

ON Semiconductor

Is Now

onsemi™

To learn more about onsemi™, please visit our website at
www.onsemi.com

onsemi and **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** 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. Other names and brands may be claimed as the property of others.

MMBT4403M3T5G

PNP Switching Transistor

The MMBT4403M3T5G device is a spin-off of our popular SOT-23 three-leaded device. It is designed for general purpose switching applications and is housed in the SOT-723 surface mount package. This device is ideal for low-power surface mount applications where board space is at a premium.

Features

- Reduces Board Space
- This is a Halide-Free Device
- This is a Pb-Free Device

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector- Emitter Voltage	V_{CEO}	-40	Vdc
Collector- Base Voltage	V_{CBO}	-40	Vdc
Emitter- Base Voltage	V_{EBO}	-5.0	Vdc
Collector Current - Continuous	I_C	-600	mAdc

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board (Note 1) $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	265 2.1	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	470	$^\circ\text{C}/\text{W}$
Total Device Dissipation Alumina Substrate, (Note 2) $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	640 5.1	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	195	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature	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.

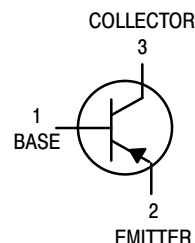
1. FR-5 = $1.0 \times 0.75 \times 0.062$ in.

2. Alumina = $0.4 \times 0.3 \times 0.024$ in. 99.5% alumina.

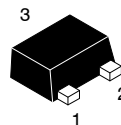


ON Semiconductor®

<http://onsemi.com>



MARKING DIAGRAM



SOT-723
CASE 631AA
STYLE 1



AG = Specific Device Code
M = Date Code

ORDERING INFORMATION

Device	Package	Shipping†
MMBT4403M3T5G	SOT-723 (Pb-Free)	8000/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.

MMBT4403M3T5G

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit	
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (Note 3)	(I _C = -1.0 mA _{dc} , I _B = 0)	V _{(BR)CEO}	-40	-	Vdc
Collector-Base Breakdown Voltage	(I _C = -0.1 mA _{dc} , I _E = 0)	V _{(BR)CBO}	-40	-	Vdc
Emitter-Base Breakdown Voltage	(I _E = -0.1 mA _{dc} , I _C = 0)	V _{(BR)EBO}	-5.0	-	Vdc
Base Cutoff Current	(V _{CE} = -35 Vdc, V _{EB} = -0.4 Vdc)	I _{BEV}	-	-0.1	μA _{dc}
Collector Cutoff Current	(V _{CE} = -35 Vdc, V _{EB} = -0.4 Vdc)	I _{CEX}	-	-0.1	μA _{dc}

ON CHARACTERISTICS

DC Current Gain	(I _C = -0.1 mA _{dc} , V _{CE} = -1.0 Vdc) (I _C = -1.0 mA _{dc} , V _{CE} = -1.0 Vdc) (I _C = -10 mA _{dc} , V _{CE} = -1.0 Vdc) (I _C = -150 mA _{dc} , V _{CE} = -2.0 Vdc) (I _C = -500 mA _{dc} , V _{CE} = -2.0 Vdc)	h _{FE}	30 60 100 100 20	- - - 300 -	- - - - -
Collector-Emitter Saturation Voltage (Note 3)	(I _C = -150 mA _{dc} , I _B = -15 mA _{dc}) (I _C = -500 mA _{dc} , I _B = -50 mA _{dc})	V _{CE(sat)}	- -	-0.4 -0.75	Vdc
Base-Emitter Saturation Voltage (Note 3)	(I _C = -150 mA _{dc} , I _B = -15 mA _{dc}) (I _C = -500 mA _{dc} , I _B = -50 mA _{dc})	V _{BE(sat)}	-0.75 -	-0.95 -1.3	Vdc

SMALL-SIGNAL CHARACTERISTICS

Current-Gain-Bandwidth Product	(I _C = -20 mA _{dc} , V _{CE} = -10 Vdc, f = 100 MHz)	f _T	200	-	MHz
Collector-Base Capacitance	(V _{CB} = -10 Vdc, I _E = 0, f = 1.0 MHz)	C _{cb}	-	8.5	pF
Emitter-Base Capacitance	(V _{BE} = -0.5 Vdc, I _C = 0, f = 1.0 MHz)	C _{eb}	-	30	pF
Input Impedance	(I _C = -1.0 mA _{dc} , V _{CE} = -10 Vdc, f = 1.0 kHz)	h _{ie}	1.5	15	kΩ
Voltage Feedback Ratio	(I _C = -1.0 mA _{dc} , V _{CE} = -10 Vdc, f = 1.0 kHz)	h _{re}	0.1	8.0	X 10 ⁻⁴
Small-Signal Current Gain	(I _C = -1.0 mA _{dc} , V _{CE} = -10 Vdc, f = 1.0 kHz)	h _{fe}	60	500	-
Output Admittance	(I _C = -1.0 mA _{dc} , V _{CE} = -10 Vdc, f = 1.0 kHz)	h _{oe}	1.0	100	μMhos

SWITCHING CHARACTERISTICS

Delay Time	(V _{CC} = -30 Vdc, V _{EB} = -2.0 Vdc, I _C = -150 mA _{dc} , I _{B1} = -15 mA _{dc})	t _d	-	15	ns
Rise Time		t _r	-	20	
Storage Time	(V _{CC} = -30 Vdc, I _C = -150 mA _{dc} , I _{B1} = I _{B2} = -15 mA _{dc})	t _s	-	225	ns
Fall Time		t _f	-	30	

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

SWITCHING TIME EQUIVALENT TEST CIRCUIT

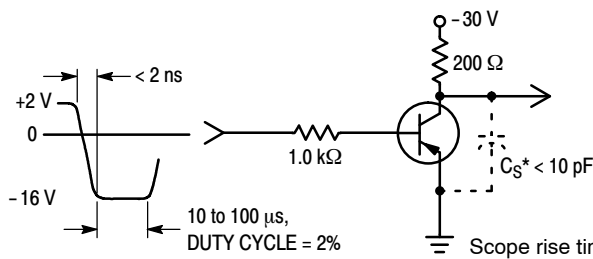


Figure 1. Turn-On Time

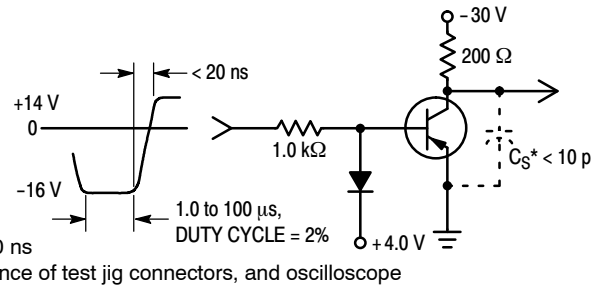


Figure 2. Turn-Off Time

MMBT4403M3T5G

STATIC CHARACTERISTICS

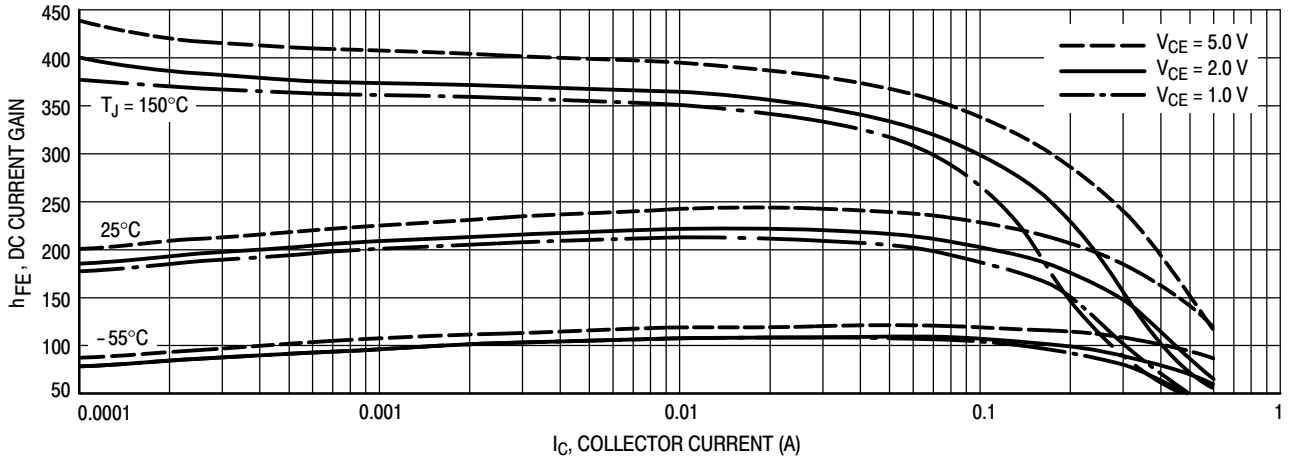


Figure 3. DC Current Gain

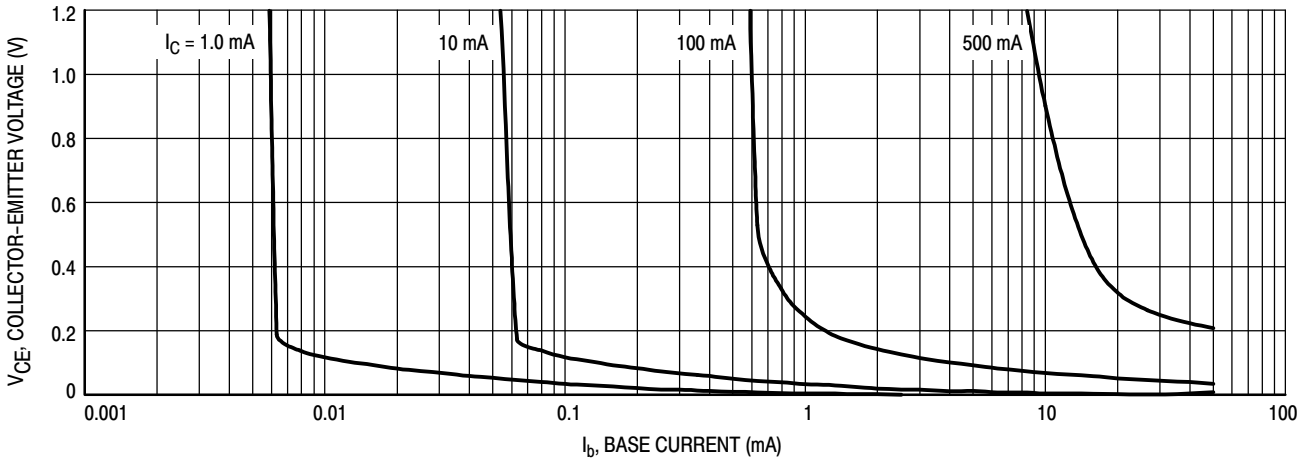


Figure 4. Collector Saturation Region

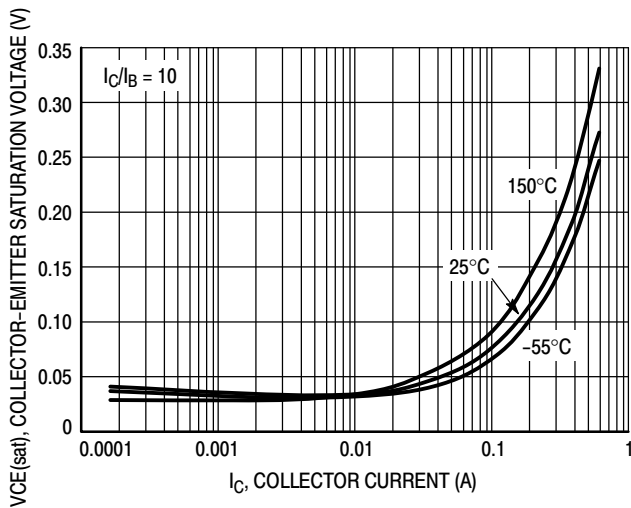


Figure 5. Collector-Emitter Saturation Voltage vs. Collector Current

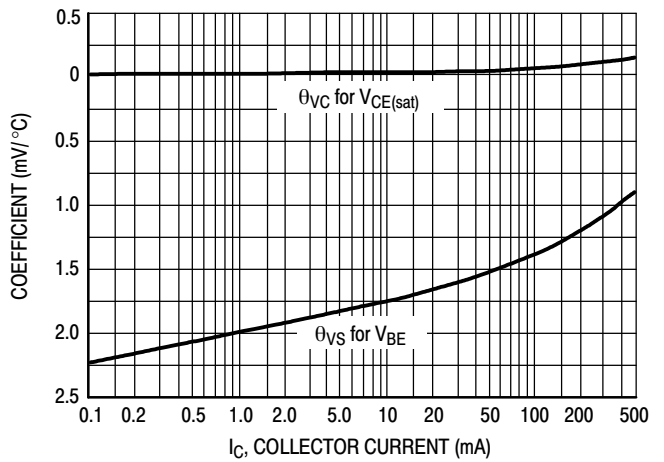


Figure 6. Temperature Coefficients

MMBT4403M3T5G

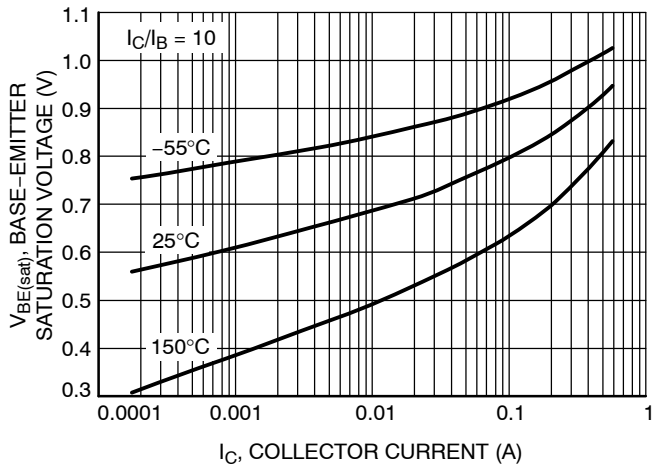


Figure 7. Base-Emitter Saturation Voltage vs. Collector Current

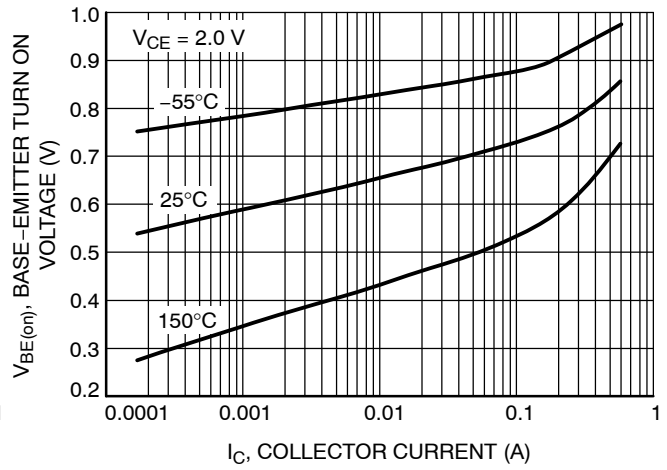


Figure 8. Base-Emitter Turn On Voltage vs. Collector Current

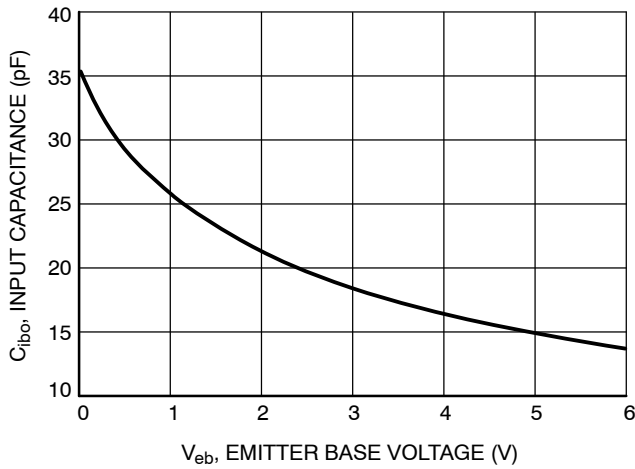


Figure 9. Input Capacitance vs. Emitter Base Voltage

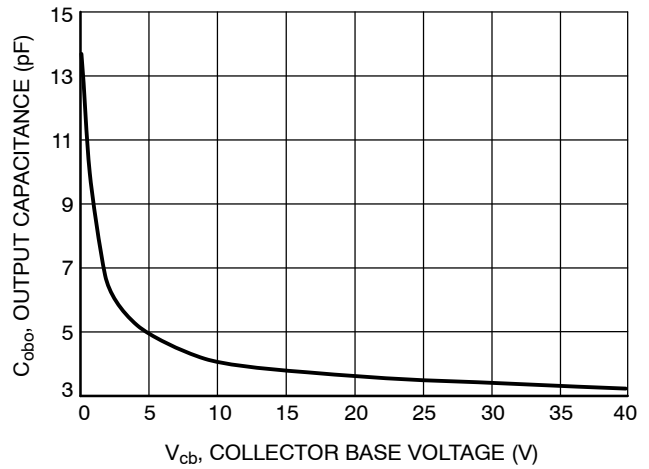
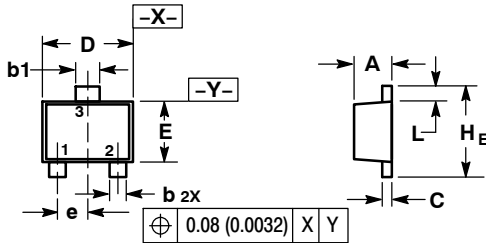


Figure 10. Output Capacitance vs. Collector Base Voltage

MMBT4403M3T5G

PACKAGE DIMENSIONS

SOT-723
CASE 631AA-01
ISSUE C



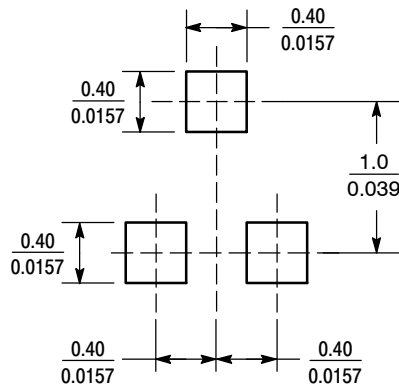
NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
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 E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.45	0.50	0.55	0.018	0.020	0.022
b	0.15	0.21	0.27	0.0059	0.0083	0.0106
b1	0.25	0.31	0.37	0.010	0.012	0.015
C	0.07	0.12	0.17	0.0028	0.0047	0.0067
D	1.15	1.20	1.25	0.045	0.047	0.049
E	0.75	0.80	0.85	0.03	0.032	0.034
e	0.40 BSC			0.016 BSC		
H e	1.15	1.20	1.25	0.045	0.047	0.049
L	0.15	0.20	0.25	0.0059	0.0079	0.0098

STYLE 1:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

SOLDERING FOOTPRINT*



SCALE 20:1 (mm/inches)

*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 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 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: 81-3-5773-3850

ON Semiconductor Website: www.onsemi.com

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

For additional information, please contact your local Sales Representative