OMESH Networks

OPM15-E Application Note: Reflowing and Soldering

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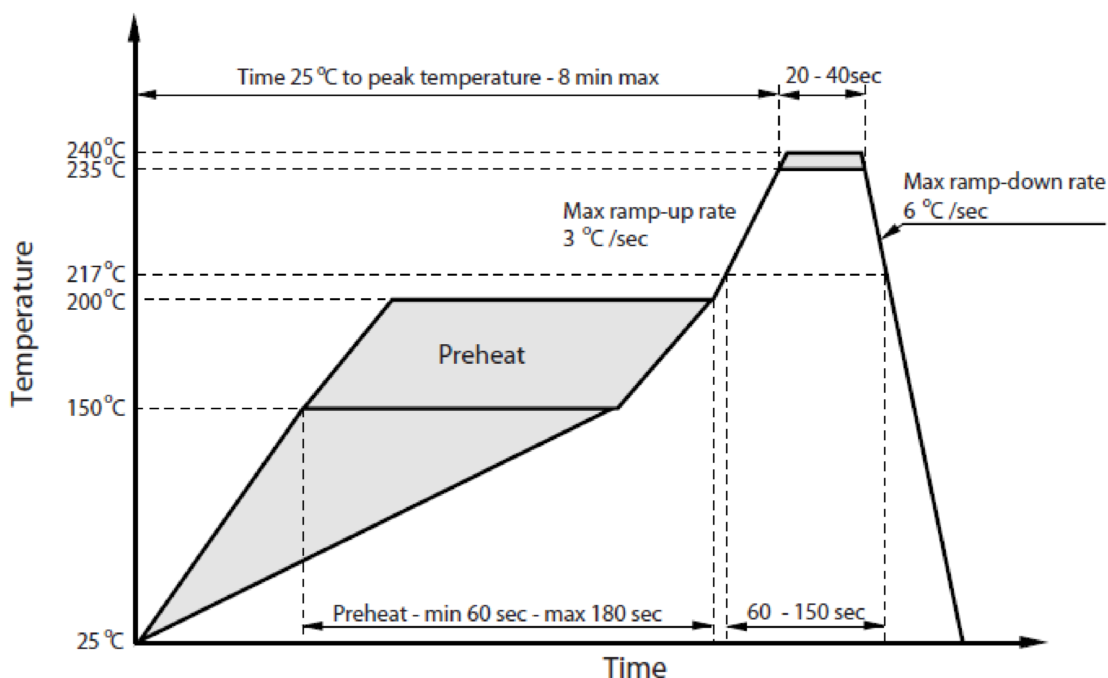
1.0 Introduction

The OPM15-E radio module (the low-power version) is a miniature thick-film hybrid, housing integrated circuits, ceramic chip capacitors, tantalum capacitors and discrete thick-film resistors. The hybrid inputs and outputs are pre-tinned copper pads, and can be reflowed on to alumina, flex and FR4 materials use conventional reflow methods. The following information is to provide assistance to design and production personnel in the attachment of the hybrid package onto printed circuit boards or alumina substrates.

2.0 Recommended Temperature Profile



Notes:

1. Maximum reflow temperature of the assembly must not exceed 240° C as measured on the top of the device package.
2. The moisture sensitivity is Rating of '4' (MSL#4), according to IPC/JEDEC J-STD-020C. Moisture/reflow sensitivity Classification for Non-Hermetic Components (72 hour floor life at 30°C/60%RH after opening dry pack). MSL classification was designed for reflow operation and it is good practice to follow the recommendations for point-to-point hand soldering as well.
3. Please note that every OPM15-E hybrid has an integrated circuit under the encapsulation, therefore ESD precautions should be taken at all times.

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3.0 Recommended Attachment Land Geometry

The recommended land size to which the hybrid package is to be reflowed, is 0.05mm (2mil) shorter per axis. The stencil apertures should be same size as the land sizes on the carrier board. The stencil should be 0.15mm (6mil) thick, with the pattern obtained by a chemical etching or a laser machining process. If chemical etching is used, the stencil should be etched from both sides.

4.0 Recommended Steps in Assembly

Step 1: Solder Paste Application
Solder paste is deposited onto the board using a stencil and semiautomatic solder printer. Important variables include the following:

- Age of solder paste
- Time between solder paste application and reflow
- Deposited solder registration accuracy and consistency of solder paste thickness during printing process.

It is recommended that the maximum mis-registration of solder paste to the land on the board in X or Y direction should not be more than 0.05mm (see Figure 4). A solder paste thickness of 125 to 175 μ m is recommended.

Step 2: Hybrid Placement
For prototype applications or low volume applications, OPM15-E hybrids can be placed using tweezers. Alignment fiducials should be designed on the carrier board to assist in accurately placing hybrids. It is best to bring the device over the application area, then descend vertically in one movement to avoid smearing the solder paste. Make sure the hybrid aligns to at least two corner fiducials. It is important to precisely position the device over the contact lands.

For high volume production, a pick and place machine should be used. The pick and place machine should have vision capability with two attributes: 1) board error correction; 2) hybrid pads to board land alignment capability. Adequate placement force should be applied to the hybrid so that all the device pads contact the solder on the board lands. Excessive placement force will displace the wet solder under the device thus increasing the probability of solder bridging during reflow. Excellent results have been achieved using 10g of placement force. It is important that the hybrid pads be aligned to the board land, rather than the deposited solder paste, to avoid cumulative placement error. Alignment tolerances must be sufficient to guarantee a maximum of 0.1mm (4mils) misalignment between hybrid pad and the board land.

Step 3: Solder Reflow
The carrier board can be heated to 235° C for reflow (as measured on the carrier board close to the OPM15-E hybrid device). It can be accomplished using any of the following techniques: 1) infra-red/convection reflow oven; 2) vapor phase solder reflow. The rate of heating and cooling must be controlled to avoid thermal shock cracking of the chip capacitor components.

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Step 4: Cleaning of Solder Joints

Cleaning the reflowed hybrid circuit is the final step in this assembly process. The cleaning method will depend on the type of flux being used in the solder paste. For RMA based solder material, ultrasonic cleaning is preferred to remove any flux residues. Aqueous or semi-aqueous cleaning techniques may also be used.

It is important to note that the metal shield of OPM15-E hybrids is plated with Silver (Ag) and Nickel alloy. Therefore, any washing solution shall not react with Ag and Nickel, or otherwise the metal shield would have discoloration issues.

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