

# MM25 MEMS MICROPHONE HIGH SNR TRIMMABLE



The MM25 is a uniquely trimmable microphone. Using Knowles' proven ultralow noise MEMS technology, the MM25 consists of an acoustic sensor, a low noise input buffer, and an output amplifier. These devices are suitable for applications where excellent matching is required.

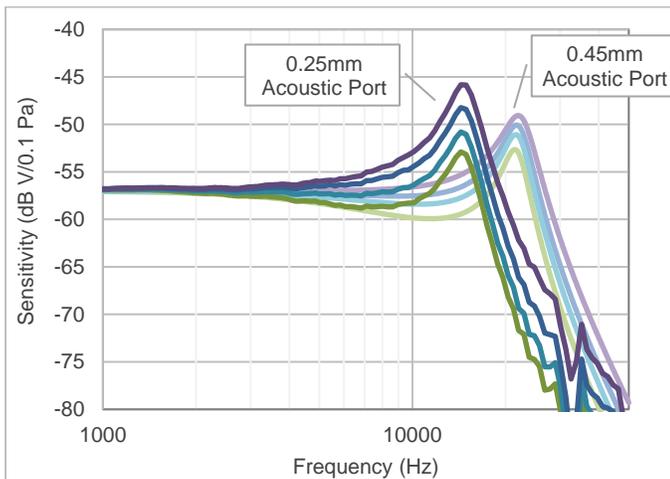
## PRODUCT FEATURES

- Trimmable Sensitivity, Phase and Current
- Small Package / Bottom Port
- High SNR
- Extended Dynamic Range
- Maximum RF Protection
- Ultra-Stable Performance
- Standard SMD Reflow
- Omnidirectional

## SENSITIVITY AND PHASE MATCHING

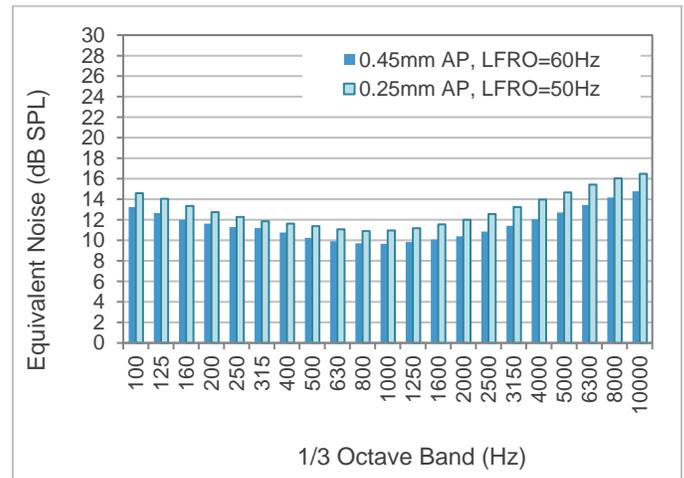
The MM25 has trimmed sensitivity with part to part variation no more than +/-1 dB. Phase at low frequency is also trimmable (e.g., 200Hz). This feature allows use of more aggressive algorithms such as beam forming. Tight microphone matching reduces the range of calibration at the final device level.

The MM25 has adjustable high and low pass filters for tight control of LFRO and for adjusting peak amplitude per customer requirements (see Figure).

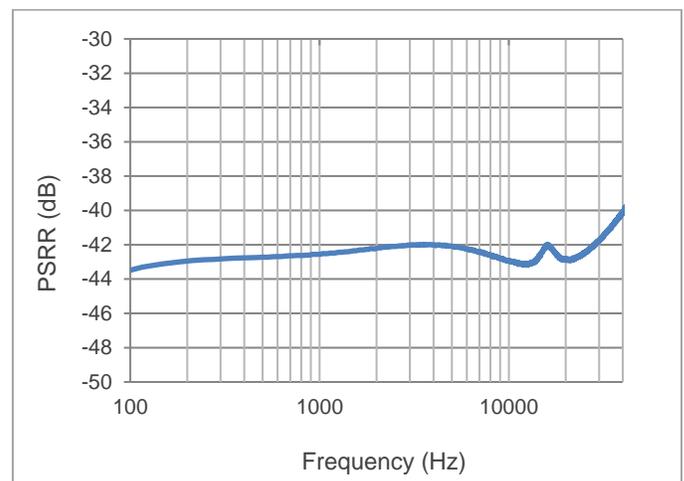


## NOISE

Noise levels depend on choice of audio port size, gain and filter settings.



## POWER SUPPLY REJECTION



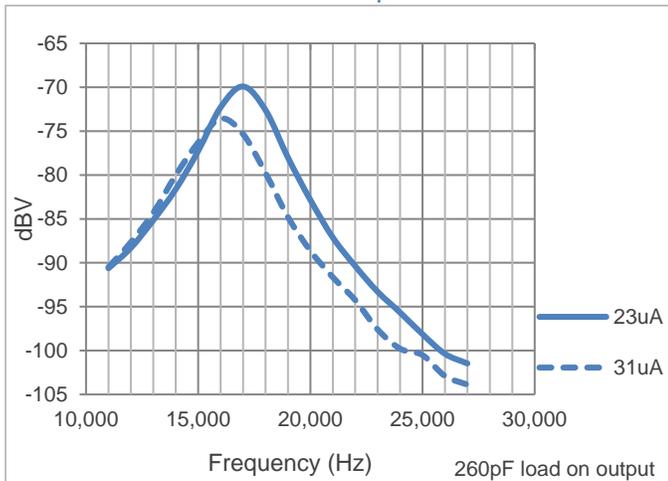
## CURRENT DRAW

Current draw can be trimmed. While low current draw is desirable, there is a trade-off between current draw and distortion. A minimum IDD of 23uA provides acceptable distortion performance. While 31uA is recommended for best distortion performance.

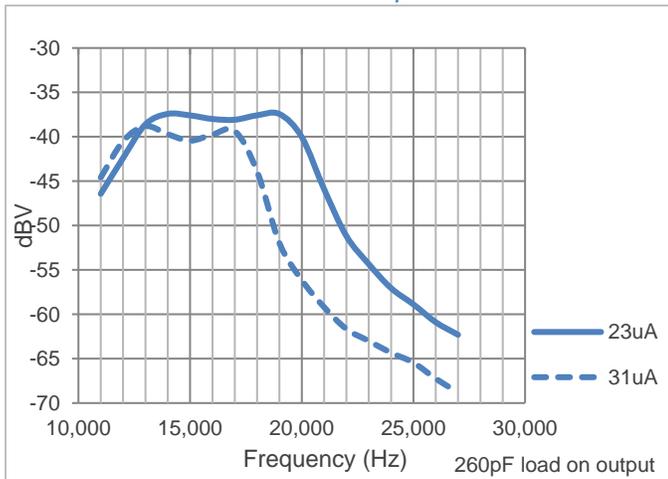
## DISTORTION

This section illustrate outcome of choice in current draw and effect on distortion. Results shown for 0.25mm audio port.

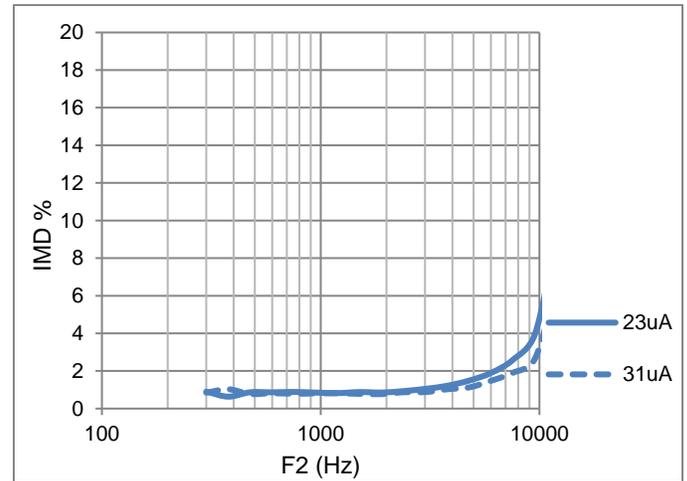
*Ultrasonic IMD 87dB SPL per Tone*



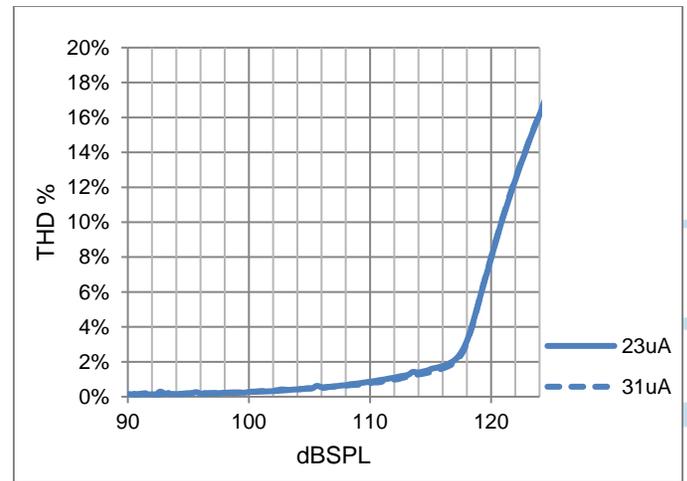
*Ultrasonic IMD 107dB SPL per Tone*



*Audio IMD 2nd % (Power Sum) 107dB SPL per Tone*

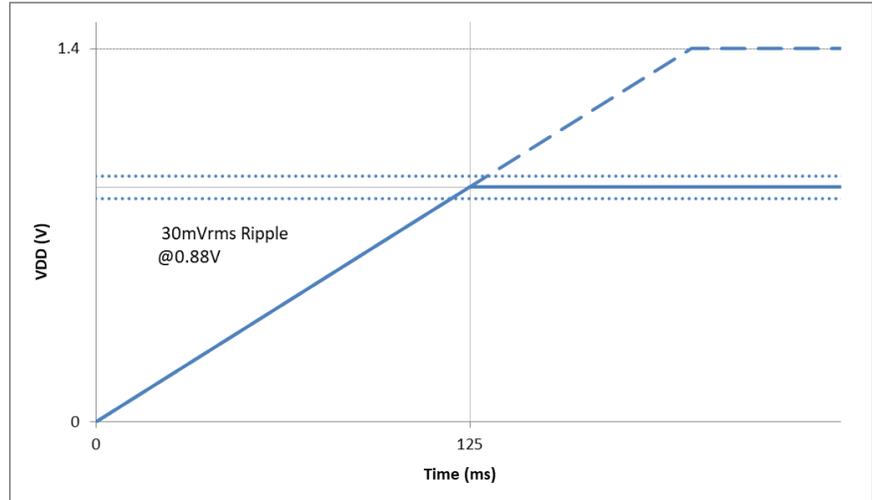


*Total Harmonic Distortion at 1kHz*



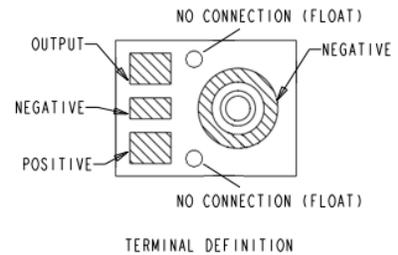
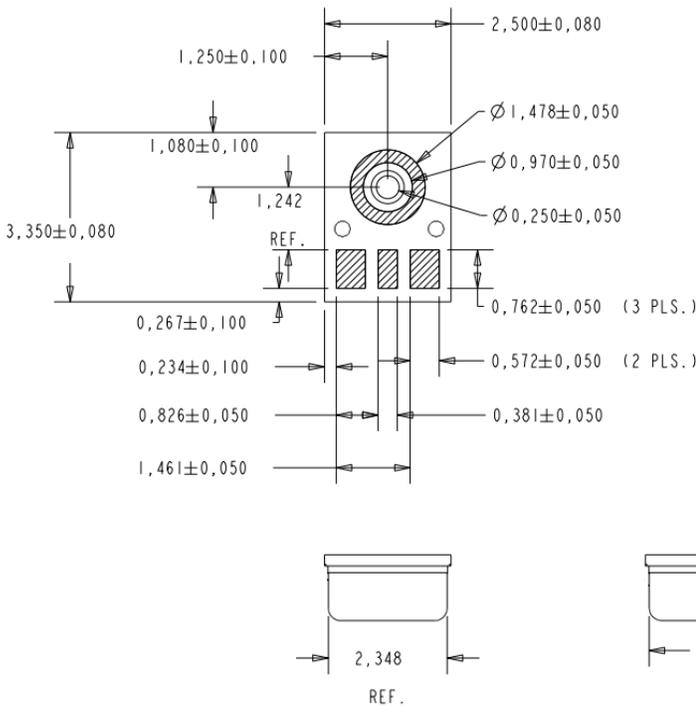
## START UP

For a linear ramp, the supply must reach 0.88V in 125ms or less to ensure proper startup. The microphone memory is robust to supply noise  $\leq 30\text{mVr.m.s.}$  from  $-20^{\circ}\text{C}$  to  $63^{\circ}\text{C}$ .



## MECHANICAL DESIGN CONSIDERATIONS

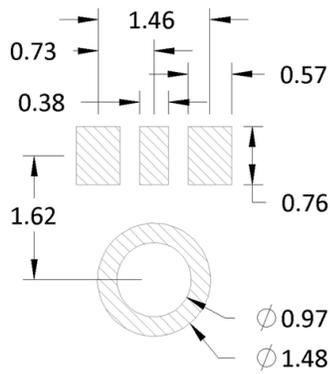
The MM25 microphone is a bottom port microphone and same size as the MQM, MM15, and MM20 microphones (PCB dimensions). The MM25/MM20 can (lid) is approximately 100um larger in width and length relative to the MQM/MM15 microphones.



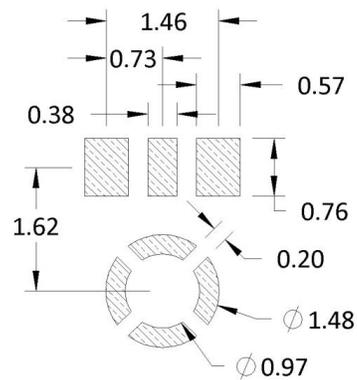
## PCB LAND PATTERN AND SOLDER STENCIL PATTERN

The PCB land pattern, the solder stencil pattern, the solder paste, and the reflow profile should be designed to yield reliable solder joints. The solder joints serve as the electrical connection, mechanical connection, and (for bottom-port mics) the acoustic seal between the mic and PCB. The recommended PCB land pattern matches the microphone solder pads dimensions. The solder stencil pattern must be optimized for production, and for bottom-port models must use a broken solder ring such as that shown in the figure below (dimensions are in millimeters).

### Example Land Pattern

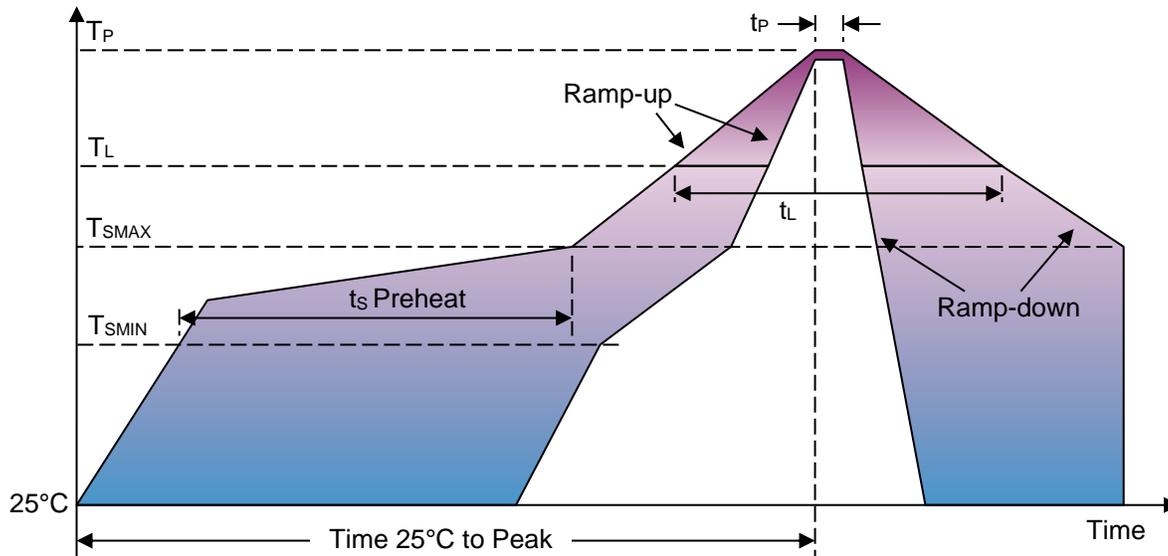


### Example Solder Stencil Pattern



## MANUFACTURING INFORMATION

### REFLOW



Profile Feature	Pb-Free
Ramp-up rate (25°C to $T_{SMIN}$ )	3°C/second (see note)
Average Ramp-up rate ( $T_{SMAX}$ to $T_P$ )	3°C/second max.
Preheat <ul style="list-style-type: none"> <li>• Temperature Min (<math>T_{SMIN}</math>)</li> <li>• Temperature Max (<math>T_{SMAX}</math>)</li> <li>• Time (<math>T_{SMIN}</math> to <math>T_{SMAX}</math>) (<math>t_s</math>)</li> </ul>	150°C 200°C 60-180 seconds
Time maintained above: <ul style="list-style-type: none"> <li>• Temperature (<math>T_L</math>)</li> <li>• Time (<math>t_L</math>)</li> </ul>	217°C 60-150 seconds
Peak Temperature ( $T_P$ )	260°C
Time within 5°C of actual Peak Temperature ( $t_p$ )	20-40 seconds
Ramp-down rate ( $T_P$ to $T_{SMAX}$ )	6°C/second max
Time 25°C to Peak Temperature	8 minutes max

#### Notes:

Based on IPC/JDEC J-STD-020 Revision C.

All temperatures refer to topside of the package, measured on the package body surface

Ramp-up rate (25°C to  $T_{SMIN}$ ) can be optimized based on application.

## HANDLING AND STORAGE

- MSL (moisture sensitivity level) Class 1.
- Maximum of 3 reflow cycles is recommended.
- In order to minimize device damage:
  - Do not board wash or clean after the reflow process.
  - Do not brush board with or without solvents after the reflow process.
  - Do not directly expose to ultrasonic processing, welding, or cleaning.
  - Do not insert any object in port hole of device at any time.
  - Do not apply over 30 psi of air pressure into the port hole.
  - Do not pull a vacuum over port hole of the microphone.
  - Do not apply a vacuum when repacking into sealed bags at a rate faster than 0.5 atm/sec.

## PICK-AND-PLACE

Knowles microphones come in various size reels for use in auto pick-and-place machines. The bottom-port models may be picked anywhere on the lid. Exact packaging information, including pocket size, spacing and pick-and-place area, is shown in each model's datasheet.

## QUALIFICATION TESTING

Test	Description
Reflow	5 reflow cycles with peak temperature of +260°C
High Temperature Storage	+105°C environment for 1,000 hours (IEC 68-2-2 Test Ba)
Low Temperature Storage	-40°C environment for 1,000 hours (IEC 68-2-1 Test Aa)
High Temperature Bias	+105°C environment while under bias for 1,000 hours (IEC 68-2-2 Test Ba)
Low Temperature Bias	-40°C environment while under bias for 1,000 hours (IEC 68-2-1 Test Aa)
Temperature/Humidity Bias	+85°C/85% R.H. environment while under bias for 1,000 hours (JESD22-A101A-B)
Thermal Shock	100 cycles of air-air thermal shock from -40°C to +125°C with 15 minute soaks (IEC 68-2-4)
Vibration	16 minutes in each X, Y, Z axis from 20 to 2,000 Hz with peak acceleration of 20 G (MIL 883E, Method 2007.2,A)
Mechanical Shock	3 pulses of 10,000 G in each of the X, Y, and Z directions (IEC 68-2-27 Test Ea)
ESD-HBM	3 discharges of ±2kV direct contact to I/O pins (MIL 883E, Method 3015.7)
ESD-LID/GND	3 discharges of ±8kV direct contact to lid while unit is grounded (IEC 61000-4-2)
ESD-MM	3 discharges of ±200V direct contact to IO pins (ESD STM5.2)

Notes: After reliability tests are performed, the sensitivity of the microphones shall not deviate more than 3dB from their initial value. After 3 reflow cycles, the sensitivity of the microphones shall not deviate more than 1 dB from its initial value.

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