

NTGS3136P, NVGS3136P

Power MOSFET

–20 V, –5.8 A, Single P–Channel, TSOP–6

Features

- Low $R_{DS(on)}$ in TSOP–6 Package
- 1.8 V Gate Rating
- Fast Switching
- NV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC–Q101 Qualified and PPAP Capable
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Optimized for Battery and Load Management Applications in Portable Equipment
- High Side Load Switch
- Switching Circuits for Game Consoles, Camera Phone, etc.

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

Parameter		Symbol	Value	Unit	
Drain–to–Source Voltage		V_{DSS}	–20	V	
Gate–to–Source Voltage		V_{GS}	± 8.0	V	
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	I_D	–5.1	A
		$T_A = 85^\circ\text{C}$		–3.6	
	$t \leq 5 \text{ s}$	$T_A = 25^\circ\text{C}$		–5.8	
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	P_D	1.25	W
				1.6	
	$t \leq 5 \text{ s}$				
Continuous Drain Current (Note 2)	Steady State	$T_A = 25^\circ\text{C}$	I_D	–3.7	A
		$T_A = 85^\circ\text{C}$		–2.7	
		$T_A = 25^\circ\text{C}$	P_D	0.7	
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	I_{DM}	–20	A	
Operating Junction and Storage Temperature		T_J, T_{STG}	–55 to 150	$^\circ\text{C}$	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		T_L	260	$^\circ\text{C}$	

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.

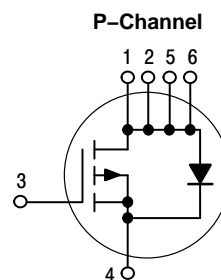
1. Surface–mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces)
2. Surface–mounted on FR4 board using the minimum recommended pad size (Cu area = 0.0775 in sq).



ON Semiconductor®

www.onsemi.com

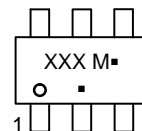
$V_{(BR)DSS}$	$R_{DS(ON)}$ TYP	I_D MAX
–20 V	25 m Ω @ –4.5 V	–5.1 A
	32 m Ω @ –2.5 V	–4.5 A
	41 m Ω @ –1.8 V	–2.5 A



MARKING DIAGRAM



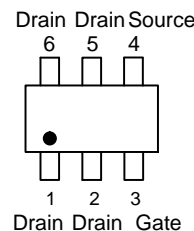
TSOP–6
CASE 318G
STYLE 1



XXX = Device Code
M = Date Code
▪ = Pb–Free Package

(Note: Microdot may be in either location)

PIN ASSIGNMENT



ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

NTGS3136P, NVGS3136P

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	100	°C/W
Junction-to-Ambient – $t = 5$ s (Note 3)	$R_{\theta JA}$	77	
Junction-to-Ambient – Steady State (Note 4)	$R_{\theta JA}$	185	

3. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces)
 4. Surface-mounted on FR4 board using the minimum recommended pad size (Cu area = 0.0775 in sq).

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

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

OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0$ V, $I_D = -250$ μA	-20			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = -250$ μA , Reference 25°C		-13		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0$ V, $V_{DS} = -20$ V			-1.0	μA
		$T_J = 25^\circ\text{C}$				
		$T_J = 85^\circ\text{C}$			-5.0	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0$ V, $V_{GS} = \pm 8.0$ V			± 0.1	μA

ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}$, $I_D = -250$ μA	-0.4		-1.0	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			3		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = -4.5$ V, $I_D = -5.1$ A		25	33	m Ω
		$V_{GS} = -2.5$ V, $I_D = -4.5$ A		32	40	
		$V_{GS} = -1.8$ V, $I_D = -2.5$ A		41	51	
Forward Transconductance	g_{FS}	$V_{DS} = -5.0$ V, $I_D = -5.1$ A		22		S

CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{GS} = 0$ V, $f = 1$ MHz, $V_{DS} = -10$ V		1901		pF
Output Capacitance	C_{OSS}			274		
Reverse Transfer Capacitance	C_{RSS}			175		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -4.5$ V, $V_{DS} = -10$ V; $I_D = -5.1$ A		18	29	nC
Threshold Gate Charge	$Q_{G(TH)}$			0.7		
Gate-to-Source Charge	Q_{GS}			2.4		
Gate-to-Drain Charge	Q_{GD}			4.3		
Gate Resistance	R_G			7.6		

SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = -4.5$ V, $V_{DD} = -10$ V, $I_D = -1.0$ A, $R_G = 6.0$ Ω		9	19	ns
Rise Time	T_r			9	19	
Turn-Off Delay Time	$t_{d(OFF)}$			99	160	
Fall Time	T_f			48	79	

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0$ V, $I_S = -1.7$ A	$T_J = 25^\circ\text{C}$	-0.7	-1.2	V
			$T_J = 125^\circ\text{C}$	-0.6		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0$ V, $dI_S/dt = 100$ A/ μs , $I_S = -1.7$ A		37	60	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.

5. Pulse Test: pulse width ≤ 300 μs , duty cycle $\leq 2\%$
 6. Switching characteristics are independent of operating junction temperatures

NTGS3136P, NVGS3136P

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

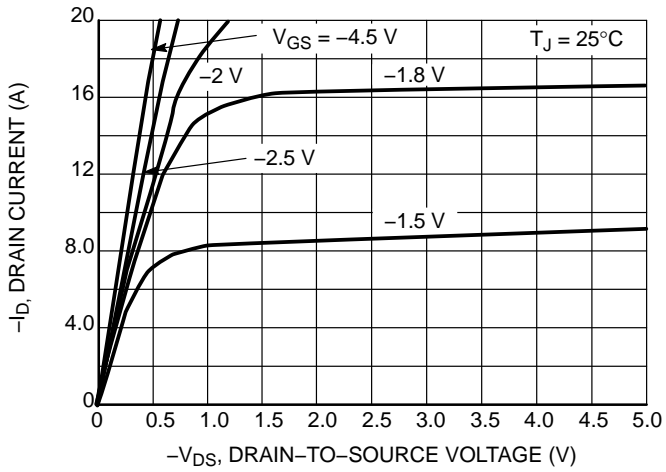


Figure 1. On-Region Characteristics

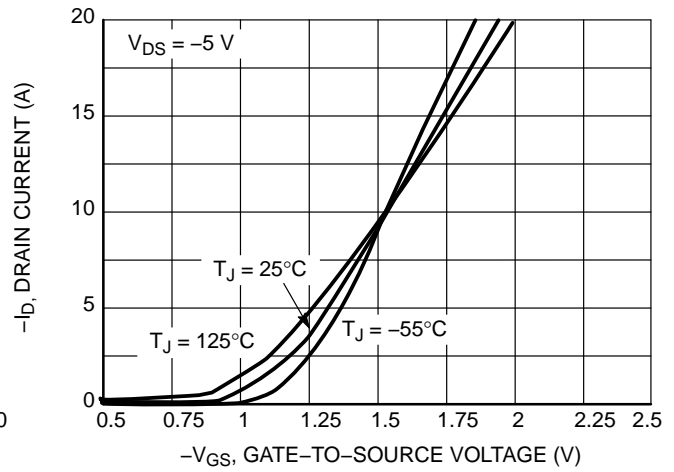


Figure 2. Transfer Characteristics

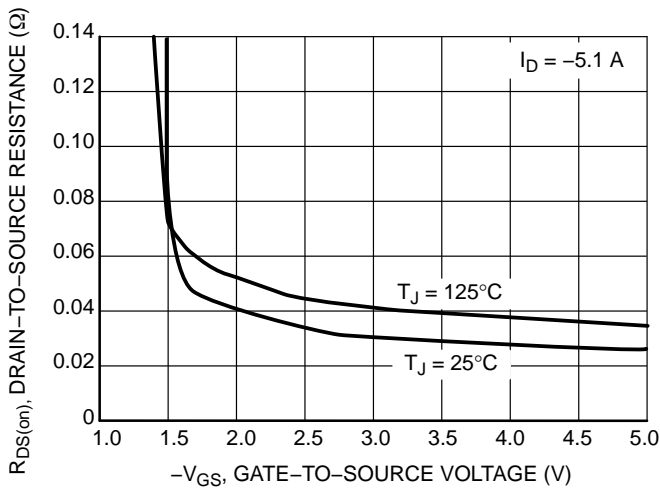


Figure 3. On-Resistance vs. Gate-to-Source Voltage

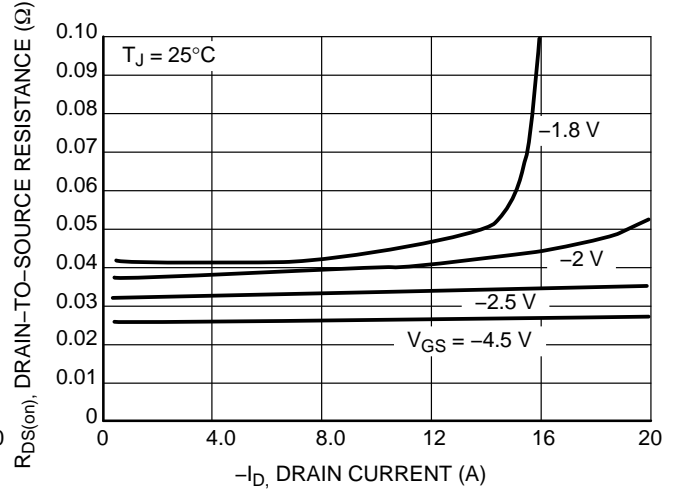


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

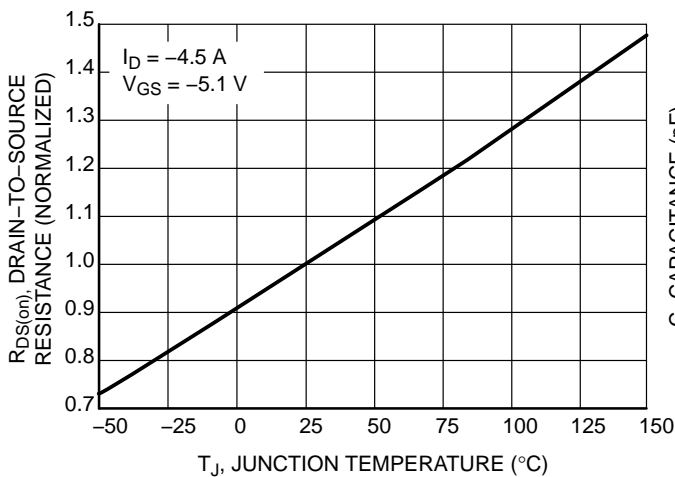


Figure 5. On-Resistance Variation with Temperature

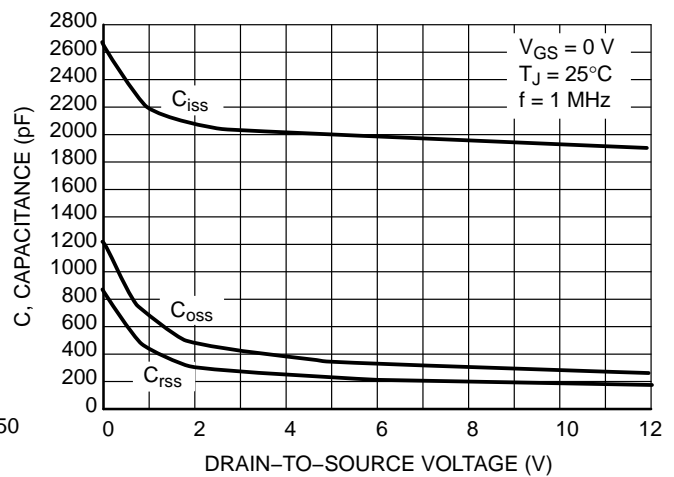


Figure 6. Capacitance Variation

NTGS3136P, NVGS3136P

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

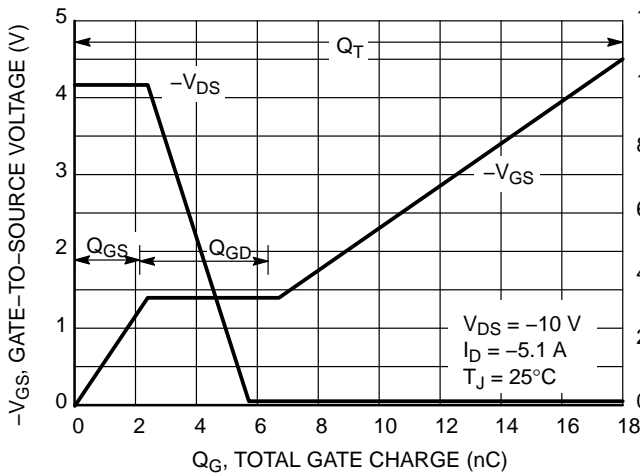


Figure 7. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

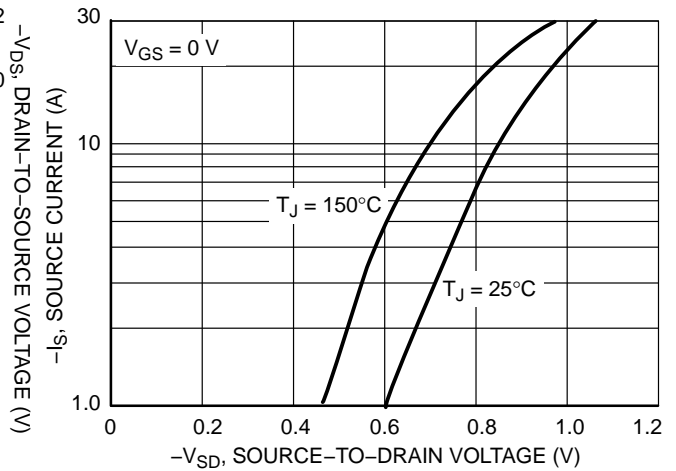


Figure 8. Diode Forward Voltage vs. Current

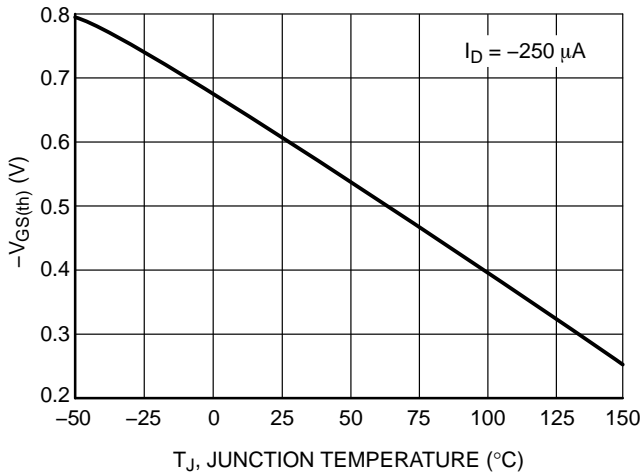


Figure 9. Threshold Voltage

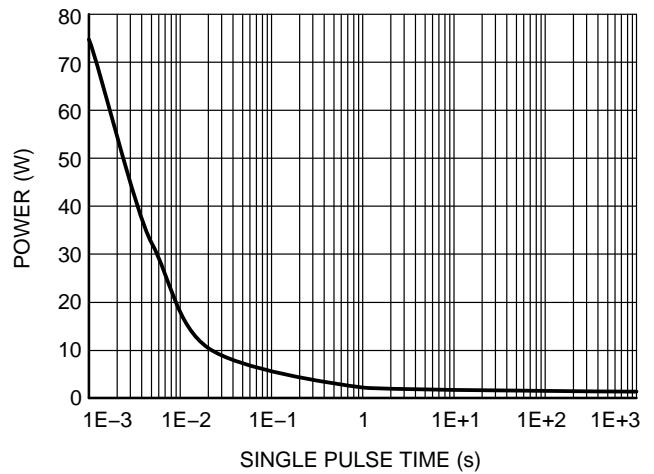


Figure 10. Single Pulse Maximum Power Dissipation

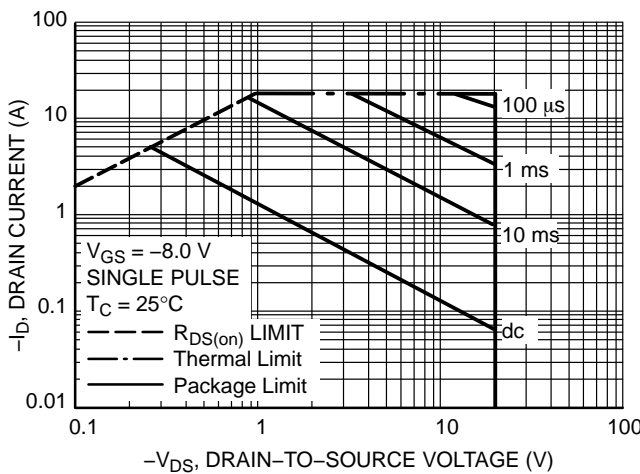


Figure 11. Maximum Rated Forward Biased Safe Operating Area

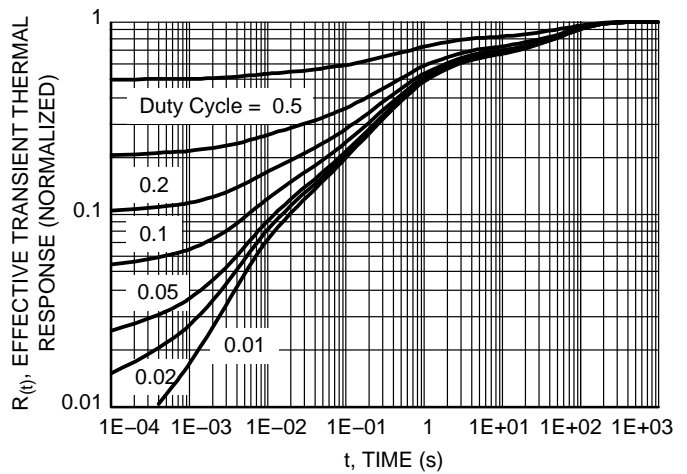


Figure 12. FET Thermal Response

NTGS3136P, NVGS3136P

ORDERING INFORMATION

Device	Marking	Package	Shipping†
NTGS3136PT1G	SD	TSOP-6 (Pb-Free)	3000 / Tape & Reel
NVGS3136PT1G*	VSD		

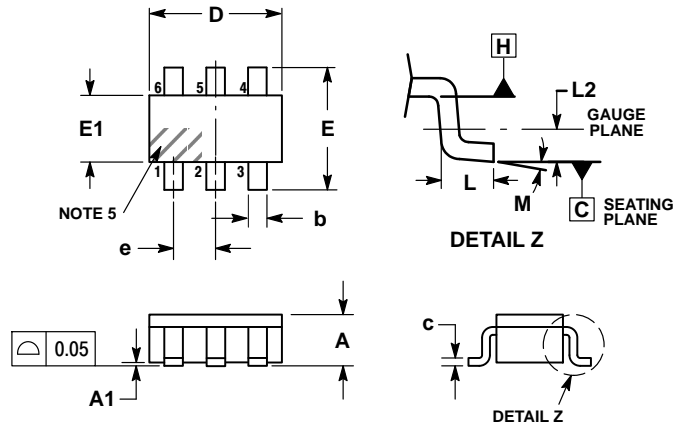
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*NV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

NTGS3136P, NVGS3136P

PACKAGE DIMENSIONS

TSOP-6 CASE 318G-02 ISSUE V



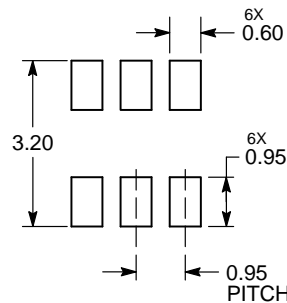
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
5. PIN ONE INDICATOR MUST BE LOCATED IN THE INDICATED ZONE.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.01	0.06	0.10
b	0.25	0.38	0.50
c	0.10	0.18	0.26
D	2.90	3.00	3.10
E	2.50	2.75	3.00
E1	1.30	1.50	1.70
e	0.85	0.95	1.05
L	0.20	0.40	0.60
L2	0.25 BSC		
M	0°	-	10°

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

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

ON Semiconductor and the are registered trademarks of Semiconductor Components Industries, LLC (SCILLC) or its subsidiaries in the United States and/or other countries. SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. 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. This literature is subject to all applicable copyright laws and is not for resale in any manner.

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: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com
Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative