Silicon Hyper-Abrupt Tuning Diode

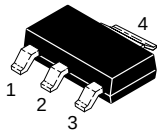
MV7404T1

Motorola Preferred Device

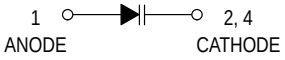
This silicon tuning diode is designed for high capacitance and a tuning ratio of greater than 10 times over a bias range of 2.0 to 10 volts. It provides tuning over a broad frequency range from the AM broadcast band to 100 MHz. The device is housed in the SOT-223 package which is designed for medium power surface mount applications.

- High Capacitance
- Large Capacitance Change with Small Bias Change
- Guaranteed High Q
- The SOT-223 Package can be soldered using wave or reflow.
- SOT–223 package ensures level mounting which results in improved thermal conduction and allows visual inspection of soldered joints. The formed leads absorb thermal stress during soldering, eliminating the possibility of damage to the die.

SOT–223 PACKAGE HIGH TUNING RATIO VOLTAGE VARIABLE SURFACE MOUNT DIODE



CASE 318E–04, STYLE 2
SOT–223 (TO–261AA)



MAXIMUM RATINGS (T_C = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Reverse Voltage	V_R	12	Vdc
Forward Current	I_F	250	mAdc
Total Power Dissipation @ T_A = 25°C(1) Derate above 25°C	P_D	800 6.4	mW mW/°C
Operating and Storage Temperature Range	T_J, T_{stg}	–55 to +125	°C
Lead Temperature for Soldering Purposes, 1/6” from case Time in Solder Bath	T_L	260 10	°C Sec

1. FR-4 board, 0.0625 in^2, 2 oz. copper.

DEVICE MARKING

V7404

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

Characteristic	Symbol	Min	Typ	Max	Unit
Reverse Breakdown Voltage (I_R = 10 μAdc)	$V_{(BR)R}$	12	—	—	Vdc
Reverse Voltage Leakage Current (V_R = 10 Vdc, f = 1.0 MHz)	I_R	—	—	100	nAdc
Diode Capacitance (V_R = 2.0 Vdc, f = 1.0 MHz)	C_T	96	120	144	pF
Figure of Merit (V_R = 2.0 Vdc, f = 1.0 MHz)	Q	200	—	—	—
Tuning Ratio C2/C10 (f = 1.0 MHz)	T_R	10	—	—	—

Thermal Clad is a trademark of the Bergquist Company

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

REV 1

TYPICAL CHARACTERISTICS

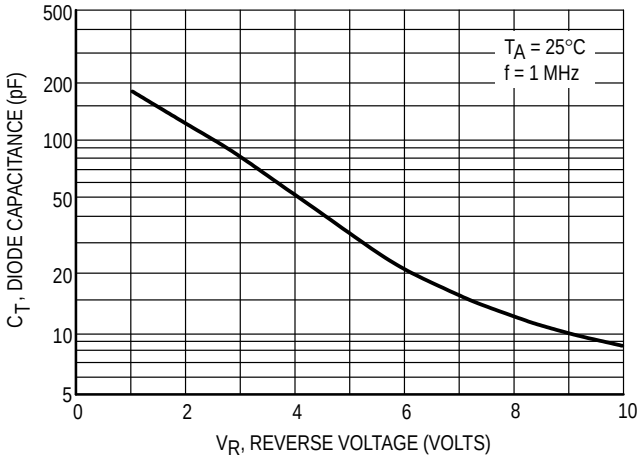


Figure 1. Diode Capacitance versus Reverse Voltage

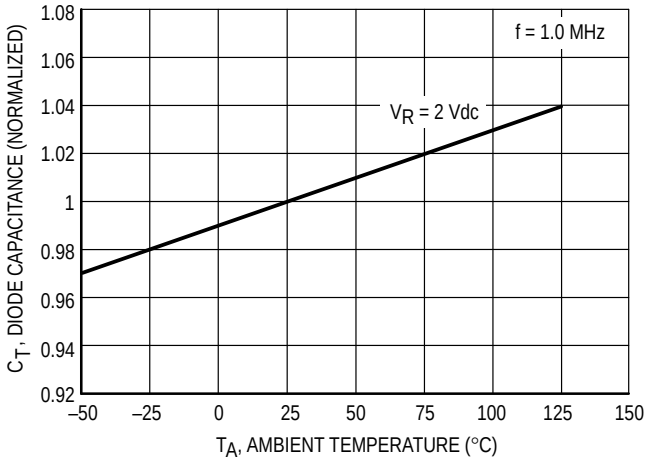


Figure 2. Diode Capacitance versus Ambient Temperature

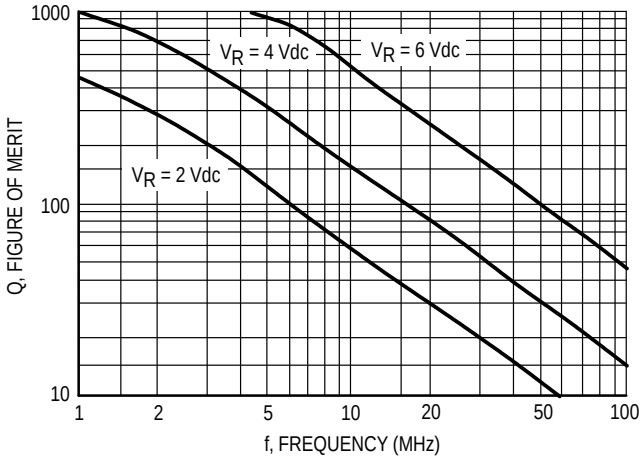
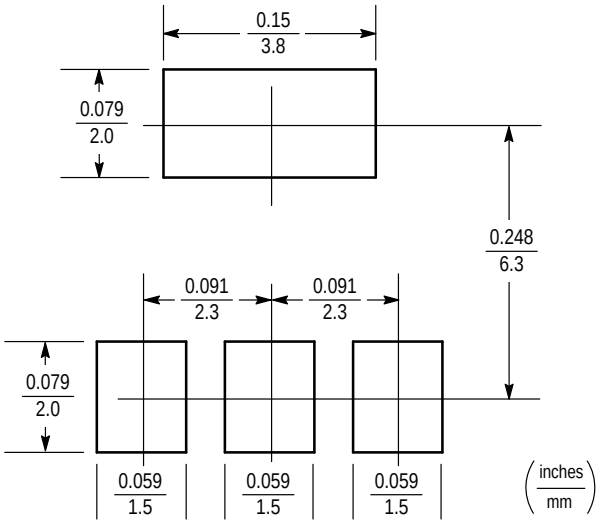


Figure 3. Figure of Merit versus Frequency

INFORMATION FOR USING THE SOT-223 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–223

POWER DISSIPATION

The power dissipation of the SOT-223 is a function of the pad size. These 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 for the SOT-223 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 1.5 watts.

$$P_D = \frac{150°C - 25°C}{83.3°C/W} = 1.5 \text{ watts}$$

The 83.3°C/W for the SOT-223 package assumes the recommended collector pad area of 965 sq. mils on a glass epoxy printed circuit board to achieve a power dissipation of 1.5 watts. If space is at a premium, a more realistic approach is to use the device at a P_D of 833 mW using the footprint shown. Using a board material such as Thermal Clad™, a power dissipation of 1.6 watts can be achieved using the same footprint.

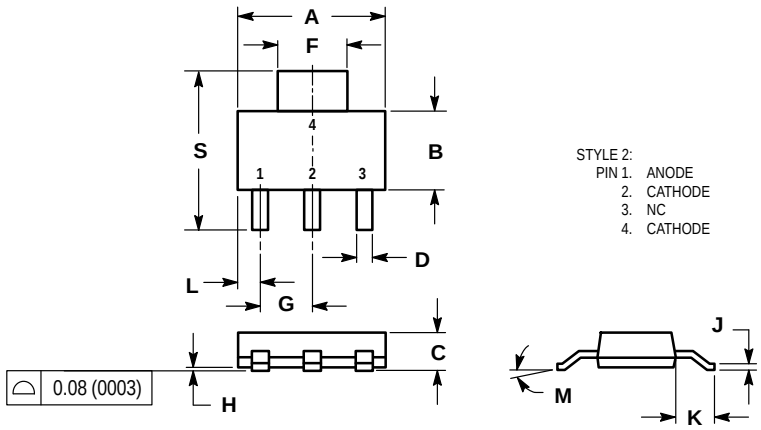
MOUNTING PRECAUTIONS

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.

PACKAGE DIMENSIONS



STYLE 2:
PIN 1. ANODE
2. CATHODE
3. NC
4. CATHODE

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

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.249	0.263	6.30	6.70
B	0.130	0.145	3.30	3.70
C	0.060	0.068	1.50	1.75
D	0.024	0.035	0.60	0.89
F	0.115	0.126	2.90	3.20
G	0.087	0.094	2.20	2.40
H	0.0008	0.0040	0.020	0.100
J	0.009	0.014	0.24	0.35
K	0.060	0.078	1.50	2.00
L	0.033	0.041	0.85	1.05
M	0 °	10 °	0 °	10 °
S	0.264	0.287	6.70	7.30

CASE 318E–04
ISSUE H
SOT–223 (TO–261AA)

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