

# MOSFET – P-Channel, **POWERTRENCH<sup>®</sup>**, Common Drain: 1.5 V, WLCSP -20 V, -3 A, 126 mΩ



**ON Semiconductor<sup>®</sup>**

[www.onsemi.com](http://www.onsemi.com)

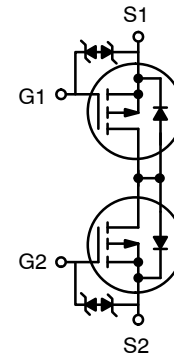
## FDZ1905PZ

### General Description

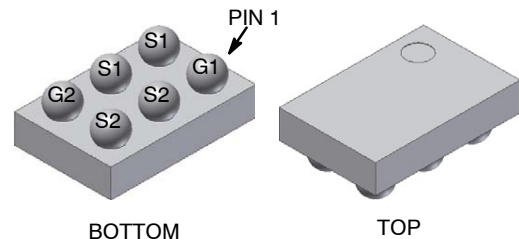
This device is designed specifically as a single package solution for the battery charge switch in cellular handset and other ultra-portable applications. It features two common drain P-channel MOSFETs, which enables bidirectional current flow, on ON Semiconductor's advanced 1.5 V POWERTRENCH process with state of the art "low pitch" WLCSP packaging process, the FDZ1905PZ minimizes both PCB space and  $r_{S1S2(on)}$ . This advanced WLCSP MOSFET embodies a breakthrough in packaging technology which enables the device to combine excellent thermal transfer characteristics, ultra-low profile packaging, low gate charge, and low  $r_{S1S2(on)}$ .

### Features

- Max  $r_{S1S2(on)}$  = 126 mΩ at  $V_{GS} = -4.5$  V,  $I_{S1S2} = -1$  A
- Max  $r_{S1S2(on)}$  = 141 mΩ at  $V_{GS} = -2.5$  V,  $I_{S1S2} = -1$  A
- Max  $r_{S1S2(on)}$  = 198 mΩ at  $V_{GS} = -1.8$  V,  $I_{S1S2} = -1$  A
- Max  $r_{S1S2(on)}$  = 303 mΩ at  $V_{GS} = -1.5$  V,  $I_{S1S2} = -1$  A
- Occupies only 1.5 mm<sup>2</sup> of PCB area, less than 50% of the area of 2 x 2 BGA
- Ultra-thin package: less than 0.65 mm height when mounted to PCB
- High power and current handling capability
- HBM ESD protection level > 4 kV (Note 3)
- This Device is Pb-Free and is RoHS Compliant



**P-Channel MOSFET**

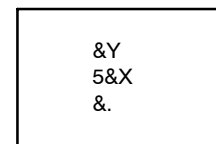


**BOTTOM**

**TOP**

**WLCSP6 1.5x1x0.6  
 CASE 567PW**

### MARKING DIAGRAM



- 5 = Specific Device Code
- &Y = Year Date Code
- &X = Weekly Date Code
- &. = Pin Mark

### ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

# FDZ1905PZ

## MOSFET MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Rating	Unit
$V_{S1S2}$	Source1 to Source2 Voltage	-20	V
$V_{GS}$	Gate to Source Voltage	$\pm 8$	V
$I_{S1S2}$	Source1 to Source2 Current	- Continuous, $T_A = 25^\circ\text{C}$ (Note 1a)	-3
		- Pulsed	-15
$P_D$	Power Dissipation (Steady State)	$T_A = 25^\circ\text{C}$ (Note 1a)	1.5
	Power Dissipation	$T_A = 25^\circ\text{C}$ (Note 1b)	0.9
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

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.

## THERMAL CHARACTERISTICS

Symbol	Parameter	Rating	Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	83	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1b)	140	

## ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
--------	-----------	----------------	------	------	------	------

### OFF CHARACTERISTICS

$I_{S1S2}$	Zero Gate Voltage Source1 to Source2 Current	$V_{S1S2} = -16\text{ V}, V_{GS} = 0\text{ V}$	-	-	-1	$\mu\text{A}$
$I_{GSS}$	Gate Body Leakage Current	$V_{GS} = \pm 8\text{ V}, V_{S1S2} = 0\text{ V}$	-	-	$\pm 10$	$\mu\text{A}$

### ON CHARACTERISTICS (Note 2)

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{S1S2}, I_{S1S2} = -250\text{ mA}$	-0.4	-0.7	-1.0	V
$r_{S1S2(on)}$	Static Source1 to Source2 On Resistance	$V_{GS} = -4.5\text{ V}, I_{S1S2} = -1\text{ A}$	-	99	126	$\text{m}\Omega$
		$V_{GS} = -2.5\text{ V}, I_{S1S2} = -1\text{ A}$	-	112	141	
		$V_{GS} = -1.8\text{ V}, I_{S1S2} = -1\text{ A}$	-	132	198	
		$V_{GS} = -1.5\text{ V}, I_{S1S2} = -1\text{ A}$	-	164	303	
		$V_{GS} = -4.5\text{ V}, I_{S1S2} = -1\text{ A}, T_J = 125^\circ\text{C}$	-	135	195	
$g_{FS}$	Forward Transconductance	$V_{S1S2} = -5\text{ V}, I_{S1S2} = -1\text{ A}$	-	8	-	S

### SWITCHING CHARACTERISTICS (Note 2)

$t_{d(on)}$	Turn-On Delay Time	$V_{S1S2} = -10\text{ V}, I_{S1S2} = -1\text{ A}$ $V_{GS} = -4.5\text{ V}, R_{GEN} = 6\ \Omega$	-	12	22	ns
$t_r$	Rise Time		-	36	58	ns
$t_{d(off)}$	Turn-Off Delay Time		-	143	229	ns
$t_f$	Fall Time		-	182	291	ns

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.

# FDZ1905PZ

## 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. 83°C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



b. 0°C/W when mounted on a minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 ms, Duty cycle < 2.0%.
3. The diode connected between the gate and source serves only protection against ESD. No gate overvoltage rating is implied.

TYPICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

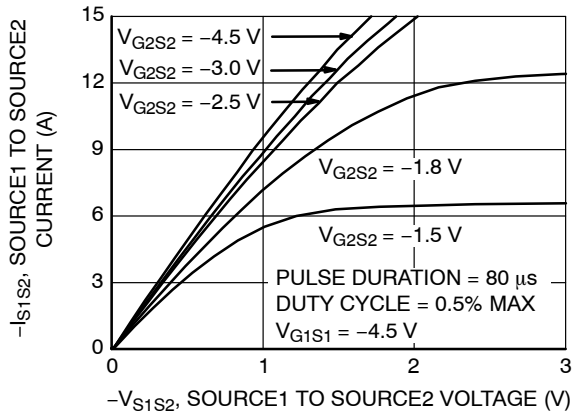


Figure 1. On Region Characteristics

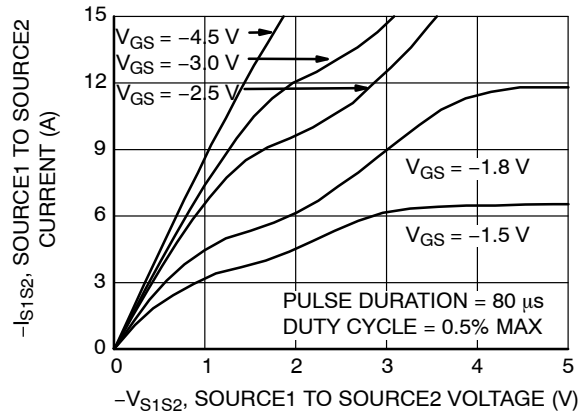


Figure 2. On Region Characteristics

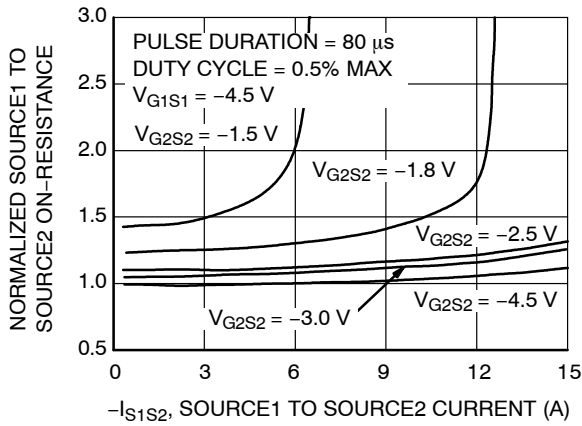


Figure 3. Normalized On-Resistance vs Drain Current and Gate Voltage

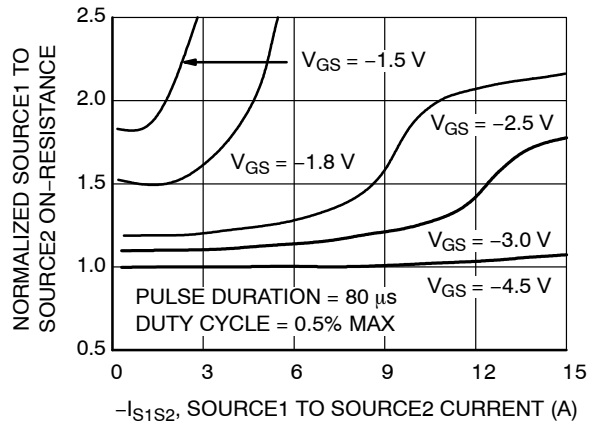


Figure 4. Normalized On-Resistance vs Drain Current and Gate Voltage

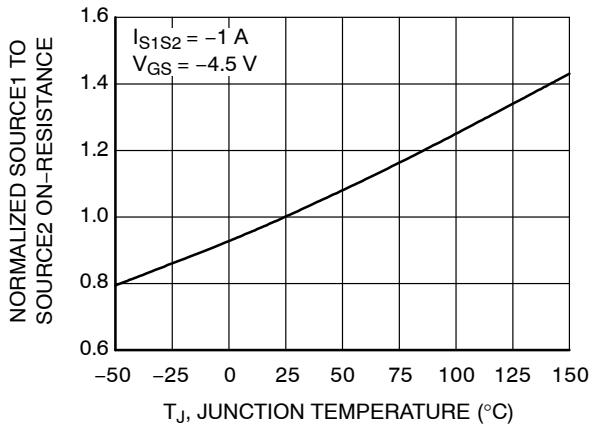


Figure 5. Normalized On-Resistance vs Junction Temperature

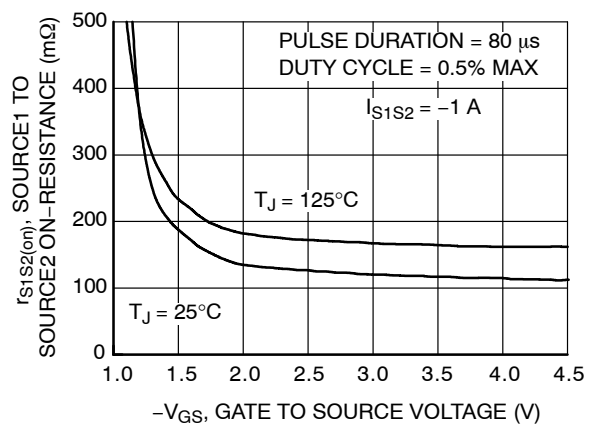


Figure 6. On-Resistance vs Gate to Source Voltage

TYPICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

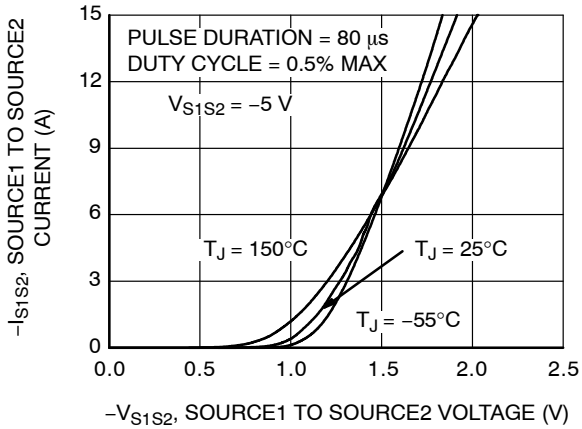


Figure 7. Transfer Characteristics

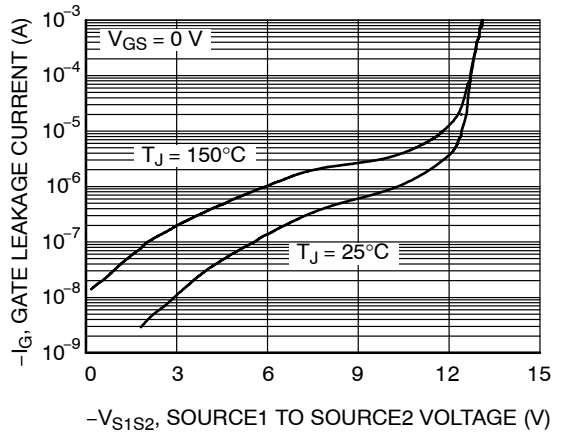


Figure 8. Gate Leakage vs Gate to Source Voltage

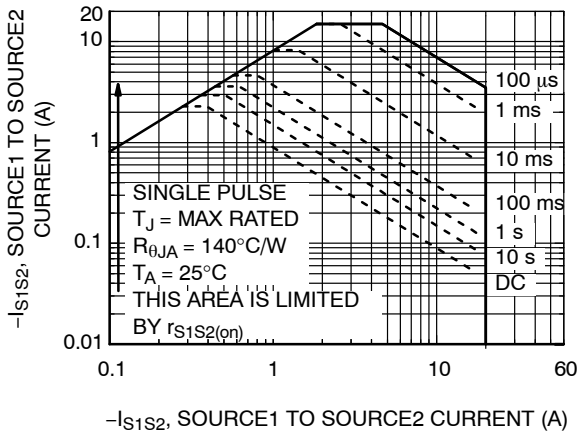


Figure 9. Forward Bias Safe Operating Area

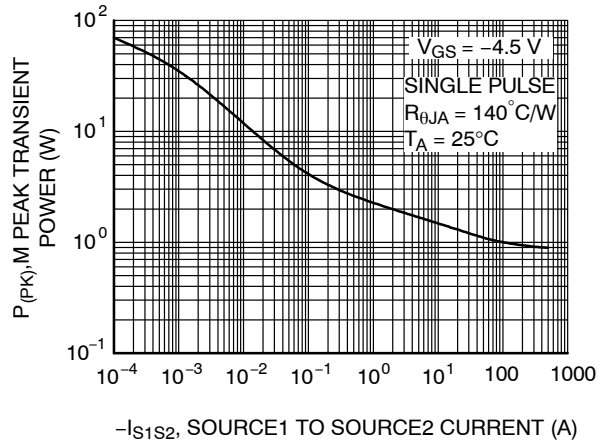


Figure 10. Single Pulse Maximum Power Dissipation

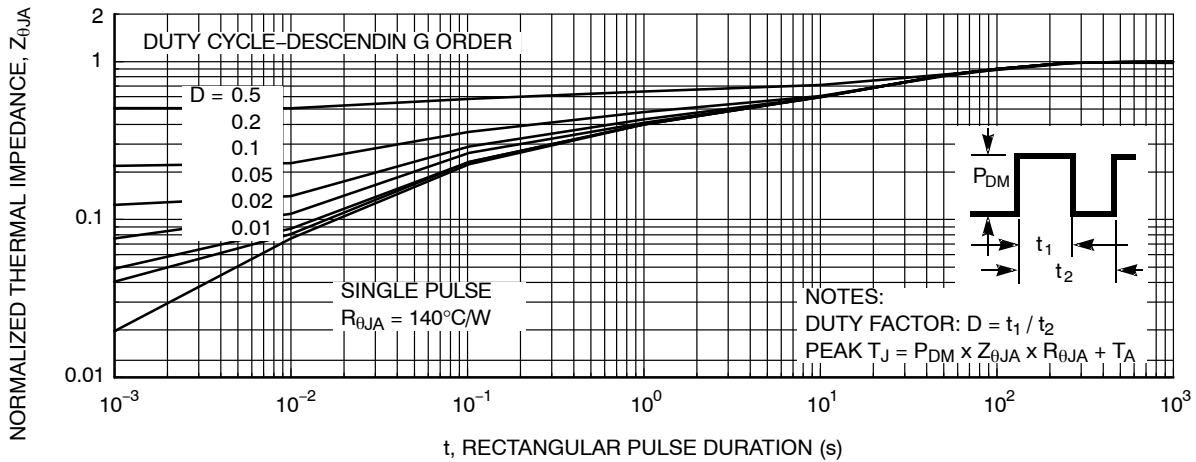


Figure 11. Transient Thermal Response Curve

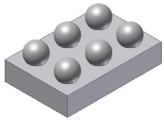
# FDZ1905PZ

## ORDERING INFORMATION

Device	Device Marking	Package	Reel Size	Tape Width	Shipping†
FDZ1905PZ	5	WLCSP6 1.5x1x0.6 (Pb-Free)	7"	8 mm	5000 / Tape & Reel

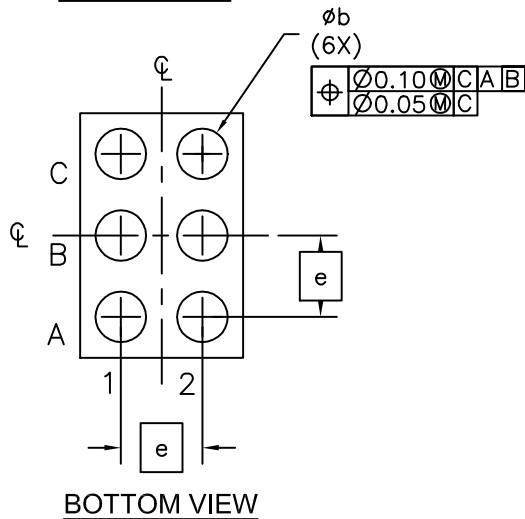
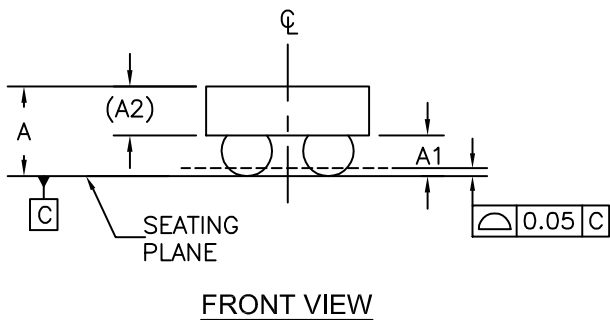
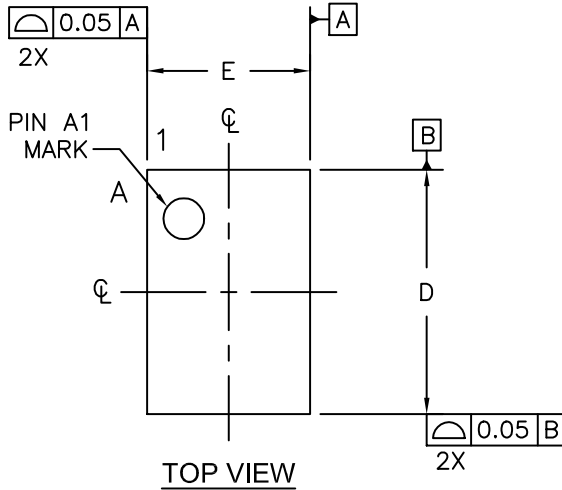
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

POWERTRENCH is registered trademark of Semiconductor Components Industries, LLC (SCILLC) or its subsidiaries in the United States and/or other countries.



**WLCSP6 1.5x1x0.6**  
CASE 567PW  
ISSUE A

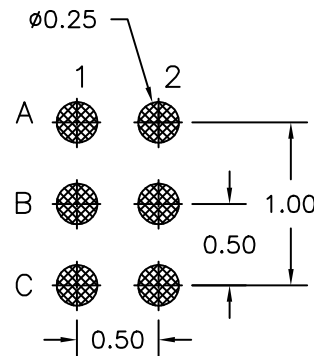
DATE 04 AUG 2021



NOTES: UNLESS OTHERWISE SPECIFIED

- A) ALL DIMENSIONS ARE IN MILLIMETERS.
- B) NO JEDEC REGISTRATION REFERENCE AS OF OCTOBER 2005.
- C) DRAWING CONFORMS TO ASME Y14.5M-2009

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	-	-	0.60
A1	0.22	0.25	0.28
A2	0.30 REF		
b	0.24	0.31	0.39
D	1.45	1.50	1.55
E	0.95	1.00	1.05
e	0.50 BSC		



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

<b>DOCUMENT NUMBER:</b> 98AON13306G	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
<b>DESCRIPTION:</b> WLCSP6 1.5x1x0.6	<b>PAGE 1 OF 1</b>

ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

**onsemi**, **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](http://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](http://www.onsemi.com/design/resources/technical-documentation)  
onsemi Website: [www.onsemi.com](http://www.onsemi.com)

### ONLINE SUPPORT: [www.onsemi.com/support](http://www.onsemi.com/support)

For additional information, please contact your local Sales Representative at [www.onsemi.com/support/sales](http://www.onsemi.com/support/sales)