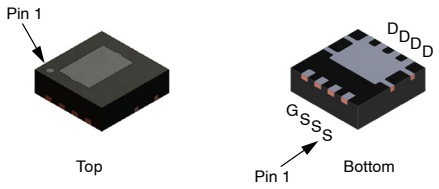
MOSFET – N-Channel DUAL COOL™ 33 POWERTRENCH®

30 V, 40 A, 6.25 mΩ

FDMC3020DC



PQFN8 3.3X3.3, 0.65P
CASE 483AL

Description

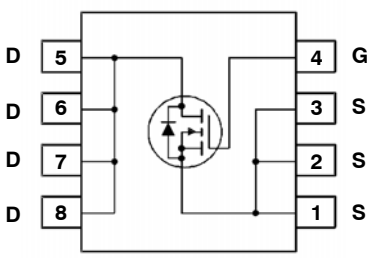
This N−Channel MOSFET is produced using **onsemi**'s advanced POWERTRENCH® process. Advancements in both silicon and DUAL COOL package technologies have been combined to offer the lowest $R_{DS(on)}$ while maintaining excellent switching performance by extremely low Junction−to−Ambient thermal resistance.

Features

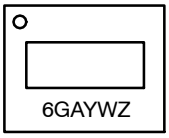
- DUAL COOL™ Top Side Cooling PQFN Package
- Max $R_{DS(on)}$ = 6.25 m Ω at V_{GS} = 10 V, I_D = 12 A
- Max $R_{DS(on)}$ = 9.0 m Ω at V_{GS} = 4.5 V, I_D = 10 A
- High Performance Technology for Extremely Low $R_{DS(on)}$
- These Device is Pb−Free, Halide Free, and is RoHS Compliant

Typical Applications

- Synchronous Rectifier for DC−DC Converters
- Telecom Secondary Side Rectification
- High End Server/Workstation



MARKING DIAGRAM



6G = Specific Device Code
A = Assembly Plant Code
YW = 3−Date Code (Year & Week)
Z = Lot Code

MOSFET MAXIMUM RATINGS T_A = 25°C unless otherwise noted

Symbol	Parameter	Value	Unit
V_{DS}	Drain to Source Voltage	30	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current – Continuous (Package limited) T_C = 25°C – Continuous (Silicon limited) T_C = 25°C – Continuous T_A = 25°C (Note 1 a) – Pulsed	 40 70 17 100	A
E_{AS}	Single Pulse Avalanche Energy (Note 3)	60	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 4)	1.6	V/ns
P_D	Power Dissipation T_C = 25°C	50	W
	Power Dissipation T_A = 25°C (Note 1 a)	3.0	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	−55 to +150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

ORDERING INFORMATION

Device	Package	Shipping†
FDMC3020DC	PQFN8 (Pb−Free)	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

© Semiconductor Components Industries, LLC, 2016

ELECTRICAL CHARACTERISTICS T_J = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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	–	–	1	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	1.9	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	–	–6	–	mV/°C
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 12 A V_{GS} = 4.5 V, I_D = 10 A, V_{GS} = 10 V, I_D = 12 A, T_J = 125°C	– – –	5.0 7.2 7.5	6.25 9.0 9.1	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 12 A	–	44	–	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz	–	1038	1385	pF
C_{oss}	Output Capacitance		–	513	685	pF
C_{rss}	Reverse Transfer Capacitance		–	87	135	pF
R_g	Gate Resistance		0.1	0.9	2.0	Ω
Switching Characteristics						
$t_{d(on)}$	Turn−On Delay Time	V_{DD} = 15 V, I_D = 12 A, V_{GS} = 10 V, R_{GEN} = 6 Ω	–	9	18	ns
t_r	Rise Time		–	3	10	ns
$t_{d(off)}$	Turn−Off Delay Time		–	19	35	ns
t_f	Fall Time		–	2	10	ns
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V, to 10 V, V_{DD} = 15 V, I_D = 12 A	–	15.5	23	nC
	Total Gate Charge	V_{GS} = 0 V, to 4.5 V, V_{DD} = 15 V, I_D = 12 A	–	7.1	10.6	nC
Q_{gs}	Gate to Source Gate Charge	V_{DD} = 15 V, I_D = 12 A	–	3	–	nC
Q_{gd}	Gate to Drain “Miller” Charge		–	2.5	–	nC
Drain−Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 12 A (Note 2)	–	0.82	1.3	V
		V_{GS} = 0 V, I_S = 1.9 A (Note 2)	–	0.73	1.2	
t_{rr}	Reverse Recovery Time	I_F = 12 A, di/dt = 100 A/μs	–	25	45	ns
Q_{rr}	Reverse Recovery Charge		–	9	18	nC

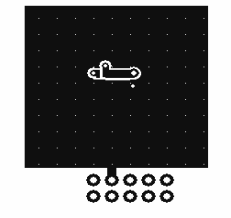
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case (Top Source)	7.9	°C/W
	Thermal Resistance, Junction to Case (Bottom Drain)	2.5	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	42	
	Thermal Resistance, Junction to Ambient (Note 1b)	105	
	Thermal Resistance, Junction to Ambient (Note 1c)	29	
	Thermal Resistance, Junction to Ambient (Note 1d)	40	
	Thermal Resistance, Junction to Ambient (Note 1e)	19	
	Thermal Resistance, Junction to Ambient (Note 1f)	23	
	Thermal Resistance, Junction to Ambient (Note 1g)	30	
	Thermal Resistance, Junction to Ambient (Note 1h)	79	
	Thermal Resistance, Junction to Ambient (Note 1i)	17	
	Thermal Resistance, Junction to Ambient (Note 1 j)	26	
	Thermal Resistance, Junction to Ambient (Note 1k)	12	
	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, 20.9 x 10.4 x 12.7 mm Aluminum Heat Sink, 1 in^2 pad of 2 oz copper

d) Still air, 20.9 x 10.4 x 12.7 mm Aluminum Heat Sink, minimum pad of 2 oz copper

e) Still air, 45.2 x 41.4 x 11.7 mm Aavid Thermalloy Part # 10−L41B−11 Heat Sink, 1 in^2 pad of 2 oz copper

f) Still air, 45.2 x 41.4 x 11.7 mm 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, 20.9 x 10.4 x 12.7 mm Aluminum Heat Sink, 1 in^2 pad of 2 oz copper

j) 200FPM Airflow, 20.9 x 10.4 x 12.7 mm Aluminum Heat Sink, minimum pad of 2 oz copper

k) 200FPM Airflow, 45.2 x 41.4 x 11.7 mm Aavid Thermalloy Part # 10−L41B−11 Heat Sink, 1 in^2 pad of 2 oz copper

l) 200FPM Airflow, 45.2 x 41.4 x 11.7 mm 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 60 mJ is based on starting T_J = 25°C, L = 1 mH, I_{AS} = 11 A, V_{DD} = 27 V, V_{GS} =10 V.
4. I_{SD} ≤ 12 A, di/dt ≤ 100 A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C.

TYPICAL CHARACTERISTICS T_J = 25°C UNLESS OTHERWISE NOTED

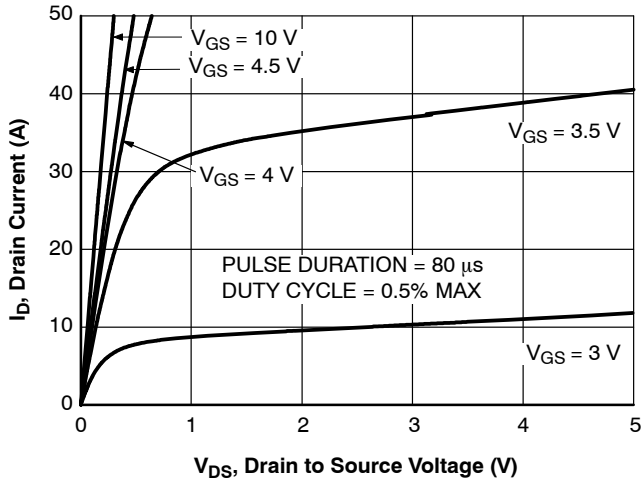


Figure 1. On−Region Characteristics

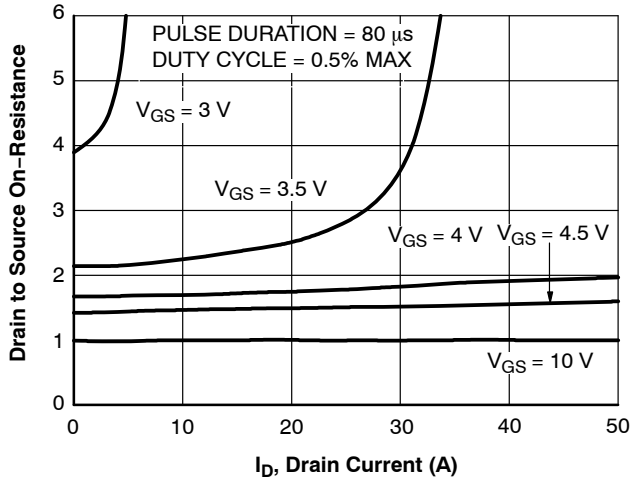


Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

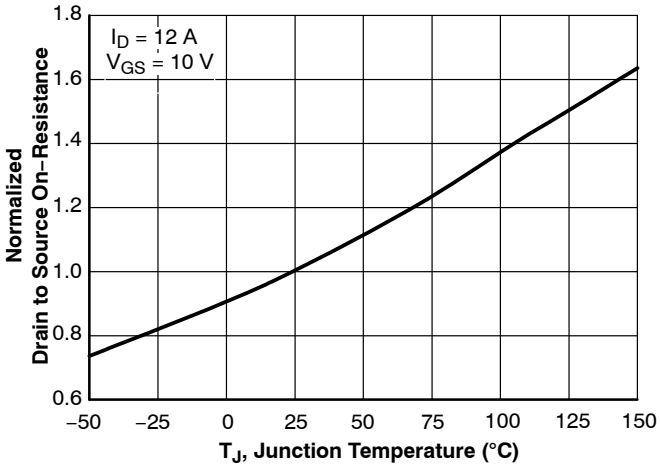


Figure 3. Normalized On Resistance vs. Junction Temperature

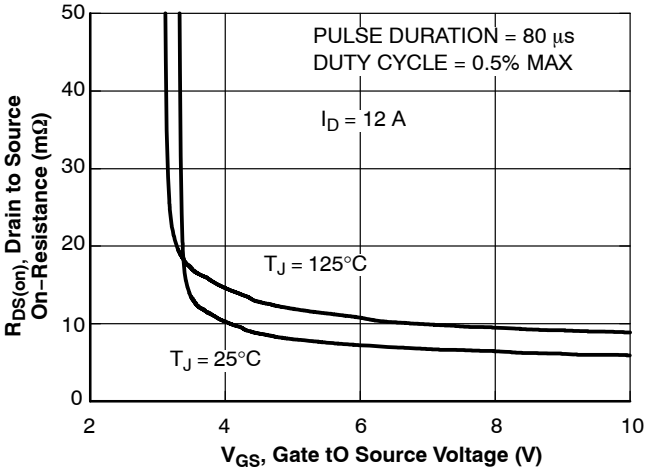


Figure 4. On Resistance vs. Gate to Source Voltage

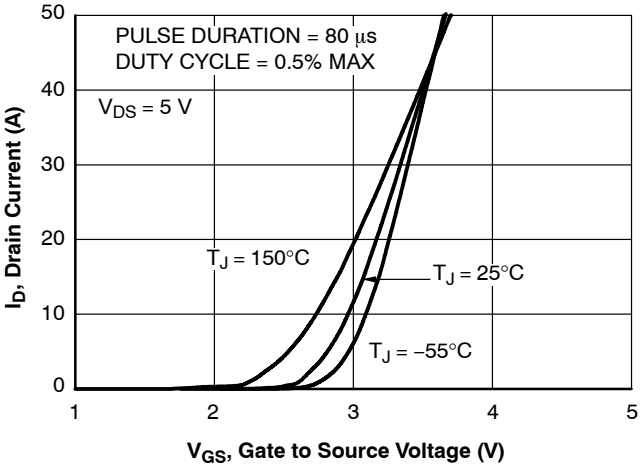


Figure 5. Transfer Characteristics

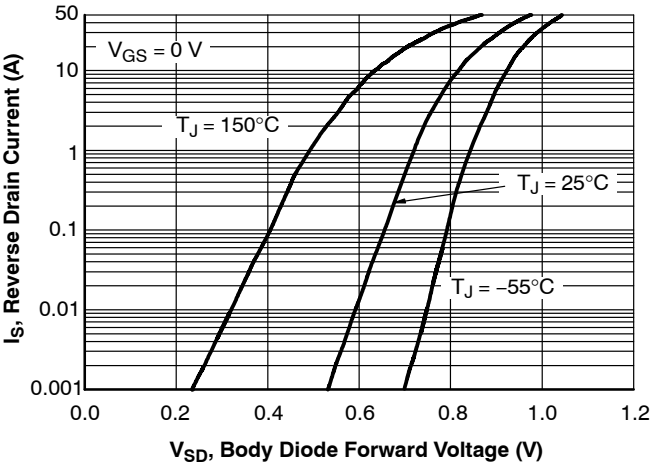


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS (CONTINUED) T_J = 25°C UNLESS OTHERWISE NOTED

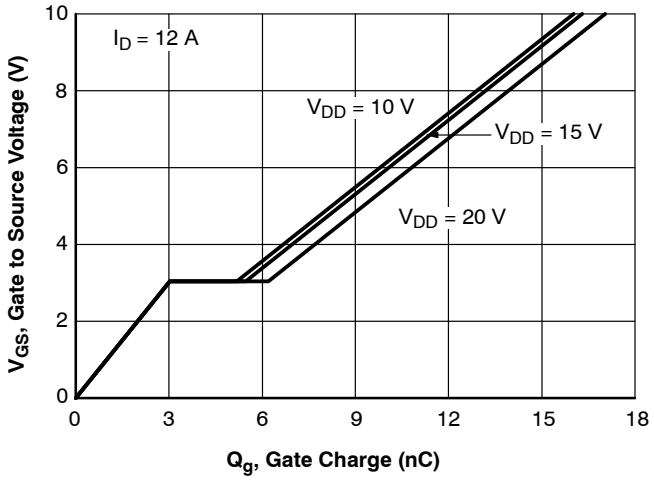


Figure 7. Gate Charge Characteristics

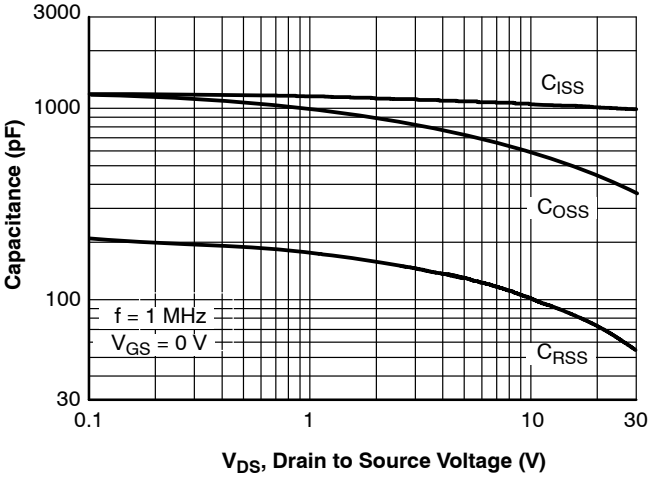


Figure 8. Capacitance vs. Drain to Source Voltage

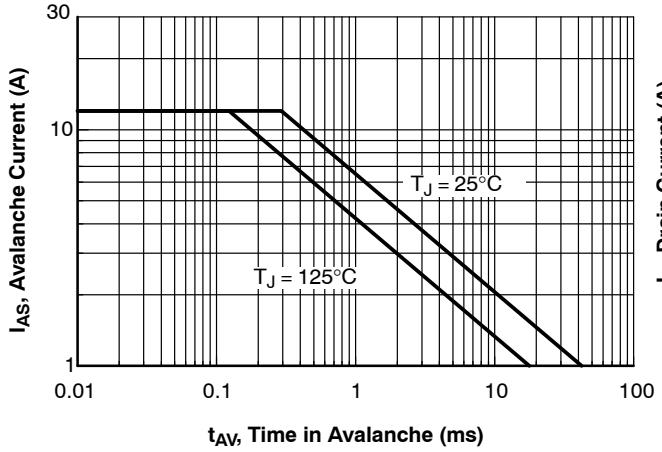


Figure 9. Unclamped Inductive Switching Capability

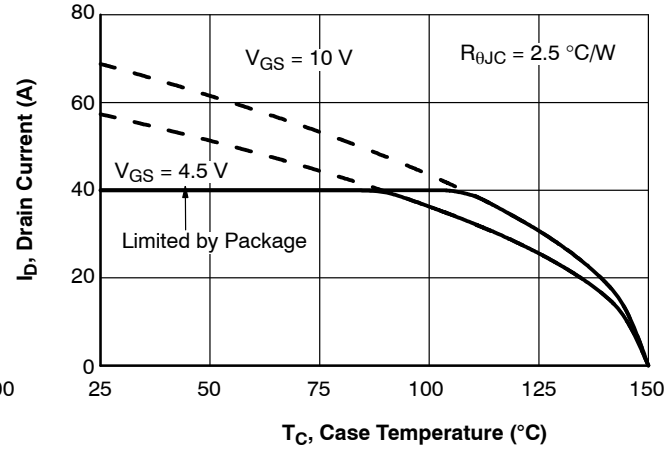


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

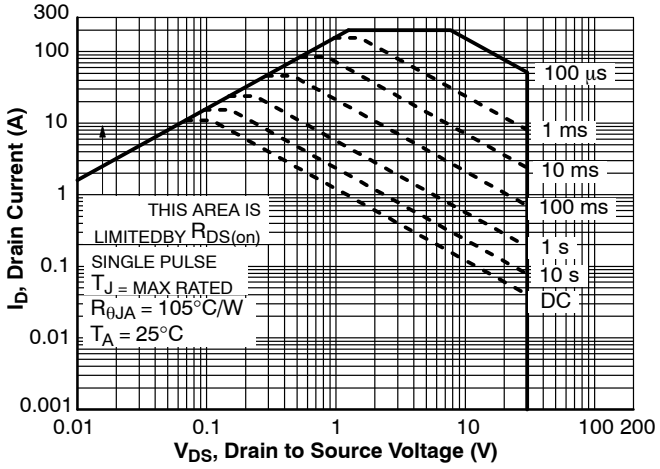


Figure 11. Forward Bias Safe Operating Area

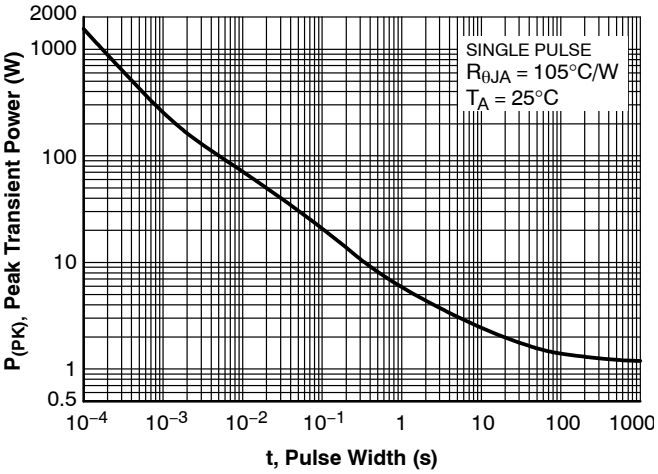


Figure 12. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS (CONTINUED) T_J = 25°C UNLESS OTHERWISE NOTED

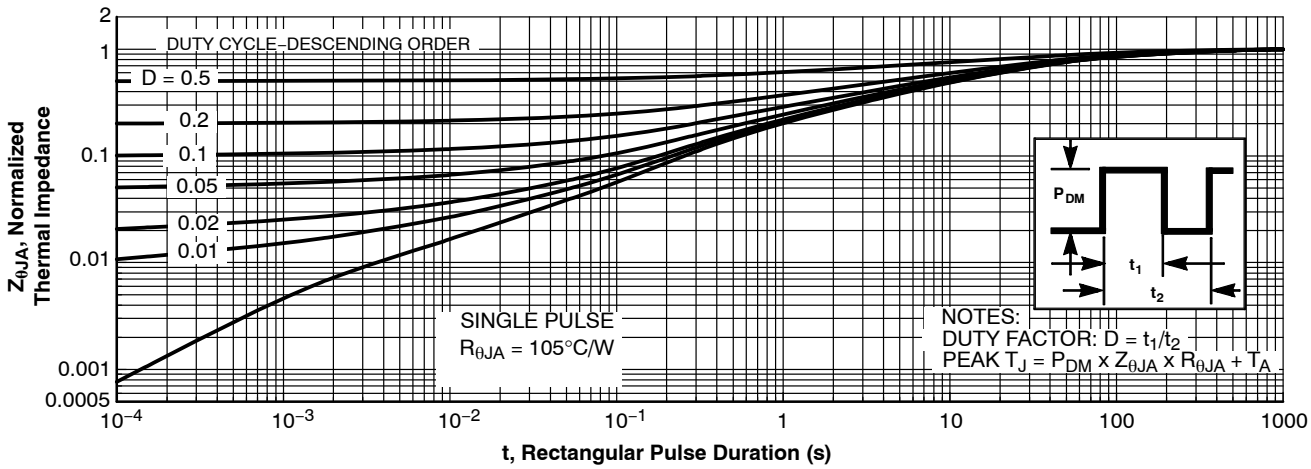
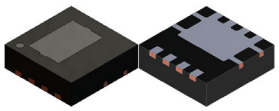


Figure 13. Junction−to−Ambient Transient Thermal Response Curve

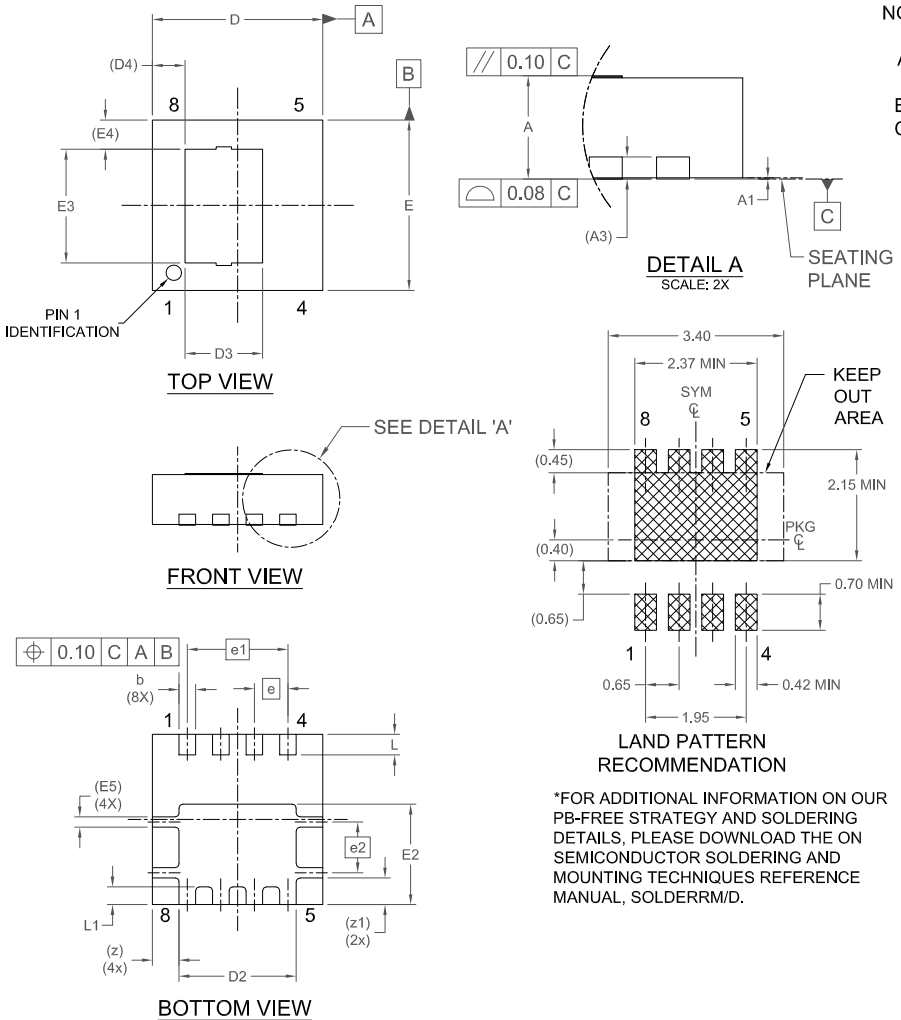
POWERTRENCH and DUAL COOL are registered trademarks of Semiconductor Components Industries, LLC dba “**onsemi**” or its affiliates and/or subsidiaries in the United States and/or other countries.

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS



PQFN8 3.30x3.30x1.00, 0.65P
CASE 483AL
ISSUE B

DATE 20 DEC 2023



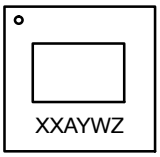
NOTES:

A. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
B. ALL DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0.00	-	0.05
b	0.27	0.32	0.37
A3		0.20 REF	
D	3.20	3.30	3.40
D2	2.17	2.27	2.37
D3	1.40	1.55	1.70
D4		0.63 REF	
E	3.20	3.30	3.40
E2	1.90	2.00	2.10
E3	2.10	2.25	2.40
E4		0.56 REF	
E5		0.20 REF	
e		0.65 BSC	
e1		1.95 BSC	
e2		0.98 BSC	
L	0.30	0.40	0.50
L4	0.29	0.39	0.49
z		0.52 REF	
z1		0.52 REF	

*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

GENERIC MARKING DIAGRAM*



XX = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
Z = Assembly Lot Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

DOCUMENT NUMBER:	**98AON13661G**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	**PQFN8 3.30x3.30x1.00, 0.65P**	**PAGE 1 OF 1**

onsemi and onsemi are trademarks of Semiconductor Components Industries, LLC dba **onsemi** or its subsidiaries in the United States and/or other countries. **onsemi** reserves the right to make changes without further notice to any products herein. **onsemi** makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. **onsemi** does not convey any license under its patent rights nor the rights of others.

© Semiconductor Components Industries, LLC, 2019

onsemi, , and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent−Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as−is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
Technical Library: www.onsemi.com/design/resources/technical−documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support
For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales