

NIF62514

Self-protected FET, Temp and Current Limit, Voltage Clamp, ESD, SOT-223

HDPlus devices are an advanced series of power MOSFETs which utilize ON Semiconductor's latest MOSFET technology process to achieve the lowest possible on-resistance per silicon area while incorporating smart features. Integrated thermal and current limits work together to provide short circuit protection. The devices feature an integrated Drain-to-Gate Clamp that enables them to withstand high energy in the avalanche mode. The Clamp also provides additional safety margin against unexpected voltage transients. Electrostatic Discharge (ESD) protection is provided by an integrated Gate-to-Source Clamp.

Features

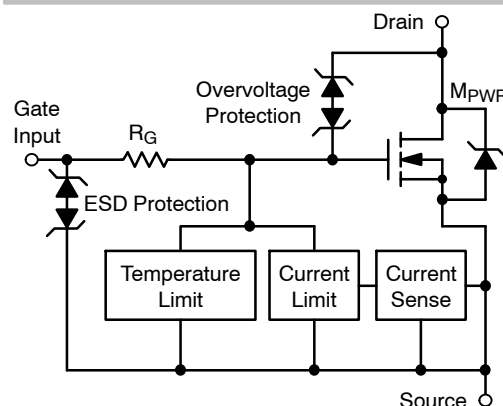
- Current Limitation
- Thermal Shutdown with Automatic Restart
- Short Circuit Protection
- Low $R_{DS(on)}$
- I_{DSS} Specified at Elevated Temperature
- Avalanche Energy Specified
- Slew Rate Control for Low Noise Switching
- Overvoltage Clamped Protection
- This is a Pb-Free Device



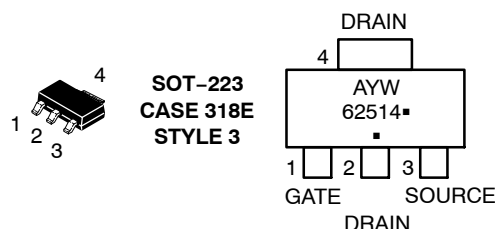
ON Semiconductor®

<http://onsemi.com>

6.0 AMPERES*
40 VOLTS CLAMPED
 $R_{DS(on)} = 90 \text{ m}\Omega$



MARKING DIAGRAM



A = Assembly Location

Y = Year

W = Work Week

62514 = Specific Device Code

■ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
NIF62514T1G	SOT-223 (Pb-Free)	1000/Tape & Reel
NIF62514T3G	SOT-223 (Pb-Free)	4000/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.

*Limited by the current limit circuit.

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

Rating	Symbol	Value	Unit
Drain-to-Source Voltage Internally Clamped	V_{DSS}	40	Vdc
Drain-to-Gate Voltage Internally Clamped ($R_{GS} = 1.0\text{ M}\Omega$)	V_{DGR}	40	Vdc
Gate-to-Source Voltage	V_{GS}	± 16	Vdc
Drain Current - Continuous @ $T_A = 25^\circ\text{C}$ - Continuous @ $T_A = 100^\circ\text{C}$ - Pulsed ($t_p \leq 10\text{ }\mu\text{s}$)	I_D I_D I_{DM}	Internally Limited	
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ (Note 1) @ $T_A = 25^\circ\text{C}$ (Note 2) @ $T_A = 25^\circ\text{C}$ (Note 3)	P_D	1.1 1.73 8.93	W
Thermal Resistance, Junction-to-Tab Junction-to-Ambient (Note 1) Junction-to-Ambient (Note 2)	$R_{\theta JT}$ $R_{\theta JA}$ $R_{\theta JA}$	14 114 72.3	$^\circ\text{C/W}$
Single Pulse Drain-to-Source Avalanche Energy ($V_{DD} = 25\text{ Vdc}$, $V_{GS} = 5.0\text{ Vdc}$, $V_{DS} = 40\text{ Vdc}$, $I_L = 2.8\text{ Apk}$, $L = 80\text{ mH}$, $R_G = 25\text{ }\Omega$)	E_{AS}	300	mJ
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Mounted onto min pad board.
2. Mounted onto 1" pad board.
3. Mounted onto large heatsink.

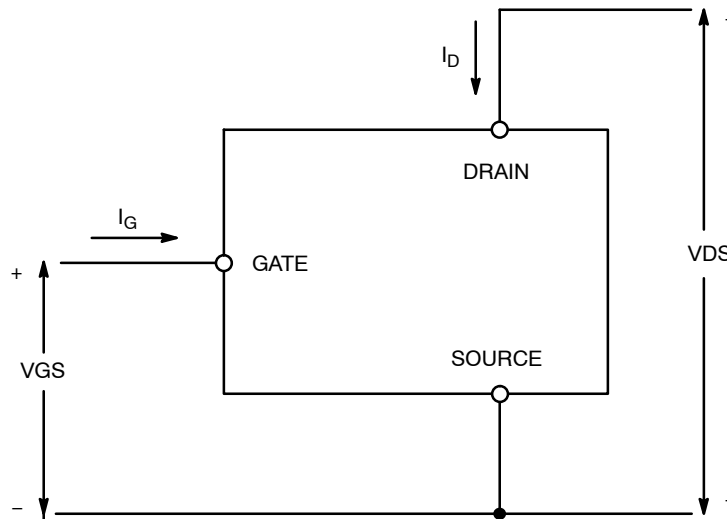


Figure 1. Voltage and Current Convention

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

Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

OFF CHARACTERISTICS

Drain-to-Source Clamped Breakdown Voltage ($V_{GS} = 0\text{ Vdc}$, $I_D = 250\text{ }\mu\text{Adc}$) ($V_{GS} = 0\text{ Vdc}$, $I_D = 250\text{ }\mu\text{Adc}$, $T_J = 150^\circ\text{C}$) (Note 4)	$V_{(BR)DSS}$	42 42	46 45	50 50	Vdc
Zero Gate Voltage Drain Current ($V_{DS} = 32\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$) ($V_{DS} = 32\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 150^\circ\text{C}$) (Note 4)	I_{DSS}	– –	0.5 2.0	2.0 10	μAdc
Gate Input Current ($V_{GS} = 5.0\text{ Vdc}$, $V_{DS} = 0\text{ Vdc}$) ($V_{GS} = -5.0\text{ Vdc}$, $V_{DS} = 0\text{ Vdc}$)	I_{GSS}	– –	50 550	100 1000	μAdc

ON CHARACTERISTICS

Gate Threshold Voltage ($V_{DS} = V_{GS}$, $I_D = 150\text{ }\mu\text{Adc}$) Threshold Temperature Coefficient (Negative)	$V_{GS(th)}$	1.0 –	1.7 4.0	2.0 –	Vdc mV/ $^\circ\text{C}$
Static Drain-to-Source On-Resistance (Note 5) ($V_{GS} = 10\text{ Vdc}$, $I_D = 1.4\text{ Adc}$, $T_J @ 25^\circ\text{C}$) ($V_{GS} = 10\text{ Vdc}$, $I_D = 1.4\text{ Adc}$, $T_J @ 150^\circ\text{C}$) (Note 4)	$R_{DS(on)}$	– –	90 165	100 190	m Ω
Static Drain-to-Source On-Resistance (Note 5) ($V_{GS} = 5.0\text{ Vdc}$, $I_D = 1.4\text{ Adc}$, $T_J @ 25^\circ\text{C}$) ($V_{GS} = 5.0\text{ Vdc}$, $I_D = 1.4\text{ Adc}$, $T_J @ 150^\circ\text{C}$) (Note 4)	$R_{DS(on)}$	– –	105 185	120 210	m Ω
Source-Drain Forward On Voltage ($I_S = 7\text{ A}$, $V_{GS} = 0\text{ V}$)	V_{SD}	–	1.05	–	V

SWITCHING CHARACTERISTICS (Note 4)

Turn-on Delay Time $R_L = 4.7\text{ }\Omega$, $V_{in} = 0\text{ to }10\text{ V}$, $V_{DD} = 12\text{ V}$	$t_{d(on)}$	–	4.0	8.0	μs
Turn-on Rise Time $R_L = 4.7\text{ }\Omega$, $V_{in} = 0\text{ to }10\text{ V}$, $V_{DD} = 12\text{ V}$	t_{rise}	–	11	20	μs
Turn-off Delay Time $R_L = 4.7\text{ }\Omega$, $V_{in} = 10\text{ to }0\text{ V}$, $V_{DD} = 12\text{ V}$	$t_{d(off)}$	–	32	50	μs
Turn-off Fall Time $R_L = 4.7\text{ }\Omega$, $V_{in} = 10\text{ to }0\text{ V}$, $V_{DD} = 12\text{ V}$	t_{fall}	–	27	50	μs
Slew-Rate On $R_L = 4.7\text{ }\Omega$, $V_{in} = 0\text{ to }10\text{ V}$, $V_{DD} = 12\text{ V}$	$-dV_{DS}/dt_{on}$	–	1.5	2.5	μs
Slew-Rate Off $R_L = 4.7\text{ }\Omega$, $V_{in} = 10\text{ to }0\text{ V}$, $V_{DD} = 12\text{ V}$	dV_{DS}/dt_{off}	–	0.6	1.0	μs

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

Current Limit ($V_{GS} = 5.0\text{ Vdc}$) ($V_{GS} = 5.0\text{ Vdc}$, $T_J = 150^\circ\text{C}$) (Note 4)	I_{LIM}	6.0 3.0	9.0 5.0	11 8.0	Adc
Current Limit ($V_{GS} = 10\text{ Vdc}$) ($V_{GS} = 10\text{ Vdc}$, $T_J = 150^\circ\text{C}$) (Note 4)	I_{LIM}	7.0 4.0	10.5 7.5	13 10	Adc
Temperature Limit (Turn-off) (Note 4)	$T_{LIM(off)}$	150	175	200	$^\circ\text{C}$
Temperature Hysteresis (Note 4)	$\Delta T_{LIM(on)}$	–	15	–	$^\circ\text{C}$
Temperature Limit (Turn-off) (Note 4)	$T_{LIM(off)}$	150	165	185	$^\circ\text{C}$
Temperature Hysteresis (Note 4)	$\Delta T_{LIM(on)}$	–	15	–	$^\circ\text{C}$

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

Electro-Static Discharge Capability	Human Body Model (HBM)	ESD	4000	–	–	V
Electro-Static Discharge Capability	Machine Model (MM)	ESD	400	–	–	V

4. Not subject to production testing.

5. Pulse Test: Pulse Width = 300 μs , Duty Cycle = 2%.

TYPICAL ELECTRICAL CHARACTERISTICS

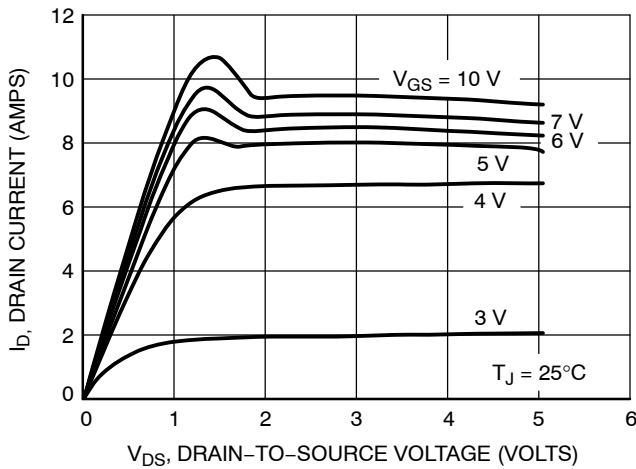


Figure 1. Output Characteristics

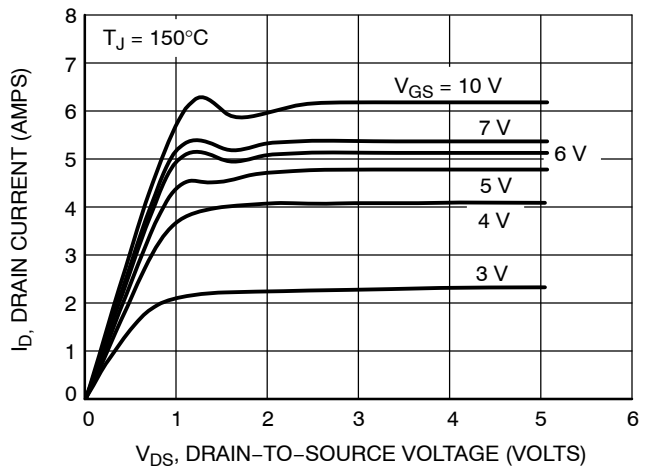


Figure 2. Output Characteristics

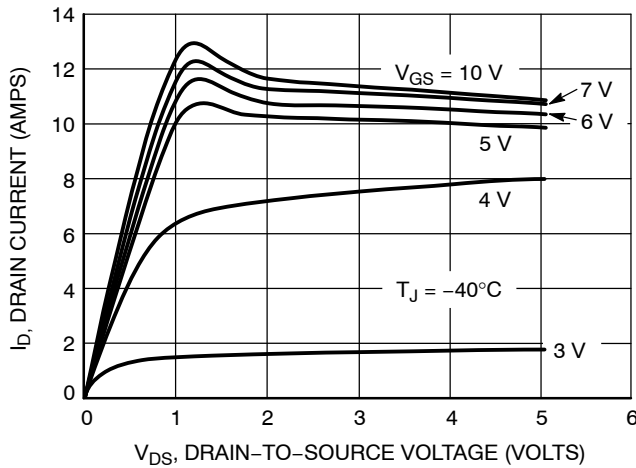


Figure 3. Output Characteristics

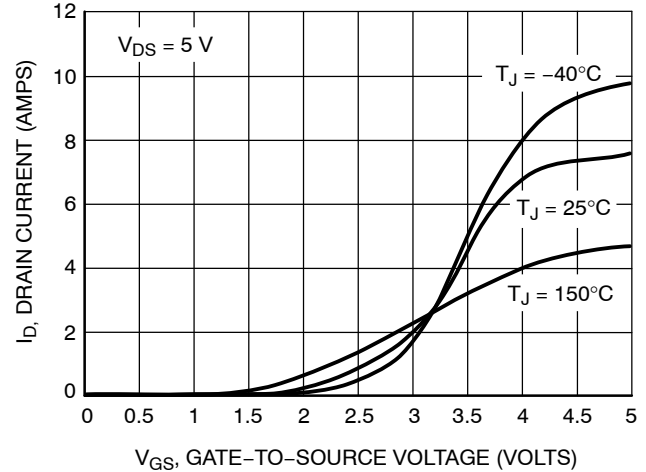


Figure 4. Transfer Characteristics

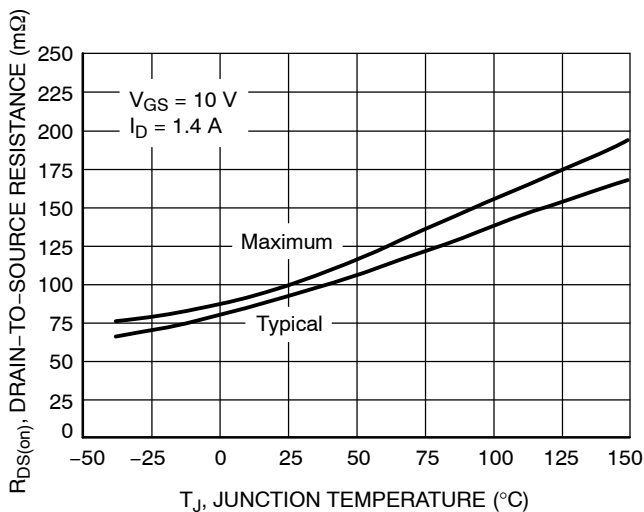


Figure 5. Drain-to-Source Resistance versus Junction Temperature

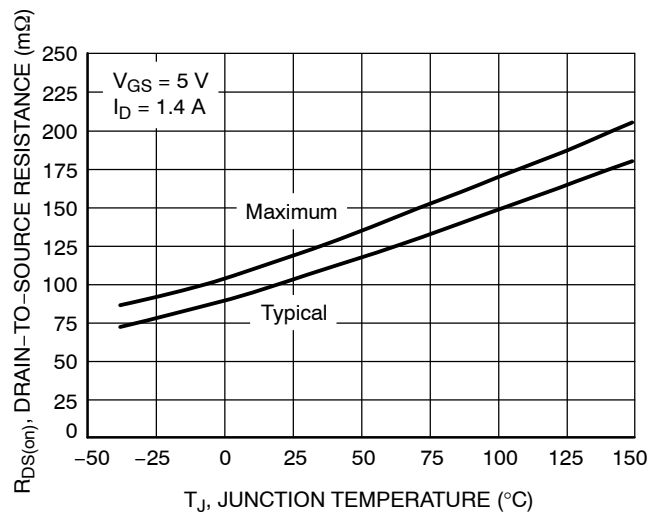


Figure 6. Drain-to-Source Resistance versus Junction Temperature

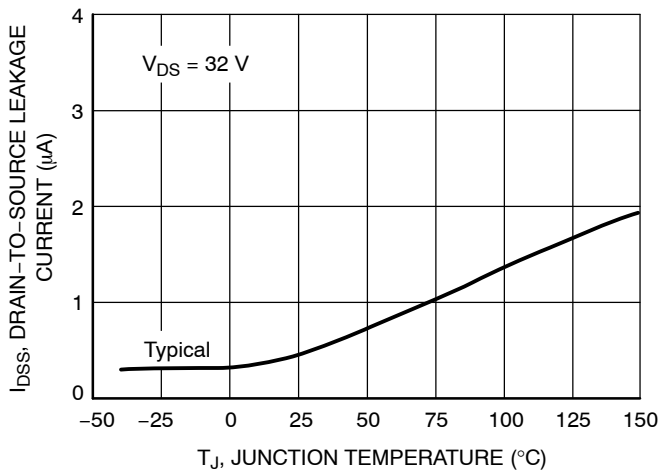


Figure 7. Drain-to-Source Resistance versus Junction Temperature

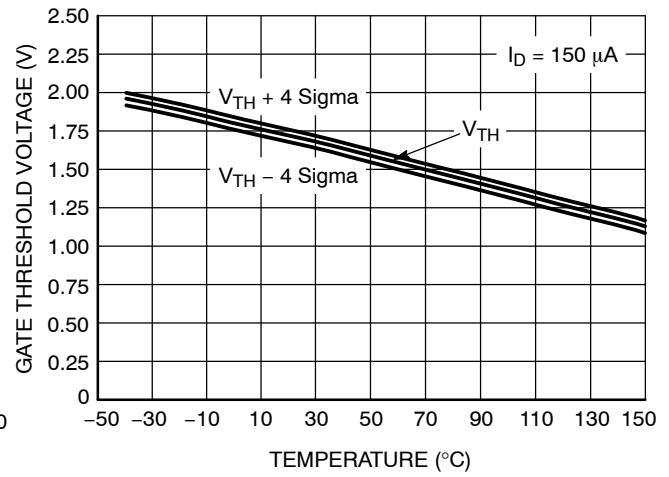


Figure 8. Gate Threshold Voltage versus Temperature

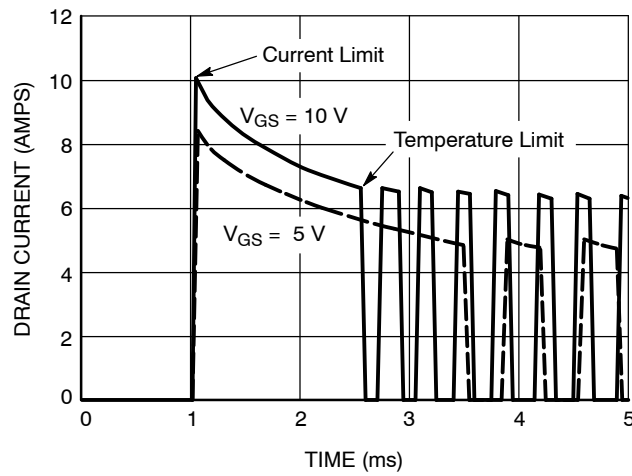


Figure 9. Short-circuit Response

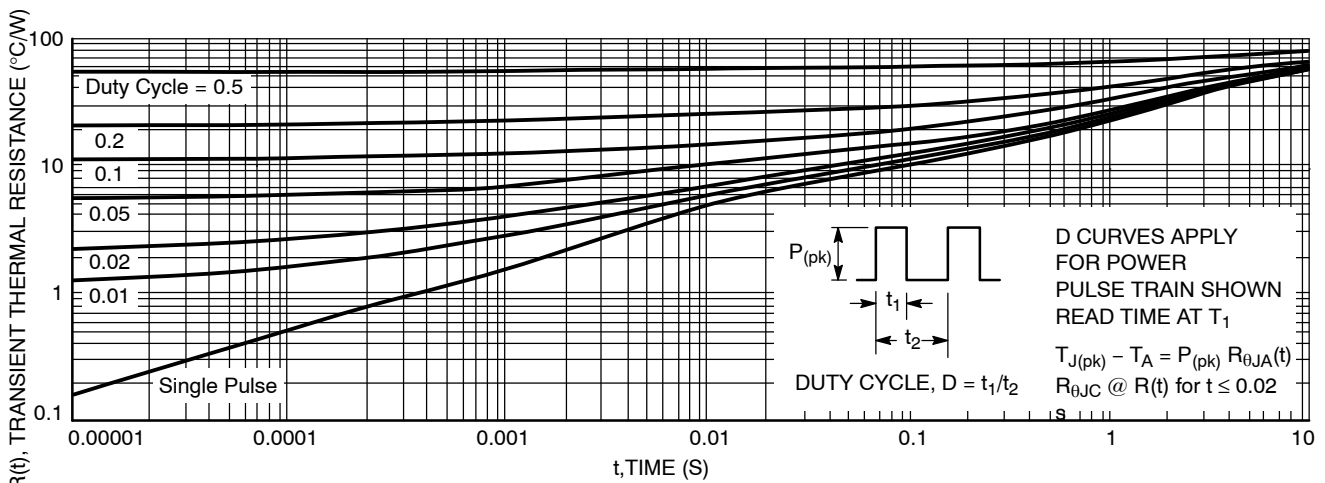


Figure 10. Transient Thermal Resistance
(Non-normalized Junction-to-Ambient mounted on minimum pad area)

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