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FDMS7678

N-Channel Power Trench® MOSFET

30 V, 26 A, 5.5 mΩ

Features

- Max $r_{DS(on)} = 5.5 \text{ mΩ}$ at $V_{GS} = 10 \text{ V}$, $I_D = 17.5 \text{ A}$
- Max $r_{DS(on)} = 6.8 \text{ mΩ}$ at $V_{GS} = 4.5 \text{ V}$, $I_D = 15 \text{ A}$
- High Performance Technology for Extremely Low $r_{DS(on)}$
- Termination is Lead-Free
- RoHS Compliant

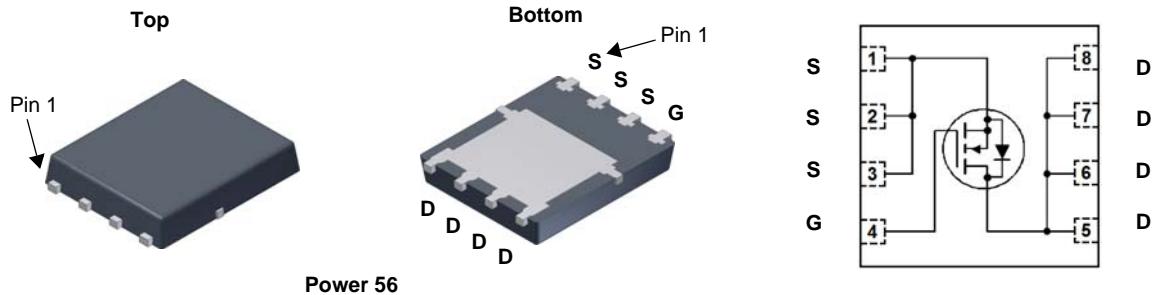


General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced Power Trench® process that has been especially tailored to minimize the on-state resistance. This device is well suited for Power Management and load switching applications common in Notebook Computers and Portable Battery Packs.

Applications

- DC - DC Buck Converters
- Notebook Battery Power Management
- Load Switch in Notebook



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

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	30	V
V_{GS}	Gate to Source Voltage	(Note 3)	V
I_D	Drain Current -Continuous (Package limited) $T_C = 25^\circ\text{C}$	26	A
	Drain Current -Continuous (Silicon limited) $T_C = 25^\circ\text{C}$	72	
	-Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	17.5	
	-Pulsed	70	
E_{AS}	Single Pulse Avalanche Energy	(Note 4)	mJ
P_D	Power Dissipation $T_C = 25^\circ\text{C}$	41	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	2.3	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	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
FDMS7678	FDMS7678	Power 56	13 "	12 mm	3000 units

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$	30			V
BV_{DSSt}	Drain to Source Breakdown Voltage (transient)	$V_{GS} = 0 \text{ V}, I_{D(\text{aval})} = 14.2 \text{ A}, T_{\text{case}} = 25^\circ\text{C}, t_{\text{transient}} = 10 \text{ ns}$	34			V
$\frac{\Delta \text{BV}_{\text{DSS}}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, referenced to 25°C		21		$\text{mV}/^\circ\text{C}$
I_{DSs}	Zero Gate Voltage Drain Current	$V_{DS} = 24 \text{ V}, V_{GS} = 0 \text{ V}$			1	μA
I_{GSS}	Gate to Source Leakage Current, Forward	$V_{GS} = 20 \text{ V}, V_{DS} = 0 \text{ V}$			100	nA

On Characteristics

$V_{GS(\text{th})}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	1.2	1.5	3.0	V
$\frac{\Delta V_{GS(\text{th})}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, referenced to 25°C		-5		$\text{mV}/^\circ\text{C}$
$r_{DS(\text{on})}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 17.5 \text{ A}$		4.7	5.5	$\text{m}\Omega$
		$V_{GS} = 4.5 \text{ V}, I_D = 15 \text{ A}$		5.6	6.8	
		$V_{GS} = 10 \text{ V}, I_D = 17.5 \text{ A}$ $T_J = 125^\circ\text{C}$		6.3	7.4	
g_{FS}	Forward Transconductance	$V_{DD} = 5 \text{ V}, I_D = 17.5 \text{ A}$		90		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 15 \text{ V}, V_{GS} = 0 \text{ V}$ $f = 1 \text{ MHz}$		1810	2410	pF
C_{oss}	Output Capacitance			620	820	pF
C_{rss}	Reverse Transfer Capacitance			75	110	pF
R_g	Gate Resistance		0.1	0.7	2.5	Ω

Switching Characteristics

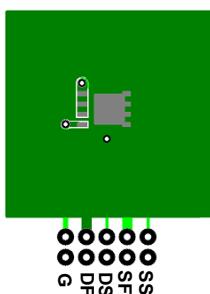
$t_{d(\text{on})}$	Turn-On Delay Time	$V_{DD} = 15 \text{ V}, I_D = 17.5 \text{ A}$ $V_{GS} = 10 \text{ V}, R_{\text{GEN}} = 6 \Omega$		10	19	ns
t_r	Rise Time			4	10	ns
$t_{d(\text{off})}$	Turn-Off Delay Time			26	41	ns
t_f	Fall Time			3	10	ns
$Q_{g(\text{TOT})}$	Total Gate Charge	$V_{GS} = 0 \text{ V} \text{ to } 10 \text{ V}$		28	39	nC
	Total Gate Charge	$V_{GS} = 0 \text{ V} \text{ to } 4.5 \text{ V}$	$V_{DD} = 15 \text{ V}$	14	19	nC
Q_{gs}	Gate to Source Charge	$I_D = 17.5 \text{ A}$		4.4		nC
Q_{gd}	Gate to Drain "Miller" Charge			3.9		nC

Drain-Source Diode Characteristics

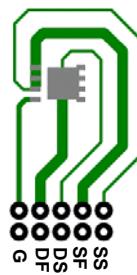
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_S = 1.9 \text{ A}$ (Note 2)		0.7	1.2	V
		$V_{GS} = 0 \text{ V}, I_S = 17.5 \text{ A}$ (Note 2)		0.8	1.2	
t_{rr}	Reverse Recovery Time	$I_F = 17.5 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$		30	49	ns
Q_{rr}	Reverse Recovery Charge			13	23	nC

NOTES:

1. R_{thJA} is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. R_{thJC} is guaranteed by design while R_{thCA} is determined by the user's board design.



a. 50 °C/W when mounted on a 1 in² pad of 2 oz copper.



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

2. Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0 %.

3. As an N-ch device, the negative V_{GS} rating is for low duty cycle pulse occurrence only. No continuous rating is implied.

4. E_{AS} of 54 mJ is based on starting $T_J = 25^\circ\text{C}$, $L = 0.3 \text{ mH}$, $I_{AS} = 19 \text{ A}$, $V_{DD} = 27 \text{ V}$, $V_{GS} = 10 \text{ V}$.

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

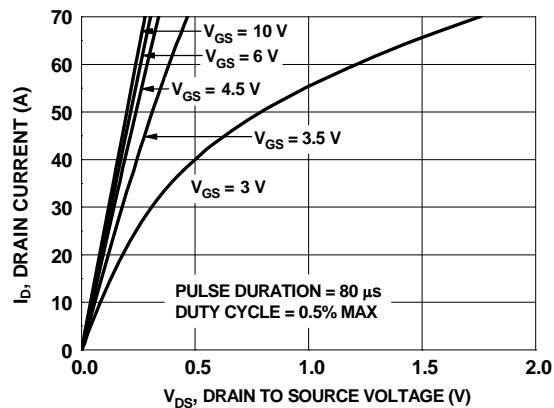


Figure 1. On Region Characteristics

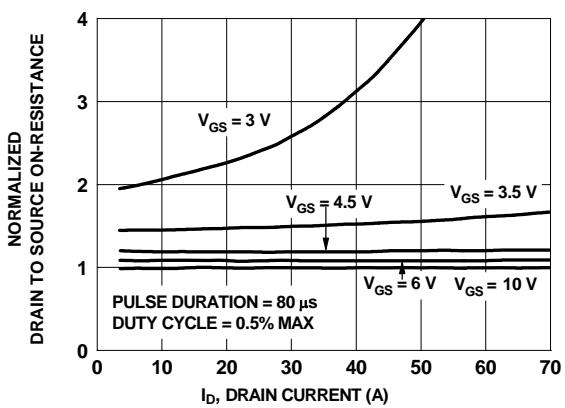


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

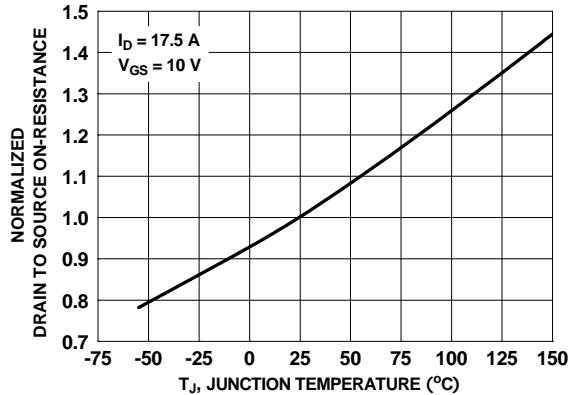


Figure 3. Normalized On Resistance vs. Junction Temperature

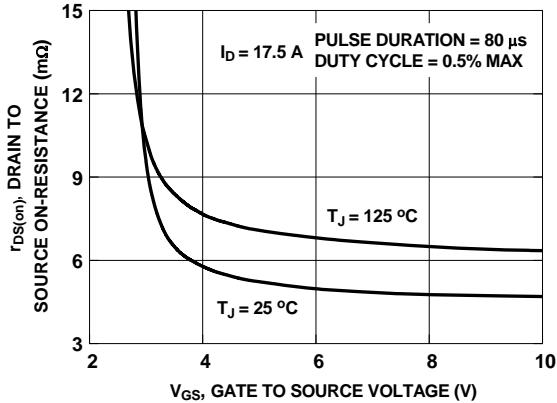


Figure 4. On-Resistance vs. Gate to Source Voltage

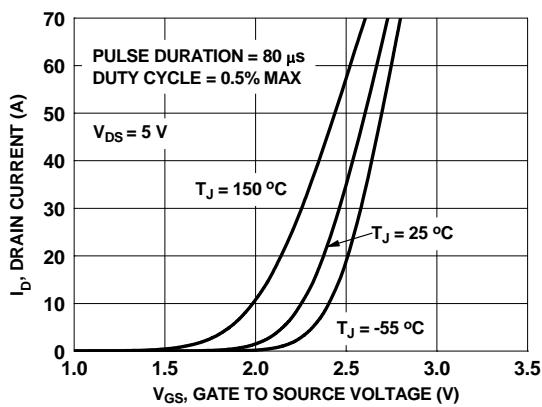


Figure 5. Transfer Characteristics

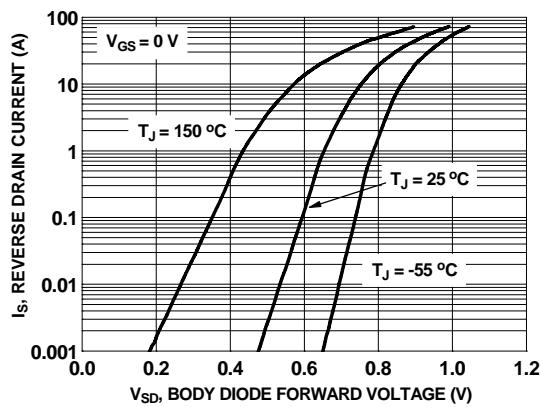


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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

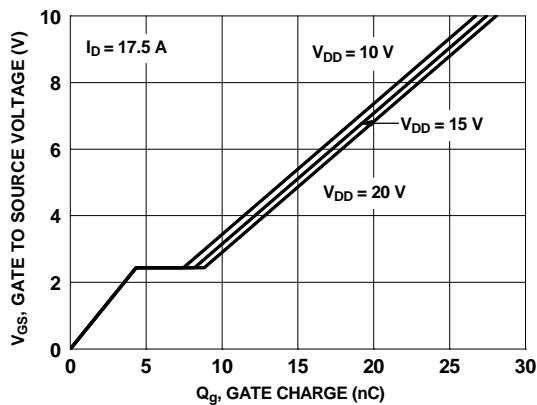


Figure 7. Gate Charge Characteristics

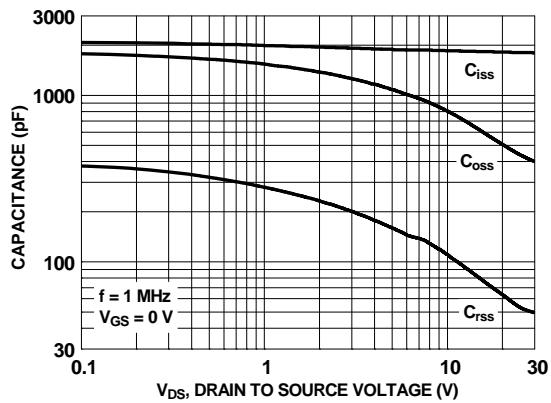


Figure 8. Capacitance vs. Drain to Source Voltage

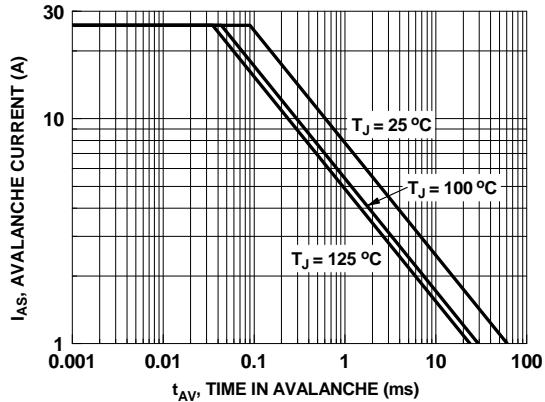


Figure 9. Unclamped Inductive Switching Capability

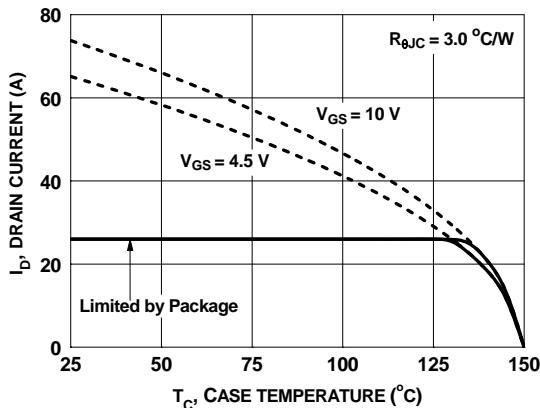


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

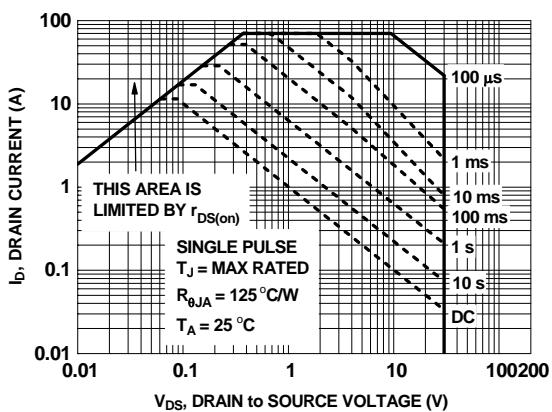


Figure 11. Forward Bias Safe Operating Area

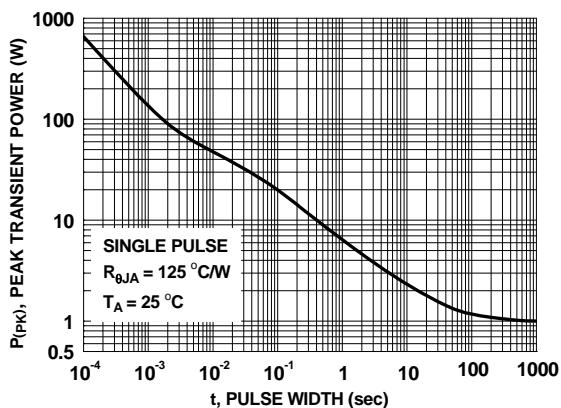


Figure 12. Single Pulse Maximum Power Dissipation

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

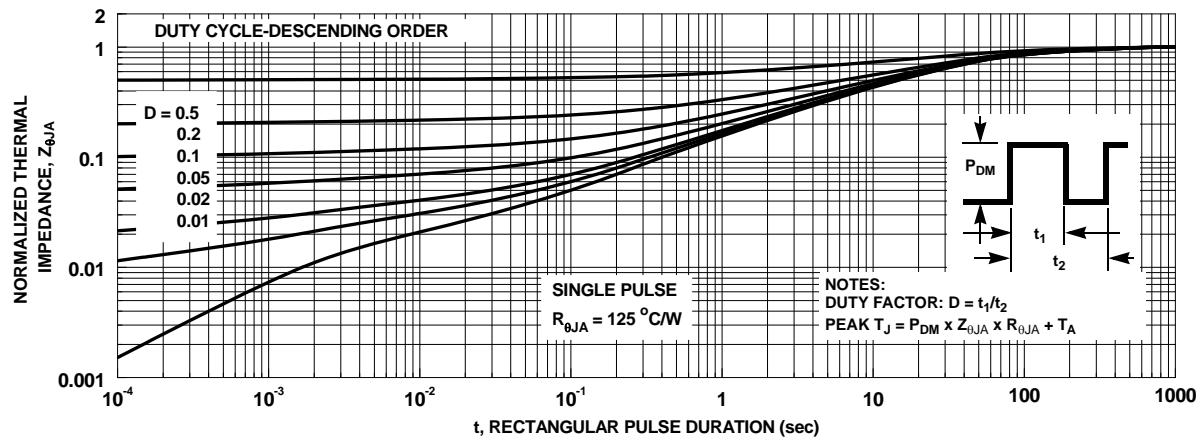
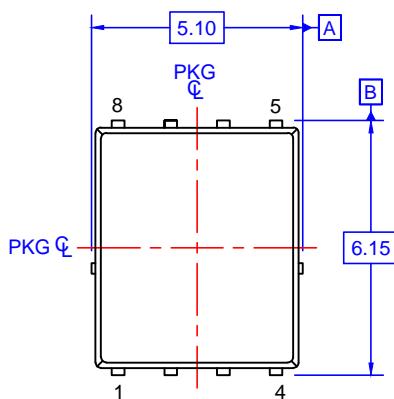
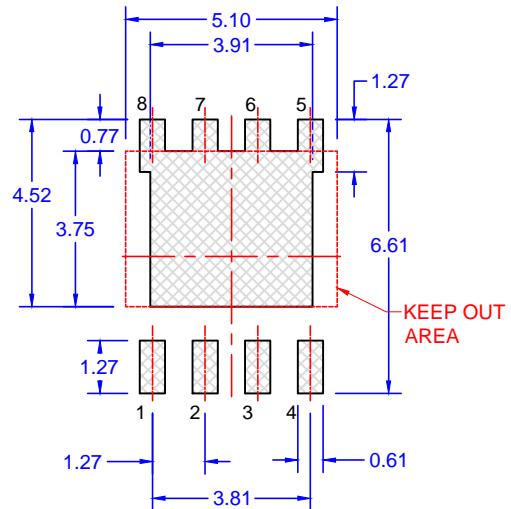
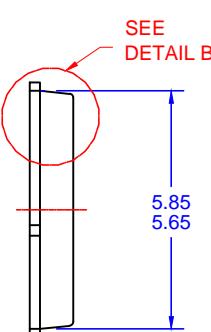


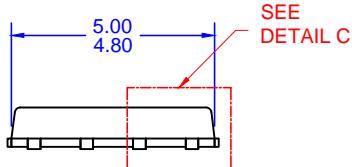
Figure 13. Junction-to-Ambient Transient Thermal Response Curve



TOP VIEW

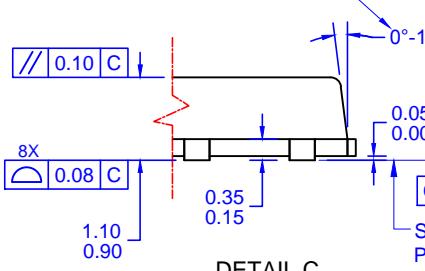


LAND PATTERN RECOMMENDATION

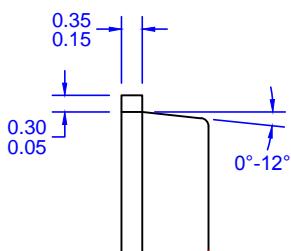


SIDE VIEW

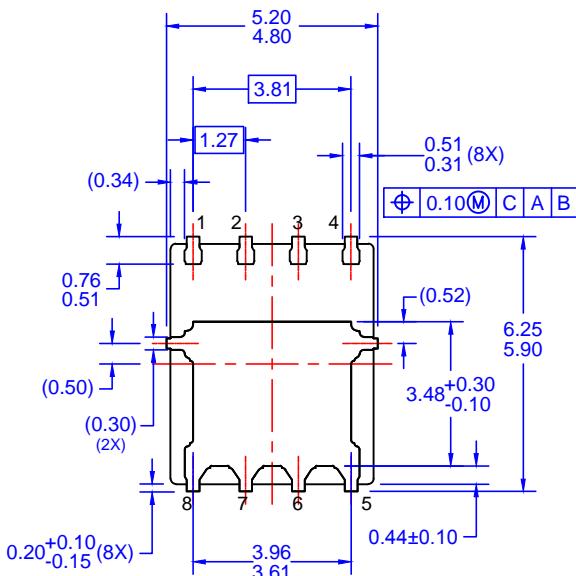
OPTIONAL DRAFT
ANGLE MAY APPEAR
ON FOUR SIDES
OF THE PACKAGE



DETAIL C



DETAIL B



BOTTOM VIEW

NOTES: UNLESS OTHERWISE SPECIFIED

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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