Is Now Part of

To learn more about ON Semiconductor, please visit our website at
www.onsemi.com

FAIRCHILD

August 2016

FDMC8010DC

N-Channel Dual Cool™ 33 PowerTrench® MOSFET

30 V, 157 A, 1.28 mΩ

Features

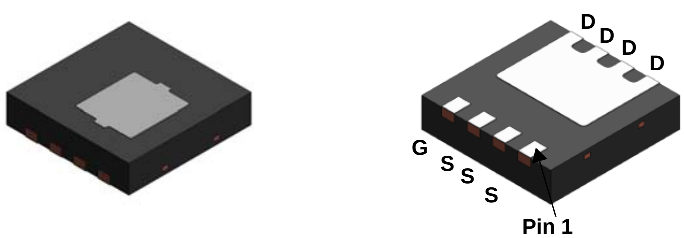
- Dual Cool™ Top Side Cooling PQFN package
- Max $r_{DS(on)}$ = 1.28 mΩ at V_{GS} = 10 V, I_D = 37 A
- Max $r_{DS(on)}$ = 1.74 mΩ at V_{GS} = 4.5 V, I_D = 32 A
- High Performance Technology for Extremely Low $r_{DS(on)}$
- RoHS Compliant

General Description

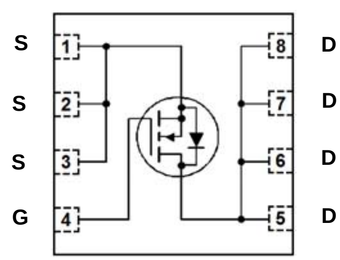
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process. Advancements in both silicon and Dual Cool™ package technologies have been combined to offer the lowest $r_{DS(on)}$ while maintaining excellent switching performance by extremely low Junction-to-Ambient thermal resistance.

Applications

- Load Switch
- Motor Bridge Switch
- Synchronous Rectifier



Top Dual Cool™ 33 Bottom



MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted.

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	30	V
V_{GS}	Gate to Source Voltage (Note 4)	±20	V
I_D	Drain Current -Continuous T_C = 25 °C (Note 6)	157	A
	-Continuous T_C = 100 °C (Note 6)	99	
	-Continuous T_A = 25 °C (Note 1a)	37	
	-Pulsed (Note 5)	788	
E_{AS}	Single Pulse Avalanche Energy (Note 3)	337	mJ
P_D	Power Dissipation T_C = 25 °C	50	W
	Power Dissipation T_A = 25 °C (Note 1a)	3.0	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case (Bottom Drain)	2.5	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	42	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
8010	FDMC8010DC	Dual Cool™ 33	13 ''	12 mm	3000 units

Electrical Characteristics T_J = 25 °C unless otherwise noted.

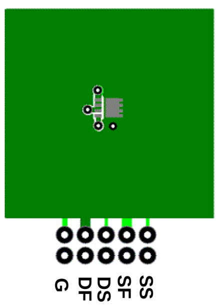
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		17		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V			10	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = 20 V, V_{DS} = 0 V			100	nA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, I_D = 250 μA	1.0	1.4	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		-5		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 37 A		0.91	1.28	mΩ
		V_{GS} = 4.5 V, I_D = 32 A		1.2	1.74	
		V_{GS} = 10 V, I_D = 37 A, T_J = 125 °C		1.34	1.89	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 37 A		231		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz		4720	7080	pF
C_{oss}	Output Capacitance			1540	2310	pF
C_{rss}	Reverse Transfer Capacitance			136	205	pF
R_g	Gate Resistance		0.1	0.5	1.1	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 15 V, I_D = 37 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		15	26	ns
t_r	Rise Time			7	14	ns
$t_{d(off)}$	Turn-Off Delay Time			40	64	ns
t_f	Fall Time			5	10	ns
$Q_{g(TOT)}$	Total Gate Charge at 10 V	V_{DD} = 15 V, I_D = 37 A		67	94	nC
$Q_{g(TOT)}$	Total Gate Charge at 4.5 V			32	44	nC
Q_{gs}	Total Gate Charge			10		nC
Q_{gd}	Gate to Drain “Miller” Charge			7.5		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 2.3 A (Note 2)		0.7	1.2	V
		V_{GS} = 0 V, I_S = 37 A (Note 2)		0.8	1.3	
t_{rr}	Reverse Recovery Time	I_F = 37 A, di/dt = 100 A/μs		55	88	ns
Q_{rr}	Reverse Recovery Charge			48	76	nC

Thermal Characteristics

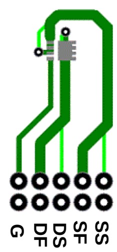
$R_{\theta JC}$	Thermal Resistance, Junction to Case (Top Source)	5.0	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction to Case (Bottom Drain)	2.5	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	42	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1b)	105	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1c)	29	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1d)	40	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1e)	19	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1f)	23	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1g)	30	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1h)	79	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1i)	17	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1j)	26	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1k)	12	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1l)	16	

Notes:

1. $R_{\theta JA}$ is determined with the device mounted on a FR-4 board using a specified pad of 2 oz copper as shown below. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a. 42 °C/W when mounted on a 1 in^2 pad of 2 oz copper



b. 105 °C/W when mounted on a minimum pad of 2 oz copper

c. Still air, 20.9x10.4x12.7mm Aluminum Heat Sink, 1 in^2 pad of 2 oz copper

d. Still air, 20.9x10.4x12.7mm Aluminum Heat Sink, minimum pad of 2 oz copper

e. Still air, 45.2x41.4x11.7mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, 1 in^2 pad of 2 oz copper

f. Still air, 45.2x41.4x11.7mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, minimum pad of 2 oz copper

g. 200FPM Airflow, No Heat Sink,1 in^2 pad of 2 oz copper

h. 200FPM Airflow, No Heat Sink, minimum pad of 2 oz copper

i. 200FPM Airflow, 20.9x10.4x12.7mm Aluminum Heat Sink, 1 in^2 pad of 2 oz copper

j. 200FPM Airflow, 20.9x10.4x12.7mm Aluminum Heat Sink, minimum pad of 2 oz copper

k. 200FPM Airflow, 45.2x41.4x11.7mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, 1 in^2 pad of 2 oz copper

l. 200FPM Airflow, 45.2x41.4x11.7mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.
3. E_{AS} of 337 mJ is based on starting T_J = 25 °C, L = 3 mH, I_{AS} = 15 A, V_{DD} = 30 V, V_{GS} = 10 V, 100% test at L = 0.1 mH, I_{AS} = 49 A.
4. As an N-ch device, the negative Vgs rating is for low duty cycle pulse occurrence only. No continuous rating is implied.
5. Pulse Id measured at 250μs, refer to Fig 11 SOA graph for more details.
6. 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.

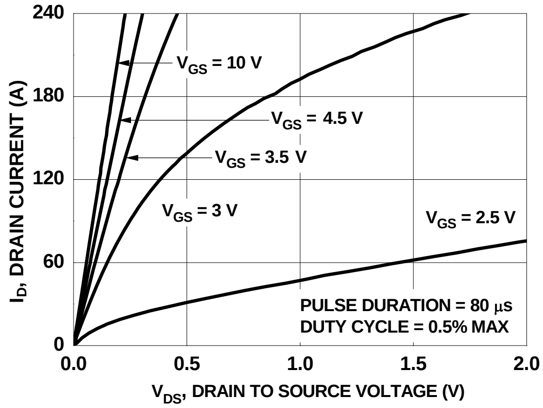


Figure 1. On Region Characteristics

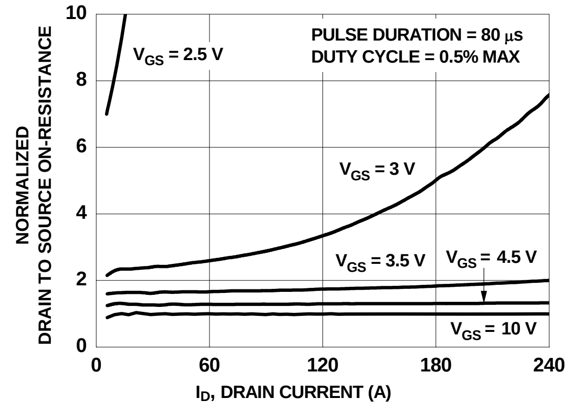


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

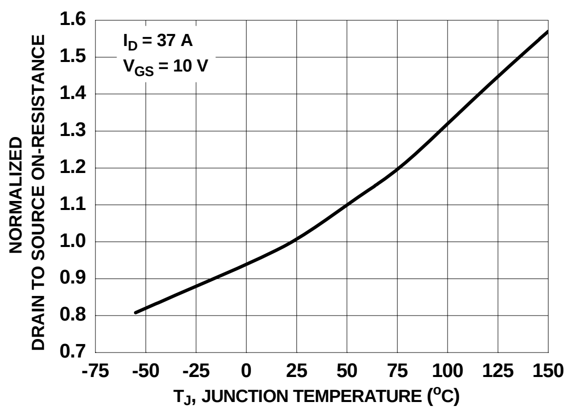


Figure 3. Normalized On Resistance vs. Junction Temperature

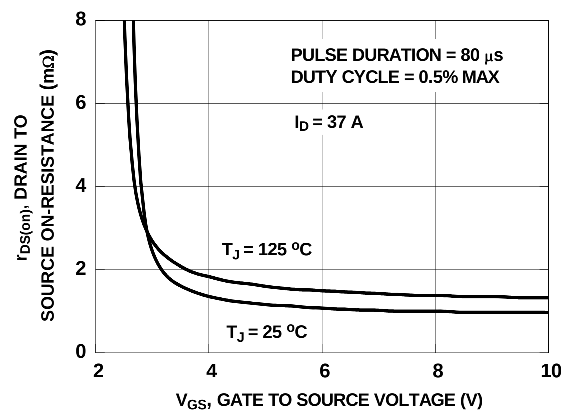


Figure 4. On-Resistance vs. Gate to Source Voltage

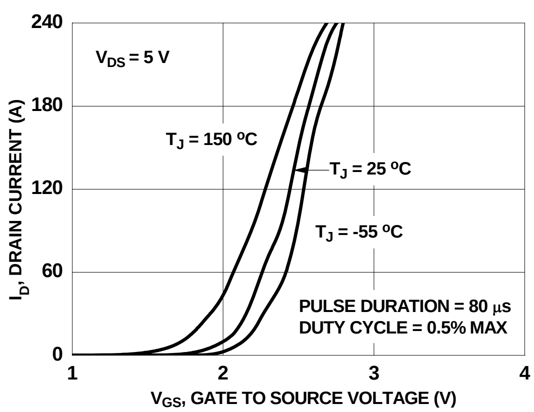


Figure 5. Transfer Characteristics

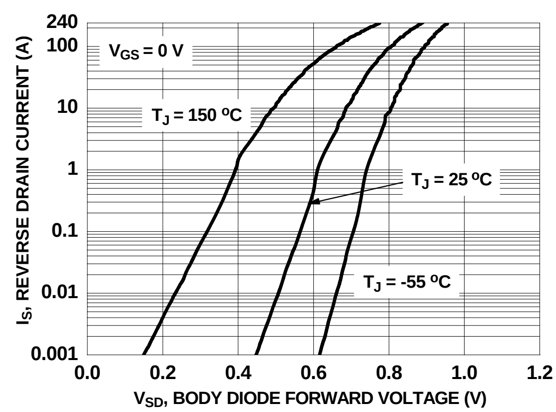


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted.

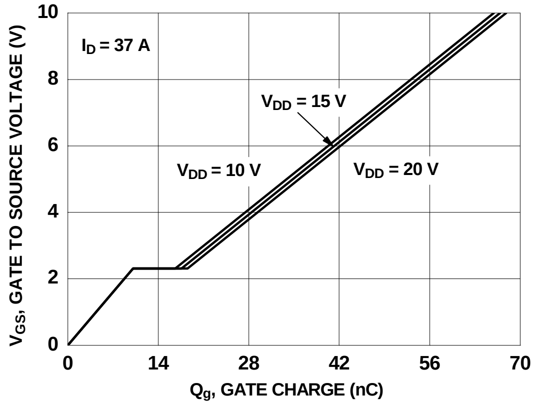


Figure 7. Gate Charge Characteristics

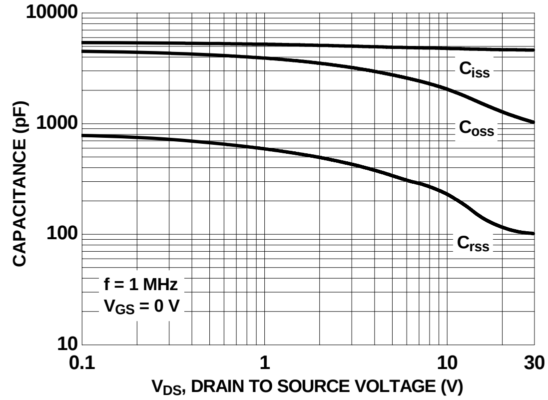


Figure 8. Capacitance vs. Drain to Source Voltage

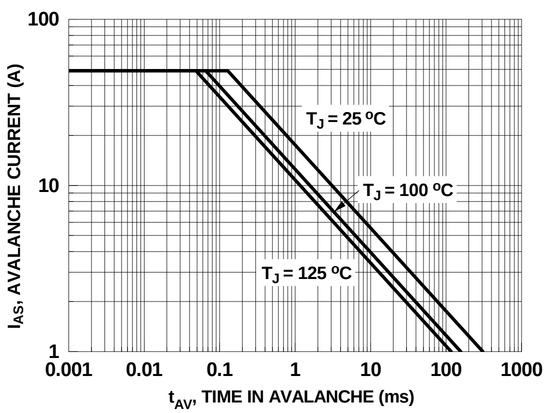


Figure 9. Unclamped Inductive Switching Capability

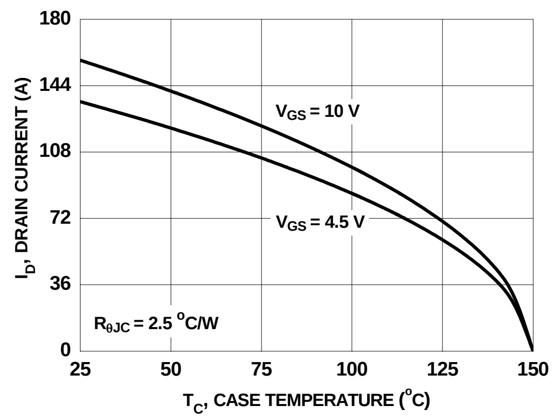


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

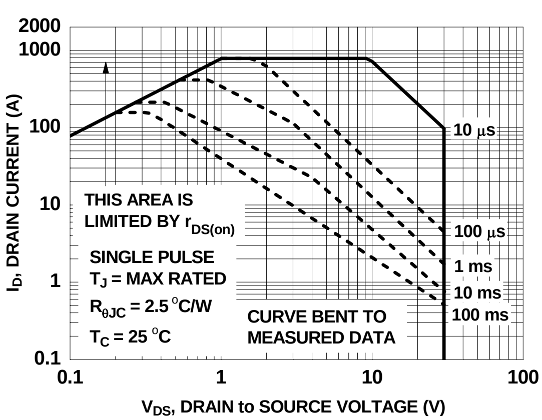


Figure 11. Forward Bias Safe Operating Area

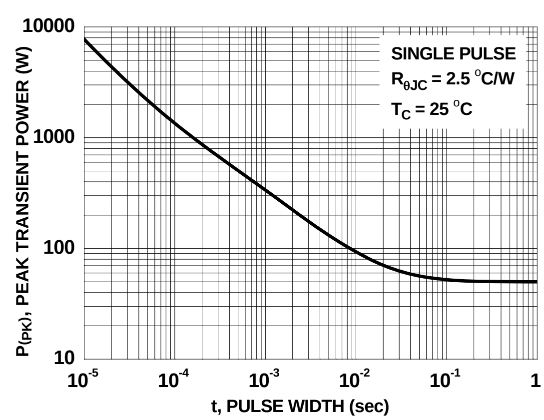


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted.

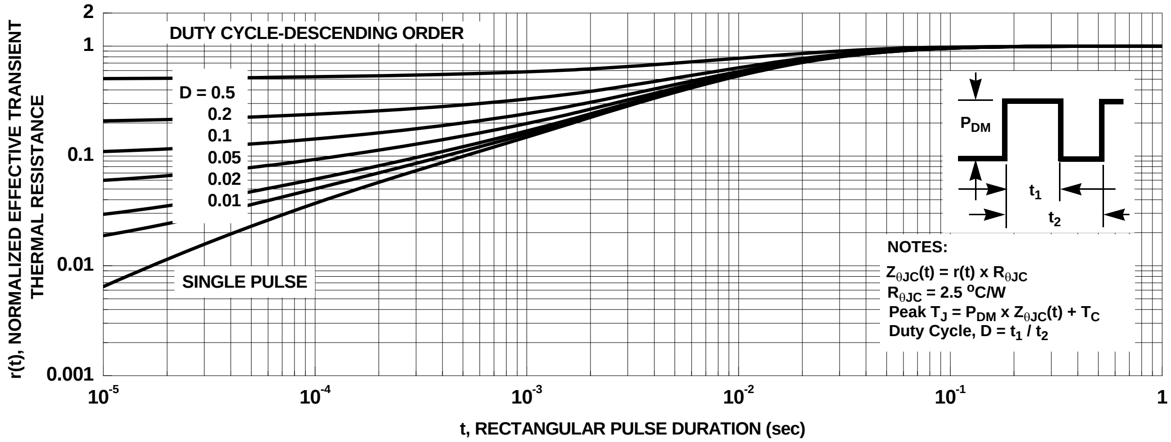
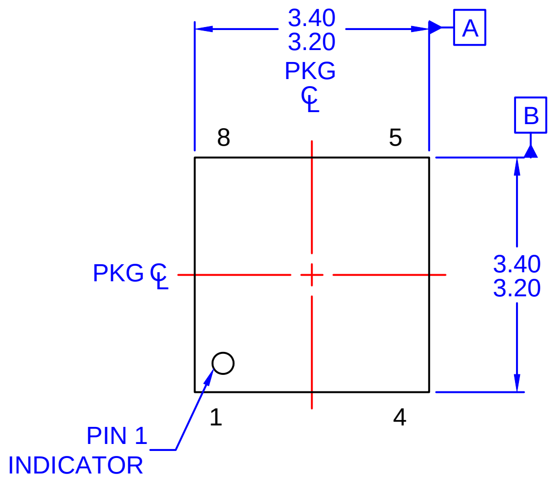
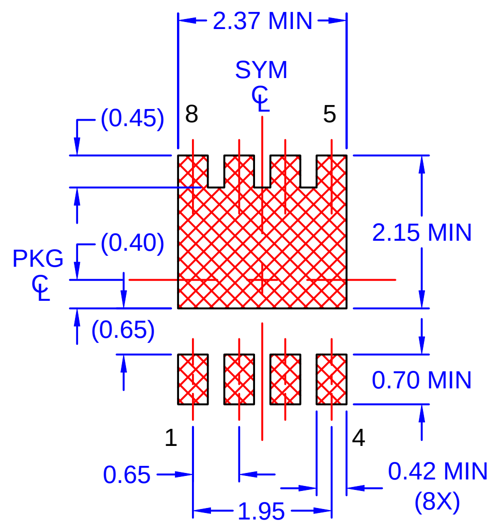
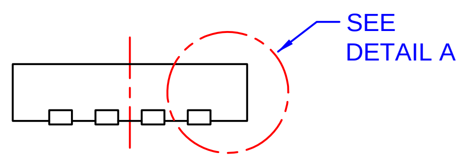


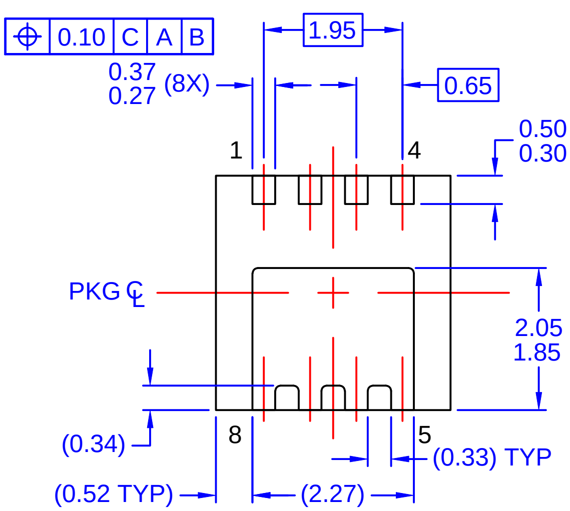
Figure 13. Junction to Case Transient Thermal Response Curve





LAND PATTERN RECOMMENDATION





NOTES: UNLESS OTHERWISE SPECIFIED

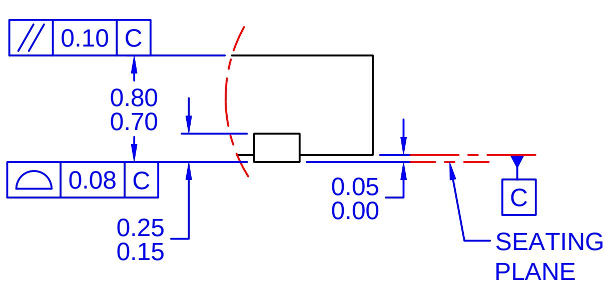
A) PACKAGE STANDARD REFERENCE: JEDEC MO-240, ISSUE A, VAR. BA, DATED OCTOBER 2002.

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-1994.

E) DRAWING FILE NAME: PQFN08HREV1



DETAIL A

SCALE: 2X

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative