

STORAGE

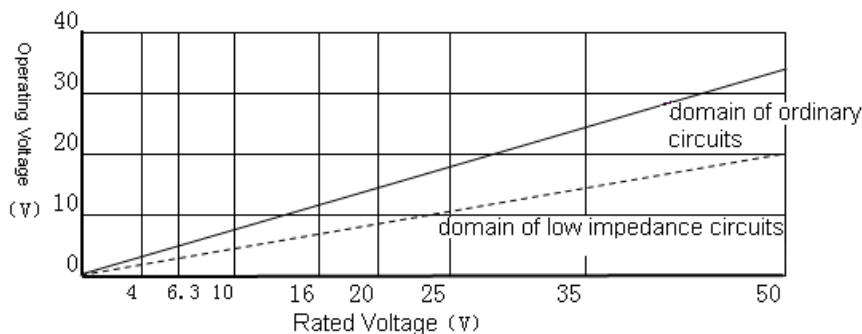
- (1) The solderability of the external electrodes may deteriorate if packages are stored where they are exposed to high humidity. Packages must be stored at 40°C and 70% RH or less.
- (2) The solderability of the external electrode may be deteriorated if packages are stored where they are exposed to dust of harmful gas (e.g. HCl, sulfurous gas of H₂S).
- (3) Packaging material may be deformed if package are stored where they are exposed to heat of direct sunlight.
- (4) The minimum package and polyethylene package should not be opened until the capacitors are used; once they were opened, use the capacitors as soon as possible.
- (5) Solderability specified shall be guaranteed for 3 months from the date of delivery on ideal conditions. For those parts, which passed more than 3 months shall be checked solder-ability before use.

Precautions on Use

- (1) Put on anti-static clothing to avoid ESD.
- (2) Equipments involved in capacitor application (such as soldering irons and measuring instruments) should be properly grounded.
- (3) Avoid touching electrode directly by hand or metal (such as metal table).
- (4) Preheat when soldering
- (5) Operating voltage

The ratio of operating voltage to rated voltage has a great influence on capacitor failures. Please take all specified reliabilities into account and derate operating voltage appropriately when a practical circuit is designed.

- a. The operating voltage of tantalum capacitors used in low impedance circuits, such as filters for power supplies (particularly switching power supplies), should be derated to less than one-third of rated voltage. In other case, keep the operating voltage below tow-thirds of rated voltage.



- b. In low impedance circuits, connecting capacitors in parallel will increase the risk of the failure caused by DC surge current. Please pay attention to the electric charge in capacitor with parallel connection which can be discharged by other capacitors.
- c. Connecting a resistor in series with capacitor is suggested to alleviate the shock caused by excessive momentary current. Please connect a protecting resistor of 3Ω/V or higher in series with the capacitor to keep current below 300mA. If protecting resistors could not be applied; please make sure operating voltage is below one-third of rated voltage

(6) Reverse voltage

Since tantalum capacitor has polarity, do not apply a reverse voltage to it. Do not apply capacitor to a circuit which only has alternating current.

- a. If there is no alternation, applying a low reverse voltage which is listed below to capacitor in a short time is approved:
 At 25°C: ≤10%U_R (rated voltage) or 1V (whichever is lower);
 At 85°C: ≤5%U_R (rated voltage) or 0.5V (whichever is lower);
 At 125°C: 1% of rated voltage, 0.1V for max.
- b. In principle, testing a circuit with tantalum capacitor or capacitor itself by using a resistor gear of millimeters in ignorance of polarity is forbidden.
- c. During measurement and application, if the tantalum capacitor is subjected to an undesirable reverse voltage due to carelessness, please dispose it, even if its electrical characteristics are still qualified.

Precautions on Use

(7) Ripple voltage

Please use the capacitor within permissible ripple voltage.

- The sum of DC bias voltage and the maximum AC branch voltage should not exceed rated voltage during operation.
- The sum of negative peak AC value and DC bias voltage should not exceed the specified reverse voltage.
- Ripple current applied to capacitor will generate active power loss, which will raise the rate of the failure caused by heat due to self-heat generation of capacitor. Therefore, ripple current and permissible power loss must be in control.

(8) Mounting

In mounting, if the capacitor has underwent excessive mechanical and thermal shock which may cause deterioration of electrical characteristics, open circuits and short circuits, please confirm the practical mounting conditions before usage.

(9) When coating products with resin, the relatively high resin curing stress may change the electrical characteristics. For exterior coating, select resin carefully so that electrical and mechanical performance of the product is not affected. Before using, please evaluate reliability with the product mounted in your application set.

(10) When mount chips with adhesive in preliminary assembly, do appropriate check before the soldering stage, i.e., the size of land pattern, type of adhesive, amount applied, hardening of the adhesive on proper usage and amounts of adhesive to use.

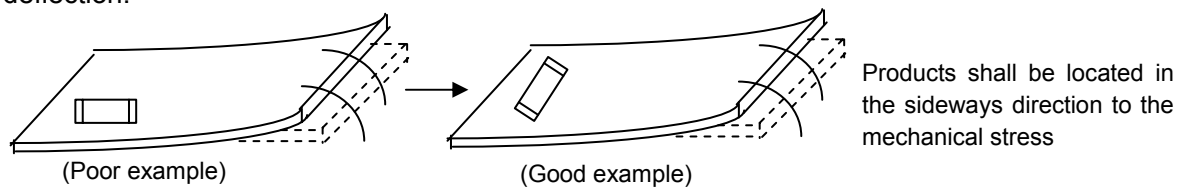
(11) Mounting density: Add special attention to radiating heat of products when mounting other components nearby. The excessive heat by other products may cause deterioration at joint of this product with substrate.

(12) Please do not give the product any excessive mechanical shocks and do not add any shock and power to a product in transportation.

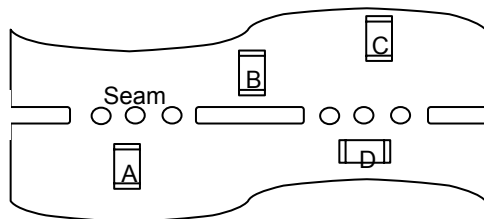
PCB Bending Design

The following shall be considered when designing and laying out PCB's.

(1) PCB shall be designed so that products are not subjected to the mechanical stress from board warp or deflection.



(2) Products location on PCB separation.



Product shall be located carefully because they may be subjected to the mechanical stress in order of $A > C = B > D$.

When splitting the PCB board after mounting beads and other components, care is required so as not to give any stress of deflection or twisting to the board. Board separation should not be done manually, but by using appropriate devices.

Recommended PCB Design for SMT Land-Patterns

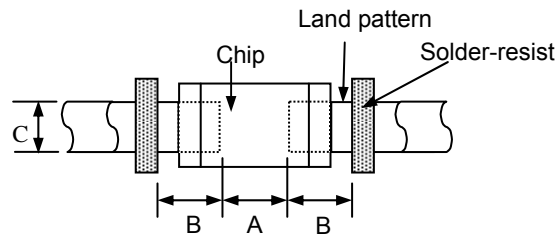
When chips are mounted on a PCB, the amount of solder used (size of fillet) can directly affect chip performance. Therefore, the following items must be carefully considered in the design of solder land patterns:

(1) The amount of solder applied can affect the ability of chips to withstand mechanical stresses which may lead to breaking or cracking. Therefore, when designing land-patterns it is necessary to consider the appropriate size and configuration of the solder pads which in turn determines the amount of solder necessary to form the fillets.

Recommended PCB Design for SMT Land-Patterns

(2) When more than one part is jointly soldered onto the same land or pad, the pad must be designed that each component's soldering point is separated by solder-resist.

The following is recommended land dimensions for a typical chip component land patterns for PCBs.



For reflow soldering (unit: mm)

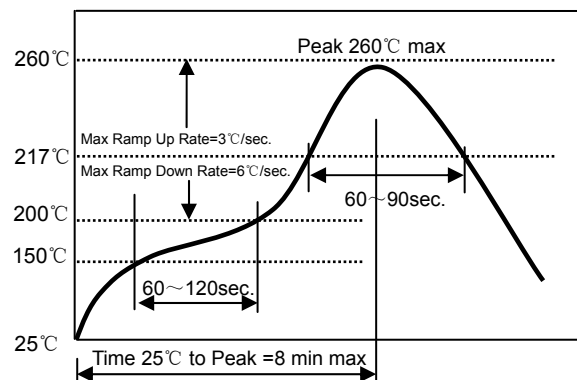
Type	A	B	C
TC2-A/NC2-A	1.1	1.35	1.5
TC2-B/TC3-B/NC2-B	1.4	1.35	2.7
TC2-C/TC3-C/NC2-C	2.9	2.0	2.7
TC2-D/TC3-D/NC2-D	4.1	2.05	2.9
TC2-E/TC3-V/TC3-E/NC2-E	4.1	2.05	2.9

Recommended Soldering Technologies

Reflow Profile

- △ Preheat condition: 150 ~200°C/60~120sec.
- △ Allowed time above 217°C: 60~90sec.
- △ Max temp: 260°C
- △ Max time at max temp: 10sec.
- △ Solder paste: Sn/3.0Ag/0.5Cu
- △ Allowed Reflow time: 2x max

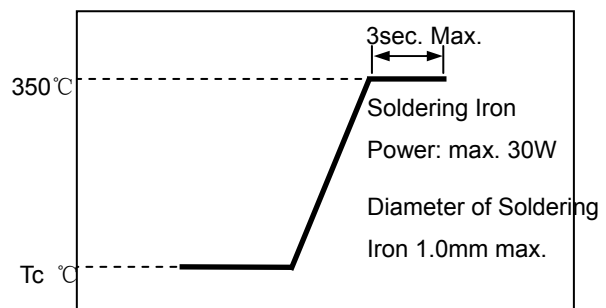
[Note: The reflow profile in the above table is only for qualification and is not meant to specify board assembly profiles. Actual board assembly profiles must be based on the customer's specific board design, solder paste and process, and should not exceed the parameters as the Reflow profile shows.]



Iron Soldering Profile

- △ Iron soldering power: Max. 30W
- △ Pre-heating: 150°C/60sec.
- △ Soldering Tip temperature: 350°C Max.
- △ Soldering time: 3sec. Max.
- △ Solder paste: Sn/3.0Ag/0.5Cu
- △ Max.1 times for iron soldering

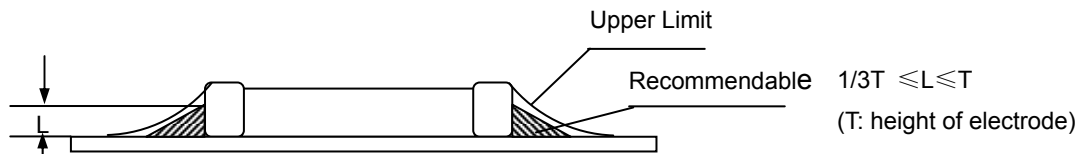
[Note: Take care not to apply the tip of the soldering iron to the terminal electrodes.]



Recommended Soldering Technologies

Solder Volume

Solder shall be used not to exceed as shown below. Exceeding solder volume may cause the failure of mechanical or electrical performance.



Accordingly increasing the solder volume, the mechanical stress to product is also increased. Exceeding solder volume may cause the failure of mechanical or electrical performance.

Cleaning

Products shall be cleaned on the following conditions:

- (1) Cleaning temperature shall be limited to 60°C Max. (40°C Max. for fluoride and alcohol type cleaner.)
- (2) Ultrasonic cleaning shall comply with the following conditions, avoiding the resonance phenomenon at the mounted products and PCB.

Power: 20WMax.

Frequency: 28 kHz to 40 kHz

Time: 5 minutes Max

Notice: Wire Wound product do not recommend for ultrasonic cleaning.

(3) Cleaner

- a Alternative cleaner
 - Isopropyl alcohol (IPA)
 - HCFC-225
- b Aqueous agent
 - Surface Active Agent Type (Clean through-750H)
 - Hydrocarbon Type (Techno Cleaner-335)
 - Higher Alcohol Type (Pine Alpha ST-100S)
 - Alkali saponifier Type (※ Aqua Cleaner 240)

※ Alkali saponification shall be diluted to 20% volume with de-ionized water.

- (4) There shall be no residual flux and residual cleaner after cleaning. In the case of using aqueous agent, product shall be dried completely after rinse with de-ionized water in order to remove the cleaner.
- (5) Some products may become slightly whitened. However, product performance or usage is not affected.