

SMM310

Silicon MEMS Microphone

Small Signal Discretes



Never stop thinking

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SMM310

Revision History: 2008-05-28, V1.1

Previous Version: 2007-08-31, V1.0

| Page | Subjects (major changes since last revision) |
|-------------|---|
| 4 | Halogen-free package |
| 9 | Typical measurement of output impedance added |
| 11 | Marking layout example removed |
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| | |

Silicon MEMS Microphone

Features

- SMD MEMS microphone for automated surface mount assembly
- Reflow soldering up to 260 °C (lead free)
- High long-term temperature stability
- Stable sensitivity over power supply range of 1.5 - 3.3 V
- Low current consumption of 80 μ A
- Excellent power supply rejection of -55 dB
- High integrated immunity to EMI
- RoHS-compliant, halogen-free package with small footprint and low height of 1.25 mm



Applications

The SMM310 is designed for

- Mobile Phones (Handsets, Headsets)
- Consumer (Game Consoles, PDA's)
- Computer (Personal Computers, Notebooks)
- Cameras (Digital Still Cameras, Video Cameras)

Product Description

Miniature Silicon MEMS (Micro Electro Mechanical System) omni-directional Microphone with single-ended analog interface designed for automated reflow soldering assembly as SMD (Surface Mounted Device) component. It is an alternative to conventional ECMs (Electret Condenser Microphones).

Due to its robust design with a metallic lid and monolithic integrated EMI-blocking capacitors and utilization of Silicon MEMS technology, the SMM310 shows high immunity to EMI (Electromagnetic Interference) and heat.

The capped Chip-On-Board package solution contains the micromechanical sensor chip and an amplifier chip. The RoHS-compliant halogen-free device has a size of 4.72 x 3.76 x 1.25 mm³.

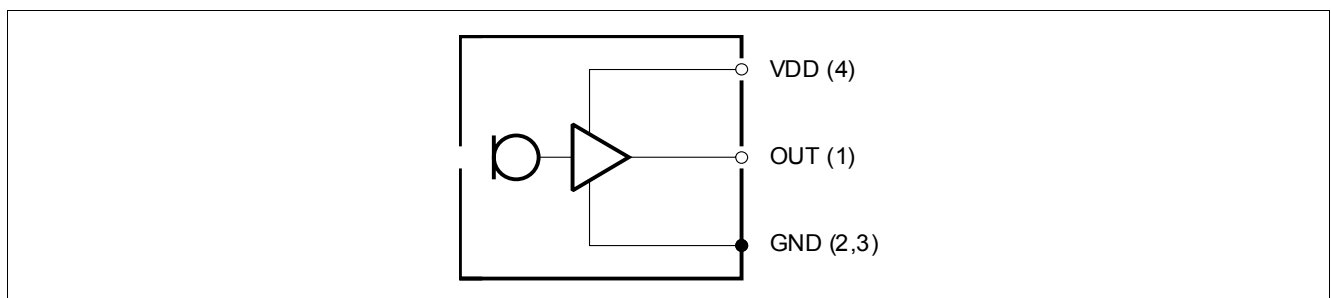


Figure 1 Block Diagram

| Type | Package | Marking |
|--------|------------|---------|
| SMM310 | HG-MMA-4-2 | S310 |

Pin Definition and Function
Table 1 Pin Definition and Function

| Pin No. | Symbol | Function |
|---------|------------|----------|
| 1 | <i>OUT</i> | Output |
| 2 | <i>GND</i> | Ground |
| 3 | <i>GND</i> | Ground |
| 4 | V_{DD} | Power |

Maximum Ratings
Table 2 Maximum Ratings

| | | |
|-----------------------------|-----------|-----------------|
| Storage Temperature | T_{STG} | -40 °C - 125 °C |
| Operating Temperature Range | T_A | -40 °C - 85 °C |
| Operating Voltage Range | V_{DD} | 1.5 V - 3.3 V |

ESD robustness
Table 3 Typical robustness to electrostatic discharge

| | | |
|--|----------------|---------|
| ESD capability all pins (HBM, JESD22-A114) | V_{ESD_HBM} | ± 4 kV |
| ESD capability all pins (MM, JESD22-A115) | V_{ESD_MM} | ± 400 V |

Acoustical and Electrical Characteristics
Table 4 Unless otherwise noted, typical test conditions are $T_A = 23\text{ °C}$, $V_{DD} = 2.1\text{ V}$ and R.H. = 50 % measured in a pressure chamber test setup. All voltages refer to GND node

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|------------------------------|--------------------|--------|------|------|----------|--|
| | | Min. | Typ. | Max. | | |
| Sensitivity 1 kHz | S_{1kHz} | -45 | -42 | -39 | dB(V/Pa) | 1 kHz, 94 dB SPL |
| Relative Sensitivity 4 kHz | ΔS_{4kHz} | -1 | | +4 | dB | Relative to sensitivity 1 kHz |
| Relative Sensitivity 240 Hz | ΔS_{240Hz} | -1 | | +1 | dB | Relative to sensitivity 1 kHz |
| Equivalent Noise Level | <i>ENL</i> | | 29.5 | 32.5 | dB(pso) | CCITT-weighted ¹⁾ |
| | | | 35 | | dB(A) | A-weighted ²⁾ |
| Signal-to-Noise Ratio | <i>SNR</i> | 61.5 | 64.5 | | dB(pso) | CCITT-weighted |
| | | | 59 | | dB(A) | A-weighted |
| Total Harmonic Distortion | <i>THD</i> | | 0.1 | 0.5 | % | 104 dB SPL, 1 kHz |
| Current Consumption | I_{CC} | | 80 | 140 | μA | $V_{DD} = 2.1\text{ V}$ |
| Power Supply Rejection Ratio | <i>PSRR</i> | | -55 | -40 | dBr | 100 mV superimposed on $V_{DD} = 2.1\text{ V}$, 1 kHz |
| DC Output Voltage | V_{OUT} | | 1.2 | | V | DC Voltage at Pin 1 |
| Output Impedance | Z_{OUT} | | 7 | | Ω | 1 kHz |

1) Psophometrically weighted noise measurement with CCITT-filter (ITU-T Rec. P.53)

2) Noise measurement with A-weighting filter (IEC 651)

Typical Measurements Results

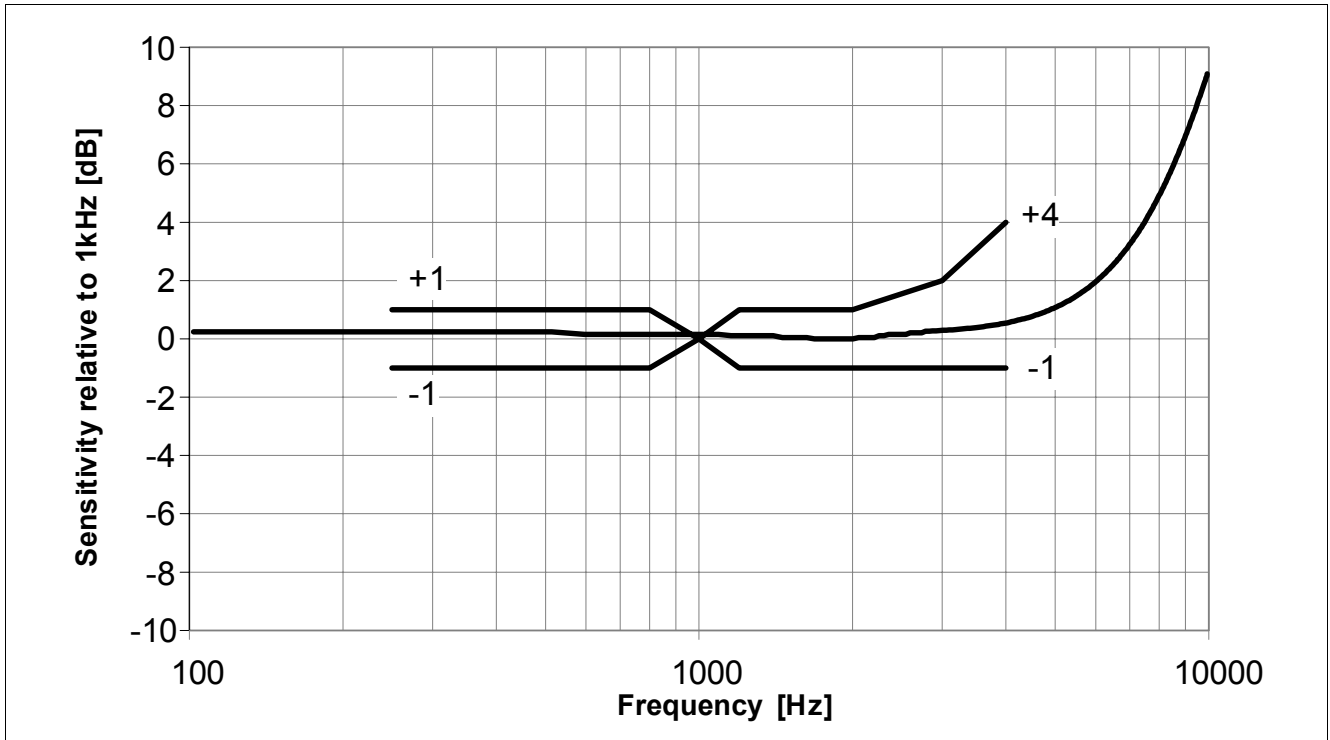


Figure 2 Typical frequency response curve relative to the sensitivity at a frequency of 1 kHz

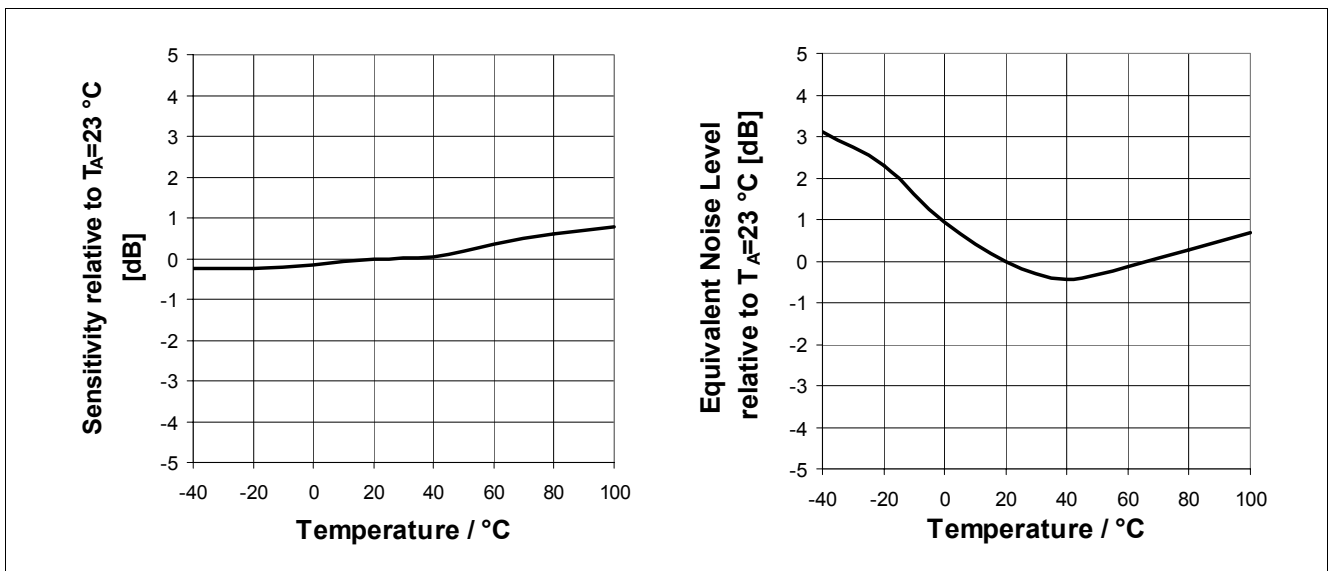


Figure 3 Typical change of sensitivity at 1 kHz and equivalent noise level over temperature relative to $T_A = 23^\circ\text{C}$

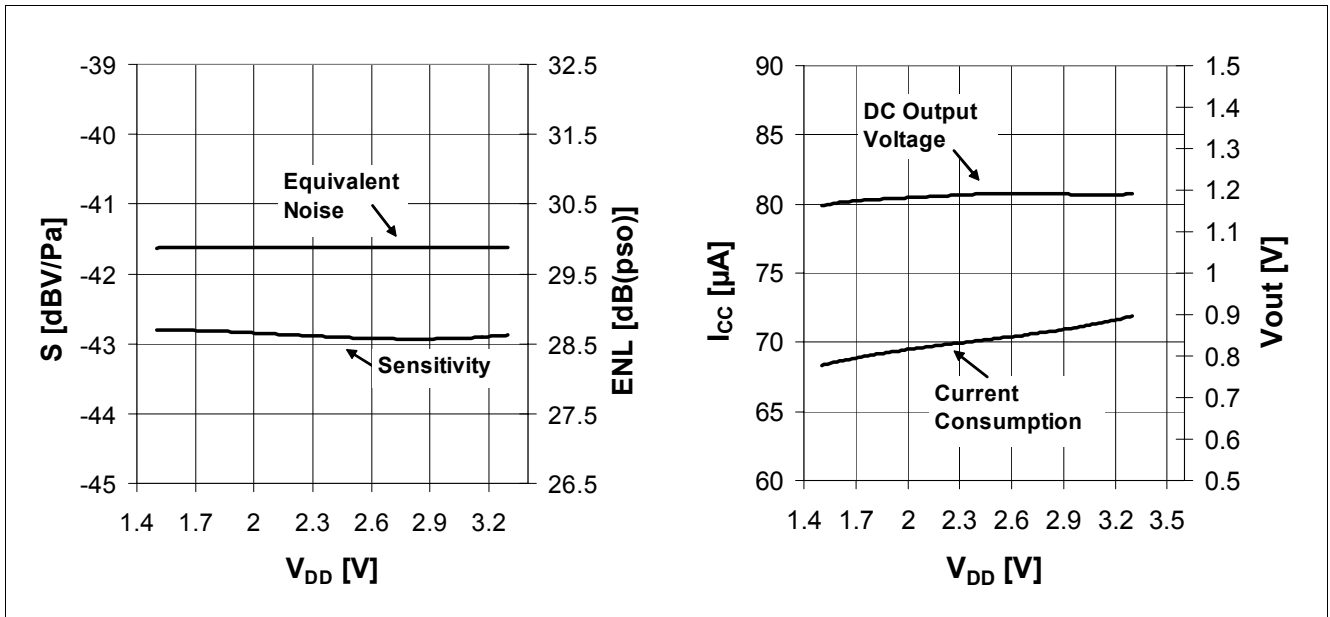


Figure 4 Typical measurement of sensitivity, equivalent noise level, current consumption and DC output voltage over power supply V_{DD}

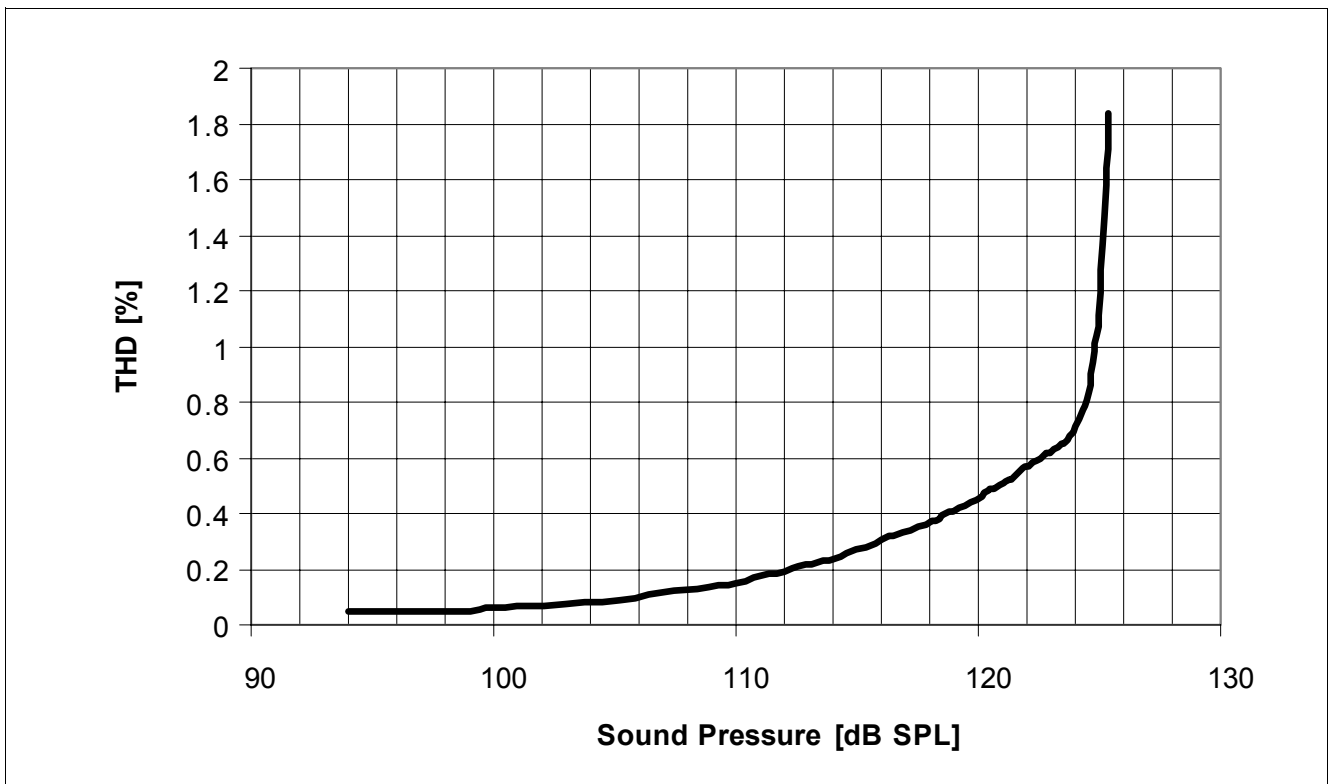


Figure 5 Typical total harmonic distortion over sound pressure level (1 kHz, $V_{DD} = 2.1$ V)

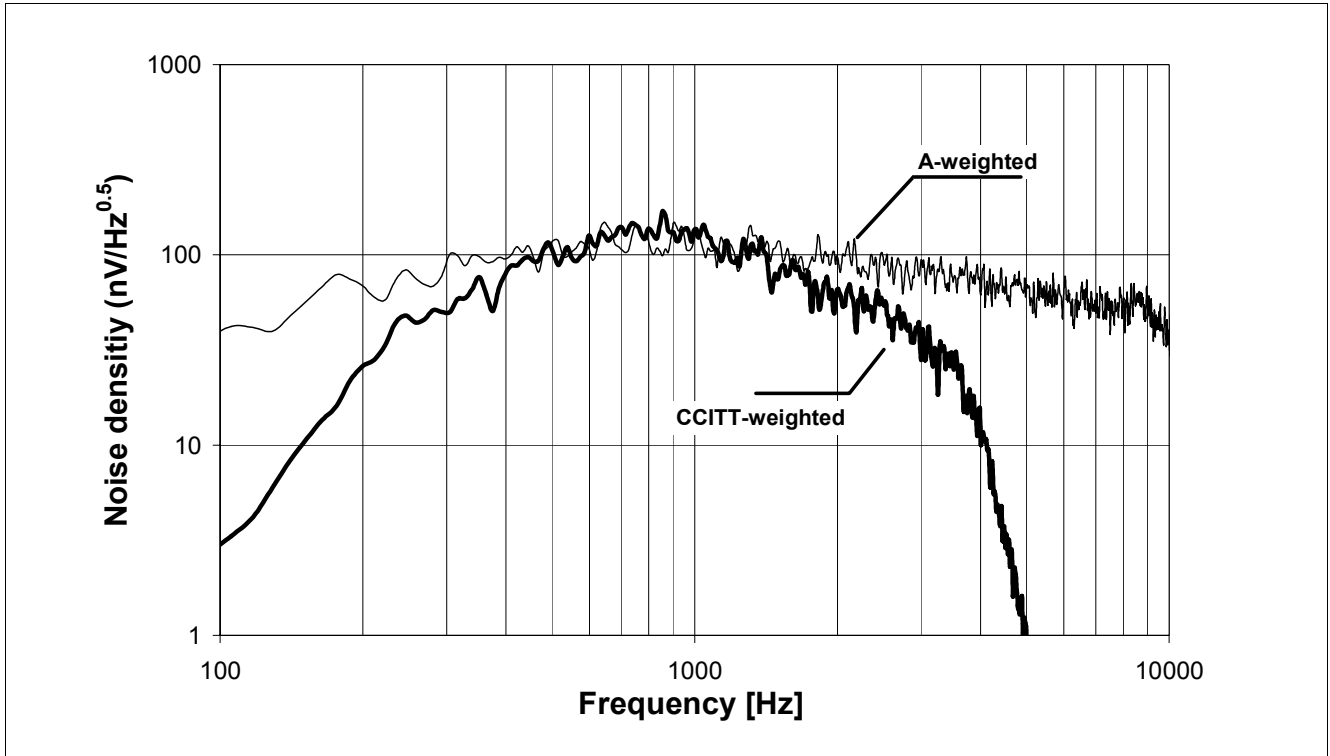


Figure 6 Typical noise density measurement with A-weighting and CCITT-weighting filter

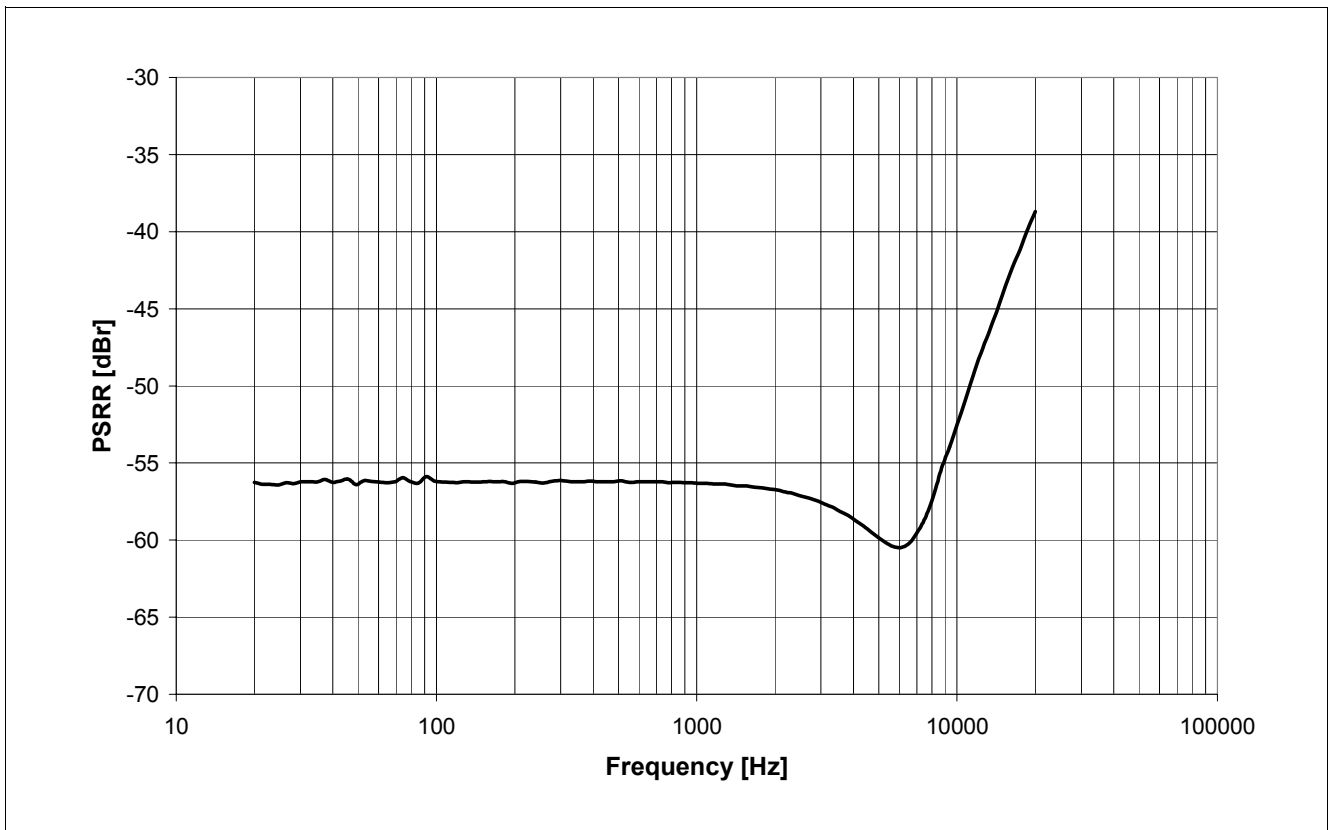


Figure 7 Typical power supply rejection ratio (relative to 100 mV sinewave superimposed on the supply voltage V_{DD})

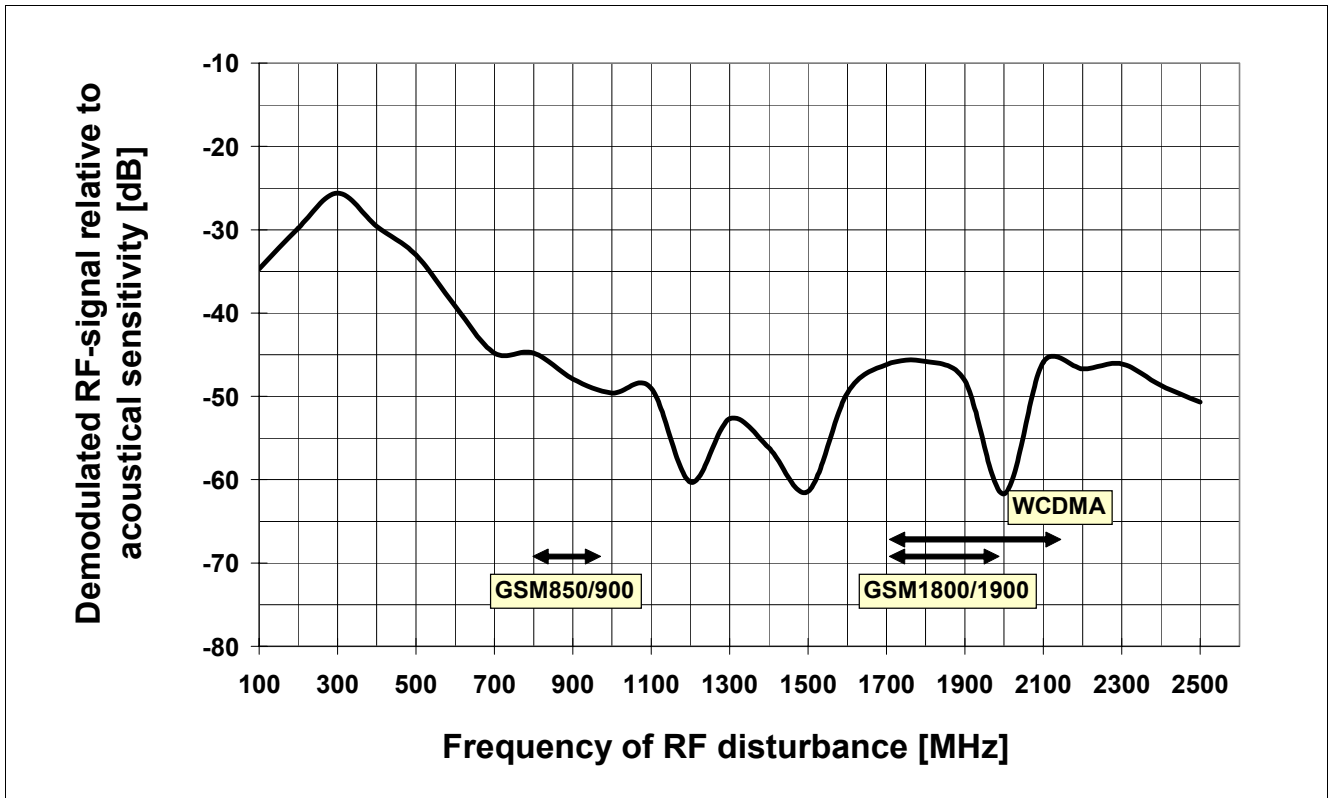


Figure 8 Typical RF demodulation relative to the microphone signal (1 kHz, 1 Pa). RF disturbance (100 MHz - 2.5 GHz, 80%-AM-modulated with 1 kHz) is directly injected in the power supply

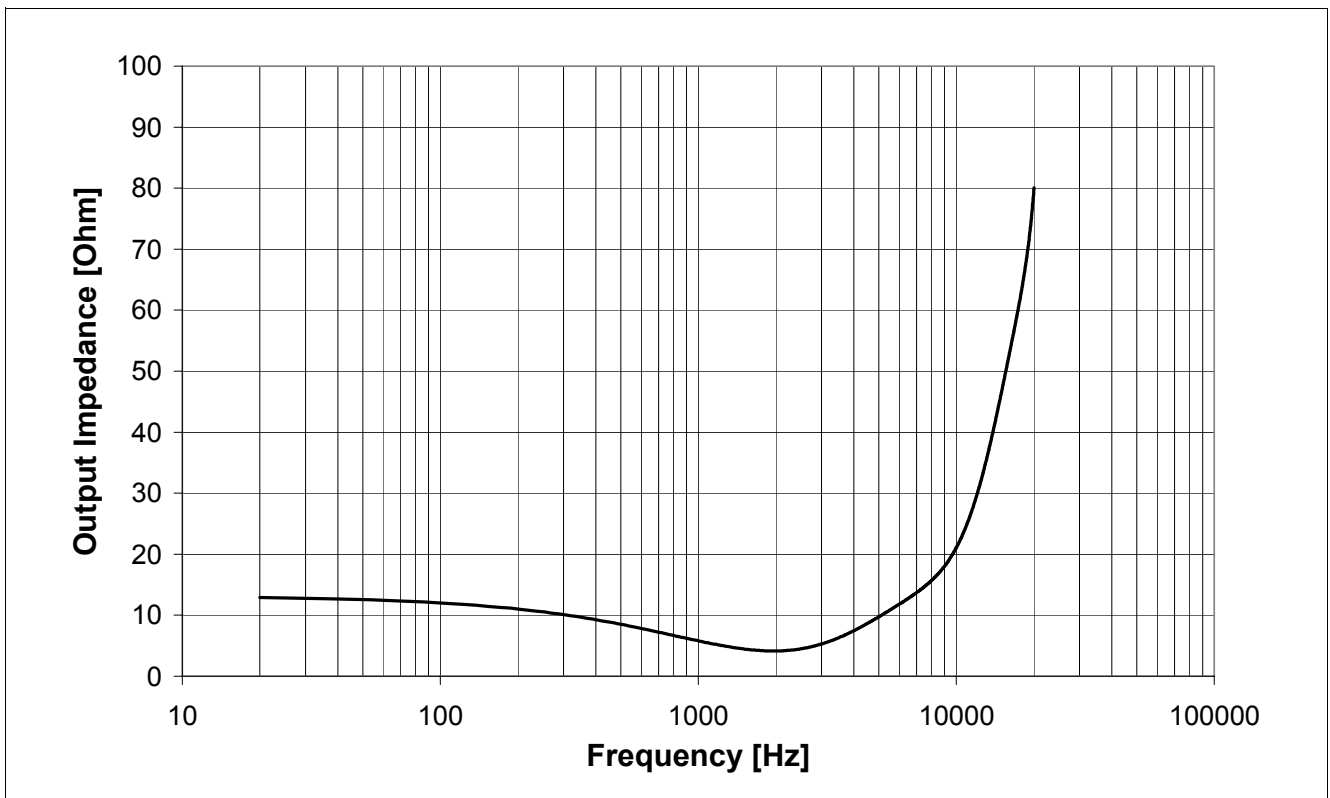


Figure 9 Typical output impedance measurement ($V_{DD} = 2.1\text{ V}$)

Package Outline

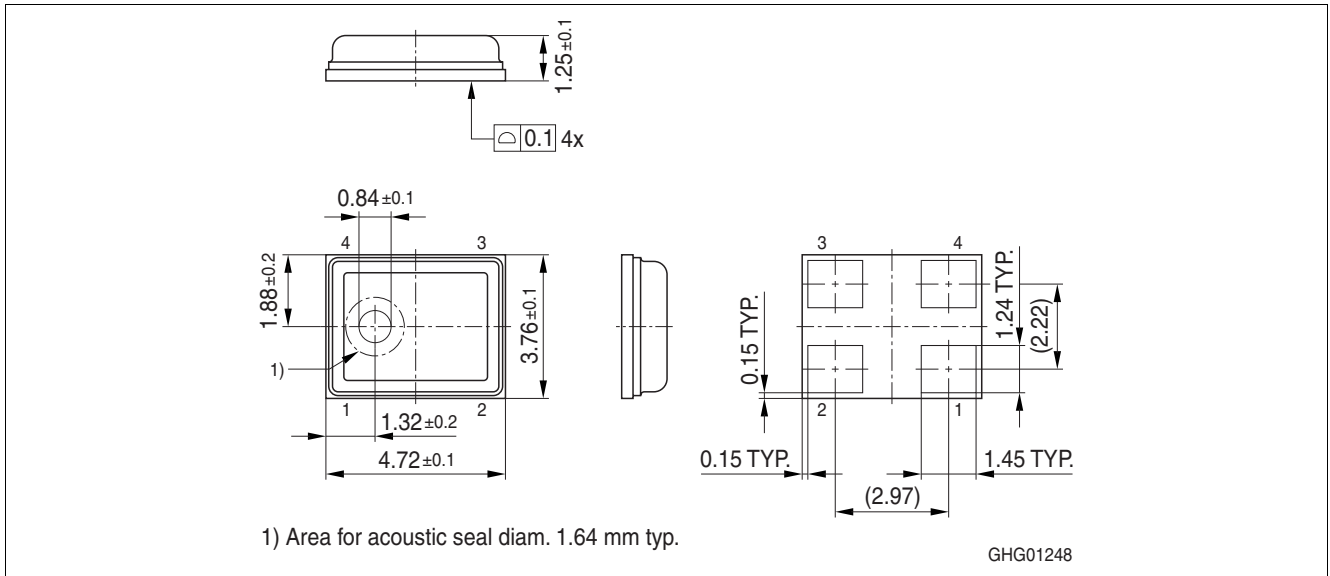


Figure 10 Package outline

Table 5 Dimensions

| Item | Dimension (mm) | Tolerance (mm) |
|---------------------|----------------|----------------|
| Height | 1.25 | ± 0.1 |
| Length | 4.72 | ± 0.1 |
| Width | 3.76 | ± 0.1 |
| Sound Port Diameter | 0.84 | ± 0.1 |

Recommended Customer Land Pattern

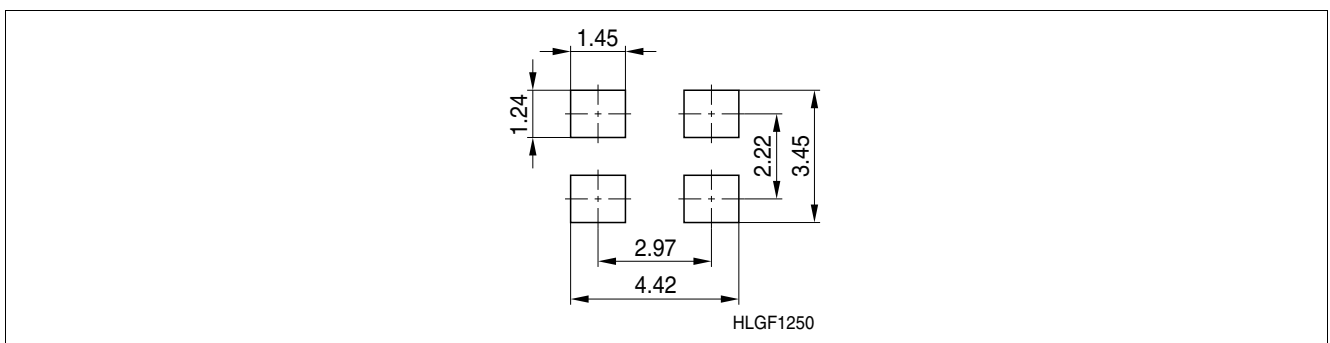


Figure 11 Recommended customer land pattern

Solder Reflow

Table 6 Solder Reflow Conditions

| | |
|----------------------------|--|
| Solder Reflow Profile | Compliant to J-STD-020-C |
| Maximum Peak Temperature | 260 °C |
| Number of Reflow | 3 times reflow soldering |
| Board washing after Reflow | Board washing can damage the microphone if the sound inlet hole is uncovered |
| Moisture Sensitivity Level | MSL 2 classified |

Recommended Vacuum Handling

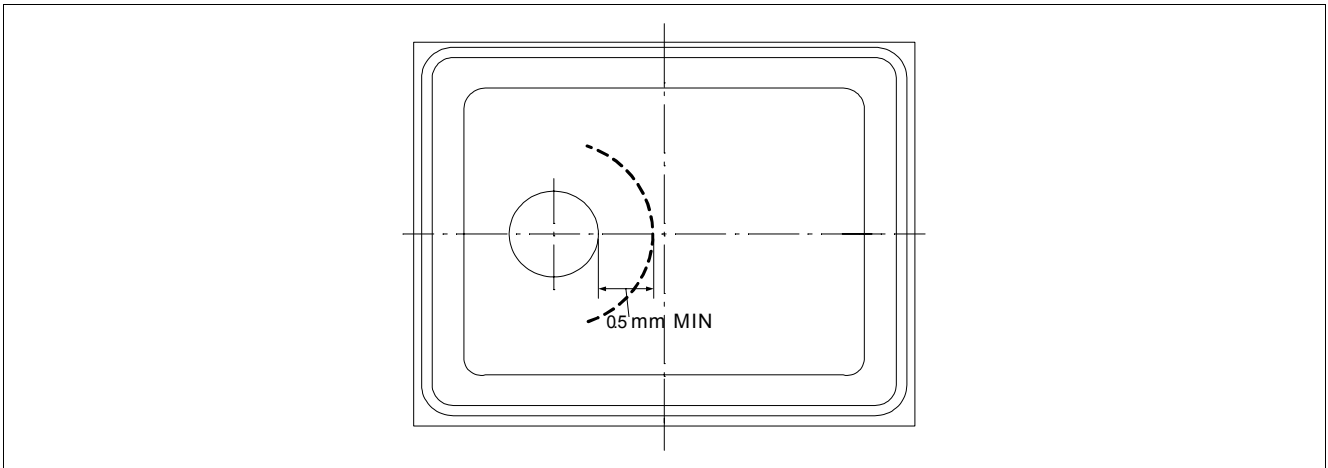


Figure 12 Recommended minimum distance between sound port hole and vacuum pick tool opening is 0.50 mm

Tape Outline

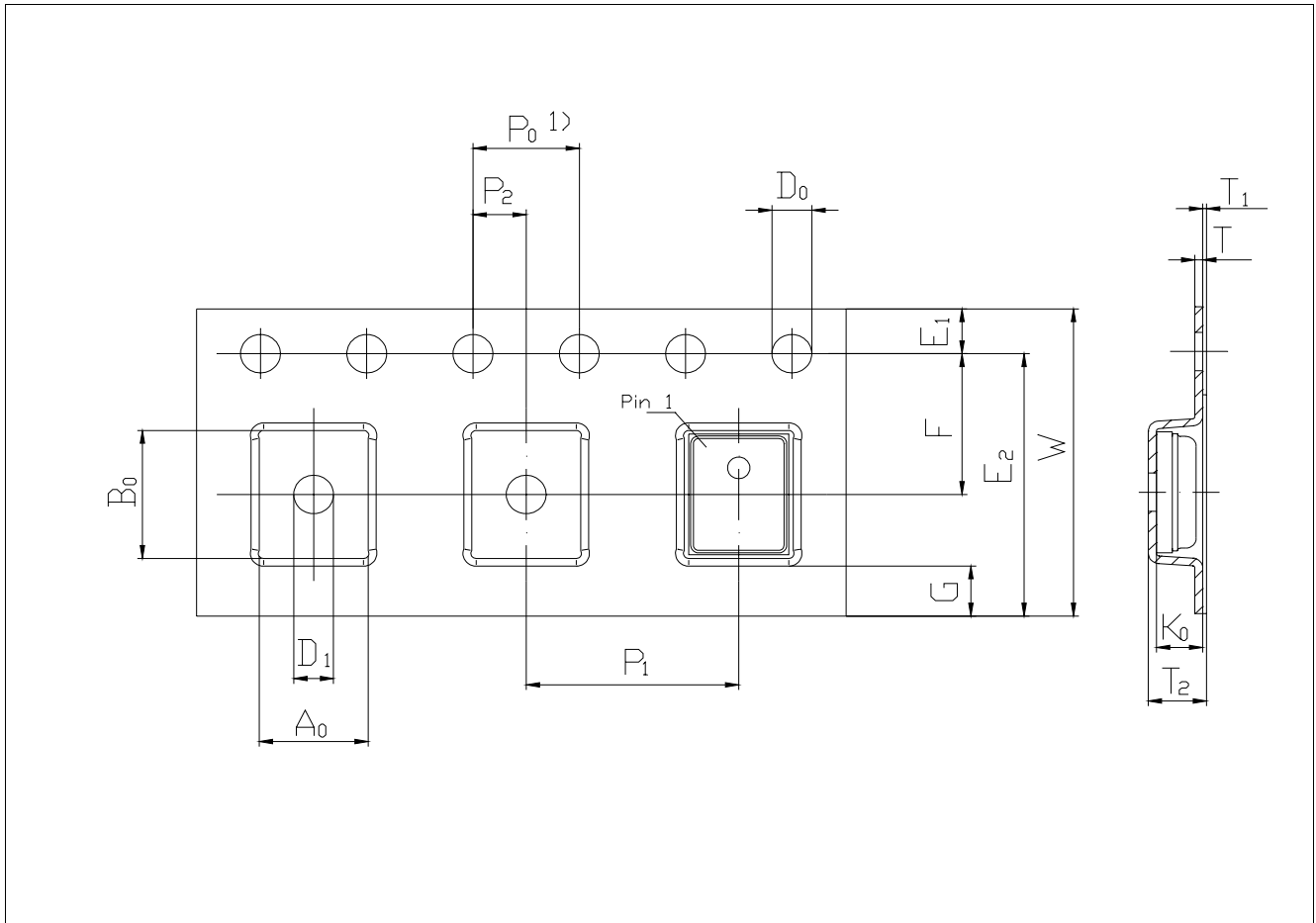


Figure 13 Tape Outline, ¹⁾ Cumulative tolerance of 10 sprocket holes is ± 0.2 mm

Table 7 Tape Dimensions (mm)

| W | P ₀ | P ₁ | P ₂ | D ₀ | A ₀ | B ₀ | E ₁ |
|----------------|----------------|----------------|----------------|------------------|----------------|----------------|----------------|
| 12 \pm 0.3 | 4 \pm 0.1 | 8 \pm 0.1 | 2 \pm 0.05 | 1.5 \pm 0.1 | 4.1 \pm 0.1 | 5 \pm 0.1 | 1.75 \pm 0.1 |
| E ₂ | F | D ₁ | T | T ₁ | T ₂ | G | K ₀ |
| 10.25 MIN | 5.5 \pm 0.05 | 1.5 MIN | 0.3 \pm 0.05 | 0.05 \pm 0.015 | 2.1 \pm 0.2 | 1.95 NOM | 1.75 \pm 0.1 |

Reel Outline

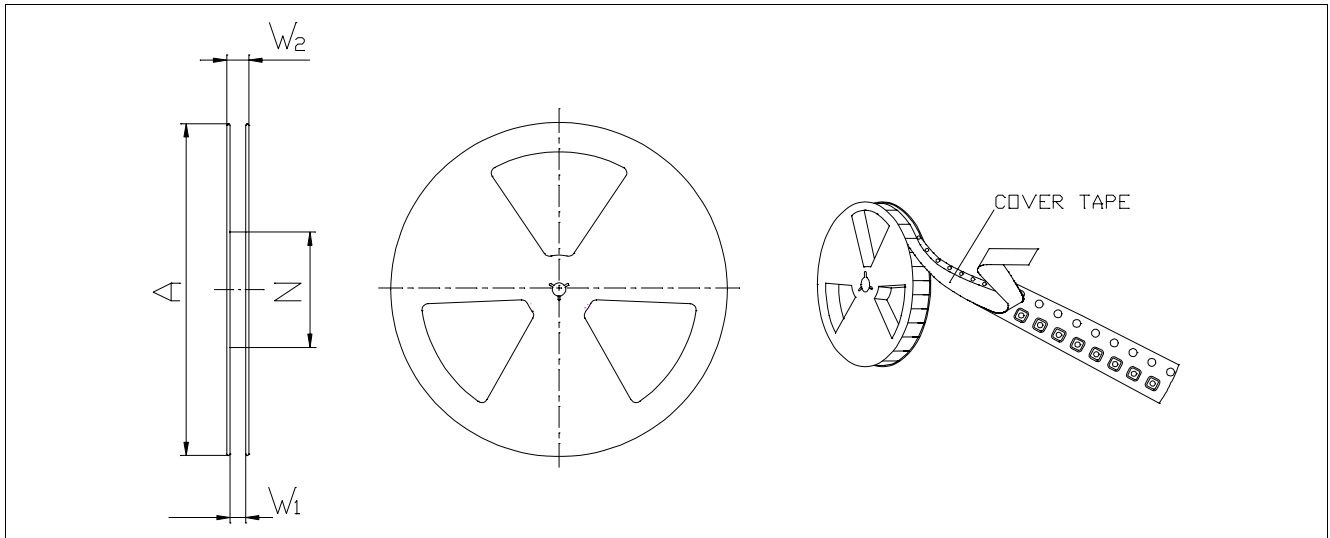


Figure 14

Table 8 Reel Dimension (mm) and Quantity per Reel

| A | W ₁ | W ₂ | N | Quantity per Reel |
|-------|----------------|----------------|-------|-------------------|
| Ø 330 | 12.4±1.5 | 18.4 MAX | Ø 100 | 4000 |