Reflow Soldering of MEMS Microphones

INTRODUCTION

This application note provides guidance and suggestions for assembling boards with MEMS microphones. Parameter and profile details are presented, followed by device footprints, suggested solder paste masks, and PCB land patterns for all InvenSense MEMS microphones.

PACKAGE INFORMATION

All MEMS microphone models described in this application note are bottom-port devices.

PRINTING PARAMETERS

The printing parameters are:

- Print pressure = 3 kg
- Print speed = 30 mm/sec
- Squeegee type = metal
- Squeegee angle = 60°

SOLDER PASTE STENCIL PARAMETERS

The solder paste stencil parameters are:

- Stencil type = laser cut
- Stencil thickness = 3 mils (~75 µm)

SUGGESTED SOLDER PASTE

The suggested solder paste is Indium8.9 (Type 4—alloy composition—96.5Sn/3.0Ag/0.5Cu (SAC305)). This paste is an air reflow, no-clean solder paste specifically formulated to accommodate the higher processing temperatures required by the Sn/Ag/Cu, Sn/Ag, and other alloy systems favored by the electronics industry to replace conventional Pb-bearing solders.

PLACEMENT FORCE

MEMS microphones can be handled using standard pick-and-place and chip shooting equipment. Care should be taken to avoid damage to the MEMS microphone structure as follows:

- Use a standard pickup tool to handle the microphone. Because the microphone hole is on the bottom of the package, the pickup tool can make contact with any part of the lid surface.
- Do not pick up the microphone with a vacuum tool that makes contact with the bottom side of the microphone. Do not pull air out of or blow air into the microphone port.
- Do not use excessive force to place the microphone on the PCB.

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REFLOW PROFILE

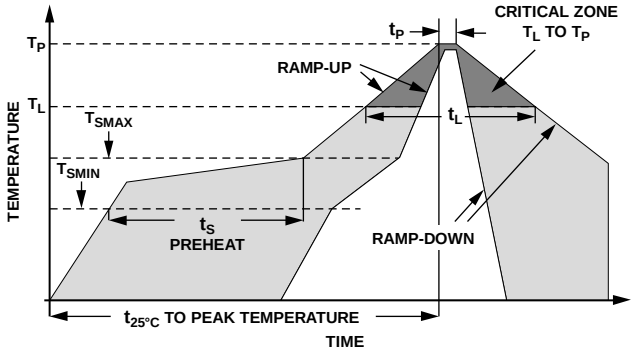


Figure 1. Recommended Soldering Profile Limits

The reflow profile in Figure 1 is recommended for board manufacturing with InvenSense MEMS microphones. These microphones are also compatible with the J-STD-020 profile.

TABLE 1. RECOMMENDED SOLDERING PROFILE LIMITS

Profile Feature	Sn-Pb	Pb-Free
Average Ramp Rate (T_L to T_P)	1.25°C/sec max	1.25°C/sec max
Preheat		
Minimum Temperature (T_{SMIN})	100°C	100°C
Maximum Temperature (T_{SMAX})	150°C	200°C
Time (T_{SMIN} to T_{SMAX}), t_S	60 sec to 75 sec	60 sec to 75 sec
Ramp-Up Rate (T_{SMAX} to T_L)	1.25°C/sec	1.25°C/sec
Time Maintained Above Liquidous (t_L)	45 sec to 75 sec	~50 sec
Liquidous Temperature (T_L)	183°C	217°C
Peak Temperature (T_P)	215°C +3°C/−3°C	260°C +0°C/−5°C
Time Within 5°C of Actual Peak Temperature (t_P)	20 sec to 30 sec	20 sec to 30 sec
Ramp-Down Rate (T_P to T_L)	3°C/sec max	3°C/sec max
Time 25°C (t25°C) to Peak Temperature	5 minutes max	5 minutes max

REWORK

The rework process of the MEMS microphone should be carried out using a rework station.

1. Preheat the board to 100°C to 125°C.
2. Place a 6 mm × 6 mm square nozzle over the part.
3. Enable the hot airflow through this nozzle so that the solder becomes liquidous.
4. Use the nozzle to remove the microphone from the substrate.
5. Apply additional solder paste to pad sites using a manually operated dispensing system, such as a syringe with a small-gauge tip.
6. Use a surface-mount placement machine to place the replacement component.
7. Reflow the component on the rework station.

CAUTION

The MEMS microphone package has a port hole opening at the bottom and is sensitive to solder flux. Do not use a vapor phase soldering process. The MEMS microphone device may be damaged if subjected to cleaning processes. The cleaning solvents may enter through the port hole and damage the device.

CE-6-1 PACKAGE (ADMP401, ADMP411)

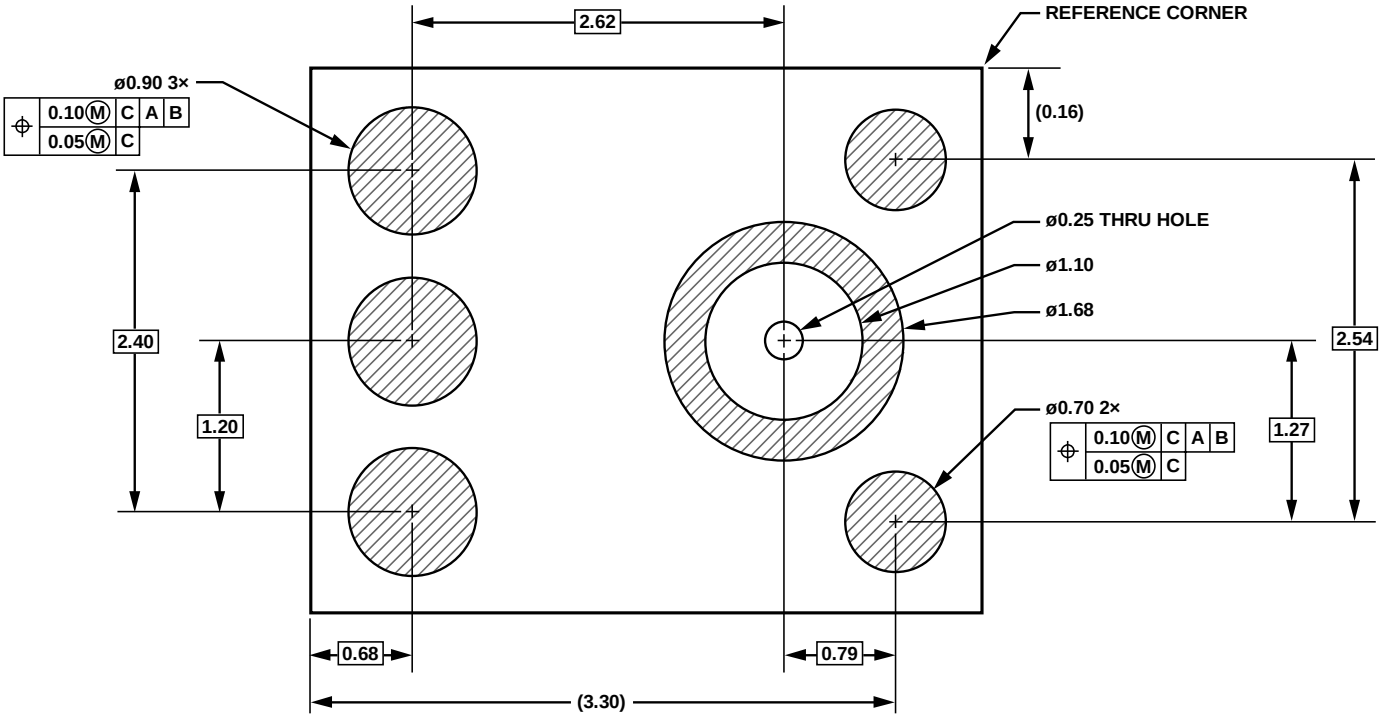


Figure 2. CE-6-1 Device Footprint (Bottom View)

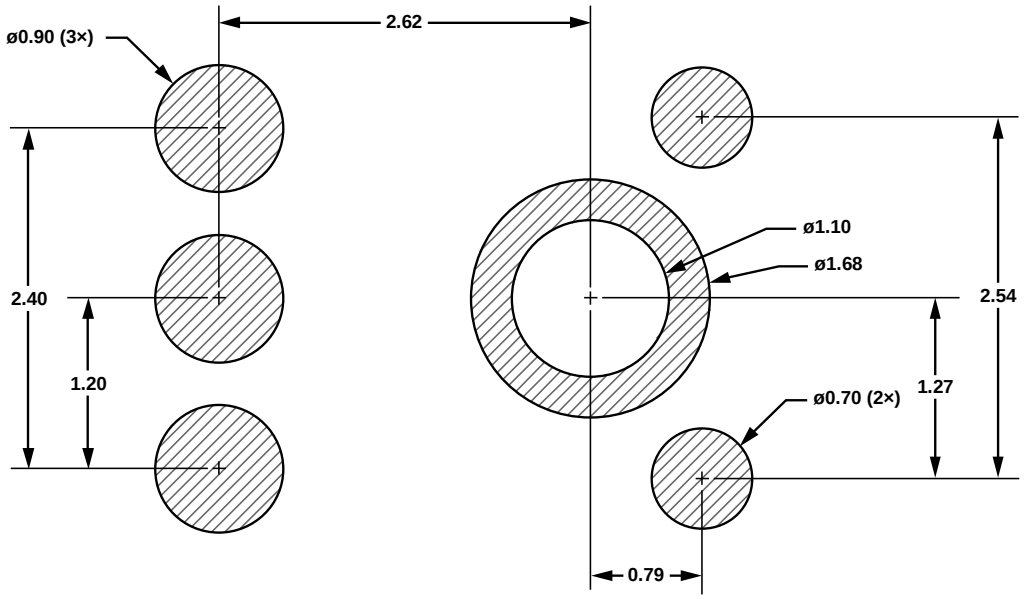


Figure 3. Recommended CE-6-1 PCB Land Pattern

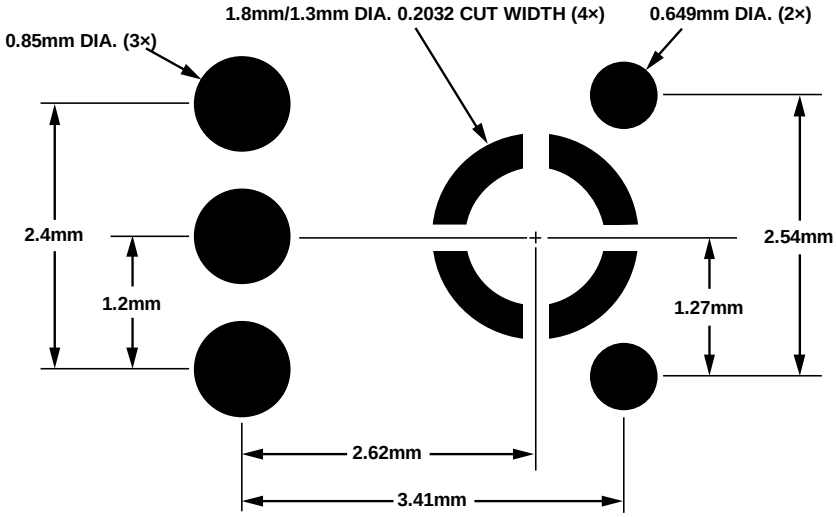


Figure 4. Recommended CE-6-1 Solder Paste Mask

CE-5-1 PACKAGE (ADMP421, ADMP521, ADMP522, ADMP621)

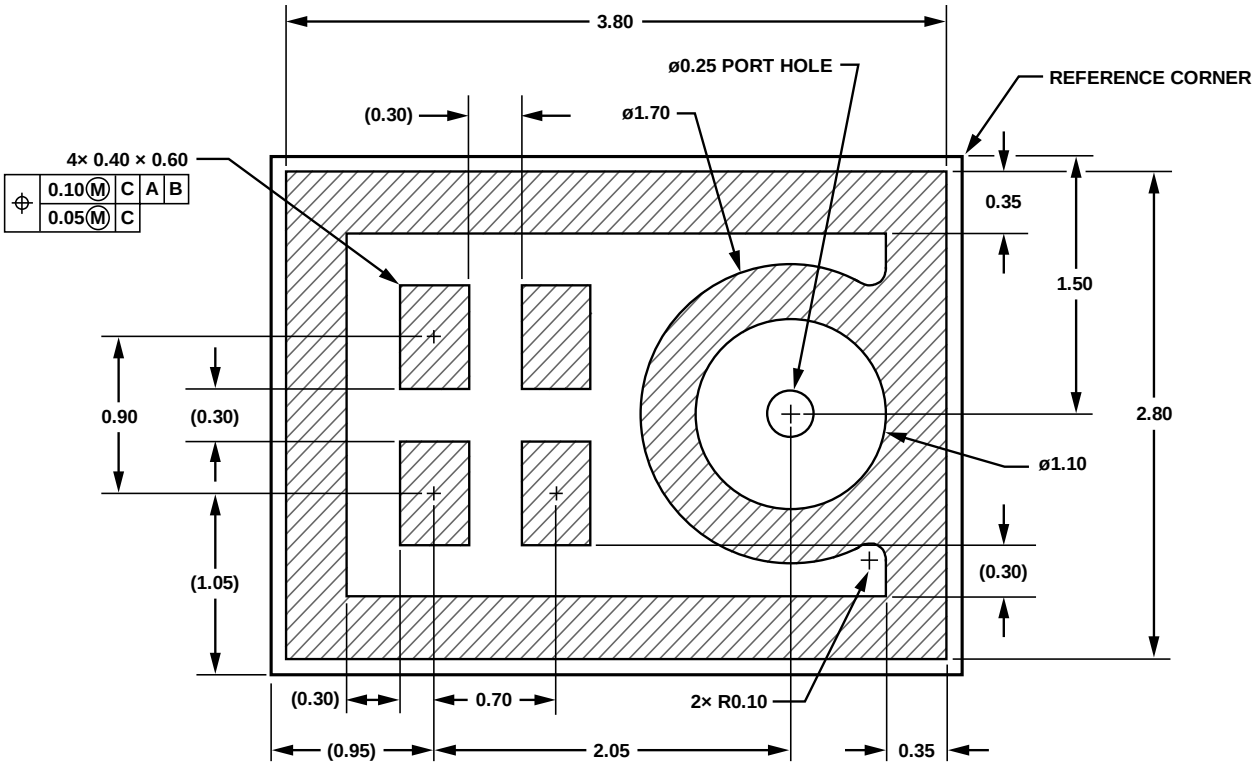


Figure 5. CE-5-1 Device Footprint (Bottom View)

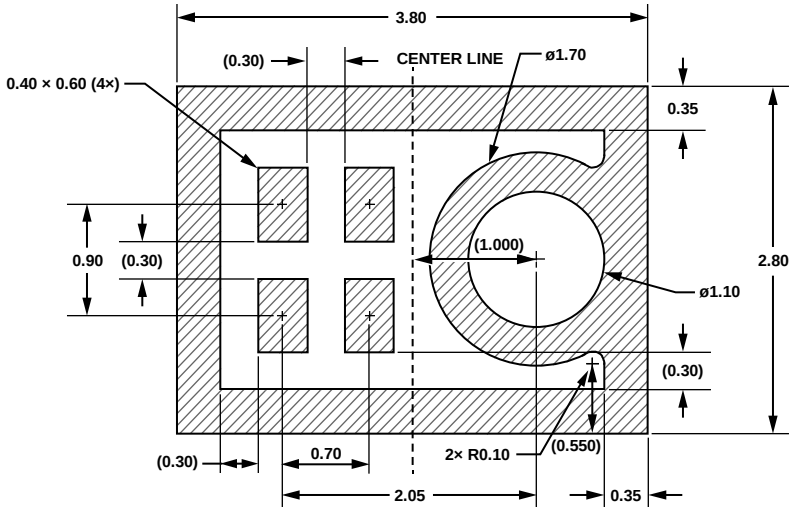


Figure 6. Recommended CE-5-1 PCB Land Pattern

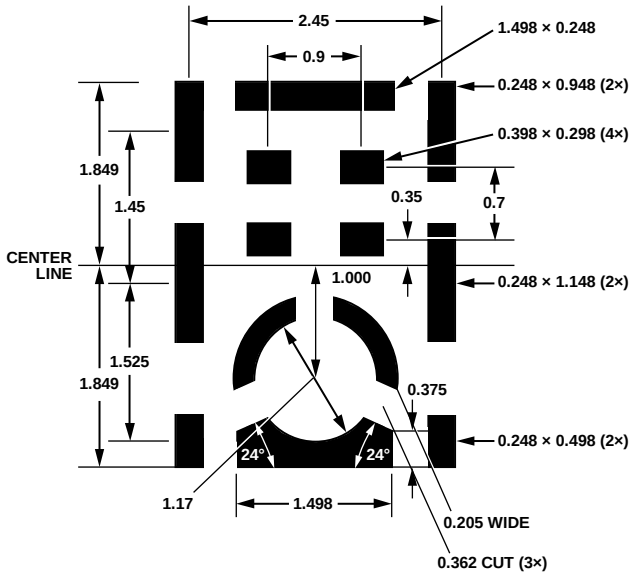
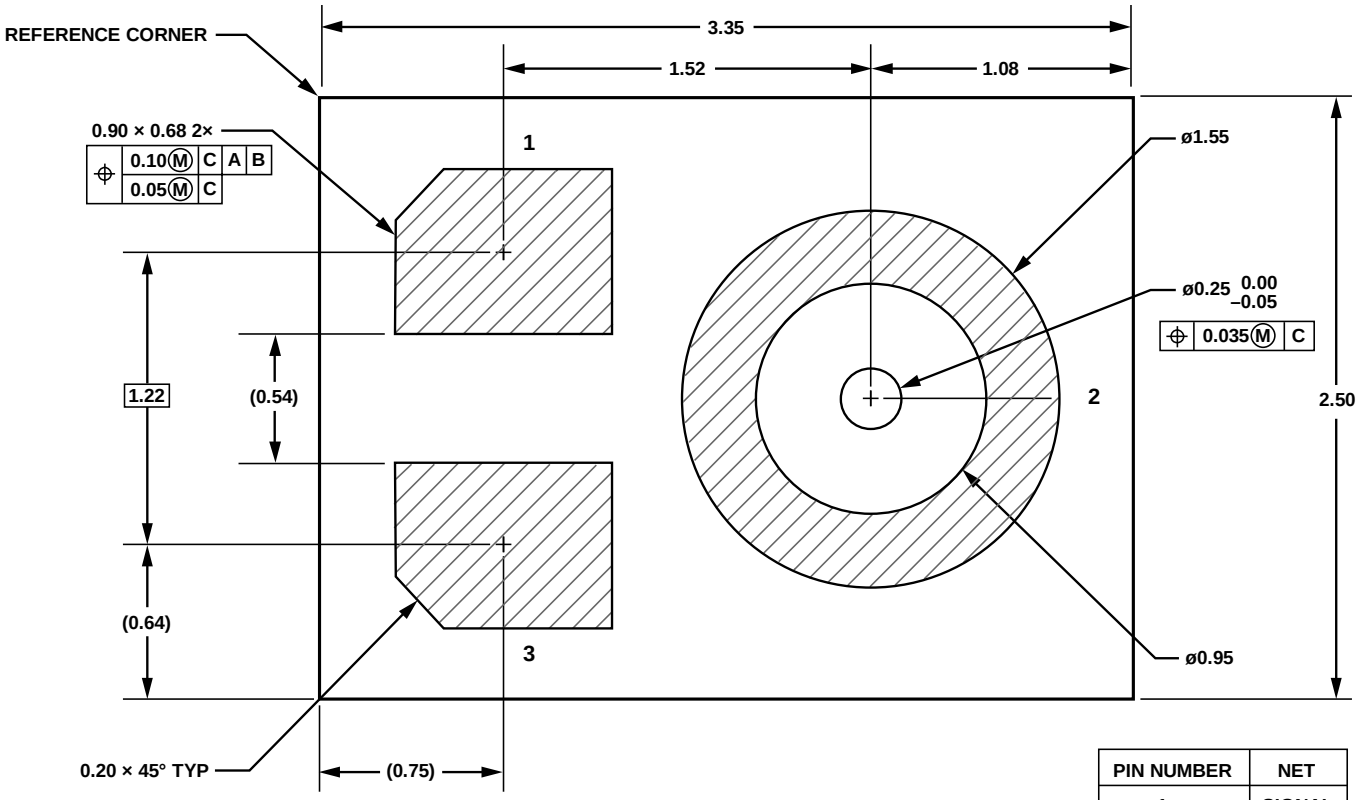


Figure 7. Recommended CE-5-1 Solder Paste Mask

CE-3-2 PACKAGE (ADMP404, ADMP405, ADMP504, ADMP510)



PIN NUMBER	NET
1	SIGNAL
2	GND
3	VDD

Figure 8. CE-3-2 Device Footprint (Bottom View)

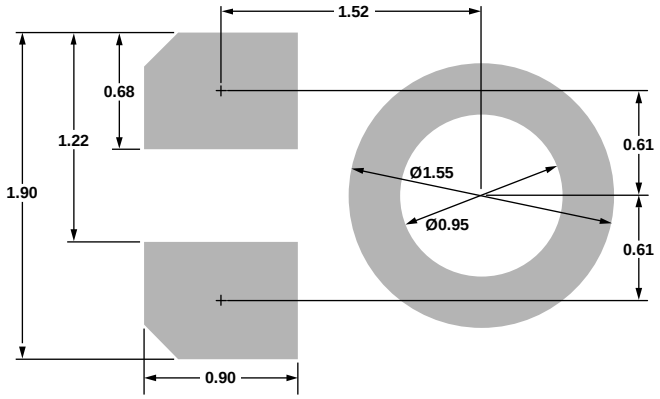


Figure 9. Recommended CE-3-2 PCB Land Pattern

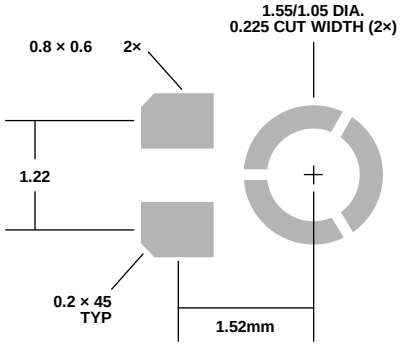


Figure 10. Recommended CE-3-2 Solder Paste Mask

CE-9-1 PACKAGE (ADMP441)

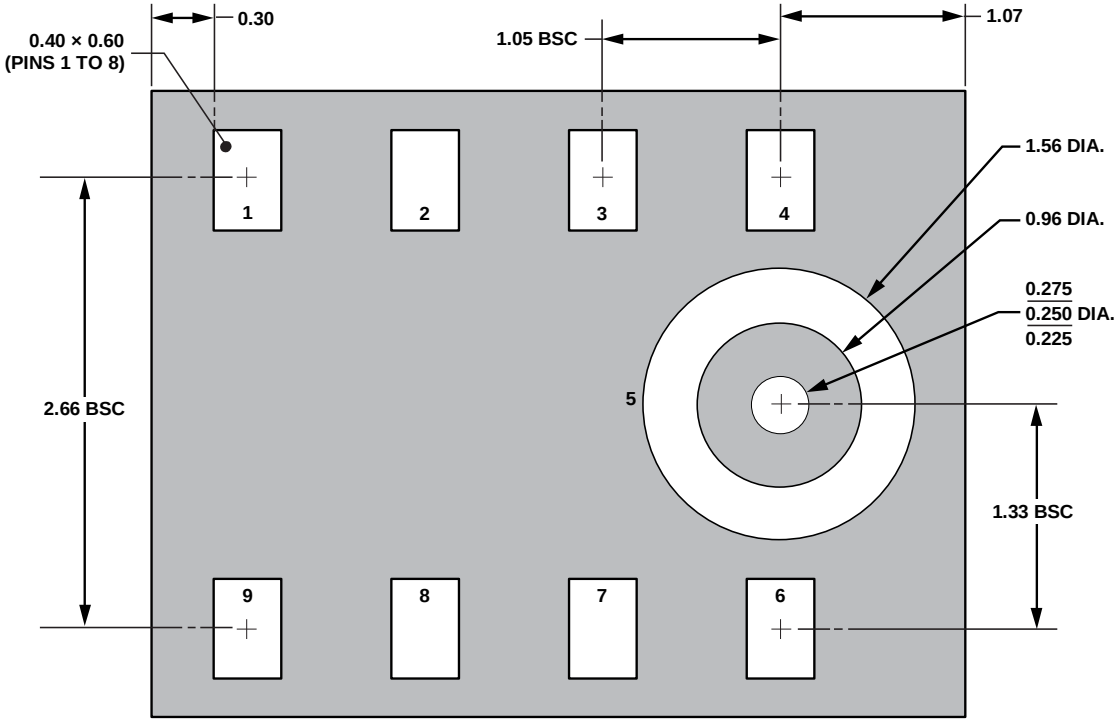
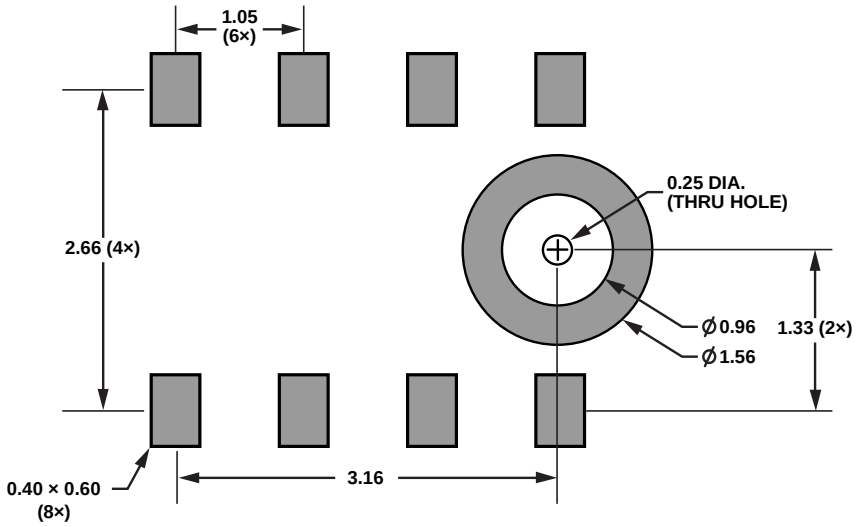
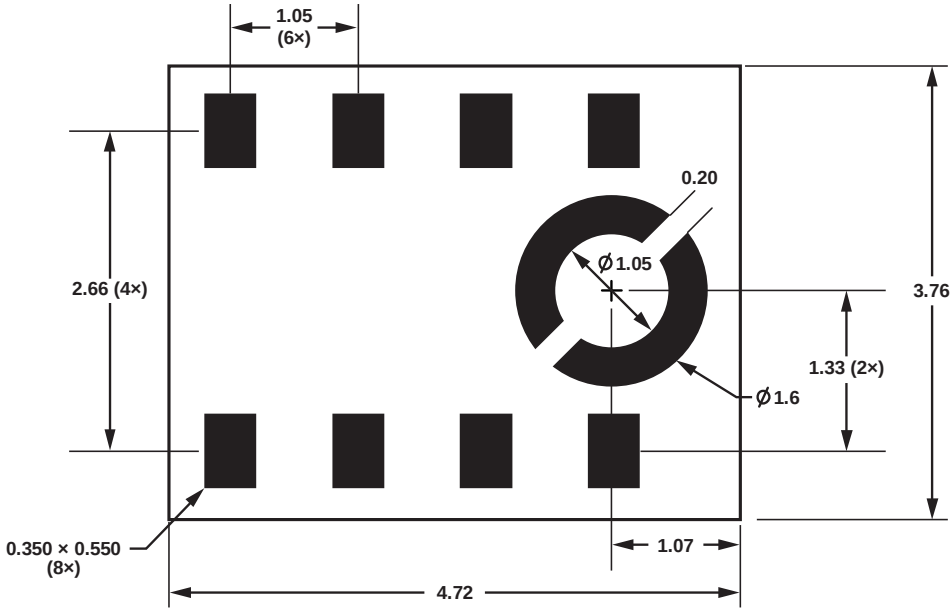


Figure 11. CE-9-1 Device Footprint (Bottom View)



DIMENSIONS SHOWN IN MILLIMETERS

Figure 12. Recommended CE-9-1 PCB Land Pattern



DIMENSIONS SHOWN IN MILLIMETERS

Figure 13. Recommended CE-9-1 Solder Paste Mask

Compliance Declaration Disclaimer:

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