

3SM121NZB1HA MEMS Microphone IC

Product Description

The **3SM121NZB1HA** microphone IC are integrated with specialized pre-amplification ASIC to provide high sensitivity, high SNR output from a capacitive audio sensor. It's packaged for surface mounting and high temperature reflow assembly. **3SM121NZB1HA** which is able to endure reflow temperature up to 260°C for 30 seconds can be used in SMT process. It is widely used in telecommunication and electronics device such as headset, smart speaker, surveillance.

Features

- Bottom port
- High stability - no risk of membrane aging
- Suitable for automatic pick-and-place handler and SMT process
- Miniature dimension 3.50mm x 2.65mm x 0.98mm
- Low current consumption 80uA
- RoHS/Green compliant
- Sensitivity deviation within $\pm 1\text{dB}$
- Package type : LGA 5-pin
- Omnidirectional

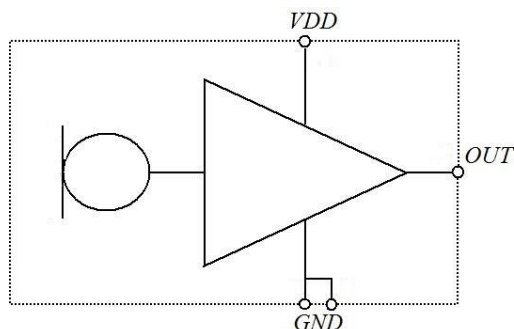
Applications

- ANC Headsets
- Smart Speakers
- Surveillance
- IoT Devices

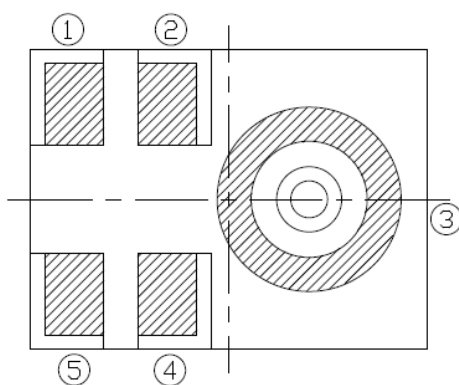
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Functional Block Diagram



Pin Definition and Function



Bottom View

Table 1

Pin #	Symbol	Function
1	OUTPUT	Analog signal output
2	GND	Ground
3	GND	Ground
4	GND	Ground
5	VDD	Power supply

Temperature Range

Table 2

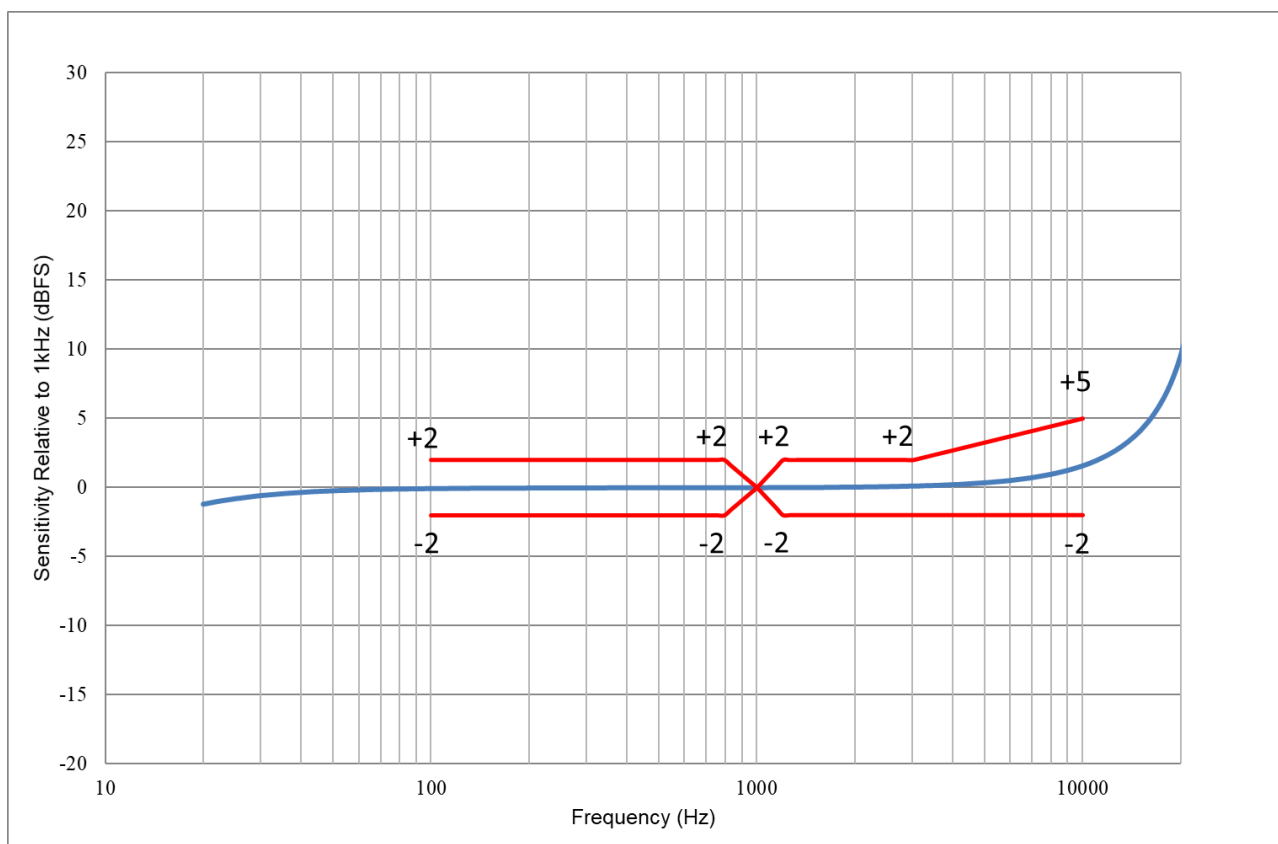
Storage Temperature	T _{STG}	-40°C ~ 125°C
Operating Temperature Range	T _A	-40°C ~ 105°C

Acoustical and Electrical Characteristics

Table 3 Typical test conditions are $T_A = 23\text{ }^{\circ}\text{C}$, $V_{DD} = 1.8\text{V}$ and $R.H. = 50\%$ measured in a pressure chamber test setup. All voltages refer to GND node

Parameters	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Acoustic						
Sensitivity	S	-39	-38	-37	dBV/Pa	1KHz, 94dBSPL
Signal to Noise Ratio	S/N		67		dBA	A-weighted
Equivalent Noise Level	ENL		27		dBA	A-weighted
Total Harmonic Distortion	THD		0.1		%	94dBSPL
			1		%	118dBSPL
Acoustic Overload Point	AOP		128		dBSPL	10% THD@1KHz, S = Typ.
Low Frequency Roll-off	LFRO		10		Hz	-3dB relative to 1KHz
High Frequency Flatness			13		kHz	+3dB relative to 1KHz
Resonant Frequency Peak			24		kHz	
Electrical						
Supply Voltage	Vdd	1.6		3.6	V	
Current Consumption	Isb		80		μA	Vdd=2.1V
			80		μA	Vdd=3.6V
Power Supply Rejection	PSR+N		-93		dBV(A)	217Hz, 100 mV peak to peak square wave
Power Supply Rejection Ratio	PSRR		63		dB	1KHz, 200 mV peak to peak sine wave
Output Impedance	Zout			200	Ω	@1KHz
Output DC Offset		1.3			V	
Directivity	Omnidirectional					
Polarity	Decreasing output voltage					Increasing sound pressure

Frequency Response



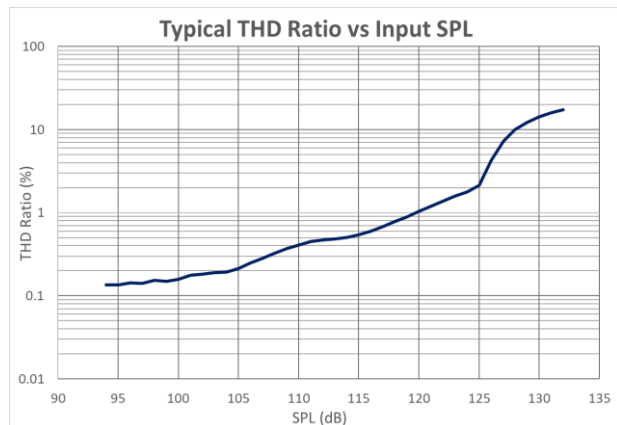
Typical frequency response normalized to 1KHz (Measured)

Upper Limit						
Hz	100	800	1000	1200	3000	10000
dB ref. 1KHz	+2	+2	0	+2	+2	+5
Lower Limit						
Hz	100	800	1000	1200	3000	10000
dB ref. 1KHz	-2	-2	0	-2	-2	-2

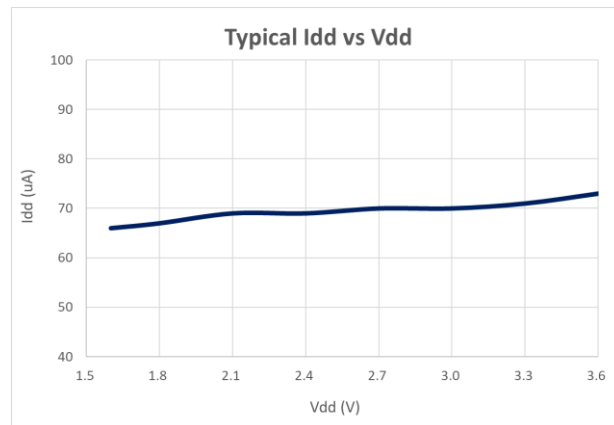
Performance Curves

Typical test conditions are $T_A = 23\text{ }^{\circ}\text{C}$, $V_{DD} = 1.8\text{V}$ and $R.H. = 50\%$, output unloaded

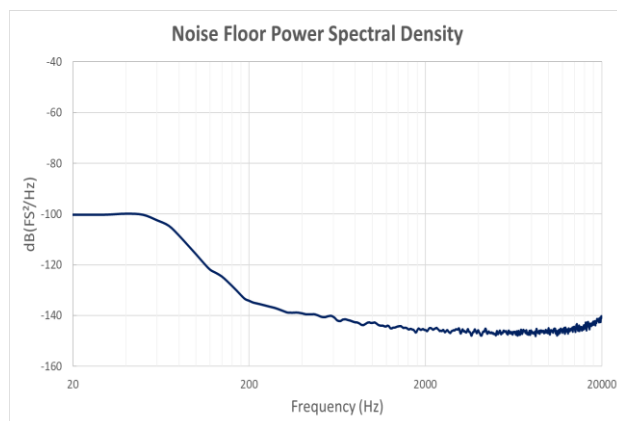
Typical THD vs Input SPL



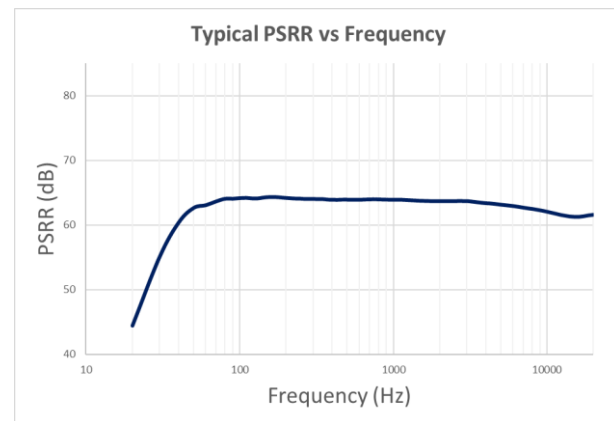
Typical Idd vs Vdd



Noise Floor Power Spectral Density



Typical PSRR vs Frequency



Reliability Qualifications

Table 4

Test Item	Description
High Temperature Storage	Storage at 125°C for 1,000 hours JESD22-A103
Low Temperature Storage	Storage at -40°C for 1,000 hours JESD22-A119
High Temperature Operation Bias	Under Bias at 105°C for 1,000 hours JESD22-A108
Low Temperature Operation Bias	Under Bias at -40°C for 1,000 hours JESD22-A108
Temperature Humidity Bias	Under Bias at 85°C/85%RH for 1,000 hours JESD22-A101
Thermal Cycling Test	Thermal Cycle from -40°C~125°C, 100 cycles JESD22-A104
Reflow	5 reflow cycles with peak 260°C J-STD-020
Vibration	4 cycles lasting 12 minutes from 20 to 2KHz in X, Y and Z with peak acceleration of 20G JESD22-B103
Mechanical Shock	Total 18 pulses 10,000G in X,Y and Z JESD22-B104
ESD	HBM:3KV, MM:300V, CDM:500V Air Discharge:15KV, Contact Discharg:8KV JESD22-A114(HBM) JESD22-A115(MM) JESD22-C101(CDM) IEC 61000-4-2(Air Discharge) IEC 61000-4-2(Contact Discharge)

Notes: Microphones meet all acoustic and electrical specifications before and after reliability testing, except sensitivity which can deviate up to 3dB from its initial value.

After 5 reflow cycles, the sensitivity of the microphone shall not deviate more than 1 dB from its initial value.

Reflow Profile

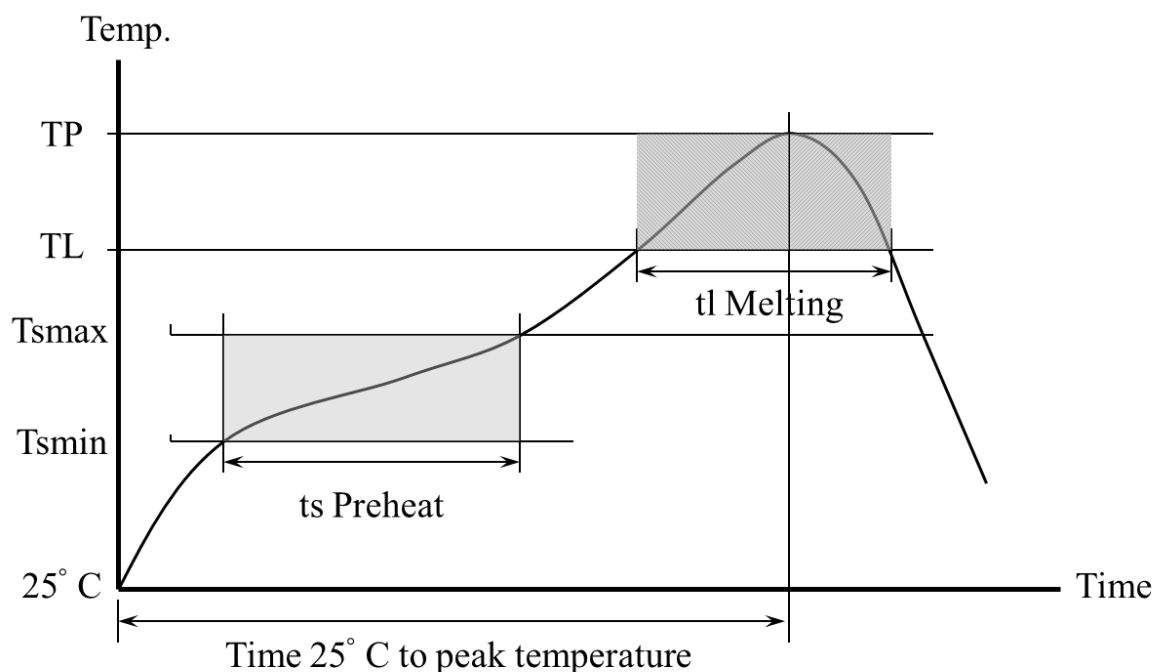


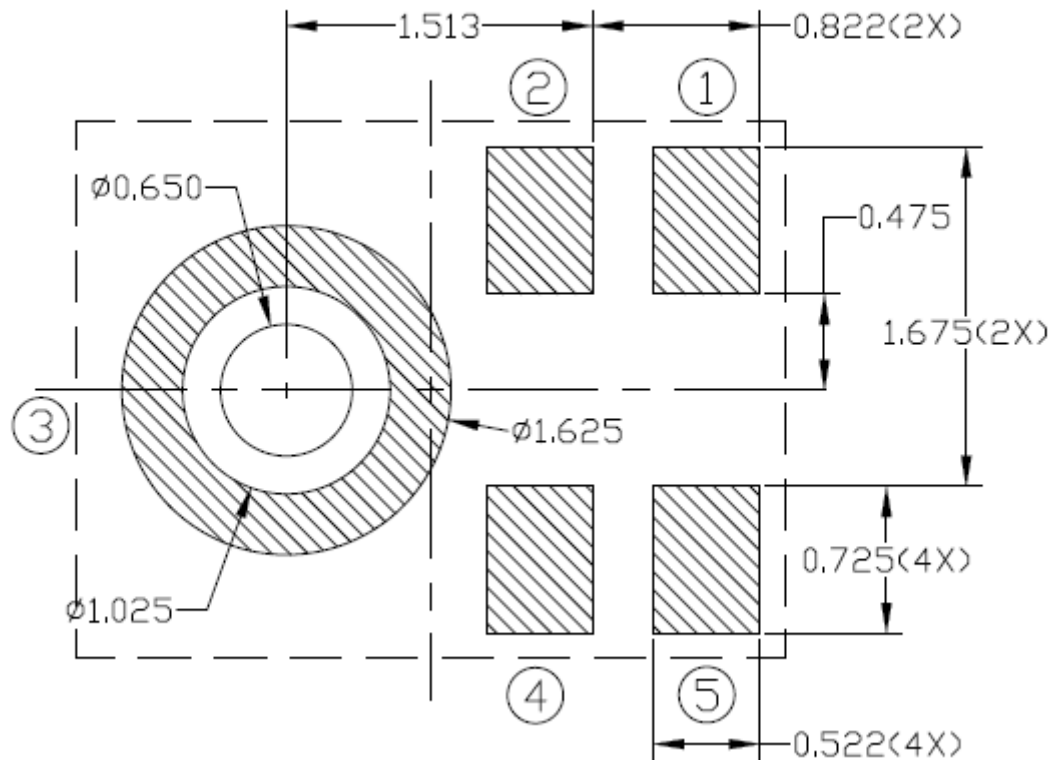
Table 5. Recommended Reflow Profile Limits

Profile Feature	Pb-free
Preheat	
Minimum temperature (Tsmmin)	150 °C
Maximum temperature (Tsmmax)	200 °C
Time (ts)	60~180 sec
Average Ramp up rate (Tsmmax to Tp)	3 °C/sec
Melting area	
Melting temperature (TL)	217 °C
Time maintained above melting (tl)	60~150 sec
Peak Temperature (TP)	260 °C
Time within 5°C of actual peak temperature	20~40 sec
Ramp down rate	6 °C/sec maximum
Time 25°C to peak temperature	8 minute maximum

Notes: Based on IPC/JDEC J-STD-020 Revision F.

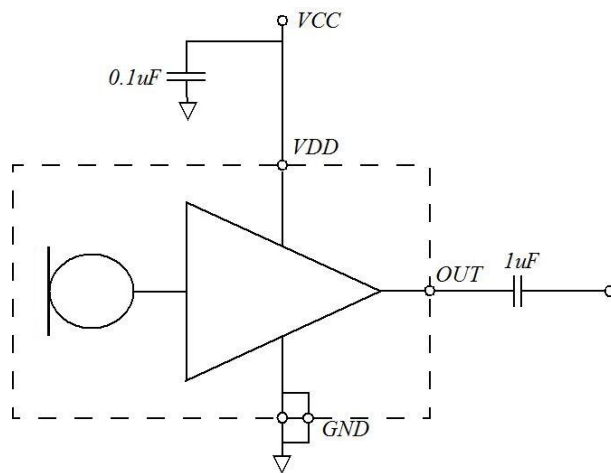
All temperatures refer to topside of the package, measured on the package body surface.

PCB Land Pattern Layout



Application Circuit

Typical Application:

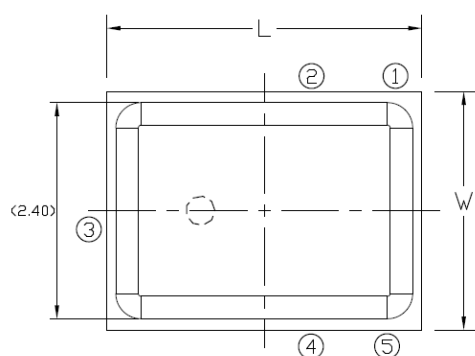


Handling Instructions

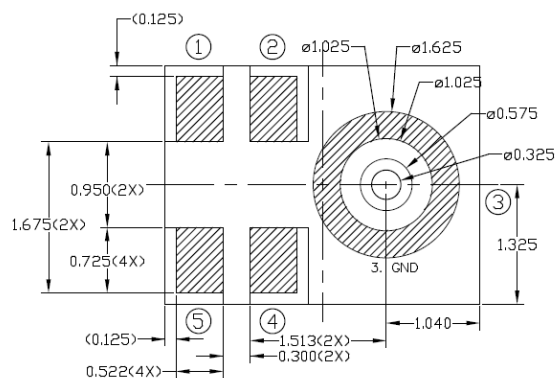
The MEMS microphone IC can be handled using standard pick-and-place and chip-shooting equipment. Care should be taken to avoid damage to the MEMS microphone IC structure as follows:

- Do not apply vacuum nozzle over the acoustic port (AP) of the microphone to avoid damage to the device.
- Do not blow air directly into acoustic port. If air gun cleaning is required, the minimum distance is 10cm and the maximum air blow pressure is 30psi.
- Brushing the board with/without solvents may damage the device.
- Do not use excessive force to place the microphone on the PCB.
- In case of manual handling, it should be handled with plastic tweezers to avoid damage to the device.
- Do not open and remove IC from packaging until devices are ready to be mounted.
- Suggest PCB depaneling be done with depaneling cutter/router, or manually de-panel PCB with care and without any contact of MEMS Microphone IC.

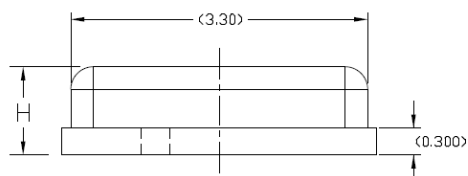
Dimensions



Top View



Bottom View



Side View

Unit: mm

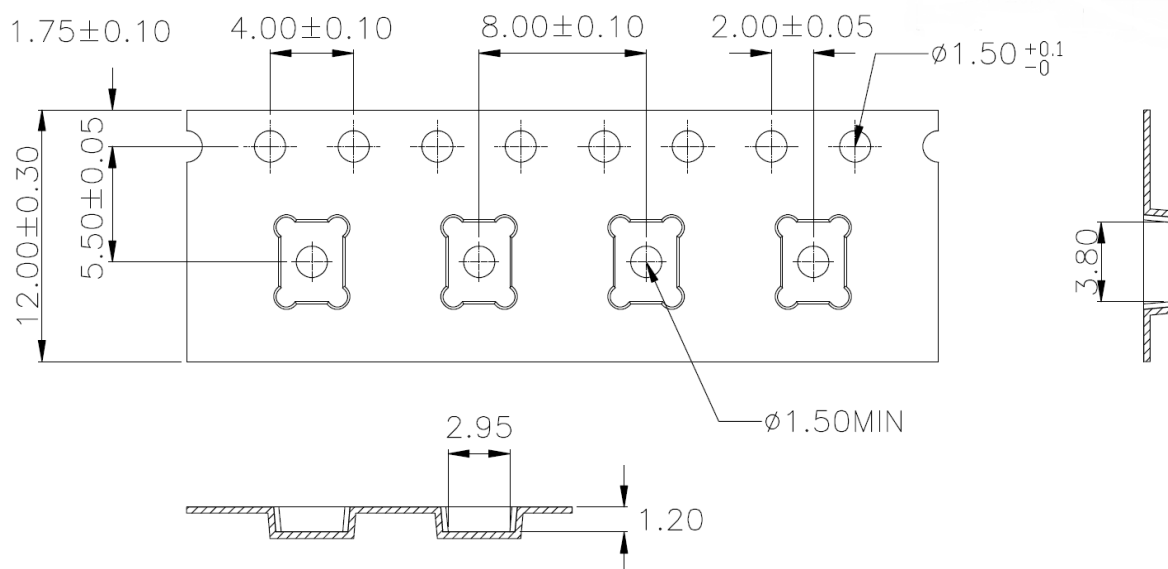
Dimension tolerance is ± 0.15 mm unless otherwise specified

Table 6(Top View)

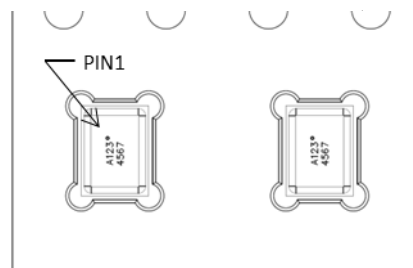
Item	Dimension	Tolerance
Length (L)	3.50 mm	± 0.10 mm
Width (W)	2.65 mm	± 0.10 mm
Height (H)	0.98 mm	± 0.10 mm
Acoustic Port	$\Phi 0.325$ mm	± 0.05 mm

Package Information

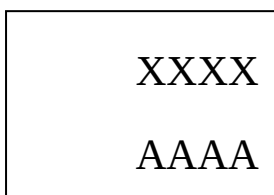
Carrier Tape:



1. 10 sprocket hole pitch cumulative tolerance ± 0.20 .
2. Carrier camber is within 1 mm in 250 mm.
3. Material : Black Conductive Polystyrene Alloy.
4. All dimensions meet EIA-481 requirements.
5. Thickness : 0.30 ± 0.05 mm.
6. MSL(Moisture sensitivity level) Class1.
7. Materials comply with ANSI/ESD S20.20 and IEC61340-5-1 standard.

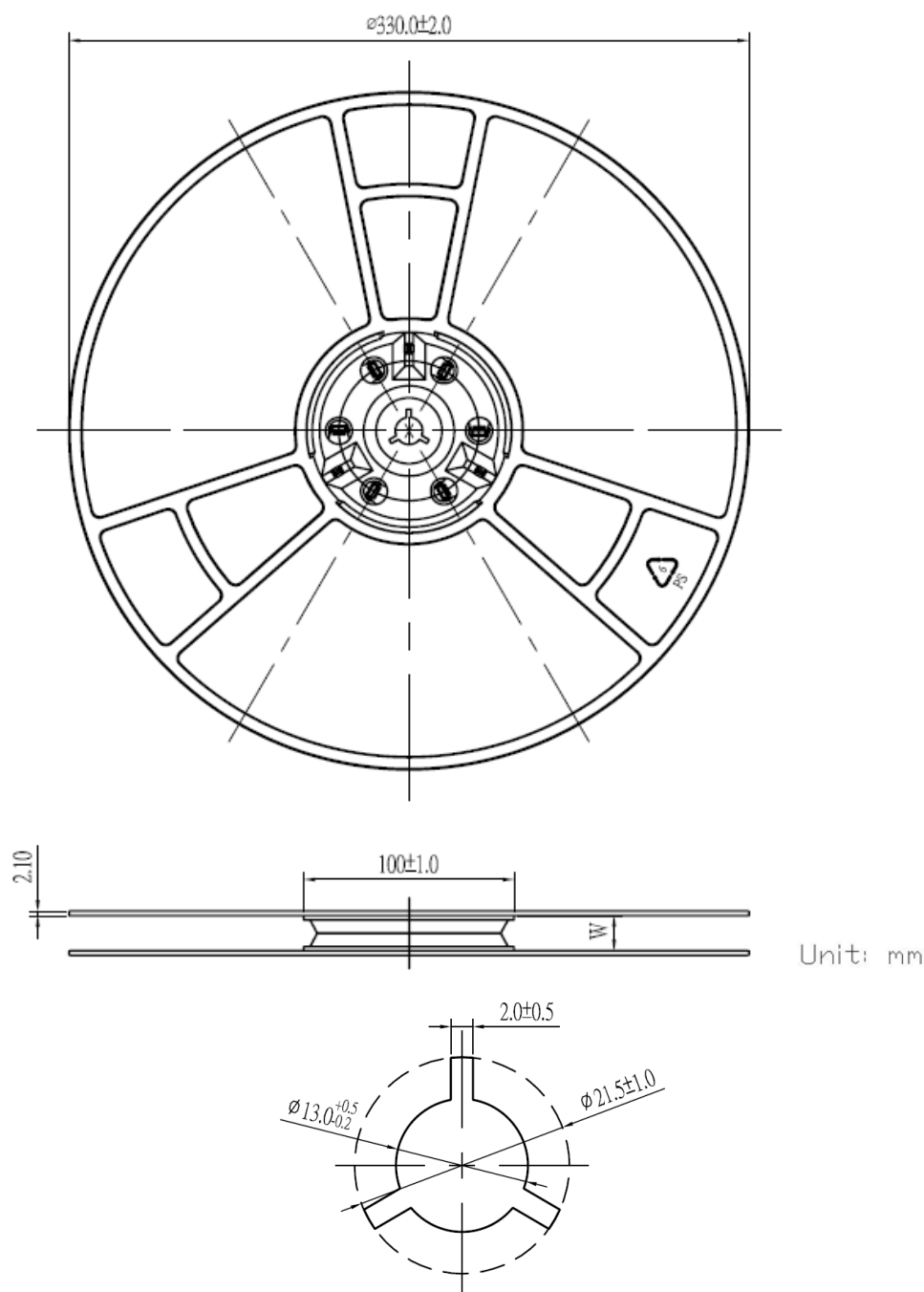


Laser Marking:

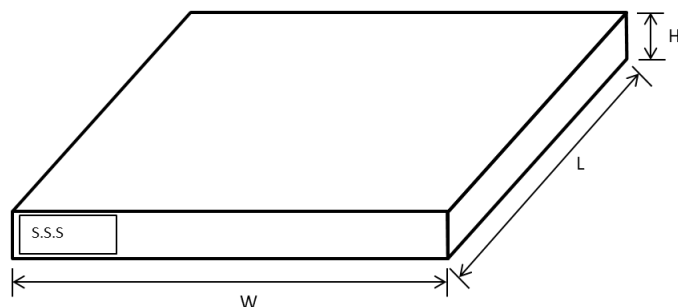


Laser marking on the top side

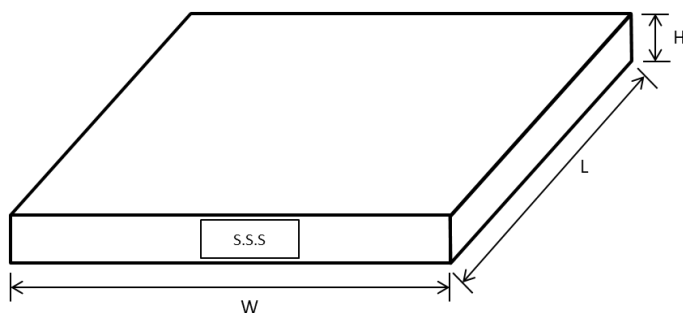
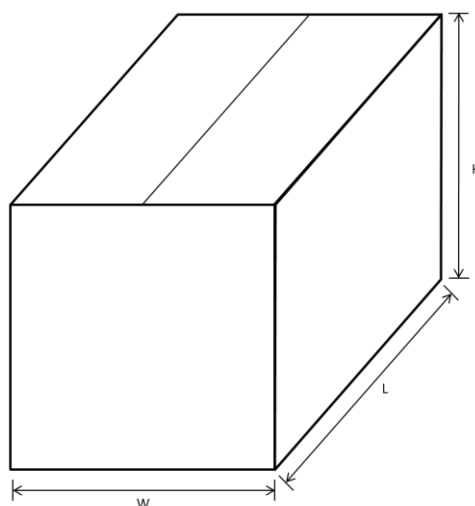
XXXX	Internal Tracking Code
AAAA	Lot Tracking Code

13" Tape Reel :


Model Number	Reel Diameter	Quantity Per Reel
3SM121NZB1HA	13"	5,000

Dimensions for Inner Box :

Unit : mm

L	W	H
355	375	40

Dimensions for Outer Box:
Outer Box for Quantity 5K-10K

Outer Box for Quantity 15K-30K, 35K-50K

Unit : mm

Quantity	L	W	H
5K - 10K	400	410	100
15K - 30K	380	280	380
35K – 50K	420	380	380

Revision History

Revision	Date	Description
1.0	2024/06/24	Formal release
1.1	2024/07/11	Modify “Acoustical and Electrical Characteristics” Modify “Performance Curves”
1.2	2024/08/05	Modify “Acoustical and Electrical Characteristics” Modify “Package Information”
1.3	2024/10/17	Modify “Frequency Response”
1.4	2024/10/23	Modify “Acoustical and Electrical Characteristics”
1.5	2025/03/28	Modify “Acoustical and Electrical Characteristics” Modify “Package Information”