

AFBR-S4NxxPyy4M NUV-MT Soldering

Solder Precautions

The Broadcom[®] AFBR-S4NXX (AFBR-S4NxxPyy4M) is a silicon photomultiplier (SiPM) series that is used for ultra-sensitive precision measurements of single photons. This product family has been qualified according to moisture/reflow sensitivity classification (MSL) 6. Refer to the Joint Industry Standard (IPC/JEDEC J-STD-020) for details on the moisture sensitivity classification. Precautions must be taken to reduce thermo-mechanical stress during the solder process of the SiPMs.

Table 1 shows the details of the solder profile.

1. **Preheat:** For the first 90 seconds to 125 seconds, the temperature gradient should not exceed 1 K/s.
2. **Preheat/Soak:** For the time between the end of point 1 until 200 seconds are reached, the maximum temperature gradient is 0.4 K/s.
3. **150°C to 200°C:** The recommended overall time to ramp up from 150°C to 200°C is 90 seconds. Therefore, the temperature gradient from 200°C until the peak temperature is determined by the aforementioned constraints:
 - ... 200 seconds: Temperature gradient < 0.4 K/s
 - 150°C to 200°C: 90 seconds
4. **Cool-Down:** The maximum cool-down rate is 3 K/s and is also determined by the requirement of being above the liquidus temperature for 60 seconds and being above 240°C for 30 seconds.

The solder profile shown in Figure 1 represents one profile that follows the aforementioned guidelines. The solder profile reflects maximum temperature rates during the reflow solder process, which must not be exceeded during the solder process. Exceeding the specified maximum temperature ramps can lead to a reliability problem of the component and reduce the service life. It is recommended to verify the profile on all new PCB materials and designs with thermocouple measurements. Thermo-mechanical stress can occur at all steps during the solder process. Therefore, not only must the heat-up phase follow the recommended solder profile, but the peak temperature and the cool-down rate must also be obeyed.

Prior Soldering

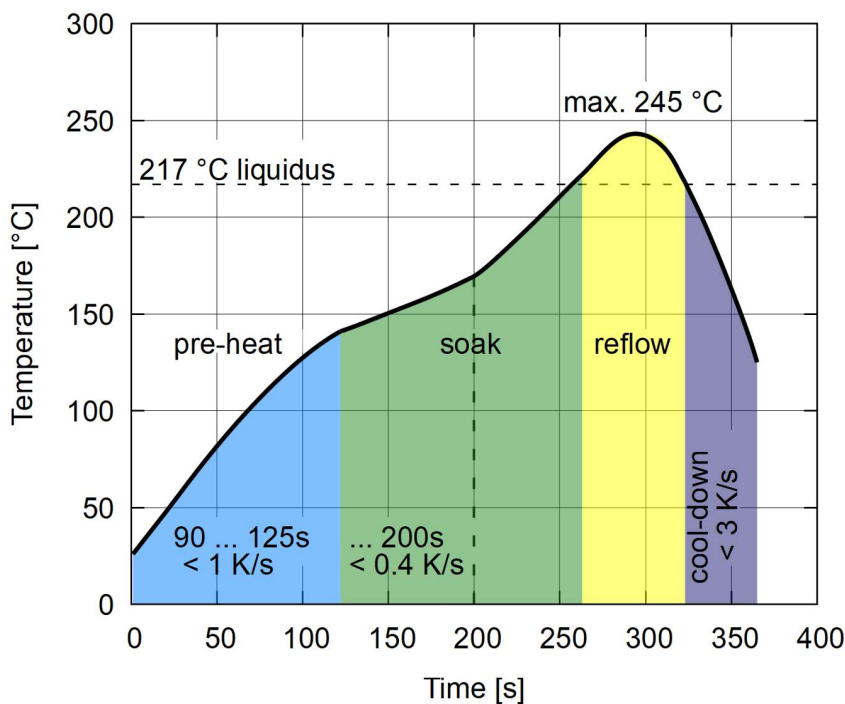
- Baking at 125°C for 16 hours is mandatory before soldering.
- MLD is according to MSL 6 with a *maximum* floor life of 4 hours at 30°C and 60% relative humidity.

Solder Procedure

- Preheat temperature ramp-up must not exceed 1 K/s.
- The peak temperature is 245°C.
- The cool-down rate must be less than 3 K/s.

Table 1: Recommended Solder Profile Features

Profile Feature	Recommendation
Preheat Rate	< 1K/s
Preheat/Soak (150°C to 200°C)	90s
Liquidus Temperature	217°C
Time above Liquidus Temperature	60s
Peak Temperature	245°C
Time within 5°C of the Peak Temperature	30s
Ramp-Down Rate	< 3K/s

Figure 1: Recommended Reflow Soldering Profile**NOTE:**

- When assembling a two-sided PCB, the floor life, baking, and solder profile must be considered each time the SiPM is placed in a reflow oven.
- If the SiPMs (arrays) must be stored, N₂ storage is recommended.

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