Power Modules | Application Note

Mounting Instructions for TO-244 Modules

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This application note introduces Vishay´s TO-244 modules. It covers their key features and gives instructions for using heat sinks with the modules.

TO-244 modules are designed to provide reliable performance. Several configurations are available based on various types of silicon power diodes, including Schottky, Ultrafast, standard recovery, and glass passivated. Circuit configurations including common anode and common cathode are available.

Fig. 1 - Example of TO-244 Modules

INTRODUCTION

Vishay's TO-244 modules are distinguished by these key features:

- Reduced RFI and EMI
- Suitable for high-frequency operation
- Not isolated versus heatsink
- Screwable electrical terminals secured against axial pull-outs
  - They are fixed to the module housing via a click-stop feature

Important factors in the assembly process are:

- Heatsink design
- Power leads size/area
- Distance from adjacent heating parts

Recommendations for each of these items and requirements for mounting TO-244 modules to the heatsink are discussed in the following sections.

HEATSINK SPECIFICATIONS

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

Coat the heatsink surface and the power module baseplate uniformly 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 baseplate / heatsink interface, and its use 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 silicone-free HTCP (Electrolube), or an equivalent. Screen printing and rubber rolling are the preferred methods for applying the grease. A final grease layer thickness in the range of 80 µm to 100 µm is considered suitable for most applications.

Mounting Instructions for TO-244 Modules

MOUNTING TO HEATSINK

Confirm that there are no foreign particles on the surface of the screen tooling and baseplate. Place a suitable amount of thermal compound on the baseplate and spread it evenly with a roller or spatula. The 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 heat sink using the fixing holes. Apply uniform pressure on the package to force the compound to spread over the entire contact area and check the device bottom surface to verify the full and uniform coverage. An even amount of torque should be applied for each individual mounting screw. For proper mounting it is recommended to use fitted screws (refer to each individual datasheet or outline dimensions). The device is designed with a metal bushing that also acts as a washer, although it is possible to add an external lock washer and flat washer. Please refer to each individual datasheet to find the torque rating 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.

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 the opposite sequence to allow the spread of the compound.

There are three holes (see outline in data sheets as reference) through which the mounting screws should be affixed. All of them must be used to optimize the thermal dissipation of the module. We do not recommend skipping the central screw even if it appears to be unnecessary.

POWER LEADS OR BUS BARS CONNECTION

An even amount of torque (refer to individual datasheet) should be applied for each individual screw. For proper connection, it is recommended to use fitted screws (refer to the individual datasheet or outline dimensions) secured by a lock washer and flat washer. The maximum thread depth into the module mounting studs should conform to each individual package outline drawing in the datasheet. Also refer to each individual datasheet to find the maximum torque that can be applied. A torque wrench that is accurate in the specified range must be used in fixing the screws of the power leads or bus bars to achieve optimum results. Vishay provides screws to connect power leads inside each shipping box together with the devices.

WORK SAFELY RECOMMENDATION

In order for these components to work safely, the module maximum external plastic temperature is 140 °C.

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.