

# BAS19LT1, BAS20LT1, BAS21LT1, BAS21DW5T1

Preferred Devices

## High Voltage Switching Diode

Device Marking:

- BAS19LT1 = JP
- BAS20LT1 = JR
- BAS21LT1 = JS
- BAS21DW5T1 = JS

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-54151736  
 勝特力电子(深圳) 86-755-83298787  
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ON Semiconductor®

### HIGH VOLTAGE SWITCHING DIODE

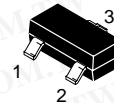
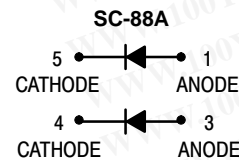
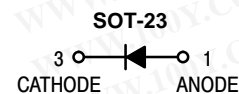
#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Continuous Reverse Voltage	$V_R$	120 200 250	Vdc
Continuous Forward Current	$I_F$	200	mAdc
Peak Forward Surge Current	$I_{FM}(\text{surge})$	625	mAdc
Maximum Junction Temperature	$T_{Jmax}$	150	°C
Power Dissipation (Note 3)	$P_D$	385	mW

#### THERMAL CHARACTERISTICS (SOT-23)

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board (Note 1) $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	225	mW
Thermal Resistance Junction-to-Ambient (SOT-23)	$R_{\theta JA}$	556	°C/W
Total Device Dissipation Alumina Substrate (Note 2) $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	300	mW
Thermal Resistance Junction-to-Ambient	$R_{\theta JA}$	417	°C/W
Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	°C

- FR-5 =  $1.0 \times 0.75 \times 0.062$  in.
- Alumina =  $0.4 \times 0.3 \times 0.024$  in. 99.5% alumina.

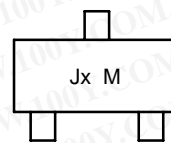


SOT-23  
CASE 318  
STYLE 8

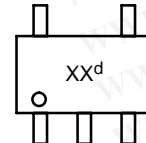


SOT-353  
SC-88A  
CASE 419A

#### MARKING DIAGRAM



Jx = Specific Device Code  
 M = Date Code



XX = Specific Device Code  
 d = Date Code

#### ORDERING INFORMATION

Device	Package	Shipping
BAS19LT1	SOT-23	3000/Tape & Reel
BAS20LT1	SOT-23	3000/Tape & Reel
BAS21LT1	SOT-23	3000/Tape & Reel
BAS21DW5T1	SC-88A	3000/Tape & Reel

Preferred devices are recommended choices for future use and best overall value.

# BAS19LT1, BAS20LT1, BAS21LT1, BAS21DW5T1

## Thermal Characteristics (SC-88A)

Characteristic	Symbol	Max	Unit
Power Dissipation (Note 3)	$P_D$	385	mW
Thermal Resistance - Junction to Ambient Derate Above 25°C	$R_{\theta JA}$	328 3.0	°C/W mW/°C
Maximum Junction Temperature	$T_{Jmax}$	150	°C
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	°C

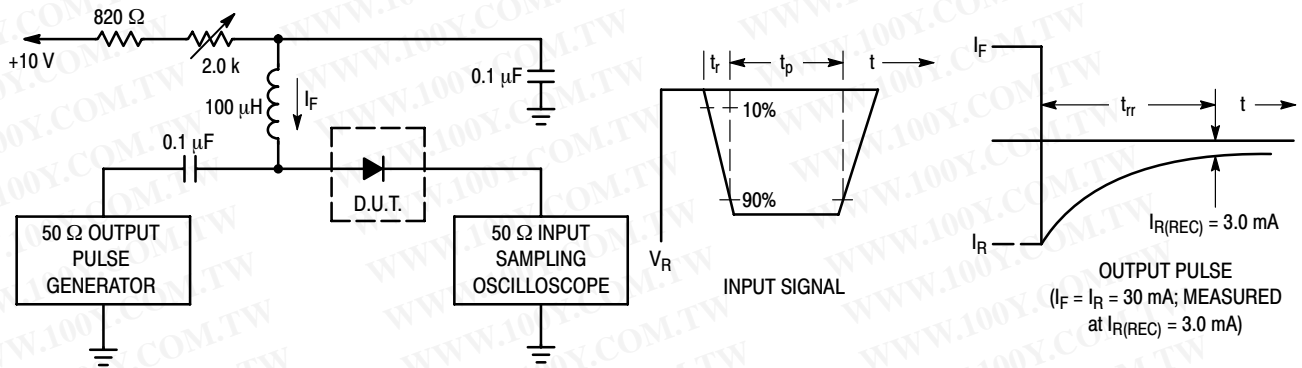
3. Mounted on FR-5 Board = 1.0 x 0.75 x 0.062 in.

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

Characteristic	Symbol	Min	Max	Unit
Reverse Voltage Leakage Current ( $V_R = 100\text{ Vdc}$ ) ( $V_R = 150\text{ Vdc}$ ) ( $V_R = 200\text{ Vdc}$ ) ( $V_R = 100\text{ Vdc}, T_J = 150^\circ\text{C}$ ) ( $V_R = 150\text{ Vdc}, T_J = 150^\circ\text{C}$ ) ( $V_R = 200\text{ Vdc}, T_J = 150^\circ\text{C}$ )	$I_R$ BAS19 BAS20 BAS21 BAS19 BAS20 BAS21	- - - - - -	0.1 0.1 0.1 100 100 100	$\mu\text{Adc}$
Reverse Breakdown Voltage ( $I_{BR} = 100\ \mu\text{Adc}$ ) ( $I_{BR} = 100\ \mu\text{Adc}$ ) ( $I_{BR} = 100\ \mu\text{Adc}$ )	$V_{(BR)}$ BAS19 BAS20 BAS21	120 200 250	- - -	Vdc
Forward Voltage ( $I_F = 100\text{ mAdc}$ ) ( $I_F = 200\text{ mAdc}$ )	$V_F$	- -	1.0 1.25	Vdc
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

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# BAS19LT1, BAS20LT1, BAS21LT1, BAS21DW5T1



- 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

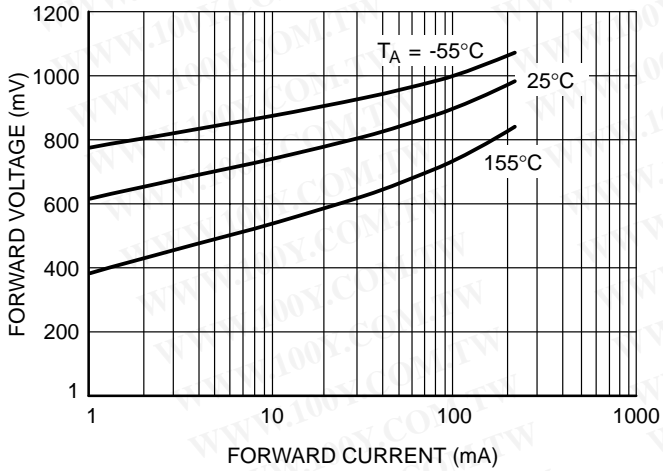


Figure 2. Forward Voltage

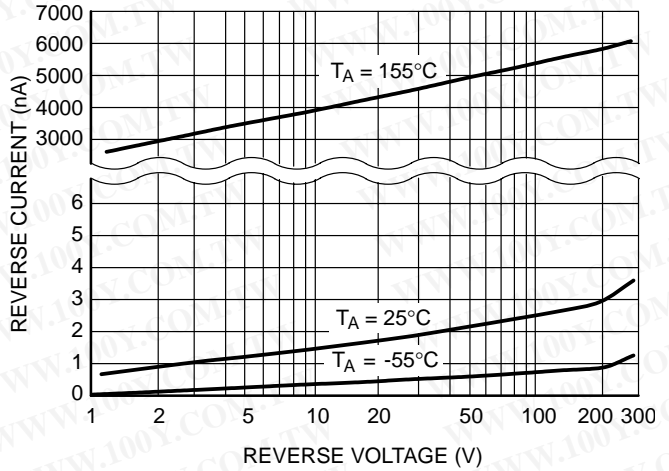


Figure 3. Reverse Leakage

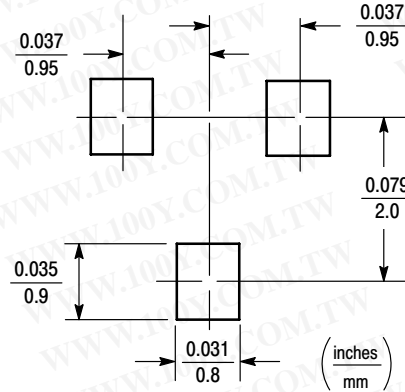
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**INFORMATION FOR USING THE SOT-23 SURFACE MOUNT PACKAGE**

**MINIMUM RECOMMENDED FOOTPRINT FOR SURFACE MOUNTED APPLICATIONS**

Surface mount board layout is a critical portion of the total design. The footprint for the semiconductor packages must be the correct size to insure proper solder connection

interface between the board and the package. With the correct pad geometry, the packages will self align when subjected to a solder reflow process.



**SOT-23**

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**SOT-23 POWER DISSIPATION**

The power dissipation of the SOT-23 is a function of the pad size. This can vary from the minimum pad size for soldering to a pad size given for maximum power dissipation. Power dissipation for a surface mount device is determined by  $T_{J(max)}$ , the maximum rated junction temperature of the die,  $R_{\theta JA}$ , the thermal resistance from the device junction to ambient, and the operating temperature,  $T_A$ . Using the values provided on the data sheet for the SOT-23 package,  $P_D$  can be calculated as follows:

$$P_D = \frac{T_{J(max)} - T_A}{R_{\theta JA}}$$

The values for the equation are found in the maximum ratings table on the data sheet. Substituting these values into the equation for an ambient temperature  $T_A$  of 25°C,

one can calculate the power dissipation of the device which in this case is 225 milliwatts.

$$P_D = \frac{150^\circ\text{C} - 25^\circ\text{C}}{556^\circ\text{C/W}} = 225 \text{ milliwatts}$$

The 556°C/W for the SOT-23 package assumes the use of the recommended footprint on a glass epoxy printed circuit board to achieve a power dissipation of 225 milliwatts. There are other alternatives to achieving higher power dissipation from the SOT-23 package. Another alternative would be to use a ceramic substrate or an aluminum core board such as Thermal Clad®. Using a board material such as Thermal Clad, an aluminum core board, the power dissipation can be doubled using the same footprint.

**SOLDERING PRECAUTIONS**

The melting temperature of solder is higher than the rated temperature of the device. When the entire device is heated to a high temperature, failure to complete soldering within a short time could result in device failure. Therefore, the following items should always be observed in order to minimize the thermal stress to which the devices are subjected.

- Always preheat the device.

- The delta temperature between the preheat and soldering should be 100°C or less.\*
- When preheating and soldering, the temperature of the leads and the case must not exceed the maximum temperature ratings as shown on the data sheet. When using infrared heating with the reflow soldering method, the difference shall be a maximum of 10°C.

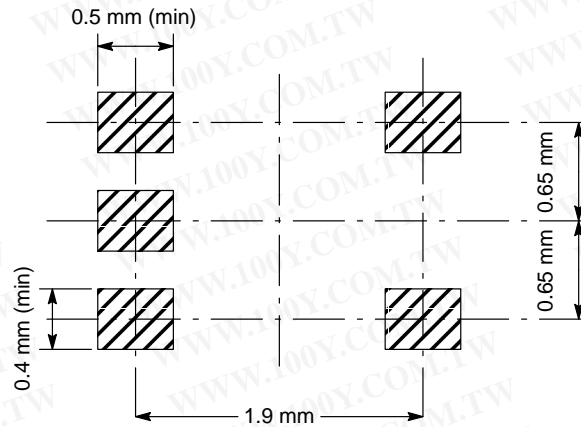
INFORMATION FOR USING THE SOT-353/SC-88A SURFACE MOUNT PACKAGE

MINIMUM RECOMMENDED FOOTPRINT FOR SURFACE MOUNTED APPLICATIONS

Surface mount board layout is a critical portion of the total design. The footprint for the semiconductor packages must be the correct size to ensure proper solder connection

interface between the board and the package. With the correct pad geometry, the packages will self align when subjected to a solder reflow process.

SOT-353



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SOT-353/SC-88A POWER DISSIPATION

The power dissipation of the SOT-353/SC-88A is a function of the pad size. This can vary from the minimum pad size for soldering to the pad size given for maximum power dissipation. Power dissipation for a surface mount device is determined by  $T_{J(max)}$ , the maximum rated junction temperature of the die,  $R_{\theta JA}$ , the thermal resistance from the device junction to ambient; and the operating temperature,  $T_A$ . Using the values provided on the data sheet,  $P_D$  can be calculated as follows.

$$P_D = \frac{T_{J(max)} - T_A}{R_{\theta JA}}$$

The values for the equation are found in the maximum ratings table on the data sheet. Substituting these values

into the equation for an ambient temperature  $T_A$  of 25°C, one can calculate the power dissipation of the device which in this case is 125 milliwatts.

$$P_D = \frac{150^\circ\text{C} - 25^\circ\text{C}}{833^\circ\text{C/W}} = 150 \text{ milliwatts}$$

The 833°C/W assumes the use of the recommended footprint on a glass epoxy printed circuit board to achieve a power dissipation of 150 milliwatts. Another alternative would be to use a ceramic substrate or an aluminum core board such as Thermal Clad™. Using a board material such as Thermal Clad, a higher power dissipation can be achieved using the same footprint.

SOLDERING PRECAUTIONS

The melting temperature of solder is higher than the rated temperature of the device. When the entire device is heated to a high temperature, failure to complete soldering within a short time could result in device failure. Therefore, the following items should always be observed in order to minimize the thermal stress to which the devices are subjected.

- Always preheat the device.
- The delta temperature between the preheat and soldering should be 100°C or less.\*
- When preheating and soldering, the temperature of the leads and the case must not exceed the maximum temperature ratings as shown on the data sheet. When using infrared heating with the reflow soldering method, the difference should be a maximum of 10°C.

- The soldering temperature and time should not exceed 260°C for more than 10 seconds.
- When shifting from preheating to soldering, the maximum temperature gradient should be 5°C or less.
- After soldering has been completed, the device should be allowed to cool naturally for at least three minutes. Gradual cooling should be used as the use of forced cooling will increase the temperature gradient and result in latent failure due to mechanical stress.
- Mechanical stress or shock should not be applied during cooling

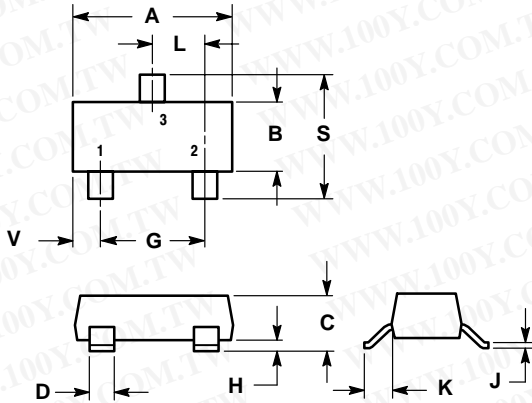
\* Soldering a device without preheating can cause excessive thermal shock and stress which can result in damage to the device.

# BAS19LT1, BAS20LT1, BAS21LT1, BAS21DW5T1

## PACKAGE DIMENSIONS

SOT-23 (TO-236)  
CASE 318-09  
ISSUE AH

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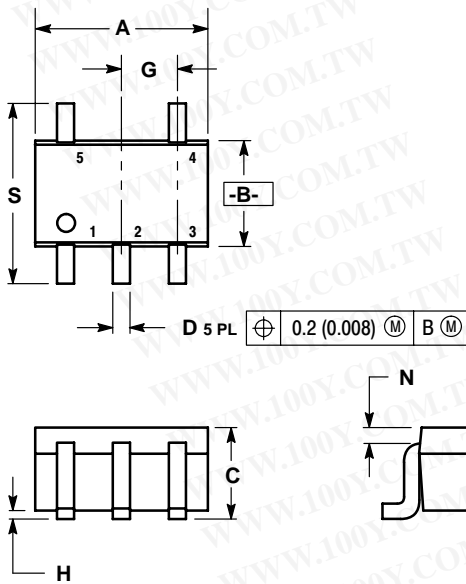


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
  4. 318-01, -02, AND -06 OBSOLETE, NEW STANDARD 318-09.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0385	0.0498	0.99	1.26
D	0.0140	0.0200	0.36	0.50
G	0.0670	0.0826	1.70	2.10
H	0.0040	0.0098	0.10	0.25
J	0.0034	0.0070	0.085	0.177
K	0.0180	0.0236	0.45	0.60
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.0984	2.10	2.50
V	0.0177	0.0236	0.45	0.60

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

SC-88A (SOT-353)  
CASE 419A-02  
ISSUE F



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. 419A-01 OBSOLETE. NEW STANDARD 419A-02.

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