

**GENERAL DATA AND INSTRUCTIONS**

**General rules**

1. Fasten the device to the heatsink before soldering the leads.
2. Avoid stress to the leads.
3. Keep mounting tool (e.g. Screwdriver) clear of the plastic body.
4. When screw mounting, the rectangular washer should not exert any force on the plastic part of the body.

**Mounting methods**

CLIP MOUNTING

Mounting with a spring clip gives:

- a) A good thermal contact under the crystal area, and slightly lower thermal resistance than screw mounting.
- b) Safe insulation for mains operation.

Minimum force for good heat transfer is 10 N.

Maximum force to avoid damaging the device is 80 N.

M3 SCREW MOUNTING

It is recommended that a metal washer is inserted between screw head and mounting tab.

Do not use self-tapping screws.

Mounting torque for screw mounting:

For thread-forming screws these are final values.

Minimum torque for good heat transfer is 0.55 Nm.

Maximum torque to avoid damaging the device is 0.80 Nm.

When a nut or screw is driven directly against the tab, the torques are as follows:

Minimum torque for good heat transfer is 0.40 Nm.

Maximum torque to avoid damaging the device is 0.60 Nm.

RIVET MOUNTING NON-INSULATED.

The device should not be pop-riveted to the heatsink. It is permissible to press-rivet the metal tab providing that eyelet rivets of soft material are used, and the press forces are slowly and carefully controlled.

This method is not permitted for full-pack envelopes (SOT186 and SOT186A) because it will damage the plastic encapsulation.

**Heatsink requirements**

Flatness in the mounting area: 0.02 mm maximum per 10 mm.

Mounting holes must be deburred, for further information see clip and screw mounting instructions.

**Heatsink compound**

The thermal resistance from mounting base to heatsink ( $R_{th\ mb-h}$ ) can be reduced by applying a metallic oxide compound between the contact surfaces. Values given are of thermal resistance using this type of compound. Dow Corning 340 Heat sink compound is recommended. For insulated mounting, the compound should be applied to the bottom of both device and insulator.

**Thermal data for TO220 envelopes with various heatsink mounting methods**

Typical figures, for exact figures see data for each device type.

$R_{th\ mb-h}$	Thermal resistance from mounting base to heatsink	K/W	
		clip	screw
	<b>Mounting method</b>		
	direct with heatsink compound	0.3	0.5
	direct without heatsink compound	1.4	1.4
	with heatsink compound and 0.1 mm maximum mica insulator	2.2	-
	with heatsink compound and 0.25 mm maximum alumina insulator	0.8	-
	with heatsink compound and 0.05 mm mica insulator		
	insulated up to 500 V	-	1.4
	insulated up to 800 V / 1000 V	-	1.6
	without heatsink compound and 0.05 mm mica insulator		
	insulated up to 500 V	-	3.0
	insulated up to 800 V / 1000 V	-	4.5

Additional insulators are generally not required when mounting the full-pack (SOT186 and SOT186A) envelopes.

**Soldering**

Recommendations for devices with a maximum storage temperature rating  $\leq 175\text{ }^\circ\text{C}$ :

DIP OR WAVE SOLDERING.

Maximum permissible solder temperature is  $260\text{ }^\circ\text{C}$  at a distance from the body of  $> 5\text{ mm}$  and for a total contact time with soldering bath or waves of  $< 7\text{ s}$ .

**HAND SOLDERING.**

Maximum permissible temperature is 275 °C at a distance from the body of > 3 mm and for a total contact time with the soldering iron of < 5 s.

The body of the device must not touch anything with a temperature > 200 °C.

It is not permitted to solder the metal tab of the device to a heatsink, otherwise the junction temperature rating will be exceeded.

Avoid any force on body and leads during or after soldering; do not correct the position of the device or of its leads after soldering.

**Lead bending**

Maximum permissible tensile force on the body for 5 seconds is 20 N.

The leads can be bent, twisted or straightened. To keep forces within the above mentioned limits the leads should always be clamped rigidly near the body during bending. This is also to prevent damage to the seal of the leads within the plastic body.

Leads can be bent as near to the body as required, but adequate length should always be allowed for clamping. This is a minimum of 1.75 mm from the body to the start of a bend radius.

The internal radius of bend should never be less than the thickness of the lead. A minimum radius of at least 1.5 x

lead thickness is preferred. See figure 1. Surface cracks in the dip tin coating on the lead are common when a radius less than 1.5 x lead thickness is used. Although exposing the copper material, these cracks do not affect the mechanical strength of the lead. Lead forming by Philips is available as an option on all products supplied in these outlines.

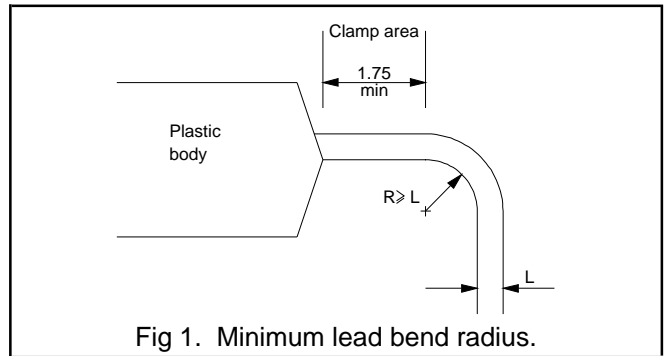


Fig 1. Minimum lead bend radius.

**Additional guidelines**

It is recommended that where a device is rigidly secured to a heatsink which is in turn rigidly secured to a PCB, that a bend is put in the leads to act as an expansion loop. This will prevent differential expansion of the mounting parts transferring stress to the soldering joint, as shown in figure 2 below. This is only necessary where the device is mounted so rigidly that expansion forces are transmitted through the assembly.

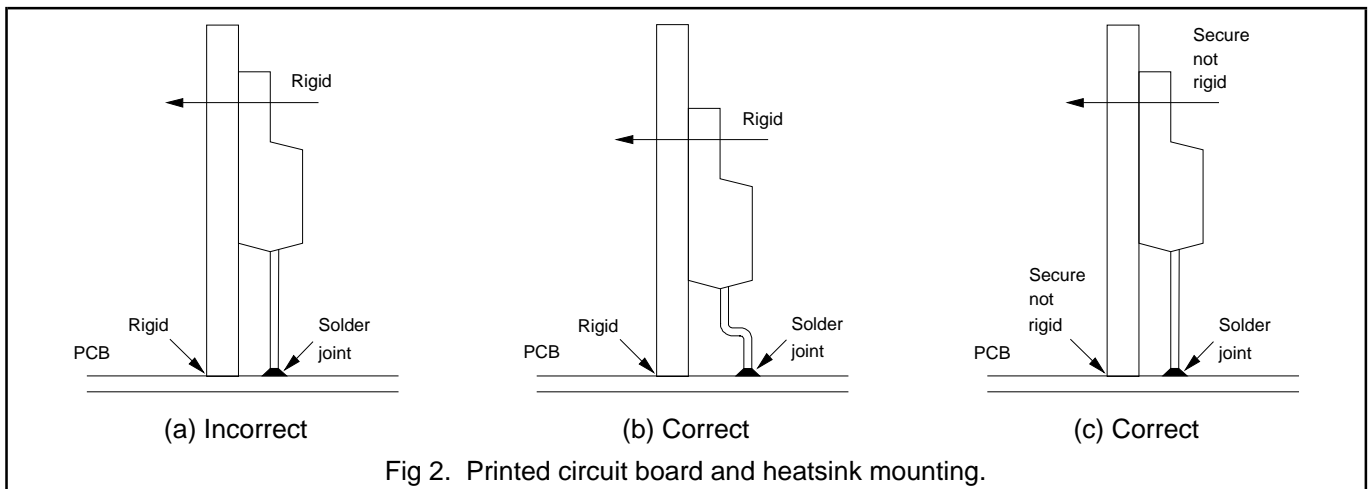


Fig 2. Printed circuit board and heatsink mounting.

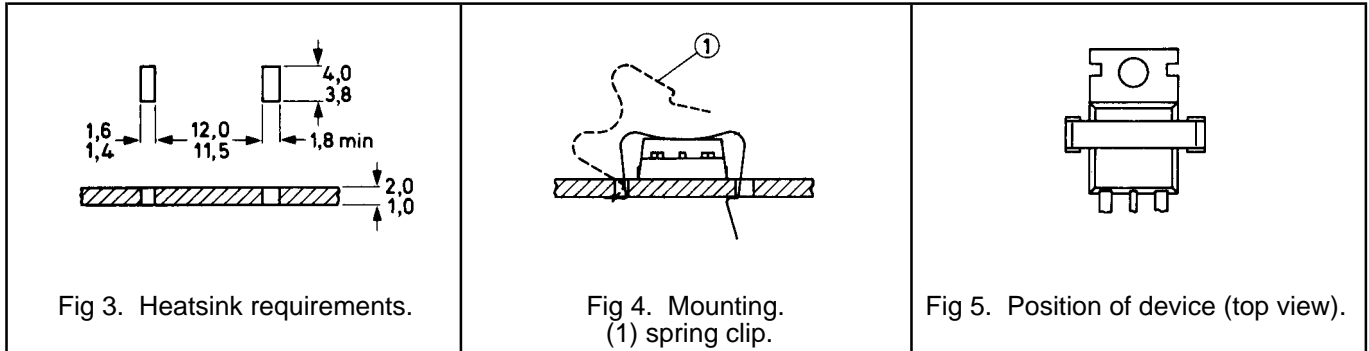
**INSTRUCTIONS FOR CLIP MOUNTING**

**Direct mounting with spring clip**

1. Apply heatsink compound to the mounting base, then place the device on the heatsink.
2. Push the short end of the clip into the narrow slot in

the heatsink with the clip at an angle of 10° to 30° to the vertical. See figures 3 and 4.

3. Push down the clip over the device until the long end of the clip snaps into the wide slot in the heatsink. The clip should bear on the plastic body, not on the tab. See figure 5.

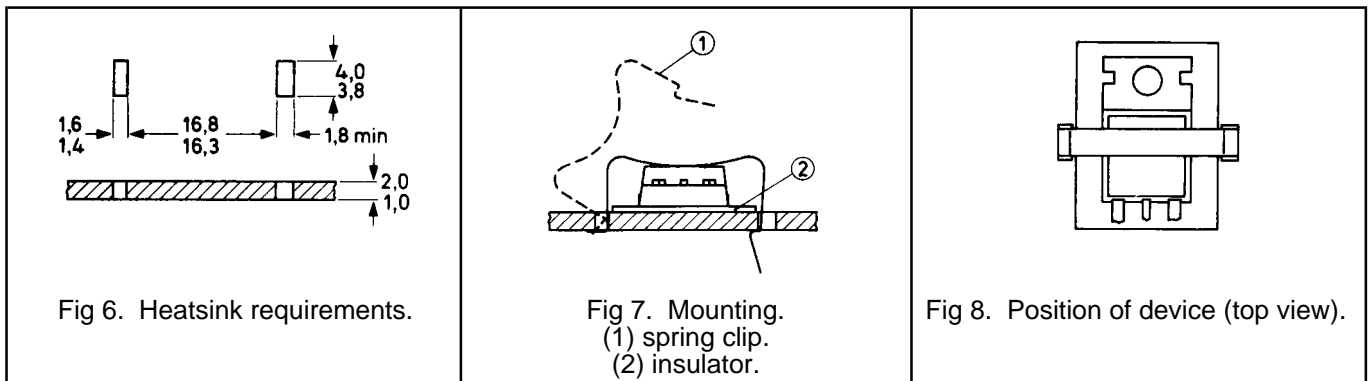


**Insulated mounting with spring clip**

1. Apply heatsink compound to the bottom of both device and insulator, then place the device with the insulator on the heatsink.
2. Push the short end of the clip into the narrow slot in the heatsink with the clip at an angle of 10° to 30° to

the vertical. See figures 6, 7 and 8.

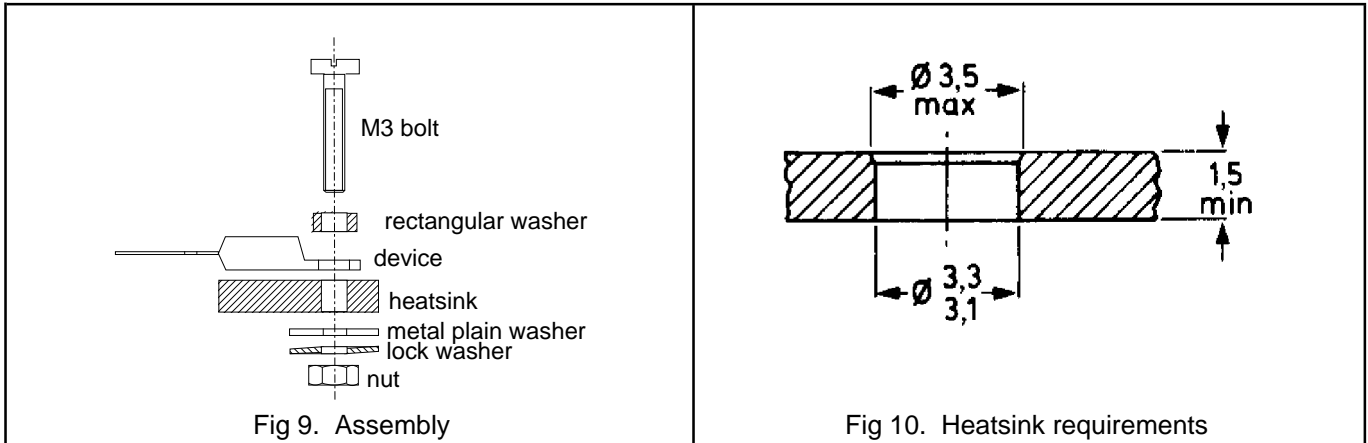
3. Push down the clip over the device until the long end of the clip snaps into the wide slot in the heatsink. The clip should bear on the plastic body, not on the tab. Ensure that the device is centred on the mica insulator to prevent unwanted movement.



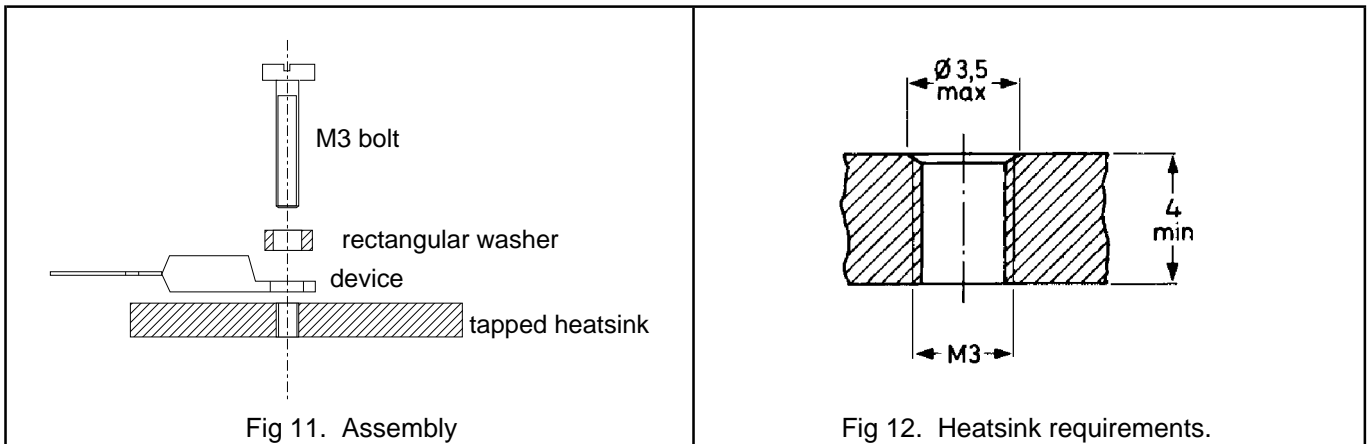
### INSTRUCTIONS FOR SCREW MOUNTING

#### Direct mounting with screw and spacing washer

THROUGH HEATSINK WITH NUT



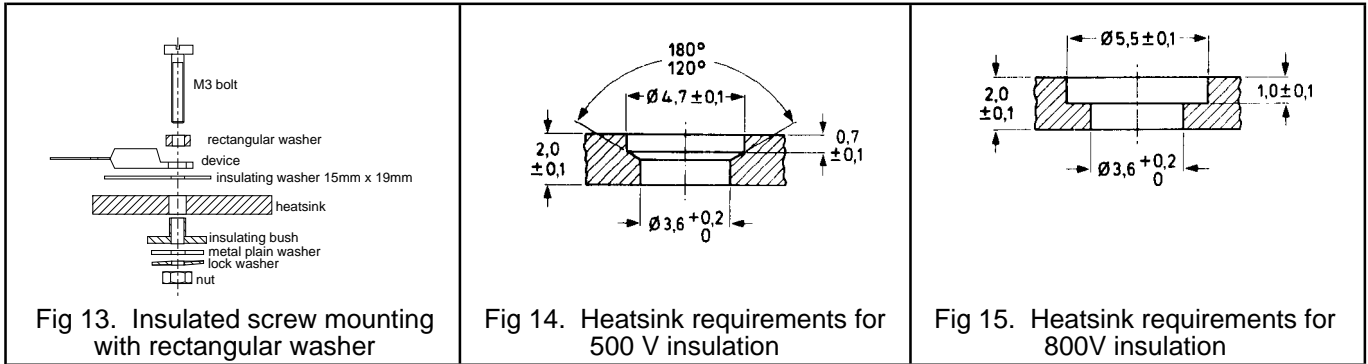
INTO TAPPED HEATSINK



**Insulated mounting with screw and spacing washer**

Not recommended where mounting tab is at mains voltage. Not applicable for SOT186 or SOT186A.

THROUGH HEATSINK WITH NUT



INTO TAPPED HEATSINK

