

FDZ192NZ

Power MOSFET, N-Channel, Trench[®], 1.5 V Specified Thin WLCSP

20 V, 5.3 A, 39 mΩ

General Description

Designed on advanced 1.5 V PowerTrench[®] process with state of the art “fine pitch” WLCSP packaging process, the FDZ192NZ minimizes both PCB space and $r_{DS(on)}$. 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 $r_{DS(on)}$.

Features

- Max $r_{DS(on)}$ = 39 mΩ at $V_{GS} = 4.5$ V, $I_D = 2.0$ A
- Max $r_{DS(on)}$ = 43 mΩ at $V_{GS} = 2.5$ V, $I_D = 2.0$ A
- Max $r_{DS(on)}$ = 49 mΩ at $V_{GS} = 1.8$ V, $I_D = 1.0$ A
- Max $r_{DS(on)}$ = 55 mΩ at $V_{GS} = 1.5$ V, $I_D = 1.0$ A
- Occupies only 1.5 mm² 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
- HBM ESD Protection Level > 2200 V (Note 3)
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

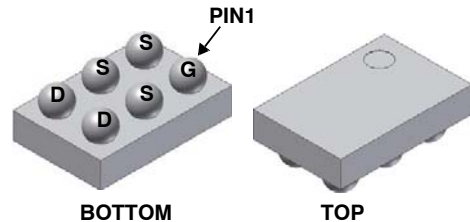
Applications

- Battery Management
- Load Switch
- Battery Protection



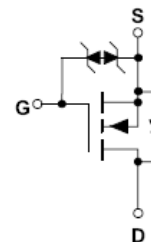
ON Semiconductor[®]

www.onsemi.com

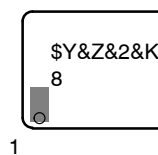


WLCSP6 1.5x1x0.6
CASE 567PW

SCHEMATIC



MARKING DIAGRAM



\$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&2	= Numeric Date Code
&K	= Lot Code
8	= Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

FDZ192NZ

ORDERING INFORMATION

Part Number	Device Marking	Package	Shipping [†]
FDZ192NZ	8	WLCSP6 1.5x1x0.6 (Pb-Free / Halogen Free)	5000 Units / Tape & Reel

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

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Value	Unit
V _{DS}	Drain to Source Voltage	20	V
V _{GS}	Gate to Source Voltage	±8	V
I _D	Drain Current Continuous, T _A = 25°C (Note 1a)	5.3	A
	Drain Current Pulsed	15	
P _D	Power Dissipation, T _A = 25°C (Note 1a)	1.9	W
	Power Dissipation, T _A = 25°C (Note 1b)	0.9	
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.

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
R _{θJA}	Thermal Resistance, Junction to Ambient (Note 1a)	65	°C/W
R _{θJA}	Thermal Resistance, Junction to Ambient (Note 1b)	133	°C/W

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	20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I _D = 250 μA, referenced to 25°C		10		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 16 V, V _{GS} = 0 V			1	μA
I _{GSS}	Gate to Source Leakage Current	V _{GS} = ±8 V, V _{DS} = 0 V			±10	μA

On Characteristics

V _{GS(th)}	Gate to Source Threshold Voltage	V _{GS} = V _{DS} , I _D = 250 μA	0.4	0.7	1.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I _D = 250 μA, referenced to 25°C		-3		mV/°C
r _{DS(on)}	Static Drain to Source On Resistance	V _{GS} = 4.5 V, I _D = 2.0 A		26	39	mΩ
		V _{GS} = 2.5 V, I _D = 2.0 A		29	43	
		V _{GS} = 1.8 V, I _D = 1.0 A		33	49	
		V _{GS} = 1.5 V, I _D = 1.0 A		38	55	
		V _{GS} = 4.5 V, I _D = 2.0 A, T _J = 125°C		31	47	
g _{FS}	Forward Transconductance	V _{DS} = 5 V, I _D = 5.3 A		36		s

Dynamic Characteristics

C _{iss}	Input Capacitance	V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz		915	1220	pF
C _{oss}	Output Capacitance			145	195	pF
C _{rss}	Reverse Transfer Capacitance			100	150	pF

FDZ192NZ

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 10\text{ V}$, $I_D = 5.3\text{ A}$, $V_{GS} = 4.5\text{ V}$, $R_{GEN} = 6\ \Omega$		6.5	13	ns
t_r	Rise Time			4	10	ns
$t_{d(off)}$	Turn-Off Delay Time			50	80	ns
t_f	Fall Time			20	32	ns
Q_g	Total Gate Charge	$V_{GS} = 0\text{ V to }4.5\text{ V}$		12	17	nC
		$V_{DD} = 10\text{ V}$, $I_D = 5.3\text{ A}$				
Q_{gs}	Gate to Source Charge			1.3		nC
Q_{gd}	Gate to Drain "Miller" Charge			2.3		nC

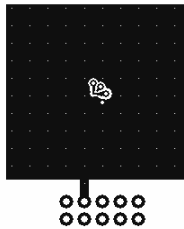
Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = 1.1\text{ A}$ (Note 2)		0.6	1.2	V
t_{rr}	Reverse Recovery Time	$I_F = 5.3\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		18	32	ns
Q_{rr}	Reverse Recovery Charge			4.6	10	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.

NOTES:

- $R_{\theta JA}$ is determined with the device mounted on a 1 in² 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.) 65°C/W when mounted on a 1 in² pad of 2 oz copper



b.) 133°C/W when mounted on a minimum pad of 2 oz copper

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

TYPICAL CHARACTERISTICS

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

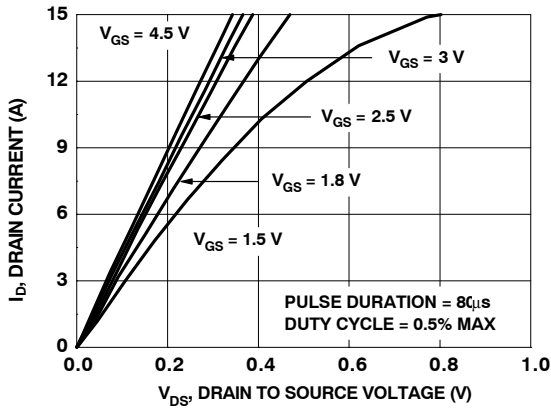


Figure 1. On-Region Characteristics

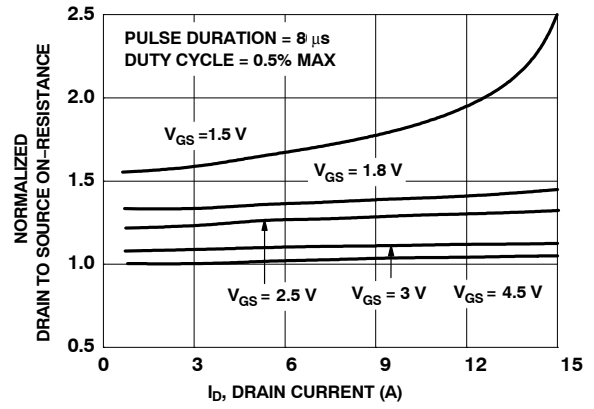


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

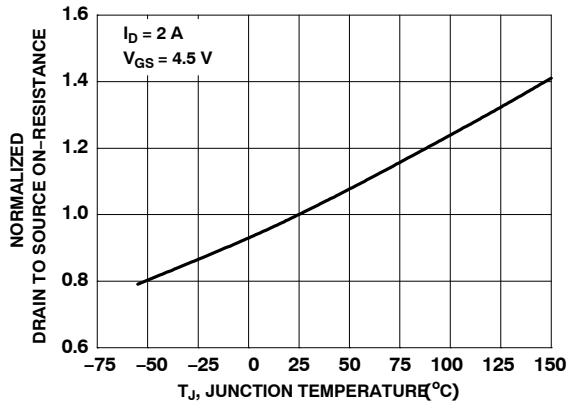


Figure 3. Normalized On-Resistance vs Junction Temperature

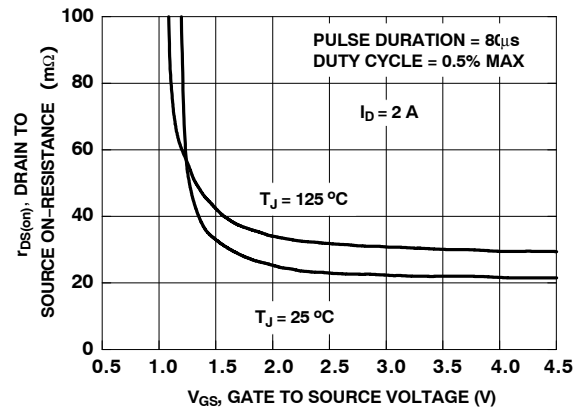


Figure 4. On-Resistance vs Gate to Source Voltage

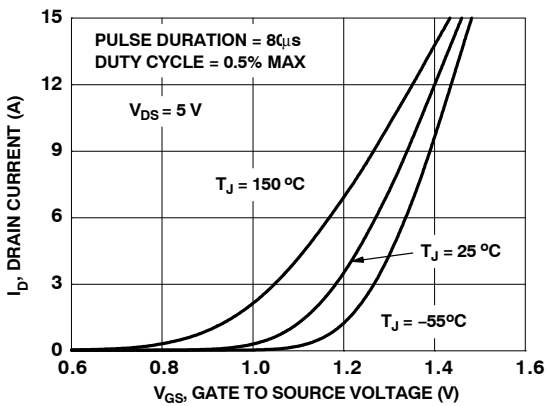


Figure 5. Transfer Characteristics

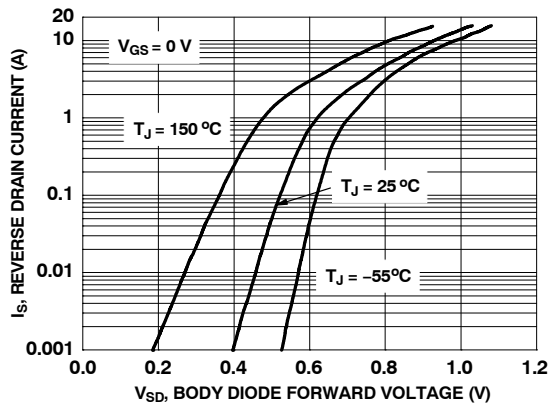


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

FDZ192NZ

TYPICAL CHARACTERISTICS

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

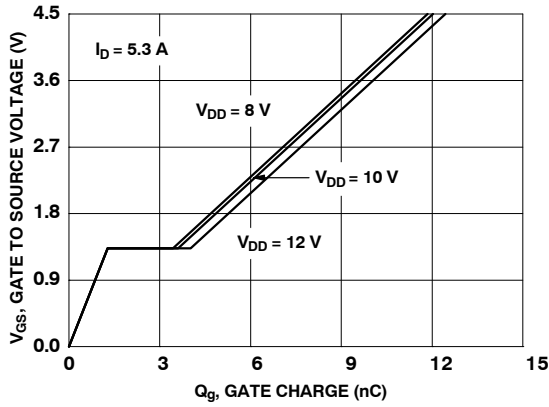


Figure 7. Gate Charge Characteristics

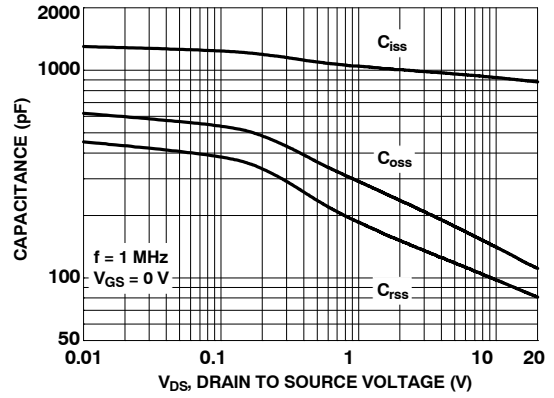


Figure 8. Capacitance vs Drain to Source Voltage

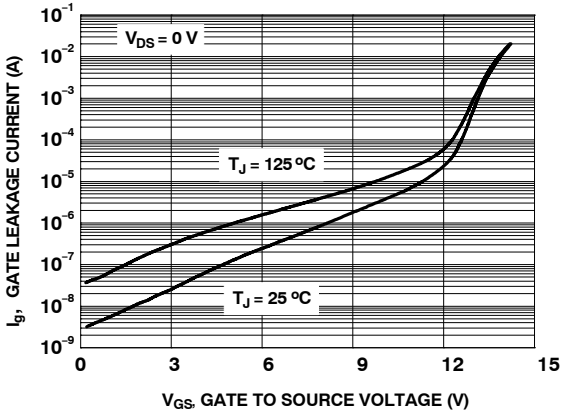


Figure 9. Gate Leakage Current vs Gate to Source Voltage

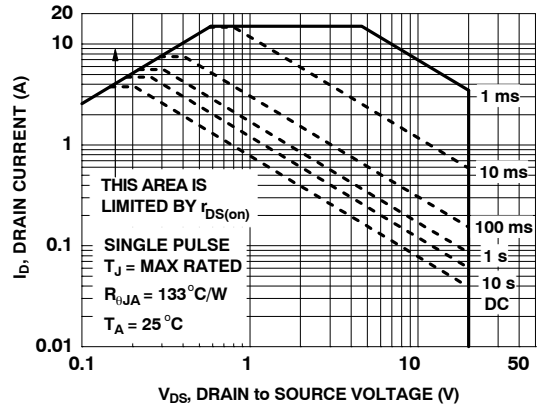


Figure 10. Forward Bias Safe Operating Area

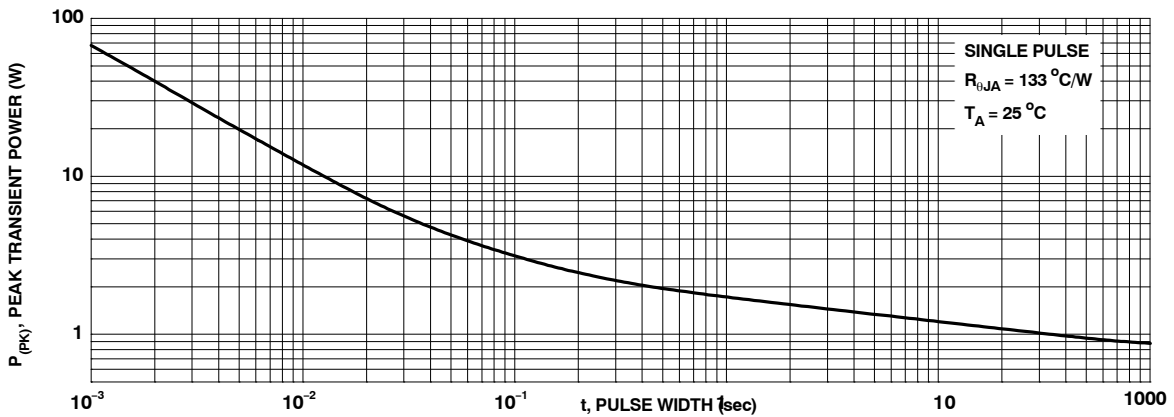


Figure 11. Single Pulse Maximum Power Dissipation

FDZ192NZ

TYPICAL CHARACTERISTICS

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

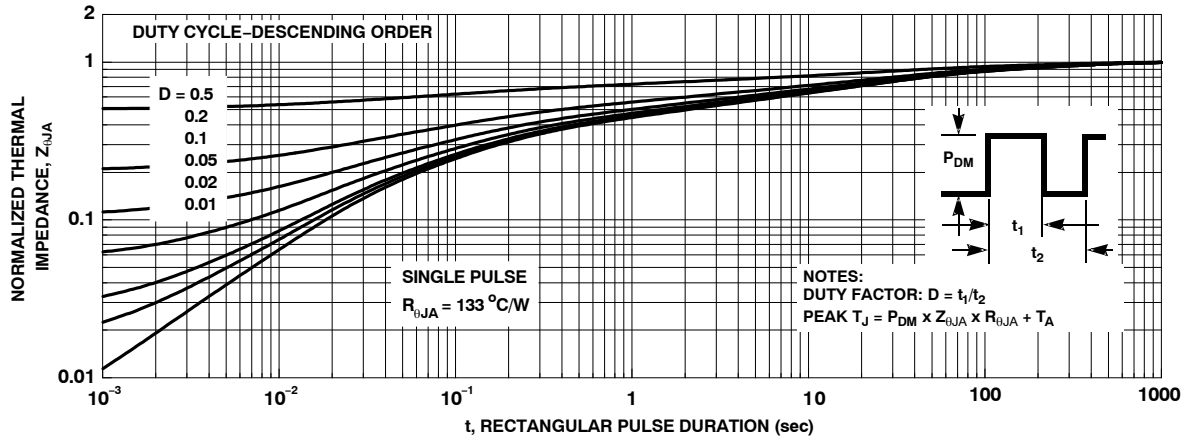


Figure 12. Junction-to-Ambient Transient Thermal Response Curve

All other brand names and product names appearing in this document are registered trademarks or trademarks of their respective holders.

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

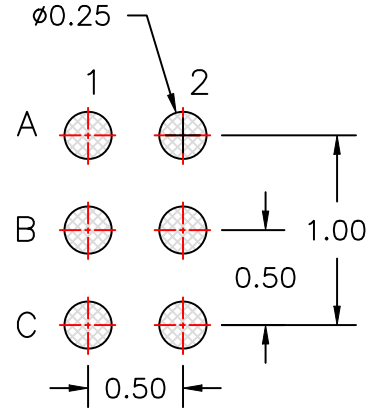
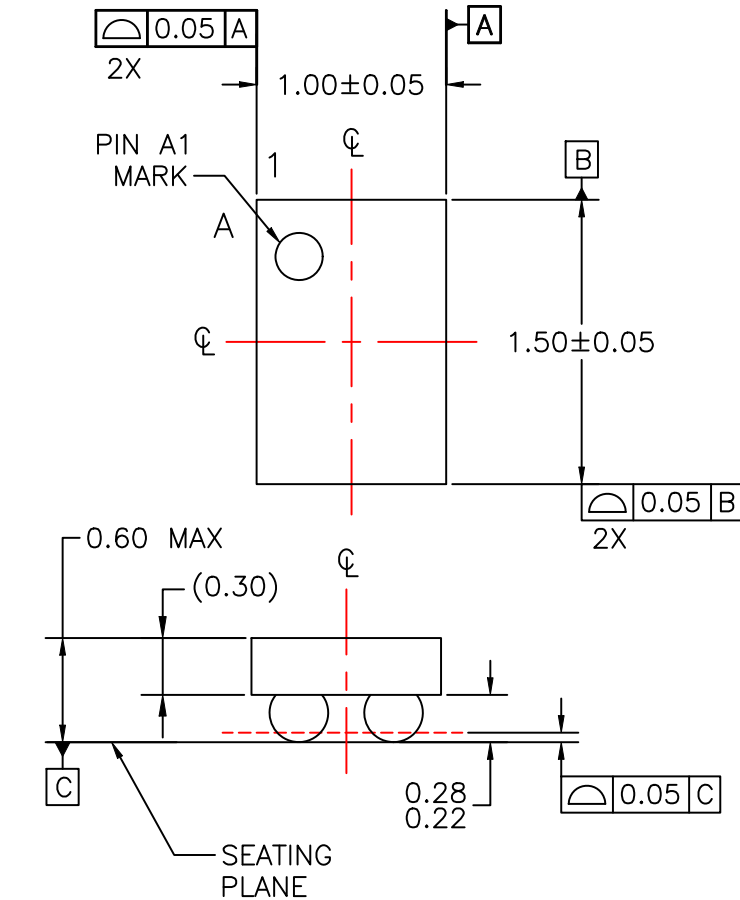
ON Semiconductor®



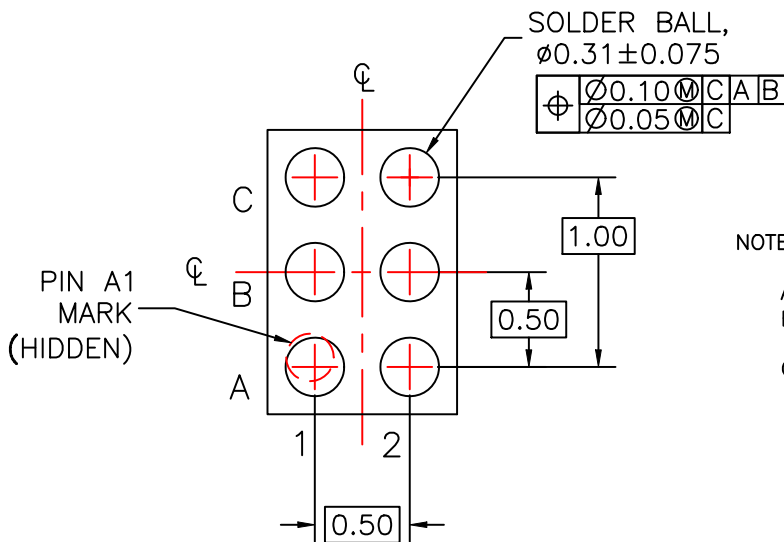
WLCSP6 1.5x1x0.6

CASE 567PW
ISSUE O

DATE 31 OCT 2016



LAND PATTERN RECOMMENDATION



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

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

ON Semiconductor and 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.

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. 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. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor 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 ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor 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 ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Email Requests to: orderlit@onsemi.com

ON Semiconductor Website: www.onsemi.com

TECHNICAL SUPPORT

North American Technical Support:
Voice Mail: 1 800-282-9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative