M1MA151AT1, M1MA152AT1

Preferred Device

Single Silicon Switching Diodes

These Silicon Epitaxial Planar Diodes are designed for use in ultra high speed switching applications. These devices are housed in the SC−59 package which is designed for low power surface mount applications.

- Fast t_{rr}, < 3.0 ns
- Low C_D, < 2.0 pF
- Available in 8 mm Tape and Reel
  Use M1MA151/2AT1 to order the 7 inch/3000 unit reel.
  Use M1MA151/2AT3 to order the 13 inch/10,000 unit reel.

MAXIMUM RATINGS (T_A = 25°C)

Rating		Symbol	Value	Unit
Reverse Voltage	M1MA151AT1	V_R	40	Vdc
	M1MA152AT1		80	
Peak Reverse Voltage	M1MA151AT1	V_{RM}	40	Vdc
	M1MA152AT1		80	
Forward Current		I_F	100	mAdc
Peak Forward Current		I_{FM}	225	mAdc
Peak Forward Surge Current		I_{FSM} (Note 3)	500	mAdc

THERMAL CHARACTERISTICS

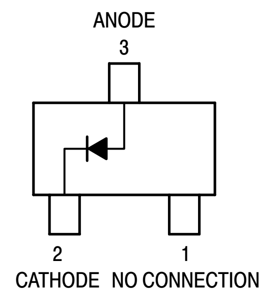
Rating	Symbol	Max	Unit
Power Dissipation	P_D	200	mW
Junction Temperature	T_J	150	°C
Storage Temperature	T_{stg}	−55 to +150	°C

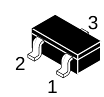
3. t = 1 SEC

ON Semiconductor®

http://onsemi.com

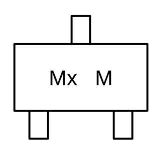
SC−59 PACKAGE SINGLE SILICON SWITCHING DIODES 40/80 V−100 mA SURFACE MOUNT





SC−59
SUFFIX
CASE 318D

MARKING DIAGRAM



x = A for 151
B for 152
M = Date Code

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

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ELECTRICAL CHARACTERISTICS (T_A = 25°C)

Characteristic		Symbol	Condition	Min	Max	Unit
Reverse Voltage Leakage Current	M1MA151AT1	I_R	V_R = 35 V	—	0.1	μAdc
	M1MA152AT1		V_R = 75 V	—	0.1	
Forward Voltage		V_F	I_F = 100 mA	—	1.2	Vdc
Reverse Breakdown Voltage	M1MA151AT1	V_R	I_R = 100 μA	40	—	Vdc
	M1MA152AT1			80	—	
Diode Capacitance		C_D	V_R = 0, f = 1.0 MHz	—	2.0	pF
Reverse Recovery Time (Figure 1)		t_{rr} (Note 4)	I_F = 10 mA, V_R = 6.0 V, R_L = 100 Ω, I_{rr} = 0.1 I_R	—	3.0	ns

4. t_{rr} Test Circuit

RECOVERY TIME EQUIVALENT TEST CIRCUIT **INPUT PULSE** **OUTPUT PULSE**

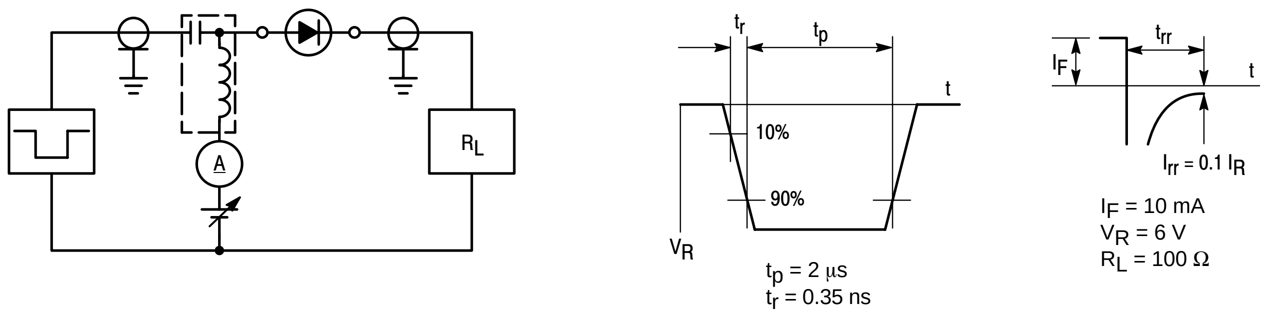
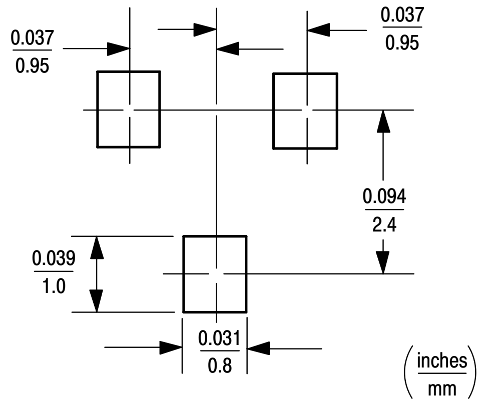


Figure 1. Reverse Recovery Time Equivalent Test Circuit

INFORMATION FOR USING THE SC−59 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.



SC−59 POWER DISSIPATION

The power dissipation of the SC−59 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 338 milliwatts.

$$P_D = \frac{150°C - 25°C}{370°C/W} = 338 \text{ milliwatts}$$

The 370°C/W assumes the use of the recommended footprint on a glass epoxy printed circuit board to achieve a power dissipation of 338 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, 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 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.

SOLDER STENCIL GUIDELINES

Prior to placing surface mount components onto a printed circuit board, solder paste must be applied to the pads. A solder stencil is required to screen the optimum amount of solder paste onto the footprint. The stencil is made of brass or stainless steel with a typical thickness of 0.008 inches. The stencil opening size for the surface mounted package should be the same as the pad size on the printed circuit board, i.e., a 1:1 registration.

TYPICAL SOLDER HEATING PROFILE

For any given circuit board, there will be a group of control settings that will give the desired heat pattern. The operator must set temperatures for several heating zones, and a figure for belt speed. Taken together, these control settings make up a heating "profile" for that particular circuit board. On machines controlled by a computer, the computer remembers these profiles from one operating session to the next. Figure 7 shows a typical heating profile for use when soldering a surface mount device to a printed circuit board. This profile will vary among soldering systems but it is a good starting point. Factors that can affect the profile include the type of soldering system in use, density and types of components on the board, type of solder used, and the type of board or substrate material being used. This profile shows temperature versus time. The line on the graph shows the actual temperature that might be experienced on the surface of a test board at or near a central solder joint. The two profiles are based on a high density and a low density board. The Vitronics SMD310 convection/infrared reflow soldering system was used to generate this profile. The type of solder used was 62/36/2 Tin Lead Silver with a melting point between 177−189°C. When this type of furnace is used for solder reflow work, the circuit boards and solder joints tend to heat first. The components on the board are then heated by conduction. The circuit board, because it has a large surface area, absorbs the thermal energy more efficiently, then distributes this energy to the components. Because of this effect, the main body of a component may be up to 30 degrees cooler than the adjacent solder joints.

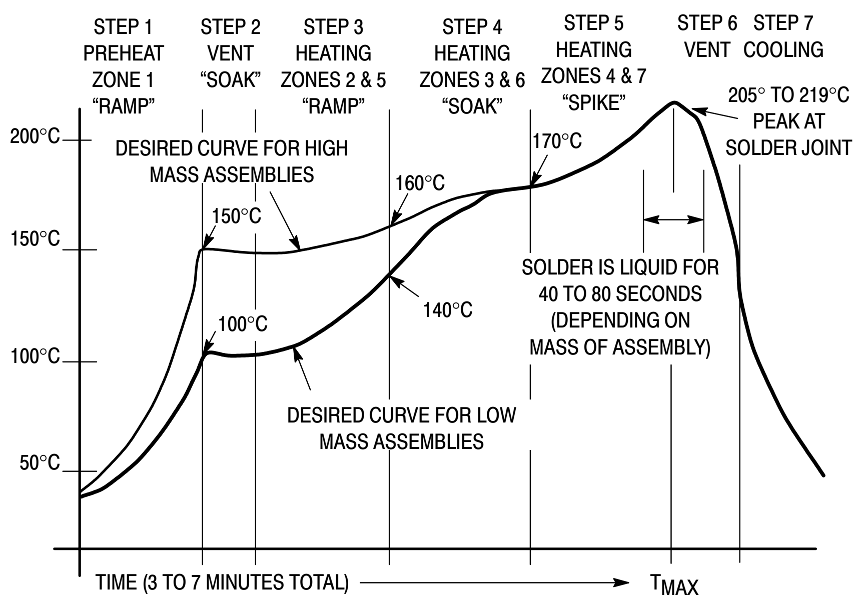


Figure 2. Typical Solder Heating Profile