PressFIT IGBT module mounting instruction section-1 press-in/push-out

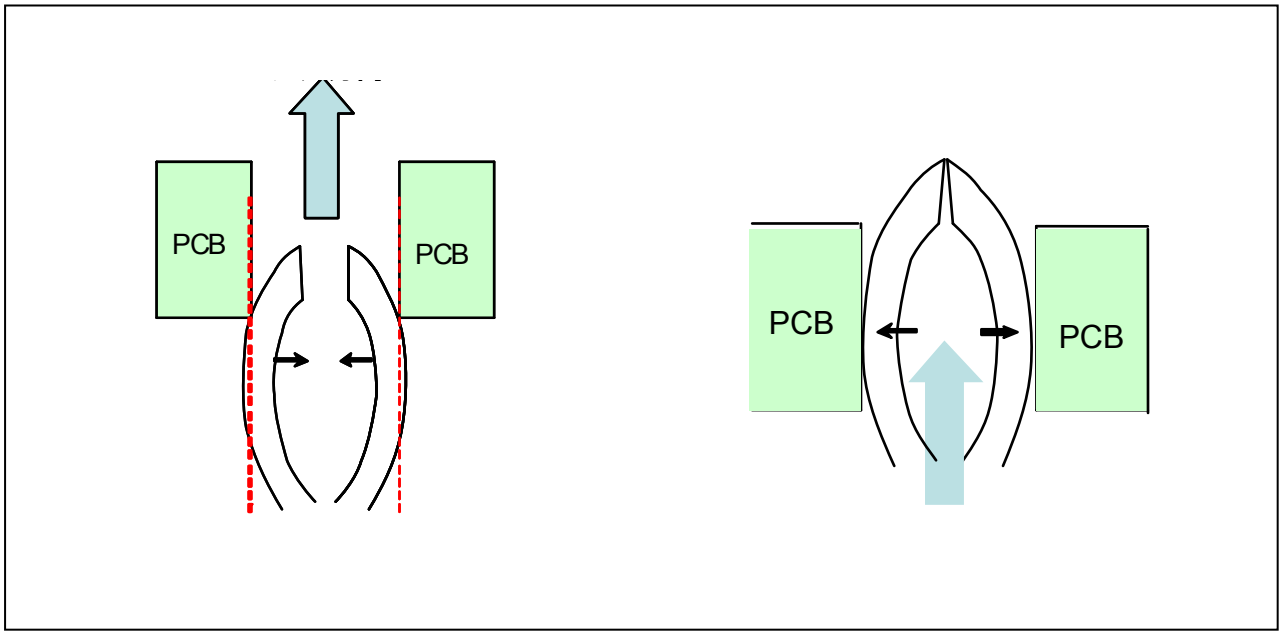
1 General Information

This application note describes the recommended PCBs specification and mounting / un-mounting advises of Fuji Electric (here in after Fuji) Press FIT IGBT modules.

This application note cannot cover every type of application and/or conditions. Therefore, Fuji PressFIT modules, which are used out of these suggestions on PCB and mounting process, will not have any warranty and/or guarantee under any circumstances. We recommend you or your technical partners to confirm throughout electro-mechanical evaluation in practical applications.

The PressFIT module provides solder less mounting onto PCB with low resistive stable contact. A PressFIT pin before insertion has opened shape as shown in Fig.1. After press-in processes, which are described in later section, the pin is closed by the contact pressure from both sides (Fig.2). During the press-in process, mechanical deformation of pin and materials of the PCB hole sidewall form cold-welding joints, it is possible to have low resistivity and stable contact with this new technology.

This application note describes a basic idea of the mounting restricted area of PCBs.
An individually consultation is needed about a detailed alimentation of the mounting restriction area.



2 Requirements on PCBs

This chapter describes the PCB recommendation for the Press FIT modules. PCB should have been designed within criteria in the Table1. For example, through hole diameter should be a range of 2.14mm to 2.29mm with properly Sn/Cu plated sidewall as described in the figure. When it smaller, mechanical issue in the press-in process would be found, on the other hands, if it bigger, shock and vibration and/or contact reliability may have concerns.

These results were experimentally obtained based from IEC60352-2. The evaluation is separately needed if PCBs which have out of these parameters.

PCB should have holes for guide pins of press-in tools with a specific position, hole diameter so that press-in lower and upper tool contact first and absorb the insertion force to protect PCB and its surface mounted devices from mechanical stress during press-in process.

<Recommended specification of PCB>

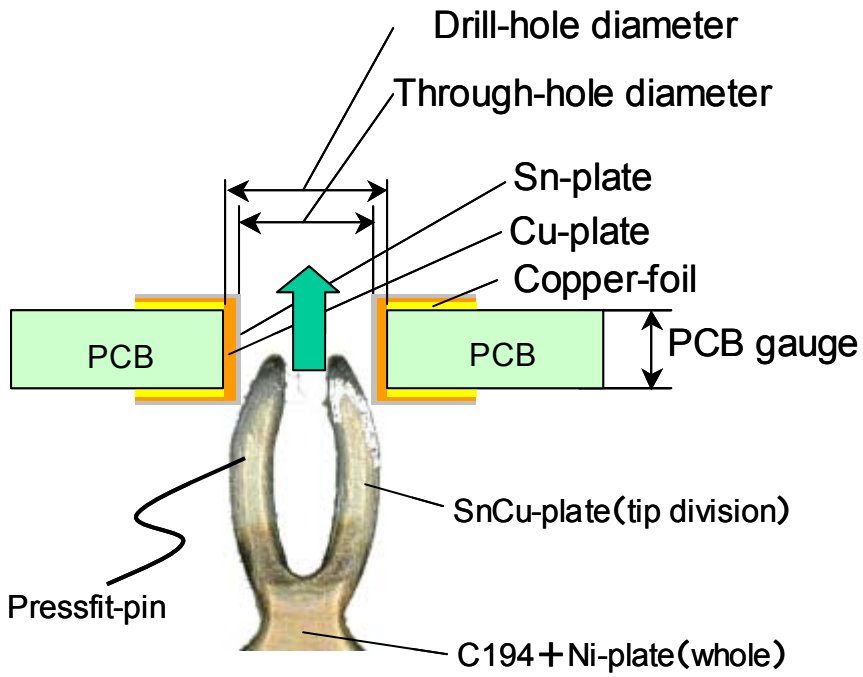


Table1. Recommended PCB specification

	min	typ	max
drill hole diameter	-	2.35mm	-
through hole diameter	2.14mm	2.2mm	2.29mm
Copper plating thickness in the hole	>25um	-	-
Metallisation in the hole	-	-	<15um
Copper gauge of the circuit board tracks	35um	70um 105um	-
PCB gauge	1.6mm	2.0mm	-
PCB material		FR4	

3 Mounting process and removing process

The procedure for mounting process and removing process of PressFIT module are described in this section. PressFIT module should be inserted within a specific range of mounting speed and force. If mounting force were below the limit, the module would have issue in low resistive and stable contact. On the other hand, mechanical damage on PCB and other parts mounted on the surface would be expected if too much press-in force.

When press-in, we recommend using the equipment as shown in Fig.3 to have accurate control in force control. We also recommend using specific press-in and push-out tools provided in the latter section with drawings.

Recommended press-in force and speed, push-out forces are described in the Table 2. Typical forces for each pin are also indicated in the table. Press-in speed of 25mm/min is also recommended to have good contact.

It is possible to remove a module from PCB and re-press-in to the PCBs again, however, we recommend soldering all pins for the modules that are not 1st-press-in, in order to avoid risk of mechanical damage during push-out process.

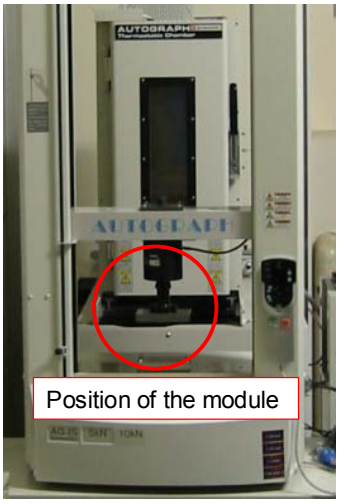


Fig.3 Press device picture

4 Example of Press-in and Push-out tools

Figures 4(a)-(d) are: (a) Photograph press-in toolset, (b) example of physical dimension (drawings) of press-in tools, (c) Push-out tools photo, (d) Push-out tool drawing examples

PCB-Guide in press-in lower tool works as mechanical stopper. Press-in lower and upper tool contact first and absorb the insertion force to protect PCB and its surface mounted devices from mechanical stress during press-in process. The height should be adjusted with the board thickness and press-in equipment.

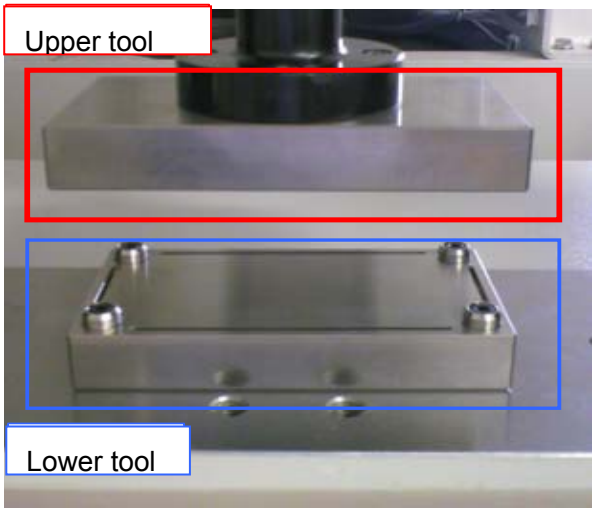


Fig.4(a) press-in tool set

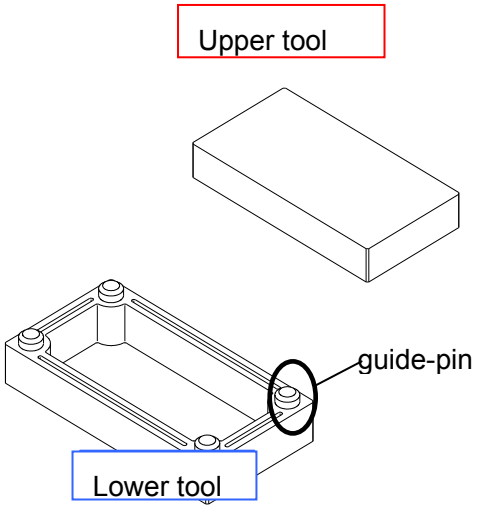


Fig.4(b) press-in tool drawing example

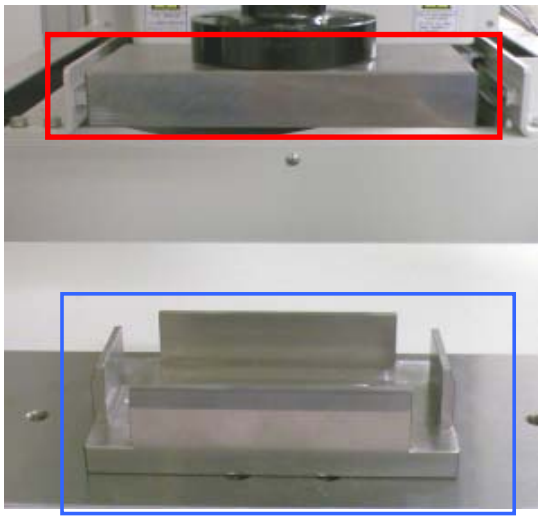


Fig.4(c) push-out tool set

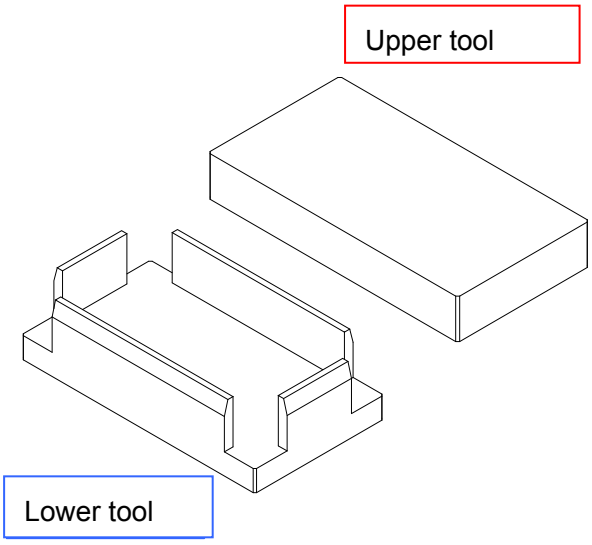
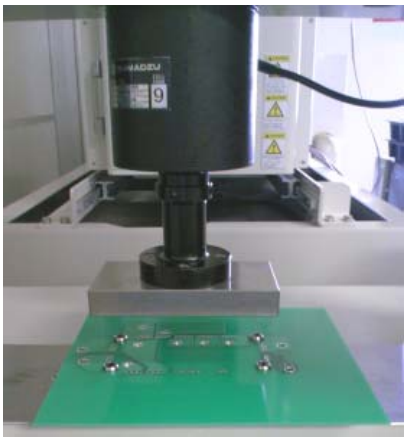


Fig.4(d) push-out tool drawing example

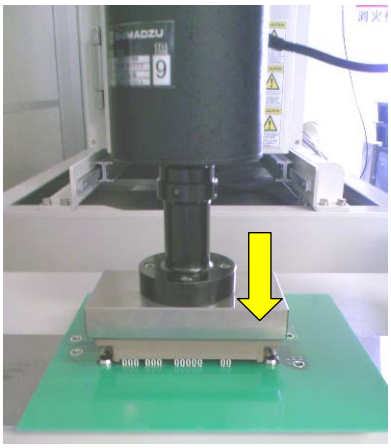
5 Example of mounting process of the module into the PCBs; Press-in



1 Set the lower and upper tools.

2 Place PCB on the lower tool to fit the PCB-guides.

3 Set the module upside down.

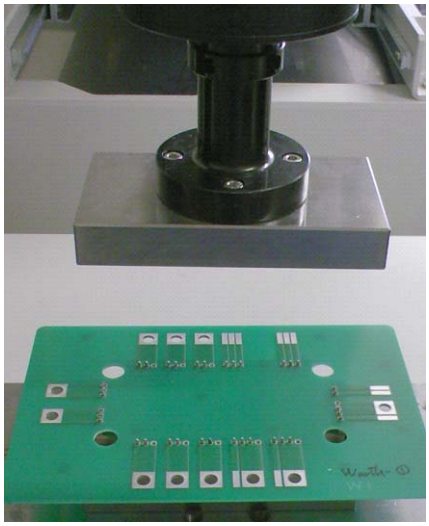


4 Press the module base plate by pressing equipment with recommended force and speed.

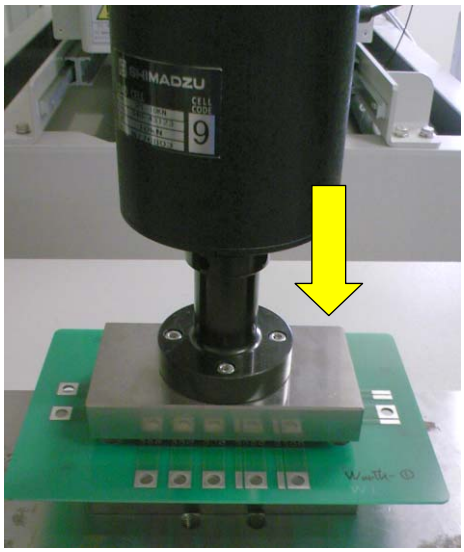
6 Example of removing process of a module from PCBs; Push out

1 Set the lower and upper tools
2 Set the PCB with module.
3 Push the top of the press-fit pins with recommended force.
4 Set the module upside down
5 The module and PCB will be separated and module will be dropped in the lower push-out tool.

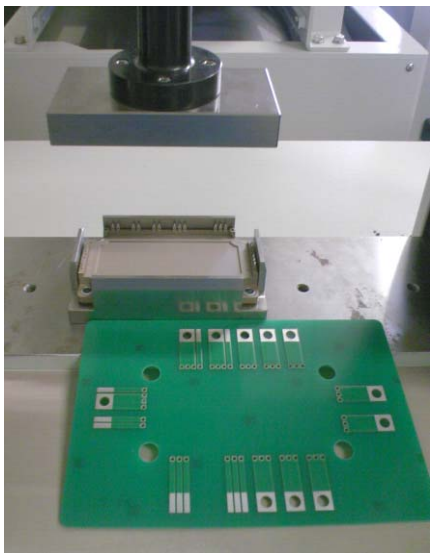
1 Set the lower and upper tools



2 Set the PCB with module



3 Push the top of the press-fit pins with recommended force



5 The module and PCB will be separated

Fig.6 Push out process

7 Restriction of mounting area of PCB surface components

In order to avoid risk of mechanical damage of other components mounted on PCB surface, we recommend reserving specific area, which would have high strain during press-in and/or push-put process. Figures 8 and 9 are restricted area for PCB front-side and backside, respectively. Basically, we recommend reserving 5mm in distance from the center of pins.

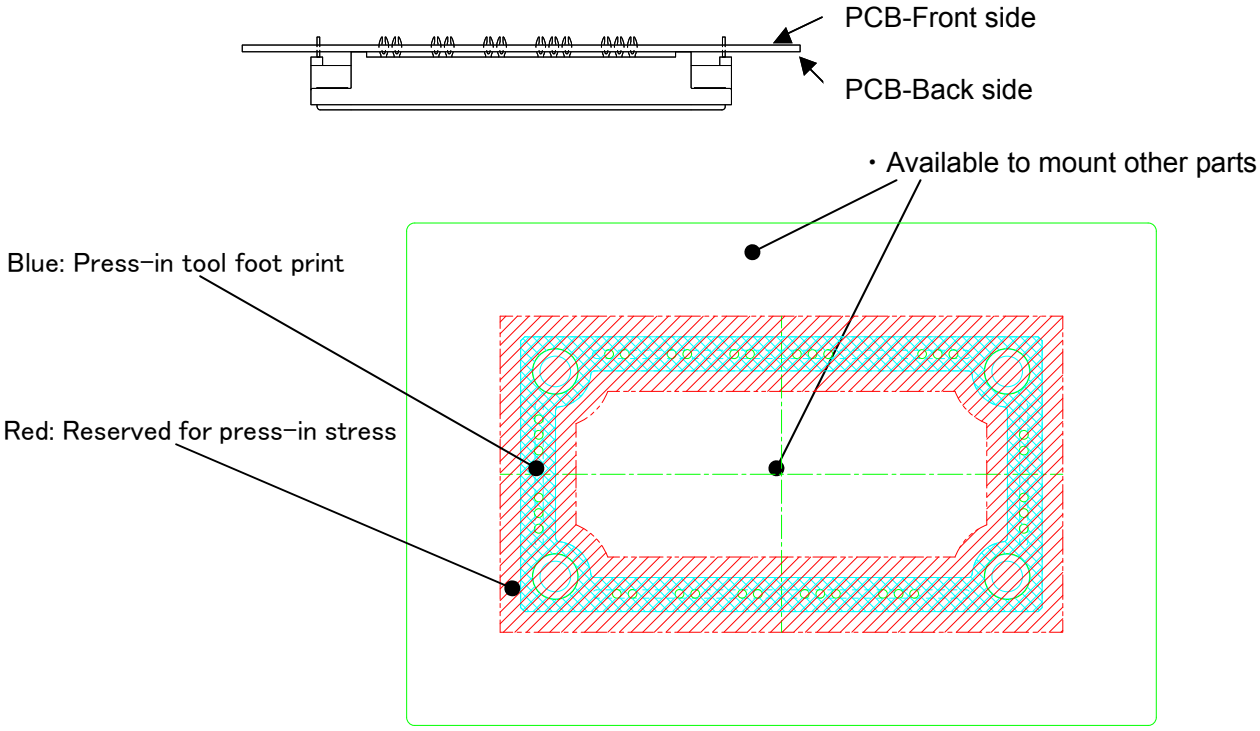


Fig.8 PCB designing recommendation (Front side)

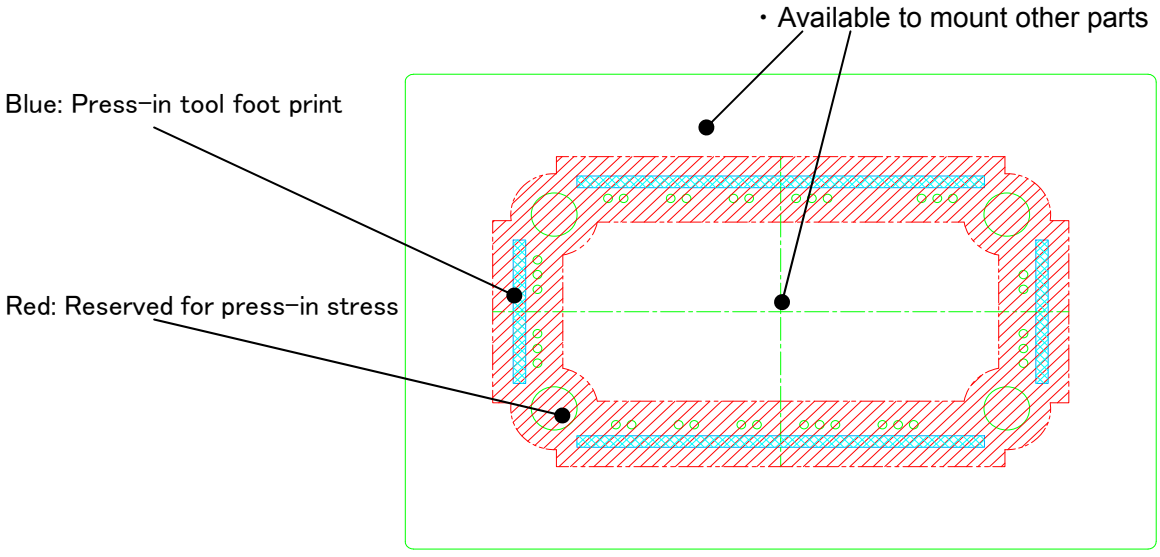


Fig9. PCB-Back side (Back side)

8 Press-in and push-out force

Recommended press-speed and the load (average a pin) of mounting process is shown at the under Table 2 shows the press-in speed and the press-in forces per pin in case of a small hole diameter (2.14mm) and a big diameter (2.29mm).

On the other hands, Table 3 shows push-out forces typical per pin in case of a small hole diameter and a big diameter.

Table2. In case of Mounting process

Hole diameter	2.14mm(min)		2.29mm(max)
Press-in speed	25mm/min		
Press-in Forces typical per pin	93N		74N

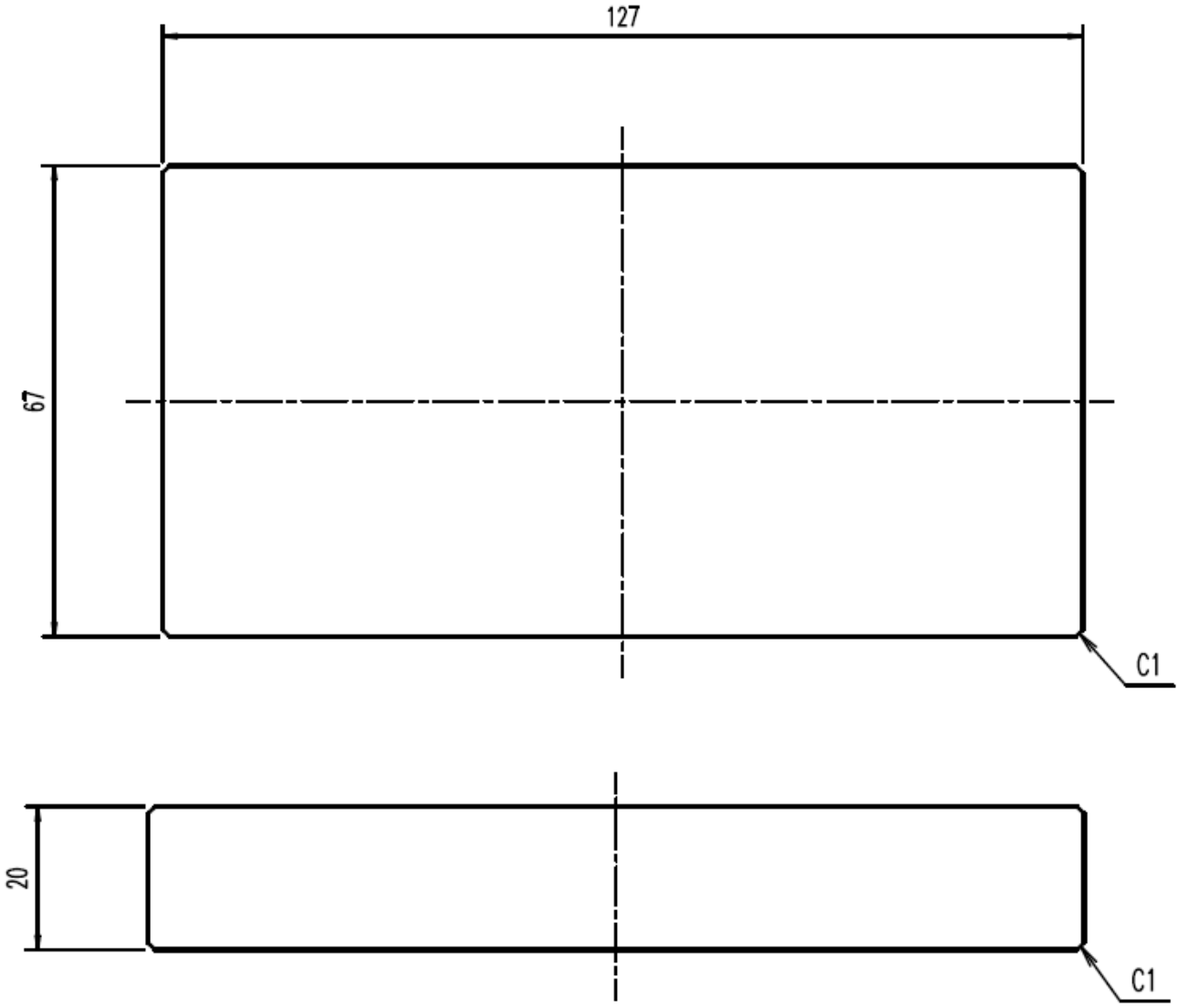
Table3. In case of Removing process

Hole diameter	2.14mm(min)		2.29mm(max)
Push-put Forces typical per pin	45N		49N

9 Drawings of recommended Press-in tool

Press-in tool (upper)

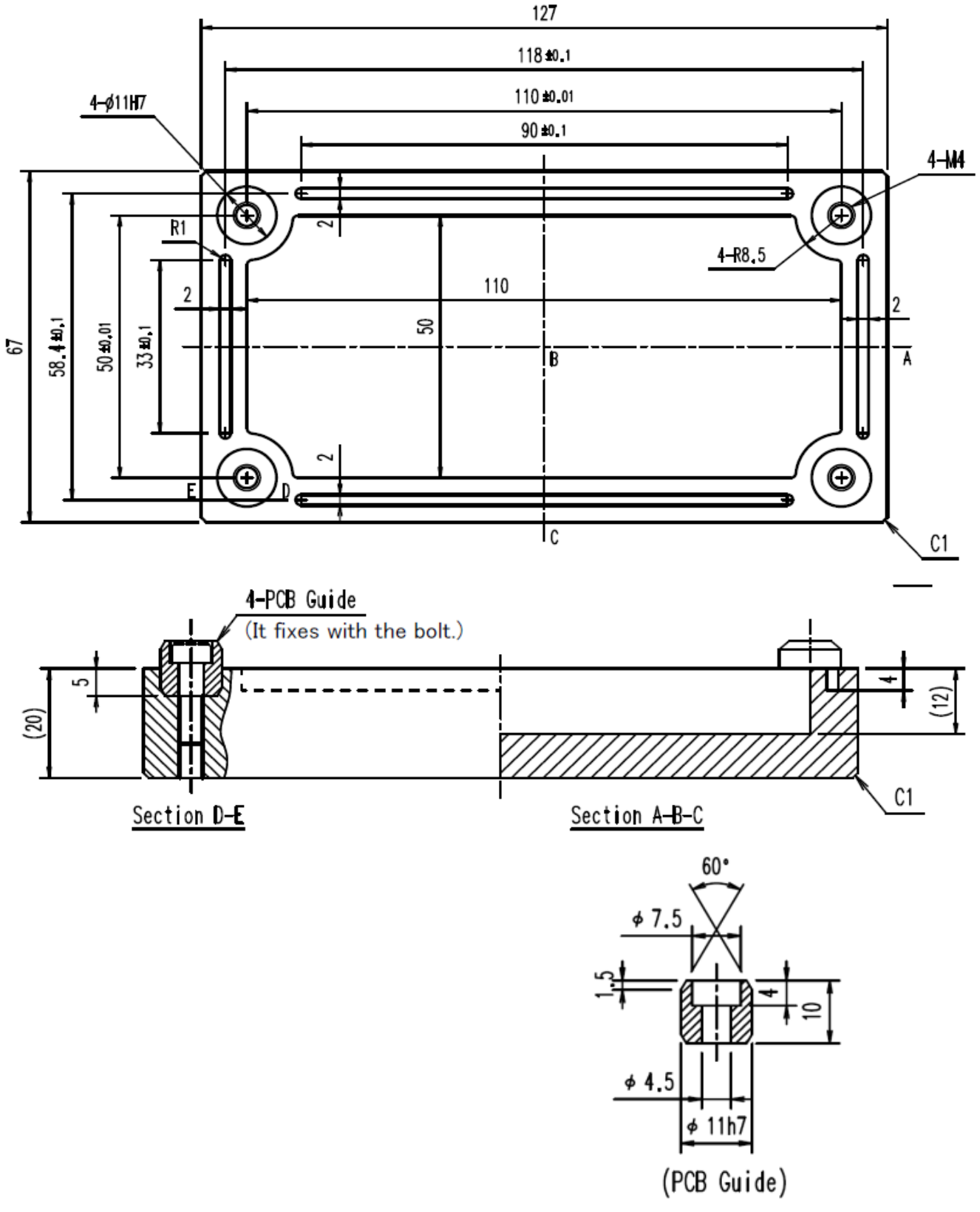
Unit:mm



Press-in tool (lower)

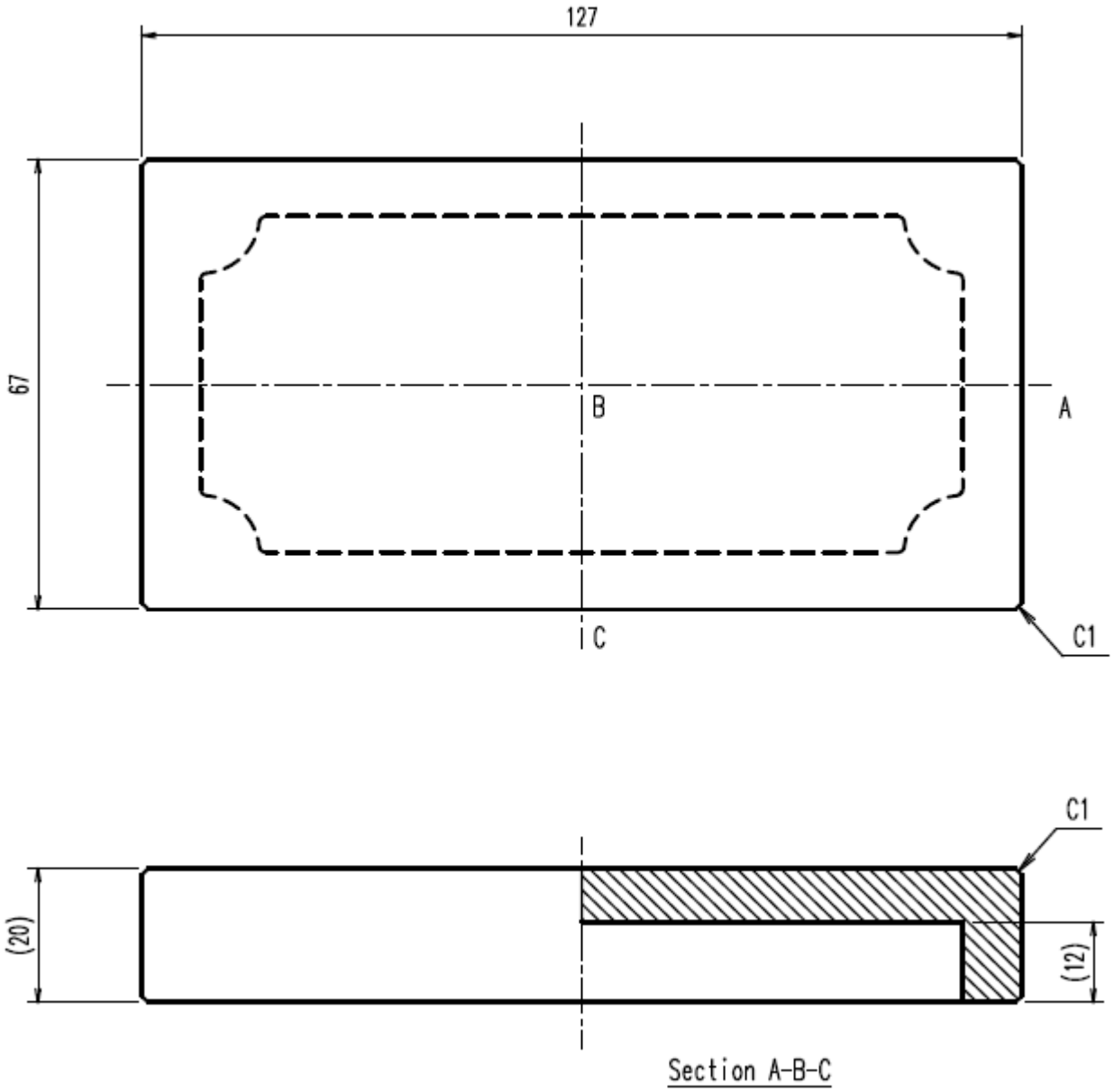
Unit:mm

Metarial:SUS



10 Drawings of recommended Push-out tool

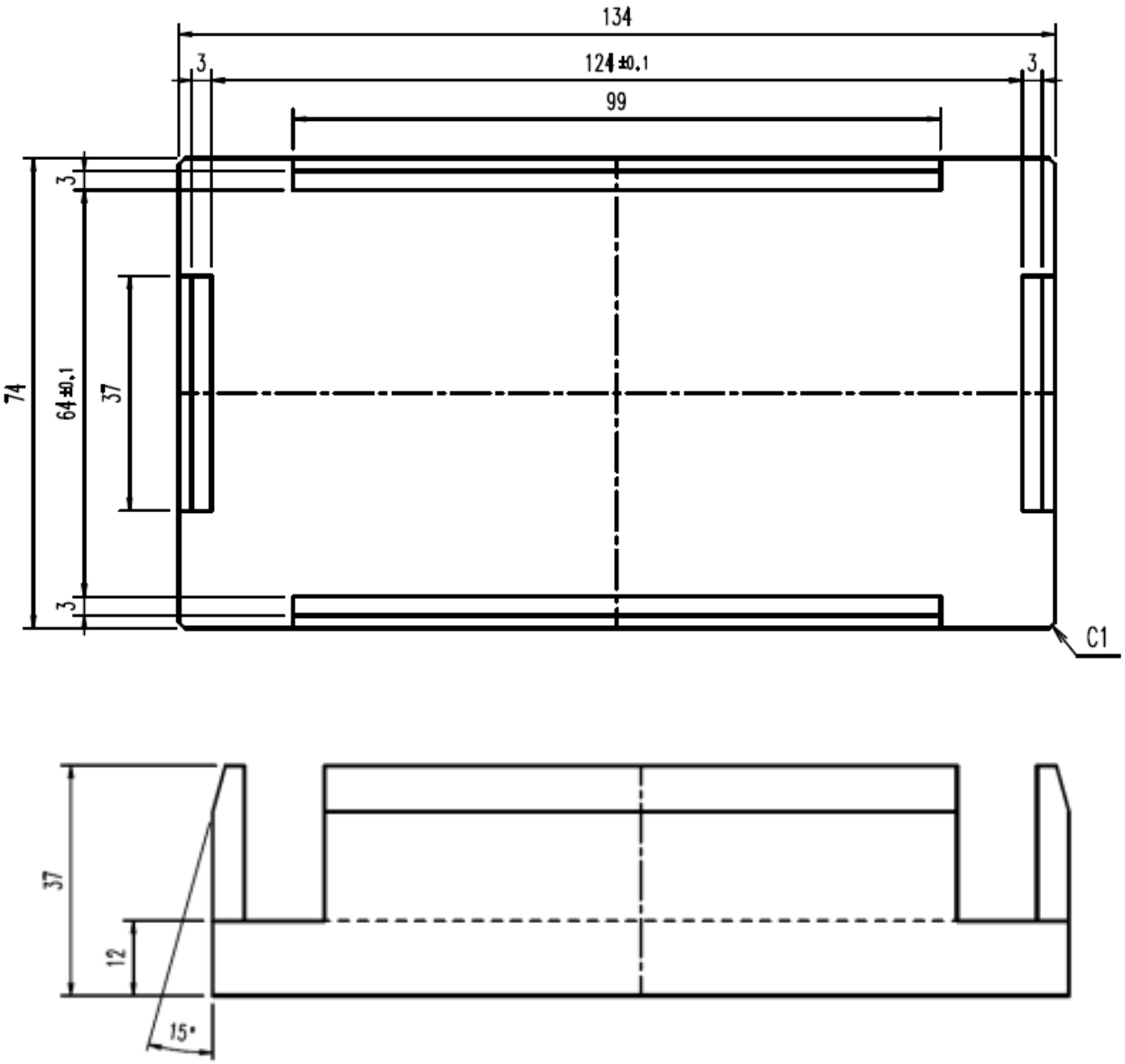
Push-out tool (upper)
Unit:mm
Metarial:SUS



Push-out tool (lower)

Unit:mm

Metarial:SUS



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