[10] Cautions in mounting and handling

To ensure safe operation over a long period of time, follow the precautions on handling shown below.

[10-1] Soldering

When a semiconductor device is soldered, the temperature of the lead exceeds the maximum rated storage temperature. Since quality assurance regarding the resistance against soldering is applicable to the level shown below, perform soldering within the listed range.

(a) Recommended mounting condition

<table>
<thead>
<tr>
<th>Packages</th>
<th>Wave Soldering (Full dipping)</th>
<th>Wave Soldering (Only terminal)</th>
<th>Infrared Reflow</th>
<th>Air Reflow</th>
<th>Soldering iron (Re-work)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TO-247</td>
<td>×</td>
<td>◎</td>
<td>×</td>
<td>×</td>
<td>◯</td>
</tr>
</tbody>
</table>

◎: Possible  ○: Limited to 1 time  ×: Unable

<table>
<thead>
<tr>
<th>Soldering temp.</th>
<th>Immersion time</th>
</tr>
</thead>
<tbody>
<tr>
<td>260±5°C</td>
<td>10±1 sec</td>
</tr>
<tr>
<td>350±10°C</td>
<td>3.5±0.5 sec</td>
</tr>
</tbody>
</table>

(b) The immersion depth of the lead should be up to 1 to 1.5 mm from the device main unit.

(c) Be careful not to let the device main unit be immersed in soldering liquid when mounting the device by the solder flow method.

(d) When using a flux, it is desirable to use rosin series flux, and not chlorine series flux.
[10-2] Processing and mounting of through hole terminal

Handling of lead wire of resin-sealed power transistor

(a) Stress to the lead wire

If stress of more than necessary is applied to the electrode lead of a semiconductor device, the internal chips and external package may be damaged. To prevent this from occurring, keep the load applied in the direction shown in Fig.10-1 to 1kg or lower.

(b) Caution in molding a lead

If there is no other choice but to mold a lead for convenience of parts layout, pay attention to the following:

- Provide an exclusive jig that does not allow stress shown in Fig.10-2 to be applied.
- When bending the lead in the horizontal direction, bend it at the thin portion or at the part 4.5mm or more away from the transistor main unit, and keep the bending angle within 30°.
- When bending the lead at the right angle against the type displaying surface, bend it at the portion 4.5mm or more away from the transistor main unit.
- Molding should be performed only once at a place, and do not perform re-molding or restore the original shape.

(c) Insertion into the printed board

When inserting a lead to the printed board, coincide the interval of lead wires and that of insertion holes to prevent excessive stress from being applied to the root portion of the leads.

To prevent the lead soldered to the printed board from being forcibly bent to mount it to a radiator plate, perform mounting work first and then perform soldering.
[ 10-3 ] Washing
When soldering is performed using a flux, washing with solvent is required in general. In this case, pay attention to the following:

(a) Solvent
   • Do not use flammable, toxic, or corrosive solvents.
   • Never use a trichloroethylene series solvent because it contains chlorine.

(b) Washing method
   It is desirable to perform washing by immersing the portion to be washed. If ultrasonic washing is to be performed, set the frequency, avoiding the resonance point (several tens of kHz), and pay attention not to let the device or printed board to directly contact the oscillation source.

[ 10-4 ] Mounting to a radiator plate
(a) If the fastening torque of the screw for mounting is too low, the thermal resistance increases. On the contrary, if it is too high, the device may be deformed, thus resulting in a failure. Consequently, it is recommended to fasten the screws at the torque listed in Table.10-1.

Table.10-1  Semiconductor device fastening torque

<table>
<thead>
<tr>
<th>Package</th>
<th>Diameter of mounting hole</th>
<th>Screws used</th>
<th>Optimum fastening torque (N•cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TO-247</td>
<td>φ3.2</td>
<td>M3</td>
<td>40-60</td>
</tr>
</tbody>
</table>

(b) It is recommended to apply a compound thinly and uniformly to improve the thermal conductivity between the semiconductor device main unit and the radiation plate, thus improving heat dissipation effect.

(c) Application of thermal compound
   As a method for allowing a thermal compound to exist between the device and a cooling body, a compound is applied uniformly to the device, which is then mounted to the cooling body. As a method for filling the gap between the device and the cooling body with a compound, apply an appropriate amount of compound to the case immediately below the semiconductor device chip-mounting portion in a shape of a point, and fasten the device to the cooling body with screws, and the compound expands, filling the gap, and a compound layer containing few air bubbles can thus be formed easily.

(d) We recommend the processing accuracy of ±50μm for the device mounting surface of the radiator plate.

(e) When fastening one device with screws at 2 positions, pay special attention to fasten the screws uniformly.

(f) Surface flatness ≤ ±30μm

(g) Surface roughness ±10μm

(h) Do not taper threaded holes.