

# BAS19L, NSVBAS19L, BAS20L, SBAS20L, BAS21L, SBAS21L, BAS21DW5, SBAS21DW5

## 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<br>BAS19, NSVBAS19<br>BAS20, SBAS20<br>BAS21, SBAS21      | $V_R$           | 120<br>200<br>250    | Vdc    |
| Repetitive Peak Reverse Voltage<br>BAS19, NSVBAS19<br>BAS20, SBAS20<br>BAS21, SBAS21 | $V_{RRM}$       | 120<br>200<br>250    | Vdc    |
| Continuous Forward Current   | $I_F$           | 200                  | mAdc   |
| Peak Forward Surge Current   | $I_{FM(surge)}$ | 625                  | mAdc   |
| 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<br>MM < 400 | V<br>V |

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



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## 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, NSVBAS19L
- R = BAS20L, SBAS20L
- S = BAS21L, SBAS21L or BAS21DW5, SBAS21DW5
- 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, NSVBAS19L, BAS20L, SBAS20L, BAS21L, SBAS21L, BAS21DW5, SBAS21DW5

## Thermal Characteristics (SOT-23)

| Characteristic  | Symbol          | Max         | Unit                      |
|---|-----------------|-------------|---------------------------|
| Total Device Dissipation FR-5 Board<br>(Note 2)<br>$T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$        | $P_D$           | 225         | mW                        |
|   |                 | 1.8         | mW/ $^\circ\text{C}$      |
| Thermal Resistance<br>Junction-to-Ambient (SOT-23)  | $R_{\theta JA}$ | 556         | $^\circ\text{C}/\text{W}$ |
| Total Device Dissipation Alumina Substrate<br>(Note 3)<br>$T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$           | 300         | mW                        |
|   |                 | 2.4         | mW/ $^\circ\text{C}$      |
| Thermal Resistance Junction-to-Ambient  | $R_{\theta JA}$ | 417         | $^\circ\text{C}/\text{W}$ |
| Junction and Storage<br>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 -<br>Junction-to-Ambient<br>Derate Above $25^\circ\text{C}$ | $R_{\theta JA}$ | 328         | $^\circ\text{C}/\text{W}$ |
|  |                 | 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 × 0.75 × 0.062 in.

3. Alumina = 0.4 × 0.3 × 0.024 in. 99.5% alumina.

4. Mounted on FR-5 Board = 1.0 × 0.75 × 0.062 in.

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

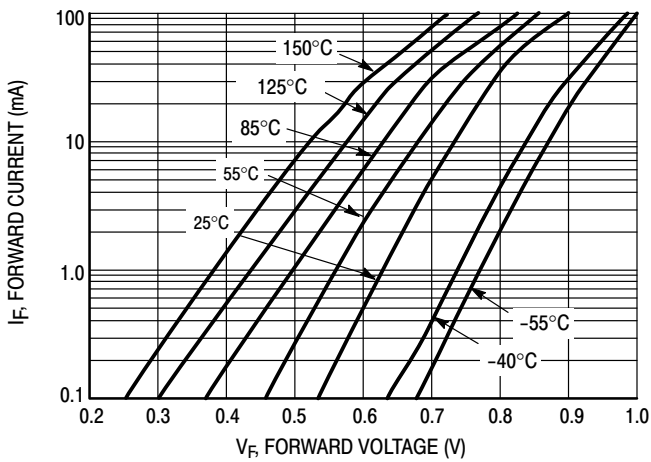
| Characteristic   | Symbol     | Min             | Max  | Unit |                 |
|--|------------|-----------------|------|------|-----------------|
| Reverse Voltage Leakage Current<br>( $V_R = 100\text{ Vdc}$ )<br>( $V_R = 150\text{ Vdc}$ )<br>( $V_R = 200\text{ Vdc}$ )<br>( $V_R = 100\text{ Vdc}, T_J = 150^\circ\text{C}$ )<br>( $V_R = 150\text{ Vdc}, T_J = 150^\circ\text{C}$ )<br>( $V_R = 200\text{ Vdc}, T_J = 150^\circ\text{C}$ ) | $I_R$      | BAS19, NSVBAS19 | -    | 0.1  | $\mu\text{Adc}$ |
|  |            | BAS20, SBAS20   | -    | 0.1  |                 |
|  |            | BAS21, SBAS21   | -    | 0.1  |                 |
|  |            | BAS19           | -    | 100  |                 |
|  |            | BAS20, SBAS20   | -    | 100  |                 |
|  |            | BAS21, SBAS21   | -    | 100  |                 |
| Reverse Breakdown Voltage<br>( $I_{BR} = 100\ \mu\text{Adc}$ )<br>( $I_{BR} = 100\ \mu\text{Adc}$ )<br>( $I_{BR} = 100\ \mu\text{Adc}$ )   | $V_{(BR)}$ | BAS19, NSVBAS19 | 120  | -    | Vdc             |
|  |            | BAS20, SBAS20   | 200  | -    |                 |
|  |            | BAS21, SBAS21   | 250  | -    |                 |
| Forward Voltage<br>( $I_F = 100\text{ mAdc}$ )<br>( $I_F = 200\text{ mAdc}$ )  | $V_F$      | -               | 1.0  | Vdc  |                 |
|  |            | -               | 1.25 |      |                 |
| Diode Capacitance ( $V_R = 0, f = 1.0\text{ MHz}$ )  | $C_D$      | -               | 5.0  | pF   |                 |
| Reverse Recovery Time ( $I_F = I_R = 30\text{ mAdc}, I_{R(REC)} = 3.0\text{ mAdc}, R_L = 100$ )  | $t_{rr}$   | -               | 50   | ns   |                 |

**BAS19L, NSVBAS19L, BAS20L, SBAS20L, BAS21L, SBAS21L, BAS21DW5, SBAS21DW5**



- Notes: 1. A 2.0 kΩ variable resistor adjusted for a Forward Current ( $I_F$ ) of 30 mA.  
 2. Input pulse is adjusted so  $I_{R(\text{peak})}$  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**

**BAS19L, NSVBAS19L, BAS20L, SBAS20L, BAS21L, SBAS21L, BAS21DW5,  
SBAS21DW5**

**ORDERING INFORMATION**

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

# BAS19L, NSVBAS19L, BAS20L, SBAS20L, BAS21L, SBAS21L, BAS21DW5, SBAS21DW5

## PACKAGE DIMENSIONS

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

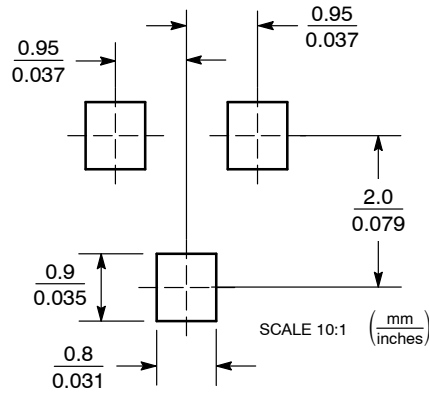


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
  4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | MILLIMETERS |      |      | INCHES |       |       |
|-----|-------------|------|------|--------|-------|-------|
|     | MIN         | NOM  | MAX  | MIN    | NOM   | MAX   |
| A   | 0.89        | 1.00 | 1.11 | 0.035  | 0.040 | 0.044 |
| A1  | 0.01        | 0.06 | 0.10 | 0.001  | 0.002 | 0.004 |
| b   | 0.37        | 0.44 | 0.50 | 0.015  | 0.018 | 0.020 |
| c   | 0.09        | 0.13 | 0.18 | 0.003  | 0.005 | 0.007 |
| 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 | 0.081 |
| L   | 0.10        | 0.20 | 0.30 | 0.004  | 0.008 | 0.012 |
| L1  | 0.35        | 0.54 | 0.69 | 0.014  | 0.021 | 0.029 |
| HE  | 2.10        | 2.40 | 2.64 | 0.083  | 0.094 | 0.104 |
| θ   | 0°          | ---  | 10°  | 0°     | ---   | 10°   |

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

### SOLDERING FOOTPRINT\*



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

# BAS19L, NSVBAS19L, BAS20L, SBAS20L, BAS21L, SBAS21L, BAS21DW5, SBAS21DW5

## PACKAGE DIMENSIONS

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

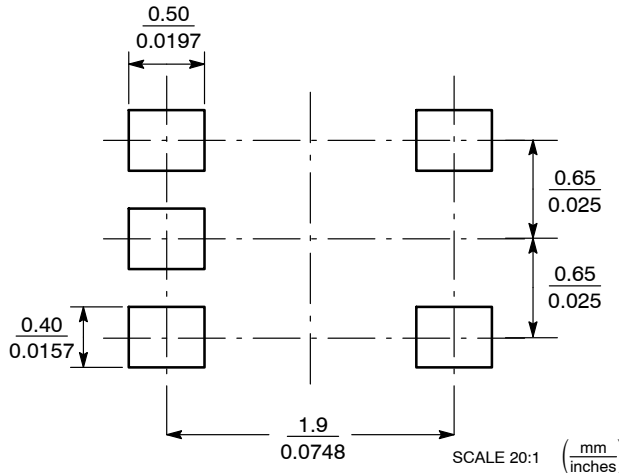


NOTES:

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 |

### SOLDERING FOOTPRINT\*



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

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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А