

# SMM310

Silicon MEMS Microphone

Small Signal Discretes



Never stop thinking

**Edition 2008-05-28**

**Published by  
Infineon Technologies AG  
81726 München, Germany**

**© Infineon Technologies AG 2008.  
All Rights Reserved.**

### **Legal Disclaimer**

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenhheitsgarantie"). With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

### **Information**

For further information on technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies Office ([www.infineon.com](http://www.infineon.com)).

### **Warnings**

Due to technical requirements components may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies Office.

Infineon Technologies Components may only be used in life-support devices or systems with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system, or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body, or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

---

**SMM310**

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

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

<b>Page</b>	<b>Subjects (major changes since last revision)</b>
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  $\mu$ 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 mm<sup>3</sup>.

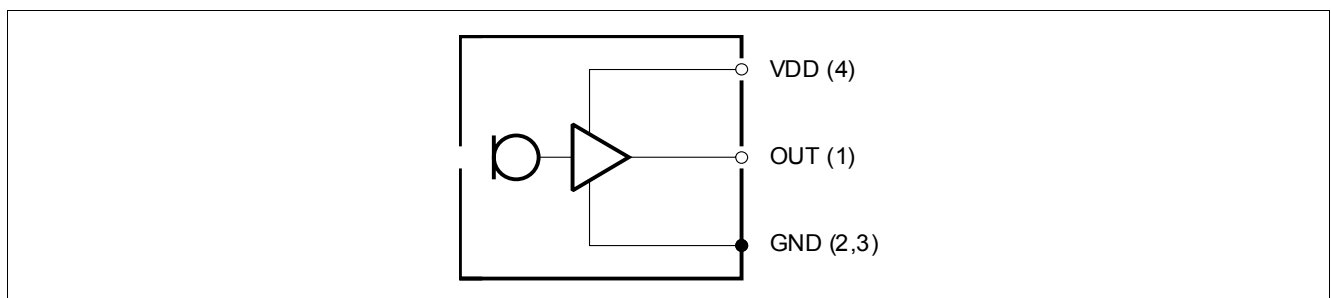


Figure 1 Block Diagram

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	$\Delta S_{4kHz}$	-1		+4	dB	Relative to sensitivity 1 kHz
Relative Sensitivity 240 Hz	$\Delta S_{240Hz}$	-1		+1	dB	Relative to sensitivity 1 kHz
Equivalent Noise Level	<i>ENL</i>		29.5	32.5	dB(pso)	CCITT-weighted <sup>1)</sup>
			35		dB(A)	A-weighted <sup>2)</sup>
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

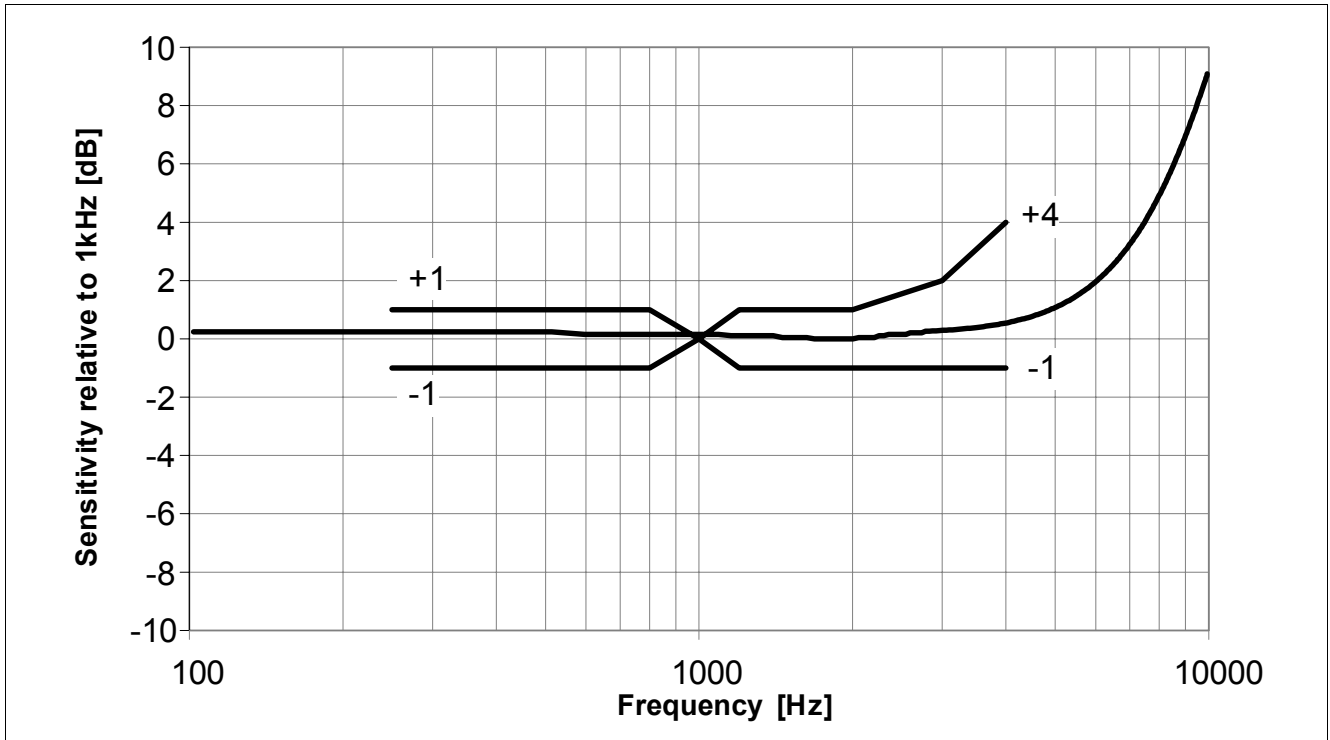


Figure 2 Typical frequency response curve relative to the sensitivity at a frequency of 1 kHz

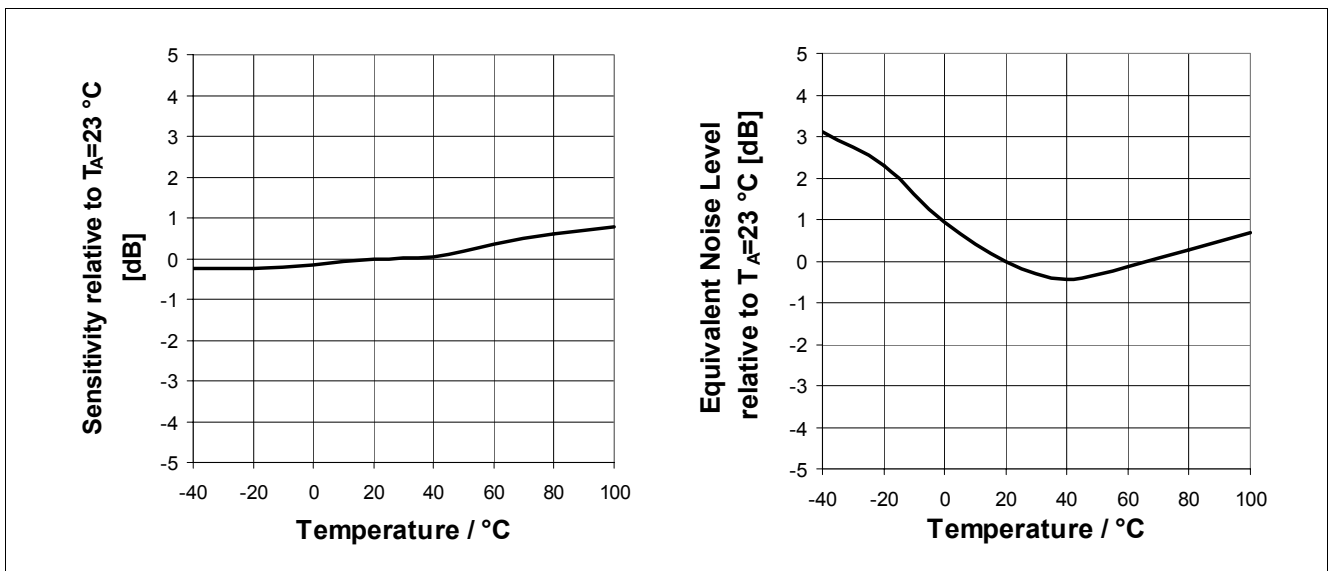


Figure 3 Typical change of sensitivity at 1 kHz and equivalent noise level over temperature relative to  $T_A = 23^\circ\text{C}$

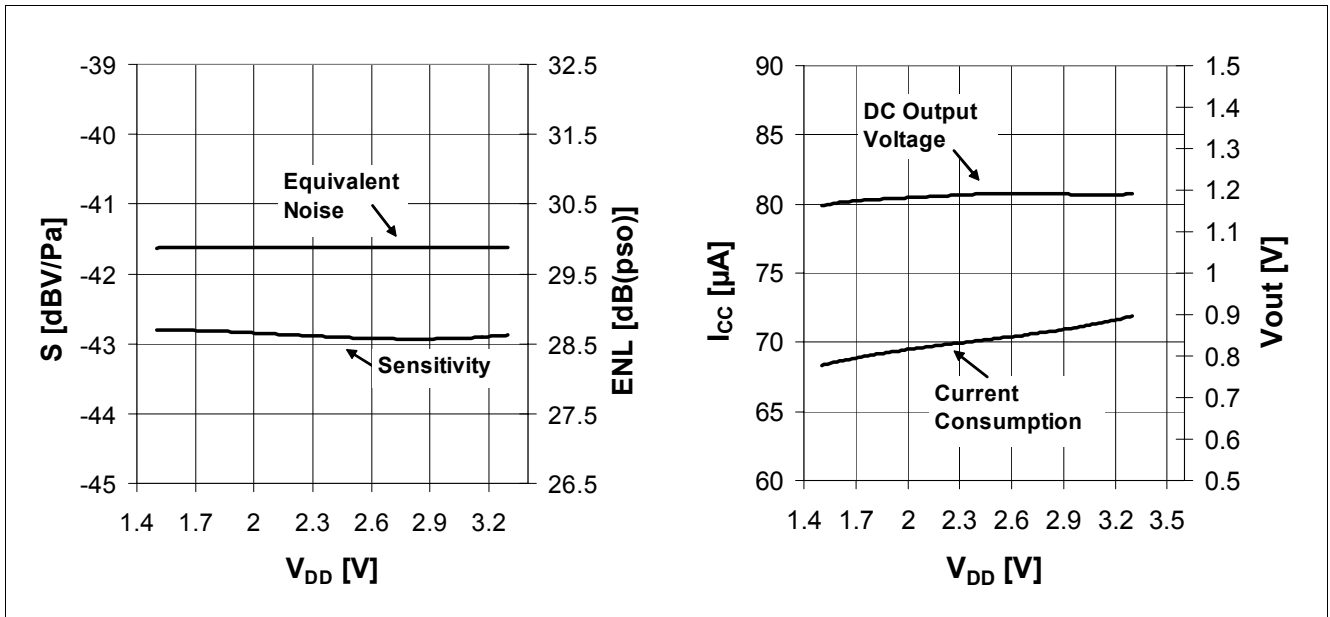


Figure 4 Typical measurement of sensitivity, equivalent noise level, current consumption and DC output voltage over power supply  $V_{DD}$

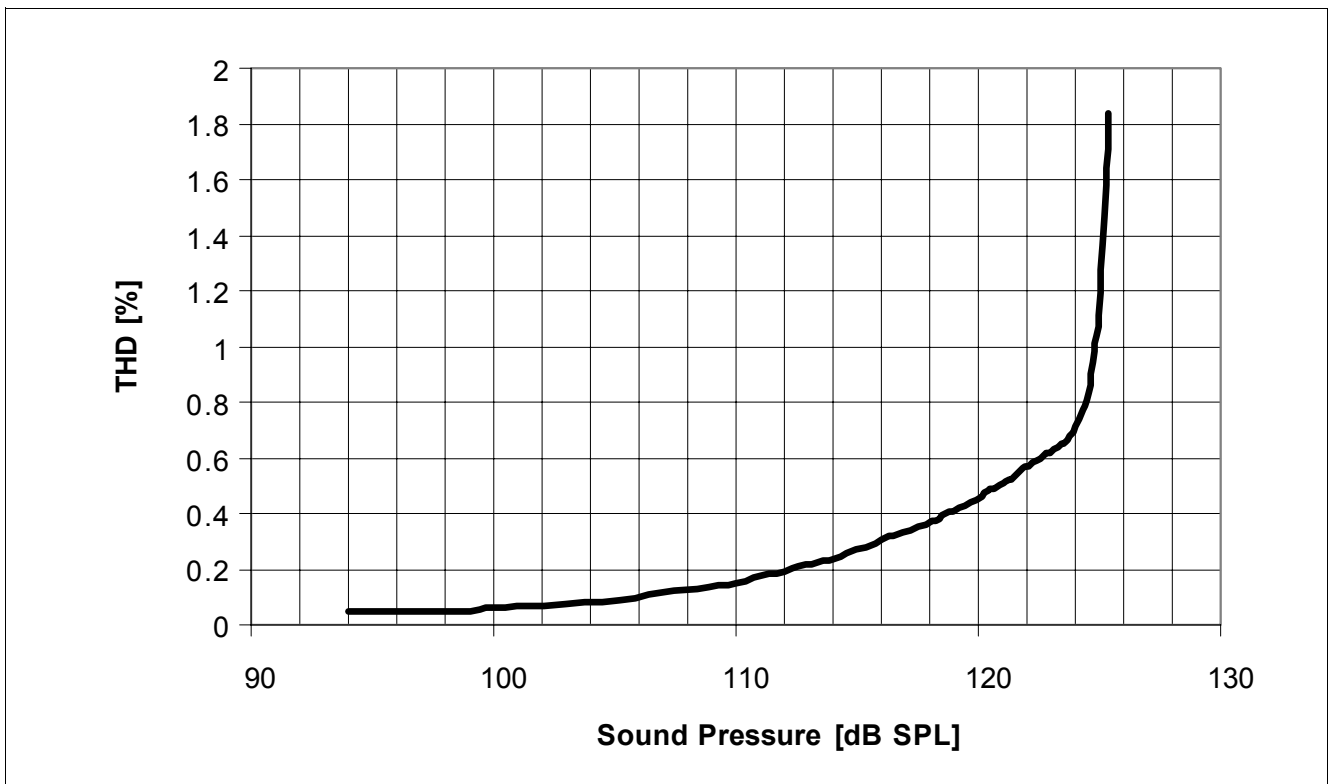


Figure 5 Typical total harmonic distortion over sound pressure level (1 kHz,  $V_{DD} = 2.1$  V)

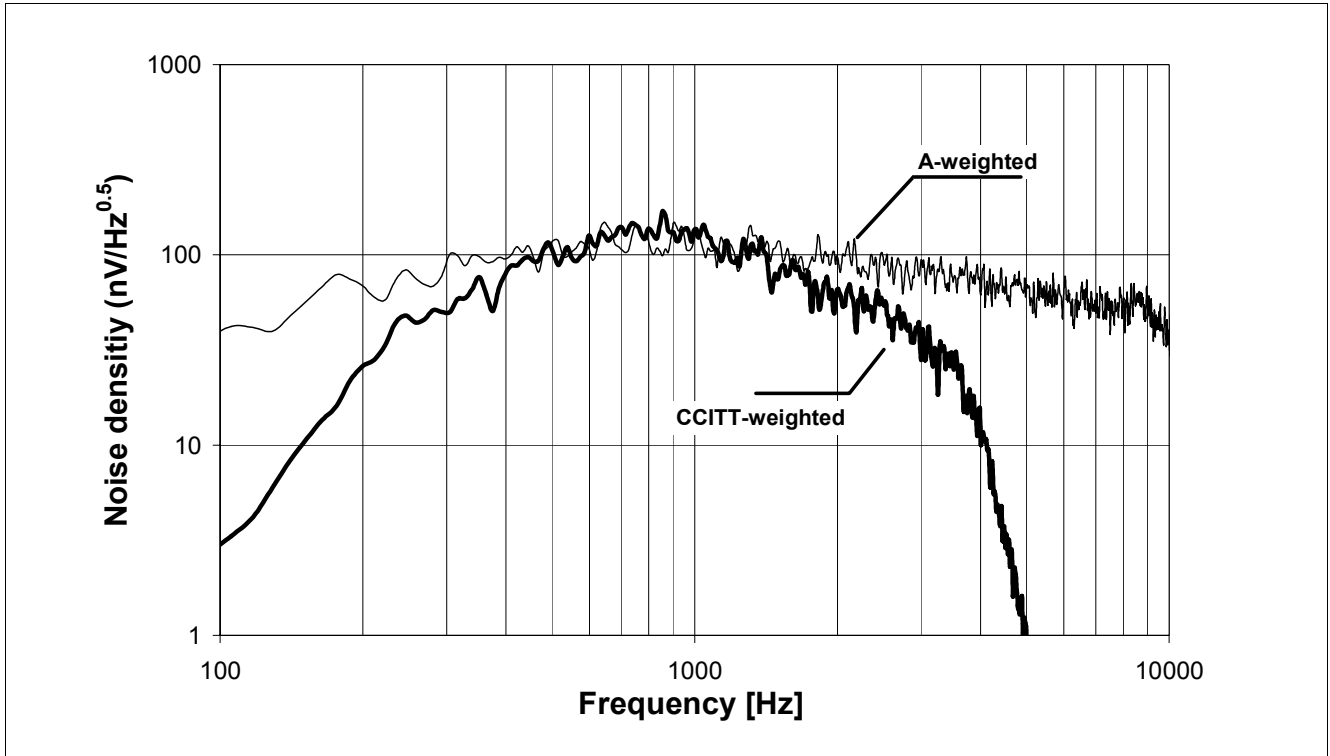


Figure 6 Typical noise density measurement with A-weighting and CCITT-weighting filter

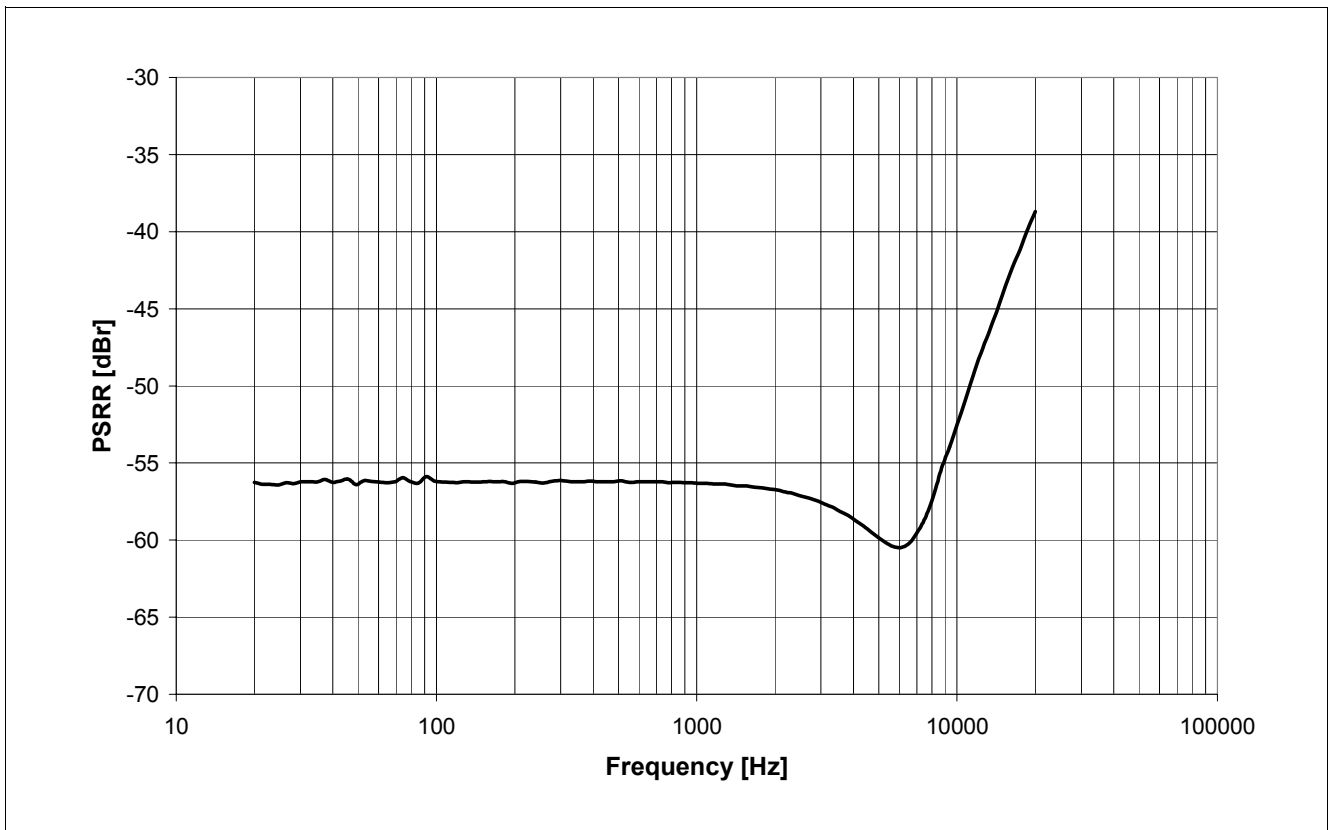


Figure 7 Typical power supply rejection ratio (relative to 100 mV sinewave superimposed on the supply voltage  $V_{DD}$ )



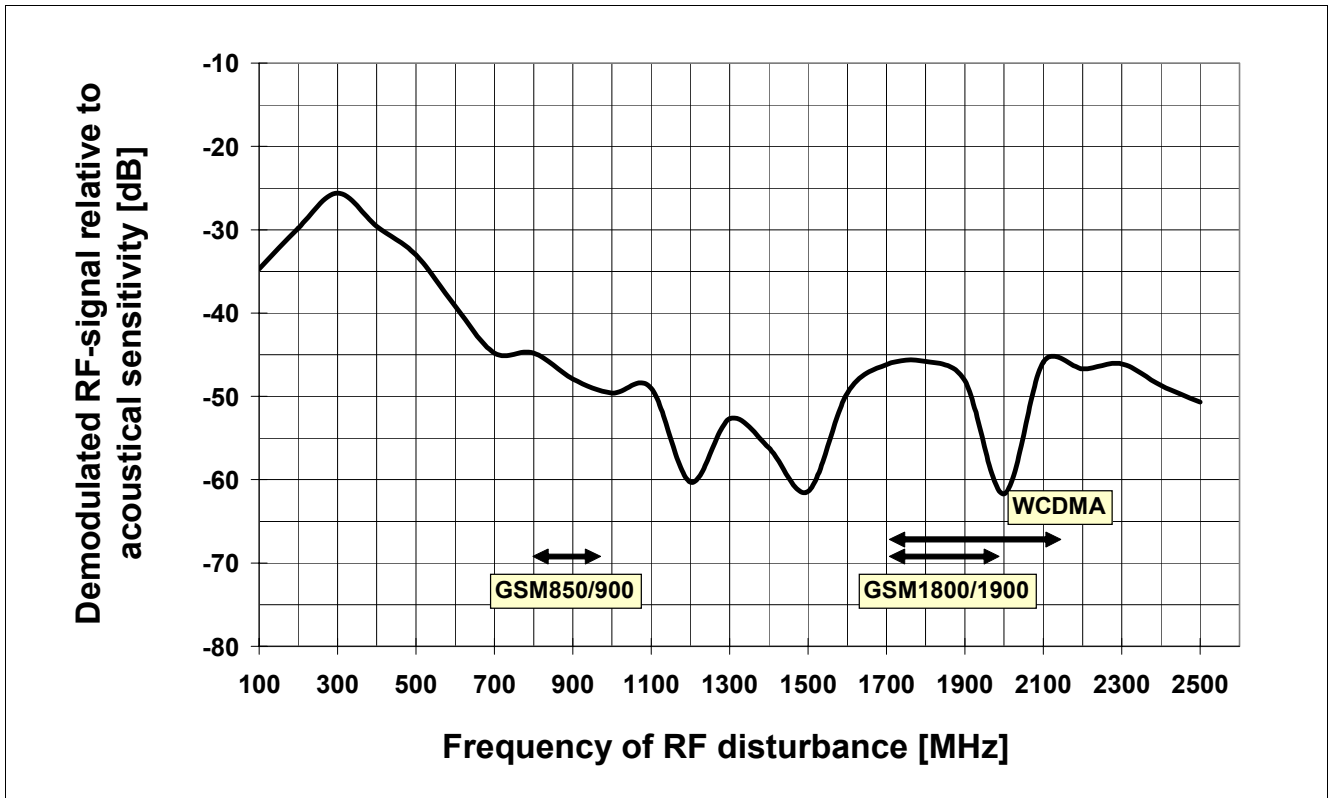


Figure 8 Typical RF demodulation relative to the microphone signal (1 kHz, 1 Pa). RF disturbance (100 MHz - 2.5 GHz, 80%-AM-modulated with 1 kHz) is directly injected in the power supply

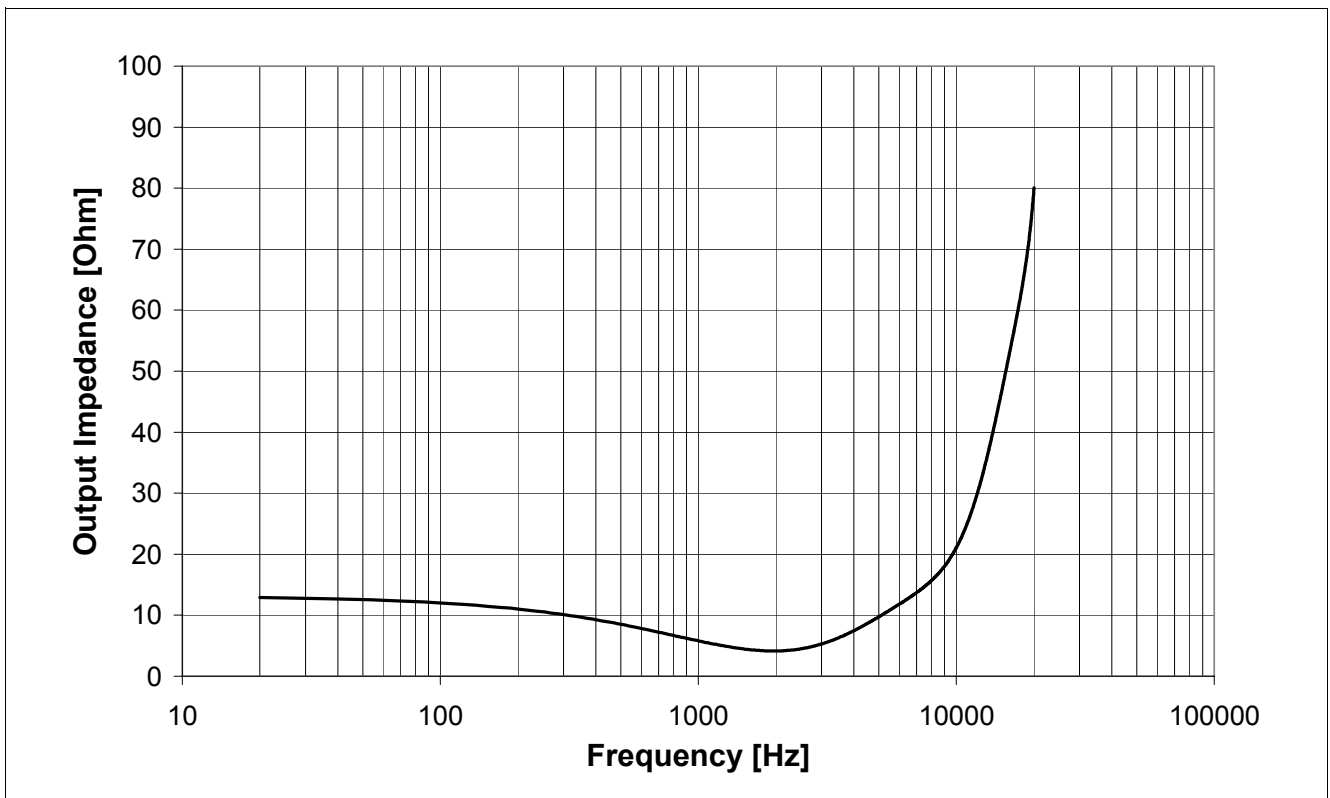


Figure 9 Typical output impedance measurement ( $V_{DD} = 2.1 V$ )

Package Outline

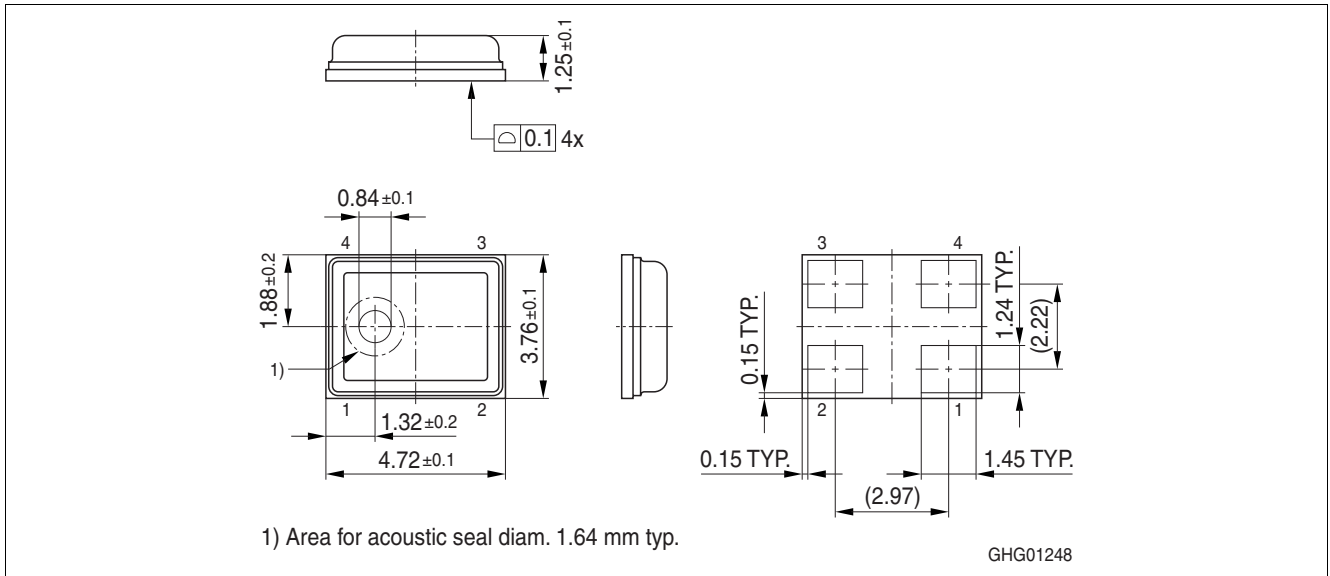


Figure 10 Package outline

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

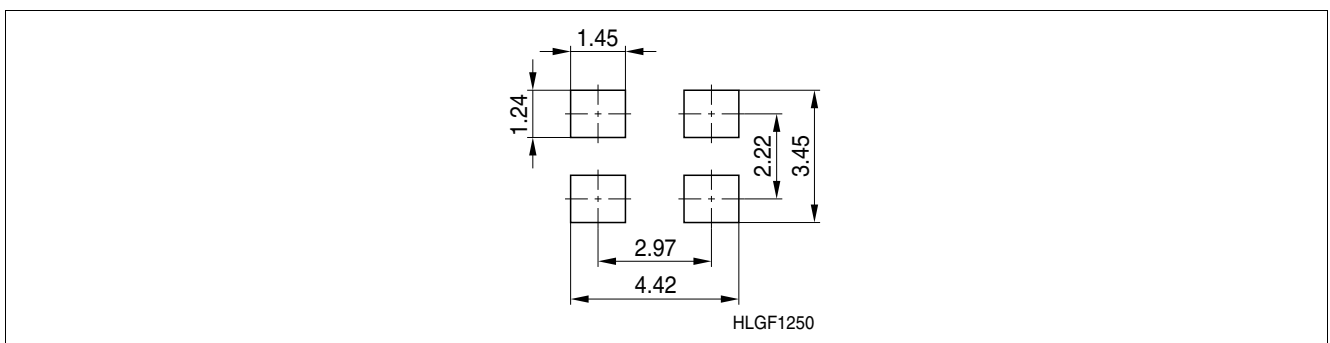


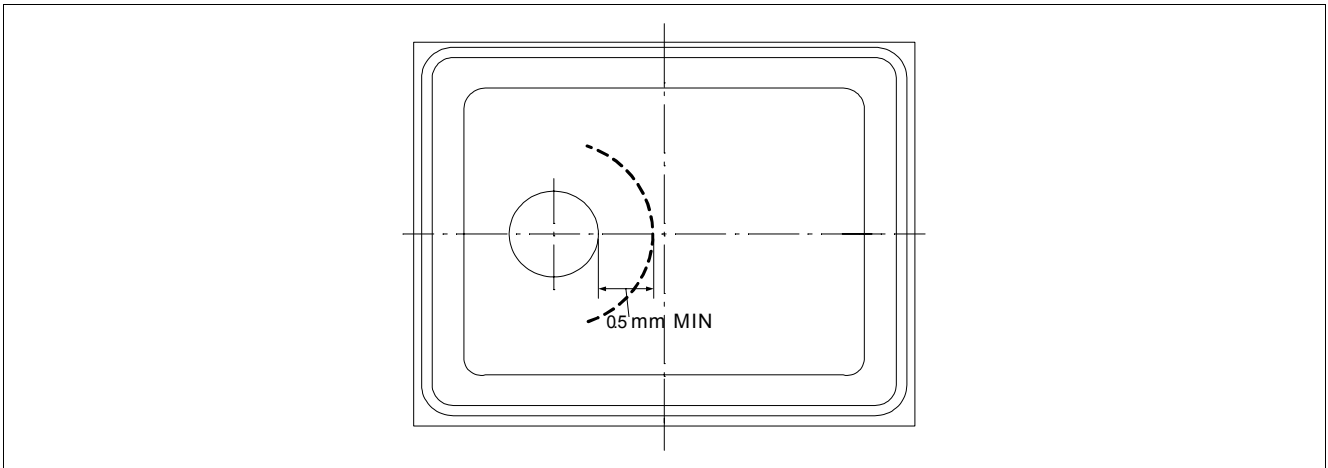
Figure 11 Recommended customer land pattern

**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

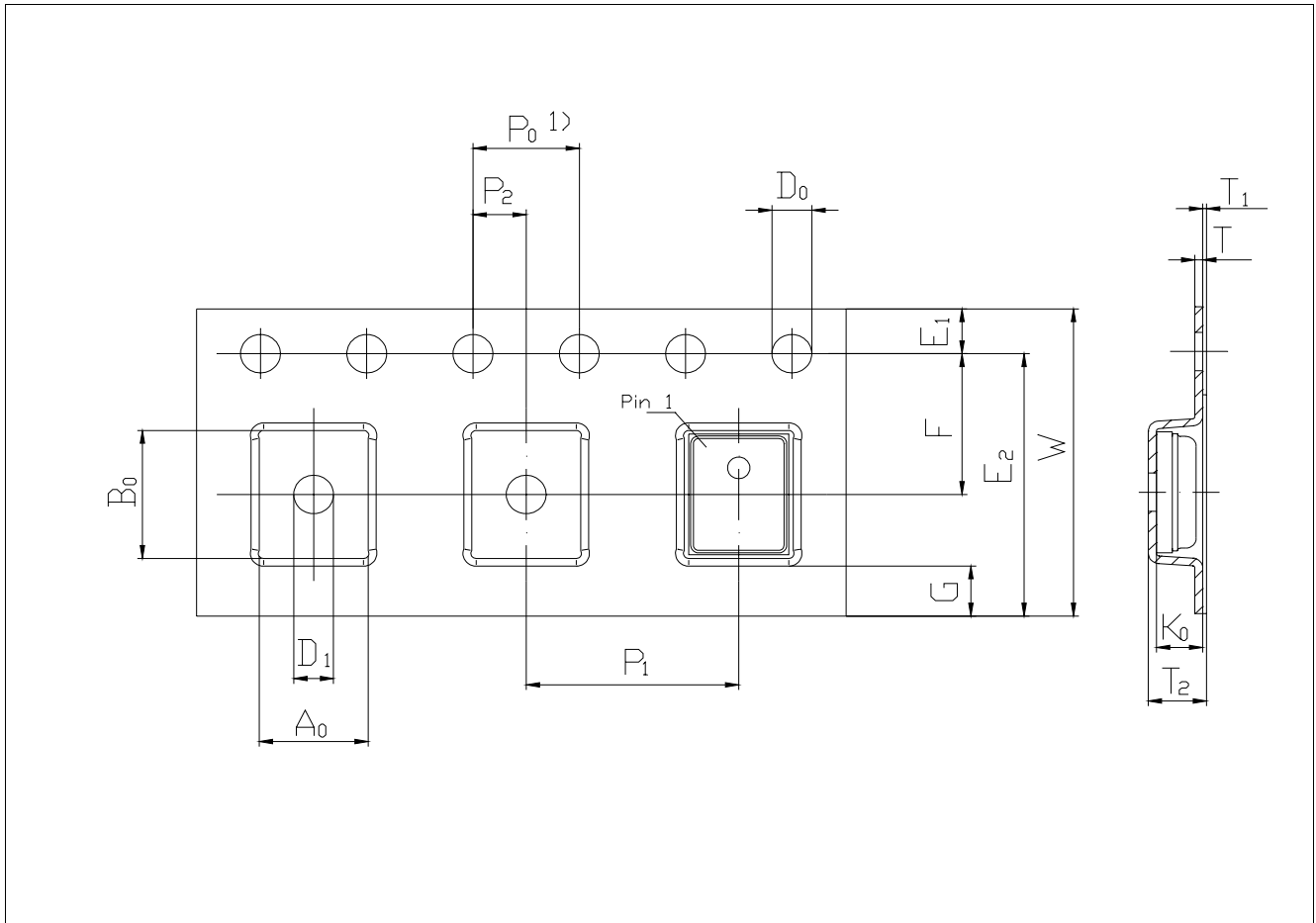


Figure 13 Tape Outline, <sup>1)</sup> Cumulative tolerance of 10 sprocket holes is  $\pm 0.2$  mm

Table 7 Tape Dimensions (mm)

W	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	D <sub>0</sub>	A <sub>0</sub>	B <sub>0</sub>	E <sub>1</sub>
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 <sub>2</sub>	F	D <sub>1</sub>	T	T <sub>1</sub>	T <sub>2</sub>	G	K <sub>0</sub>
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

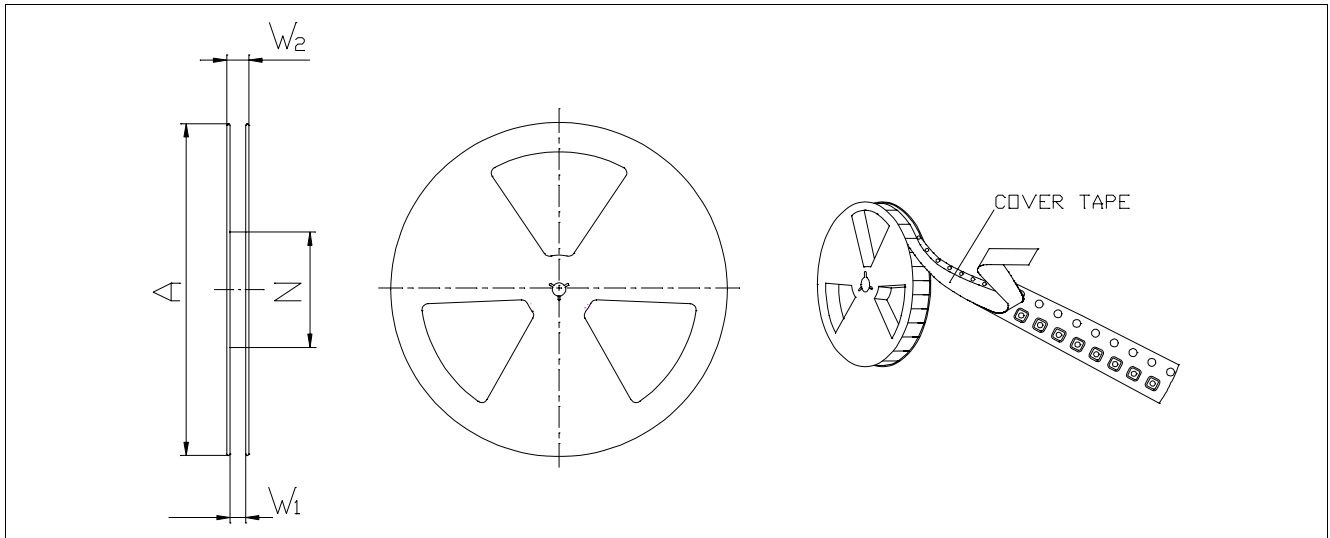


Figure 14

Table 8 Reel Dimension (mm) and Quantity per Reel

A	W <sub>1</sub>	W <sub>2</sub>	N	Quantity per Reel
Ø 330	12.4±1.5	18.4 MAX	Ø 100	4000