

NeoSpectra Micro (SWS62231) Handling and Reflow Recommendations

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1. Introduction

The NeoSpectra Micro is a chip-sized, Near InfraRed (NIR) spectral sensor that delivers the spectral response of the light absorbed by materials for quantification, qualification, and identification. It is designed to be used in different systems as an OEM module for applications that can be enabled by the spectral range 1,350 – 2,500 nm. NeoSpectra Micro's core technology is based on semiconductor Micro Electro Mechanical Systems (MEMS) microfabrication techniques promising unprecedented economies of scale. The NeoSpectra Micro sensor determines the spectral content of the input light in NIR range between 1,350 – 2,500 nm. With its unique features of size, cost, and scalability it can enable new usage models for different application areas.



2. Electrical Interface & Mechanical Fixation

NeoSpectra Micro features a ball grid array interface that enables easy integration in larger systems with a compact size. The interface consists of 30x30 ball grid array; each has a 600 um diameter and the pitch between balls is 1mm. A notch resides at the bottom left corner indicating location of the first ball and the proper orientation the of the module. Figure 1 shows the top view of the BGA of NeoSpectra Micro with a color coding map that specifies the pin assignment of the different balls.



Figure (1) Top view of NeoSpectra Micro BGA

As for mechanical fixation, no need for any screws or mounts on the host PCB. The 30x30 BGA provides a robust mechanical fixation in addition to the electrical interfacing. This saves a lot of space and makes the assembly process more cost effective at the user assembly line.

3. Reflow Profile

Reflow soldering is a process in which a solder paste (a mixture of powdered solder and flux) is used to temporarily attach one or several electrical components to their contact pads, after which the entire assembly is subjected to controlled heat, which melts the solder, permanently connecting the joint. Heating may be accomplished by passing the assembly through a reflow oven or under an infrared lamp or by soldering individual joints with a hot air pencil.



Figure (2) General Thermal Reflow Profile

The most commonly used soldering method for surface mount devices is forced convection reflow. There are other possible solder processes for surface mount devices, i.e.: infrared reflow (IR) and vapor phase.

It is almost impossible for an IC/sensor manufacturer to provide a general reflow profile recommendation for any customer in charge of board assembly. The actual sensor assembly reflow furnace settings need to be adjusted separately depending on furnace characteristics and board design. However, the selected temperatures should not exceed the parameters used for MSL classification.

Reflow furnace settings depend, for example. on the number of heating and cooling zones, type of solder paste/flux used, board and component size as well as component density. The actual temperature setting needs to be above the liquid temperature (solder melting point) of the solder paste in order to form a reliable solder joint, while the upper limit is clearly defined by the maximum peak body temperature depending on sensor volume.

For NeoSpectra micro BGAs used have the following composition Sn96.5, Ag 3.0, Cu 0.5. A new recommendation for the reflow profile which is different than what was recommended in the early ES samples is to use a low temperature solder paste. This is mainly to avoid any issues related to high temperature reflow and should be easier in optimization.

Recommended low temperature solders pastes:

- 1- Bi57/Sn42/Ag1
- 2- Bi57.6/Sn42/Ag0.4

The most popular lead-free bismuth solder alloys are (58Bi 42Sn) which melts at 138°C and (57Bi42Sn1Ag) which melts at 140°C. The addition of the 0.4% or 1% Ag makes the alloy more malleable. Both alloys can be used for step soldering applications. After the initial joints are made with a standard SAC alloy (220°C) subsequent soldering operations can be done using the bismuth alloys. The low temperature reflow profile tested on 57Bi42Sn1Ag is shown in figure (3)



n Limit Units
Degrees/Second
Seconds
Seconds
•

Figure (3) Low Temperature Reflow Profile Tested NeoSpectra Micro Sensor

Recommended sellers for low temperature solder past is Indium Corporation (preferred) and Chip Quik on mouser or Amazon.

- https://www.indium.com/solder-paste-and-powders/low-temperature/
- <u>https://eu.mouser.com/Tools-Supplies/Soldering/Solder/_/N-b11qq?P=1ynqsmxZ1z0xha9</u>

 <u>https://www.amazon.com/Solder-Bi57-6-No-Clean-Lead-Free-</u> <u>Temperature/dp/B0195V1QEI/ref=sr 1 1 sspa?crid=2AFP2LG4MC6ET&keywords=low</u> <u>+temperature+solder+paste&qid=1553169673&s=gateway&sprefix=low+temperature+so</u> <u>Ider+%2Caps%2C304&sr=8-1-spons&psc=1</u>

4. Recommendations and precautions

4.1. No condensation

As Neospectra micro sensor is a spectral sensor so any condensation will affect the overall performance and specifications. Sensor should not be subject to environments that have high temperature differences between sensor body and surroundings with high humidity as this may cause dew condensation which will affect the performance and specifications.

4.2. ESD

Neospectra micro sensor is electrostatic sensitive. When handling the sensor precautions need to be taken to avoid performance deterioration and malfunctioning.

- A wrist strap must be worn against the skin by the personnel handling the sensor. The wrist strap should be connected to GND through the appropriate connection (usually high resistance) before handling the sensors.
- Do not remove the device from the antistatic bag until you are ready to install the device in the system.
- With the device still in its antistatic bag, touch it to the metal frame of the system.
- Grasp sensors by the edges and do not touch the BGAs by hand.
- If you need to put the device down while it is out of the antistatic bag, put it on the antistatic bag.

4.3. No clean soldering process

During soldering no-clean process is recommend. The sensor has a light interface that should not be contaminated by any residues as this may affect the sensor performance.

4.4. Storage and floor life

Sensor is still under testing and certification process for MSL rating and floor life. Recommended procedure now is to use the sensors directly after they are out from shipping boxes. In high volumes the sensors will be provided in vacuum sealed ESD bags to prevent any humidity or contamination to go inside the sensor. As the sensor is a spectral sensor any contamination will affect performance and specifications.

4.5. Cleaning Light Source Head

After the final assembly on the PCBs and before packing the sensor inside the final packaging, make sure the light source head interface is clean and there is no contamination. Typical wipes used for lenses cleaning can be used for that purpose.

5. References

- J-STD-020D.1: Joint IPC/JEDEC standard for moisture and reflow sensitivity classification for non-hermetic solid state surface-mount devices
- IPC/JEDEC J-STD-033C: Joint IPC/JEDEC standard for handling, packing, shipping, and use of moisture and reflow sensitive surface-mount devices