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# FDMS86250

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

150 V, 30 A, 25 mΩ

### Features

- Shielded Gate MOSFET Technology
- Max  $r_{DS(on)}$  = 25 mΩ at  $V_{GS} = 10\text{ V}$ ,  $I_D = 6.7\text{ A}$
- Max  $r_{DS(on)}$  = 33 mΩ at  $V_{GS} = 6\text{ V}$ ,  $I_D = 5.8\text{ A}$
- Advanced package and silicon combination for low  $r_{DS(on)}$  and high efficiency
- MSL1 robust package design
- 100% UIL tested
- RoHS Compliant

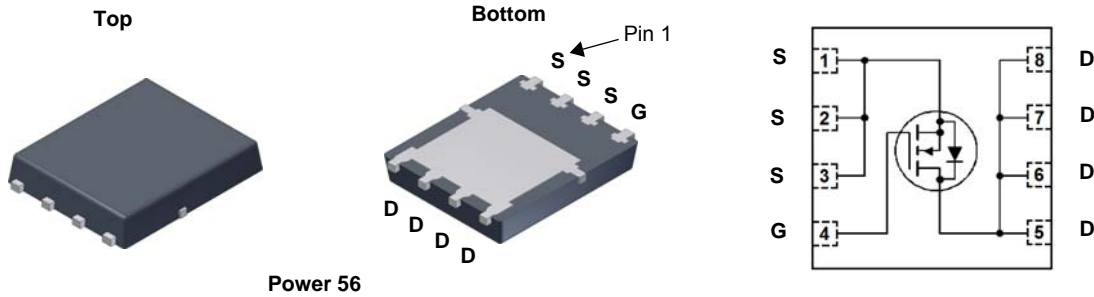


### General Description

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



Power 56

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

Symbol	Parameter	Rated Value	Units	
$V_{DS}$	Drain to Source Voltage	150	V	
$V_{GS}$	Gate to Source Voltage	±20	V	
$I_D$	Drain Current -Continuous	$T_C = 25\text{ °C}$	A	
	-Continuous	$T_A = 25\text{ °C}$ (Note 1a)		6.7
	-Pulsed	(Note 4)		100
$E_{AS}$	Single Pulse Avalanche Energy	(Note 3)	180 mJ	
$P_D$	Power Dissipation	$T_C = 25\text{ °C}$	96 W	
	Power Dissipation	$T_A = 25\text{ °C}$ (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	1.3	°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
FDMS86250	FDMS86250	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	$I_D = 250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$	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	2.9	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 $25\text{ }^\circ\text{C}$		-11		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$ , $I_D = 6.7\text{ A}$		19	25	m $\Omega$
		$V_{GS} = 6\text{ V}$ , $I_D = 5.8\text{ A}$		23	33	
		$V_{GS} = 10\text{ V}$ , $I_D = 6.7\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$		35	46	
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{ V}$ , $I_D = 6.7\text{ A}$		24		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 75\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$		1750	2330	pF
$C_{oss}$	Output Capacitance			165	220	pF
$C_{rss}$	Reverse Transfer Capacitance			8.8	15	pF
$R_g$	Gate Resistance			0.5		$\Omega$

### Switching Characteristics

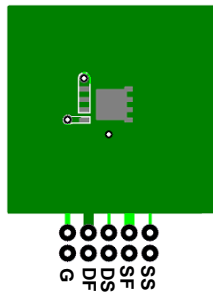
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 75\text{ V}$ , $I_D = 6.7\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$		14	25	ns	
$t_r$	Rise Time			4.3	10	ns	
$t_{d(off)}$	Turn-Off Delay Time			22	35	ns	
$t_f$	Fall Time			4.2	10	ns	
$Q_g$	Total Gate Charge		$V_{GS} = 0\text{ V to } 10\text{ V}$		25	36	nC
$Q_g$	Total Gate Charge	$V_{GS} = 0\text{ V to } 5\text{ V}$	$V_{DD} = 75\text{ V}$ , $I_D = 6.7\text{ A}$		14	20	nC
$Q_{gs}$	Gate to Source Charge				7.4		nC
$Q_{gd}$	Gate to Drain "Miller" Charge				5.5		nC

### Drain-Source Diode Characteristics

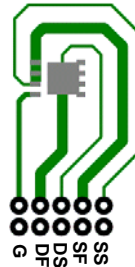
$V_{SD}$	Source-Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = 2\text{ A}$ (Note 2)		0.72	1.2	V
		$V_{GS} = 0\text{ V}$ , $I_S = 6.7\text{ A}$ (Note 2)		0.78	1.3	
$t_{rr}$	Reverse Recovery Time	$I_F = 6.7\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		73	117	ns
$Q_{rr}$	Reverse Recovery Charge			112	180	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.



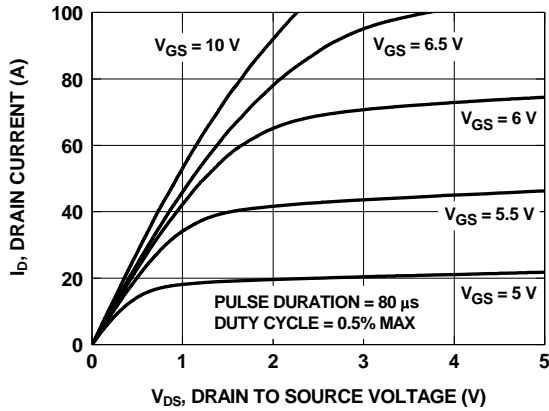
a. 50  $^\circ\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



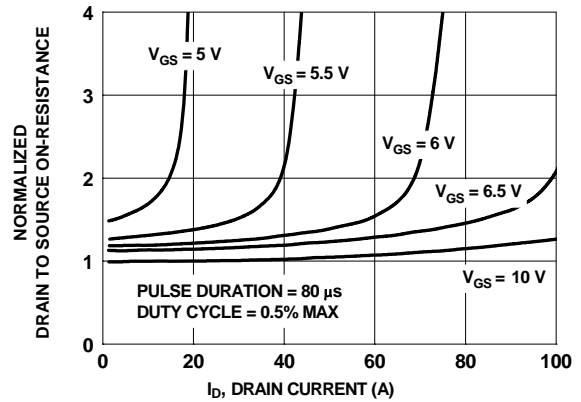
b. 125  $^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper.

- Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0%.
- Starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $L = 1\text{ mH}$ ,  $I_{AS} = 19\text{ A}$ ,  $V_{DD} = 135\text{ V}$ ,  $V_{GS} = 10\text{ V}$ .
- Pulse  $I_d$  limited by junction temperature,  $t_d \leq 100\text{ }\mu\text{s}$ . Please refer to SOA curve for more details.

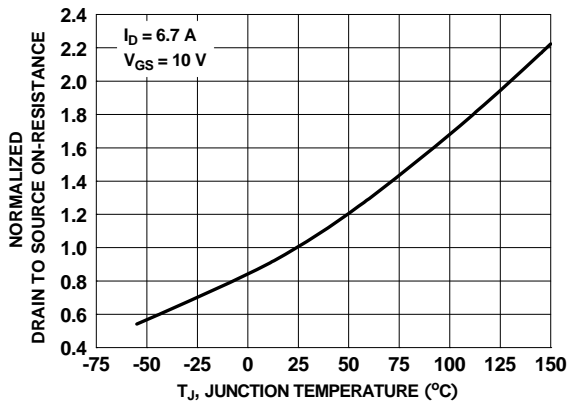
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



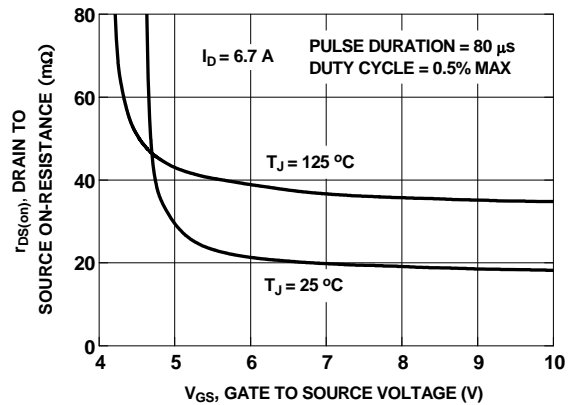
**Figure 1. On-Region Characteristics**



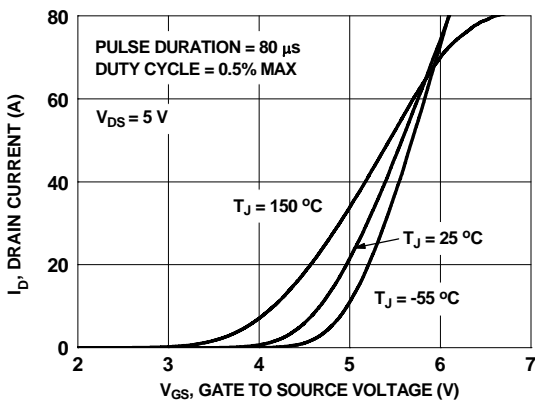
**Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage**



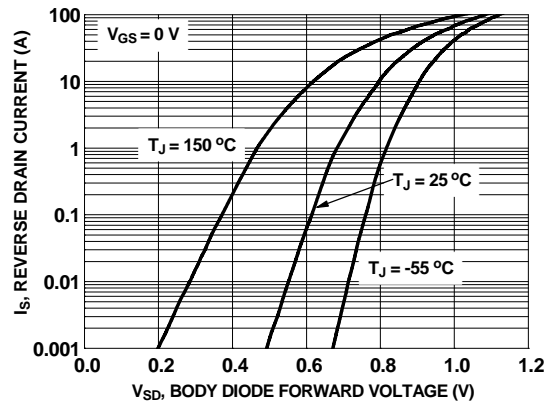
**Figure 3. Normalized On-Resistance vs Junction Temperature**



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

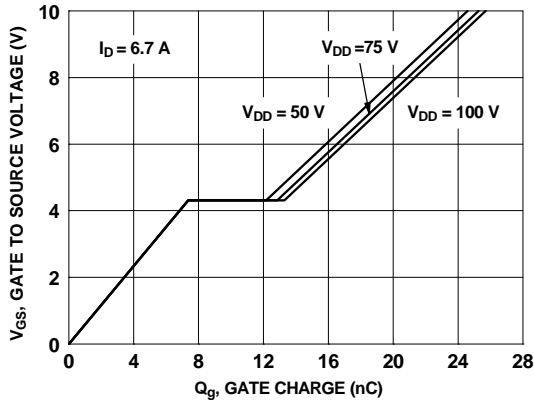


**Figure 5. Transfer Characteristics**

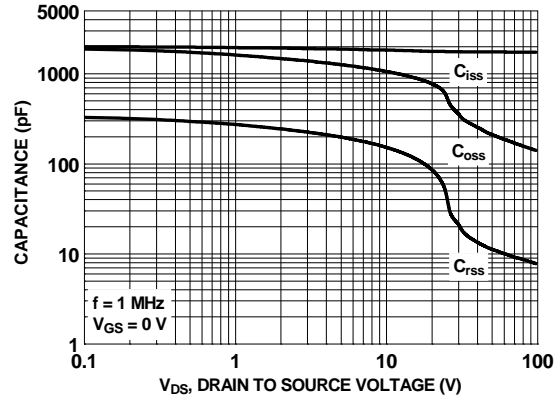


**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**

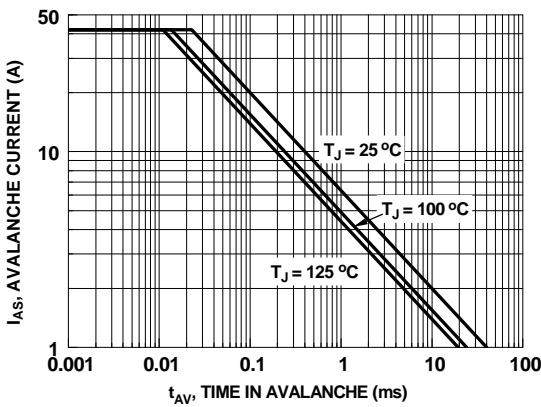
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



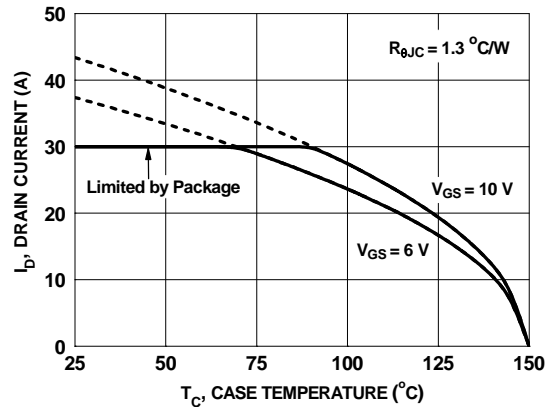
**Figure 7. Gate Charge Characteristics**



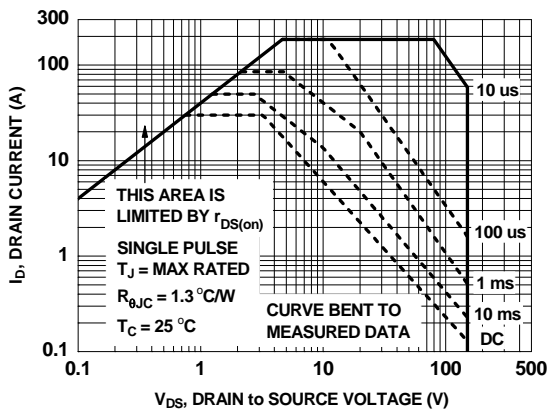
**Figure 8. Capacitance vs Drain to Source Voltage**



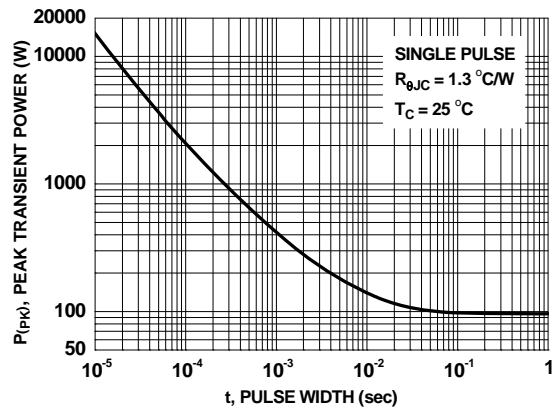
**Figure 9. Unclamped Inductive Switching Capability**



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

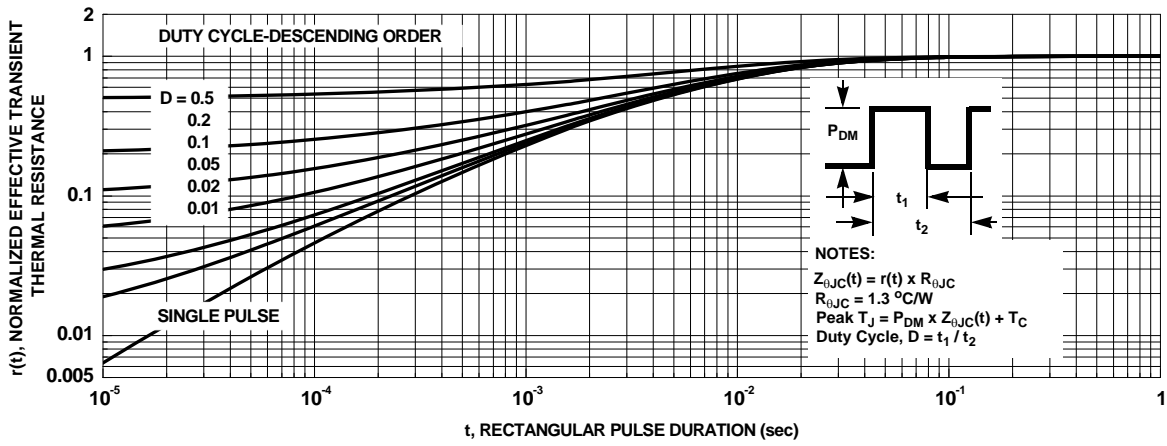


**Figure 11. Forward Bias Safe Operating Area**



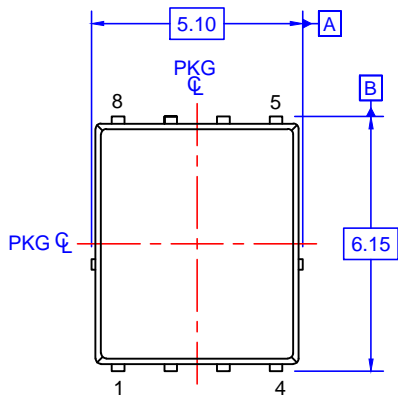
**Figure 12. Single Pulse Maximum Power Dissipation**

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

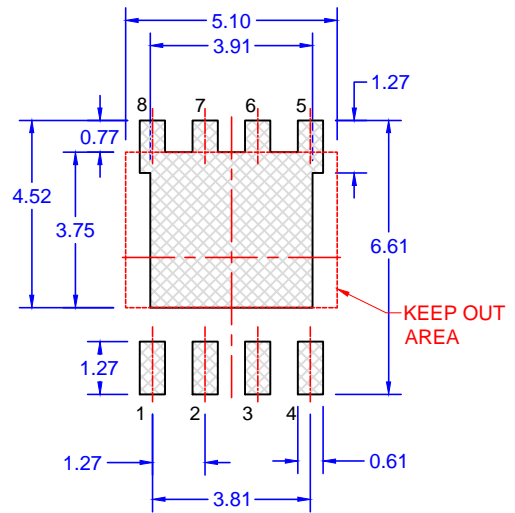
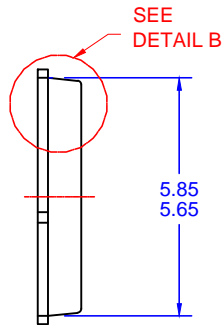


**Figure 13. Junction-to-Case Transient Thermal Response Curve**

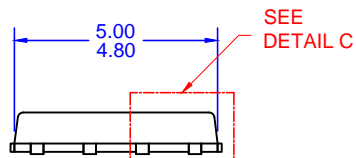
PQFN8 5X6, 1.27P  
CASE 483AE  
ISSUE A



TOP VIEW

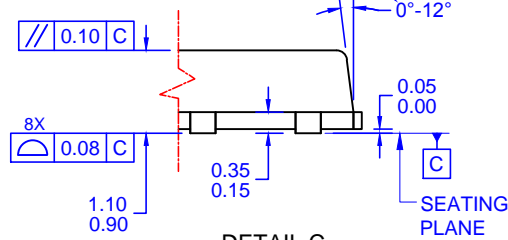


LAND PATTERN RECOMMENDATION

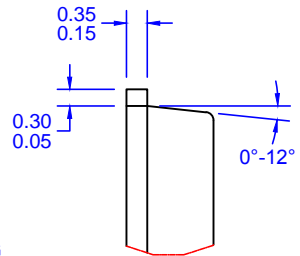


SIDE VIEW

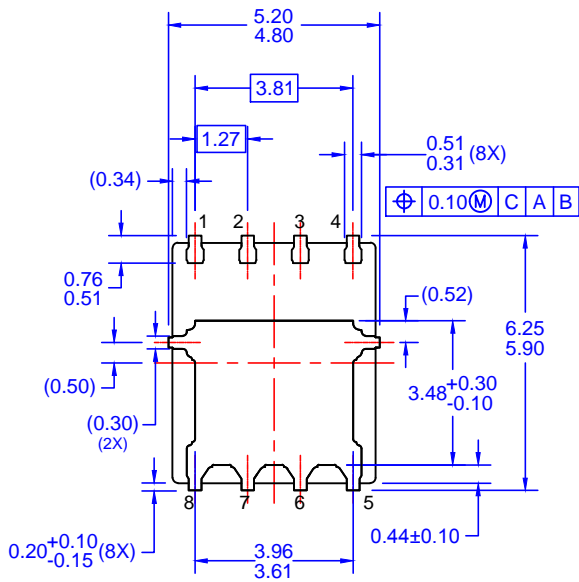
OPTIONAL DRAFT ANGLE MAY APPEAR ON FOUR SIDES OF THE PACKAGE



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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