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FIBOCOM NL668 LCC SMT

Application Design Description

Version: V1.0.3

Date: 2019-05-15



Applicability Table

No.	Product Model	Description
1	NL668-CN	NA
2	NL668-EAU	NA
3	NL668-EU	NA
4	NL668-AM	NA
5	NL668-757S	NA
6	NL668-LA	NA
7	NL668-JP	NA

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Versions

Version	Author	Assessor	Approver	Update Date	Description
V1.0.0				2018-01-22	Initial version
V1.0.1				2018-05-28	1. revisions of applicability table 2. revisions of tape packaging 3. revisions of box packaging 4. revisions of humidity level card 5.changing humidity card to six-circle style 6. revisions of floor life 7. revisions of solder paste 8.adding notes of solder paste 9. revisions of recommended oven temperature curve 10. revisions of cooling

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Version	Author	Assessor	Approver	Update Date	Description
V1.0.2				2018-06-26	Adding oven temperature plate description
V1.0.3	Li Zepu	Xie Zhenhe	Xie Zhenhe	2019-05-15	<ol style="list-style-type: none"> 1. Adding Dimensions of the Tape and Reel 2. Updating Tape Packaging Process 3. Updating storage information 4. Updating Applicability Table

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1 Packaging, Storage, and Usage

1.1 Packaging Overview

NL668 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.



Note:

- The packaging is vacuum-packed and contains humidity card and desiccant.
- The NL668 module is a precision electronic product, and may suffer permanent damage if no proper ESD protection measures are taken.
- The NL668 module is a moisture-sensitive device, with moisture sensitive level 3, and it is in line with the standards of the 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

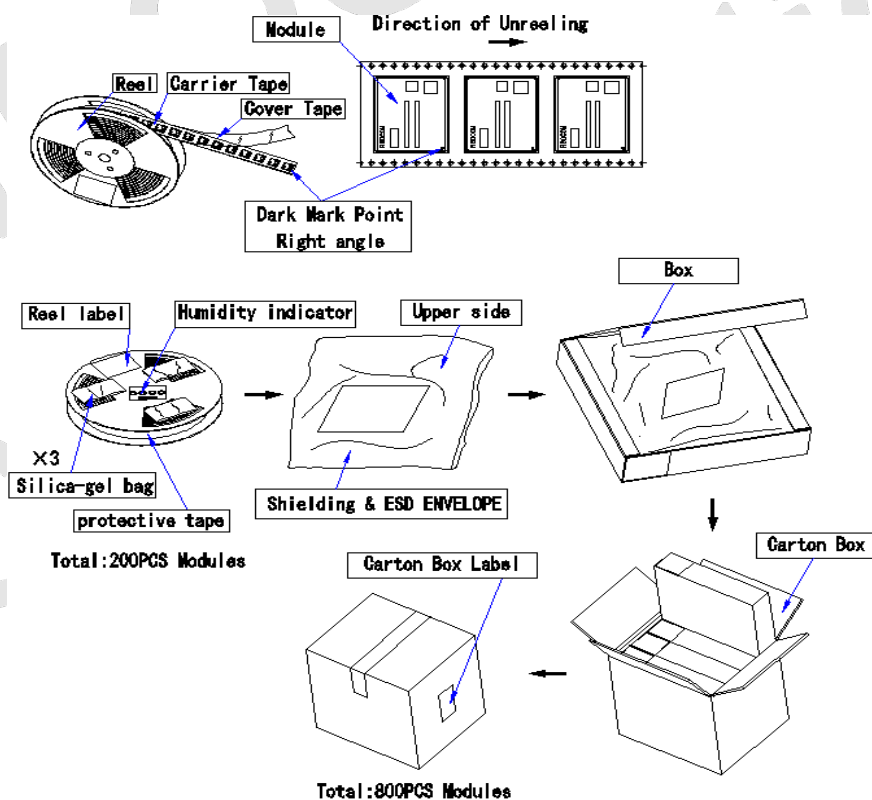
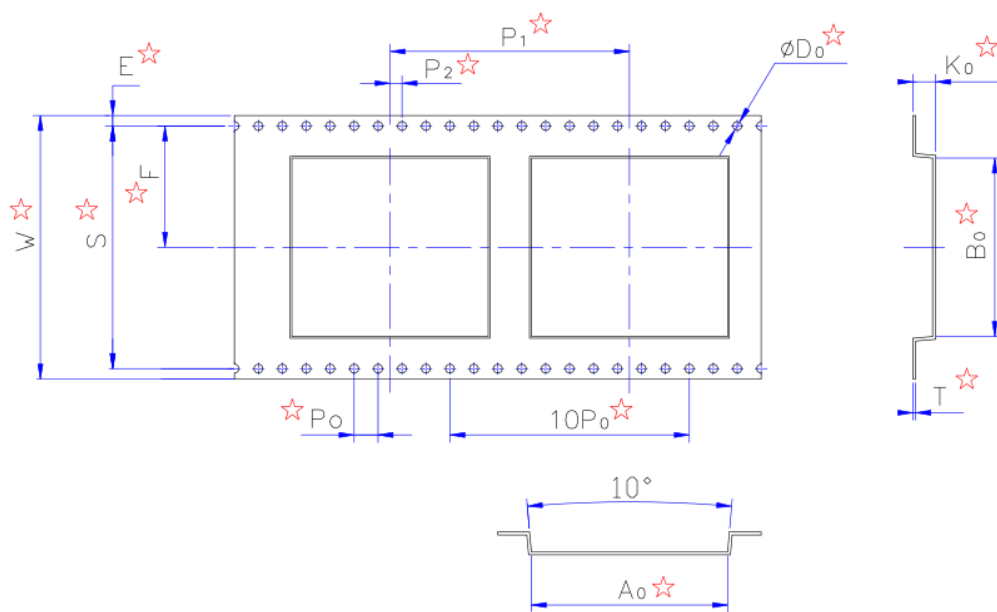


Figure 1-1 Tape Packaging Flow Chart

1.1.2 Tape&Reel Dimensions



ITEM	A ₀	B ₀	K ₀	P ₀	P ₁	P ₂	T
DIM	32.8±0.1	29.8±0.1	3.8±0.1	4.0±0.1	40.0±0.1	2.0±0.15	0.5±0.05
ITEM	E	F	D ₀	W	10P ₀	S	
DIM	1.75±0.1	20.2±0.3	1.50 ^{+0.10} _{-0.00}	44.0 ^{+0.30} _{-0.10}	40.0±0.2	40.4±0.1	

Figure 1-2 Tape Dimensions

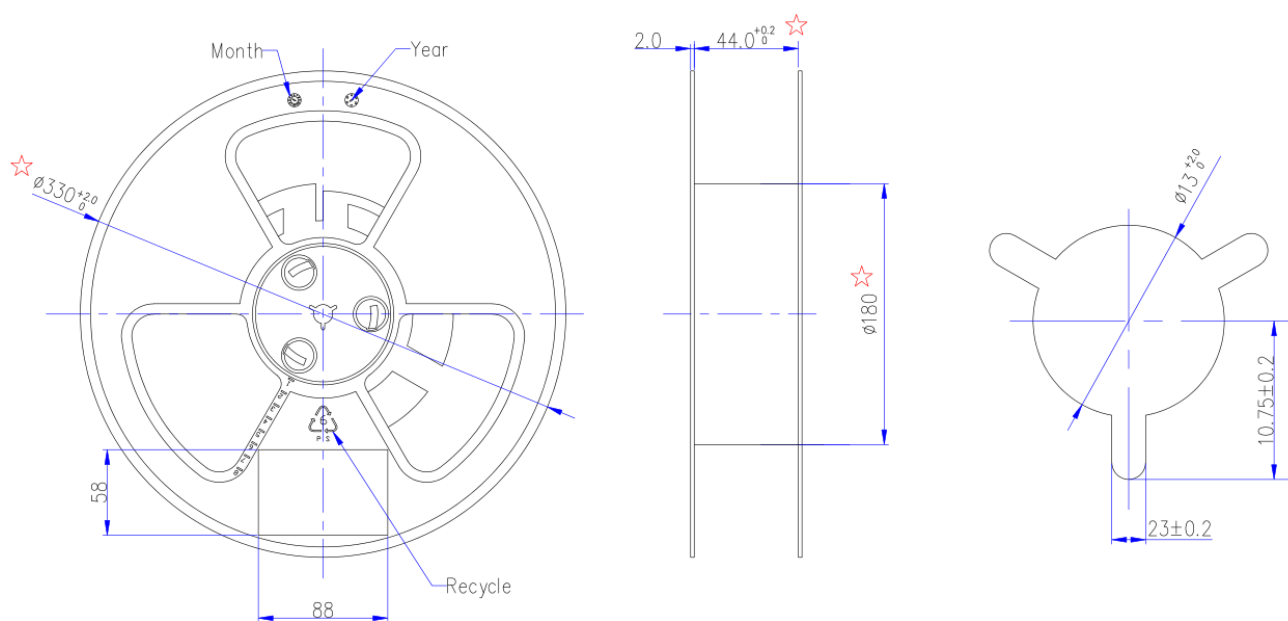


Figure 1-3 Reel Dimensions

1.2 Storage

Storage conditions (recommended): temperature $23 \pm 5^{\circ}\text{C}$, relative humidity RH 35-70%.

Storage life (sealed vacuum bag): The storage life is 12 months under the recommended storage conditions.

Other storage requirements: Refer to Figure 1-4.

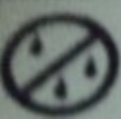
	<p>CAUTION</p> <p>This bag contains</p> <p>MOISTURE-SENSITIVE DEVICES</p> <ol style="list-style-type: none"> 1. calculated shelf life in sealed bag: 12 months at $23 \pm 5^{\circ}\text{C}$ and $<70\%$ relative humidity (RH) 2. After this bag is opened. Devices that will be subjected to reflow solder or other high temperature process must be <ol style="list-style-type: none"> a) mounted within 168 hours of factory conditions $<30^{\circ}\text{C}/60\%\text{RH}$, or b) stored at $<10\%\text{RH}$ 3. devices require baking, before mounting, if: <ol style="list-style-type: none"> a) humidity indicator card is $>10\%$ when read at $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$, or b) 2a or 2b not met. 4. if baking is required, devices may be baked for <u>24</u> hours at $125^{\circ}\text{C} \pm 5^{\circ}\text{C}$. <p>Note: if device containers cannot be subjected to high temperature or shorter bake times are desired.</p> <p>REFERENCE IPC/JEDEC J-STD-033 FORBAKE PROCEDURE.</p> <p> Note: Level and body temperature defined by IPC/JEDEC J-STD-020</p>	<p>LEVEL</p> <div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto; display: flex; align-items: center; justify-content: center;"> <p>3</p> </div>
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Figure 1-4 Humidity level card

1.3 Humidity Card

Humidity card indication description: The six-circle humidity indication shows relative humidity (RH) values 10%, 20%, 30%, 40%, 50% and 60% respectively.

Humidity indication: When the humidity gradually increases, the brown humidity indication area will gradually turn green. The current humidity value is the green area with the highest "humidity ratio".

As shown in Figure 1-5: Relative humidity RH is $>10\%$.

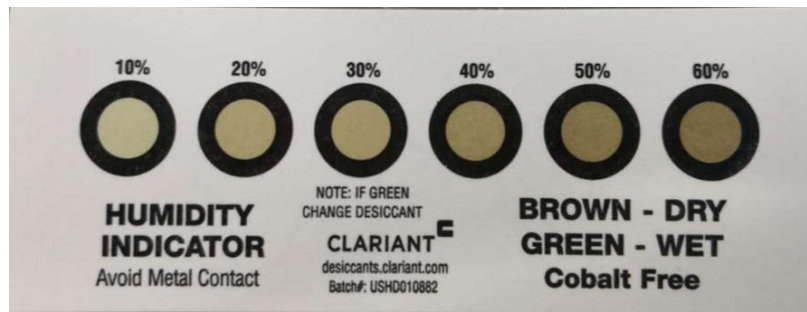


Figure 1-5 Humidity Card

1.4 Desiccant

Silica gel desiccant is used for packaging.

1.5 Floor life

According to《J-STD-033 SMD the operation, transportation, storage, packaging standards of temperature & humidity sensor》, After unpacking the “Class 3” moisture sensitive product, in the environment with $23\pm5^{\circ}\text{C}$ workshop temperature and relative humidity less than 60%, the reflow production or other high-temperature operation shall be conducted for the product within 168 hours, or stored in an environment with relative humidity less than 10% to maintain dryness of the product. When the workshop relative humidity is less than 70%, the product has a floor life of 24 hours.

1.6 Usage

1.6.1 Moisture Pretreatment (Preheating Treatment)

Sealant and matrix materials tend to absorb moisture, so preheating and drying processes are required before reflow soldering and other high-temperature operations, in order to prevent cracking and stratification of the “popcorn” effect during reflow soldering in cases where relative humidity $\text{RH} > 10\%$ or when floor life related regulations are not met.

1.6.2 Recommended Baking Standard

- Continuous baking time: 24 hours.
- Temperature: $125\pm5^{\circ}\text{C}$.
- Oven: Convection oven.



Note:

- If it cannot be processed within the specified time, put the dried parts with desiccant and humidity card into moisture-proof bag. Use the vacuum thermal barrier sealer to seal the bag. It is recommended to store it in the nitrogen cabinet.
- Do not directly bake the tape-packed module. Before baking, place the module in a high temperature resistant tape and then bake it.

1.6.3 PCB Soldering Pad and Recommended Stencil Design

Recommended NL668 soldering pad is shown in Figure 1-6:

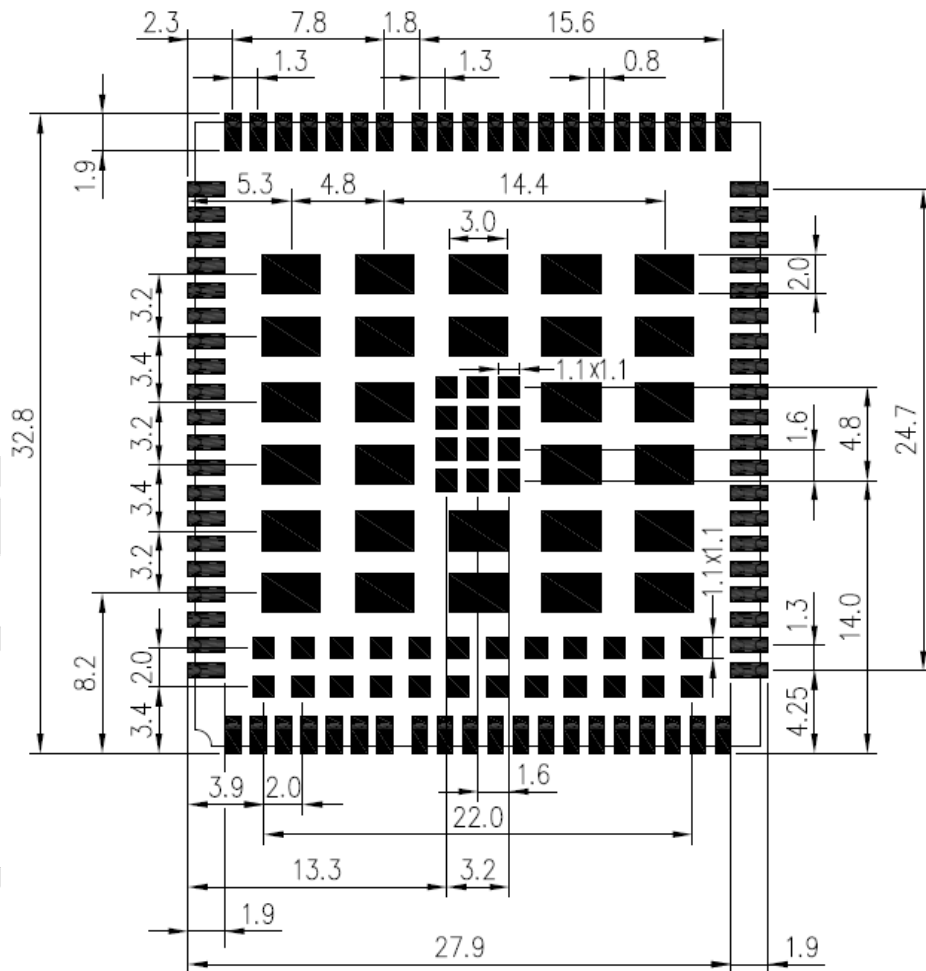


Figure 1-6 NL668 PCB Soldering Pad Design (Unit: mm)



Note:

It is recommended that in PCB design, do not place components on back of the module for easy maintenance operation.

Please do not set any printing in the bottom of the module to avoid gaps affecting the soldering.

Devices requiring a relatively small gap between steps, such as a 0201, should have a package

with a size of 5 mm or more, and ICs with a size of 8 mm or more.

Recommended NL668 stencil is shown in Figure 1-7:

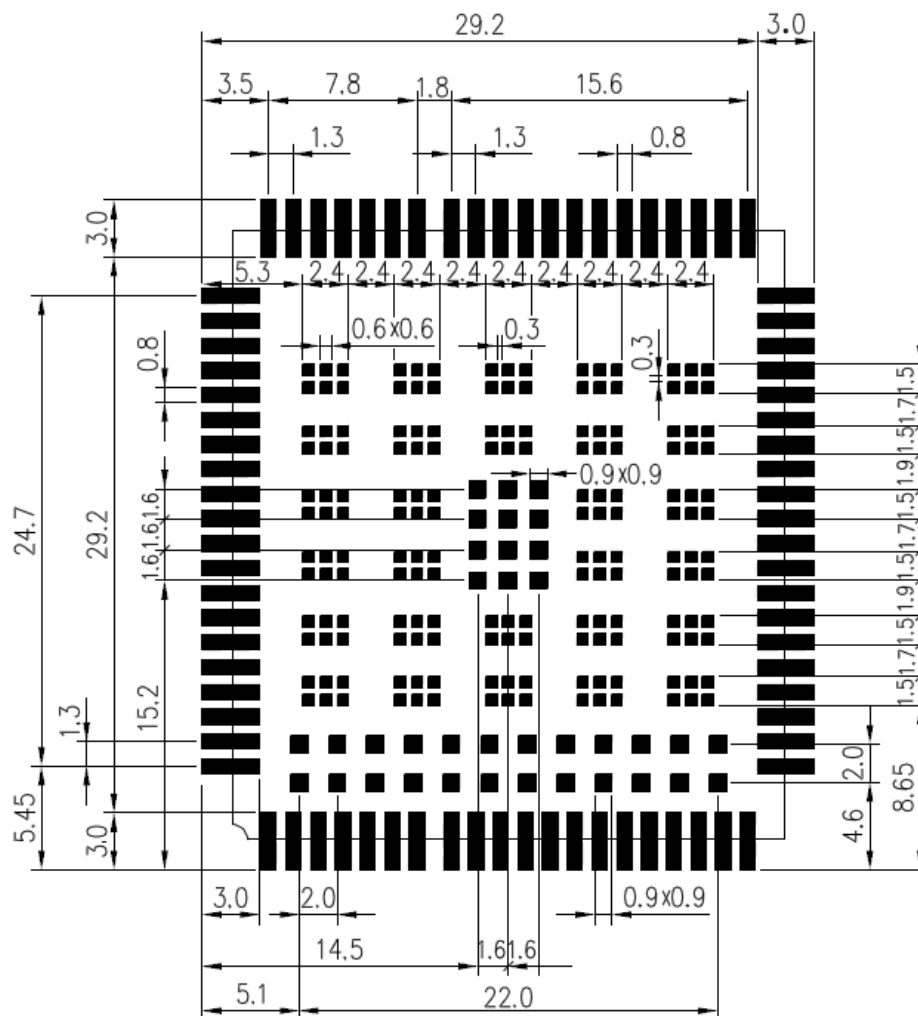


Figure 1-7 NL668 PCB Stencil Design (Unit: mm)



Note:

Recommended stencil thickness: 0.15-0.18mm.

1.6.4 SMT Production Process Parameters and Related Requirements

1.6.4.1 Solder Paste

It is recommended to use “no-clean” soldering paste and no cleaning is required after soldering. The preferred soldering paste choice is ALPHA OM350.

Paste: ALPHA OM350

PRODUCT INFORMATION

<u>Alloys:</u>	SAC305, SAC357, SAC387, SAC396, SAC405 SACX Plus™ 0307 SMT, & SACX Plus™ 0807 SMT e1 alloys per JESD97 Classification
<u>Powder Size:</u>	Type 3, Type 4, & Type 4.5
<u>Residues:</u>	Approximately 5% by (w/w)
<u>Packaging Sizes:</u>	500 gram jars, 6" & 12" cartridges, DEK ProFlow® cassettes, and 10cc and 30cc dispense syringes
<u>Flux Gel:</u>	ALPHA OM-338-PT Flux Gel is available in 10cc or 30cc syringes for rework applications
<u>Lead Free:</u>	Complies with RoHS Directive 2011/65/EU

NOTE 1: For other alloys, powder size and packaging sizes, contact your local Alpha Sales Office.

CATEGORY	RESULTS	PROCEDURES/REMARKS
CHEMICAL PROPERTIES		
Activity Level	ROLO	IPC J-STD-004A
Halide Content	Halide free (by titration)	IPC J-STD-004A
Ag Chromate Test	Pass	IPC J-STD-004A
Copper Corrosion Test	Pass , No Evidence of Corrosion	IPC J-STD-004A
ELECTRICAL PROPERTIES		
SIR (IPC 7 days @ 85° C/85% RH)	Pass , 4.1×10^9 ohms	IPC J-STD-004A (Pass $\geq 1 \times 10^9$ ohm)
SIR (Bellcore 96 hrs @ 35°C/85%RH)	Pass , 8.4×10^{11} ohms	Bellcore GR78-CORE (Pass $\geq 1 \times 10^{11}$ ohm)
Electromigration (Bellcore 96 hrs @ 65°C/85%RH 10V 500 hrs)	Pass , Initial = 3.8×10^9 ohms Final = 1.9×10^9 ohms	Bellcore GR78-CORE (Pass=final > initial/10)
PHYSICAL PROPERTIES (Using 88.5% Metal, Type #3 Powder)		
Color	Clear, Colorless Flux Residue	
Tack Force vs. Humidity	Pass , Change of $<1 \text{ g/mm}^2$ over 24 hours at 25%, 50% and 75 % Relative Humidity	IPC J-STD-005
Tack Force vs. Time	Pass , Change of $<10\%$ when stored at $25 \pm 2^\circ\text{C}$ and $50 \pm 10\%$ relative humidity	JIS Z-3284, Annex 9
Viscosity	83.3% metal load for T3 designated M04 for dispensing. 88.5% metal load for T3 designated M15 and 88.5% metal load for T4 designated M16 for printing.	Malcom Spiral Viscometer, 1. J-STD-005
Solderball	Acceptable (SAC 305 and SAC405 alloys)	IPC J-STD-005
Stencil Life	8 hours	@ 50%RH, 23°C (74°F)
Spread	Pass	JIS-Z-3197: 1999 8.3.1.1
Slump	Pass	IPC J-STD-005 (10 min 150°C)

For other parameters, please refer to the soldering paste instruction or specification.



Note:

The recommended soldering paste has undergone repeated experiments and is approved to be reliable. When in use, the soldering solder paste types can be properly adjusted according to actual needs.

1.6.4.2 Printing Parameters

Printing speed: 45±20 mm /s

Printing pressure: 5±1KG

1.6.4.3 Mounting

The module needs to be mounted on IC head of the multi-function chip mounter. The module has a certain weight, so it is recommended to use the largest possible nozzle, set a lower axis to take the materials, and set acceleration to mount, otherwise there will be a risk of displacement of the body, resulting in soldering misalignment, and other soldering problems.



Note:

- The module should not be mounted manually
- The polarity of the module is shown in the figure. The black dot on the left bottom of the module must be consistent with the positioning pin 1 on the PCB



Figure 1-8 Top View of the NL668 Module

1.6.4.4 Cooling

Controlled cooling prevents negative soldering effects (soldering points become brittle) and mechanical stresses within the product. Controlled cooling helps achieve bright tin filling effect, has an aesthetic appearance and low contact angle. The optimal cooling rate is ≤3°C/second.

1.6.4.5 Appearance Inspection

After the module is welded, use the optical inspection method to check the soldering quality. For the specific standard, please refer to the latest IPC-610 standard.

1.6.4.6 Furnace temperature plate

The furnace temperature plate needs to take points on the module pins. Points shall be taken at the middle edge of the plate, the nearest edge of the reflow oven, and the edge of bottom with large heat capacitor, as shown in the circled box in the following figure

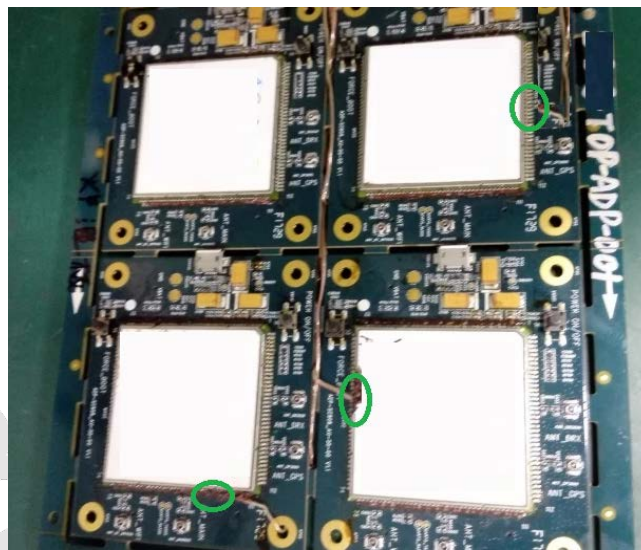


Figure 1-9 Furnace Temperature Plate Reference

1.6.4.7 Soak Temperature and Reflow Soldering

The heating/reflow phase will produce a liquid phase temperature exceeding 216-221°C. It is necessary to prevent a sudden increase in temperature, otherwise it will increase the risk of soldering paste collapse. Above 220°C liquid phase temperature time: 60~90 seconds.

Peak reflow temperature: 235~245°C.

Preheating time (170~220°C): 60~120 seconds.

Temperature increase slope: less than 3°C/s.

Cooling slope: -4~ -1°C/s.

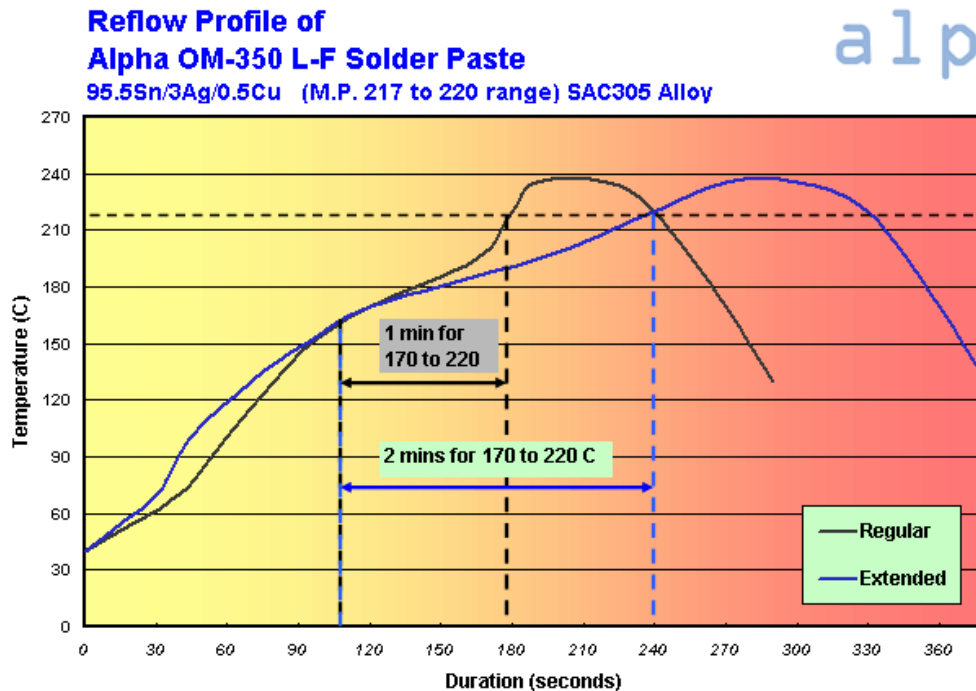


Figure 1-10 Recommended Oven Temperature Curve



Note:

The actual soldering temperature depends on other external factors such as the selected soldering paste, base size, thickness, and board design. If the maximum soldering temperature in the recommended soldering curve is exceeded, there is a permanent damage risk to the module.

1.6.4.8 Cleaning

The best method is to use “no-clean” soldering paste, which minimizes the permanent damage risk to the module due to the cleaning process. It is not recommended to clean the welded module for the following reasons:

- Dirt remaining on the bottom of the module cannot be easily cleaned.
- Cleaning with water will cause a capillary effect. Water will flow into the gap between the bottom plate and the module. The residual paste and the water in the gap will be mixed together, which may cause a short circuit or the formation of a resistor between adjacent pads like connected circuit. Water may also damage label silkscreen and other marks.
- Cleaning with alcohol or a similar organic solution will flush residual paste into the two shields. This will be difficult to detect. The solution will also damage the label silkscreen and other marks.
- Ultrasonic cleaning can cause permanent damage to the module, especially the crystal.

2 Other Notes

2.1 Repeated Soldering

It is not recommended to conduct repeated reflow soldering for the module, and there is a risk of permanent damage to the module.

2.2 Wave Soldering

If there are both plug-in components and surface mounted components on the circuit board, wave soldering is required to weld the plug-in components. Only one wave soldering process is allowed for the circuit board of the module.

2.3 Manual Soldering

Manual soldering shall be performed in accordance with the relevant provisions of the IPC7711 standard document.

Always wear an anti-static wrist strap during operation. The device must be grounded.

Method one:

Equipment: Soak temperature heating platform, electric iron, tin absorption tape, soldering wire, flat mouth tweezers.

Recommended temperature setting: Soak temperature heating platform 320 °C, soldering iron 350 °C.

Adjust according to equipment characteristics and actual conditions.

Recommended soldering procedures:

- Use soldering iron to pre-weld the motherboard PCB pad, and remove the excess tin with a tin absorption tape to keep the pad surface flat.
- Use plant tin- stencil t (which can made when opening the stencil) to pre-weld the module pins. Note that the weld paste should be adequate and even.
- Place the motherboard module to be welded face up and place it above the soak temperature heating platform. Place the module in the correct position on the motherboard. It is expected to take about 30 seconds. After the soldering paste is melted, press it slightly to complete the soldering.

Method two:

Equipment: hot air gun (large outlet), electric iron, tin absorption tape, weld wire, flat mouth tweezers

elbow.

Recommended temperature setting: hot air gun 400 °C, soldering iron 350 °C. Adjust according to equipment characteristics and actual conditions.

Recommended soldering procedures:

- Use soldering iron to pre-weld the motherboard PCB pad, and remove the excess tin with a tin absorption tape to keep the pad surface flat.
- Use soldering iron to pre-weld the module pins so that the amount of tin is adequate and evenly distributed.
- Accurately place the module on the motherboard PCB. Use a hot air gun to heat it from the bottom of the motherboard PCB. The heating needs to be even, and the area should be sufficient to cover the module area. After the soldering paste is heated and melted at the bottom of the module, the soldering is completed.

2.4 Disassembly

It is not recommended to remove the module from the circuit board, which may damage the module. If you need to disassemble the module, please use a soak temperature heating platform. The temperature is set to 320°C (adjust according to the characteristics of the equipment and the actual conditions). Heat from the bottom module of motherboard PCB, which is expected to take 30s, and the soldering paste melts after being heated to a certain temperature, then gently lift the parts. If the module is still stuck on the PCB, continue heating evenly.



Note:

Do not disassemble the module, or the warranty terminates immediately.