Mounting Instruction for M271/M272 "PrimePACK™" Packages

MT5Q01780
12-Jul-2011
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Contents

Note: Prime PACK™ is registered trademark of Infineon Technology AG, Germany.

This document provides information how to mount IGBT modules of M271/272 packages.

This mounting instruction is available for types as shown in below including customized specification.

2MBI****VXB-120*-50 / 2MBI****VXB-170*-50
2MBI****VXA-120*-50 / 2MBI****VXA-170*-50
1MBI****VXB-120*L-50 / 1MBI****VXB-170*L-50
1MBI****VXB-120*H-50 / 1MBI****VXB-170*H-50
1MBI****VXA-120*L-50 / 1MBI****VXA-170*L-50
1MBI****VXA-120*H-50 / 1MBI****VXA-170*H-50
(ex. 2MBI1000VXB-170E-50)

Revision records

Date	Classification	Ind.	Drawn	Check	Approval	Content
12-Jul-'11	Enactment	-	T.Hyakutake	Y.Takamiya	M.Kikuchi	

1 Mounting IGBT modules

This section explains how to mount M271/M272 packages, so called “PrimePACK™”

1.1 Mounting on heatsink

The thermal resistance between IGBT module baseplate and heatsink depends on module location on the heatsink, thermal properties, such as thermal conductivity, of heatsink, and cooling methods, such as air cooling with fan. In this section, module location on heatsink is focused and described. Followings should be taken into account in IGBT module mounting process since thermal resistance will be varied according to the position of the mounted modules:

- ✓ IGBT module(s) should have thermally optimized layout on heat sink according to the mechanical-thermal design so that the modules have good heat spread to minimize the thermal resistance.
- ✓ In case of several IGBT modules to be mounted on same heatsink, the distance between IGBT modules should be optimized based on the mechanical-thermal design and the estimated total power dissipation of each module in order to avoid the thermal coupling effect between neighbor modules.

1.2 Heat sink surface finishing (module mounting area)

The mounting surface of the heatsink should be finished for both the roughness Rz of 10μm or less, and the flatness of 30μm or less for a 172×89 mm module, or and 50 μm or less for a 250×89 mm module. If the surface of the heat sink does not have enough flatness, the modules may have unexpected increase of the contact thermal resistance (Rth(c-f)). Also, If the heatsink flatness does not suit the above requirements, the high mechanical stress to the DCB in the modules may happen and result in insulation failure because of DCB cracking.

1.3 Thermal grease pasting

Thermal grease between heatsink and module baseplate is absolutely necessary to reduce the contact thermal resistance. Screen-printing, rollers or spatulas are typical method of thermal grease pasting. However, stencil mask is recommended when target grease thickness is less than 100μm.

Recommended properties of thermal grease

Items	Recommendation
Penetration (typ.)	>= 338
Thermal conductivity	>= 0.92 W/m.K
Thermal grease thickness	100μm +/- 30μm

*1 The thermal desistance between the heatsink and the module depends on the thermal grease properties and thickness. Fuji Electric strongly recommends customer to confirm contact interface after mounting whether the thermal grease spreading is good enough or not. Also Fuji Electric recommends confirmation of the thermal interface status after thermal cycling if the thermal grease

has low viscosity.

*2 Electrical document of the stencil mask pattern and recommended method are also available on request.

1.4 Mounting procedure

Mounting procedures onto heatsink are described in below.

(a) Minimum and maximum torque for mounting screws (M5) indicated as (1)-(14) in the picture below are:

Minimum: 3.0Nm
Maximum: 6.0Nm

(b) Pre-fastening is recommended with 1/3 of the final torque and sequence of (1) - (14) in Fig.1.

(c) Final torque must be within specified force of 3.0 to 6.0 Nm with sequence of (1) - (14).

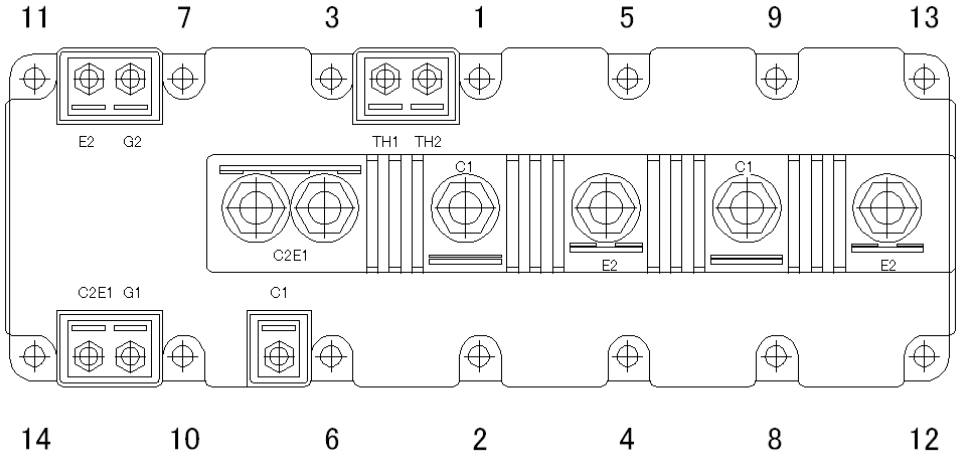

Fig.1 Mounting holes 1 – 14 in M272 modules

1.5 Electrostatic Discharge (ESD) protection

If excessive static electricity is applied to the control terminals, the devices might be broken. Some countermeasures against static electricity is necessary.

2 Maximum allowable strength and vectors from bus bar

Maximum allowable strength and vectors are defined and described in the table below.

Vector	Strength*
A	±100 N
B	±100 N
C	100 N
D	500 N
E	±20 N
F	±20 N
G	50 N
H	200 N

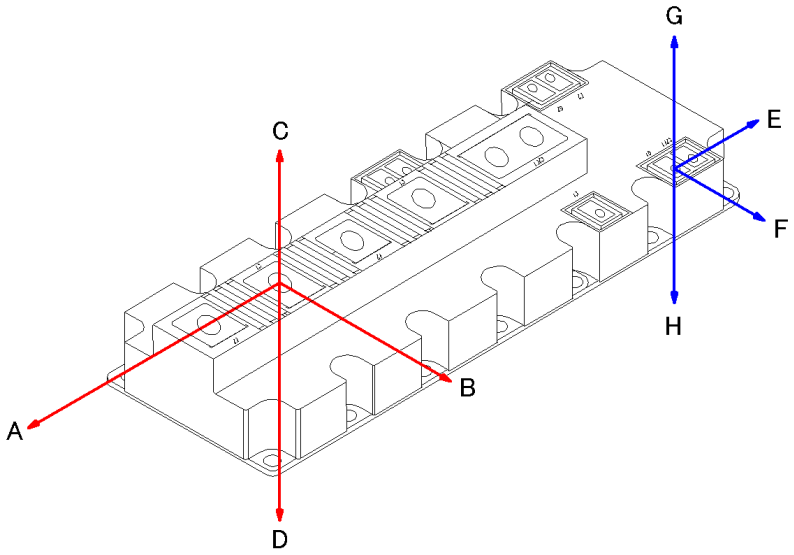

Fig.2 Allowable strength and vectors for M272 modules

*) Strength in the table is the mechanical capability for the short period in mounting process.

The auxiliary terminals have to be connected accordingly, with caring the common ESD guidelines. No load current is permitted to flow through any of the auxiliary terminal.

To terminate the power terminals with the best possible strain relief, an assembly similar to the drawing shown in figure 3 is recommended. This is especially important if the modules or bus bars are subjected to vibration. It is recommended to keep the terminals in compression rather than tension (or being pulled up).

Note: It is recommended to put the module (main terminals) under compression when attaching the bus bar. The tolerances and compliance of the bus bar must not allow the forces that exceeds the values shown in Fig 2.

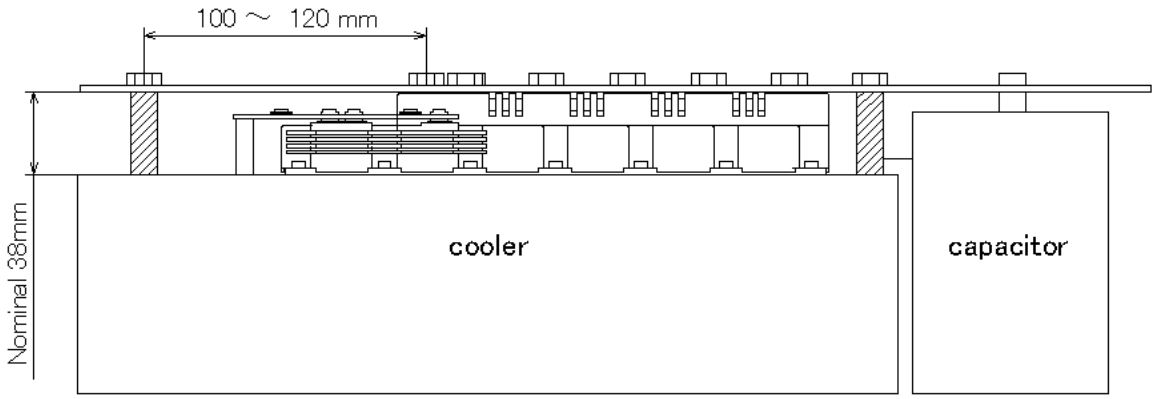

Figure 3 Example of configuration for M272 module with a suggested method of strain relief.

Screw size and torques:

mounting hole of base plate: M5 3…6 Nm

auxiliary terminals: M4 1.8…2.1 Nm

main power terminals: M8 8….10Nm

Screw length: Bus bar thickness + (7~9)mm

M271/M272 “ PrimePACK™”封装模块安装说明

中文翻译：

内容

注： PrimePACK™ 是德国英飞凌科技股份公司的注册商标。

本文件提供如何安装 M271/272 封装的 IGBT 模块的信息。

这个安装说明适用以下面型号，包括客户定制型号。

2MBI****VXB-120*-50 / 2MBI****VXB-170*-50

2MBI****VXA-120*-50 / 2MBI****VXA-170*-50

1MBI****VXB-120*L-50 / 1MBI****VXB-170*L-50

1MBI****VXB-120*H-50 / 1MBI****VXB-170*H-50

1MBI****VXA-120*L-50 / 1MBI****VXA-170*L-50

1MBI****VXA-120*H-50 / 1MBI****VXA-170*H-50

(例如. 2MBI1000VXB-170E-50)

一、　安装 IGBT 模块

本节说明如何安装 M271/M272 也称“ PrimePACK™ ” 封装的模块

1.1 在散热器上安装

IGBT 模块底板和散热器之间的热阻取决于散热器上模块的区域、热性能（如散热器导热效率）以及冷却方法（如风冷），在本节重点说明在散热器上模块的区域。在 IGBT 模块安装过程中，以下因素会改变模块的热阻。

- IGBT 模块在散热片上应根据机械热设计进行热优化布局，使模块具有良好的热传导，以尽量减少热阻。
- 在同一的散热片上安装多个 IGBT 模块的情况下，应基于机械热设计和每个模块的耗散功率优化 IGBT 模块之间的距离，以避免相邻模块之间产生热耦合。

1.2 散热器表面处理（模块安装区域）

散热器安装表面粗糙度 Rz 应为 10 微米或以下，对于 172 × 89 毫米模块平整度为 30μm 或更少；对于 250 × 89 毫米模块平整度为 50 微米或以下。如果散热器表面没有足够的平整度，模块可能产生额外增加接触热阻（$R_{th(c-f)}$）。另外，如果散热器的平整度不适合上述要求，模块的 DCB 可能产生高机械应力导致 DCB 破裂，造成绝缘失效。

1.3 导热硅脂涂抹

散热器和模块基板之间的导热硅脂是绝对必要的，以减少接触热阻。使用印刷丝网，辊或刮刀涂抹散热膏是典型涂抹方法。不过，建议掩模模板涂抹硅脂厚度小于 100μm。

推荐导热脂性能

项目	推荐值
Penetration (typ.)渗透力	>= 338
Thermal conductivity热导	>= 0.92 W/m.K
Thermal grease thickness导热脂厚度	100μm +/- 30μm

1) 散热器与模块之间的热阻取决于导热硅脂的性能和厚度。富士电机强烈建议客户确认模块安装后的接触界面，散热膏散布是否是足够好或不好。还有，如果导热硅脂粘度低，富士电机建议确认热循环后的热接触面的状态。
2) 也可以要求用电子文档推荐的模板掩模图形的方法。

1.4 安装步骤

安装到散热器上的步骤描述如下。

1) 下图（1） -（14）所示，安装螺丝（M5）的最小和最大扭矩：

   最低： 3.0Nm

   最大： 6.0Nm
2) 建议在 1/3 最终力矩预紧固，顺序（1） - （14）。见图 1 。
3) 按（1）- （14）顺序，最终力矩必须达到规定的 3.0 至 6.0 牛米。

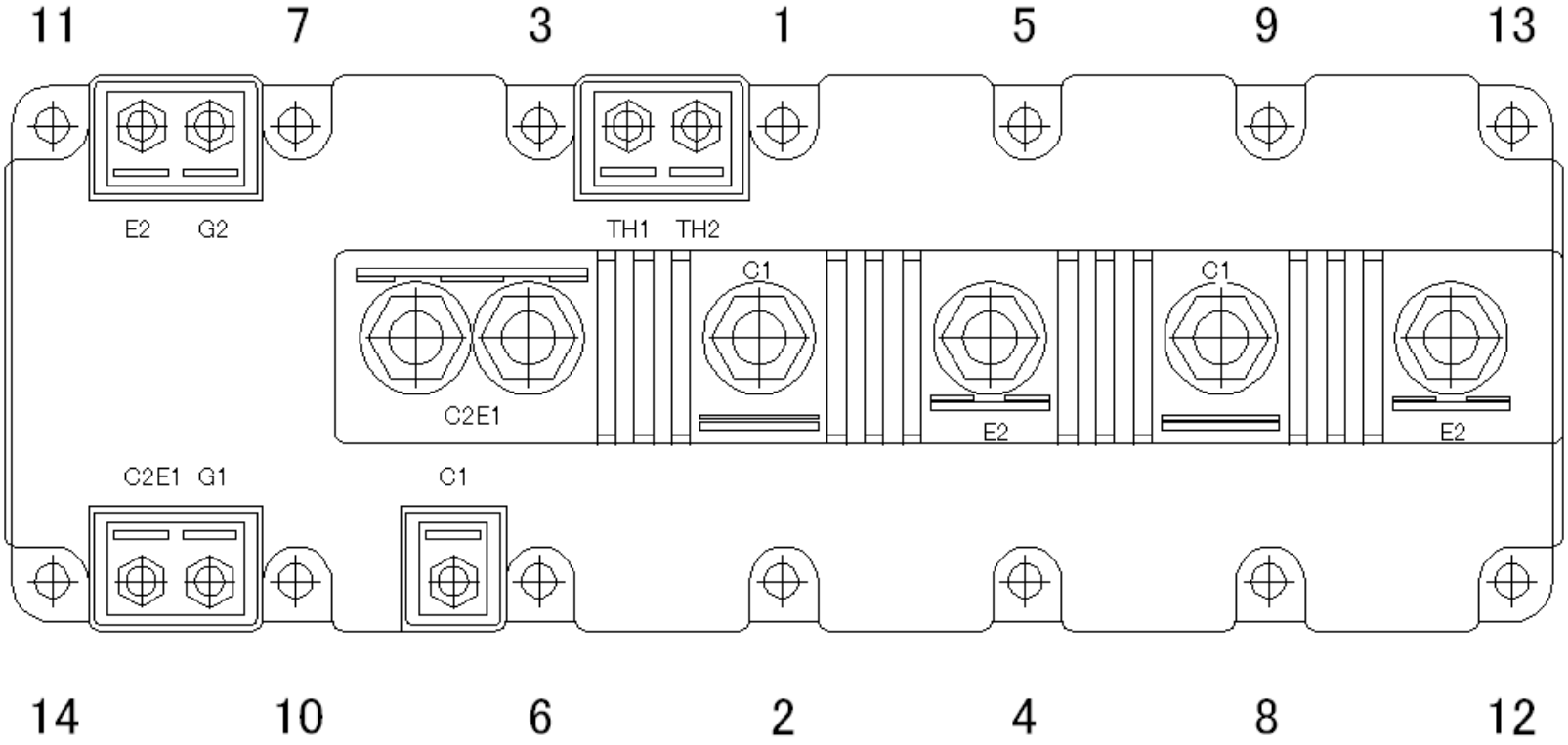

Fig.1 Mounting holes 1 – 14 in M272 modules

1.5 静电释放（ESD）保护

如果过多的静电被加到控制端子，模块可能被损坏。一些防静电措施是必要的。

二、　来自母排的向量和最大允许强度

最大允许强度和向量定义如下表所述。

向量 Vector	强度 Strength
A	±100 N
B	±100 N
C	100 N
D	500 N
E	±20 N
F	±20 N
G	50 N
H	200 N

*）表中的强度是在安装过程中的短时机械力。

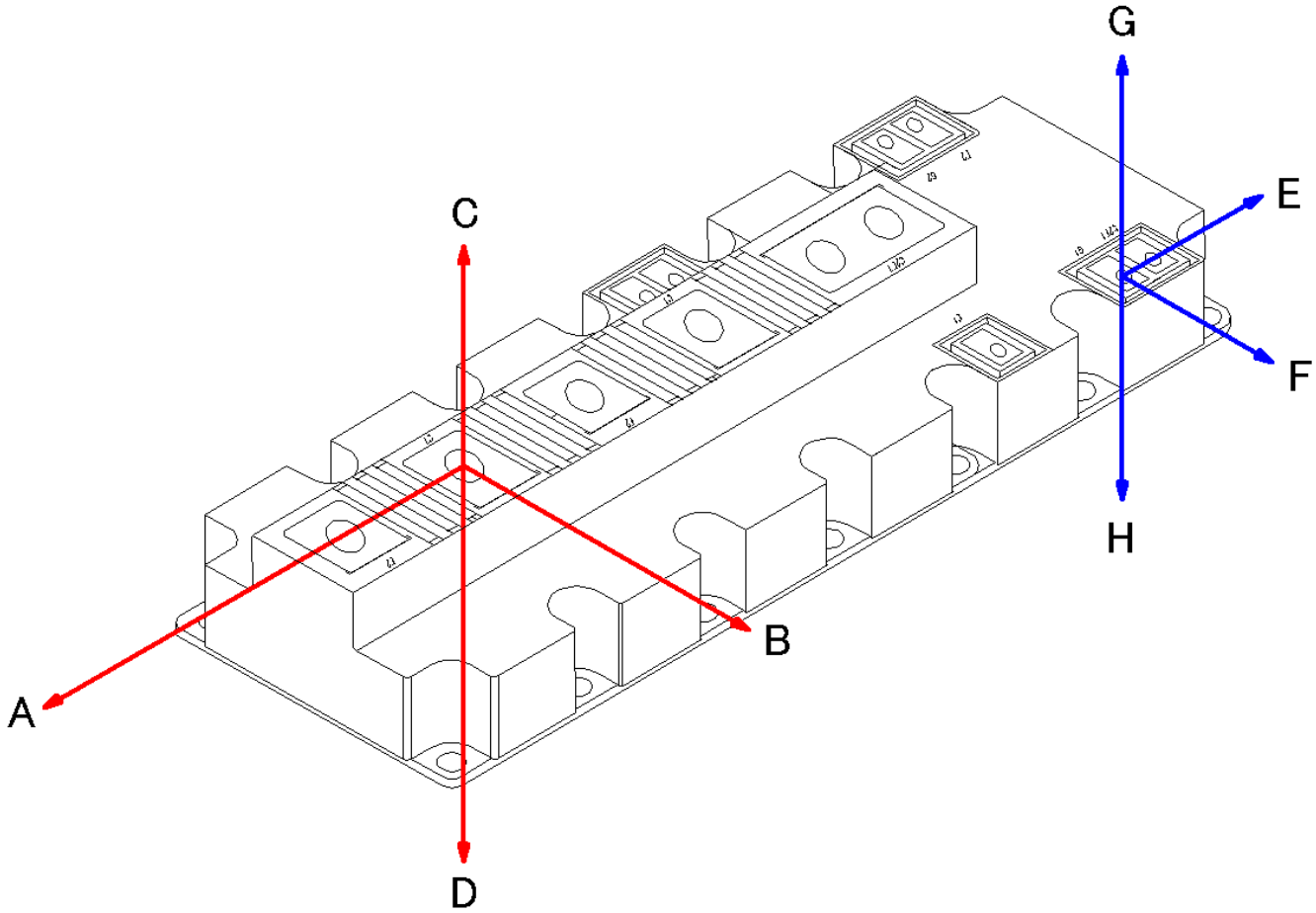

图 2. M272 模块容许强度和向量

辅助端子（注：这里指门极端子）必须按常规 ESD 准则连接，不允许负载电流流经任何辅助端子。

尽可能消除功率端子末端的张力，推荐使用类似于图 3 这样的母排结构。如果模块或母排受到振动，建议在端子处保持下压力而不是张力(或是拉力) ，这一点尤为重要。

注：建议安装母排时向下压紧模块（主端子），不容许应力超出图 2.给出的数值范围。

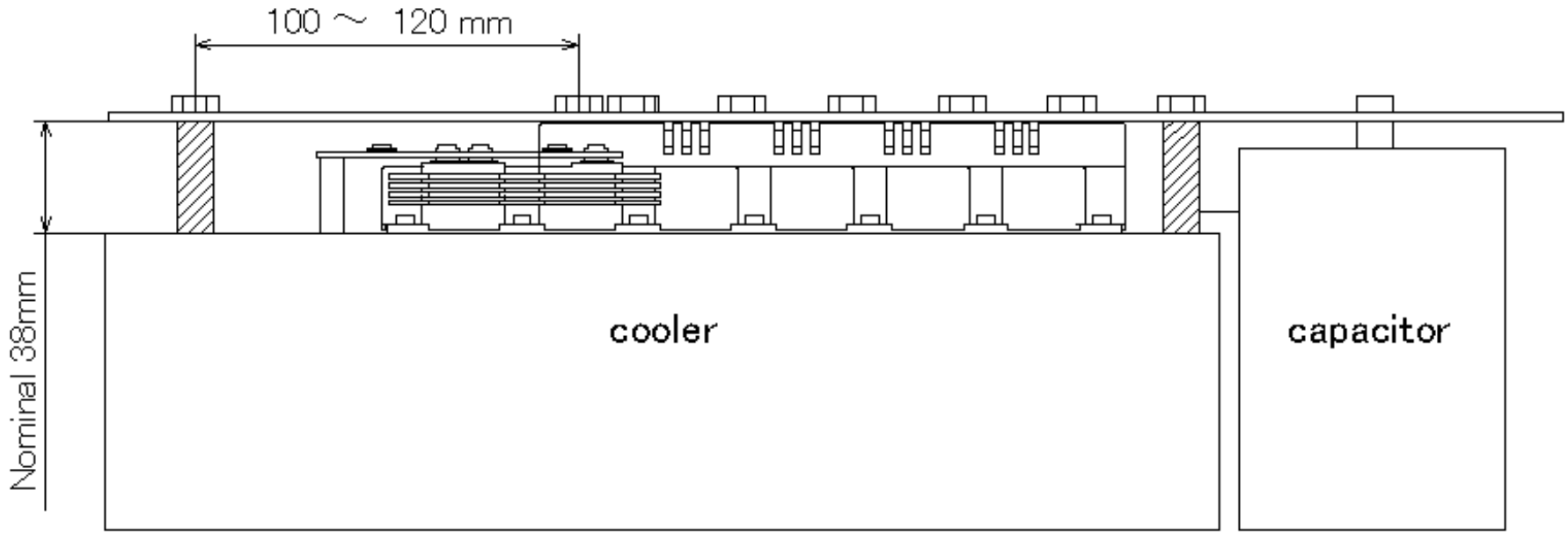

图 3. 建议消除应力方法的用于 M272 模块结构的实例

螺丝尺寸和扭矩： 底座安装孔： M5 3.0- 6.0 牛米， 门极终端： M4 1.8- 2.1 Nm

主电源端子： M8 8.0-10.0Nm， 螺栓杆长度：母排厚度+（7 ～9）毫米