

NIF62514

Preferred Device

Self-protected FET with Temperature and Current Limit

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

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_{D1} 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	$^\circ\text{C}$

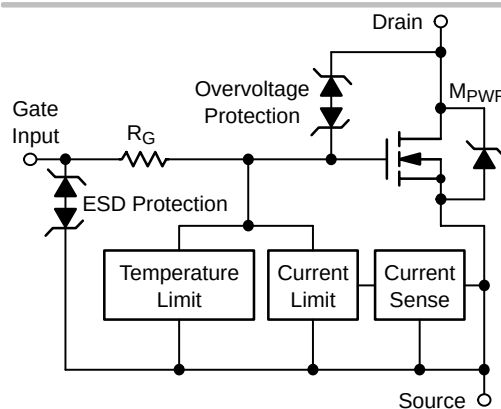
1. Mounted onto min pad board.
2. Mounted onto 1" pad board.
3. Mounted onto large heatsink.



ON Semiconductor®

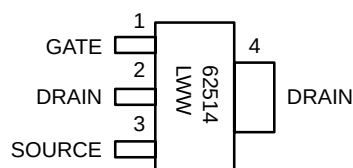
<http://onsemi.com>

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



SOT-223
CASE 318E
STYLE 3

MARKING DIAGRAM



(Top View)

62514 = Specific Device Code
L = Location Code
WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping
NIF62514T1	SOT-223	1000/Tape & Reel
NIF62514T3	SOT-223	4000/Tape & Reel

*Limited by the current limit circuit.

Preferred devices are recommended choices for future use and best overall value.

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 ($V_{GS} = 0\text{ Vdc}$, $I_D = 250\text{ }\mu\text{Adc}$) ($V_{GS} = 0\text{ Vdc}$, $I_D = 250\text{ }\mu\text{Adc}$, $T_J = 150^\circ\text{C}$)	$V_{(BR)DSS}$	42 42	46 45	50 50	Vdc
Zero Gate Voltage Drain Current ($V_{DS} = 32\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$) ($V_{DS} = 32\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 150^\circ\text{C}$)	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 6.0	Vdc mV/ $^\circ\text{C}$
Static Drain-to-Source On-Resistance (Note 4) ($V_{GS} = 10\text{ Vdc}$, $I_D = 1.4\text{ Adc}$, $T_J @ 25^\circ\text{C}$) ($V_{GS} = 10\text{ Vdc}$, $I_D = 1.4\text{ Adc}$, $T_J @ 150^\circ\text{C}$)	$R_{DS(on)}$	- -	90 165	100 190	m Ω
Static Drain-to-Source On-Resistance (Note 4) ($V_{GS} = 5.0\text{ Vdc}$, $I_D = 1.4\text{ Adc}$, $T_J @ 25^\circ\text{C}$) ($V_{GS} = 5.0\text{ Vdc}$, $I_D = 1.4\text{ Adc}$, $T_J @ 150^\circ\text{C}$)	$R_{DS(on)}$	- -	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

Turn-on Delay Time	10% V_{in} to 10% I_D $R_L = 4.7\text{ }\Omega$, $V_{in} = 0$ to 10 V, $V_{DD} = 12\text{ V}$	$t_{d(on)}$	-	4.0	8.0	μs
Turn-on Rise Time	10% I_D to 90% I_D $R_L = 4.7\text{ }\Omega$, $V_{in} = 0$ to 10 V, $V_{DD} = 12\text{ V}$	t_{rise}	-	11	20	μs
Turn-off Delay Time	90% V_{in} to 90% I_D $R_L = 4.7\text{ }\Omega$, $V_{in} = 10$ to 0 V, $V_{DD} = 12\text{ V}$	$t_{d(off)}$	-	32	50	μs
Turn-off Fall Time	90% I_D to 10% I_D $R_L = 4.7\text{ }\Omega$, $V_{in} = 10$ to 0 V, $V_{DD} = 12\text{ V}$	t_{fall}	-	27	50	μs
Slew-Rate On	$R_L = 4.7\text{ }\Omega$, $V_{in} = 0$ to 10 V, $V_{DD} = 12\text{ V}$	$-dV_{DS}/dt_{on}$	-	1.5	2.5	μs
Slew-Rate Off	$R_L = 4.7\text{ }\Omega$, $V_{in} = 10$ to 0 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	($V_{GS} = 5.0\text{ Vdc}$) ($V_{GS} = 5.0\text{ Vdc}$, $T_J = 150^\circ\text{C}$)	I_{LIM}	6.0 3.0	9.0 5.0	11 8.0	Adc
Current Limit	($V_{GS} = 10\text{ Vdc}$) ($V_{GS} = 10\text{ Vdc}$, $T_J = 150^\circ\text{C}$)	I_{LIM}	7.0 4.0	10.5 7.5	13 10	Adc
Temperature Limit (Turn-off)	$V_{GS} = 5.0\text{ Vdc}$	$T_{LIM(off)}$	150	175	200	$^\circ\text{C}$
Temperature Limit (Circuit Reset)	$V_{GS} = 5.0\text{ Vdc}$	$T_{LIM(on)}$	135	160	185	$^\circ\text{C}$
Temperature Limit (Turn-off)	$V_{GS} = 10\text{ Vdc}$	$T_{LIM(off)}$	150	155	185	$^\circ\text{C}$
Temperature Limit (Circuit Reset)	$V_{GS} = 10\text{ Vdc}$	$T_{LIM(on)}$	130	140	170	$^\circ\text{C}$

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

TYPICAL ELECTRICAL CHARACTERISTICS

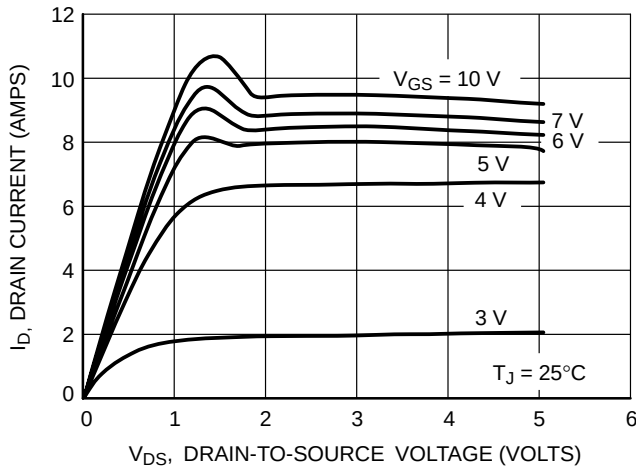


Figure 1. Output Characteristics

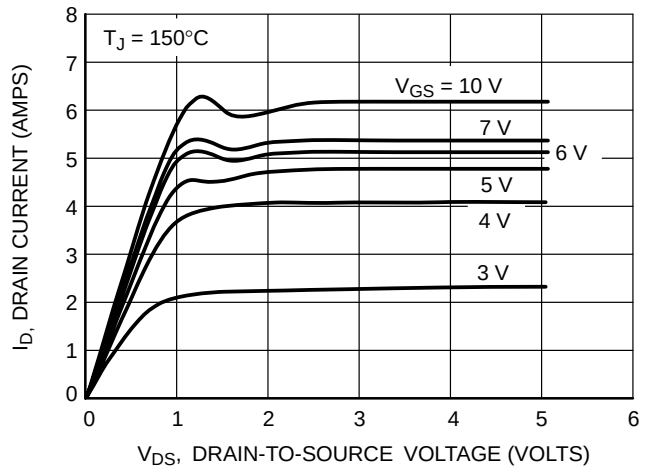


Figure 2. Output Characteristics

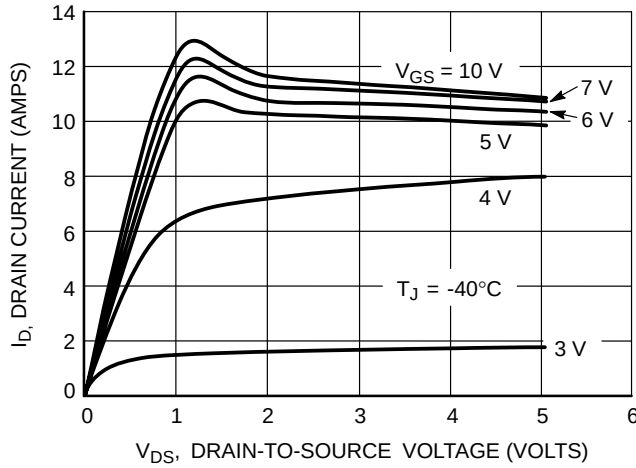


Figure 3. Output Characteristics

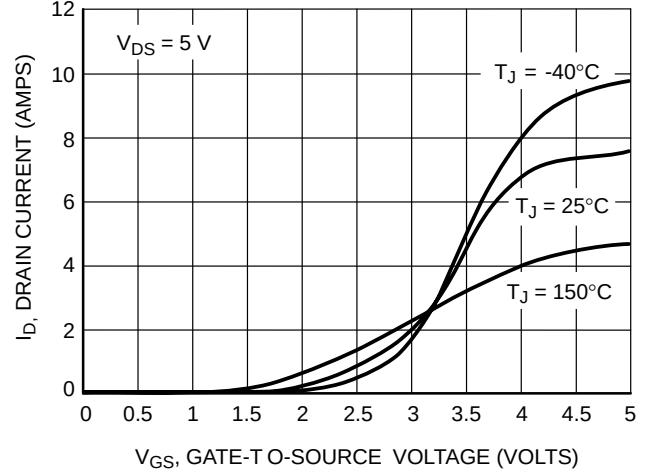


Figure 4. Transfer Characteristics

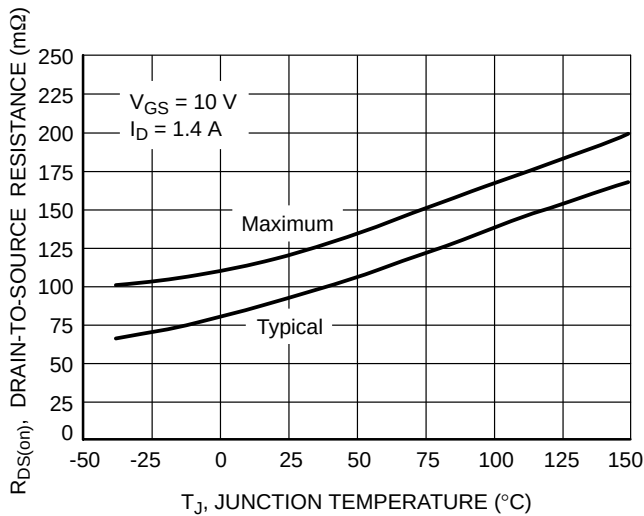


Figure 5. Drain-to-Source Resistance versus Junction Temperature

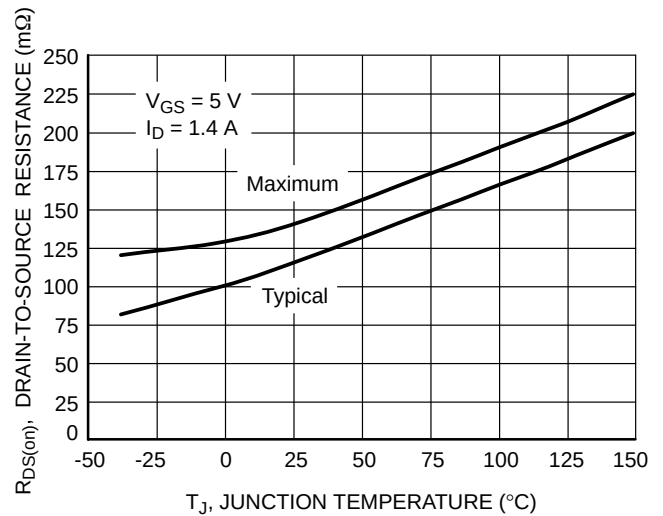


Figure 6. Drain-to-Source Resistance versus Junction Temperature

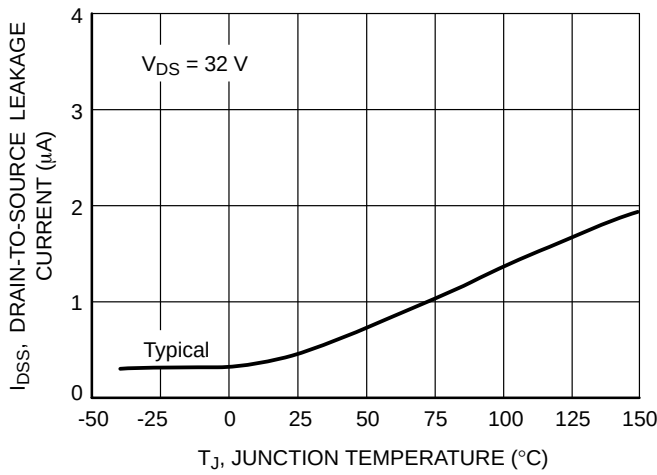


Figure 7. Drain-to-Source Resistance versus Junction Temperature

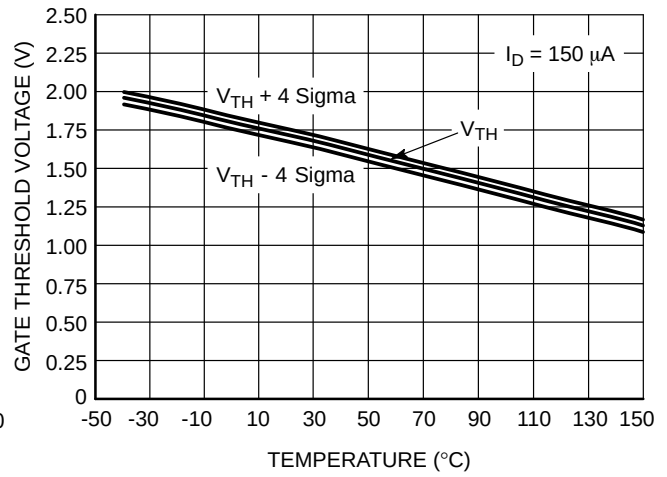


Figure 8. Gate Threshold Voltage versus Temperature

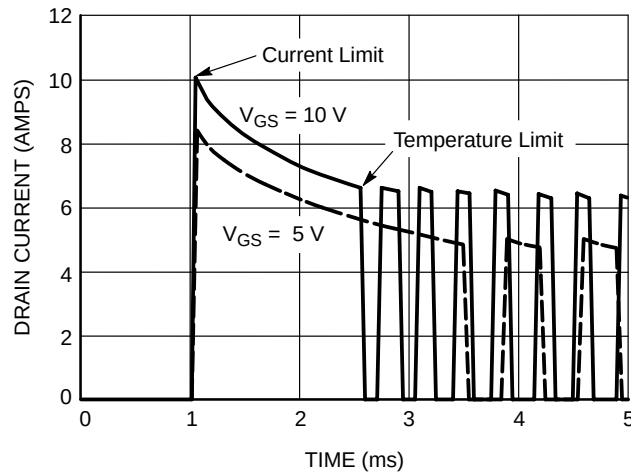


Figure 9. Short-circuit Response

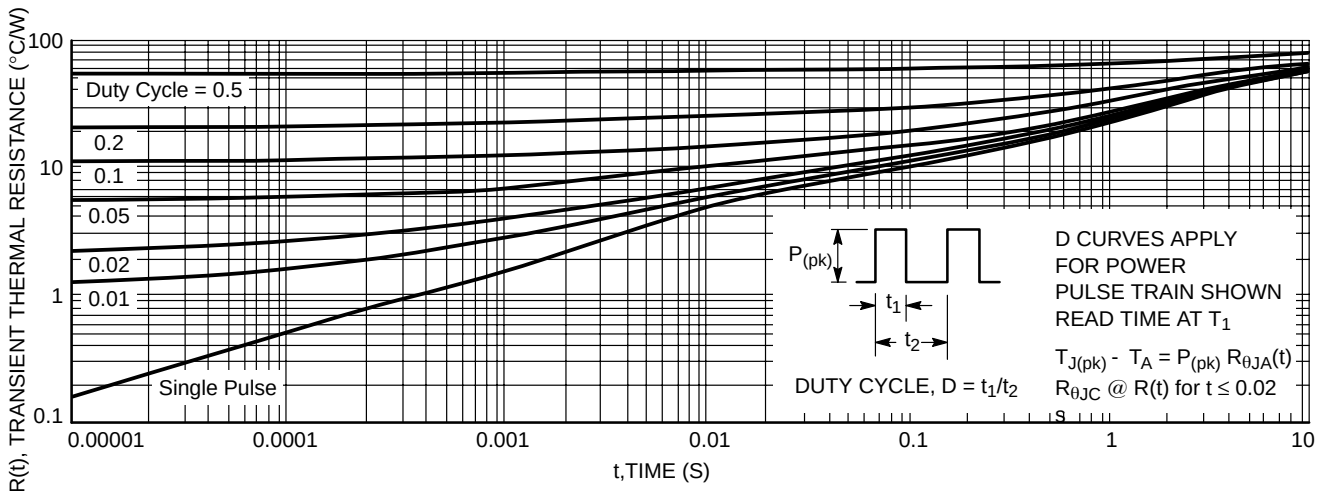
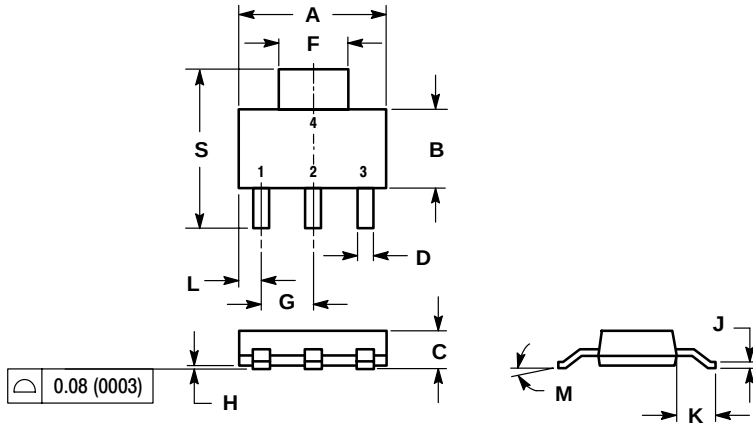


Figure 10. Transient Thermal Resistance
(Non-normalized Junction-to-Ambient mounted on minimum pad area)

NIF62514

PACKAGE DIMENSIONS

SOT-223
CASE 318E-04
ISSUE K



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.249	0.263	6.30	6.70
B	0.130	0.145	3.30	3.70
C	0.060	0.068	1.50	1.75
D	0.024	0.035	0.60	0.89
F	0.115	0.126	2.90	3.20
G	0.087	0.094	2.20	2.40
H	0.0008	0.0040	0.020	0.100
J	0.009	0.014	0.24	0.35
K	0.060	0.078	1.50	2.00
L	0.033	0.041	0.85	1.05
M	0°	10°	0°	10°
S	0.264	0.287	6.70	7.30

STYLE 3:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

ON Semiconductor and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC 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. "Typical" parameters which may be provided in SCILLC 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. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC 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 SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer.

PUBLICATION ORDERING INFORMATION

Literature Fulfillment:

Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: ONlit@hibbertco.com

N. American Technical Support: 800-282-9855 Toll Free USA/Canada

JAPAN: ON Semiconductor, Japan Customer Focus Center
2-9-1 Kamimeguro, Meguro-ku, Tokyo, Japan 153-0051
Phone: 81-3-5773-3850

ON Semiconductor Website: <http://onsemi.com>

For additional information, please contact your local
Sales Representative.