Modules | Application Note

Mounting Instructions for ADD-A-PAK Generation VII

Generation VII ADD-A-PAK (AAP) power modules combine the excellent thermal performance enabled by a direct bonded copper (Al_2O_3) substrate, superior mechanical ruggedness, and an environmentally friendly manufacturing process that eliminates the use of hard molds, thus reducing direct stresses on the leads. To prevent axial pull-out, the electrical terminals are co-molded to the module housing.

The VSK series of AAP modules uses glass passivated and Schottky power diodes and thyristors in circuit configurations including common anode, common cathode, half-bridge, and single switch. The semiconductors are internally connected through wire-bonding and electrically isolated from the bottom baseplate, allowing the use of a common heatsink and enabling a more compact overall assembly.

INTRODUCTION

Major AAP Generation VII module features

- High blocking voltage up to 1600 V
- Industrial standard package style, fully compatible with TO-240AA
- High isolation capability up to V_{RMS} = 3500 V
- High surge capability with I_{FSM} up to 3000 A
- No toxic material: Completely lead (Pb)-free, RoHS and UL compliant
- Elimination of copper base plate reduces weight to 75 g
- Elimination of process steps requiring usage of chemicals and related waste treatment promotes a cleaner and more environmentally friendly manufacturing process

These features allow AAP Generation VII modules to fit into existing standardized assembly processes. Important factors in the assembly process include

- Heatsink design
- PCB, busbar, and cable design
- Power leads size/area
- Distance from adjacent heat-generating parts

The implications of these items and the requirements for assembly of AAP Generation VII modules are discussed over the following pages.

SPECIFYING THE HEATSINK

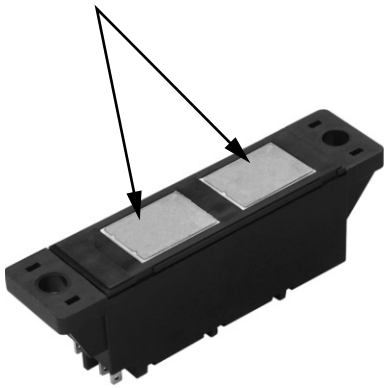
The heat generated by the module has to be dissipated with a heatsink. Typically natural or forced air cooling is used.

To optimize the device performance, the contact surface of the heatsink must be flat, with a recommended flatness of ≤ 0.03 mm (≤ 1.18 mils) and a levelling depth of less than 0.02 mm (≤ 0.79 mils), according to DIN/ISO 1302. A milled or machined surface is generally satisfactory if prepared with tools in good working condition. The heatsink mounting surface must be clean, with no dirt, corrosion, or surface oxide. It is very important to keep the mounting surface free from particles exceeding 0.05 mm (2 mils) in thickness, provided a thermal compound is used.

MOUNTING OPERATIONS

The AAP Generation VII modules are designed with an exposed DBC Al_2O_3 substrate.

This is used to optimize the thermal behavior of the module. To reduce the risk of damage during mounting, the ceramic has been given additional mechanical ruggedness in the form of two separate 15.8 mm by 21.1 mm (0.62" by 0.83") pieces of DBC substrate, which can be seen in the photo below.



Before mounting, inspect the module to insure that the contact surface of the bottom substrate is clean and free of any lumps or bulges that could damage the device or impede heat transfer across its surface.

APPLICATION NOTE

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Next, make a uniform coating on the heatsink mounting surfaces and module substrate with a good quality thermal compound. Screen printing of the compound is recommended, as well as direct application through a roller or spatula. The datasheet values for thermal resistance assume a uniform layer of thermal compound with a maximum thickness of 0.08 mm. The thermal conductivity of the compound should be no less than 0.5 W/mK. 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 full and uniform coverage.

Bolt the module to the heatsink using the two fixing holes.

An even amount of torque should be applied for each individual mounting screw. An M6 screw should be used with lock washers. A torque wrench, which is accurate in the specified range, must be used in mounting the module to achieve optimum results. 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. Full tightening of both the screws can then be completed by applying the recommended torque (see data in bulletins). Over-tightening the mounting screw 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.

Power terminals can be screwed to busbars and/or flexible cables with eyelets.

We recommend the use of M5 screws with spring washers. Users should consult published datasheets to determine the optimal torque.

AAP Generation VII modules are designed to guarantee a good and reliable contact even at 3 ± 10 % Nm on a busbar, so there is no need to apply an especially high level of force to obtain a good and reliable connection.

SOLDERING TO THE PCB

The signal terminal (gate and auxiliary cathode) pins of AAP Gen VII modules based on thyristors can be soldered to the PCB using hand iron or wave soldering processes.

The PCB should be designed with appropriate tolerances on the hole diameters, and soldering must be done without imposing any mechanical stress on the module pins (pulling and tensioning the pins).

To prevent overheating of the device, the soldering time should not exceed 8 to 10 seconds at a temperature of 260 °C.

Alternatively, a fast-on cable connector can be used to contact the signal pins.