VISHAY SEMICONDUCTORS

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Mounting Instructions for Single In-Line Package Modules

By Kevin Liu

This application note introduces Vishay´s single in-line package (SIP) modules. It covers their key features and gives instructions for using heatsinks with the modules.

SIP modules are designed to provide reliable performance. A single housing is used to integrate the power components, providing higher power density.

Various die selections are available in several configurations.

These modules are more efficient than comparable bipolar transistor modules, while at the same time having the simpler gate-drive requirements of the familiar power MOSFET. This superior technology has now been coupled to a state-of-the-art materials system that maximizes power throughput with low thermal resistance.

This package is highly suited to motor controls, the injection system, and voltage regulators for outboard engines or in similar applications where space is at a premium.

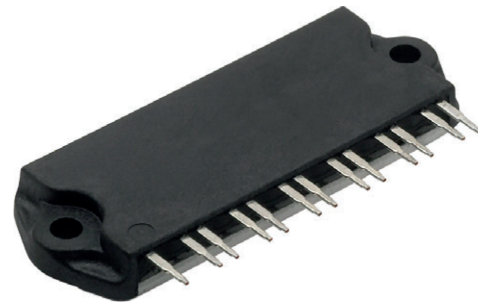

Fig. 1 - Example of SIP

KEY FEATURES AND ASSEMBLY CONSIDERATIONS

Vishay's SIP modules are distinguished by these key features:

- Fully isolated printed circuit board mount package
- Wire-bonded internal connections
- Short circuit rated ultrafast: optimized for high speeds over 5.0 kHz, and short circuit rated to 10 μs at 125 °C, V_{GE} = 15 V
- Low junction-to-case thermal resistance

Important factors in the assembly process are:

- Heatsink design
- Distance from adjacent parts
- Protection against electrostatic discharge (ESD)

Recommendations for each of these items and requirements for mounting SIP modules to the heatsink are discussed in the following sections.

ESD PROTECTION

IGBT, MOSFET, and diode modules are sensitive to ESD. All SIP modules are ESD-protected during shipment by an antistatic tube. Anyone handling or working with the modules during the assembly process must wear a conductive grounded wristband.

For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com

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HEATSINK SPECIFICATION

If a heatsink is used, the contact surface of the heatsink must be flat, with a recommended tolerance of < 0.03 mm (< 1.18 mils) and a levelling depth (surface roughness) of < 0.02 mm (< 0.79 mils), according to DIN/ISO 1302. In general, a milled or machined surface is satisfactory if prepared with tools in good working condition. The heatsink mounting surface must be clean, with no dirt, corrosion, or surface oxides. It is very important to keep the mounting surface free from particles exceeding 0.05 mm (2 mils) in thickness.

THERMAL COMPOUND

If a heatsink is used, uniformly coat the heatsink surface and the power module base plate with a good quality thermal compound. Apply uniform pressure on the package to force the compound to spread over the entire contact area. The purpose of thermal grease is to fill gaps at the base plate-heatsink interface. The use of thermal grease is recommended to ensure low case-to-sink thermal resistance. The thermal conductivity of the compound should be not less than 0.5 W/mK. The suggested thermal grease is DC340 (Dow Corning) or silicone free HTCP (Electrolube), or equivalent. Screen printing or rubber rolling are the preferred methods to apply the grease. A final thickness of grease layer in the range of 80 μm to 100 μm is suitable for most applications.

MOUNTING TO HEATSINK

If a heatsink is used, confirm that there are no any foreign particles on the surface of the screen tooling and plate. Place a suitable amount of thermal compound on the plate and spread it evenly using a roller or spatula. Thermal grease contact and distribution will be improved during the first hours and after heating up the system for the first time.

Bolt the module to the heatsink using the fixing holes. An even amount of torque should be applied for each individual mounting screw. For proper mounting it is recommended to use M3 screws secured by a lock washer and flat washer. Please refer to each individual datasheet to find the maximum torque that can be applied. A torque wrench which is accurate in the specified range must be used in mounting the module to achieve optimum results.

All mounting holes should be free of burrs. The first mounting screw should be tightened to one third of the recommended torque; the second screw should then be tightened to the same torque and so on until all screws are fully tightened. Over-tightening the mounting screws may lead to deformation of the package, which would hence increase the thermal resistance and damage the semiconductors. After a period of three hours, check the torque with a final tightening in opposite sequence to allow the spread of the compound.

MOUNT TO PCB

The SIP pins have been designed with the size and shape required to fit into the PCB holes during the assembly process. The contact between the pin and PCB hole will result in a very low contact resistance. Insert the pin straight into the PCB hole without jamming it. Any mounting error may cause a crack in the semiconductor die.

END OF LIFE MODULE WASTE DISPOSAL RECOMMENDATION

Corporate social responsibility is more and more important for the environment protection, Vishay is certified by ISO 140001 and Vishay modules are always compliant with the Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) directive.

We recommend that the end of life modules (include components of the modules) shall be segregated by hazardous and collected in a labeled container (refer to CER code # 16.02.16) which should be put in a designated place.

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