

2N5302

High-Power NPN Silicon Transistor

High-power NPN silicon transistors are for use in power amplifier and switching circuits applications.

Features

- Low Collector–Emitter Saturation Voltage –
 $V_{CE(sat)} = 0.75 \text{ Vdc (Max) @ } I_C = 10 \text{ Adc}$
- Pb–Free Package is Available*

MAXIMUM RATINGS (Note 1) ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	60	Vdc
Collector–Base Voltage	V_{CB}	60	Vdc
Collector Current – Continuous (Note 2)	I_C	30	Adc
Base Current	I_B	7.5	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	200 1.14	W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–65 to +200	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction–to–Case	θ_{JC}	0.875	$^\circ\text{C/W}$
Thermal Resistance, Case–to–Ambient	θ_{CA}	34	$^\circ\text{C/W}$

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. Indicates JEDEC Registered Data.
2. Pulse Test: Pulse Width = 5 μs , Duty Cycle $\leq 10\%$.

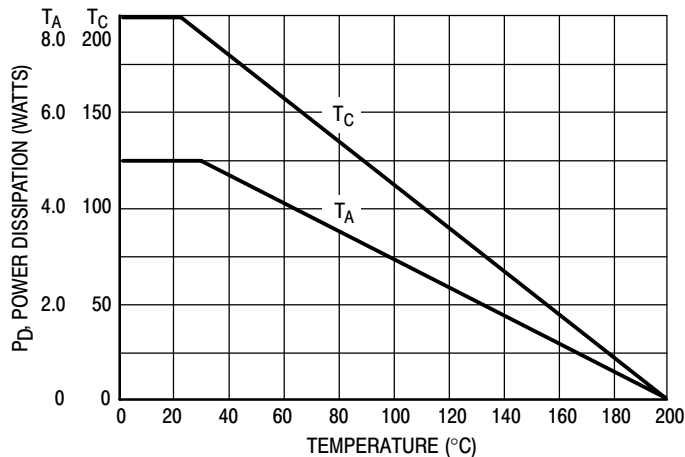


Figure 1. Power Temperature Derating Curve

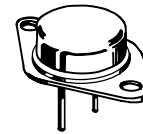
*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



ON Semiconductor®

<http://onsemi.com>

**30 AMPERES
POWER TRANSISTOR
NPN SILICON
60 VOLTS, 200 WATTS**



**TO–204AA (TO–3)
CASE 1–07
STYLE 1**

MARKING DIAGRAM



2N5302 = Device Code
 G = Pb–Free Package
 A = Location Code
 YY = Year
 WW = Work Week
 MEX = Country of Origin

ORDERING INFORMATION

Device	Package	Shipping
2N5302	TO–204	100 Units/Tray
2N5302G	TO–204 (Pb–Free)	100 Units/Tray

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS (Note 3)				
Collector–Emitter Sustaining Voltage (Note 4) ($I_C = 200\text{ mA}$, $I_B = 0$)	$V_{CEO(sus)}$	60	–	Vdc
Collector Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $I_B = 0$)	I_{CEO}	–	5.0	mAdc
Collector Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$)	I_{CEX}	–	1.0	mAdc
Collector Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$, $T_C = 150^\circ\text{C}$)	I_{CEX}	–	10	mAdc
Collector Cutoff Current ($V_{CB} = 80\text{ Vdc}$, $I_E = 0$)	I_{CBO}	–	1.0	mAdc
Emitter Cutoff Current ($V_{BE} = 5.0\text{ Vdc}$, $I_C = 0$)	I_{EBO}	–	5.0	mAdc

ON CHARACTERISTICS

DC Current Gain (Note 4) *($I_C = 1.0\text{ Adc}$, $V_{CE} = 2.0\text{ Vdc}$) *($I_C = 15\text{ Adc}$, $V_{CE} = 2.0\text{ Vdc}$) ($I_C = 30\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$)	h_{FE}	40 15 5.0	– 60 –	–
*Collector–Emitter Saturation Voltage (Note 4) ($I_C = 10\text{ Adc}$, $I_B = 1.0\text{ Adc}$) ($I_C = 20\text{ Adc}$, $I_B = 2.0\text{ Adc}$) ² ($I_C = 30\text{ Adc}$, $I_B = 6.0\text{ Adc}$)	$V_{CE(sat)}$	– – –	0.75 2.0 3.0	Vdc
*Base Emitter Saturation Voltage (Note 4) ($I_C = 10\text{ Adc}$, $I_B = 1.0\text{ Adc}$) ($I_C = 15\text{ Adc}$, $I_B = 1.5\text{ Adc}$) ($I_C = 20\text{ Adc}$, $I_B = 2.0\text{ Adc}$)	$V_{BE(sat)}$	– – –	1.7 1.8 2.5	Vdc
*Base–Emitter On Voltage (Note 4) ($I_C = 15\text{ Adc}$, $V_{CE} = 2.0\text{ Vdc}$) ($I_C = 30\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$)	$V_{BE(on)}$	– –	1.7 3.0	Vdc

DYNAMIC CHARACTERISTICS (Note 3)

Current–Gain – Bandwidth Product ($I_C = 1.0\text{ Adc}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ MHz}$)	f_T	2.0	–	MHz
Small–Signal Current Gain ($I_C = 1.0\text{ Adc}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$)	h_{fe}	40	–	–

SWITCHING CHARACTERISTICS (Note 3)

Rise Time	$(V_{CC} = 30\text{ Vdc}$, $I_C = 10\text{ Adc}$, $I_{B1} = I_{B2} = 1.0\text{ Adc}$)	t_r	–	1.0	μs
Storage Time		t_s	–	2.0	μs
Fall Time		t_f	–	1.0	μs

- 3. Indicates JEDEC Registered Data.
- 4. Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2.0\%$.

SWITCHING TIME EQUIVALENT TEST CIRCUITS

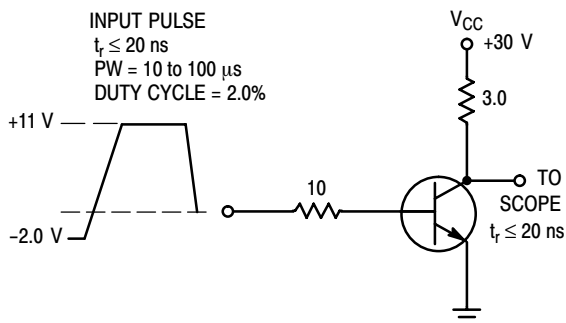


Figure 2. Turn–On time

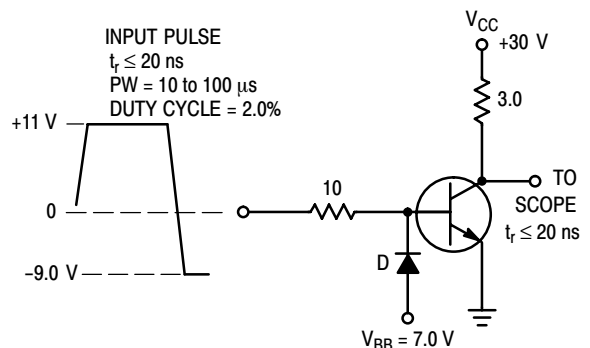


Figure 3. Turn–Off time

2N5302

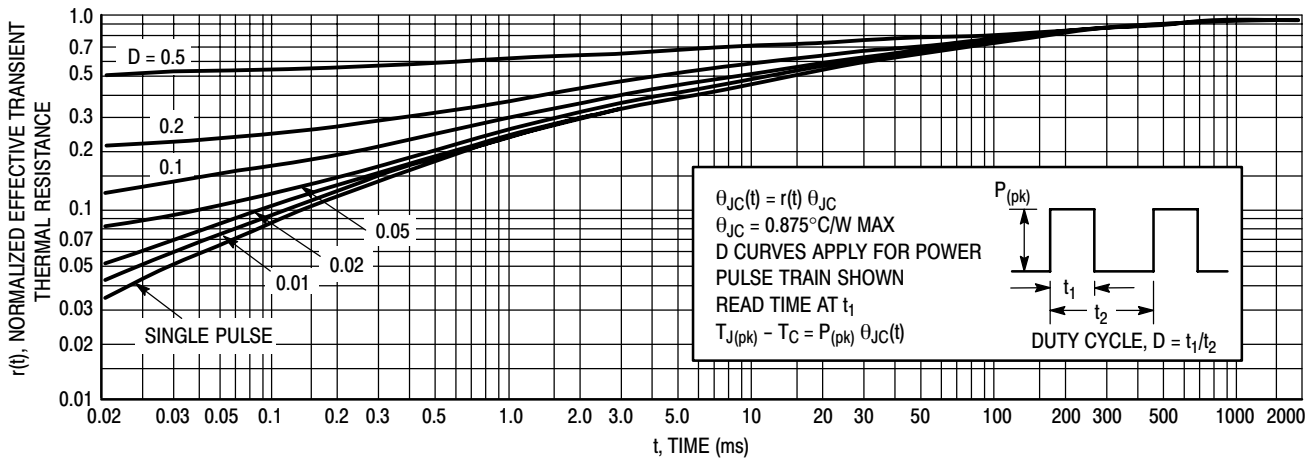


Figure 4. Thermal Response

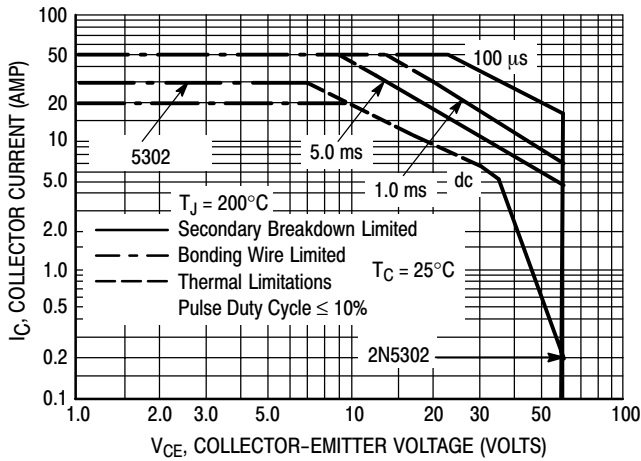


Figure 5. Active-Region Safe Operating Area

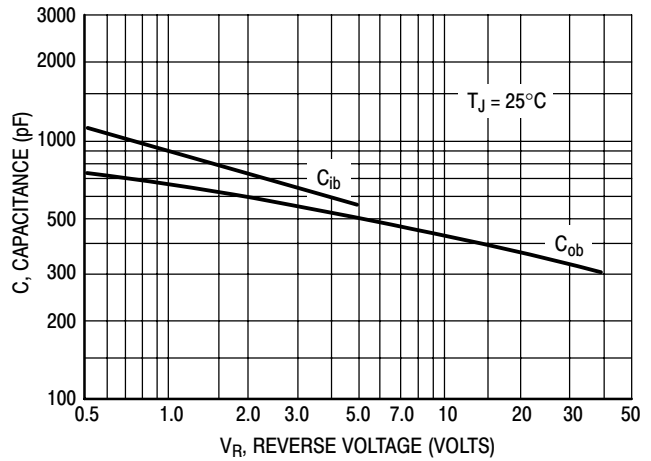


Figure 6. Capacitance versus Voltage

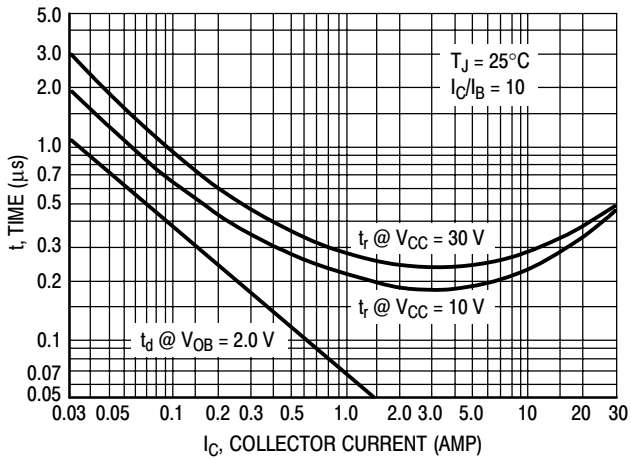


Figure 7. Turn-On Time

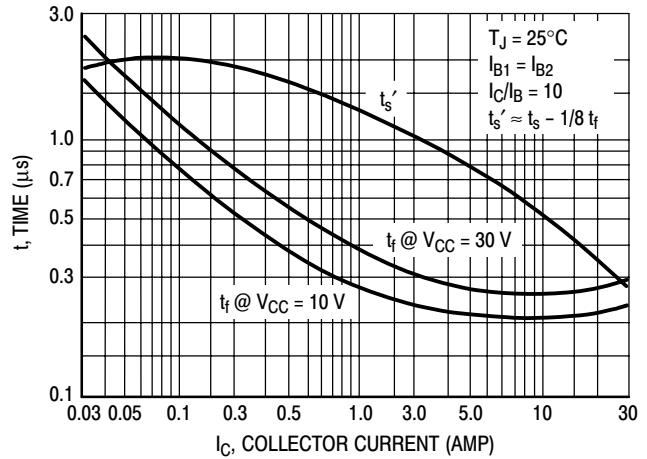


Figure 8. Turn-Off Time

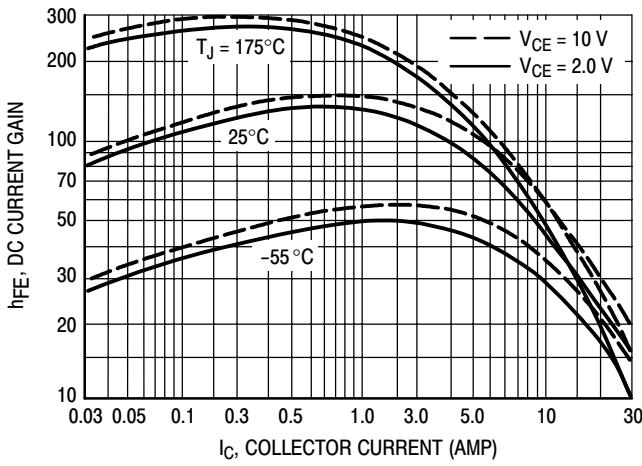


Figure 9. DC Current Gain

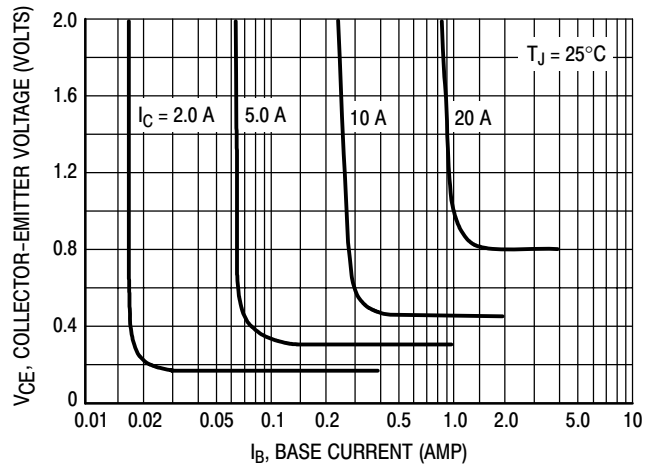


Figure 10. Collector Saturation Region

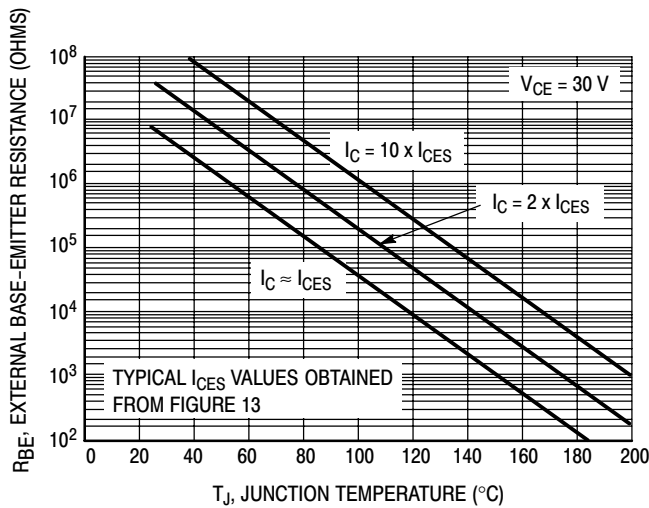


Figure 11. Effects of Base-Emitter Resistance

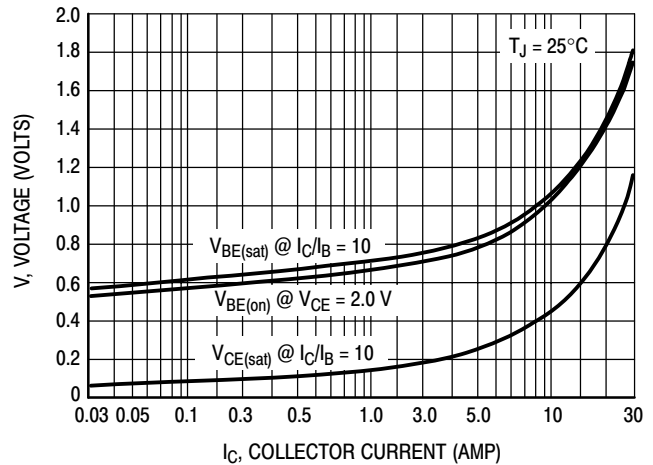


Figure 12. "On" Voltages

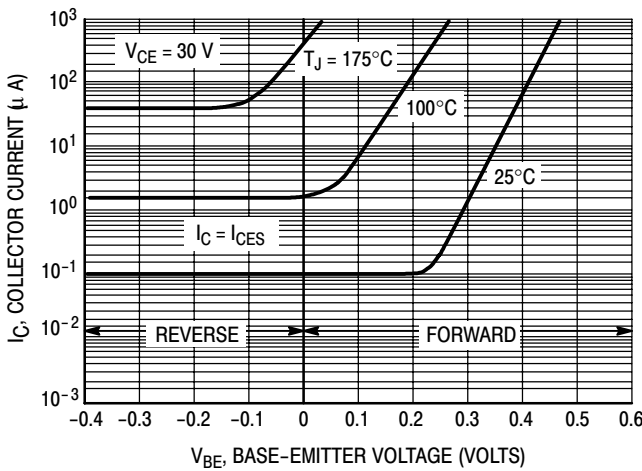


Figure 13. Collector Cut-Off Region

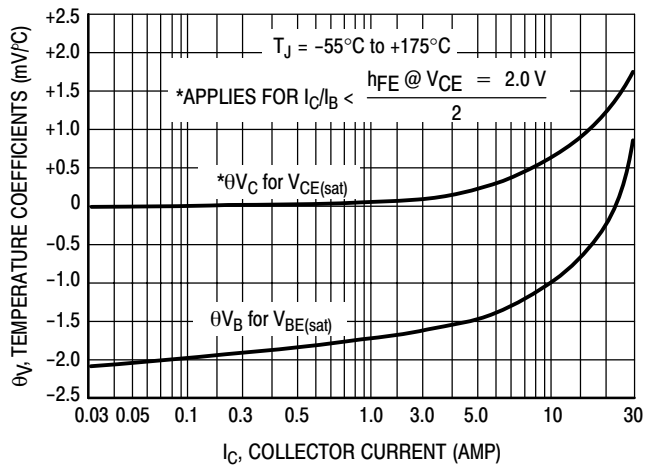
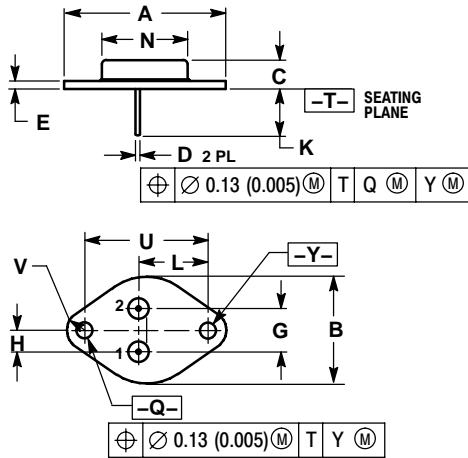


Figure 14. Temperature Coefficients

2N5302

PACKAGE DIMENSIONS

TO-204 (TO-3) CASE 1-07 ISSUE Z



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. ALL RULES AND NOTES ASSOCIATED WITH REFERENCED TO-204AA OUTLINE SHALL APPLY.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.550 REF		39.37 REF	
B	---	1.050	---	26.67
C	0.250	0.335	6.35	8.51
D	0.038	0.043	0.97	1.09
E	0.055	0.070	1.40	1.77
G	0.430 BSC		10.92 BSC	
H	0.215 BSC		5.46 BSC	
K	0.440	0.480	11.18	12.19
L	0.665 BSC		16.89 BSC	
N	---	0.830	---	21.08
Q	0.151	0.165	3.84	4.19
U	1.187 BSC		30.15 BSC	
V	0.131	0.188	3.33	4.77

STYLE 1:

- PIN 1: BASE
 - EMITTER
- CASE: COLLECTOR

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. 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 61312, Phoenix, Arizona 85082-1312 USA
Phone: 480-829-7710 or 800-344-3860 Toll Free USA/Canada
Fax: 480-829-7709 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.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>

Order Literature: <http://www.onsemi.com/litorder>

For additional information, please contact your local Sales Representative.