HSSOP31 Package Application Note
Mounting Procedure and Instructions for Adding a Heat Sink

Introduction

This document sets out the mounting procedure and instructions for adding a heat sink to the HSSOP31 package.

Content

1. Features and benefit of the HSSOP31 package

HSSOP31 is a thin and compact package featuring a simplified substrate wiring format with the high-voltage terminals and control terminals on opposite sides of the package. It is available in two configurations: with the exposed parts of the metal frame either facing the substrate or facing upwards.

The metal frame should not be soldered to components such as the heat sink or substrate. Where a heat sink is deemed necessary to dissipate heat associated with the ambient temperature or heat from internal components or peripheral devices, refer to Section 6 below.

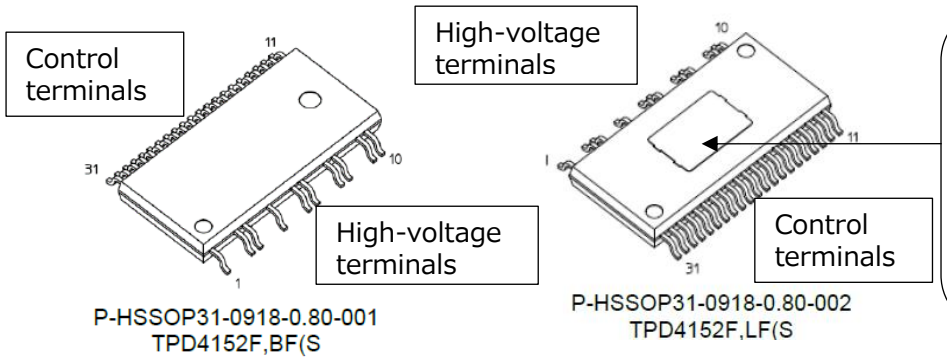

Figure 1 HSSOP31 package

2. Markings

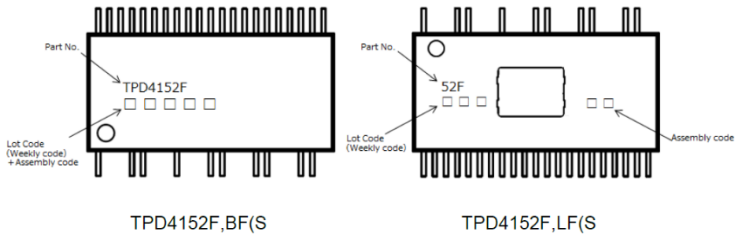

Figure 2 HSSOP31 package typical markings

3. Dimensions

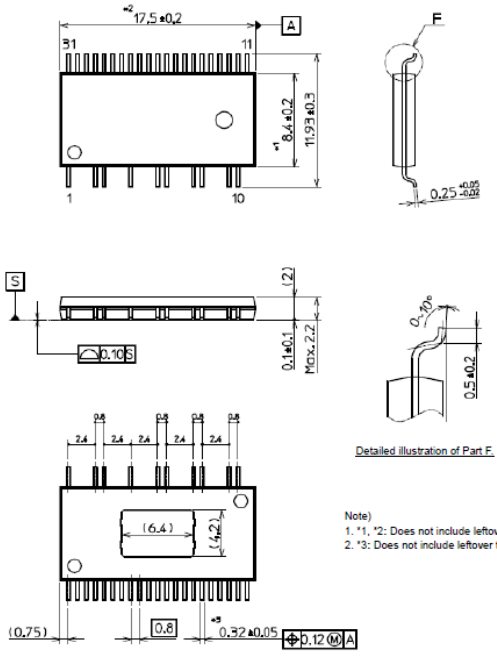

Figure 3 P-HSSOP31-0918-0.80-001

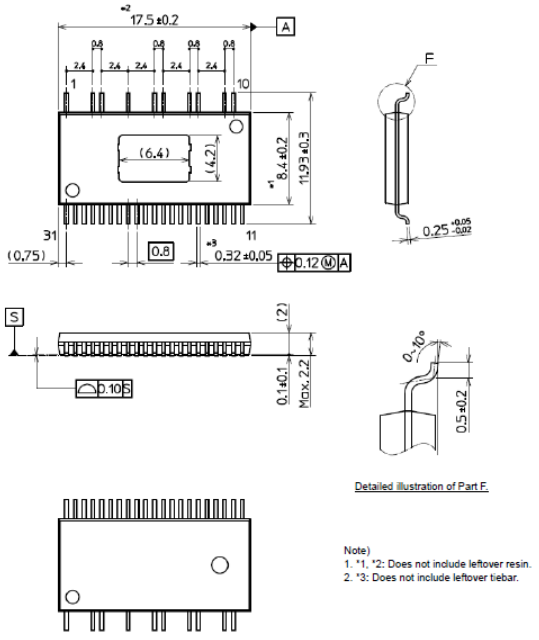

Figure 4 P-HSSOP31-0918-0.80-002

4. Pad dimensions

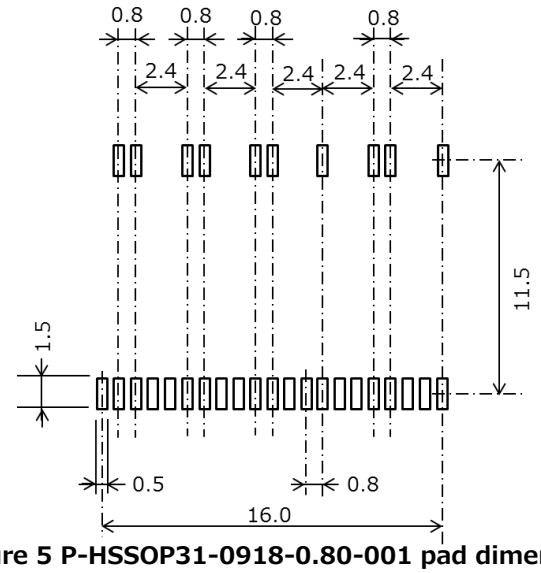

Figure 5 P-HSSOP31-0918-0.80-001 pad dimensions

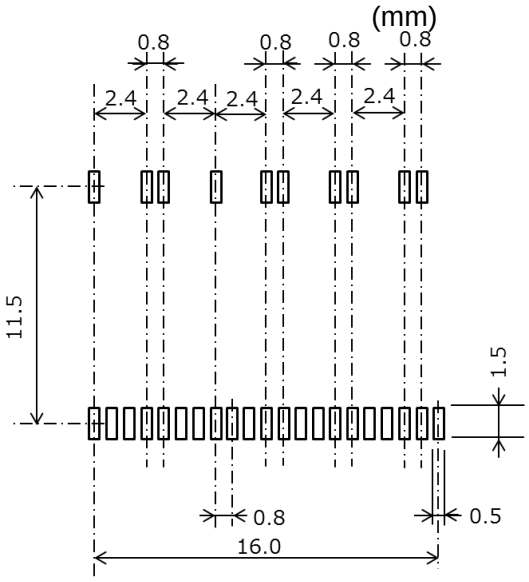

Figure 6 P-HSSOP31-0918-0.80-002 pad imensions

5. Mounting procedure

● Requirements

Reflow	Flow	Soldering iron
Up to three uses	Not supported	Single use only

① Reflow
Peak temperature: Maximum 260°C (instantaneous)
Internal device temperature/period: 230°C or more for 30 – 50 sec
Pre-heat temperature/period: 180 - 190°C for 60 – 120 sec

Note: Maximum mounting temperature is based on package surface temperature.

Figure 7 shows the temperature profile.
This profile represents the maximum device temperature at which device performance can be guaranteed.
The pre-heat temperature and heating temperature will be governed by factors such as the type of solder paste used, but must be within the range shown in Figure 7.

The package is carefully wrapped to be protected against humidity.

After unwrapping, the package should be maintained at 30°C and 60% RH until the final reflow stage, and mounting should be completed within 168 hours.

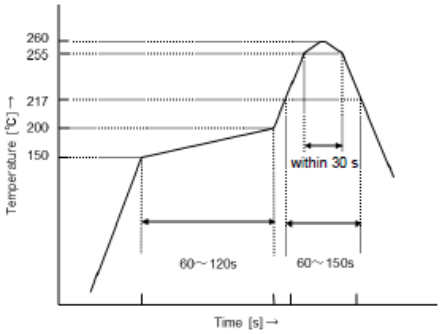

Figure 7 Typical package temperature profile

② Flow
This package is not suitable for solder flow mounting.

③ Soldering iron
Heating: Via lead tip of soldering iron
Maximum 400°C (at tip) for no more than 3 sec
Repetitions: No repetitions (once only per terminal)

● Other
Check solder bonding strength via in-house testing at the substrate mounting stage.

6. Adding a heat sink

In some cases a heat sink may be necessary to dissipate heat associated with the ambient temperature or heat from internal components or peripheral devices.

● Typical example

① Using insulating sheet

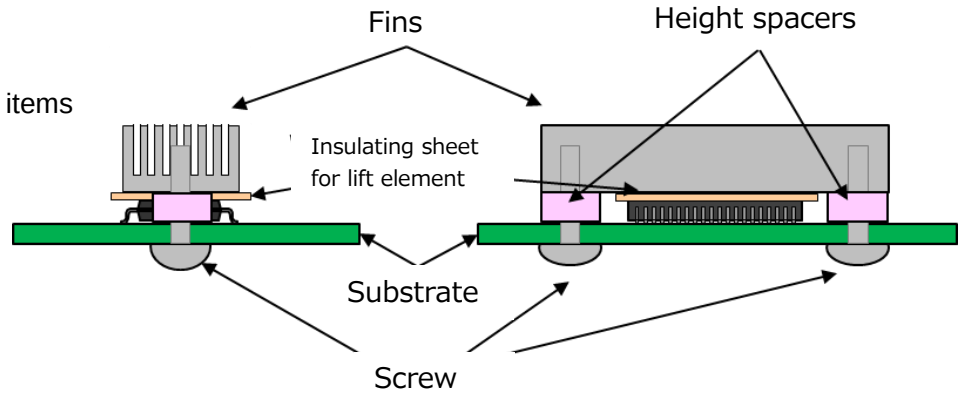

Table 2 Required items

Screws	M3
Insulating material	0.5 mm soft material
Spacers	t = 2.5 mm, hole diameter = 3.2 mm

Figure 8 Adding a heat sink using insulating sheets

② Plastic or gel insulation

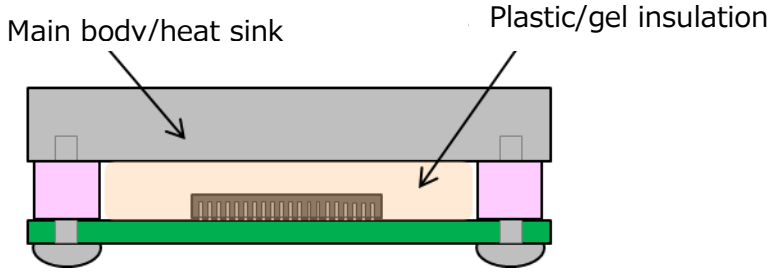

Figure 9 Adding a heat sink using plastic or gel insulation

● Insulating sheet and buffer material

Heat fins fixed to the top of the package can cause device failure due to heat stress. Hard components (such as the heat sink) should be mounted onto the package together with a buffer layer (typically soft insulating sheet or conductive gel). Silicon grease should be avoided.

● Mounting to substrate

Where the HSSOP31 package is sandwiched between the heat sink and the substrate, it the static load should be no greater than 10 N. The load should be spread uniformly across the device, and screw mountings should not result in substrate bending as shown in Figure 10, as the resulting distortion could cause device damage or failure. Consider using spacers or equivalent to attach the heat sink so as to prevent substrate bending.

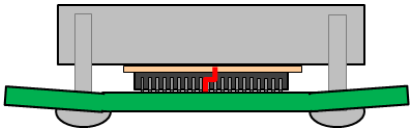

Figure 10 Substrate bending

● Flatness

The surface beneath the heat sink to which the device is attached must be suitably smooth and flat. The heat sink should likewise show no signs of warping or undulation and should be free of foreign matter such as burrs and scraps from pressing and cutting processes. In the worst-case scenario this could lead to device failure.

■ Other important information

・ The HSSOP31 package is a MOS device and as such should be shielded from electrostatic sources at all times.

・ The product has exposed metal frame on one side at the same electrical potential as the GND terminals (pin 11/31). Do not allow live current to pass through the exposed metal frame. Insulating material may be required between the heat sink and/or substrate. Do not use solder between the metal frame and the heat sink or substrate.

7. Calculating the junction temperature and choosing a heat sink

The device junction temperature (bonding temperature) can be estimated from the case temperature and device loss as follows.

$$Tj = Tc + P \times Rjc$$

where

Tj is maximum junction temperature (°C)

Tc is case temperature (°C)

P is device loss (W)

Rjc is heat resistance between case and junction (°C/W) = 5.22 °C/W approx.

Use the equation below to select the optimum heat sink.

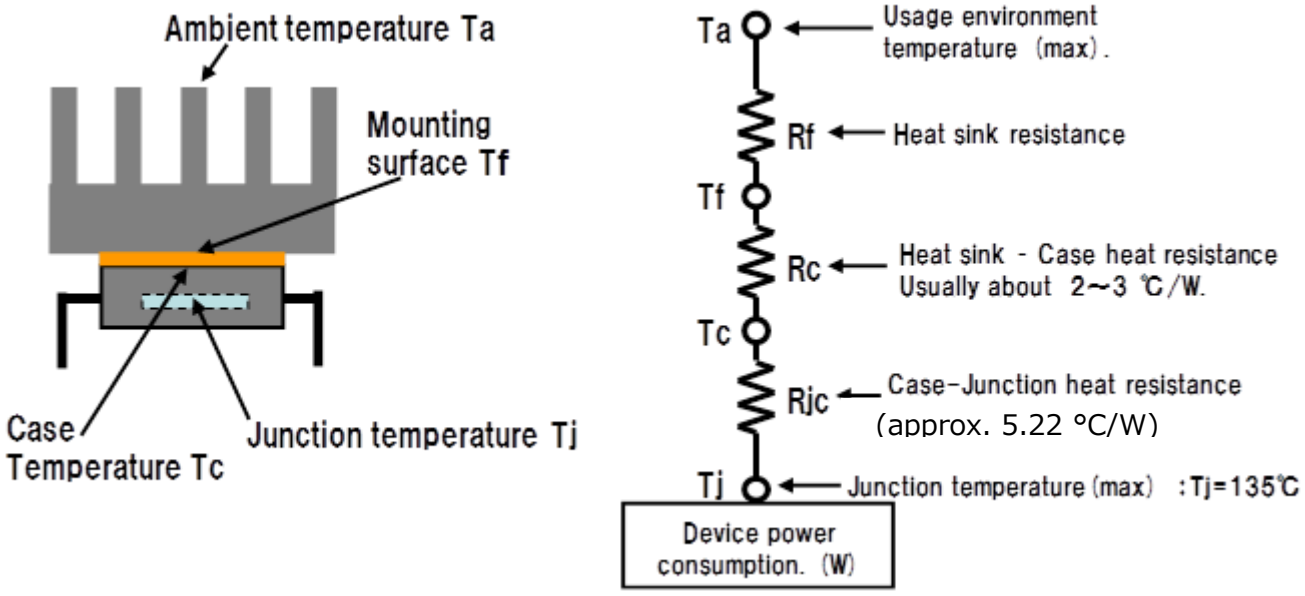

Figure 11 Selecting a heat sink

From the above, we have:

$Rf + Rc + Rjc < (Tj-Ta)/Rjc$

If maximum operating temperature T_a = 50°C, maximum junction temperature T_j = 135°C x 80%, thermal resistance between heat sink and case R_c = 3°C/W and thermal resistance between case and junction R_{jc} = 5.22°C/W then:

$Rf + 3 + 5.22 < (135 \times 0.8 - 50)/5$
$Rf < 3.38$ °C/W

In this case, the heat sink should have thermal resistance no greater than 3.38 °C/W.

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