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October 2014

# FDMS86252

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

150 V, 16 A, 51 mΩ

### Features

- Shielded Gate MOSFET Technology
- Max  $r_{DS(on)}$  = 51 mΩ at  $V_{GS} = 10$  V,  $I_D = 4.6$  A
- Max  $r_{DS(on)}$  = 70 mΩ at  $V_{GS} = 6$  V,  $I_D = 3.9$  A
- Advanced package and silicon combination for low  $r_{DS(on)}$  and high efficiency
- MSL1 robust package design
- 100% UIL tested
- RoHS Compliant

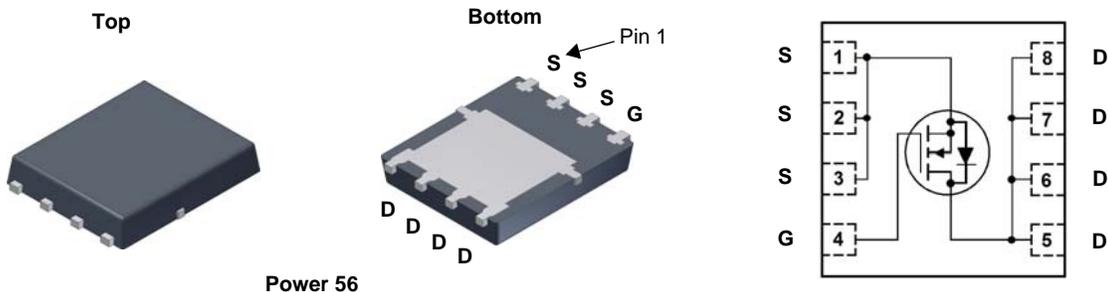


### General Description

This N-Channel MOSFET is 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.

### Application

- DC-DC Conversion



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

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	150	V
$V_{GS}$	Gate to Source Voltage	±20	V
$I_D$	Drain Current -Continuous	$T_C = 25$ °C	16
	-Continuous	$T_A = 25$ °C (Note 1a)	4.6
	-Pulsed		20
$E_{AS}$	Single Pulse Avalanche Energy	(Note 3)	50
$P_D$	Power Dissipation	$T_C = 25$ °C	69
	Power Dissipation	$T_A = 25$ °C (Note 1a)	2.5
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	°C

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.8	°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
FDMS86252	FDMS86252	Power 56	13 "	12 mm	3000 units

FDMS86252 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	$I_D = 250\text{ }\mu\text{A}, V_{GS} = 0\text{ V}$	150			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		106		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 120\text{ V}, V_{GS} = 0\text{ V}$			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	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	2.0	2.8	4.0	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 $25\text{ }^\circ\text{C}$		-9		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 4.6\text{ A}$		43.9	51	m $\Omega$
		$V_{GS} = 6\text{ V}, I_D = 3.9\text{ A}$		50.5	70	
		$V_{GS} = 10\text{ V}, I_D = 4.6\text{ A}, T_J = 125\text{ }^\circ\text{C}$		83	96	
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{ V}, I_D = 4.6\text{ A}$		15		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 75\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		678	905	pF
$C_{oss}$	Output Capacitance			74	115	pF
$C_{rss}$	Reverse Transfer Capacitance			4.3	10	pF
$R_g$	Gate Resistance		0.1	0.4	1.8	$\Omega$

### Switching Characteristics

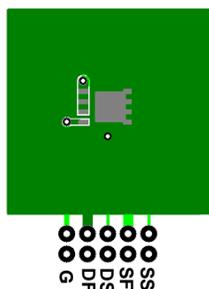
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 75\text{ V}, I_D = 4.6\text{ A}, V_{GS} = 10\text{ V}, R_{GEN} = 6\text{ }\Omega$		7.7	16	ns	
$t_r$	Rise Time			2.3	10	ns	
$t_{d(off)}$	Turn-Off Delay Time			15	27	ns	
$t_f$	Fall Time			3.2	10	ns	
$Q_g$	Total Gate Charge		$V_{GS} = 0\text{ V to } 10\text{ V}$		11	15	nC
$Q_g$	Total Gate Charge	$V_{GS} = 0\text{ V to } 5\text{ V}$	$V_{DD} = 75\text{ V}, I_D = 4.6\text{ A}$		6.1	8.6	nC
$Q_{gs}$	Gate to Source Charge				2.8		nC
$Q_{gd}$	Gate to Drain "Miller" Charge				2.4		nC

### Drain-Source Diode Characteristics

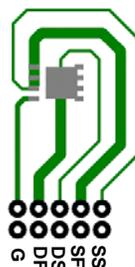
$V_{SD}$	Source-Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 2\text{ A}$ (Note 2)		0.75	1.2	V
		$V_{GS} = 0\text{ V}, I_S = 4.6\text{ A}$ (Note 2)		0.80	1.3	
$t_{rr}$	Reverse Recovery Time	$I_F = 4.6\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		56	90	ns
$Q_{rr}$	Reverse Recovery Charge			61	98	nC

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



b. 125  $^\circ\text{C}/\text{W}$  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  $T_J = 25\text{ }^\circ\text{C}$ ,  $L = 1\text{ mH}$ ,  $I_{AS} = 10\text{ A}$ ,  $V_{DD} = 135\text{ V}$ ,  $V_{GS} = 10\text{ V}$ .

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

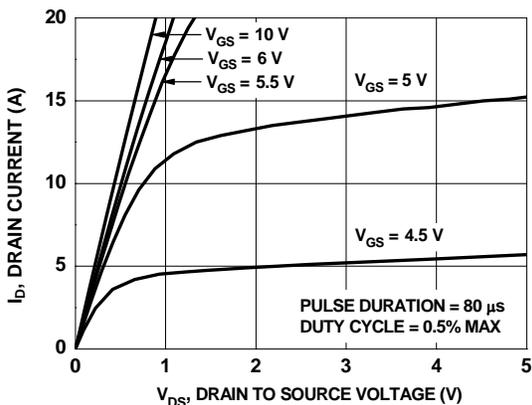


Figure 1. On Region Characteristics

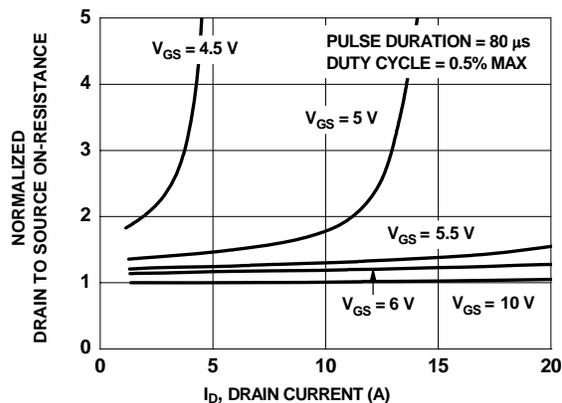


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

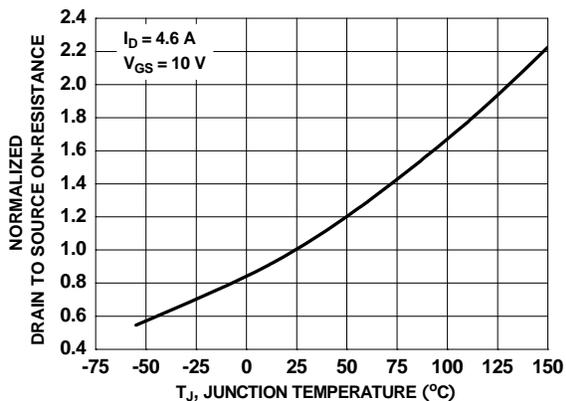


Figure 3. Normalized On Resistance vs Junction Temperature

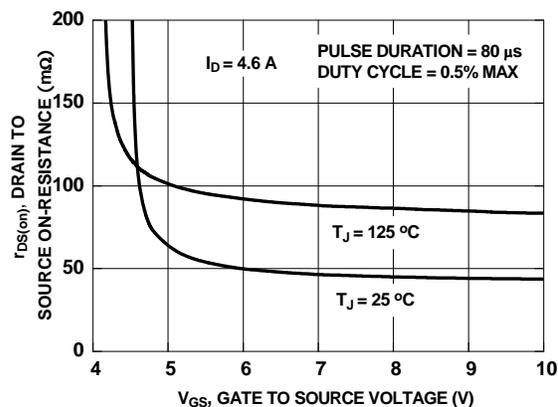


Figure 4. On-Resistance vs Gate to Source Voltage

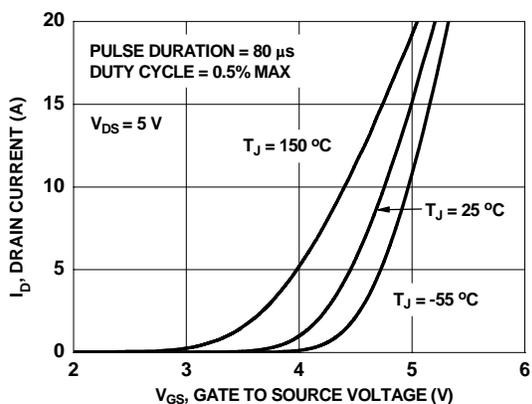


Figure 5. Transfer Characteristics

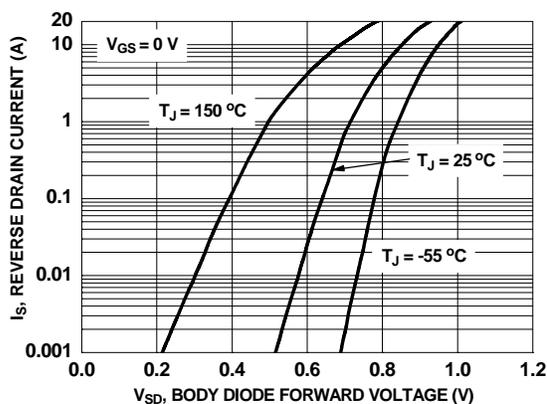
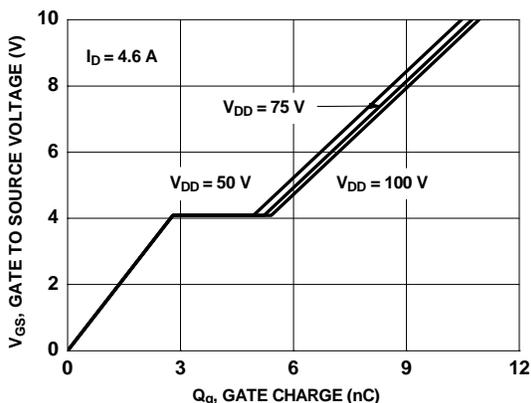
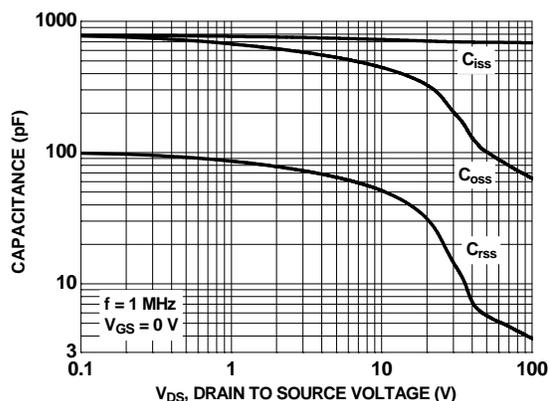


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

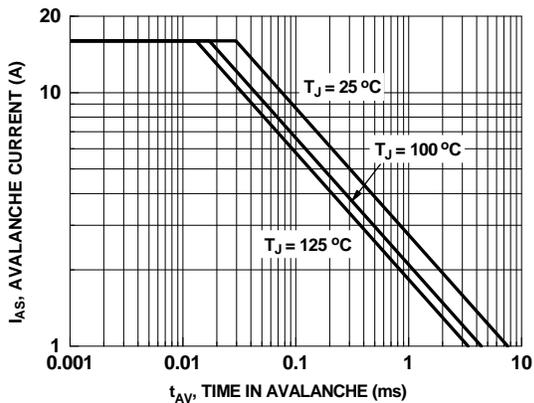
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



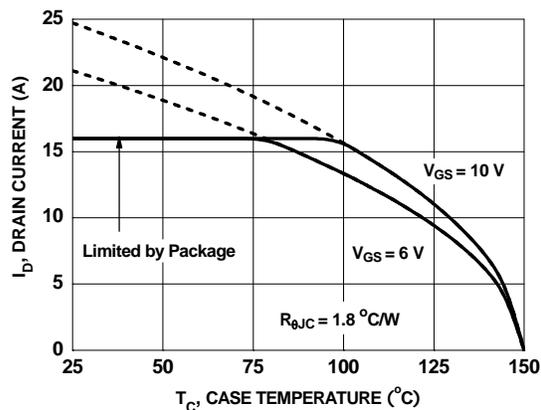
**Figure 7. Gate Charge Characteristics**



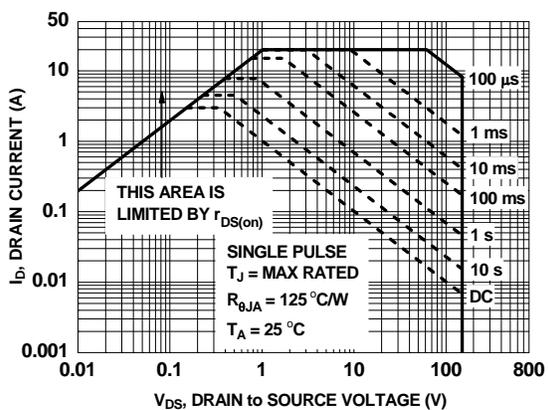
**Figure 8. Capacitance vs Drain to Source Voltage**



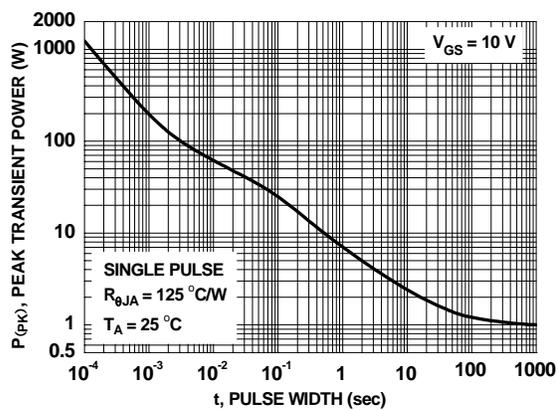
**Figure 9. Unclamped Inductive Switching Capability**



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

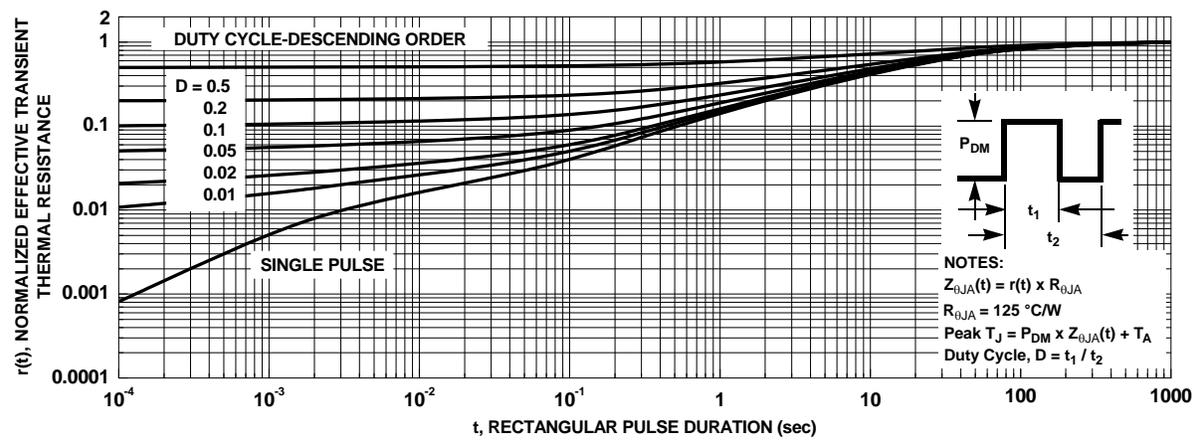


**Figure 11. Forward Bias Safe Operating Area**

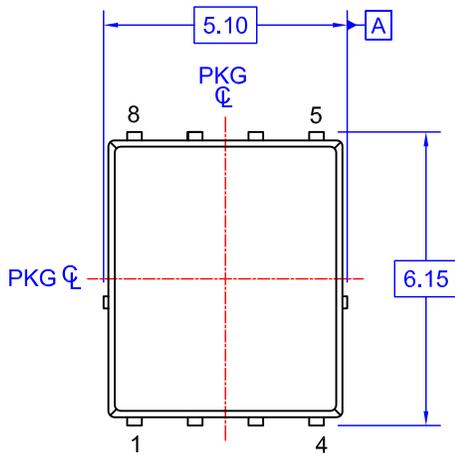


**Figure 12. Single Pulse Maximum Power Dissipation**

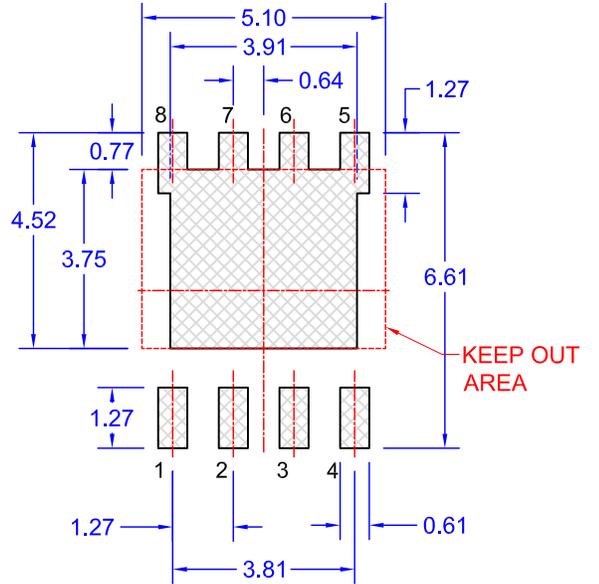
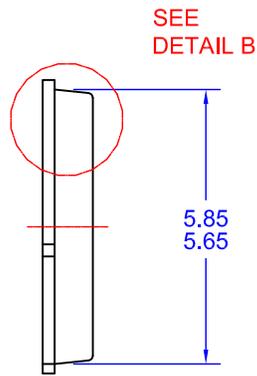
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



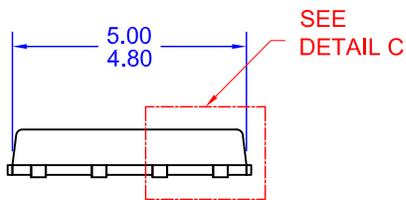
**Figure 13. Junction-to-Ambient Transient Thermal Response Curve**



TOP VIEW

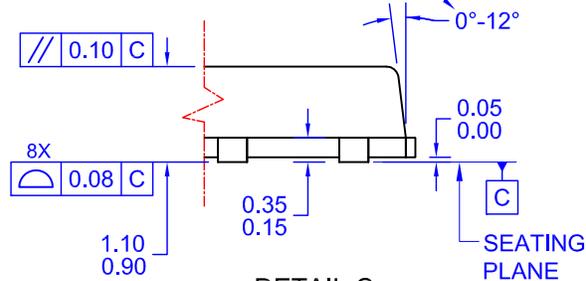


LAND PATTERN RECOMMENDATION

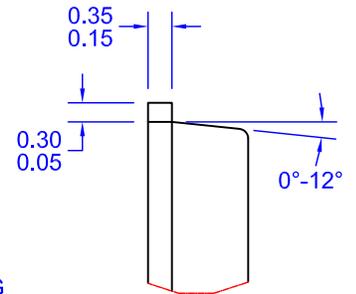


SIDE VIEW

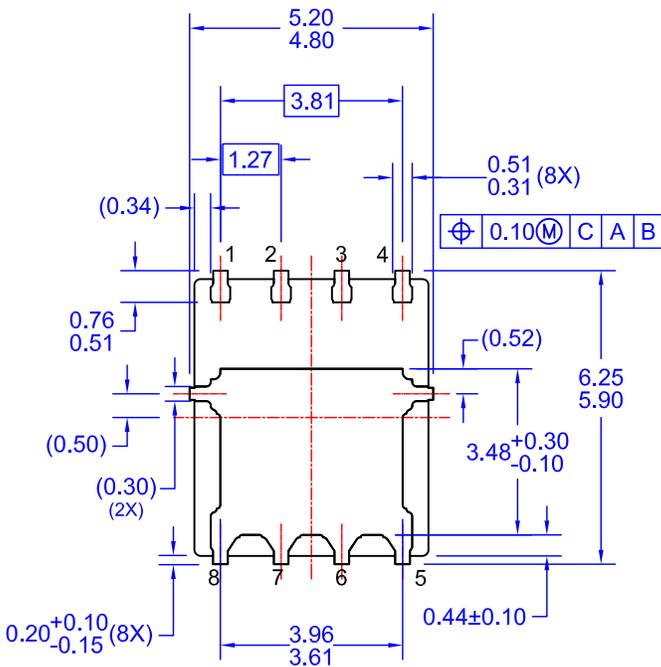
OPTIONAL DRAFT ANGLE MAY APPEAR ON FOUR SIDES OF THE PACKAGE



DETAIL C  
SCALE: 2:1



DETAIL B  
SCALE: 2:1



BOTTOM VIEW

NOTES: UNLESS OTHERWISE SPECIFIED

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- 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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