

## **3SM123E4T1VA-002-R MEMS Microphone IC**

### **Product Description**

The *3SM123E4T1VA-002-R* 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. *3SM123E4T1VA-002-R* 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, wearable device.

### **Features**

- Top port
- High stability - no risk of membrane aging
- Suitable for automatic pick-and-place handler and SMT process
- Miniature dimension 2.75mm x 1.85mm x 0.95mm
- Low current consumption 80uA
- RoHS/Green compliant
- Sensitivity deviation within  $\pm 1$ dB
- Package type : LGA 4-pin
- Omnidirectional

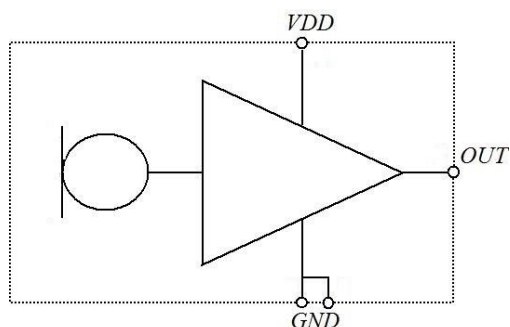
### **Applications**

- Headsets
- Wearable Devices

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## Functional Block Diagram



## Pin Definition and Function

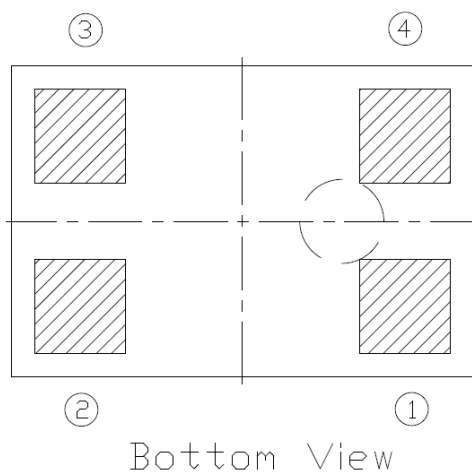


Table 1

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

## Temperature Range

Table 2

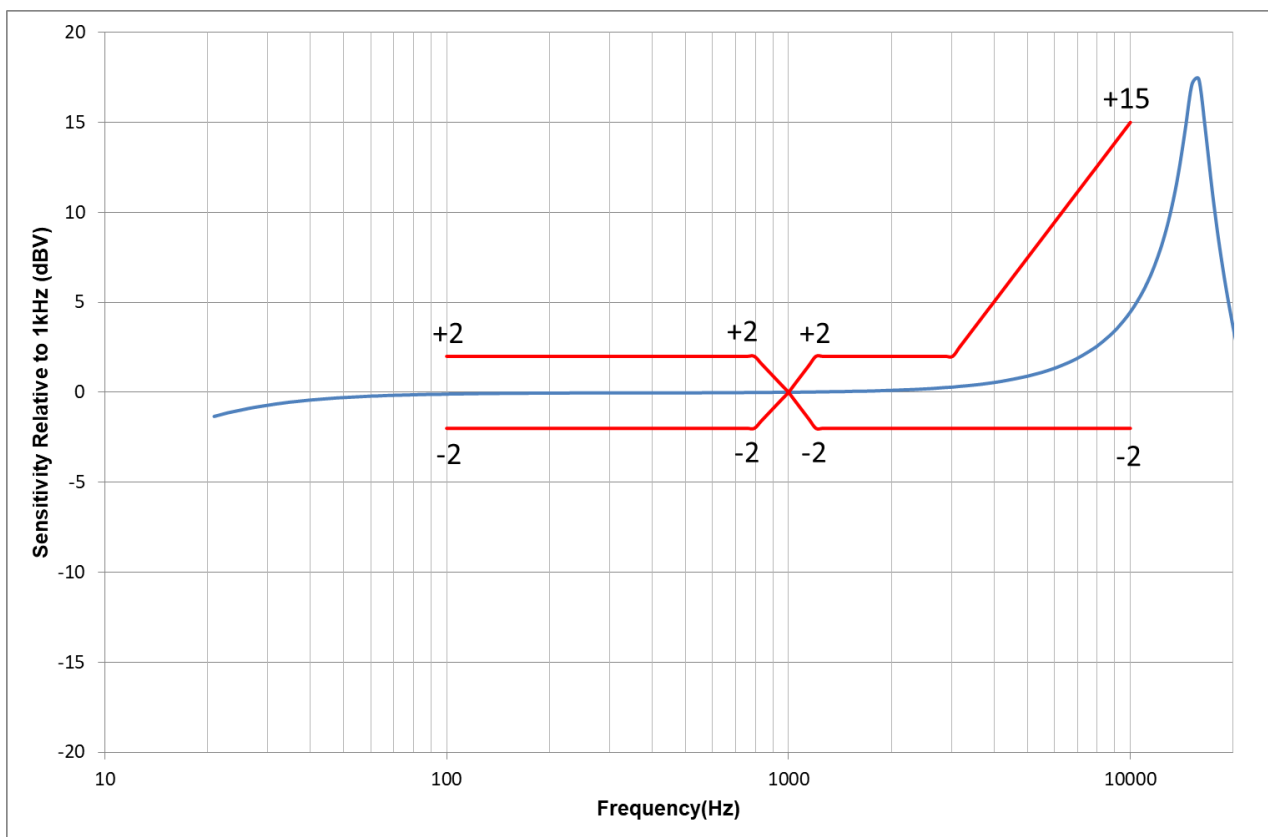
Storage Temperature	T <sub>STG</sub>	-40°C ~ 125°C
Operating Temperature Range	T <sub>A</sub>	-40°C ~ 105°C

## Acoustical and Electrical Characteristics

Table 3 Typical test conditions are  $T_A = 23\text{ }^\circ\text{C}$ ,  $V_{DD} = 2.1\text{ V}$  and  $R.H. = 50\%$  measured in a pressure chamber test setup. All voltages refer to GND node

Parameters	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
<b>Acoustic</b>						
Sensitivity	S	-43	-42	-41	dBV/Pa	1KHz, 94dB SPL
Signal to Noise Ratio	S/N		59		dB	A-weighted
Equivalent Noise Level	ENL		35		dB	A-weighted
Total Harmonic Distortion	THD		0.1		%	94dB SPL
			1		%	120dB SPL
Acoustic Overload Point	AOP		130		dB SPL	10% THD @ 1KHz, S = Typ.
Low Frequency Roll-off	LFRO		<20		Hz	-3dB relative to 1KHz
<b>Electrical</b>						
Supply Voltage	V <sub>dd</sub>	1.6		3.6	V	
Current Consumption	I <sub>sb</sub>		80		μA	V <sub>dd</sub> =2.1V
			80		μA	V <sub>dd</sub> =3.6V
Power Supply Rejection	PSR+N		-93		dBV(A)	217Hz, 100 mV peak to peak square wave on V <sub>cc</sub> 2.1V
Power Supply Rejection Ratio	PSRR		63		dB	1KHz, 200 mV peak to peak sine wave on V <sub>cc</sub> 2.1V
Output Impedance	Z <sub>out</sub>			200	Ω	@ 1KHz
Output DC Offset			1.3		V	
Directivity	Omnidirectional					
Polarity	Increasing 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	+15
Lower Limit						
Hz	100	200	800	1000	1200	10000
dB ref. 1KHz	-2	-2	-2	0	-2	-2

## 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

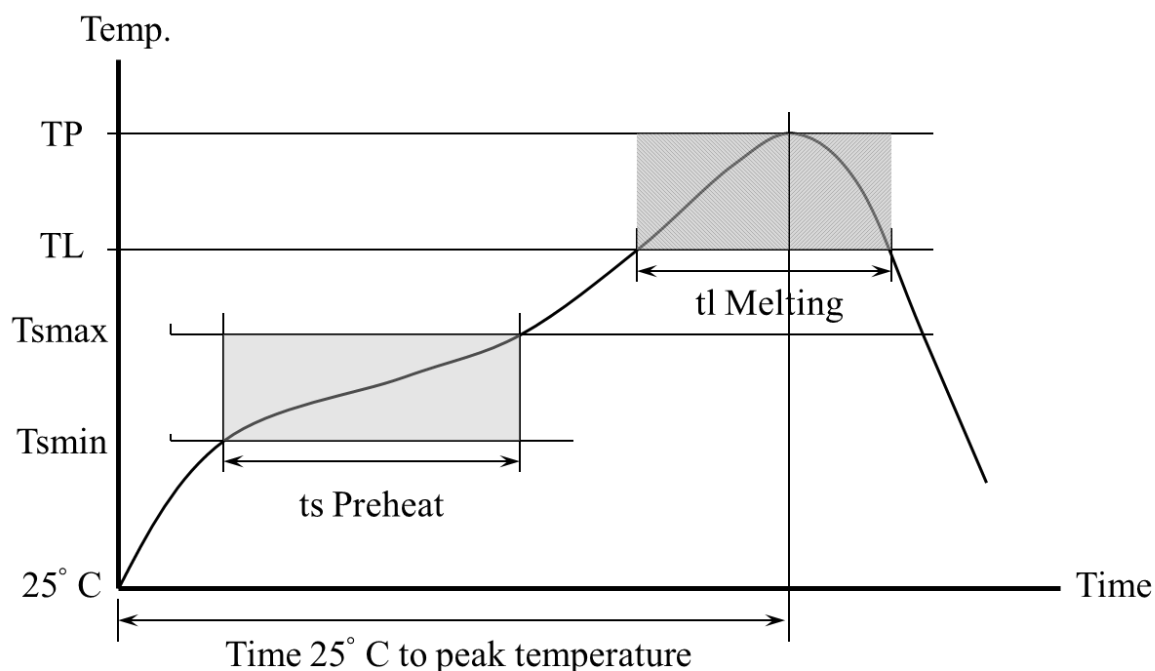


Table 5. Recommended Reflow Profile Limits

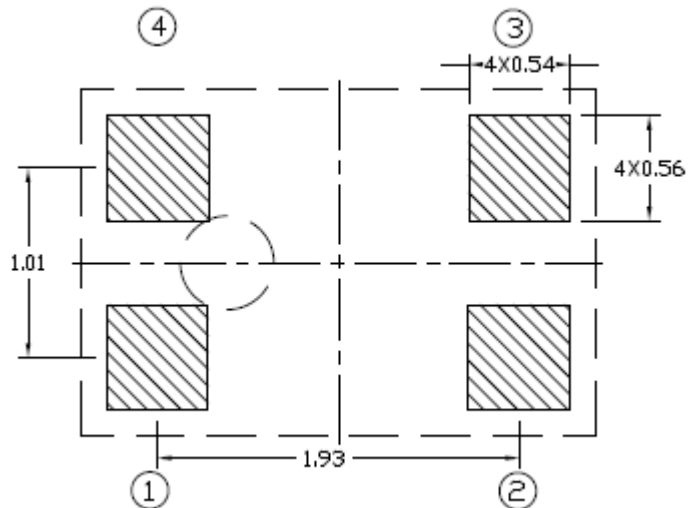
Profile Feature	Pb-free
Preheat	
Minimum temperature (Tsmín)	150 °C
Maximum temperature (Tsmáx)	200 °C
Time (ts)	60~180 sec
Average Ramp up rate (Tsmáx to Tp)	3 °C/sec
Melting area	
Melting temperature (TL)	217 °C
Time maintained above melting (tl)	60~150 sec
Peak Temperature (TP)	260 °C
Time within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

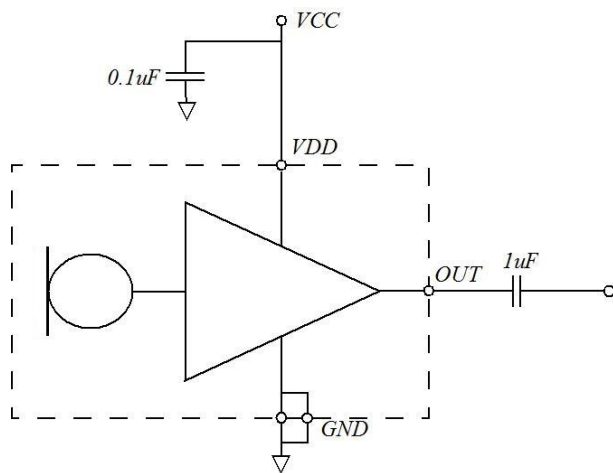
### Recommended Land Pattern





## 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

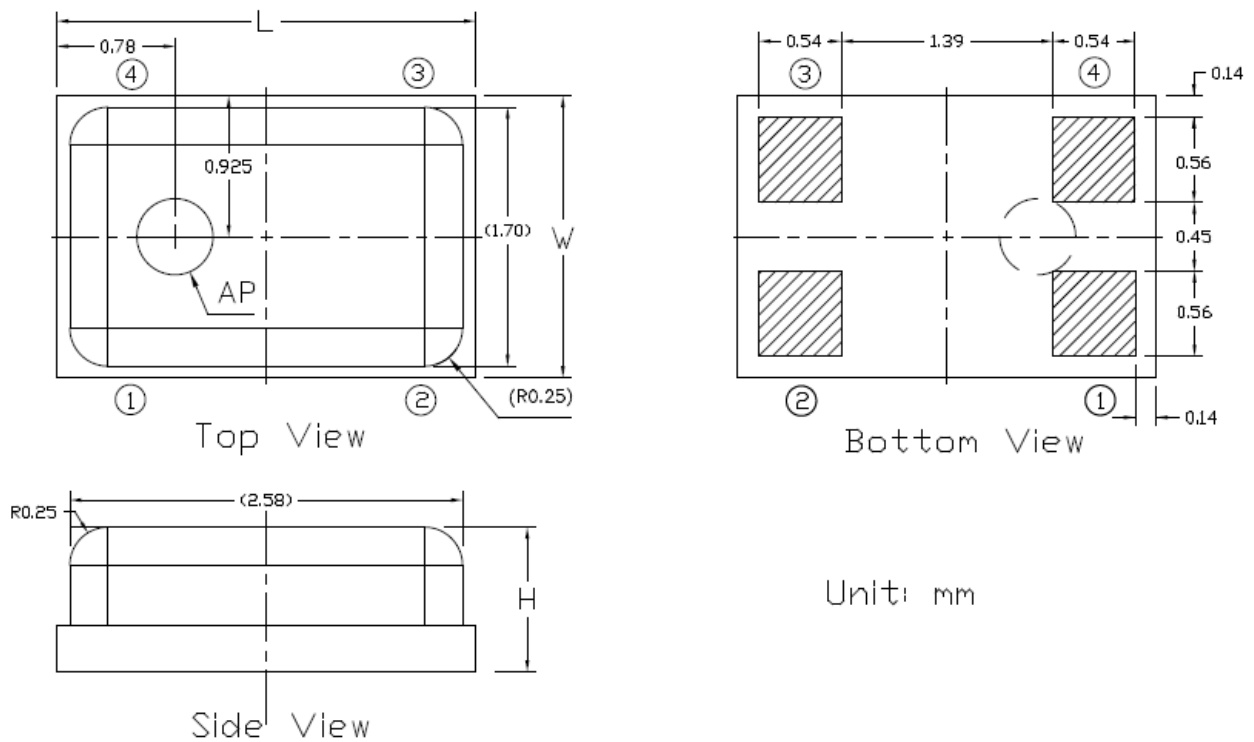
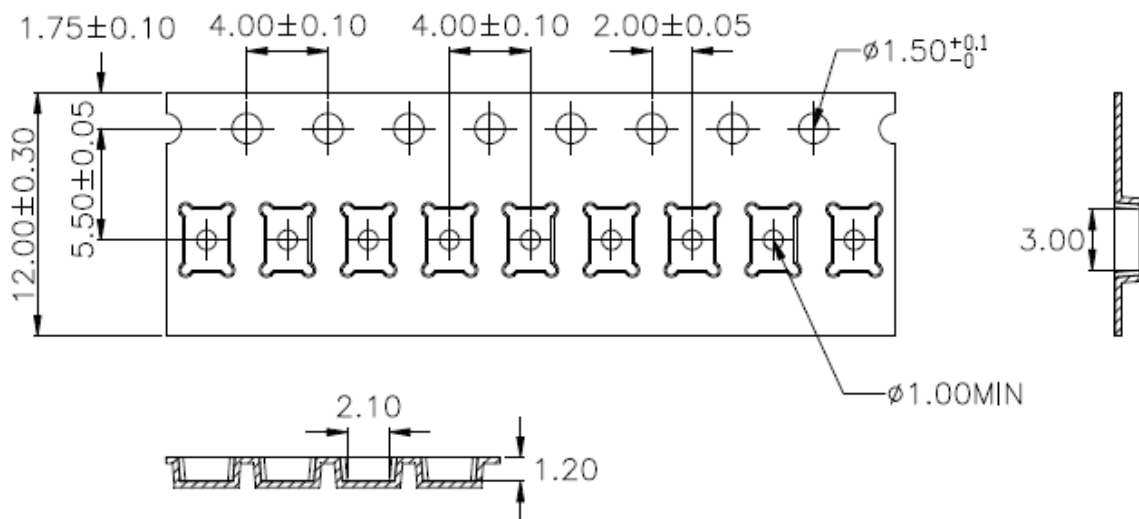


Table 6(Top View)

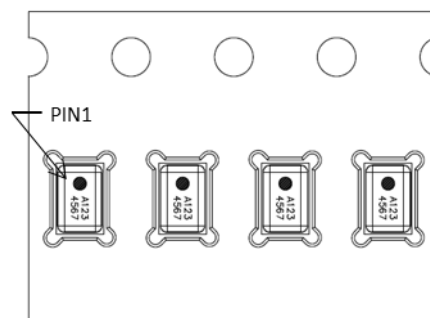
Item	Dimension	Tolerance
Length (L)	2.75 mm	±0.10 mm
Width (W)	1.85 mm	±0.10 mm
Height (H)	0.95 mm	±0.10 mm
Acoustic Port	Φ 0.50 mm	±0.05 mm

## Package Information

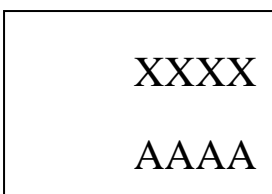
### Carrier Tape:



1. 10 sprocket hole pitch cumulative tolerance  $\pm 0.20$ .
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 :  $0.30 \pm 0.05$  mm.
6. MSL(Moisture sensitivity level) Class1.

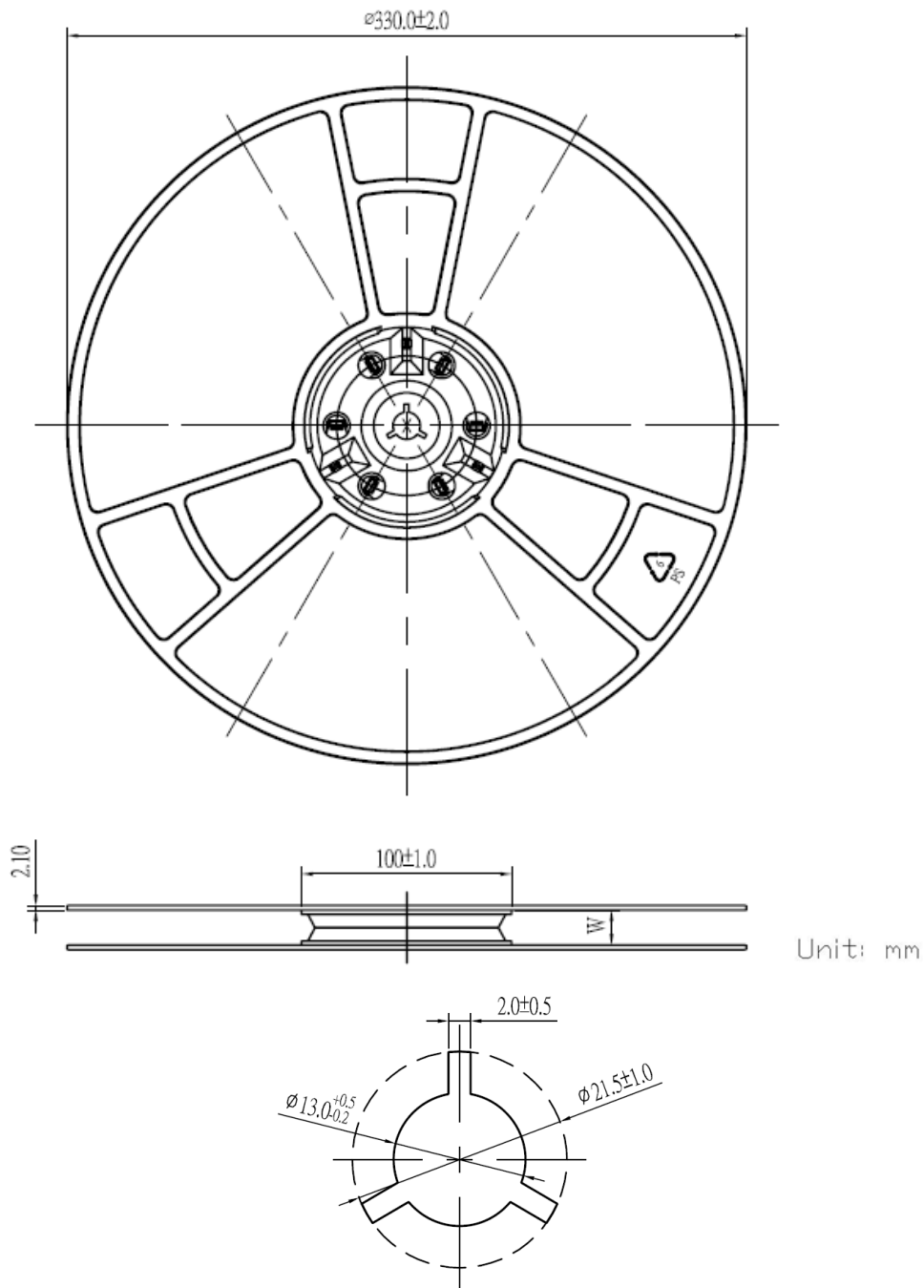


### Laser Marking:



### Laser marking on the top side

<b>XXXX</b>	<b>Internal Tracking Code</b>
<b>AAAA</b>	<b>Lot Tracking Code</b>

**13" Tape Reel :**


Model Number	Reel Diameter	Quantity Per Reel
3SM123E4T1VA-002-R	13"	5,000

## Revision History

Revision	Date	Description
1.0	2020/10/27	Formal release
1.1	2020/12/15	Add “Laser Marking”
1.2	2021/07/02	Modify “Acoustical and Electrical Characteristics” Modify “Frequency Response” Modify “Reliability Qualifications” Modify “Package Information”
1.3	2023/04/20	Modify “Reliability Qualifications” Modify “Package Information”