

BAS19L, BAS20L, BAS21L, BAS21DW5

High Voltage Switching Diode

Features

- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant
- S and NSV Prefixes for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|----------------|----------------------|--------|
| Continuous Reverse Voltage | V_R | 120 200 250 | Vdc |
| Repetitive Peak Reverse Voltage | V_{RRM} | 120 200 250 | Vdc |
| Continuous Forward Current | I_F | 200 | mAdc |
| Peak Forward Surge Current (1/2 Cycle, Sine Wave, 60 Hz) | I_{FSM} | 2 | A |
| Repetitive Peak Forward Current (Pulse Train: $T_{ON} = 1$ s, $T_{OFF} = 0.5$ s) | I_{FRM} | 0.6 | A |
| Junction and Storage Temperature Range | T_J, T_{stg} | -55 to +150 | °C |
| Power Dissipation (Note 1) | P_D | 385 | mW |
| Electrostatic Discharge | ESD | HM < 500 MM < 400 | V V |

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.

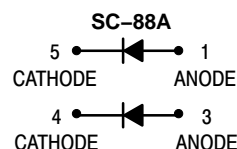
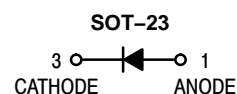
1. Mounted on FR-5 Board = 1.0 x 0.75 x 0.062 in.



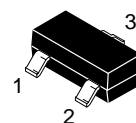
ON Semiconductor®

www.onsemi.com

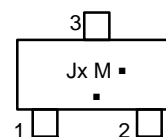
HIGH VOLTAGE SWITCHING DIODE



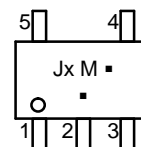
MARKING DIAGRAMS



SOT-23 (TO-236)
CASE 318
STYLE 8



SC-88A (SOT-353)
CASE 419A



x = P, R, or S
P = BAS19L
R = BAS20L
S = BAS21L or BAS21DW5
M = Date Code
▪ = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or overbar may vary depending upon the manufacturing location.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

BAS19L, BAS20L, BAS21L, BAS21DW5

Thermal Characteristics (SOT-23)

| Characteristic | Symbol | Max | Unit |
|---|-----------------|-------------|----------------------|
| Total Device Dissipation FR-5 Board (Note 2) $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 225 | mW |
| | | 1.8 | mW/ $^\circ\text{C}$ |
| Thermal Resistance Junction-to-Ambient (SOT-23) | $R_{\theta JA}$ | 556 | $^\circ\text{C/W}$ |
| Total Device Dissipation Alumina Substrate (Note 3) $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 300 | mW |
| | | 2.4 | mW/ $^\circ\text{C}$ |
| Thermal Resistance Junction-to-Ambient | $R_{\theta JA}$ | 417 | $^\circ\text{C/W}$ |
| Junction and Storage Temperature Range | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |

Thermal Characteristics (SC-88A)

| Characteristic | Symbol | Max | Unit |
|--|-----------------|-------------|----------------------|
| Power Dissipation (Note 4) | P_D | 385 | mW |
| Thermal Resistance – Junction-to-Ambient Derate Above 25°C | $R_{\theta JA}$ | 328 | $^\circ\text{C/W}$ |
| | | 3.0 | mW/ $^\circ\text{C}$ |
| Maximum Junction Temperature | T_{Jmax} | 150 | $^\circ\text{C}$ |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |

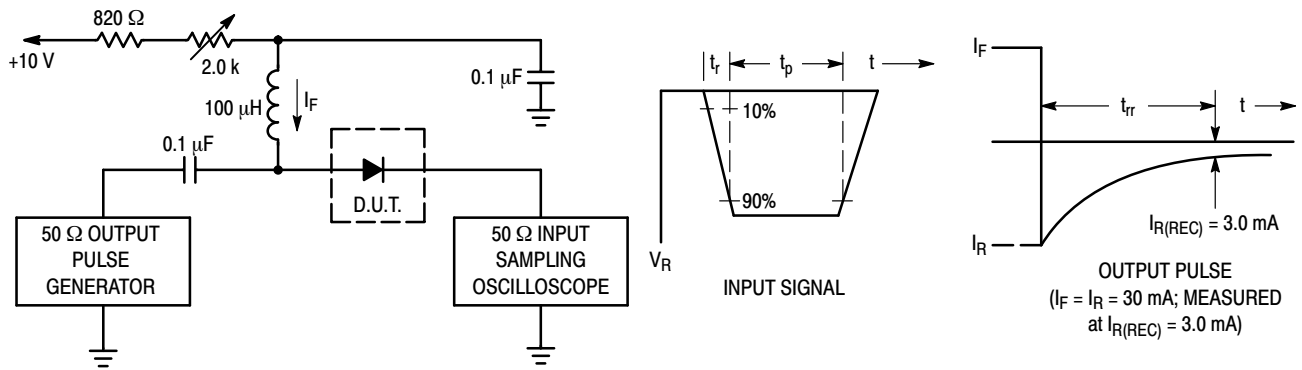
2. FR-5 = $1.0 \times 0.75 \times 0.062$ in.
3. Alumina = $0.4 \times 0.3 \times 0.024$ in. 99.5% alumina.
4. Mounted on FR-5 Board = $1.0 \times 0.75 \times 0.062$ in.

Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Min | Max | Unit | |
|---|------------|-------|------|------|-----------------|
| Reverse Voltage Leakage Current ($V_R = 100$ Vdc) ($V_R = 150$ Vdc) ($V_R = 200$ Vdc) ($V_R = 100$ Vdc, $T_J = 150^\circ\text{C}$) ($V_R = 150$ Vdc, $T_J = 150^\circ\text{C}$) ($V_R = 200$ Vdc, $T_J = 150^\circ\text{C}$) | I_R | BAS19 | – | 0.1 | μAdc |
| | | BAS20 | – | 0.1 | |
| | | BAS21 | – | 0.1 | |
| | | BAS19 | – | 100 | |
| | | BAS20 | – | 100 | |
| | | BAS21 | – | 100 | |
| Reverse Breakdown Voltage ($I_{BR} = 100$ μAdc) ($I_{BR} = 100$ μAdc) ($I_{BR} = 100$ μAdc) | $V_{(BR)}$ | BAS19 | 120 | – | Vdc |
| | | BAS20 | 200 | – | |
| | | BAS21 | 250 | – | |
| Forward Voltage ($I_F = 100$ mAdc) ($I_F = 200$ mAdc) | V_F | – | 1.0 | Vdc | |
| | | – | 1.25 | | |
| Diode Capacitance ($V_R = 0$, $f = 1.0$ MHz) | C_D | – | 5.0 | pF | |
| Reverse Recovery Time ($I_F = I_R = 30$ mAdc, $I_{R(REC)} = 3.0$ mAdc, $R_L = 100$) | t_{rr} | – | 50 | 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.

BAS19L, BAS20L, BAS21L, BAS21DW5



- Notes: 1. A 2.0 kΩ variable resistor adjusted for a Forward Current (I_F) of 30 mA.
 2. Input pulse is adjusted so $I_{R(peak)}$ is equal to 30 mA.
 3. $t_p \gg t_{rr}$

Figure 1. Recovery Time Equivalent Test Circuit

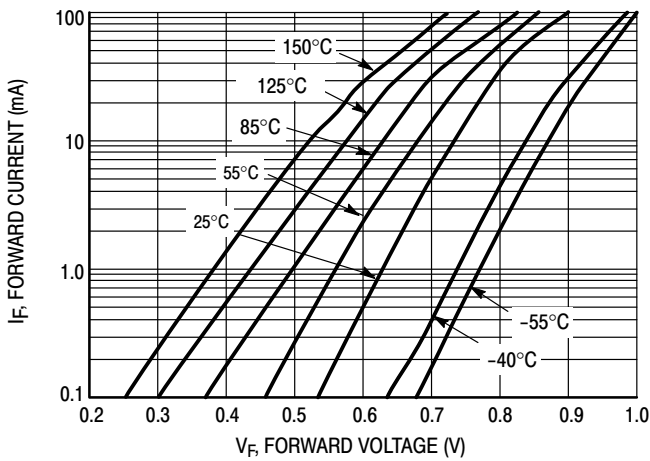


Figure 2. V_F vs. I_F

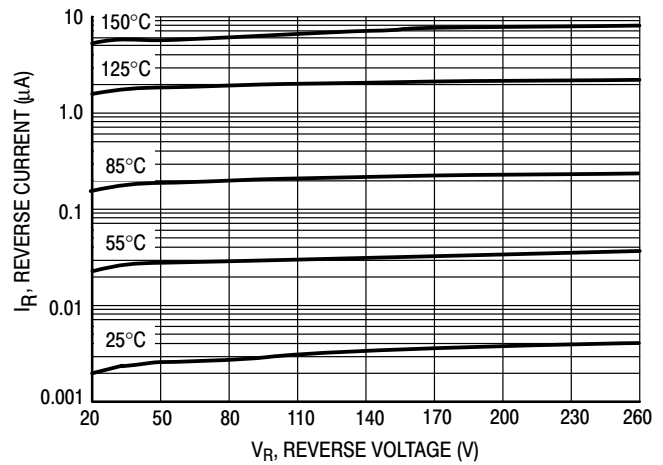


Figure 3. I_R vs. V_R

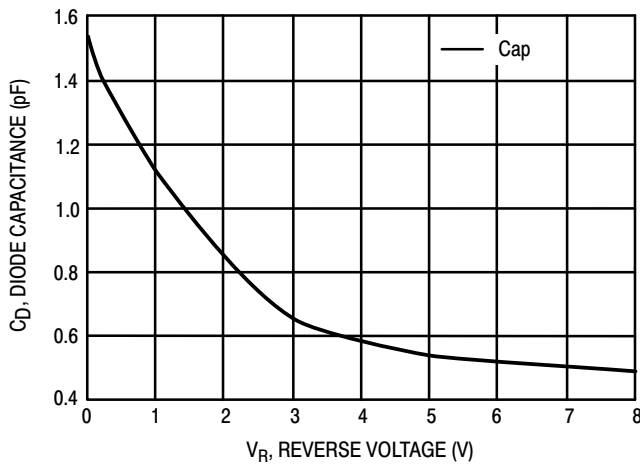


Figure 4. Capacitance

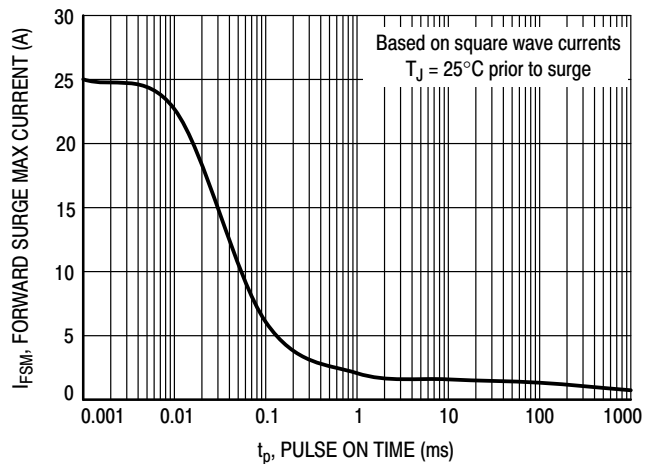


Figure 5. Forward Surge Current

BAS19L, BAS20L, BAS21L, BAS21DW5

ORDERING INFORMATION

| Device | Package | Shipping† |
|---------------|---------------------|---------------------|
| BAS19LT1G | SOT-23 (Pb-Free) | 3000 / Tape & Reel |
| BAS19LT3G | SOT-23 (Pb-Free) | 10000 / Tape & Reel |
| NSVBAS19LT1G* | SOT-23 (Pb-Free) | 3000 / Tape & Reel |
| BAS20LT1G | SOT-23 (Pb-Free) | 3000 / Tape & Reel |
| BAS20LT3G | SOT-23 (Pb-Free) | 10000 / Tape & Reel |
| NSVBAS20LT3G* | SOT-23 (Pb-Free) | 10000 / Tape & Reel |
| SBAS20LT1G* | SOT-23 (Pb-Free) | 3000 / Tape & Reel |
| BAS21LT1G | SOT-23 (Pb-Free) | 3000 / Tape & Reel |
| SBAS21LT1G* | SOT-23 (Pb-Free) | 3000 / Tape & Reel |
| BAS21LT3G | SOT-23 (Pb-Free) | 10000 / Tape & Reel |
| SBAS21LT3G* | SOT-23 (Pb-Free) | 10000 / Tape & Reel |
| BAS21DW5T1G | SC-88A (Pb-Free) | 3000 / Tape & Reel |
| SBAS21DW5T1G* | SC-88A (Pb-Free) | 3000 / Tape & Reel |
| SBAS21DW5T3G* | SC-88A (Pb-Free) | 10000 / 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.

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

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

ON Semiconductor®



SOT-23 (TO-236)
CASE 318-08
ISSUE AS

DATE 30 JAN 2018

SCALE 4:1



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 THE 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 | 0.89 | 1.00 | 1.11 | 0.035 | 0.039 | 0.044 |
| A1 | 0.01 | 0.06 | 0.10 | 0.000 | 0.002 | 0.004 |
| b | 0.37 | 0.44 | 0.50 | 0.015 | 0.017 | 0.020 |
| c | 0.08 | 0.14 | 0.20 | 0.003 | 0.006 | 0.008 |
| D | 2.80 | 2.90 | 3.04 | 0.110 | 0.114 | 0.120 |
| E | 1.20 | 1.30 | 1.40 | 0.047 | 0.051 | 0.055 |
| e | 1.78 | 1.90 | 2.04 | 0.070 | 0.075 | 0.080 |
| L | 0.30 | 0.43 | 0.55 | 0.012 | 0.017 | 0.022 |
| L1 | 0.35 | 0.54 | 0.69 | 0.014 | 0.021 | 0.027 |
| HE | 2.10 | 2.40 | 2.64 | 0.083 | 0.094 | 0.104 |
| T | 0° | --- | 10° | 0° | --- | 10° |

RECOMMENDED SOLDERING FOOTPRINT



GENERIC MARKING DIAGRAM*



XXX = Specific Device Code
M = Date Code
▪ = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

STYLE 1 THRU 5:
CANCELLED

STYLE 6:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

STYLE 7:
PIN 1. EMITTER
2. BASE
3. COLLECTOR

STYLE 8:
PIN 1. ANODE
2. NO CONNECTION
3. CATHODE

STYLE 9:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 10:
PIN 1. DRAIN
2. SOURCE
3. GATE

STYLE 11:
PIN 1. ANODE
2. CATHODE
3. CATHODE-ANODE

STYLE 12:
PIN 1. CATHODE
2. CATHODE
3. ANODE

STYLE 13:
PIN 1. SOURCE
2. DRAIN
3. GATE

STYLE 14:
PIN 1. CATHODE
2. GATE
3. ANODE

STYLE 15:
PIN 1. GATE
2. CATHODE
3. ANODE

STYLE 16:
PIN 1. ANODE
2. CATHODE
3. CATHODE

STYLE 17:
PIN 1. NO CONNECTION
2. ANODE
3. CATHODE

STYLE 18:
PIN 1. NO CONNECTION
2. CATHODE
3. ANODE

STYLE 19:
PIN 1. CATHODE
2. ANODE
3. CATHODE-ANODE

STYLE 20:
PIN 1. CATHODE
2. ANODE
3. GATE

STYLE 21:
PIN 1. GATE
2. SOURCE
3. DRAIN

STYLE 22:
PIN 1. RETURN
2. OUTPUT
3. INPUT

STYLE 23:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 24:
PIN 1. GATE
2. DRAIN
3. SOURCE

STYLE 25:
PIN 1. ANODE
2. CATHODE
3. GATE

STYLE 26:
PIN 1. CATHODE
2. ANODE
3. NO CONNECTION

STYLE 27:
PIN 1. CATHODE
2. CATHODE
3. CATHODE

STYLE 28:
PIN 1. ANODE
2. ANODE
3. ANODE

| | | |
|-------------------------|------------------------|--|
| DOCUMENT NUMBER: | 98ASB42226B | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| DESCRIPTION: | SOT-23 (TO-236) | PAGE 1 OF 1 |

ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

ON Semiconductor®



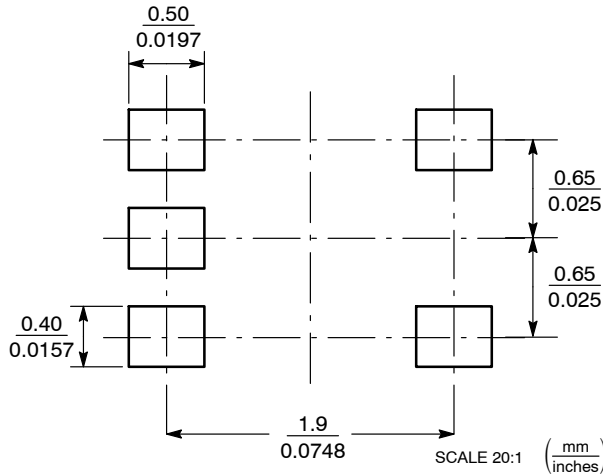
SCALE 2:1

SC-88A (SC-70-5/SOT-353)
CASE 419A-02
ISSUE L

DATE 17 JAN 2013



SOLDER FOOTPRINT

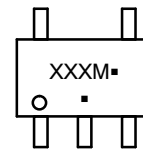


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419A-01 OBSOLETE. NEW STANDARD 419A-02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | 0.071 | 0.087 | 1.80 | 2.20 |
| B | 0.045 | 0.053 | 1.15 | 1.35 |
| C | 0.031 | 0.043 | 0.80 | 1.10 |
| D | 0.004 | 0.012 | 0.10 | 0.30 |
| G | 0.026 BSC | | 0.65 BSC | |
| H | --- | 0.004 | --- | 0.10 |
| J | 0.004 | 0.010 | 0.10 | 0.25 |
| K | 0.004 | 0.012 | 0.10 | 0.30 |
| N | 0.008 REF | | 0.20 REF | |
| S | 0.079 | 0.087 | 2.00 | 2.20 |

GENERIC MARKING DIAGRAM*



- XXX = Specific Device Code
- M = Date Code
- = Pb-Free Package

(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.

- | | | | | |
|--|--|--|--|--|
| <p>STYLE 1: PIN 1. BASE 2. EMITTER 3. BASE 4. COLLECTOR 5. COLLECTOR</p> | <p>STYLE 2: PIN 1. ANODE 2. EMITTER 3. BASE 4. COLLECTOR 5. CATHODE</p> | <p>STYLE 3: PIN 1. ANODE 1 2. N/C 3. ANODE 2 4. CATHODE 2 5. CATHODE 1</p> | <p>STYLE 4: PIN 1. SOURCE 1 2. DRAIN 1/2 3. SOURCE 1 4. GATE 1 5. GATE 2</p> | <p>STYLE 5: PIN 1. CATHODE 2. COMMON ANODE 3. CATHODE 2 4. CATHODE 3 5. CATHODE 4</p> |
| <p>STYLE 6: PIN 1. EMITTER 2 2. BASE 2 3. EMITTER 1 4. COLLECTOR 5. COLLECTOR 2/BASE 1</p> | <p>STYLE 7: PIN 1. BASE 2. EMITTER 3. BASE 4. COLLECTOR 5. COLLECTOR</p> | <p>STYLE 8: PIN 1. CATHODE 2. COLLECTOR 3. N/C 4. BASE 5. EMITTER</p> | <p>STYLE 9: PIN 1. ANODE 2. CATHODE 3. ANODE 4. ANODE 5. ANODE</p> | <p>Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.</p> |

| | | |
|------------------|--------------------------|--|
| DOCUMENT NUMBER: | 98ASB42984B | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| DESCRIPTION: | SC-88A (SC-70-5/SOT-353) | PAGE 1 OF 1 |

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

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.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT

North American Technical Support:

Voice Mail: 1 800-282-9855 Toll Free USA/Canada

Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative

