Vesper Piezoelectric MEMS Microphone Assembly Guidelines

Application Note
Rev1.0

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1 Introduction

This Application Note is intended to be used as a reference for the best practices in the manufacturing process using Vesper Piezo MEMS Microphones. Vesper Piezo MEMS microphones are inherently robust by design.

1.1 Moisture Sensitivity (MSL) Rating

Vesper Microphones have a Moisture Sensitivity Level (MSL) of 1, which means they have an unlimited shelf life and do not need to be kept in an airtight container or dry-box after the package has been opened.

1.2 General Handling

Vesper's piezoelectric MEMS microphones are very resistant to harsh environments such as dust and moisture. However, to avoid mechanical damage to the microphone, we recommend using appropriate handling procedures when manually handling the parts or when using pick and place equipment. The following guidelines will avoid damage:

- Do not apply a vacuum to the bottom side of the microphone. A vacuum pen may be used with care on the top side only.*
- Do not apply very high air pressure over the port hole.
- Do not insert any large particles or objects in the port hole. The microphone is resistant to small particles per IP5x specification.

- Do not brush clean the PCB in the area around the port hole, the individual bristles can get into the port and break the MEMS.
- Do not board wash or clean after the reflow process or expose the acoustic port to harsh chemicals.
- Use a placement force of <1,000g when using a pick and place machine

*For Top Port devices this is only allowed on a specific area listed in the product datasheet

2 PCB Mount Setup

Vesper piezoelectric MEMS microphones are fully solder reflow compatible. They can be placed on the pcb using a pick and place machine or by hand. The following guidelines will ensure successful PCB mount every time

2.1 Solder Type

Solder: SAC305 alloy (Sn 96.5%, Ag %3.0, Cu %0.5) or equivalent
Flux: No clean flux

2.2 Solder Stencil Type

Stencil Type: Laser cut
Stencil Thickness: 100um approx.

2.3 Solder Stencil and PCB Land Pattern Design

The PCB land pattern should be a 1:1 mirror of the microphone pins. The solder stencil pattern may be marginally smaller than the pad sizes to allow for better paste distribution

during reflow. The example drawings illustrate this where the stencil of regular pads are 0.05mm smaller than the pcb and the ground ring includes 4x0.15mm gaps. In all cases the solder stencil and pcb land pattern design should follow the design rules of the assembly house being used.

The following PCB land patterns and solder stencil patterns are for VM1000 and VM1010/VM2000. For other mics see their specific datasheets for details.

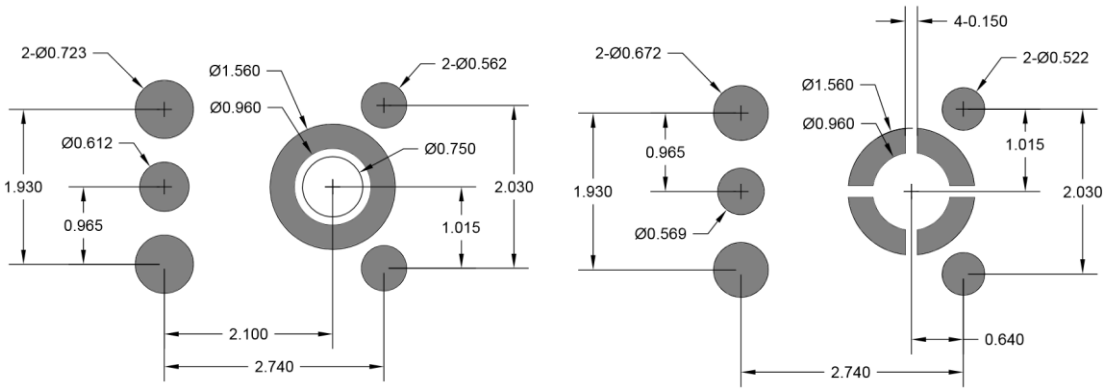


Figure 1: VM1000 PCB land pattern (left) and solder stencil pattern (right)

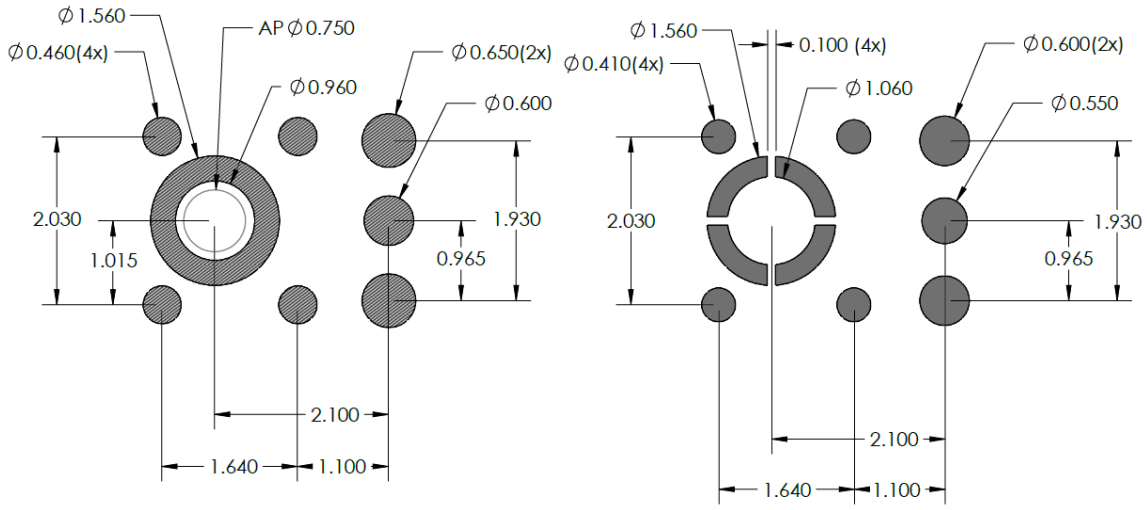


Figure 2: VM1010/VM2000 PCB land pattern (left) and solder stencil pattern (right)

3 Solder Reflow Profile

Vesper piezoelectric MEMS microphones can be soldered with the industry standard reflow profile described in JEDEC standard J-STD-020.

3.1 Reflow Profile

For Pb-free solder the mic should reach a peak temperature of 260°C:

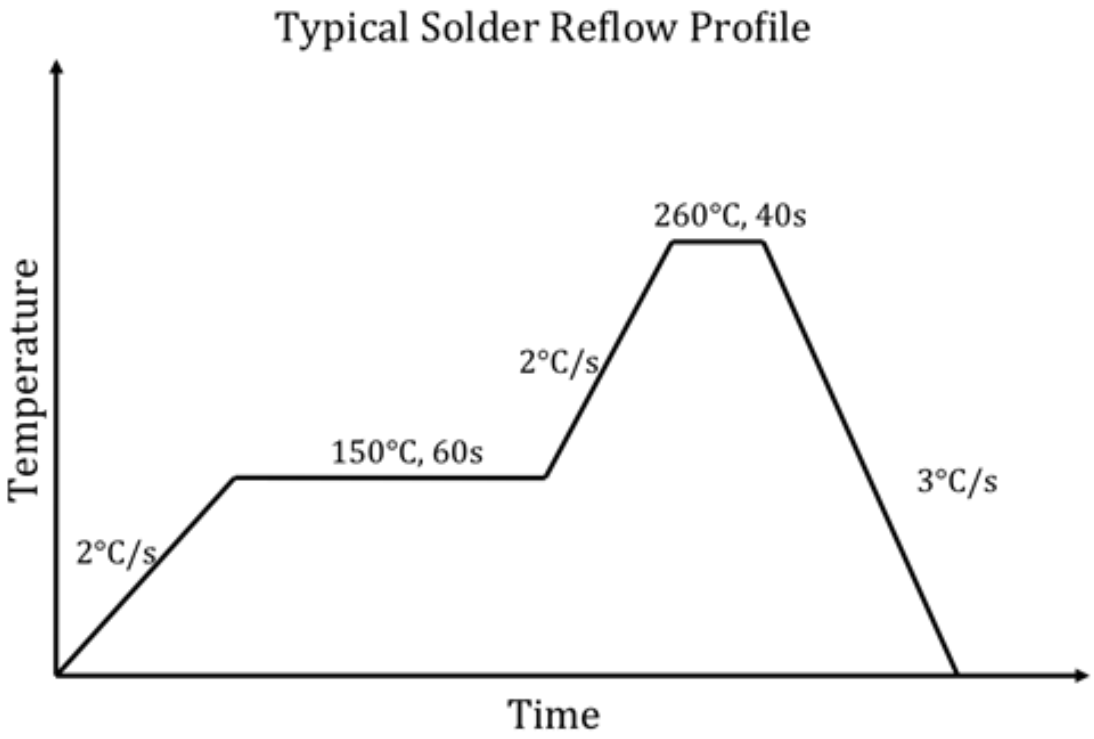
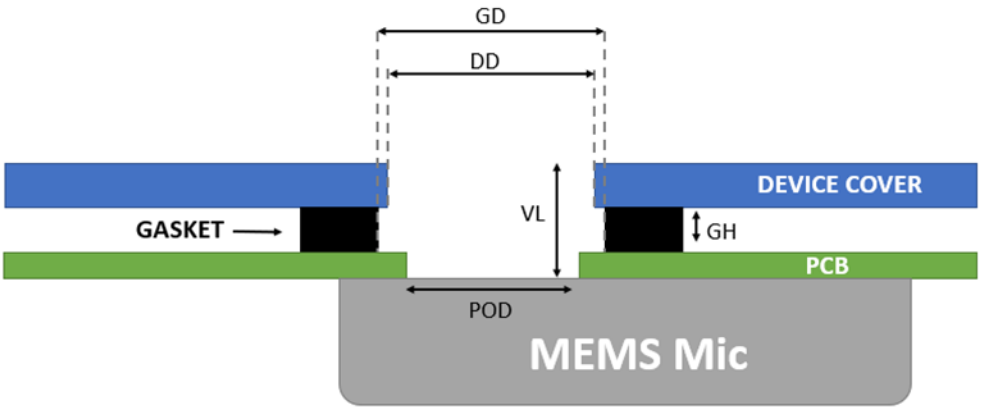


Figure 3: Recommended Solder Reflow Profile

4 Mechanical Design Considerations

We recommend the mic be placed close to the device cover if possible. A gasket should be placed between the pcb and the device cover. The parameters are described in detail in Figure 4 below, including their recommended dimensions.



POD: Pcb Opening Diameter
VL: Vent Length
GH: Gasket Height
DD: Device cover opening Diameter
GD: Gasket Diameter

POD: Should be 0.75mm to match Piezo MEMS Mic
GD & DD: Can be bigger than POD but should match each other as closely as possible i.e. the overhang of Device Cover over the Gasket should be kept small. This avoids forming a cavity and having unwanted resonances.
VL: Should be kept as short as possible to maximize acoustic performance i.e. mount the PCB close to the cover

Figure 4: Recommended mechanical design of the pcb, gasket and device cover.

For additional information on integrating Vesper's piezoelectric microphones into your designs and the latest roadmap of microphone products, reach out to info@vespermems.com.