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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

January 2015

FDMS86202ET120

N-Channel Shielded Gate PowerTrench® MOSFET

120 V, 102 A, 7.2 mΩ

Features

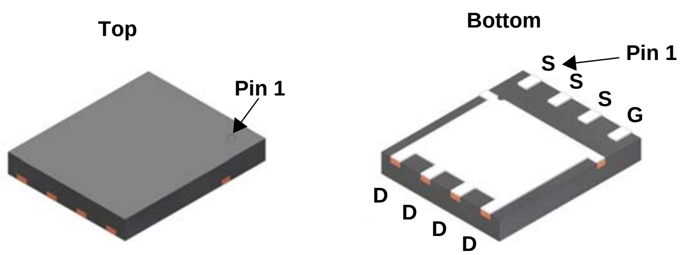
- Extended T_J rating to 175°C
- Shielded Gate MOSFET Technology
- Max $r_{DS(on)}$ = 7.2 mΩ at V_{GS} = 10 V, I_D = 13.5 A
- Max $r_{DS(on)}$ = 10.3 mΩ at V_{GS} = 6 V, I_D = 11.5 A
- Advanced Package and Silicon combination for low $r_{DS(on)}$ and high efficiency
- MSL1 robust package design
- 100% UIL tested
- RoHS Compliant

General Description

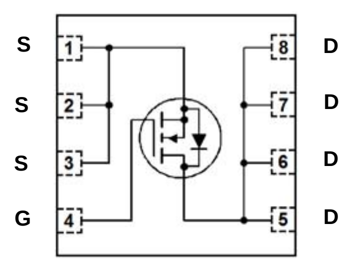
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that incorporates Shielded Gate technology. This process has been optimized for the on-state resistance and yet maintain superior switching performance.

Application

- DC-DC Conversion



Power 56



MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	120	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current -Continuous T_C = 25 °C (Note 5)	102	A
	-Continuous T_C = 100 °C (Note 5)	72	
	-Continuous T_A = 25 °C (Note 1a)	13.5	
	-Pulsed (Note 4)	538	
E_{AS}	Single Pulse Avalanche Energy (Note 3)	600	mJ
P_D	Power Dissipation T_C = 25 °C	187	W
	Power Dissipation T_A = 25 °C (Note 1a)	3.3	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +175	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.8	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	45	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS86202ET	FDMS86202ET120	Power 56	13 "	12 mm	3000 units

Electrical Characteristics T_J = 25 °C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units

Off Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	120			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		103		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 96 V, V_{GS} = 0 V			1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V			±100	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	2.0	3.1	4.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		-10		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 13.5 A		6.0	7.2	mΩ
		V_{GS} = 6 V, I_D = 11.5 A		8.1	10.3	
		V_{GS} = 10 V, I_D = 13.5 A, T_J = 125 °C		10.9	13.2	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 13.5 A		44		S

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
C_{iss}	Input Capacitance	V_{DS} = 60 V, V_{GS} = 0 V, f = 1 MHz		3275	4585	pF
C_{oss}	Output Capacitance			460	644	pF
C_{rss}	Reverse Transfer Capacitance			17	30	pF
R_g	Gate Resistance		0.1	0.9	2.7	Ω

Switching Characteristics

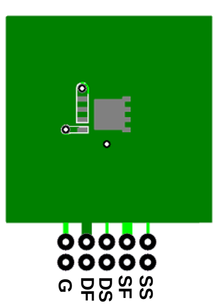
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 60 V, I_D = 13.5 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		21	33	ns
t_r	Rise Time			8.75	17.5	ns
$t_{d(off)}$	Turn-Off Delay Time			27.2	44	ns
t_f	Fall Time			6.1	12.2	ns
Q_g	Total Gate Charge	V_{GS} = 0 V to 10 V; V_{DD} = 60 V, I_D = 13.5 A		45	64	nC
Q_g	Total Gate Charge	V_{GS} = 0 V to 6 V		29	41	nC
Q_{gs}	Gate to Source Charge			14.3		nC
Q_{gd}	Gate to Drain “Miller” Charge			9.5		nC

Drain-Source Diode Characteristics

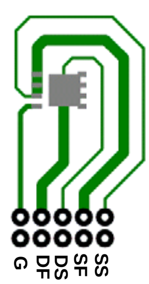
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 2.1 A (Note 2)		0.69	1.2	V
		V_{GS} = 0 V, I_S = 13.5 A (Note 2)		0.76	1.3	
t_{rr}	Reverse Recovery Time	I_F = 13.5 A, di/dt = 100 A/μs		79	127	ns
Q_{rr}	Reverse Recovery Charge			140	224	nC

Notes:

1. $R_{\theta JA}$ is determined with the device mounted on a 1in^2 pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta CA}$ is determined by the user's board design.



a) 45 °C/W when mounted on a 1 in^2 pad of 2 oz copper



b) 115 °C/W when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.
3. E_{AS} of 600 mJ is based on starting T_J = 25 °C, L = 3 mH, I_{AS} = 20 A, V_{DD} = 120 V, V_{GS} = 10 V. 100% test at L = 0.1 mH, I_{AS} = 65 A.
4. Pulse Id please refer to Fig.11 SOA curve for detail.
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 °C unless otherwise noted

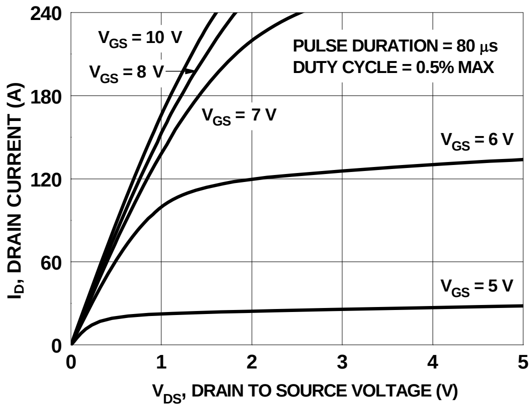


Figure 1. On Region Characteristics

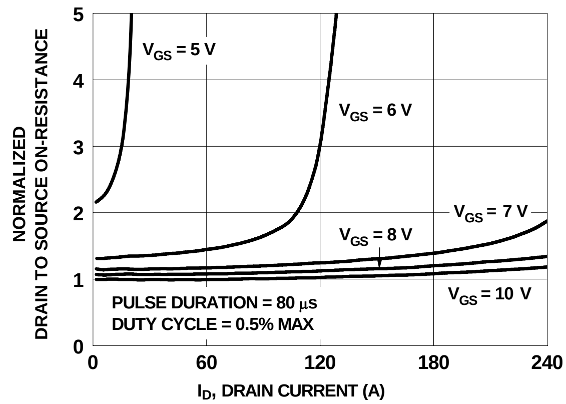


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

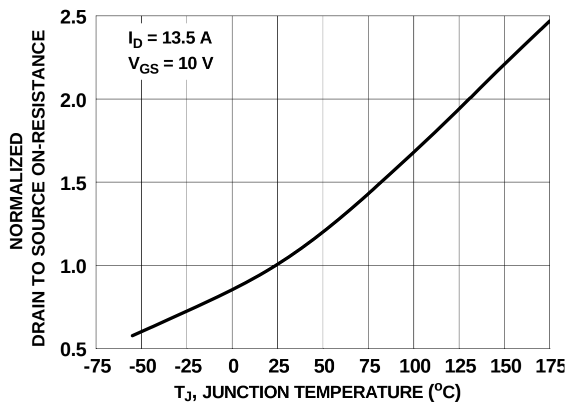


Figure 3. Normalized On Resistance vs Junction Temperature

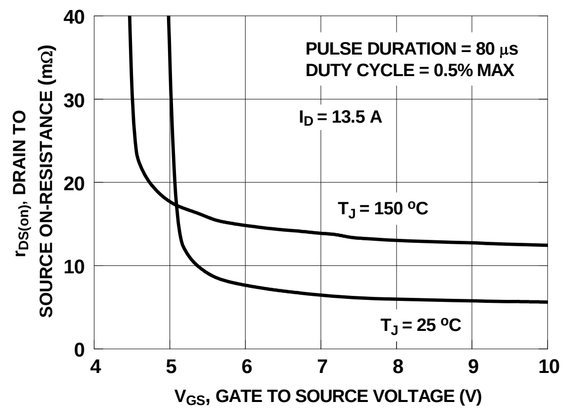


Figure 4. On-Resistance vs Gate to Source Voltage

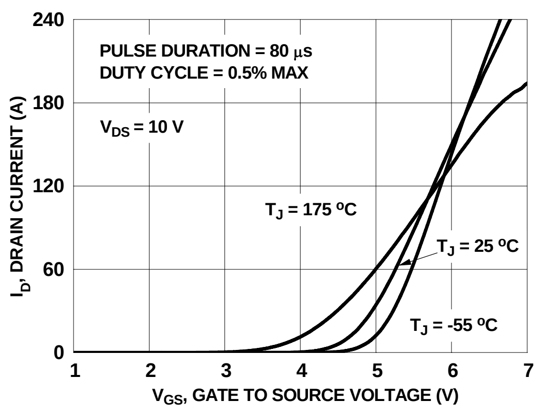


Figure 5. Transfer Characteristics

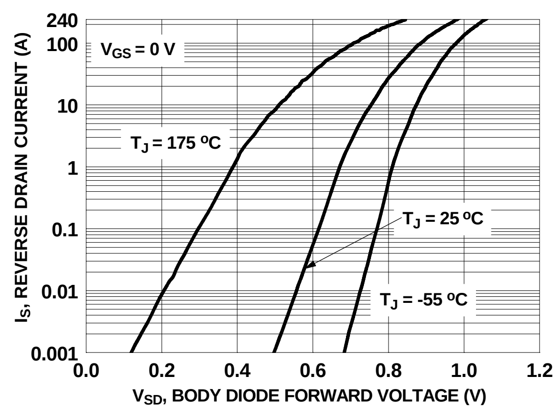


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted

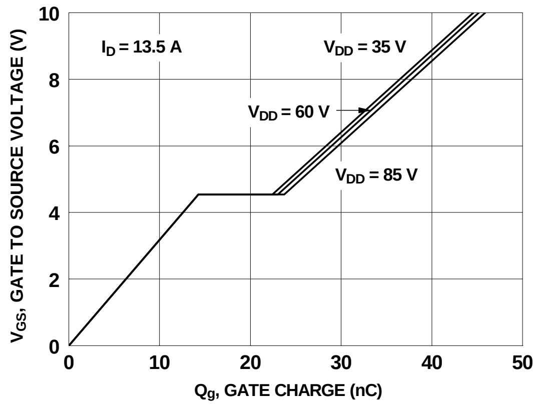


Figure 7. Gate Charge Characteristics

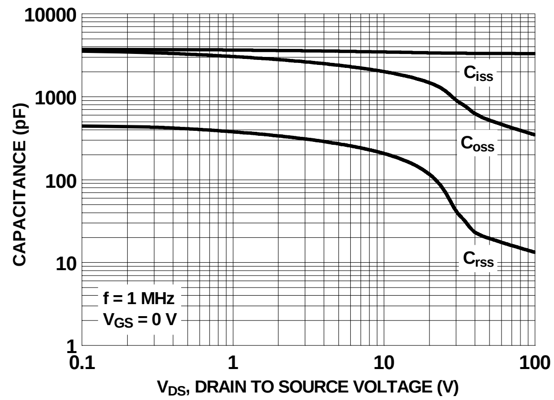


Figure 8. Capacitance vs Drain to Source Voltage

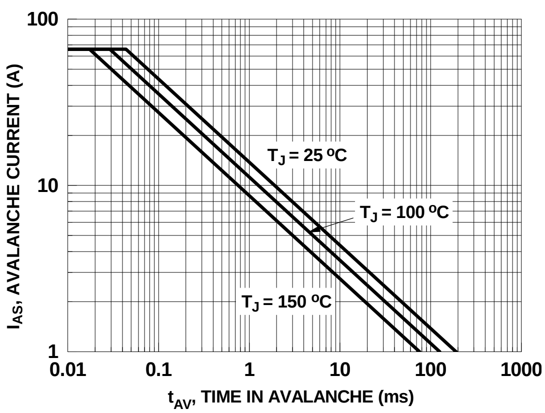


Figure 9. Unclamped Inductive Switching Capability

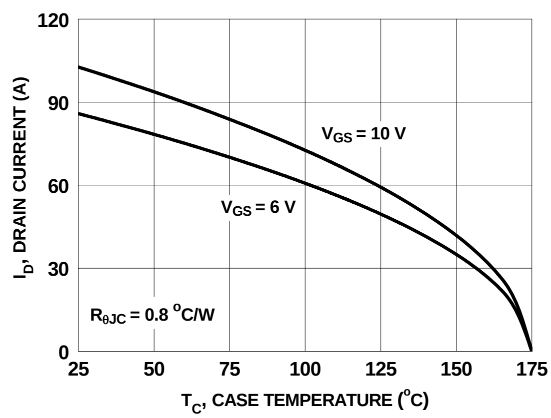


Figure 10. Maximum Continuous Drain Current vs Case Temperature

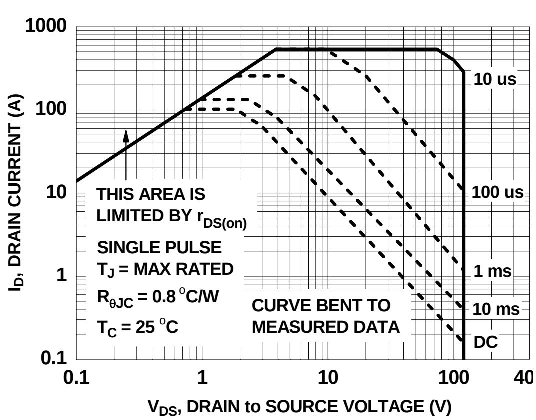


Figure 11. Forward Bias Safe Operating Area

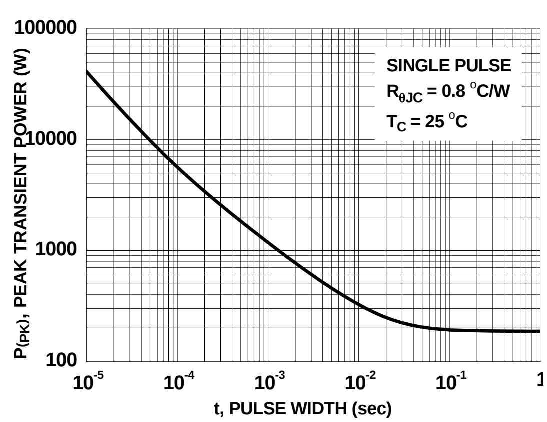


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted

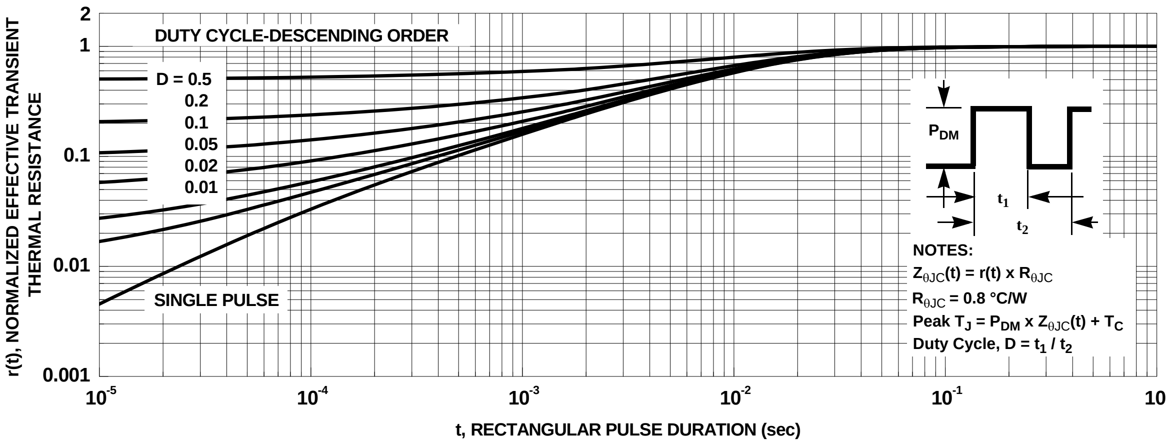
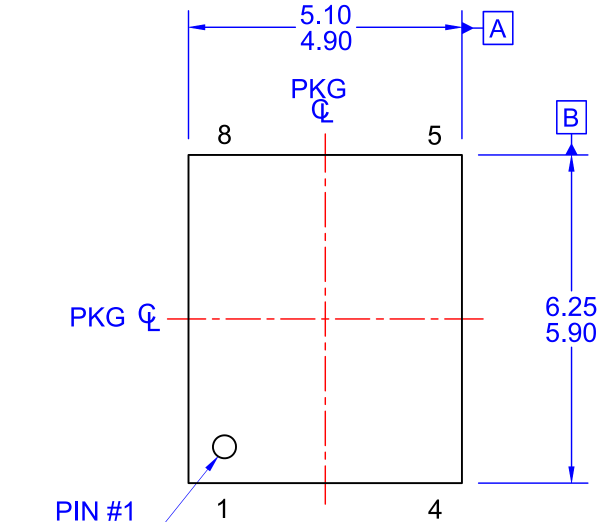
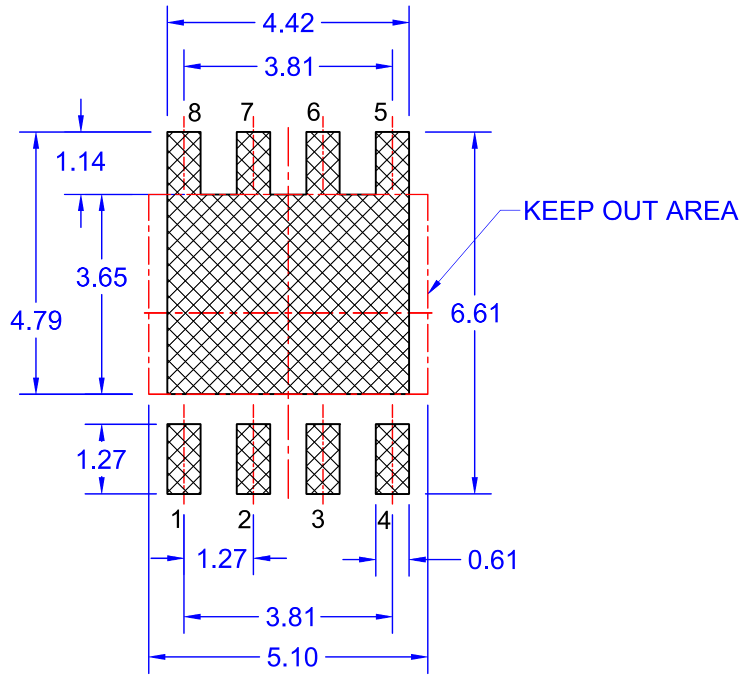


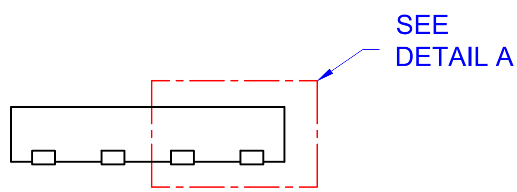
Figure 13. Junction-to-Ambient Transient Thermal Response Curve



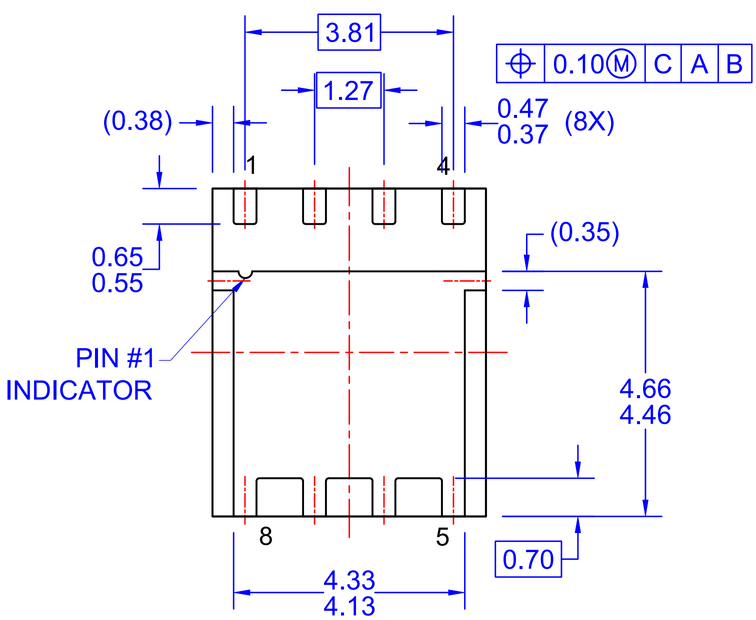
TOP VIEW



LAND PATTERN
RECOMMENDATION



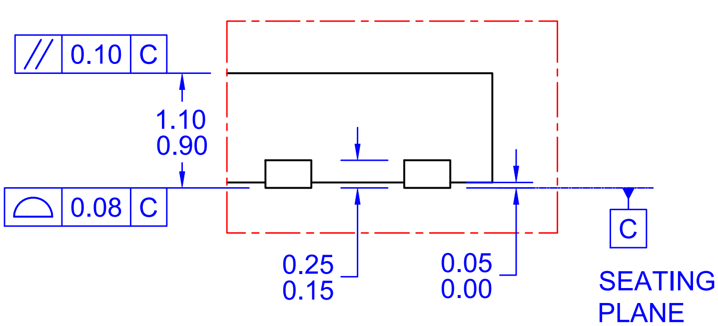
SIDE VIEW



BOTTOM VIEW

NOTES: UNLESS OTHERWISE SPECIFIED

A) PACKAGE STANDARD REFERENCE: JEDEC MO-240, ISSUE A, VAR. AA,
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
E) IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.
F) DRAWING FILE NAME: PQFN08JREV3.



DETAIL A

SCALE: 2:1

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