SMM310

Silicon MEMS Microphone

Small Signal Discretes

Never stop thinking

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SMM310

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

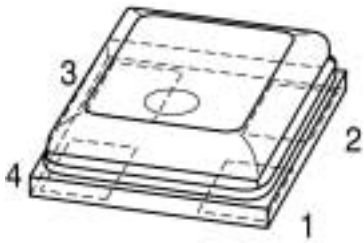
Previous Version: 2007-08-31, V1.0

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

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 µA
- 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 mm^3.

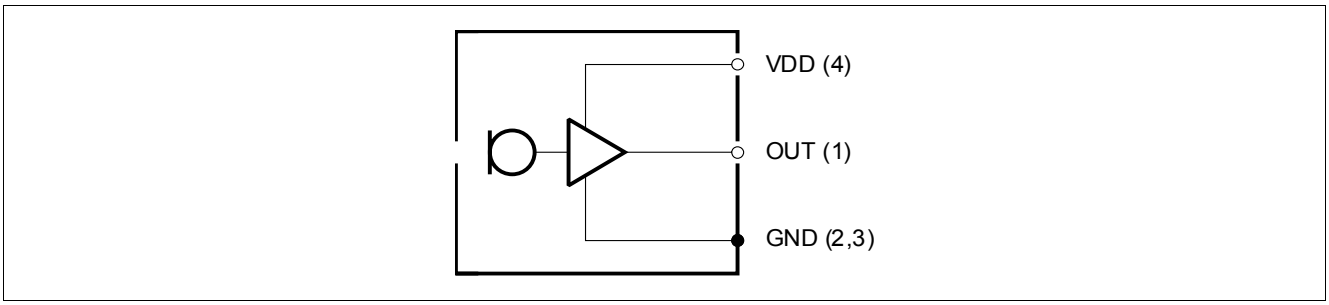


Figure 1 Block Diagram

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

Pin Definition and Function

Table 1 Pin Definition and Function

Pin No.	Symbol	Function
1	OUT	Output
2	GND	Ground
3	GND	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 °C, V_{DD} = 2.1 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	ENL		29.5	32.5	dB(pso)	CCITT-weighted[1)]
			35		dB(A)	A-weighted[2)]
Signal-to-Noise Ratio	SNR	61.5	64.5		dB(pso)	CCITT-weighted
			59		dB(A)	A-weighted
Total Harmonic Distortion	THD		0.1	0.5	%	104 dB SPL, 1 kHz
Current Consumption	I_{CC}		80	140	µA	V_{DD} = 2.1 V
Power Supply Rejection Ratio	$PSRR$		-55	-40	dBr	100 mV superimposed on V_{DD} = 2.1 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

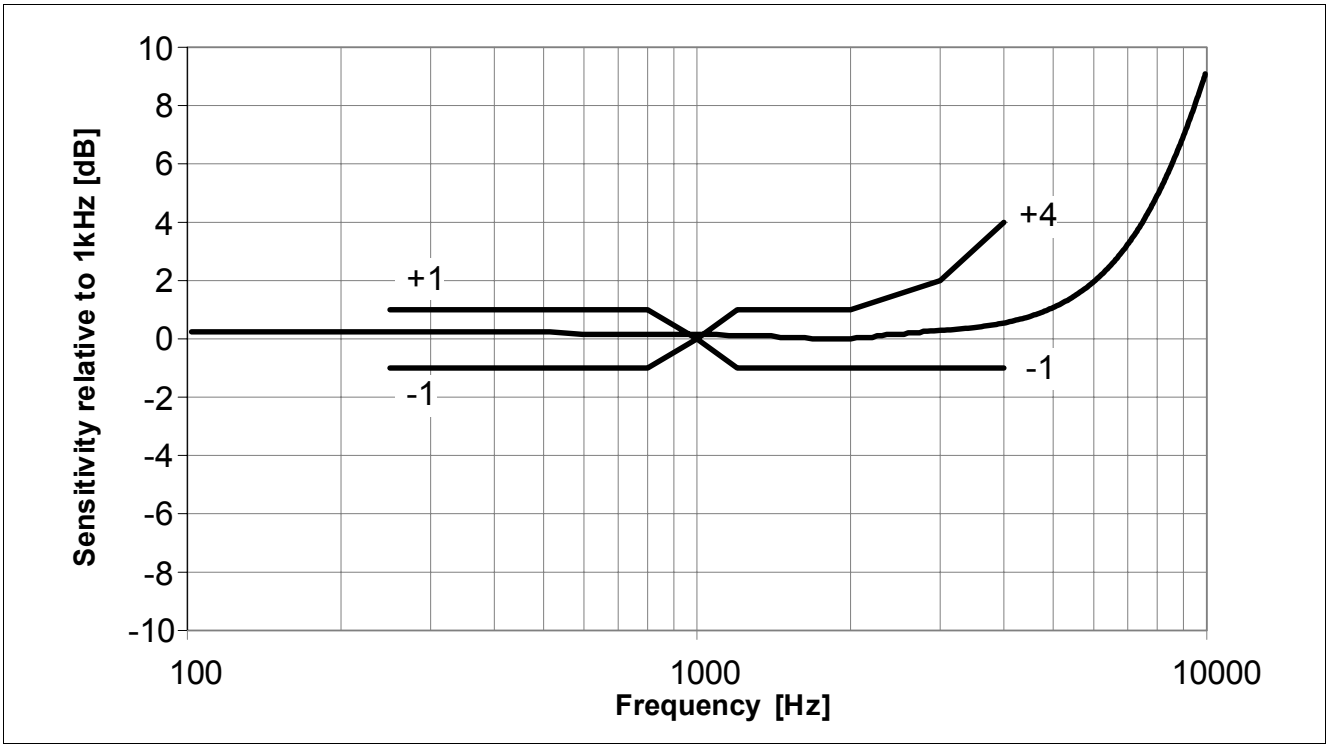


Figure 2 Typical frequency response curve relative to the sensitivity at a frequency of 1 kHz

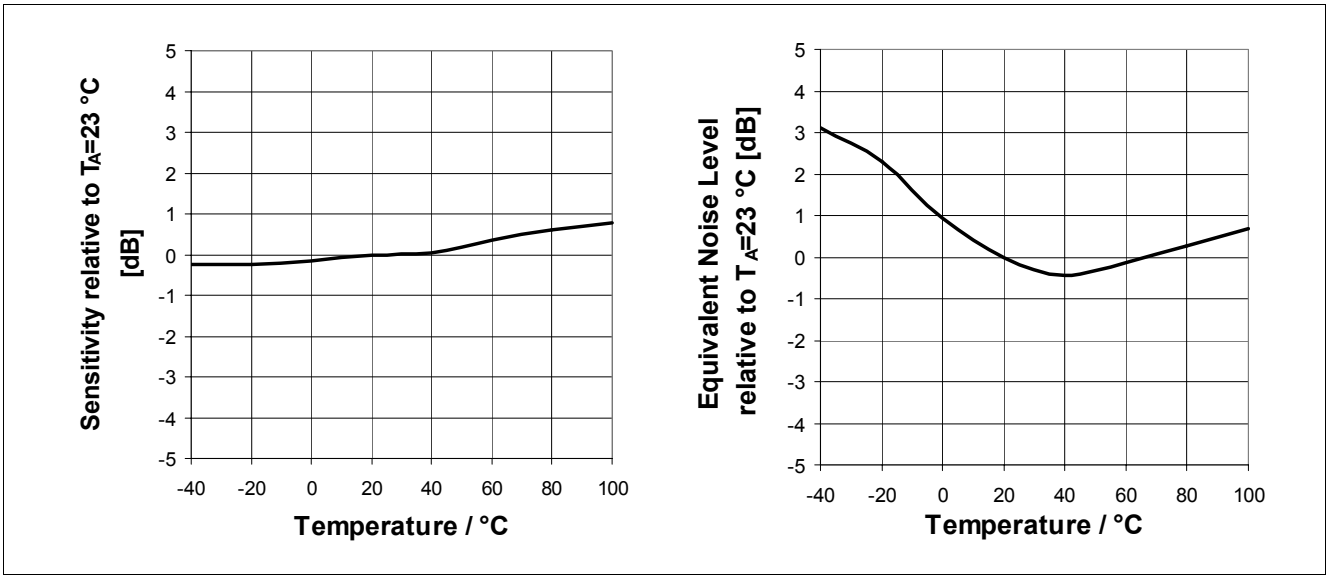


Figure 3 Typical change of sensitivity at 1 kHz and equivalent noise level over temperature relative to T_A = 23° C

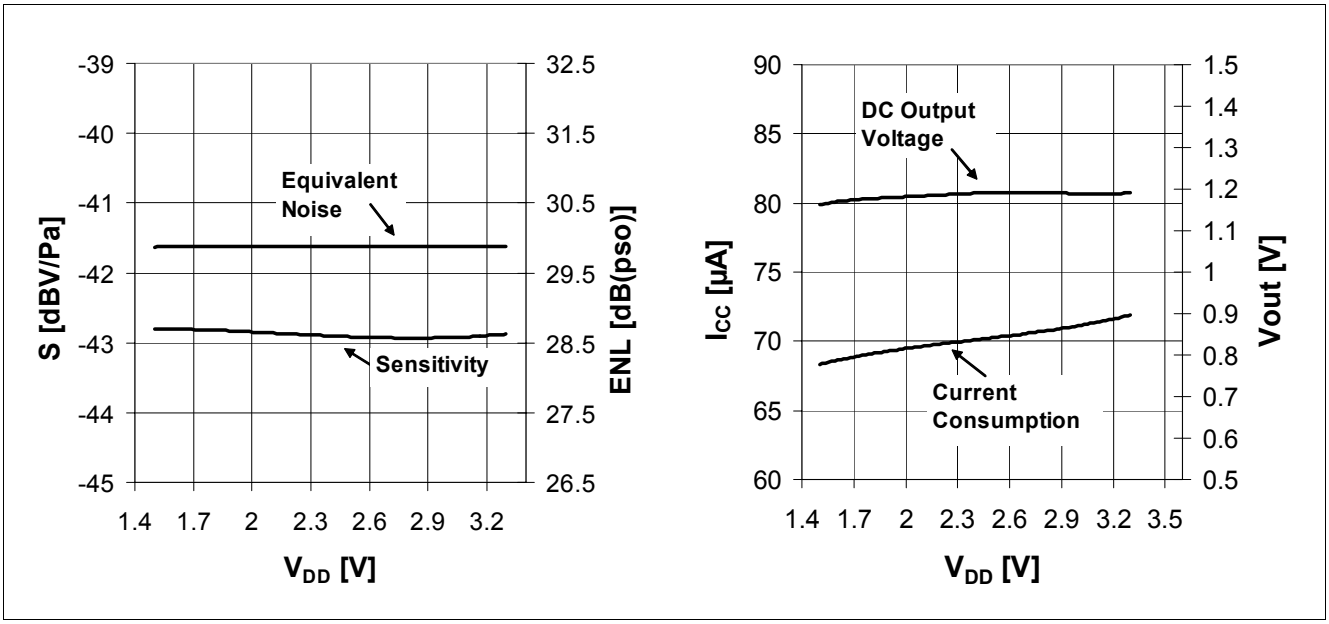


Figure 4 **Typical measurement of sensitivity, equivalent noise level, current consumption and DC output voltage over power supply V_{DD}**

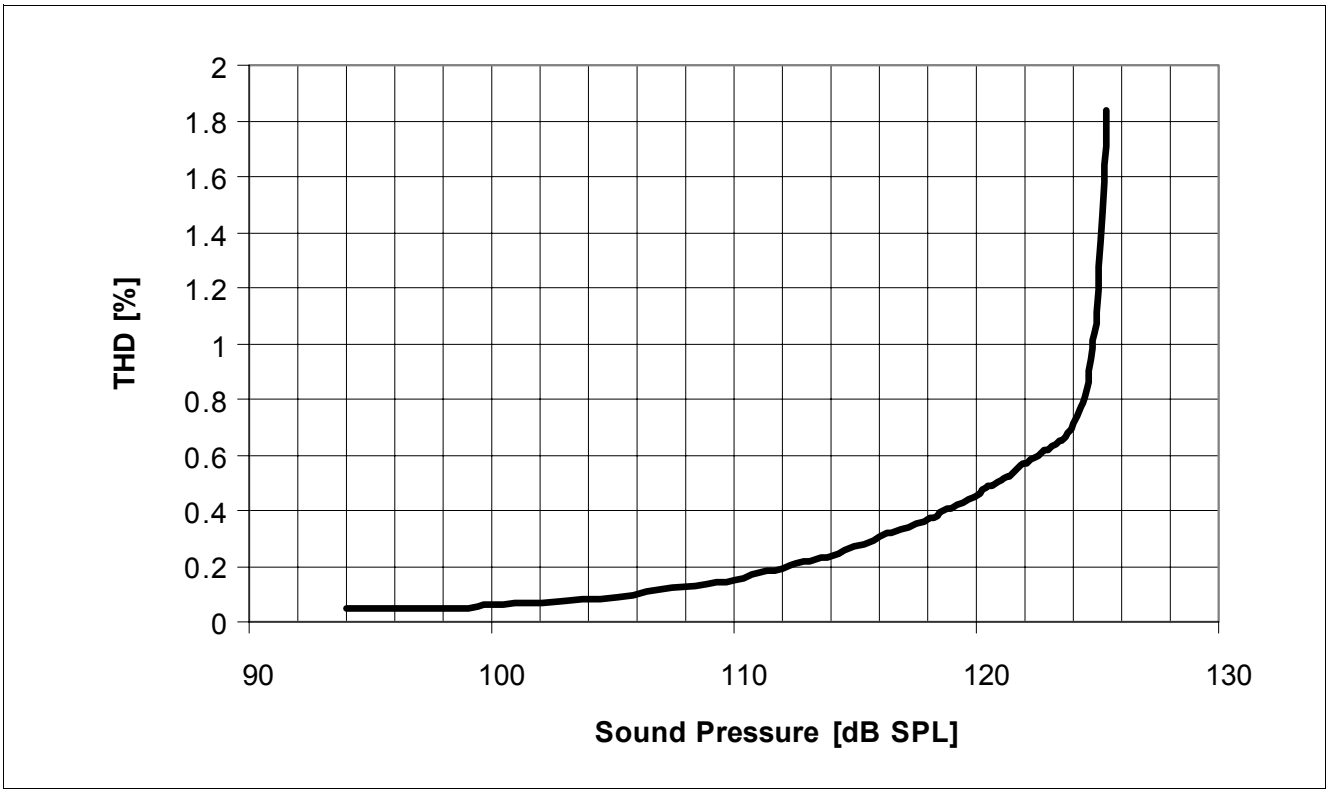


Figure 5 **Typical total harmonic distortion over sound pressure level (1 kHz, V_{DD} = 2.1 V)**

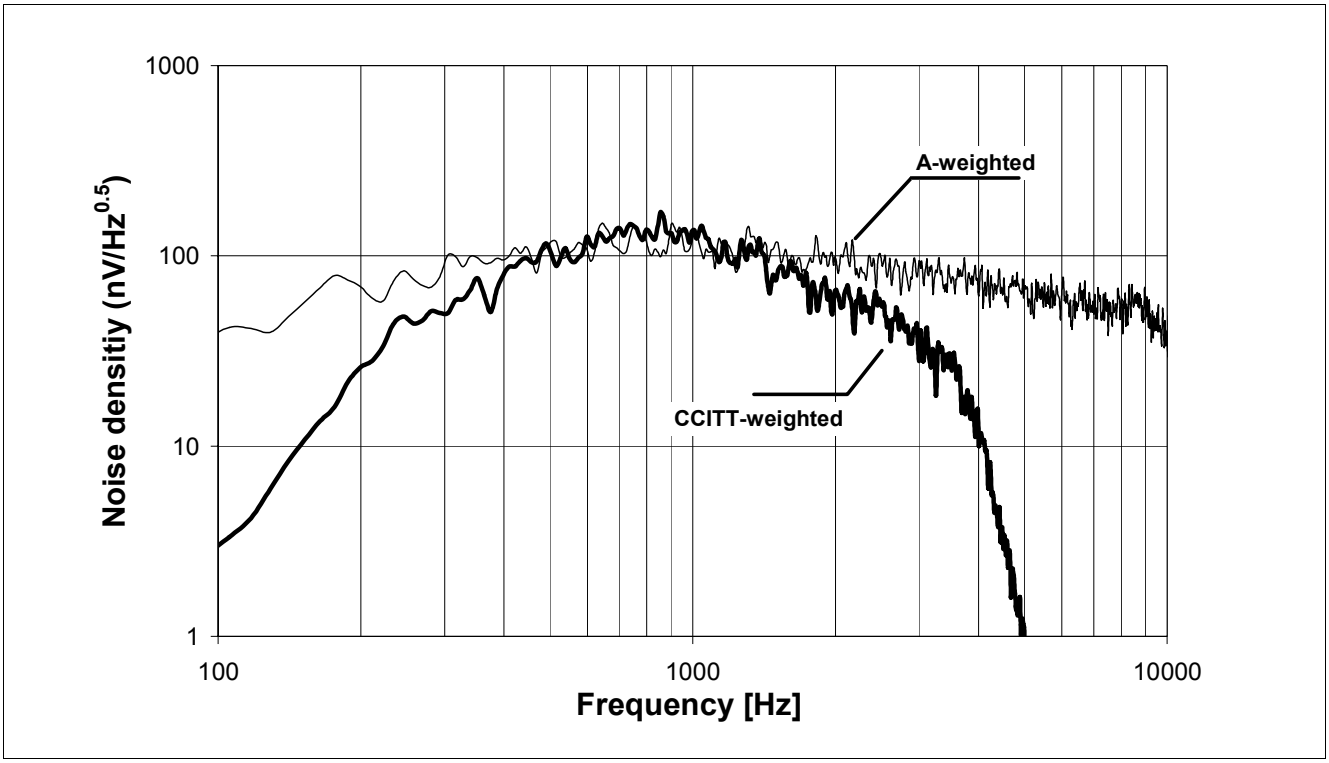


Figure 6 Typical noise density measurement with A-weighting and CCITT-weighting filter

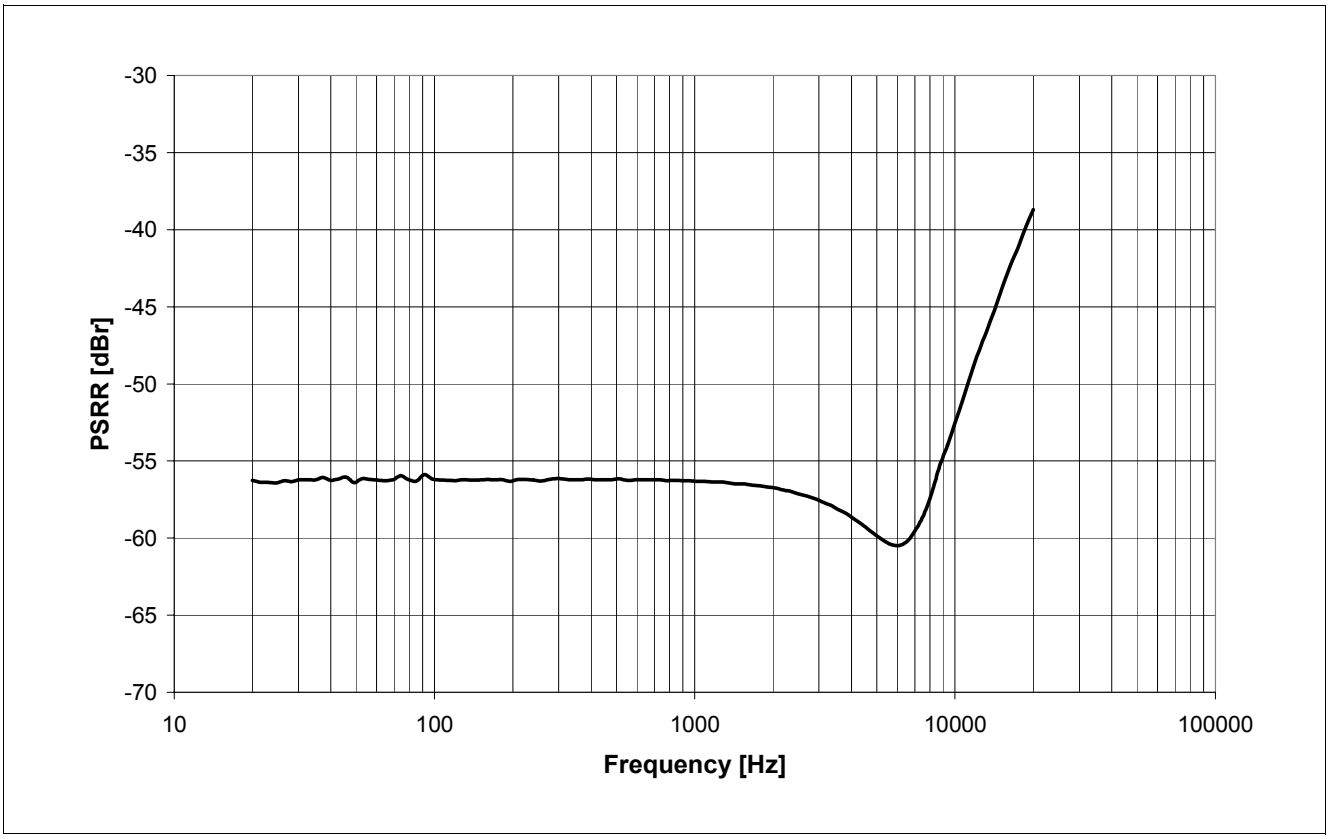


Figure 7 Typical power supply rejection ratio (relative to 100 mV sinewave superimposed on the supply voltage V_{DD})

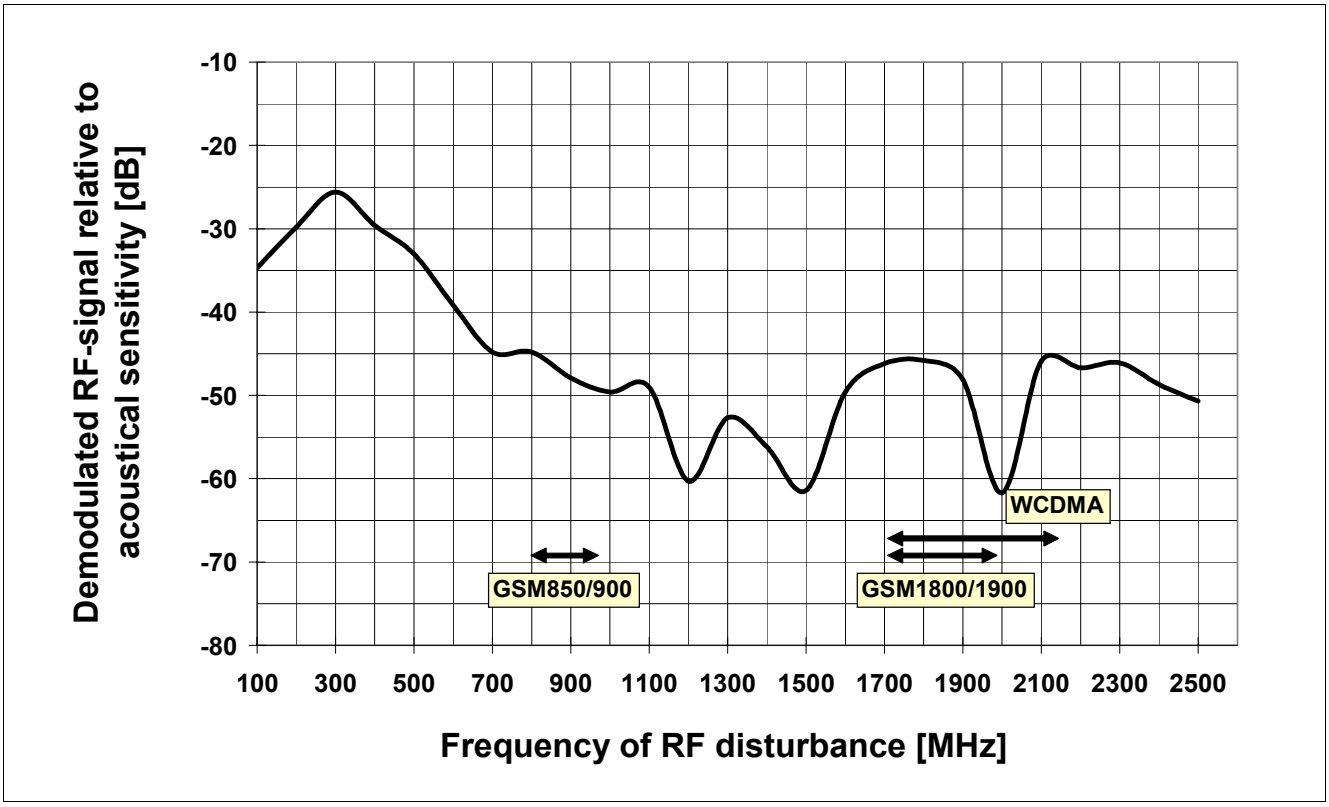


Figure 8 Typical RF demodulation relative to the microphone signal (1 kHz, 1 Pa). RF disturbance (100 MHz - 2.5 GHz, 80%-AM-modulated with 1 kHz) is directly injected in the power supply

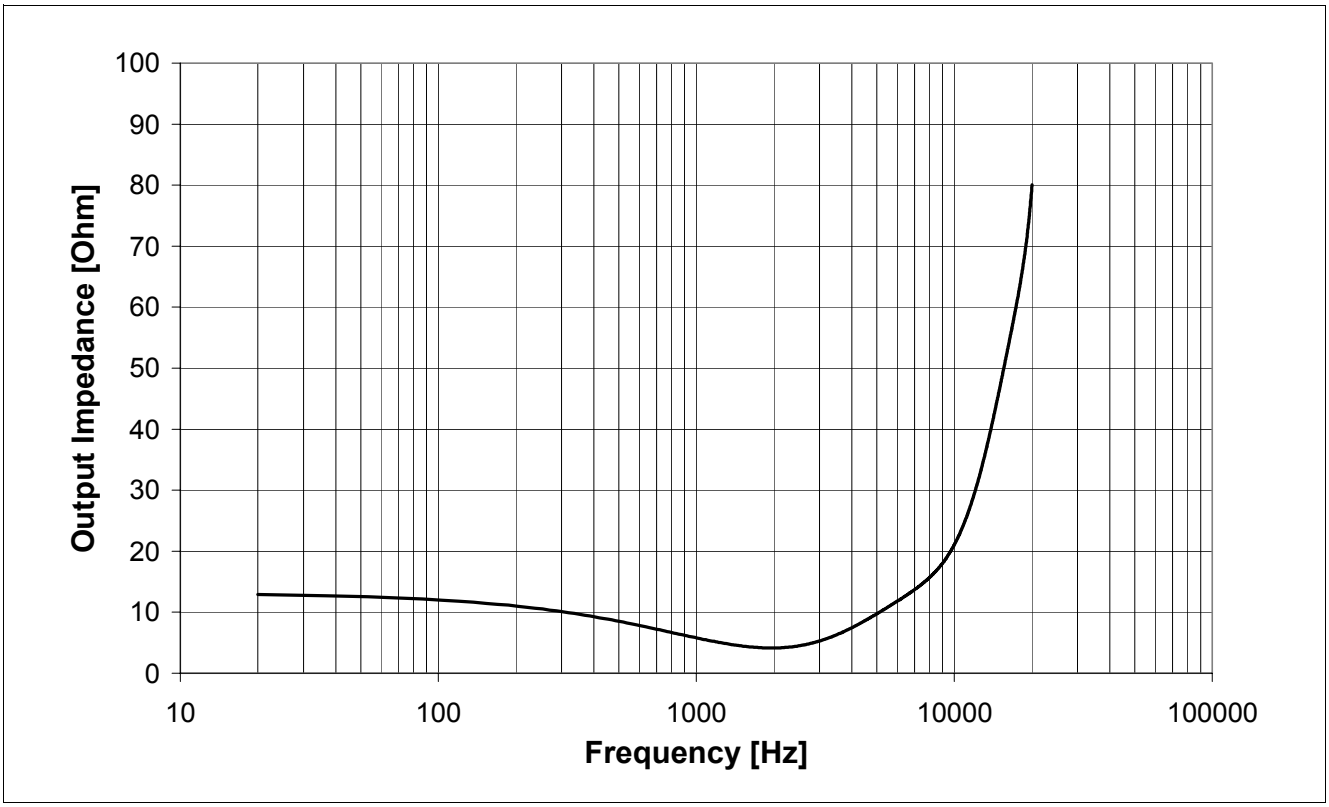


Figure 9 Typical output impedance measurement (V_{DD} = 2.1 V)

Package Outline

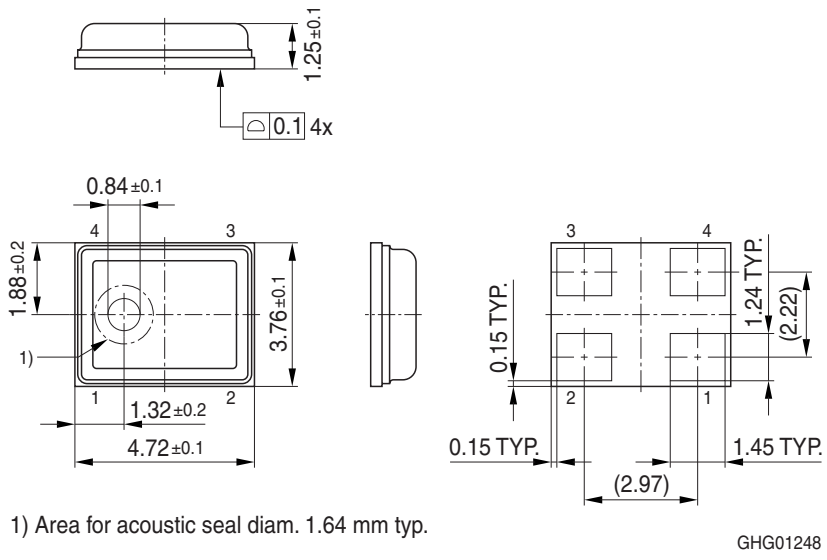


Figure 10 Package outline

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

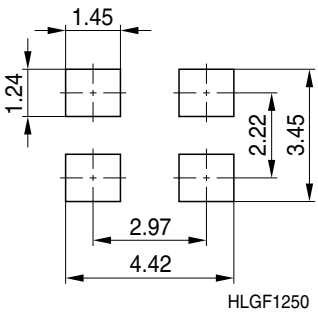


Figure 11 Recommended customer land pattern

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

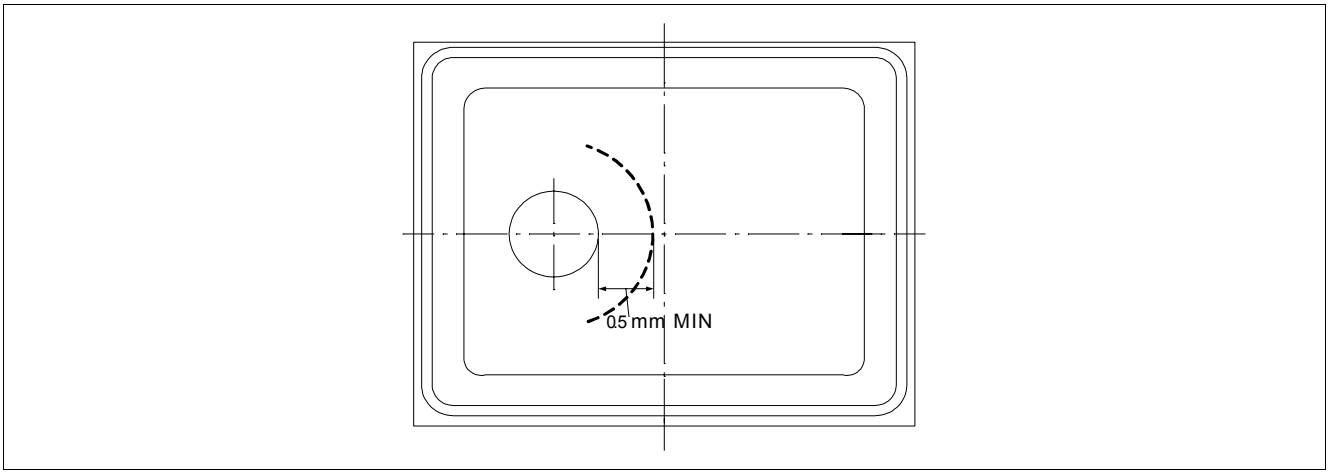


Figure 12 Recommended minimum distance between sound port hole and vacuum pick tool opening is 0.50 mm

Tape Outline

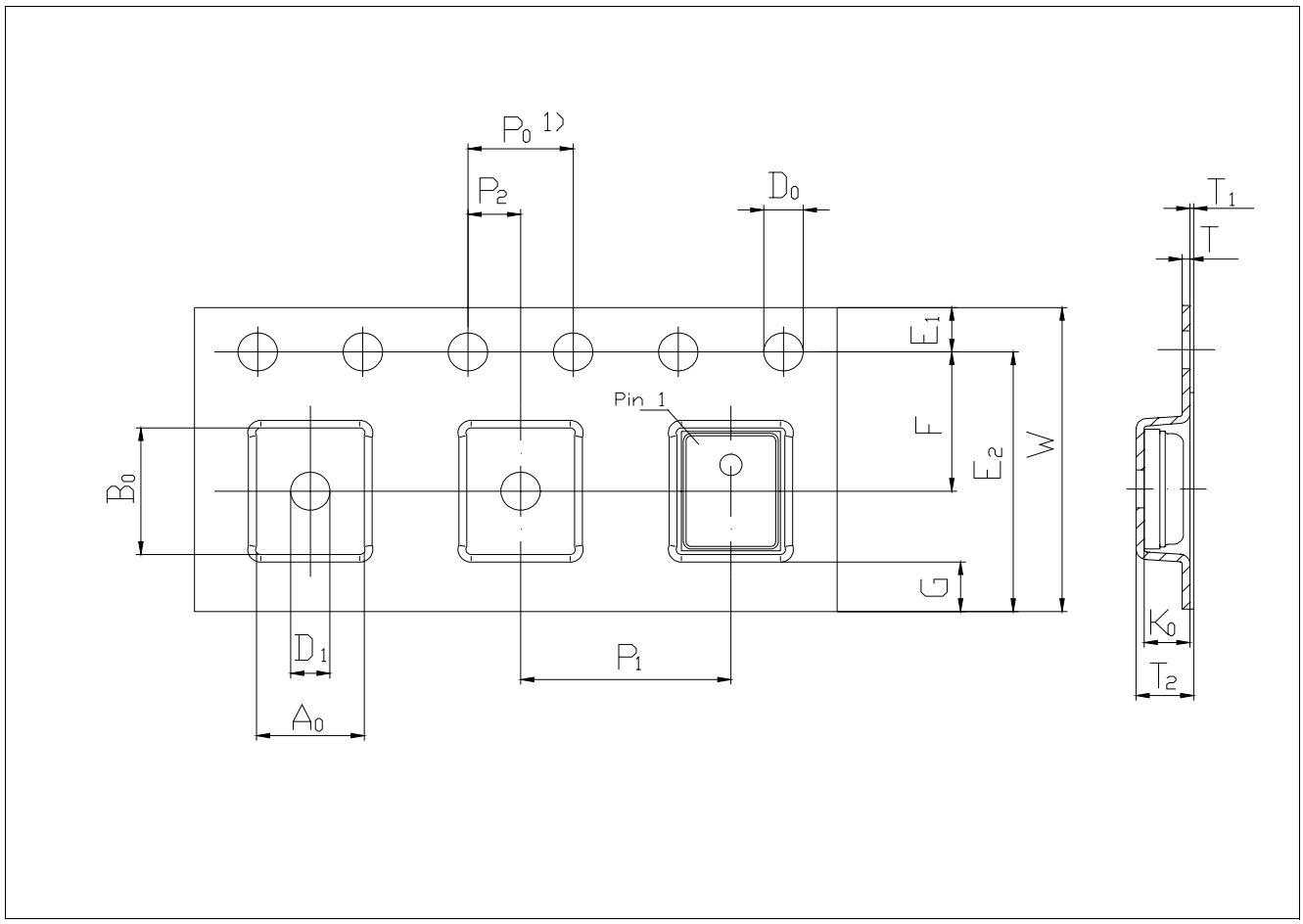


Figure 13 Tape Outline, 1) Cumulative tolerance of 10 sprocket holes is ±0.2 mm

Table 7 Tape Dimensions (mm)

W	P_0	P_1	P_2	D_0	A_0	B_0	E_1
12±0.3	4±0.1	8±0.1	2±0.05	1.5±0.1	4.1±0.1	5±0.1	1.75±0.1
E_2	F	D_1	T	T_1	T_2	G	K_0
10.25 MIN	5.5±0.05	1.5 MIN	0.3±0.05	0.05±0.015	2.1±0.2	1.95 NOM	1.75±0.1

Reel Outline

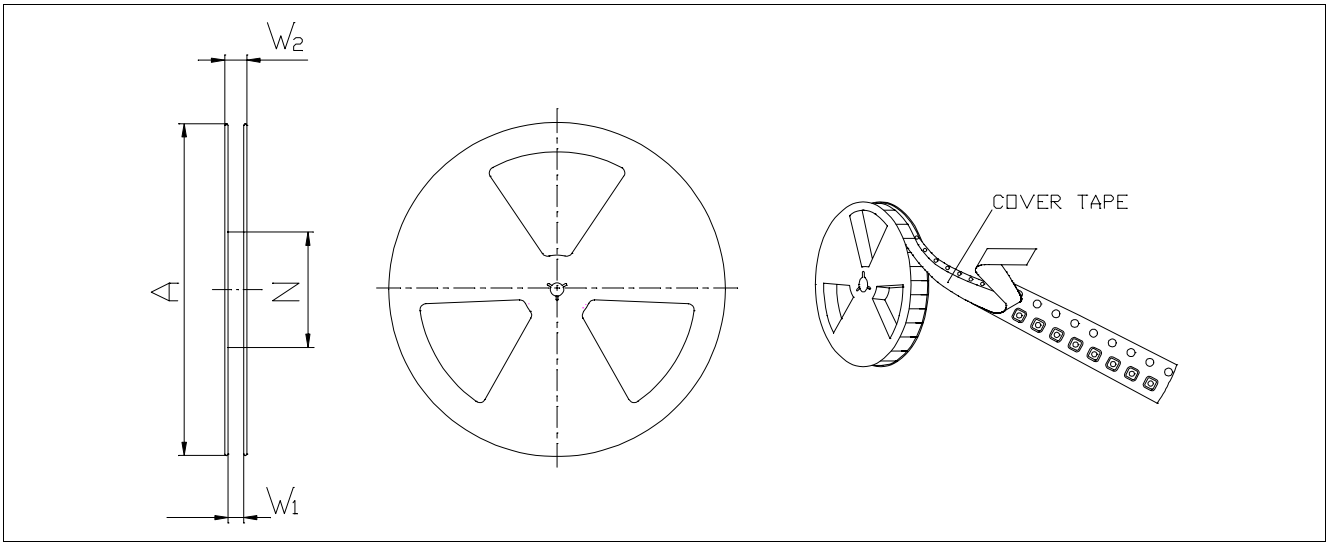


Figure 14

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