}, I_D = -7.9\text{ A}$		29		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = -50\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		3070	4085	pF
$C_{oss}$	Output Capacitance			501	670	pF
$C_{riss}$	Reverse Transfer Capacitance			21	35	pF
$R_g$	Gate Resistance		0.1	2.6	5.3	$\Omega$

### Switching Characteristics

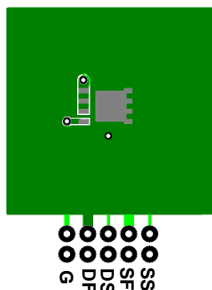
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -50\text{ V}, I_D = -7.9\text{ A}, V_{GS} = -10\text{ V}, R_{GEN} = 6\text{ }\Omega$		17	30	ns	
$t_r$	Rise Time			8.8	18	ns	
$t_{d(off)}$	Turn-Off Delay Time			33	53	ns	
$t_f$	Fall Time			6.9	14	ns	
$Q_g$	Total Gate Charge		$V_{GS} = 0\text{ V to } -10\text{ V}$		42	59	nC
$Q_g$	Total Gate Charge	$V_{GS} = 0\text{ V to } -6\text{ V}$	$V_{DD} = -50\text{ V}, I_D = -7.9\text{ A}$		26	37	nC
$Q_{gs}$	Gate to Source Charge				11.8		nC
$Q_{gd}$	Gate to Drain "Miller" Charge				7.1		nC

### Drain-Source Diode Characteristics

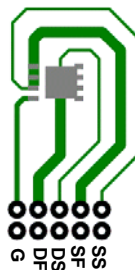
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = -7.9\text{ A}$ (Note 2)		-0.81	-1.3	V
		$V_{GS} = 0\text{ V}, I_S = -2\text{ A}$ (Note 2)		-0.75	-1.2	
$t_{rr}$	Reverse Recovery Time	$I_F = -7.9\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		63	102	ns
$Q_{rr}$	Reverse Recovery Charge			132	210	nC

#### Notes:

- $R_{\theta JA}$  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)  $50\text{ }^\circ\text{C/W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



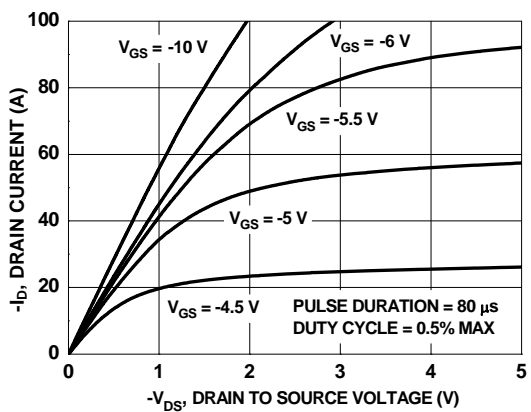
b)  $125\text{ }^\circ\text{C/W}$  when mounted on a minimum pad of 2 oz copper.

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

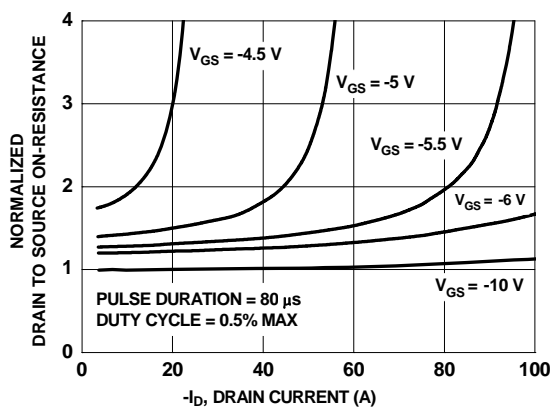
3. Starting  $T_J = 25\text{ }^\circ\text{C}$ ; P-ch: L = 3 mH,  $I_{AS} = -18\text{ A}$ ,  $V_{DD} = -100\text{ V}$ ,  $V_{GS} = -10\text{ V}$ . 100% test at L = 0.1 mH,  $I_{AS} = -58\text{ A}$ .

4. Pulse Id refers to Figure.11 Forward Bias Safe Operation Area.

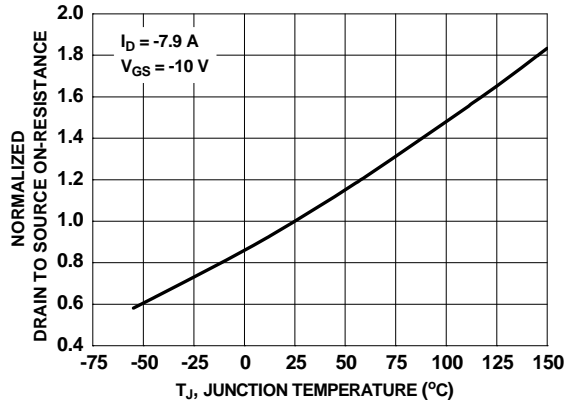
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



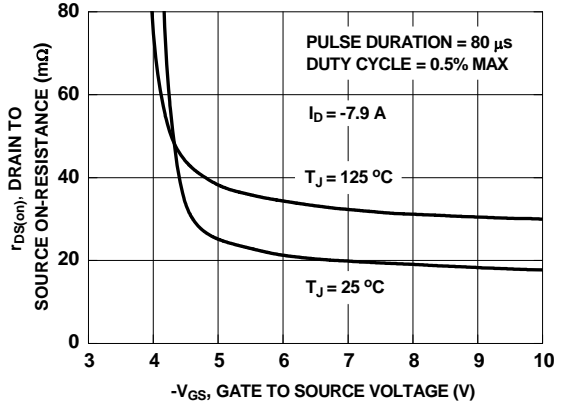
**Figure 1. On Region Characteristics**



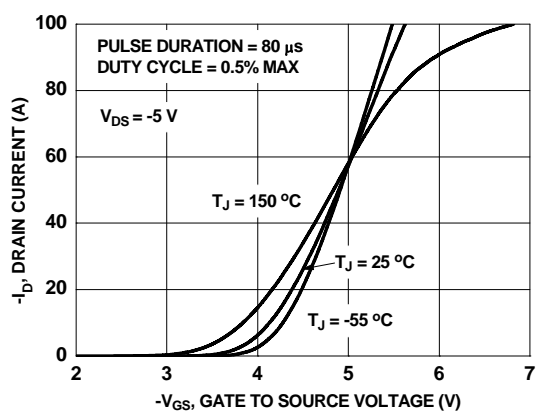
**Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage**



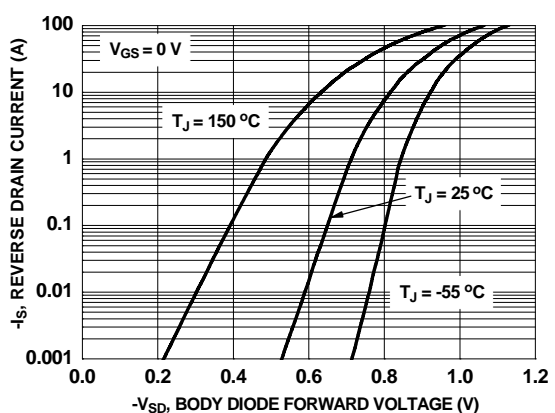
**Figure 3. Normalized On Resistance vs Junction Temperature**



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

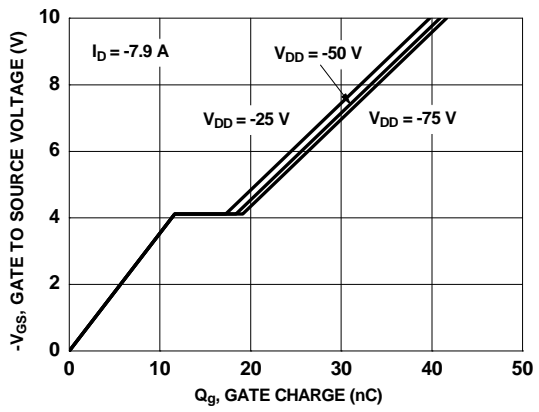


**Figure 5. Transfer Characteristics**

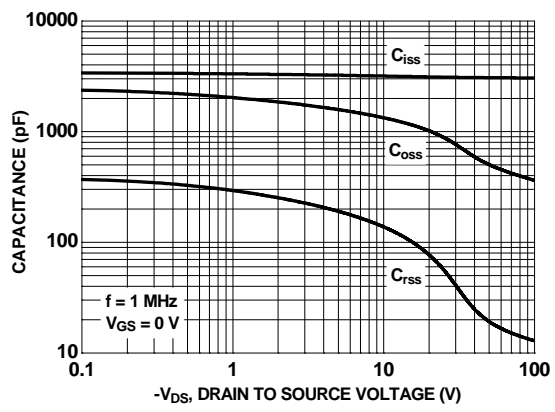


**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**

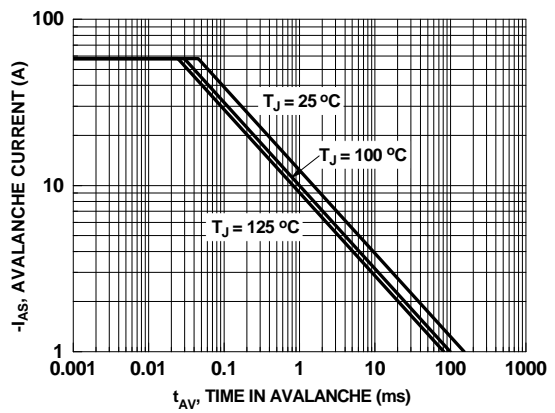
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



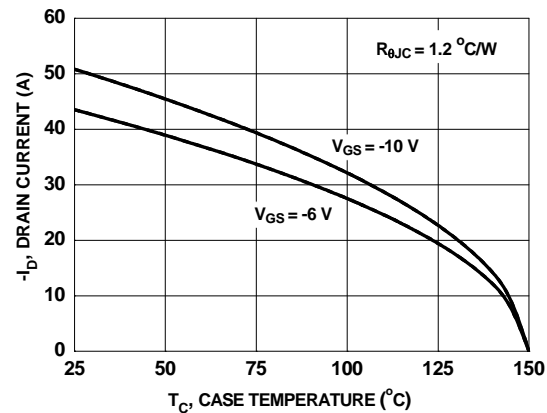
**Figure 7. Gate Charge Characteristics**



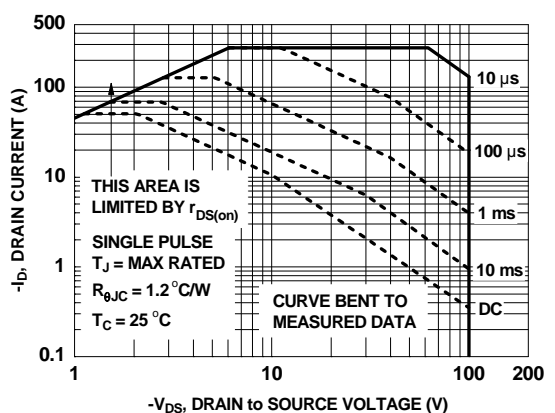
**Figure 8. Capacitance vs Drain to Source Voltage**



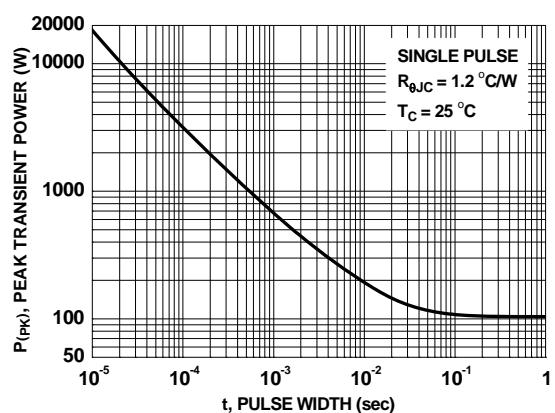
**Figure 9. Unclamped Inductive Switching Capability**



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

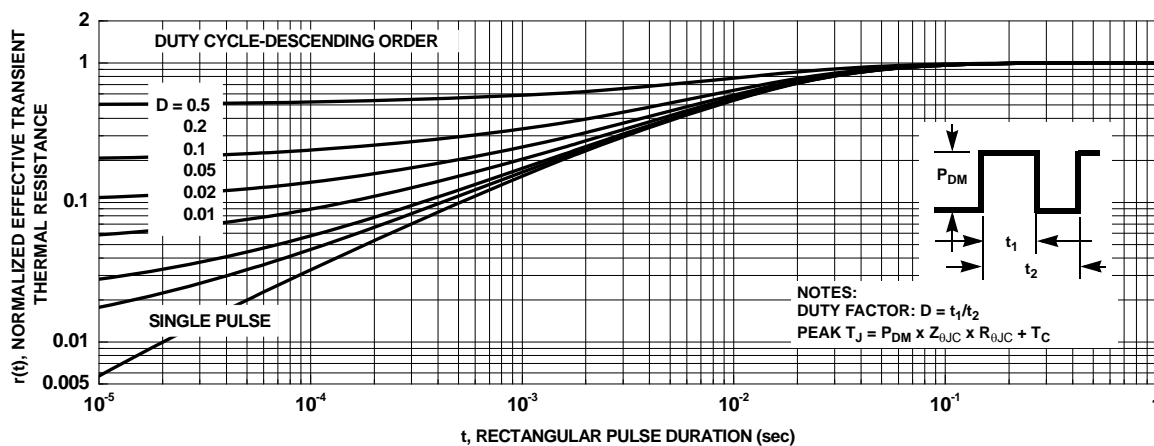


**Figure 11. Forward Bias Safe Operating Area**



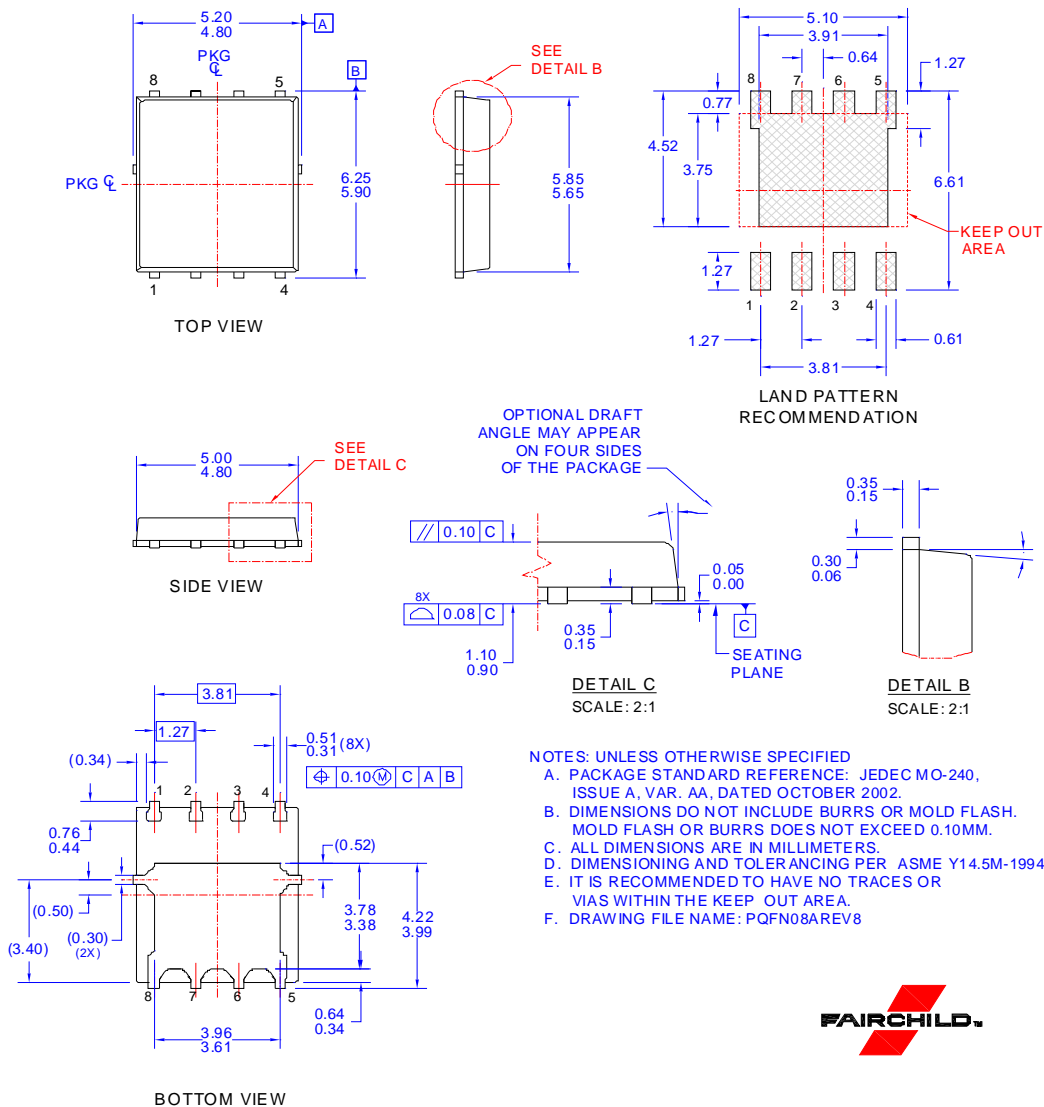
**Figure 12. Single Pulse Maximum Power Dissipation**

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



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

## Dimensional Outline and Pad Layout



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  - 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-1994.
  - E. IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.
  - F. DRAWING FILE NAME: PQFN08AREV8




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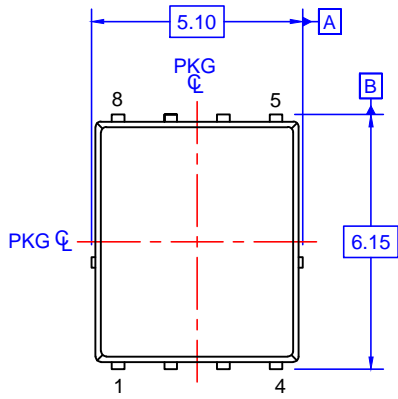
**PRODUCT STATUS DEFINITIONS**

**Definition of Terms**

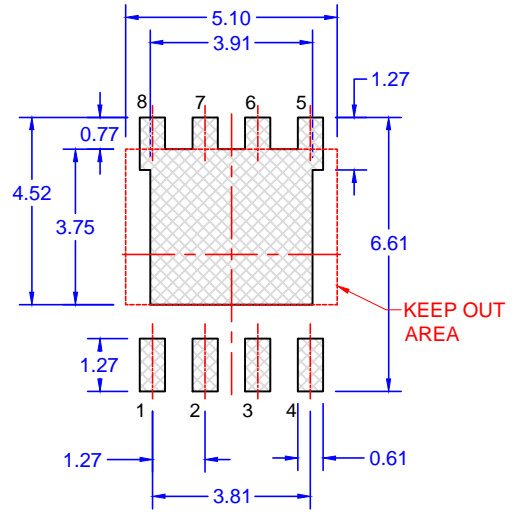
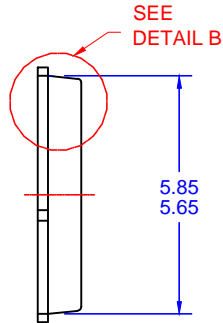
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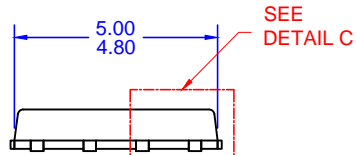
PQFN8 5X6, 1.27P  
CASE 483AE  
ISSUE A



TOP VIEW

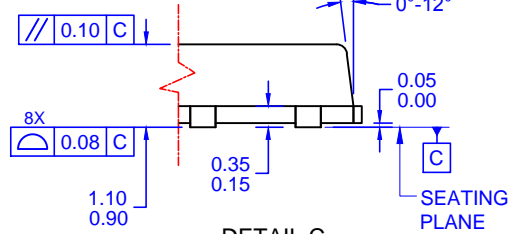


LAND PATTERN RECOMMENDATION

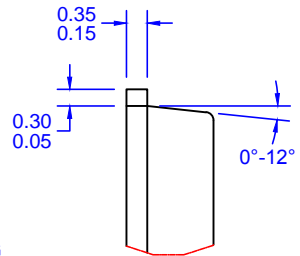


SIDE VIEW

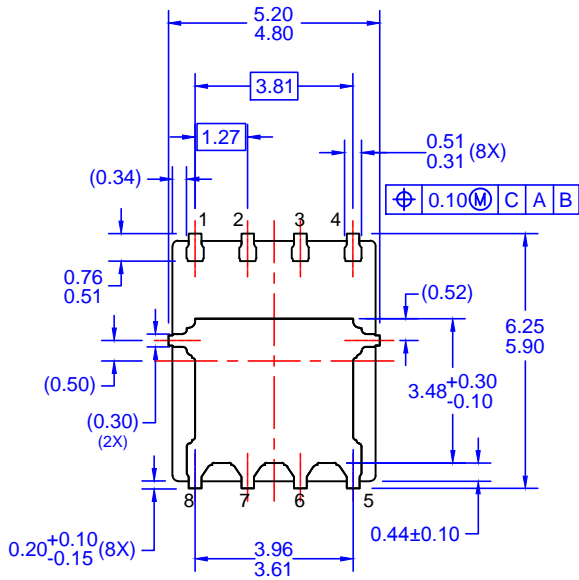
OPTIONAL DRAFT ANGLE MAY APPEAR ON FOUR SIDES OF THE PACKAGE



DETAIL C  
SCALE: 2:1



DETAIL B  
SCALE: 2:1



BOTTOM VIEW

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