Assembly Instructions

General

Optoelectronic semiconductor devices can be mounted in any position. Connection wires may be bent provided the bend is not less than 1.5 mm from the bottom of the case. During bending, no forces must be transmitted from the pins to the case (e.g., by spreading the pins).

If the device is to be mounted near heat generating components, the resultant increase in ambient temperature should be taken into account.

Soldering Instructions

Protection against overheating is essential when a device is being soldered. It is recommended, therefore, that the connection wires are left as long as possible. The time during which the specified maximum permissible device junction temperature is exceeded at the soldering process should be as short as possible (one minute maximum). In the case of plastic encapsulated devices, the maximum permissible soldering temperature is governed by the maximum permissible heat that may be applied to the encapsulant rather than by the maximum permissible junction temperature.

The maximum soldering iron (or solder bath) temperatures are given in Tab. 5. During soldering, no forces must be transmitted from the pins to the case (e.g., by spreading the pins).

Table 1. Maximum Soldering Temperatures

Iron soldering				Wave soldering		
	Iron temperature	Distance of the soldering position from the lower edge of the case	Maximum allowable soldering time	Soldering temperature see temperature-time profiles	Distance of the soldering position from the lower edge of the case	Maximum allowable soldering time
Devices in metal case	≦245°C	≧1.5 mm	5s	245°C	≧1.5 mm	5s
	≦245°C	≧5.0 mm	10s			
	≦350°C	≧5.0 mm	5s	300°C	≧5.0 mm	3s
Devices in plastic case ≥3 mm	≦260°C	≧2.0 mm	5s	235°C	≧2.0 mm	8s
	≦300°C	≧5.0 mm	3s	260°C	≧2.0 mm	5s
Devices in plastic case <3 mm	≦300°C	≧5.0 mm	3s	260°C	≧2.0 mm	3s
TELUX	≦260°C	≧2.0 mm	5s	260°C	≧1.5 mm	5s

Soldering Methods

There are several methods in use to solder devices on to the substrate. Some of them are listed in the following:

(a) Soldering in the vapor phase

Soldering in saturated vapor is also known as condensation soldering. This soldering process is used as a batch system (dual vapor system) or as a continuous single vapor system. Both systems may also include preheating of the assemblies to prevent high temperature shock and other undesired effects.

(b) Infrared soldering

With infrared (IR) reflow soldering the heating is contact-free and the energy for heating the assembly is derived from direct infrared radiation and from convection.

The heating rate in an IR furnace depends on the absorption coefficients of the material surfaces and on the ratio of the component's mass to its irradiated surface.

The temperature of parts in an IR furnace, with a mixture of radiation and convection, cannot be determined in advance. Temperature measurement may be performed by measuring the temperature of a certain component while it is beeing transported through the furnace.

The temperatures of small components, soldered together with larger ones, may rise up to 280°C. Influencing parameters on the internal temperature of the component are as follows:

- Time and power
- Mass of the component
- Size of the component
- Size of the printed circuit board
- Absorption coefficient of the surfaces
- Packing density
- Wavelength spectrum of the radiation source
- Ratio of radiated and convected energy

Temperature-time profiles of the entire process and the influencing parameters are given in figure 1.

(c) Wave soldering

In wave soldering, one or more continuously replenished waves of molten solder are generated, while the substrates to be soldered are moved in one direction across the wave's crest.

Temperature-time profiles of the entire process are given in figure 2.

(d) Iron soldering

This process cannot be carried out in a controlled way. It should not be considered for use in applications where reliability is important. There is no SMD classification for this process.

(e) Laser soldering

This is an excess heating soldering method. The energy absorbed may heat the device to a much higher temperature than desired. There is no SMD classification for this process at the moment.

(f) Resistance soldering

This is a soldering method which uses temperature controlled tools (thermodes) for making solder joints. There is no SMD classification for this process at the moment.

Warning

Devices in PLCC-packages are sensitive to moisture release if they are subjected to infrared reflow or a similar solder process (e.g. wave soldering). After opening the bag, they must be:

1. stored at ambient of <20% relative humidity (RH)
2. mounted within 72 hours at factory conditions (<30°C/60% RH)

Devices require baking before mounting if 1. or 2. is not met and humidity indicator card is > 20% at 23 ± 5°C. If baking is required, devices may be baked for 192 hours at 40°C +5°C –0°C and <5% RH.
For any devices avoid any mechanical stress on the package via the leads.

Temperature-Time Profiles

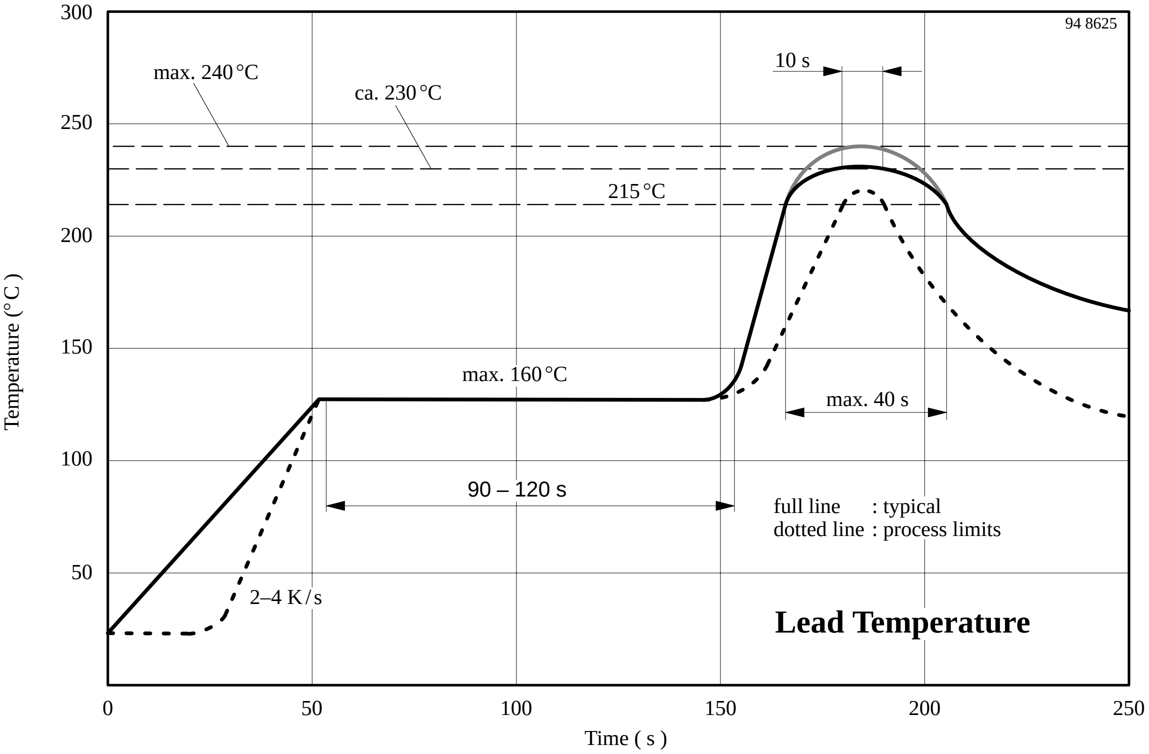

Figure 1. Infrared reflow soldering of opto devices (SMD package)

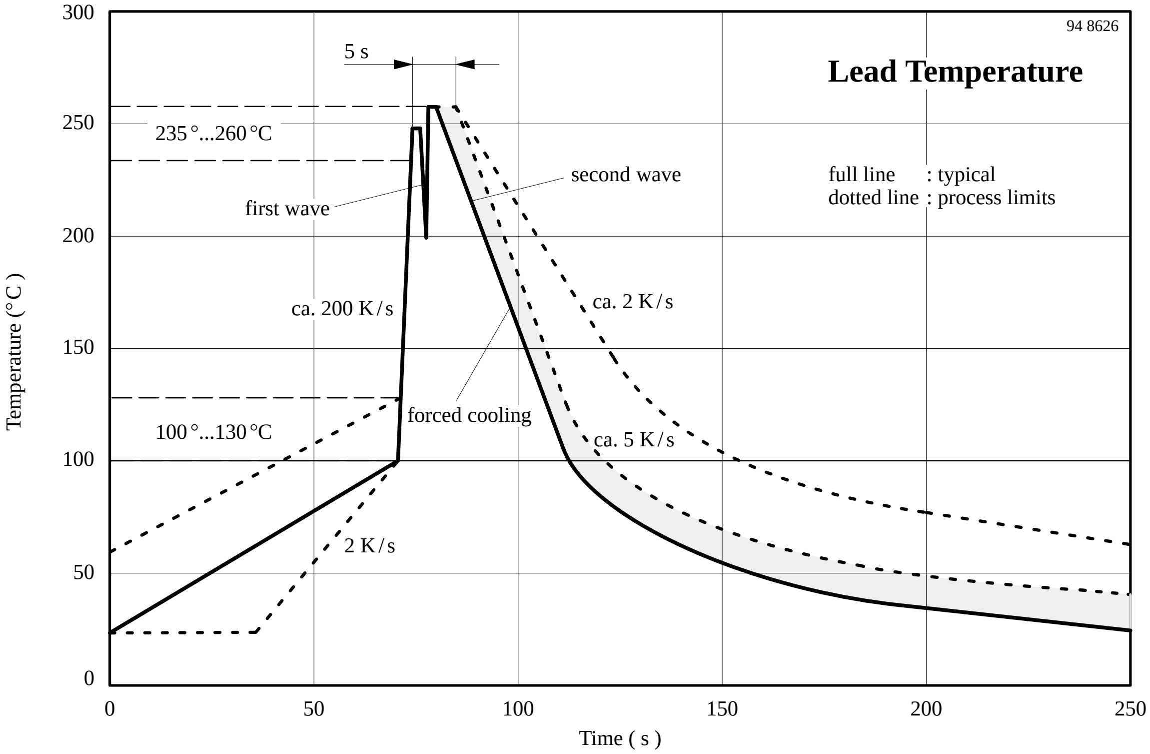

Figure 2. Double wave soldering of opto devices (all packages)

Heat Removal

To keep the thermal equilibrium, the heat generated in the semiconductor junction(s) must be removed and the junction returned to ambient temperature.

In the case of low power devices, the natural heat conductive path between the case and surrounding air is usually adequate for this purpose. The heat generated in the junction is conveyed to the case or header by conduction rather than convection. A measure of the effectiveness of heat conduction is the inner thermal resistance or thermal resistance junction case, R_{thJC}, the value of which is governed by the construction of the device.

Any heat transfer from the case to the surrounding air involves radiation convection and conduction, the effectiveness of transfer being expressed in terms of an R_{thCA} value, i.e., the external or case ambient thermal resistance. The total thermal resistance, junction ambient is consequently:

$R_{thJA} = R_{thJC} + R_{thCA}$

The total maximum power dissipation, $P_{tot\,max}$ of a semiconductor device can be expressed as follows:

$$P_{tot\,max} = \frac{T_{jmax} - T_{amb}}{R_{thJA}} = \frac{T_{jmax} - T_{amb}}{R_{thJC} + R_{thCA}}$$

where:

T_{jmax}	the maximum allowable junction temperature
T_{amb}	the highest ambient temperature likely to be reached under the most unfavorable conditions
R_{thJC}	the thermal resistance, junction case
R_{thJA}	the thermal resistance, junction ambient, is specified for the components. The following diagram shows how the different installation conditions effect the thermal resistance
R_{thCA}	the thermal resistance, case ambient. R_{thCA} depends on cooling conditions. If a heat dissipator or sink is used, R_{thCA} depends on the thermal contact between case and heat sink, heat propagation conditions in the sink and the rate at which heat is transferred to the surrounding air.

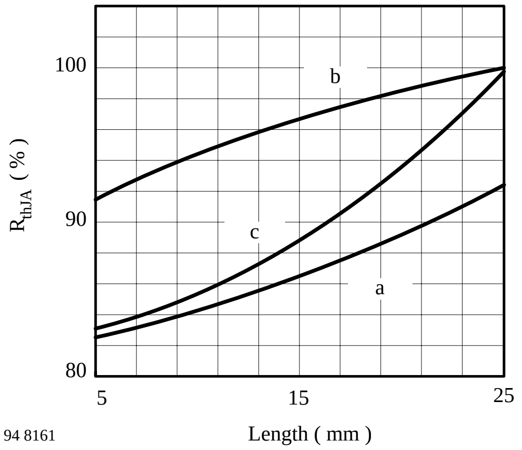

Figure 3. Thermal resistance junction/ambient vs. lead length

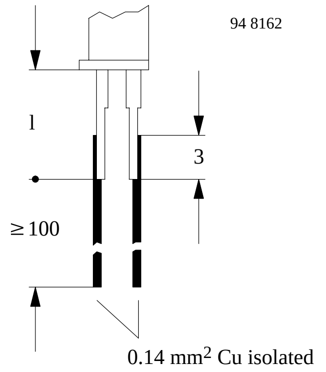

Figure 4. In the case of wire contacts (curve b, figure 3)

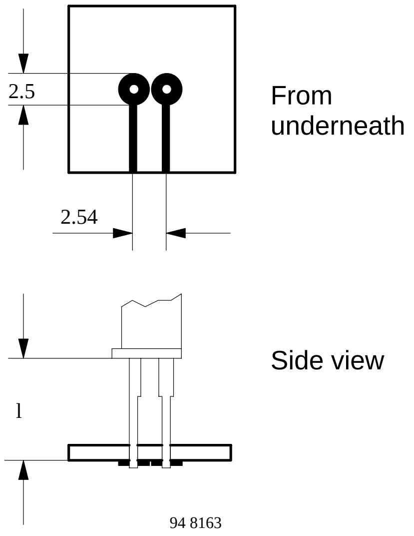

Figure 5. In the case of assembly on PC board, no heatsink (curve c, figure 3)

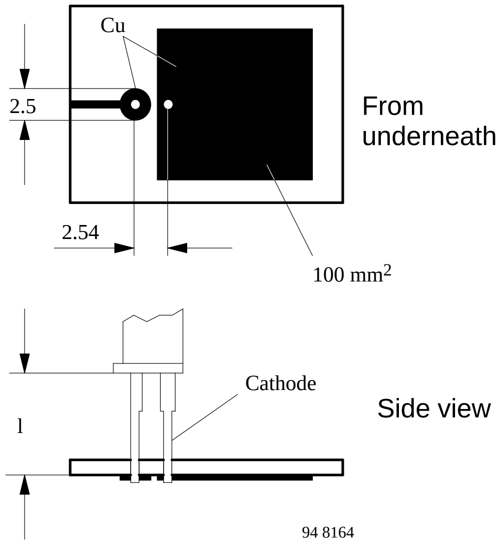

Figure 6. In the case of assembly on PC board with heatsink (curve a, figure 3)

Cleaning

Soldered assemblies are washable with the following solvents:

1) A mixture of 1, 1.2-trichlorotrifluoroethane, 70 ± 5% by weight and 2-propanol (isopropyl alcohol), 30 ± 5% by weight. Commercially available grades (industrial use) should be used.

   Warning: The component 1, 1.2-trichlorofluoroethane is hazardous to the environment. Therefore this solvent must not be used where the solvent specified in 2 or 3 is adquate.

2) 2-propanol (isopropyl alcohol). Commercially available grades (industrial use) should be used.

3) Demineralized or distilled water having a resistivity of not less than 500 mΩ corresponding to a conductivity of 2 mS/m.

Caution: The use of tetrachlor, acetone, trichloroetylene or similar is **NOT ALLOWED!**

Warning

Exceeding any one of the ratings (soldering, cleaning or short time exceeding the railings) could result in irreversible changes in the ratings.