

MOSFET – Dual, P-Channel (-1.5 V), Specified, POWERTRENCH® -20 V, -0.83 A, 0.5 Ω

FDY1002PZ

General Description

These P-Channel Logic Level MOSFETs are produced using onsemi's advanced POWERTRENCH process that has been especially tailored to minimize the on-state resistance and yet maintain low gate charge for superior switching performance. These devices are well suited for all applications where small size is desirable but especially low cost DC/DC conversion in battery powered systems.

This Dual P-Channel MOSFET has been designed using onsemi's advanced Power Trench process to optimize the $r_{DS(on)}$ @ $V_{GS} = -1.5$ V.

Features

- Max $r_{DS(on)} = 0.5 \Omega$ at $V_{GS} = -4.5$ V, $I_D = -0.83$ A
- Max $r_{DS(on)} = 0.7 \Omega$ at $V_{GS} = -2.5$ V, $I_D = -0.70$ A
- Max $r_{DS(on)} = 1.2 \Omega$ at $V_{GS} = -1.8$ V, $I_D = -0.43$ A
- Max $r_{DS(on)} = 1.8 \Omega$ at $V_{GS} = -1.5$ V, $I_D = -0.36$ A
- HBM ESD Protection Level = 1400 V (Note 1)
- This Device is Pb-Free and is RoHS Compliant

Application

- Li-Ion Battery Pack

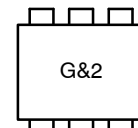
NOTE:

1. The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

V_{DS}	$r_{DS(on)}$ MAX	I_D MAX
-20 V	0.5 Ω @ -4.5 V	-0.83 A
	0.7 Ω @ -2.5 V	
	1.2 Ω @ -1.8 V	
	1.8 Ω @ -1.5 V	

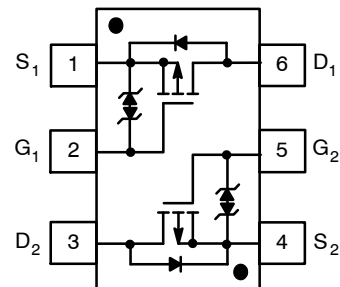


MARKING DIAGRAM



G = Device Code
&2 = 2-Digit Date Code

PIN ASSIGNMENT



ORDERING INFORMATION

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

FDY1002PZ

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

Symbol	Parameter	Ratings	Unit
V_{DS}	Drain to Source Voltage	-20	V
V_{GS}	Gate to Source Voltage	± 8	V
I_D	Drain Current	- Continuous (Note 2a)	-0.83
		- Pulsed	-1.0
P_D	Power Dissipation	(Note 2a)	0.625
		(Note 2b)	0.446
T_J, T_{STG}	Operating and Storage 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 ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Ratings	Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 2a)	200	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case (Note 2b)	280	$^\circ\text{C}/\text{W}$

2. $R_{\theta JA}$ is determined with the device mounted on a 1 in² oz. copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.



a. $200^\circ\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copper.



b. $280^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper.

FDY1002PZ

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	-	-11	-	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 (Note 3)

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 = -0.83 A	-	0.28	0.5	Ω
		V _{GS} = -2.5 V, I _D = -0.70 A	-	0.36	0.7	
		V _{GS} = -1.8 V, I _D = -0.43 A	-	0.47	1.2	
		V _{GS} = -1.5 V, I _D = -0.36 A	-	0.62	1.8	
		V _{GS} = -4.5 V, I _D = -0.83 A, T _J = 125°C	-	0.39	0.85	
g _{FS}	Forward Transconductance	V _{DD} = -5 V, I _D = -0.83 A	-	2	-	S

DYNAMIC CHARACTERISTICS

C _{iss}	Input Capacitance	V _{DS} = -10 V, V _{GS} = 0 V, f = 1 MHz	-	100	135	pF
C _{oss}	Output Capacitance		-	23	35	pF
C _{rss}	Reverse Transfer Capacitance		-	18	30	pF

SWITCHING CHARACTERISTICS (Note 3)

t _{d(on)}	Turn-On Delay Time	V _{DD} = -10 V, I _D = -0.83 A, V _{GS} = -4.5 V, R _{GEN} = 6 Ω	-	3.5	10	ns
t _r	Rise Time		-	2.9	10	ns
t _{d(off)}	Turn-Off Delay Time		-	23	37	ns
t _f	Fall Time		-	13	23	ns
Q _g	Total Gate Charge	V _{DD} = -10 V, I _D = -0.83 A, V _{GS} = -4.5 V	-	2.2	3.1	nC
Q _{gs}	Gate to Source Charge		-	0.3	-	nC
Q _{gd}	Gate to Drain "Miller" Charge		-	0.6	-	nC

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATING

I _S	Maximum Continuous Drain-Source Diode Forward Current	-	-	-0.52	A	
V _{SD}	Source to Drain Diode Forward Voltage	V _{GS} = 0 V, I _S = -0.52 A (Note 3)	-	-1.0	-1.2	V
t _{rr}	Reverse Recovery Time	I _F = -0.83 A, dI _F /dt = 100 A/μs	-	18	31	ns
Q _{rr}	Reverse Recovery Charge		-	3.8	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.

3. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%.

TYPICAL ELECTRICAL CHARACTERISTICS

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

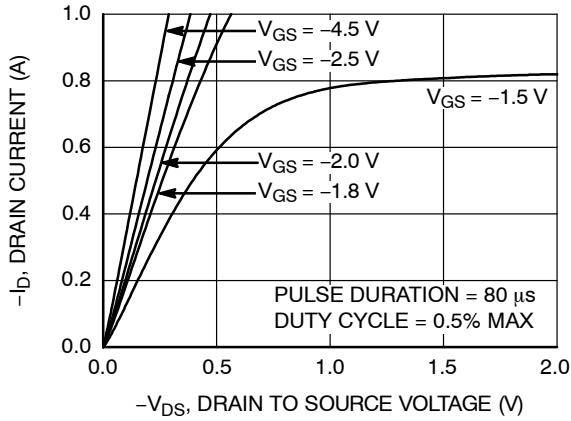


Figure 1. On Region Characteristics

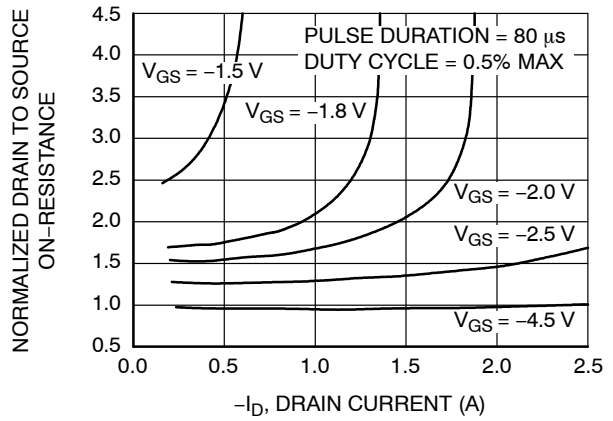


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

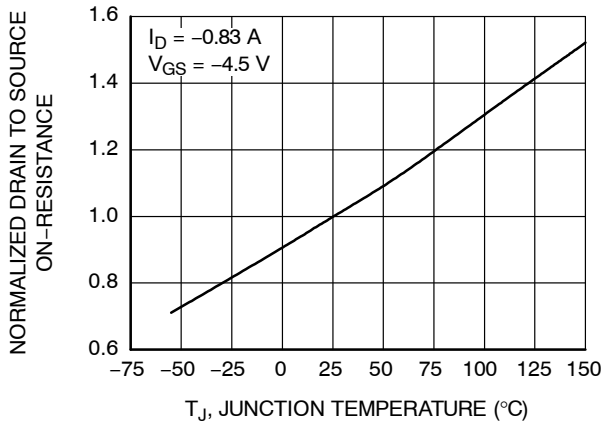


Figure 3. Normalized On Resistance vs. Junction Temperature

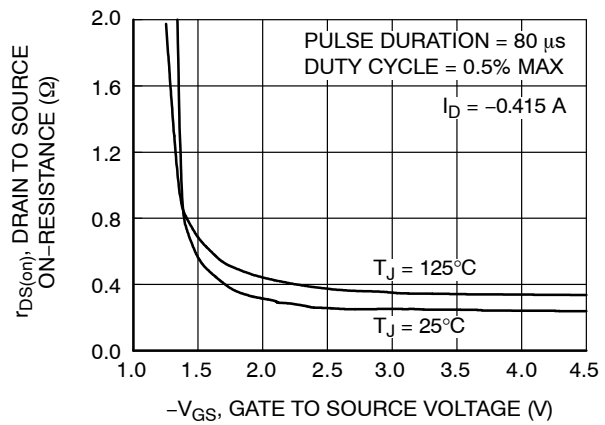


Figure 4. On-Resistance vs. Gate to Source Voltage

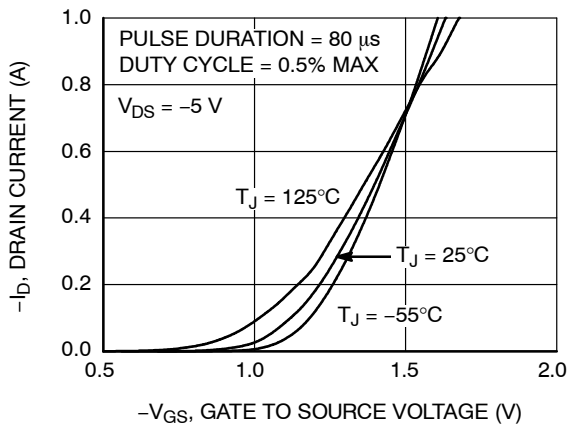


Figure 5. Transfer Characteristics

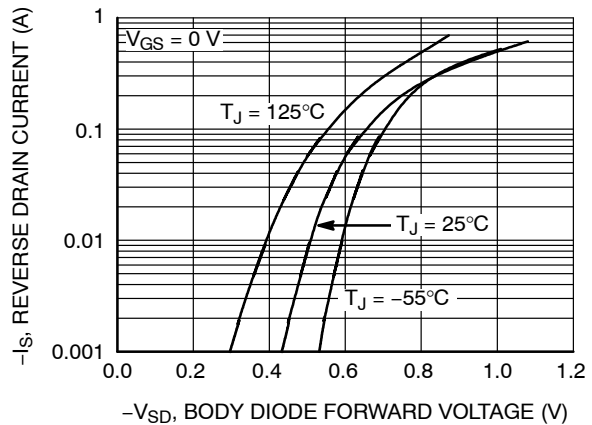


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL ELECTRICAL CHARACTERISTICS

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

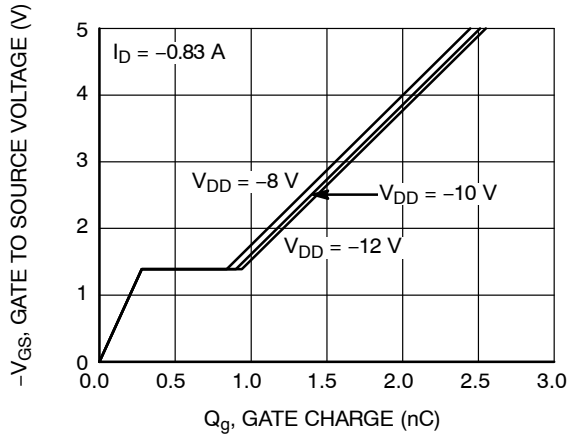


Figure 7. Gate Charge Characteristics

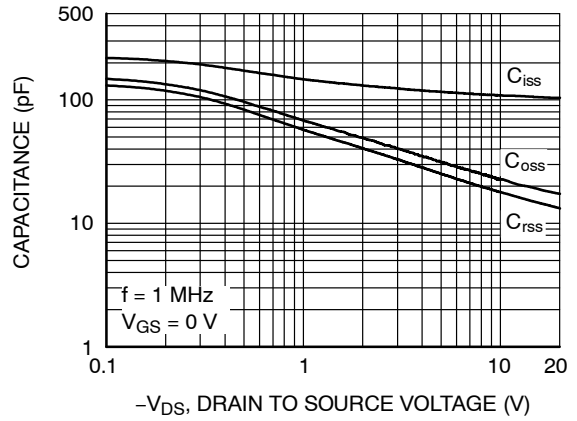


Figure 8. Capacitance vs. Drain to Source Voltage

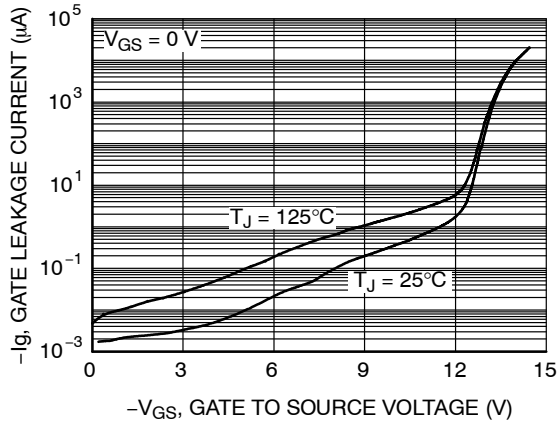


Figure 9. Gate Leakage Current vs. Gate to Source Voltage

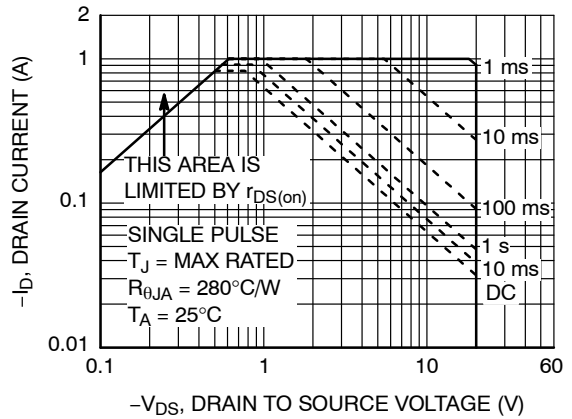


Figure 10. Forward Bias Safe Operating Area

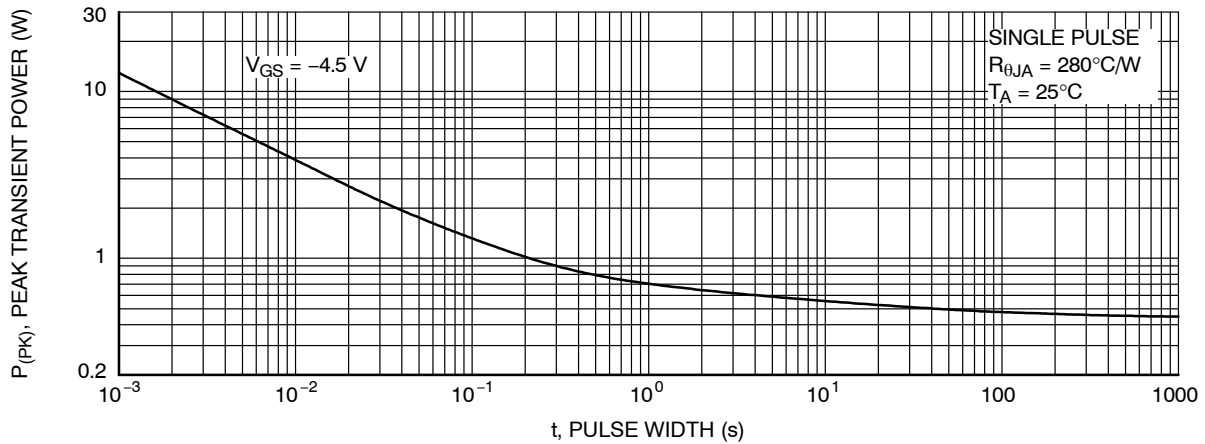


Figure 11. Single Pulse Maximum Power Dissipation

FDY1002PZ

TYPICAL ELECTRICAL CHARACTERISTICS

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

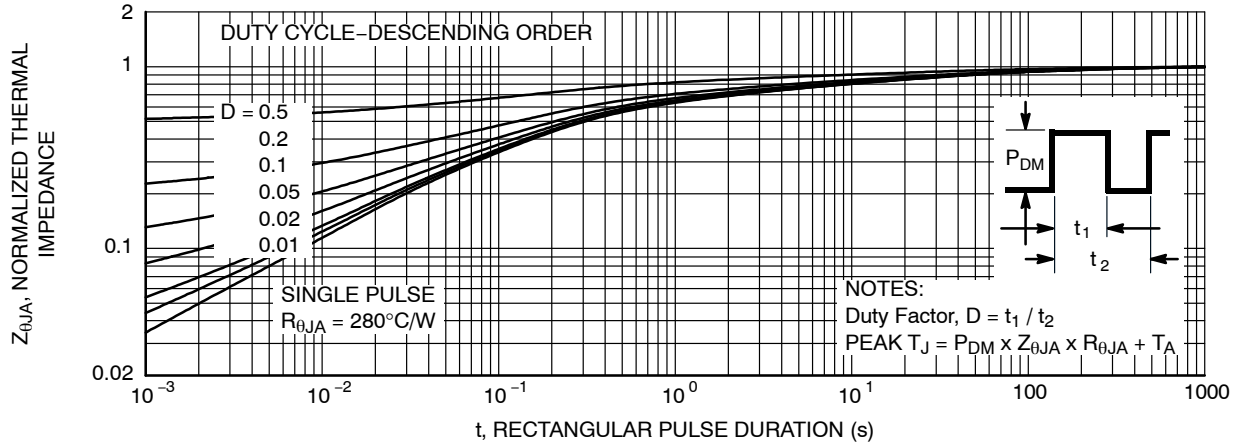


Figure 12. Junction-to-Ambient Transient Thermal Response Curve

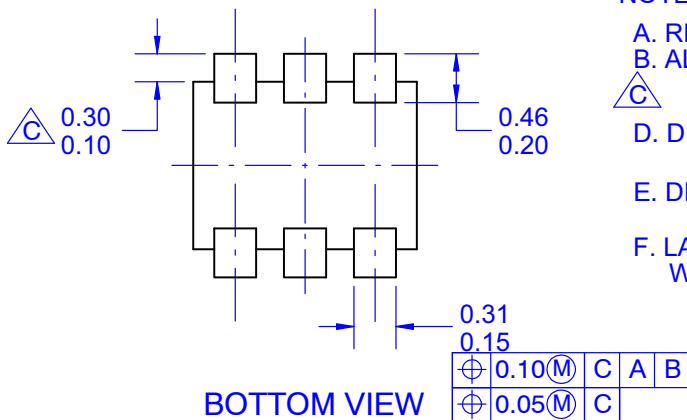
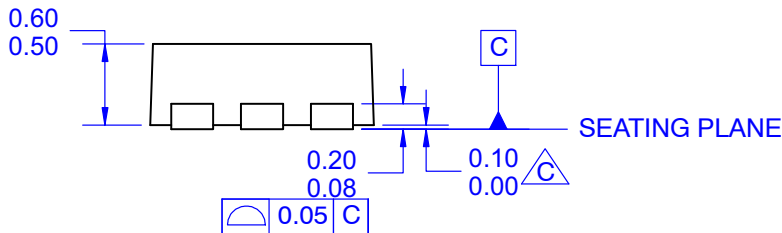
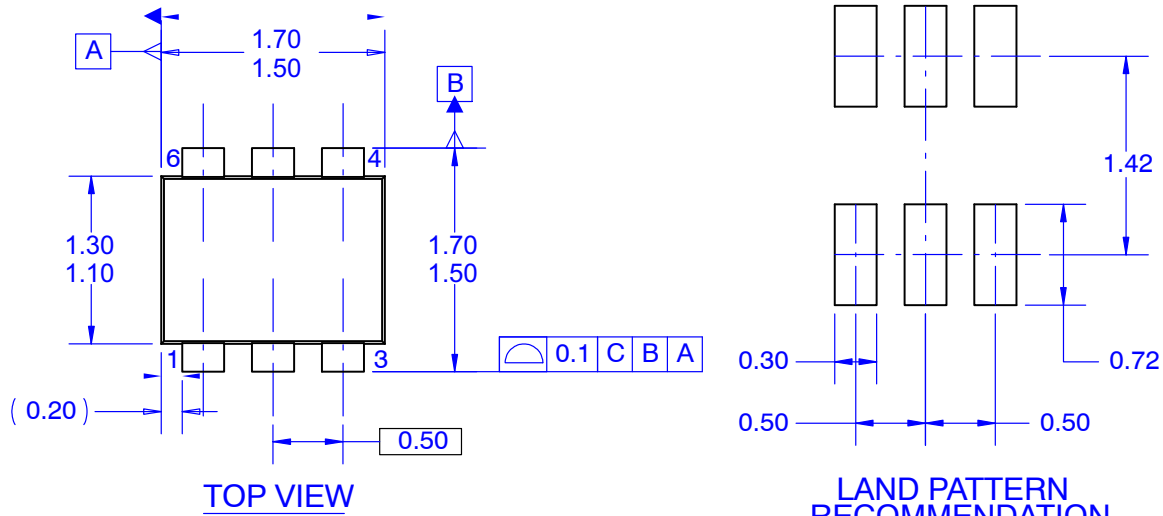
PACKAGE MARKING AND ORDERING INFORMATION

Device	Device Marking	Package	Reel Size	Tape Width	Shipping [†]
FDY1002PZ	G	SOT-563 (Pb-Free)	7"	8 mm	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.

SOT-563
CASE 419BH
ISSUE O

DATE 31 AUG 2016



NOTES: UNLESS OTHERWISE SPECIFIED.

- A. REFERENCE TO JEDEC MO293.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- DOES NOT COMPLY JEDEC STANDARD VALUE.
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSION.
- E. DIMENSION AND TOLERANCE AS PER ASME Y14.5-2009.
- F. LANDPATTERN RECOMMENDATION GENERATED WITH IPC LANDPATTERN GENERATOR

DOCUMENT NUMBER:	98AON13790G	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	SOT-563	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.

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. **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