

## Schottky Barrier Diode

These Schottky barrier diodes are designed for high speed switching applications, circuit protection, and voltage clamping. Extremely low forward voltage reduces conduction loss. Miniature surface mount package is excellent for hand held and portable applications where space is limited.

- Extremely Fast Switching Speed
- Low Forward Voltage — 0.35 Volts (Typ) @  $I_F = 10 \text{ mAdc}$



### BAT54T1

Motorola Preferred Device

30 VOLT  
SCHOTTKY BARRIER  
DETECTOR AND SWITCHING  
DIODE



CASE 425-04, STYLE 1  
SOD-123

#### MAXIMUM RATINGS ( $T_J = 125^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Reverse Voltage	$V_R$	30	Volts
Forward Power Dissipation, FR-5 Board <sup>(1)</sup> @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_F$	400 3.2	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Case	$R_{\theta JL}$	174	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	492	$^\circ\text{C/W}$
Forward Current (DC)	$I_F$	200 Max	mA
Non-Repetitive Peak Forward Current $t_p < 10 \text{ msec}$	$I_{FSM}$	600	mA
Repetitive Peak Forward Current Pulse Wave = 1 sec, Duty Cycle = 66%	$I_{FRM}$	300	mA
Junction Temperature	$T_J$	125 Max	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-55 to +150	$^\circ\text{C}$

#### DEVICE MARKING

BAT54T1 = BU

1. FR-5 = 1.0 x 0.75 x 0.062 in.

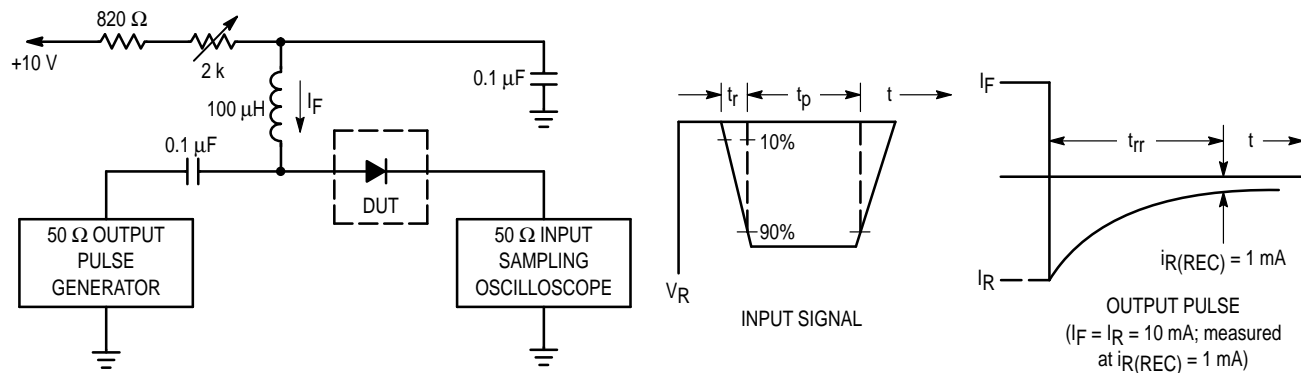
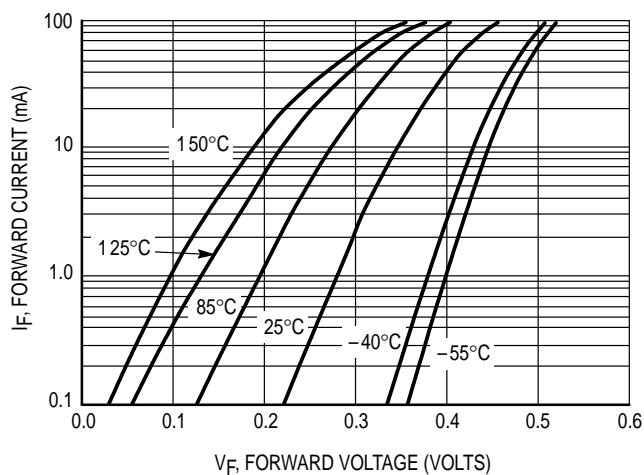
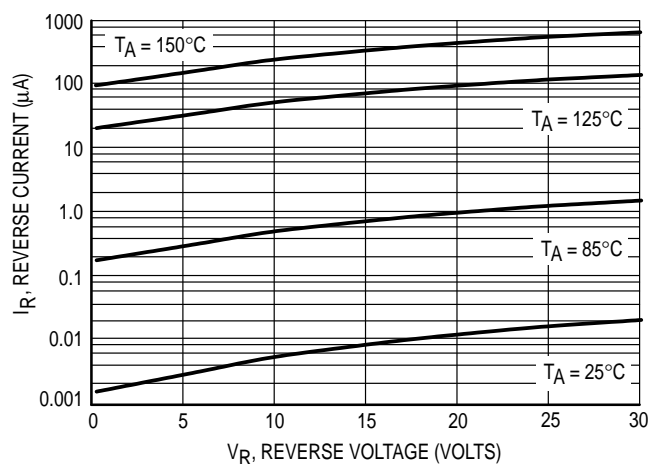
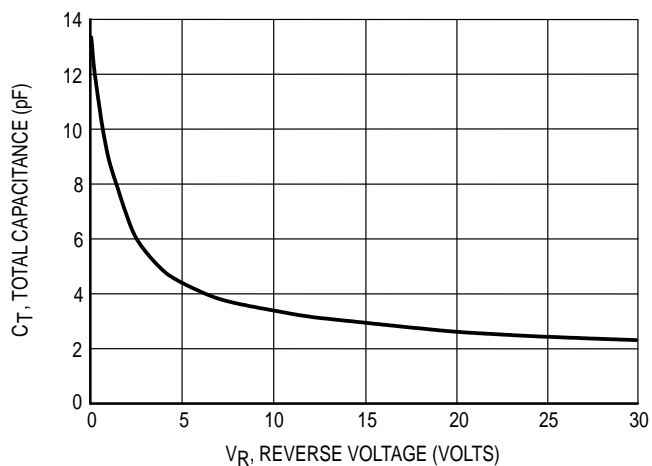
Preferred devices are Motorola recommended choices for future use and best overall value.

Thermal Clad is a registered trademark of the Bergquist Company.

## BAT54T1

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

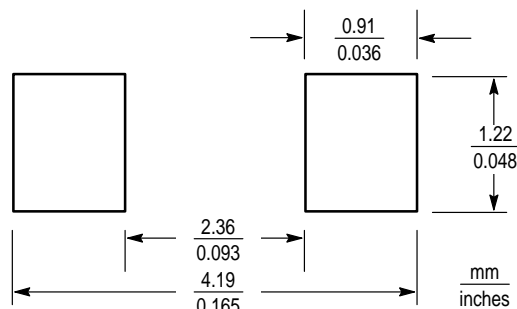
Characteristic	Symbol	Min	Typ	Max	Unit
Reverse Breakdown Voltage ( $I_R = 10\ \mu\text{A}$ )	$V_{(BR)R}$	30	—	—	Volts
Total Capacitance ( $V_R = 1.0\ \text{V}$ , $f = 1.0\ \text{MHz}$ )	$C_T$	—	7.6	10	pF
Reverse Leakage ( $V_R = 25\ \text{V}$ )	$I_R$	—	0.5	2.0	$\mu\text{A}_{dc}$
Forward Voltage ( $I_F = 0.1\ \text{mA}_{dc}$ )	$V_F$	—	0.22	0.24	Vdc
Forward Voltage ( $I_F = 30\ \text{mA}_{dc}$ )	$V_F$	—	0.41	0.5	Vdc
Forward Voltage ( $I_F = 100\ \text{mA}_{dc}$ )	$V_F$	—	0.52	1.0	Vdc
Reverse Recovery Time ( $I_F = I_R = 10\ \text{mA}_{dc}$ , $I_{R(REC)} = 1.0\ \text{mA}_{dc}$ ) Figure 1	$t_{rr}$	—	—	5.0	ns
Forward Voltage ( $I_F = 1.0\ \text{mA}_{dc}$ )	$V_F$	—	0.29	0.32	Vdc
Forward Voltage ( $I_F = 10\ \text{mA}_{dc}$ )	$V_F$	—	0.35	0.40	Vdc
Forward Current (DC)	$I_F$	—	—	200	mA <sub>dc</sub>
Repetitive Peak Forward Current	$I_{FRM}$	—	—	300	mA <sub>dc</sub>
Non-Repetitive Peak Forward Current ( $t < 1.0\ \text{s}$ )	$I_{FSM}$	—	—	600	mA <sub>dc</sub>


**Figure 1. Recovery Time Equivalent Test Circuit**

**Figure 2. Forward Voltage**

**Figure 3. Leakage Current**

**Figure 4. Total Capacitance**

**INFORMATION FOR USING THE SOD-123 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.

**SOD-123****SOD-123 POWER DISSIPATION**

The power dissipation of the SOD-123 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  $T_J(\text{max})$ , 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 SOD-123 package,  $P_D$  can be calculated as follows:

$$P_D = \frac{T_J(\text{max}) - T_A}{R_{\theta JA}}$$

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.

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

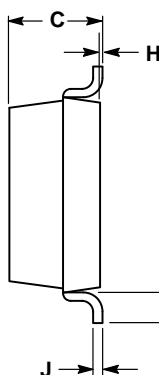
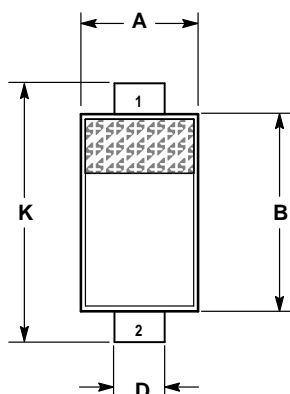
The 556°C/W for the SOD-123 package assumes the use of the recommended footprint on a glass epoxy printed circuit board to achieve a power dissipation of 225 milliwatts. There are other alternatives to achieving higher power dissipation from the SOD-123 package. Another alternative would be to use a 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.
- The soldering temperature and time shall not exceed 260°C for more than 10 seconds.
- When shifting from preheating to soldering, the maximum temperature gradient shall 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.

**PACKAGE DIMENSIONS**

**NOTES:**


1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.055	0.071	1.40	1.80
B	0.100	0.112	2.55	2.85
C	0.037	0.053	0.95	1.35
D	0.020	0.028	0.50	0.70
E	0.004	—	0.25	—
H	0.000	0.004	0.00	0.10
J	—	0.006	—	0.15
K	0.140	0.152	3.55	3.85

**STYLE 1:**

- PIN 1. CATHODE  
2. ANODE

**CASE 425-04  
ISSUE C**

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