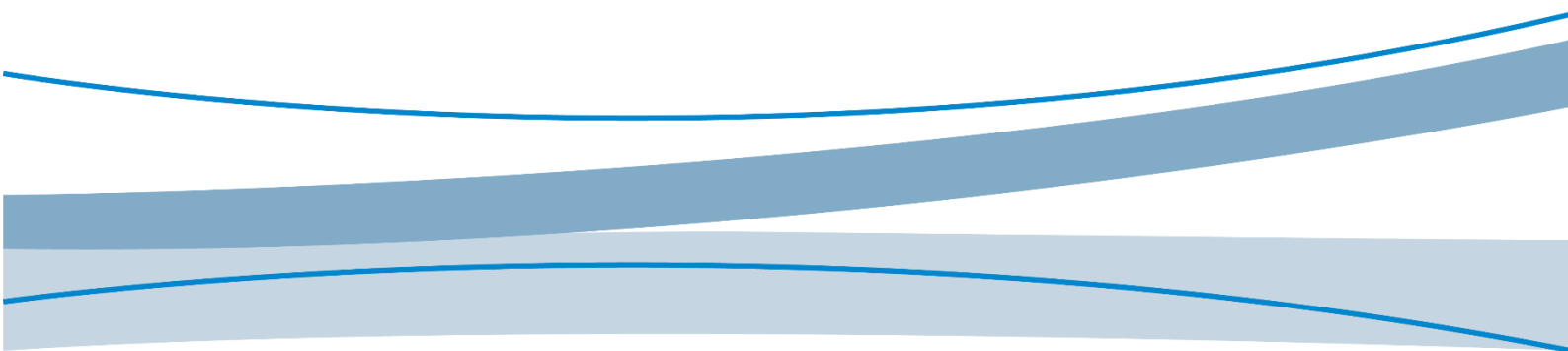




FG132&FG332

SMT Design Guide

V1.1



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Applicable model

Serial number	Products	Explain
1	FG132&FG332	LGA, 29*32*2.4mm

Change History

V1.1(2025-04-25)	Add the model FG332.
V1.0 (2023-12-23)	Initial version.

1 Packaging, Storage, and Usage

1.1 Overview

FG132&FG332 module adopts tape and sealed vacuum packaging, combined with the outer packaging method using the hard carton box, so that the storage, transportation and the usage of module can be protected to the greatest extent.



- The package is vacuum-packed and contains humidity indicator card and desiccant.
- The FG132&FG332 module is a precision electronic product, and may suffer permanent damage if no proper ESD protection measures are taken.
- The FG132&FG332 module is a moisture-sensitive device, and it is in line with the standards of the Joint Electron Device Engineering Council (JEDEC). Please read the relevant instruction and precaution in this document carefully to avoid permanent damage to the product caused by moisture.

1.1.1 Tape Packaging

FG132&FG332 modules are packed with tape. Each roll is packed with 200 pcs, each box is packed with 1 rolls, and each hard carton box is packed with 4 boxes, totaling 200 pcs of modules. The tape packaging is shown in the following figures:



Figure 1. Module tape packaging



Figure 2. Vacuum module tape packaging

1.1.2 Tape Size

Tape size is shown in the following figure.

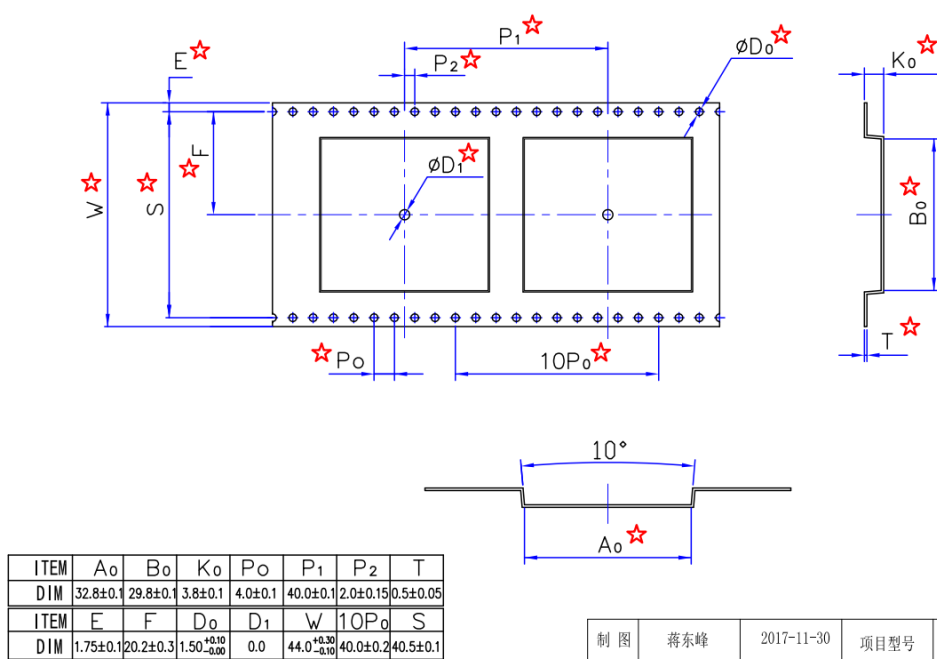


Figure 3. Tape size

The reel size is shown in the following figure.

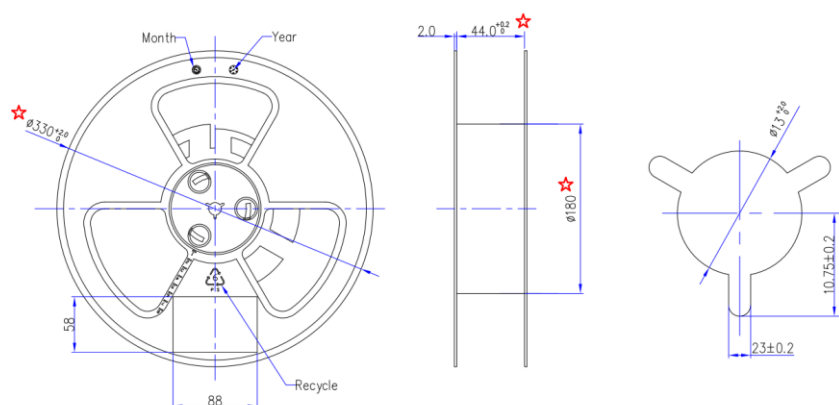


Figure 4. Reel size

1.2 Storage

- Storage conditions (recommended): temperature $23^{\circ}\text{C}\pm 5^{\circ}\text{C}$, relative humidity RH 35%–70%.
- Storage life (sealed vacuum bag): 12 months under the recommended storage conditions.

1.3 Humidity Sensitivity Level and Humidity Control

Before using the module, it is necessary to confirm whether the vacuum package of the module is in good condition. After unpacking the vacuum package, confirm the status of the humidity indicator card in the vacuum package. If the humidity indicator card turns blue at the 20% value or above, bake the module before using. As shown in Figure 5, the humidity indicator card does not change color, and as shown in Figure 6, the humidity indicator card turns blue at the 20% value, in this case, baking is required.

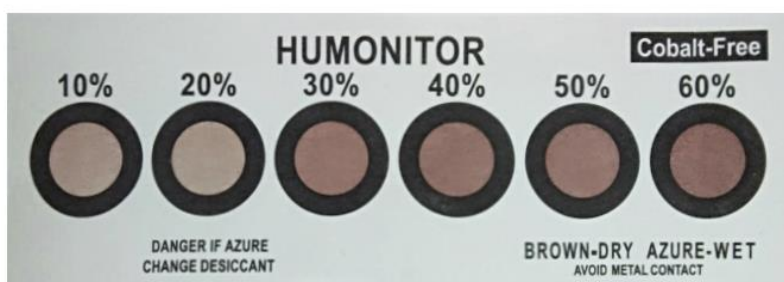


Figure 5. Humidity indicator card does not change color



Figure 6. Humidity indicator card turns blue at 20%, baking is required

According to IPC/JEDEC J-STD standard, the FG132&FG332 module has a humidity sensitivity level of 3. The level 3 moisture sensitive products, after unpacking, must be reflowed or operated at high temperature within 168 hours under the environment of workshop temperature of $23^{\circ}\text{C}\pm 5^{\circ}\text{C}$ and relative humidity lower than 60%, or stored in an environment with relative humidity lower than 10% to keep the dryness of the products. If the humidity in the workshop can only be controlled at lower than 70%, the preceding operation must be completed in 24 hours, otherwise, need to bake the module before reflow or heat the module, or vacuum packaging after baking (with desiccant and humidity indicator card inside).



Two baking methods and conditions are recommended:

Transfer the module into a tray that can withstand high temperature. The recommended baking temperature is $125^{\circ}\text{C}\pm 5^{\circ}\text{C}$ and the baking time is 8 hours.

2 SMT Production Control

2.1 Recommended PCB Pad Design

Recommended PCB pad design for FG132&FG332 module is shown in the following figure.

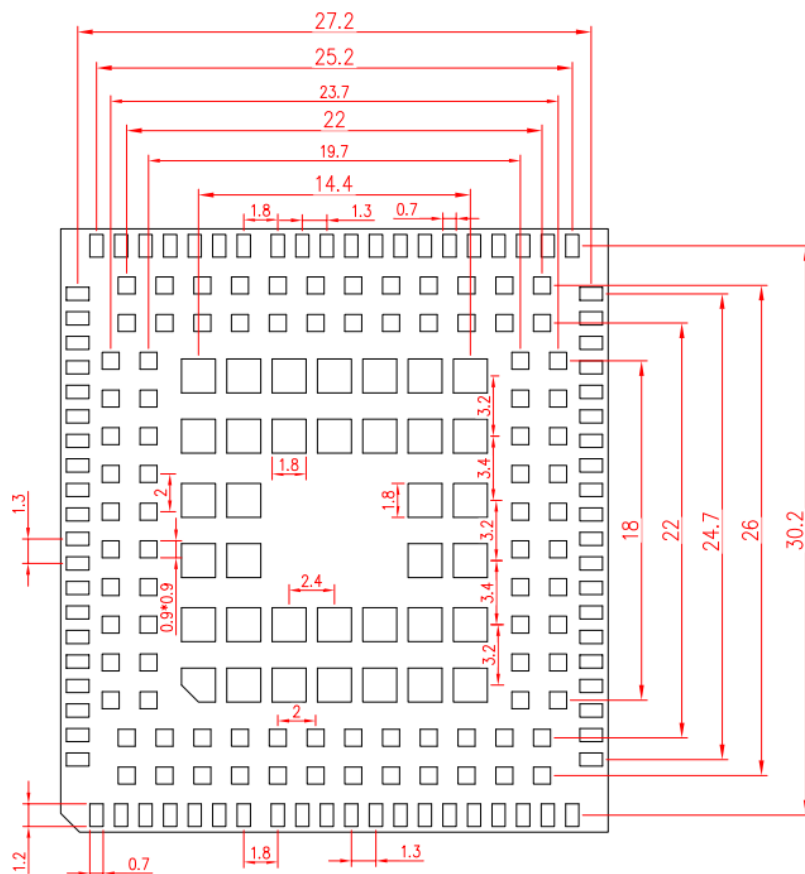


Figure 7. Recommended PCB pad design for FG132&FG332 module (unit: mm)

- It is recommended to select the board with $T_g \geq 150^\circ\text{C}$ in PCB design to reduce the PCB warpage defect.
- It is recommended that in PCB design, do not place any components on the opposite of the module for easy reworking.
- Please do not set any wires in the bottom of the module to avoid soldering along the wires.
- Please do not set any silkscreen in the bottom of the module to avoid gaps between the module and PCB.
- 0201 component and IC chip below 0.5 mm pitch need to be placed more than 5 mm away from the module, and other component are placed more than 3 mm away from the module.
- It is recommended to select ENIG for PCB surface treatment, and it is not recommended to select HASL surface treatment.

2.2 SMT Printing

2.2.1 Recommended Stencil Design

The recommended stencil design for FG132&FG332 module is shown in the following figure.

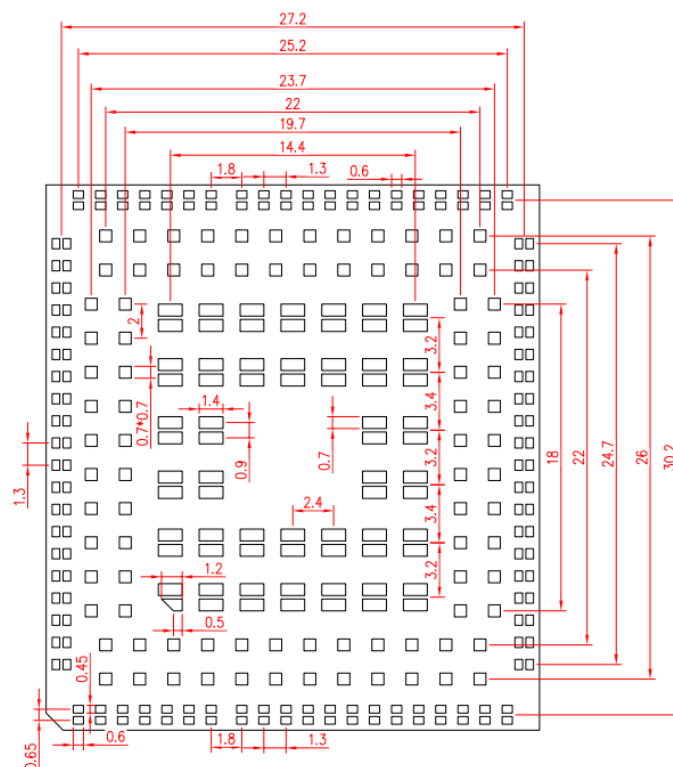


Figure 8. Recommended stencil design for FG132&FG332 module (unit: mm)



- The recommended stencil thickness is 0.15 mm.
- The above recommended design is for reference in production, and the customer can make appropriate adjustments according to the actual requirements.

2.2.2 Solder Paste Selection

It is recommended to use no-clean solder paste so that no cleaning is required after soldering. SAC305 or other low temperature solder paste with melting point not exceeding 220°C, and mainstream brands such as Alpha, Indium, and Senju are preferred.

2.3 SMT Mounting

The module is packaged in tape and the mounter needs to support a feeder with 44 mm width. The module has a certain weight and needs to be placed on the multi-functional mounter for mounting. The

inner diameter of the suction nozzle is greater than 10 mm, and the mounting speed should be slowly to ensure the mounting effect.



- The module should not be mounted by manual in case defects caused. If the equipment has thrown materials during module mounting, the module needs to be put back into the tray and mounted by the equipment.
- Taking FG132 as an example, the polarity of the module is shown in Figure 9, and the chamfer in the lower left corner corresponds to the module polarity point.
- Because the module is heavy, if it is applied on a double-sided board, the module needs to be placed on the second side to patch and pass through the reflow furnace.



Figure 9. Top view of the FG132 module

2.4 SMT Reflow Soldering

2.4.1 Temperature Test Board Making

The reflow profile measurement is recommended to use the test board made of the actual PCBA of the production. Two test points needs to be selected at least, both points are selected at the position of the soldering pad at the bottom. When making the temperature test board, drill holes from the bottom of the motherboard, connect a thermocouple to the soldering pad between the bottom of the module and the motherboard through a via, and weld and fix the thermocouple with high-temperature solder wires to get the soldering temperature for the bottom of the module. Large-size component such as BGA, card slot, connector, large inductor and other devices with large heat absorption must be kept on the temperature test board, otherwise it will affect the accuracy for profile measurement.

2.4.2 Reflow Oven Selection

It is recommended to select reflow oven with temperature range of 10 or above.

2.4.3 Reflow Profile

The recommended reflow profile and parameter requirements are as follows:

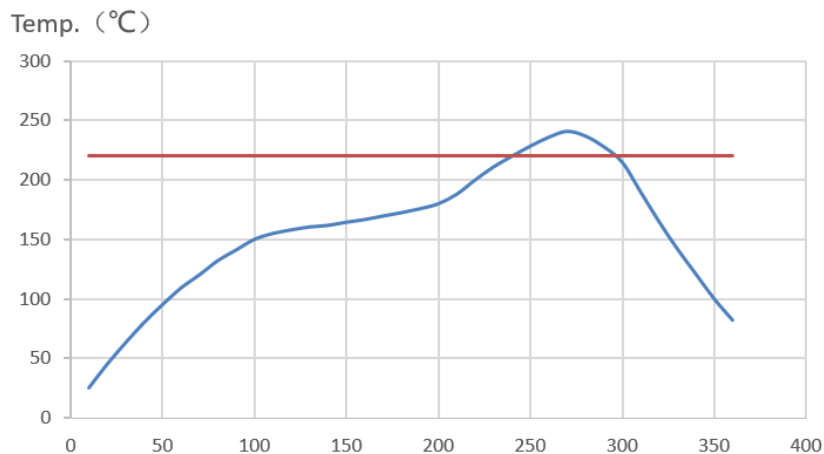


Figure 10. Recommended reflow profile

Table 1. Parameters of recommended reflow temperature profile

Parameter	Recommended Value Range
Preheating ramp-up slope	1°C/s to 3°C/s
Soak time (150°C to 180°C)	70s to 120s
Peak temperature	238°C to 245°C
Time above 220°C	45s to 70s
Cooling phase slope	-3°C/s to -1°C/s



- The actual soldering process depends on many other factors, such as solder paste, size and PCB thickness, layout design of other components, etc. If the recommended parameters cannot be reached, please contact Fibocom for confirmation in time. If the recommended maximum welding temperature is exceeded, the module will have permanent damage risk.
- It is recommended to use a special reflow carrier to support the module when passing through the reflow to prevent the PCB from warping when heated, thus affecting the module soldering.
- Repeated reflow soldering of the module is not recommended, with the risk of permanent damage to the module.

3 SMT Module Disassembly and Rework

3.1 Preparation Before Disassembly

1. Before rework, check and confirm the soldering condition of BGA and other devices inside the module through X-ray, and ensure that the disassembly starts only when the devices inside the module are normal.
2. Before disassembly, bake the PCBA for 8 hours at 125°C. If there are components on the motherboard that cannot withstand the high temperature of 125°C, refer to the baking requirements of them and adjust the baking condition during disassembly.

3.2 Disassembly Procedure

1. Place the PCBA on a preheater similar to that shown in Figure 11. The preheater is aligned with the bottom of the PCBA module for heating. The temperature of the preheater is set to about 150°C. If necessary, custom brackets can be designed to support and fix the PCBA board.
2. After the PCBA temperature is close to the preheater temperature, heat the module by using a large-caliber hot air gun, the temperature of the hot air gun is set to be about 350°C, and the air outlet of the heat gun is about 2cm-3 cm away from the upper surface of the module.
3. After heating for a period of time, gently try to clamp the edge of the module with wide-mouth tweezers. After the solder paste melts, clamp the module with wide-mouth tweezers, and then quickly place the module on a horizontal cooling platform, avoiding tilting the module during operation.



Figure 11. Bottom preheater

3.3 Re-soldering Procedure

1. Use soldering iron and solder absorption tape to remove solder from the motherboard and module pad and keep the pad surface flat.
2. Use cotton swab or dust-free cloth, dip a small amount of cleaning solvent and clean the pad. Take care to avoid the cleaning solvent soaking into the module.
3. Print solder paste on the soldering pad corresponding to the module on the motherboard by using a small stencil, wherein the solder paste is appropriate and evenly distributed.

4. Place the motherboard on the dedicated BGA rework station, operate the optical alignment system of the BGA rework station to place the modules, and confirm the polarity of the modules before placing.
5. Refer to the reflow profile of the module to set the profile of the BGA rework station, and select the nozzle with appropriate size to complete the re-soldering of the module.
6. After the temperature drops to normal temperature, use X-ray to check the soldering conditions of the bottom pad of the module and the BGA and other components inside the module.



- Take anti-static measures during operation.
- The power, preheating time and heating time of the hot air gun shall be adjusted according to the actual situation of the motherboard and the skills of rework personnel.
- If there are heat-labile components around the module on the motherboard, the heat-labile components need to be protected during disassembly and re-soldering.
- Do not disassemble the inside of the module or the warranty period will terminate immediately.