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January 2016

# FDMD8240L

## Dual N-Channel Power Trench<sup>®</sup> MOSFET 40 V, 98 A, 2.6 mΩ

### Features

- Max  $r_{DS(on)}$  = 2.6 mΩ at  $V_{GS} = 10$  V,  $I_D = 23$  A
- Max  $r_{DS(on)}$  = 3.95 mΩ at  $V_{GS} = 4.5$  V,  $I_D = 19$  A
- Ideal for Flexible Layout in Primary Side of Bridge Topology
- 100% UIL Tested
- Kelvin High Side MOSFET Drive Pin-out Capability
- Termination is Lead-free and RoHS Compliant

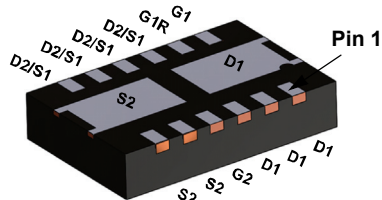
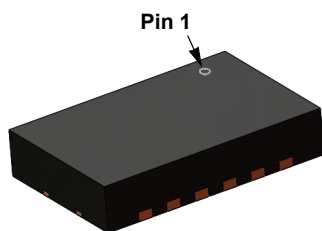


### General Description

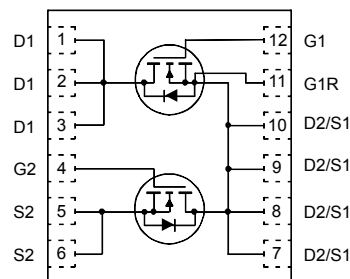
This device includes two 40V N-Channel MOSFETs in a dual Power (3.3 mm X 5 mm) package. HS source and LS Drain are internally connected for half/full bridge, low source inductance package, low  $r_{DS(on)}$ /Qg FOM silicon.

### Applications

- Synchronous Buck : Primary Switch of Half / Full Bridge Converter for Telecom
- Motor Bridge : Primary Switch of Half / Full bridge Converter for BLDC Motor
- MV POL: Synchronous Buck Switch



Power 3.3 x 5



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

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	40	V
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current -Continuous $T_C = 25^\circ\text{C}$ (Note 5)	98	A
	-Continuous $T_C = 100^\circ\text{C}$ (Note 5)	62	
	-Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	23	
	-Pulsed (Note 4)	464	
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	216	mJ
$P_D$	Power Dissipation $T_C = 25^\circ\text{C}$	42	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	2.1	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	3.0	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	60	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
8240L	FDMD8240L	Power 3.3 x 5	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	$I_D = 250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$	40			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^{\circ}\text{C}$		23		mV/ $^{\circ}\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 32\text{ V}$ , $V_{GS} = 0\text{ V}$			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	$V_{GS} = V_{DS}$ , $I_D = 250\text{ }\mu\text{A}$	1.0	2.0	3.0	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 $25\text{ }^{\circ}\text{C}$		-6		mV/ $^{\circ}\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$ , $I_D = 23\text{ A}$		2.0	2.6	m $\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 19\text{ A}$		3.2	3.95	
		$V_{GS} = 10\text{ V}$ , $I_D = 23\text{ A}$ , $T_J = 125\text{ }^{\circ}\text{C}$		3.0	3.9	
$g_{FS}$	Forward Transconductance	$V_{DD} = 5\text{ V}$ , $I_D = 23\text{ A}$		107		S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 20\text{ V}$ , $V_{GS} = 0\text{ V}$ $f = 1\text{ MHz}$		3020	4230	pF
$C_{oss}$	Output Capacitance			876	1230	pF
$C_{rss}$	Reverse Transfer Capacitance			33	52	pF
$R_g$	Gate Resistance		0.1	2.8	6	$\Omega$

**Switching Characteristics**

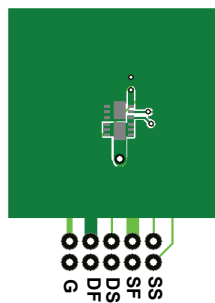
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 20\text{ V}$ , $I_D = 23\text{ A}$ $V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$		12	22	ns
$t_r$	Rise Time			8	16	ns
$t_{d(off)}$	Turn-Off Delay Time			36	58	ns
$t_f$	Fall Time			9	18	ns
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to } 10\text{ V}$	$V_{DD} = 20\text{ V}$ $I_D = 23\text{ A}$	40	56	nC
	Total Gate Charge	$V_{GS} = 0\text{ V to } 5\text{ V}$		21	30	nC
$Q_{gs}$	Gate to Source Charge			9		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			5		nC

**Drain-Source Diode Characteristics**

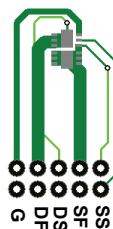
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = 23\text{ A}$ (Note 2)		0.8	1.3	V
		$V_{GS} = 0\text{ V}$ , $I_S = 1.6\text{ A}$ (Note 2)		0.7	1.2	
$t_{rr}$	Reverse Recovery Time	$I_F = 23\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		41	65	ns
$Q_{rr}$	Reverse Recovery Charge			21	32	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. 60  $^{\circ}\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



b. 130  $^{\circ}\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper

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

3.  $E_{AS}$  of 216 mJ is based on starting  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $L = 3\text{ mH}$ ,  $I_{AS} = 12\text{ A}$ ,  $V_{DD} = 40\text{ V}$ ,  $V_{GS} = 10\text{ V}$ . 100% tested at  $L = 0.1\text{ mH}$ ,  $I_{AS} = 37\text{ A}$ .

4. Pulsed  $I_D$  please refer to Fig 11 SOA graph for more details.

5. Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

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

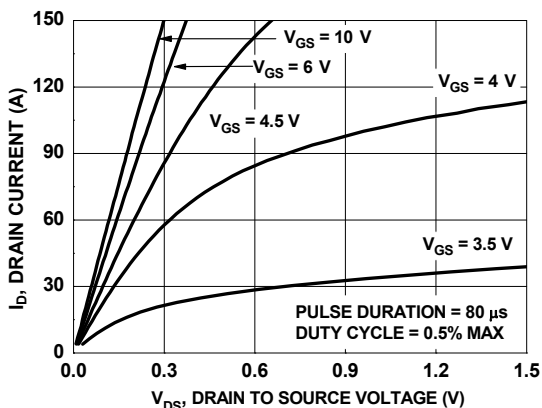


Figure 1. On-Region Characteristics

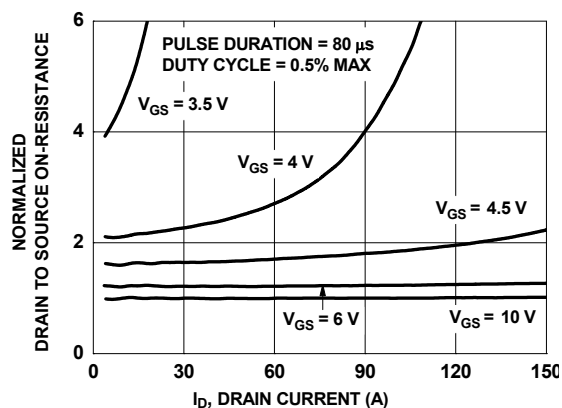


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

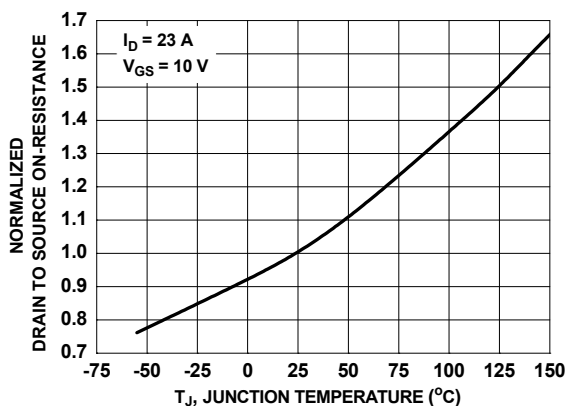


Figure 3. Normalized On Resistance vs. Junction Temperature

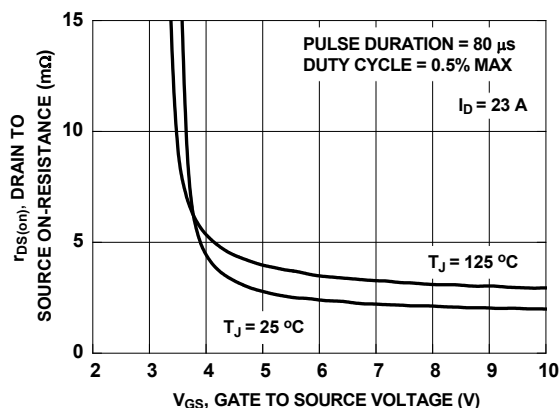


Figure 4. On Resistance vs. Gate to Source Voltage

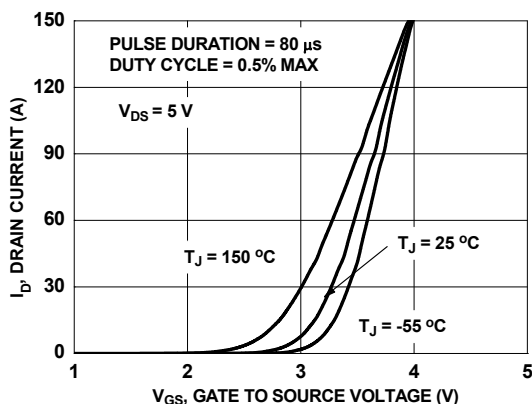


Figure 5. Transfer Characteristics

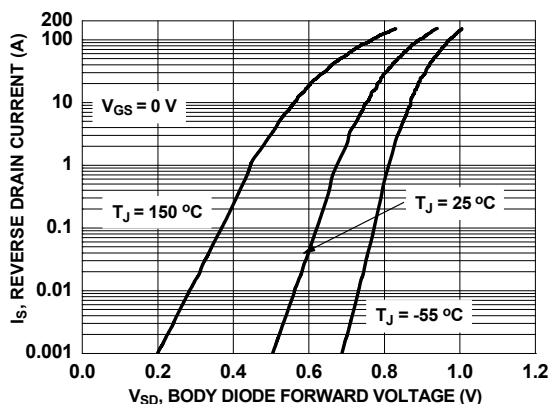


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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

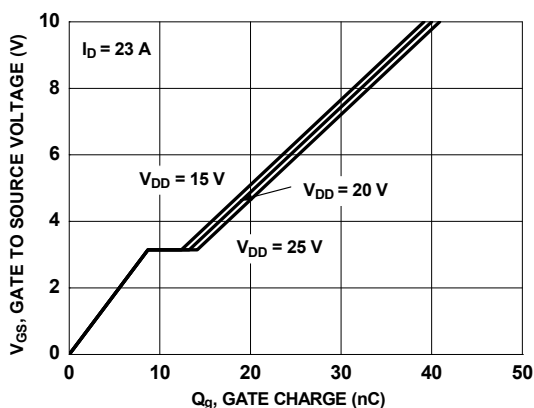


Figure 7. Gate Charge Characteristics

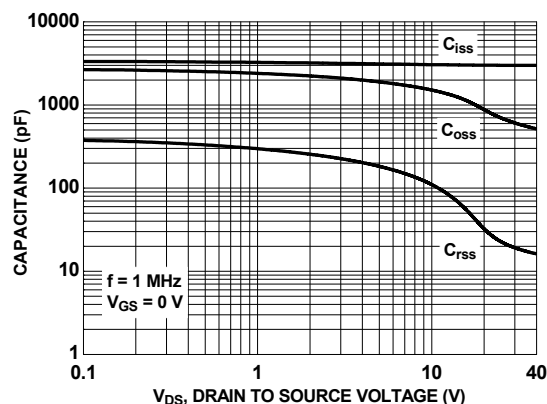


Figure 8. Capacitance vs. Drain to Source Voltage

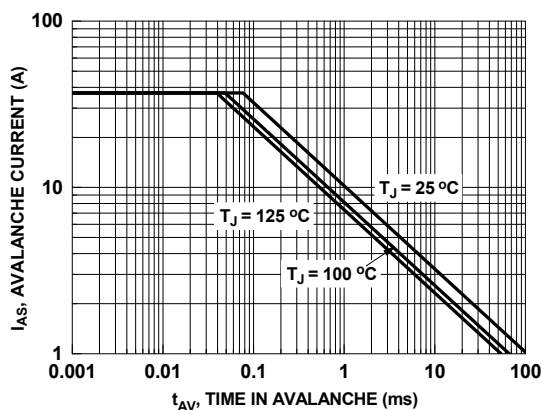


Figure 9. Unclamped Inductive Switching Capability

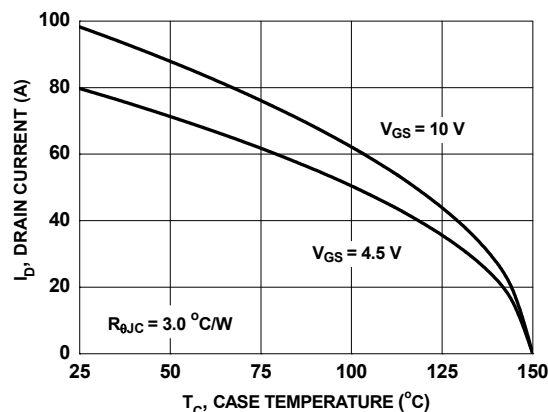


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

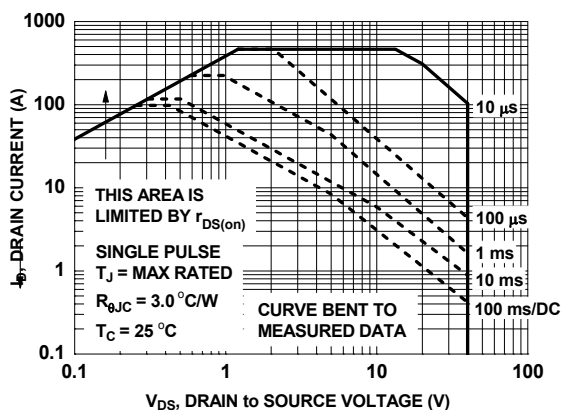


Figure 11. Forward Bias Safe Operating Area

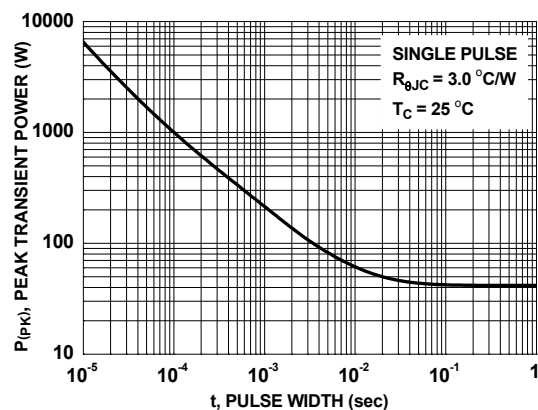


Figure 12. Single Pulse Maximum Power Dissipation

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

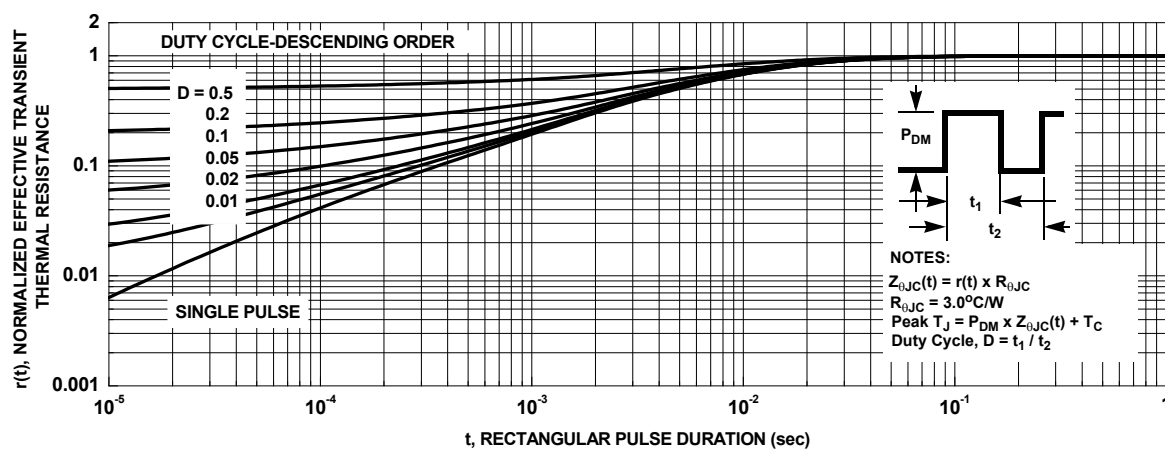
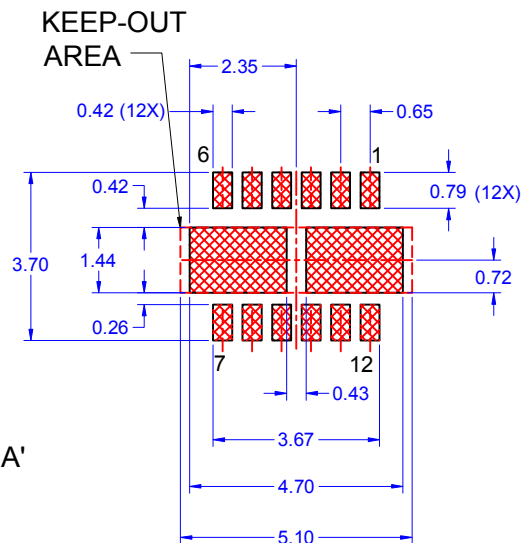
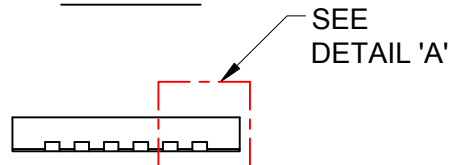
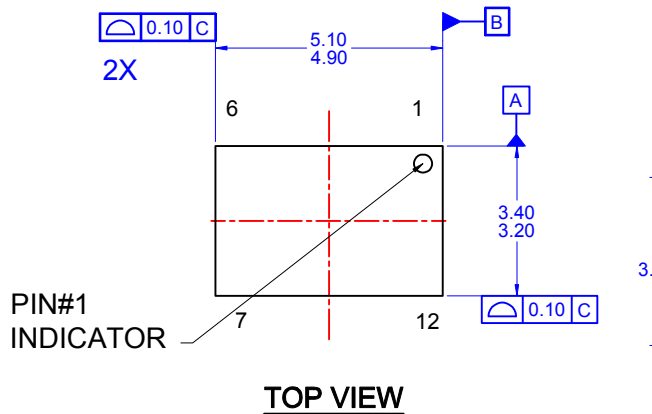
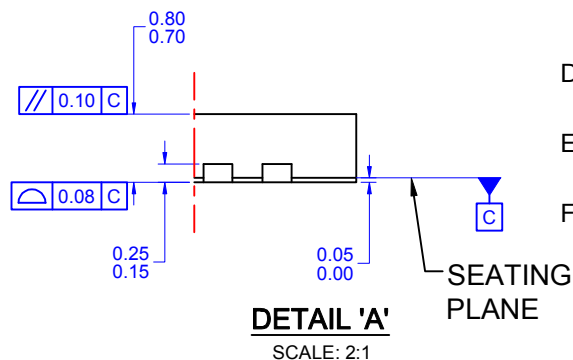
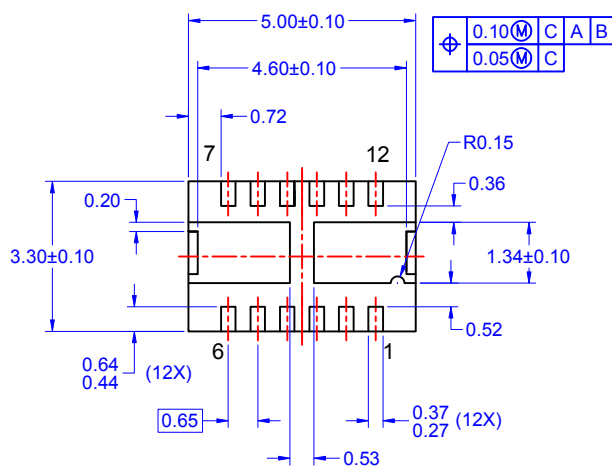


Figure 13. Junction-to-Case Transient Thermal Response Curve



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C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.

D) DIMENSIONING AND TOLERANCING PER  
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E) IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.

F) DRAWING FILE NAME: MKT-PQFN12BREV1

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