

MAICMMC40X120

Application Note

**Power Core Module Mounting and Thermal
Interface**



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1 Revision History

The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

1.1 Revision 1.0

Revision 1.0 was the first publication of this document.

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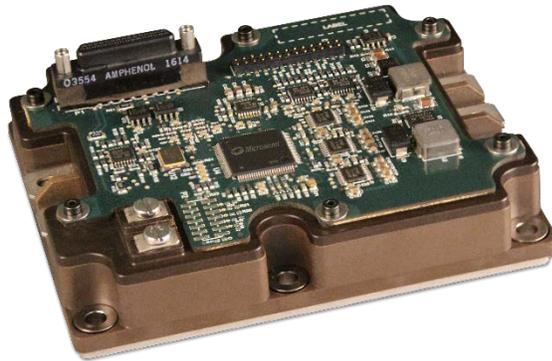
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2 PCM Mounting

This application note provides recommendations for mounting the MAICMMC40X120 [Power Core Module (PCM) with embedded Hybrid Power Drive (HPD) containing a SiC power bridge]. The instructions provided here are intended to minimize any mechanical and thermal stresses on the PCM, and should therefore be followed to ensure reliable long-term operation of the system. The use of an additional conductive path, such as a thermal strap, is recommended for the PCM's thermal management.

Figure 1 Mounted Thermal Interface



2.1 PCM Mounting Instructions

Correctly mounting the PCM onto the heat sink is essential for efficient heat transfer. In order to mitigate any mechanical stresses and optimize thermal resistance when the PCM is mounted, the application heat sink and the PCM's contact surface must meet the following specifications:

- Flat (recommended flatness is $<50 \mu\text{m}$ for 100 mm continuous, and recommended roughness is Rz 10)
- Clean (no dirt, corrosion, or damage)

This process contains two key steps—application of the thermal interface, followed by mounting the PCM onto the heat sink.

2.2 Thermal Interface Application

To achieve the lowest case-to-heat-sink thermal resistance, apply a thin layer of thermal grease between the PCM and the heat sink. The thermal interface between the module and the heat sink can also be made with an alternative type of conductive thermal interface material, such as phase change compound (screen-printed or adhesive layer).

Note: Screen printing is recommended to ensure a uniform deposit of a minimum $50 \mu\text{m}$ layer of thermal grease on the heat sink.

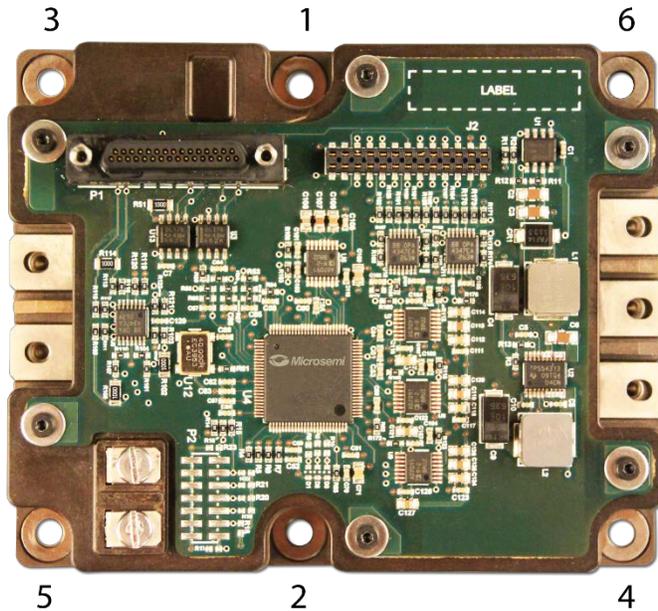
2.3 Mounting the PCM onto the Heat Sink

To mount the PCM onto the heat sink, perform the following steps.

1. Locate the six holes on the module for the mounting screws that bolt the PCM to the heat sink, as shown in the following illustration.
2. Align the PCM with the heat sink holes and apply light pressure. Insert the M4 screw with lock and flat washers in each mounting hole (a #8 screw can be used instead of M4). The screw length must be at least 12 mm (0.47 inches).
3. Lightly tighten the mounting screws in the order shown, alternating between screws until the suitable torque value has been reached. The minimum allowable torque that should be applied is 2 Nm, and the maximum allowable torque is 3.5 Nm. Using a screwdriver with controlled torque is recommended.

The numbers in the following illustration represent the order in which the screws should be tightened.

Figure 2 Mounting Holes



Once the PCM has been mounted onto the heat sink with the appropriate torque, a small amount of grease should appear around the PCM. This indicates that the bottom surface of the module has been completely covered with thermal grease, which is a requirement for efficient heat transfer. If no grease appears at the edges of the PCM after mounting, remove the module and apply more grease. Repeat as required.

2.4 Thermal Management of the PCM

Microsemi recommends the use of an additional conductive path from the controller printed wiring board assembly (PWA) to a cold source, such as a thermal strap, to maintain the PCM controller-board temperature below the maximum-rated temperature of the components. The thermal strap should be affixed to the controller board at the fastener shown in the following illustration. The area that makes contact with the board should be a minimum of 15.4 mm², and the strap should avoid

contact with any of the nearby tracks or components. The thermal strap size should ensure that the temperature at the point of interface between the PCM and the thermal strap is limited to a maximum of 67 °C when the module is operating at sustained maximum power output. The minimum bolt length required to clear the controller PWA, cover, and driver PWA is 12 mm, and the minimum thread length to engage the insert is 3.5 mm.

To connect the thermal strap, perform the following steps.

1. Remove the adhesive and fastener supplied with the PCM at the location indicated by the arrow in the following illustration.
2. Align the thermal strap with the fastener hole, and fasten it with a sufficiently long M2 (#3) bolt and washer. Apply 0.35 Nm of torque.
3. To maintain fastener torque, apply 3M Hot Melt Adhesive 3748 VO or equivalent to the bolt head.

Figure 3 PCM Thermal Management

