# High Voltage Switching Diode

# BAS19L, BAS20L, BAS21L, BAS21DW5

### 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

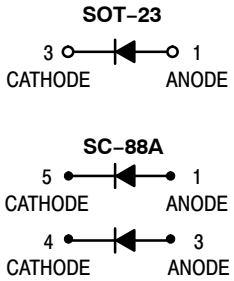
### MAXIMUM RATINGS

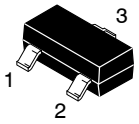
| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Continuous Reverse Voltage<br>BAS19<br>BAS20<br>BAS21 | $V_R$ | <br>120<br>200<br>250 | Vdc |
| Repetitive Peak Reverse Voltage<br>BAS19<br>BAS20<br>BAS21 | $V_{RRM}$ | <br>120<br>200<br>250 | Vdc |
| Continuous Forward Current | $I_F$ | 200 | mAdc |
| 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<br>MM < 400 | V<br>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.

## HIGH VOLTAGE SWITCHING DIODE



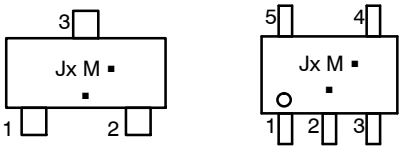




**SOT−23 (TO−236)**
**CASE 318**
**STYLE 8**




**SC−88A (SOT−353)**
**CASE 419A**

### MARKING DIAGRAMS




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.

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## THERMAL CHARACTERISTICS (SOT−23)

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

## THERMAL CHARACTERISTICS (SC−88A)

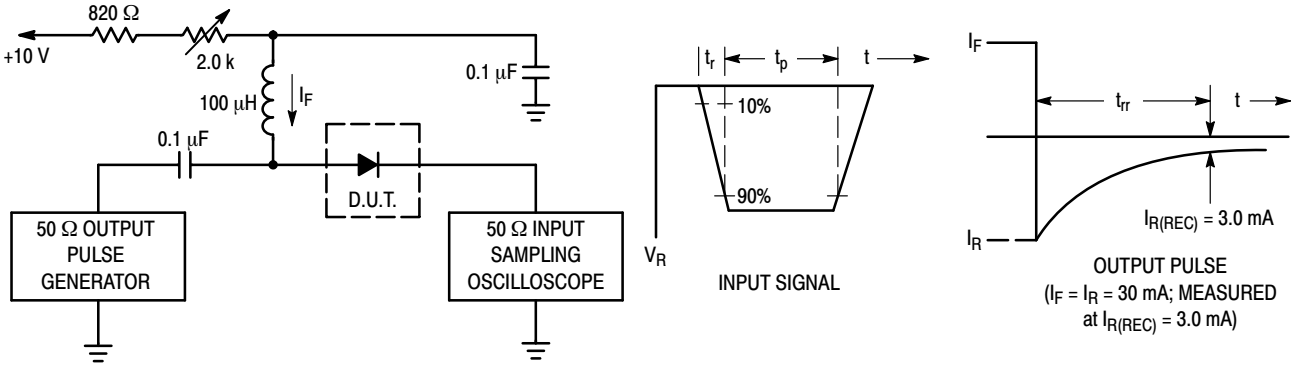
| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Power Dissipation (Note 4) | $P_D$ | 385 | mW |
| Thermal Resistance − Junction−to−Ambient<br>Derate Above 25°C | $R_{\theta JA}$ | 328<br>3.0 | °C/W<br>mW/°C |
| Maximum Junction Temperature | $T_{Jmax}$ | 150 | °C |
| Operating Junction and Storage Temperature Range | $T_J$, $T_{stg}$ | −55 to +150 | °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 x 0.75 x 0.062 in.

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

| Characteristic | | Symbol | Min | Max | Unit |
|---|---|---|---|---|---|
| Reverse Voltage Leakage Current | | $I_R$ | | | μAdc |
| ($V_R$ = 100 Vdc) | BAS19 | | − | 0.1 | |
| ($V_R$ = 150 Vdc) | BAS20 | | − | 0.1 | |
| ($V_R$ = 200 Vdc) | BAS21 | | − | 0.1 | |
| ($V_R$ = 100 Vdc, $T_J$ = 150°C) | BAS19 | | − | 100 | |
| ($V_R$ = 150 Vdc, $T_J$ = 150°C) | BAS20 | | − | 100 | |
| ($V_R$ = 200 Vdc, $T_J$ = 150°C) | BAS21 | | − | 100 | |
| Reverse Breakdown Voltage | | $V_{(BR)}$ | | | Vdc |
| ($I_{BR}$ = 100 μAdc) | BAS19 | | 120 | − | |
| ($I_{BR}$ = 100 μAdc) | BAS20 | | 200 | − | |
| ($I_{BR}$ = 100 μAdc) | BAS21 | | 250 | − | |
| Forward Voltage | | $V_F$ | | | Vdc |
| ($I_F$ = 100 mAdc) | | | − | 1.0 | |
| ($I_F$ = 200 mAdc) | | | − | 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.




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**

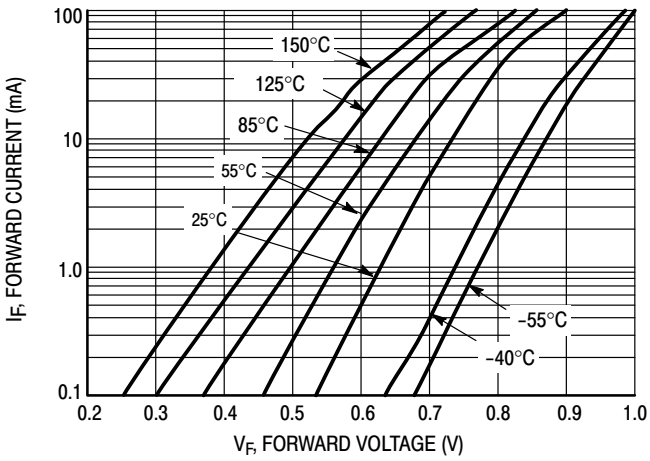



**Figure 2. $V_F$ vs. $I_F$**

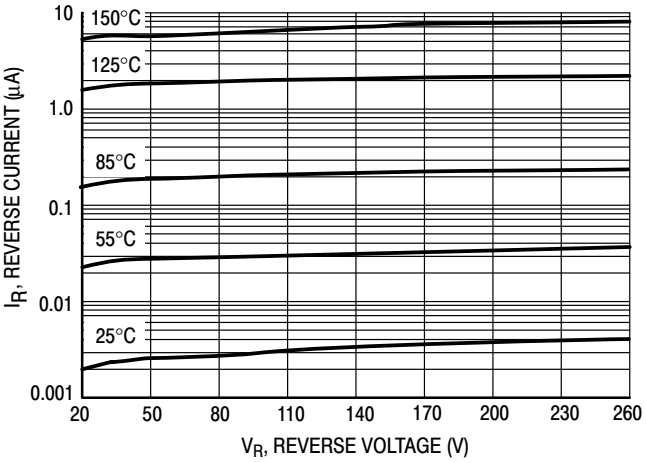



**Figure 3. $I_R$ vs. $V_R$**

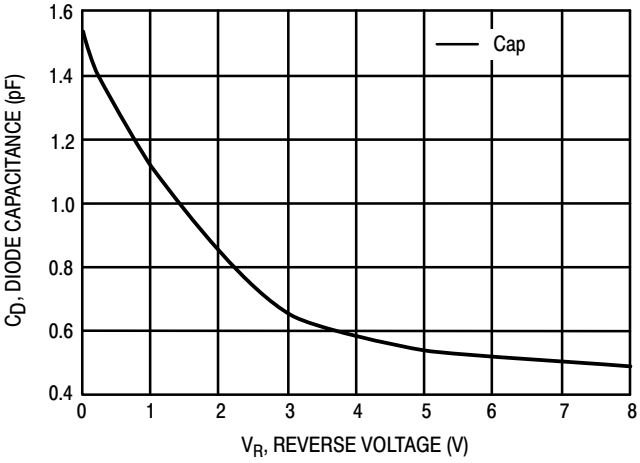



**Figure 4. Capacitance**

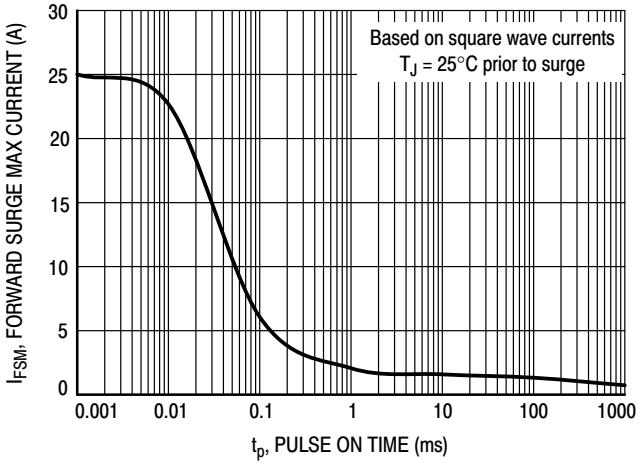



**Figure 5. Forward Surge Current**

## 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.

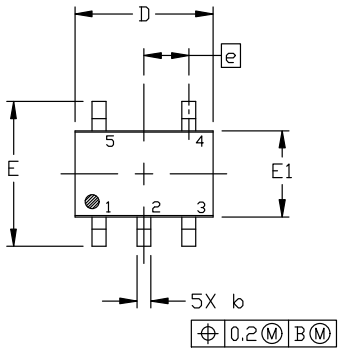
*S and NSV Prefixes for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable.

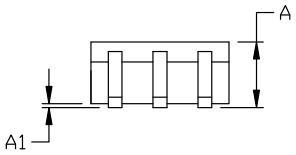
# MECHANICAL CASE OUTLINE
## PACKAGE DIMENSIONS

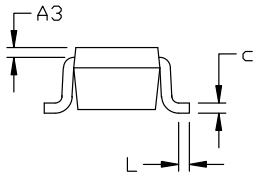
**SCALE 2:1**

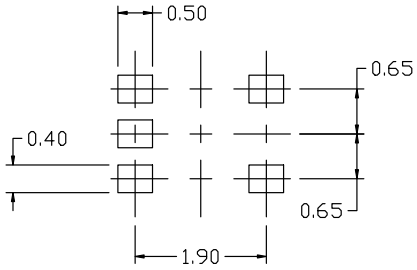
**SC−88A (SC−70−5/SOT−353)**
CASE 419A−02
ISSUE M

DATE 11 APR 2023




RECOMMENDED
MOUNTING FOOTPRINT

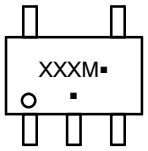
* For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. 419A−01 OBSOLETE. NEW STANDARD 419A−02
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.1016MM PER SIDE.

| DIM | MILLIMETERS | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | 0.80 | 0.95 | 1.10 |
| A1 | --- | --- | 0.10 |
| A3 | 0.20 REF | | |
| b | 0.10 | 0.20 | 0.30 |
| c | 0.10 | --- | 0.25 |
| D | 1.80 | 2.00 | 2.20 |
| E | 2.00 | 2.10 | 2.20 |
| E1 | 1.15 | 1.25 | 1.35 |
| e | 0.65 BSC | | |
| L | 0.10 | 0.15 | 0.30 |

### GENERIC MARKING DIAGRAM*




*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.

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

(Note: Microdot may be in either location)

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

STYLE 2:
PIN 1. ANODE
2. EMITTER
3. BASE
4. COLLECTOR
5. CATHODE

STYLE 3:
PIN 1. ANODE 1
2. N/C
3. ANODE 2
4. CATHODE 2
5. CATHODE 1

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

STYLE 5:
PIN 1. CATHODE
2. COMMON ANODE
3. CATHODE 2
4. CATHODE 3
5. CATHODE 4

STYLE 6:
PIN 1. EMITTER 2
2. BASE 2
3. EMITTER 1
4. COLLECTOR
5. COLLECTOR 2/BASE 1

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

STYLE 8:
PIN 1. CATHODE
2. COLLECTOR
3. N/C
4. BASE
5. EMITTER

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

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.

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|---|---|---|
| DESCRIPTION: | SC−88A (SC−70−5/SOT−353) | PAGE 1 OF 1 |

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