

## **3SM123GZB1VA MEMS Microphone IC**

### **Product Description**

The **3SM123GZB1VA** MEMS 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 re-flow assembly. **3SM123GZB1VA** 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**

- Bottom 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 0.90mm
- Low current consumption 80uA
- RoHS/Green Compliant
- Sensitivity deviation within  $\pm 1\text{dB}$
- Package type : LGA 4-pin
- Omnidirectional

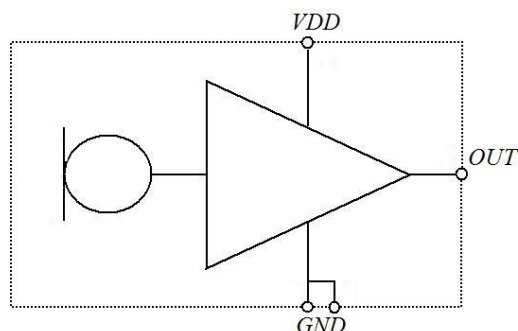
### **Applications**

- Headsets
- Wearable Devices

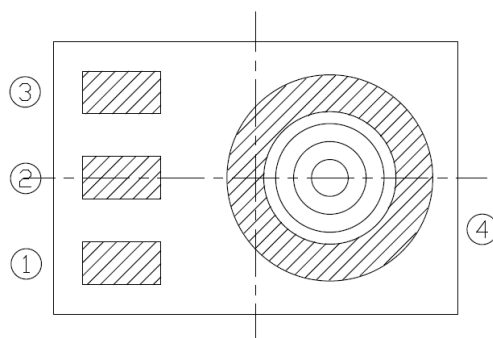
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## Functional Block Diagram



## Pin Definition and Function



Bottom View

Table 1

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

## Temperature Range

Table 2

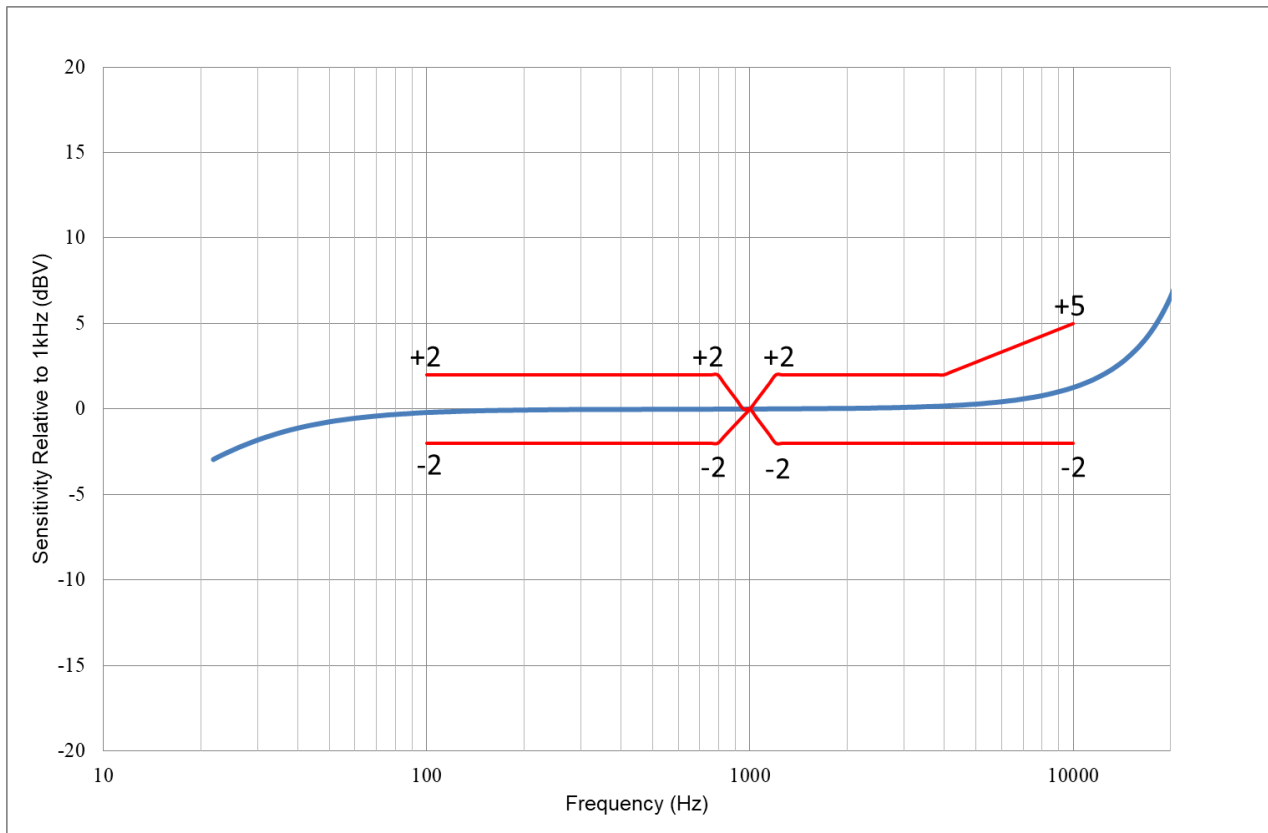
|                             |                  |               |
|-----------------------------|------------------|---------------|
| Storage Temperature         | T <sub>STG</sub> | -40°C ~ 125°C |
| Operating Temperature Range | T <sub>A</sub>   | -40°C ~ 105°C |

## 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                                    |
|------------------------------|---------------------------|------|------|------|--------|----------------------------------------------------|
| Acoustic                     |                           |      |      |      |        |                                                    |
| Sensitivity                  | S                         | -39  | -38  | -37  | dBV/Pa | 1KHz, 94dBSPL                                      |
| Signal to Noise Ratio        | S/N                       |      | 61.5 |      | dBA    | A-weighted                                         |
| Equivalent Noise Level       | ENL                       |      | 32.5 |      | dBA    | A-weighted                                         |
| Total Harmonic Distortion    | THD                       |      | 0.1  |      | %      | 94dBSPL                                            |
|                              |                           |      | 1    |      | %      | 110dBSPL                                           |
| Acoustic Overload Point      | AOP                       |      | 130  |      | dBSPL  | 10% THD@1KHz,<br>S = Typ.                          |
| Low Frequency Roll-off       | LFRO                      |      | 20   |      | Hz     | -3dB relative to 1KHz                              |
| 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 on Vcc 2.1V |
| Power Supply Rejection Ratio | PSRR                      |      | 63   |      | dB     | 1KHz, 200 mV peak to peak sine wave on Vcc 2.1V    |
| 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 | 4000 | 10000 |
| dB ref. 1KHz | +2  | +2  | 0    | +2   | +2   | +5    |
| Lower Limit  |     |     |      |      |      |       |
| Hz           | 100 | 800 | 1000 | 1200 | 4000 | 10000 |
| dB ref. 1KHz | -2  | -2  | 0    | -2   | -2   | -2    |

## Reliability Qualifications

Table 4

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

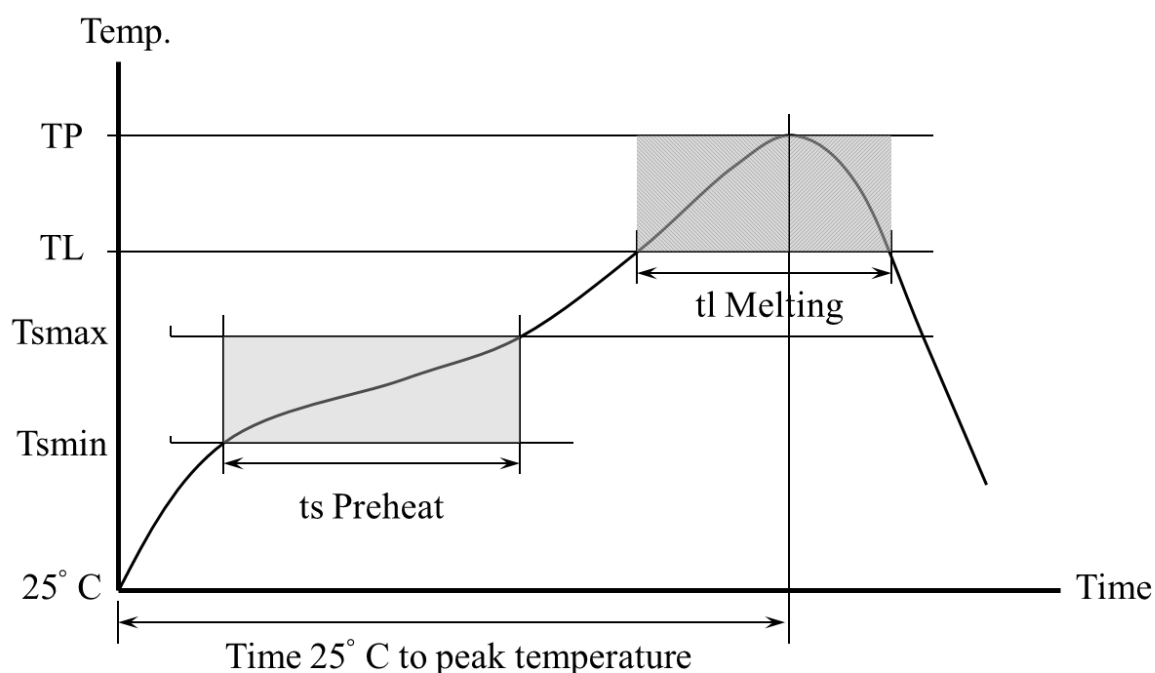


Table 5. Recommended Reflow Profile Limits

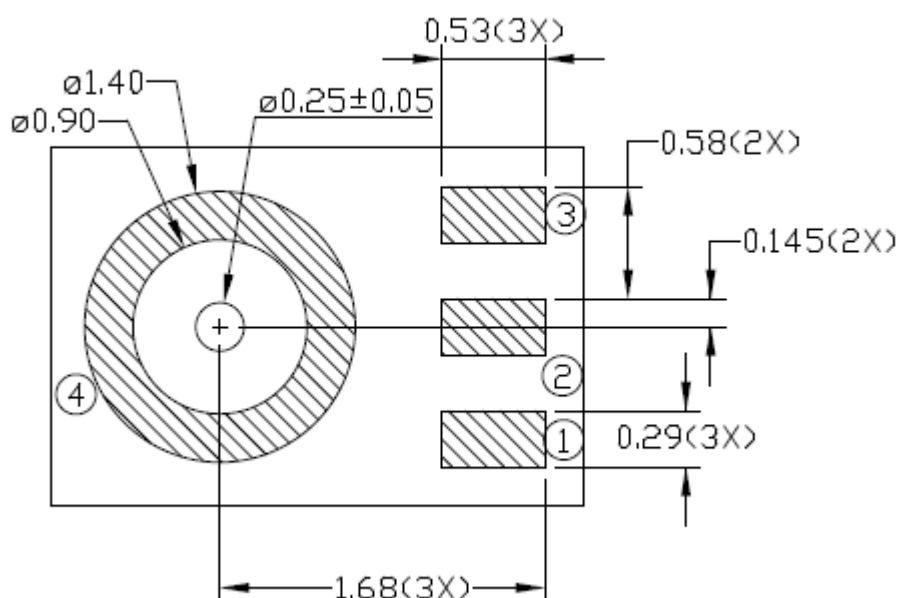
| Profile Feature                            | Pb-free          |
|--------------------------------------------|------------------|
| Preheat                                    |                  |
| Minimum temperature (Tsmmin)               | 150 °C           |
| Maximum temperature (Tsmmax)               | 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.

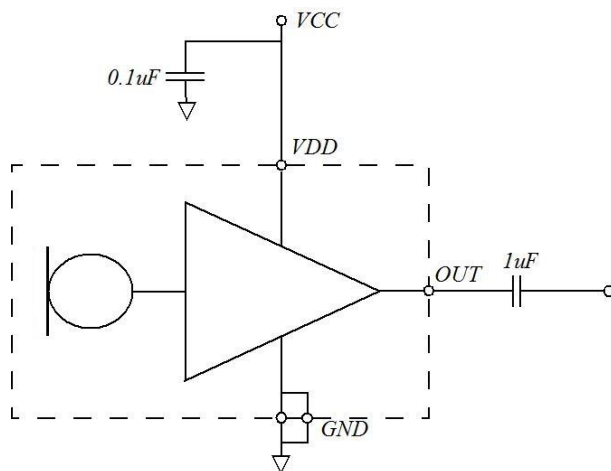
All temperatures refer to topside of the package, measured on the package body surface

## 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

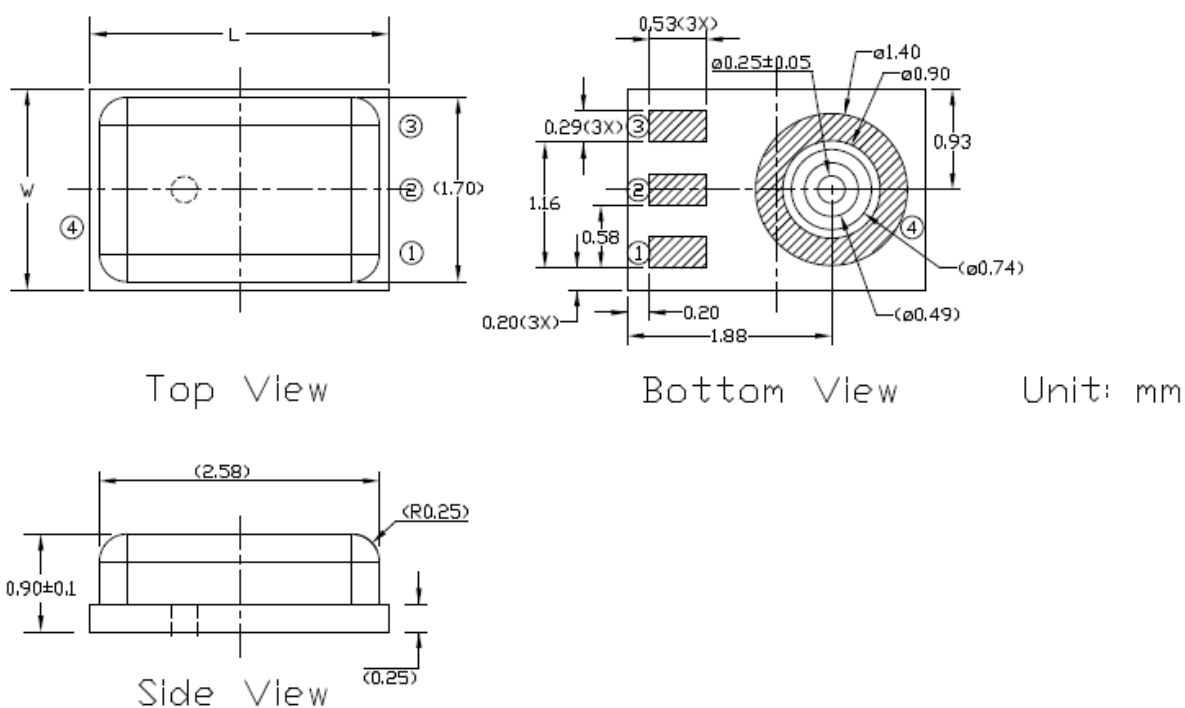
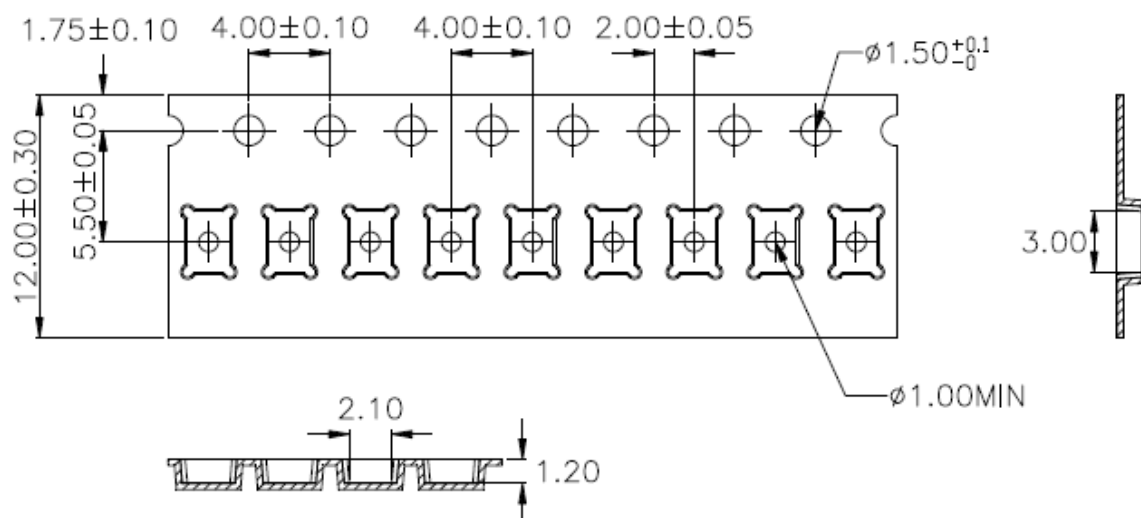


Table 6(Top View)

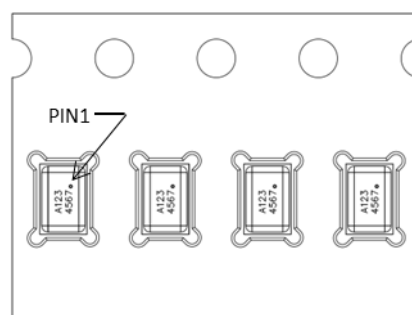
| Item          | Dimension      | Tolerance     |
|---------------|----------------|---------------|
| Length (L)    | 2.75 mm        | $\pm 0.10$ mm |
| Width (W)     | 1.85 mm        | $\pm 0.10$ mm |
| Height (H)    | 0.90 mm        | $\pm 0.10$ mm |
| Acoustic Port | $\phi 0.25$ mm | $\pm 0.05$ mm |

## Package Information

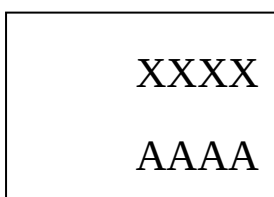
### Carrier Tape:



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.

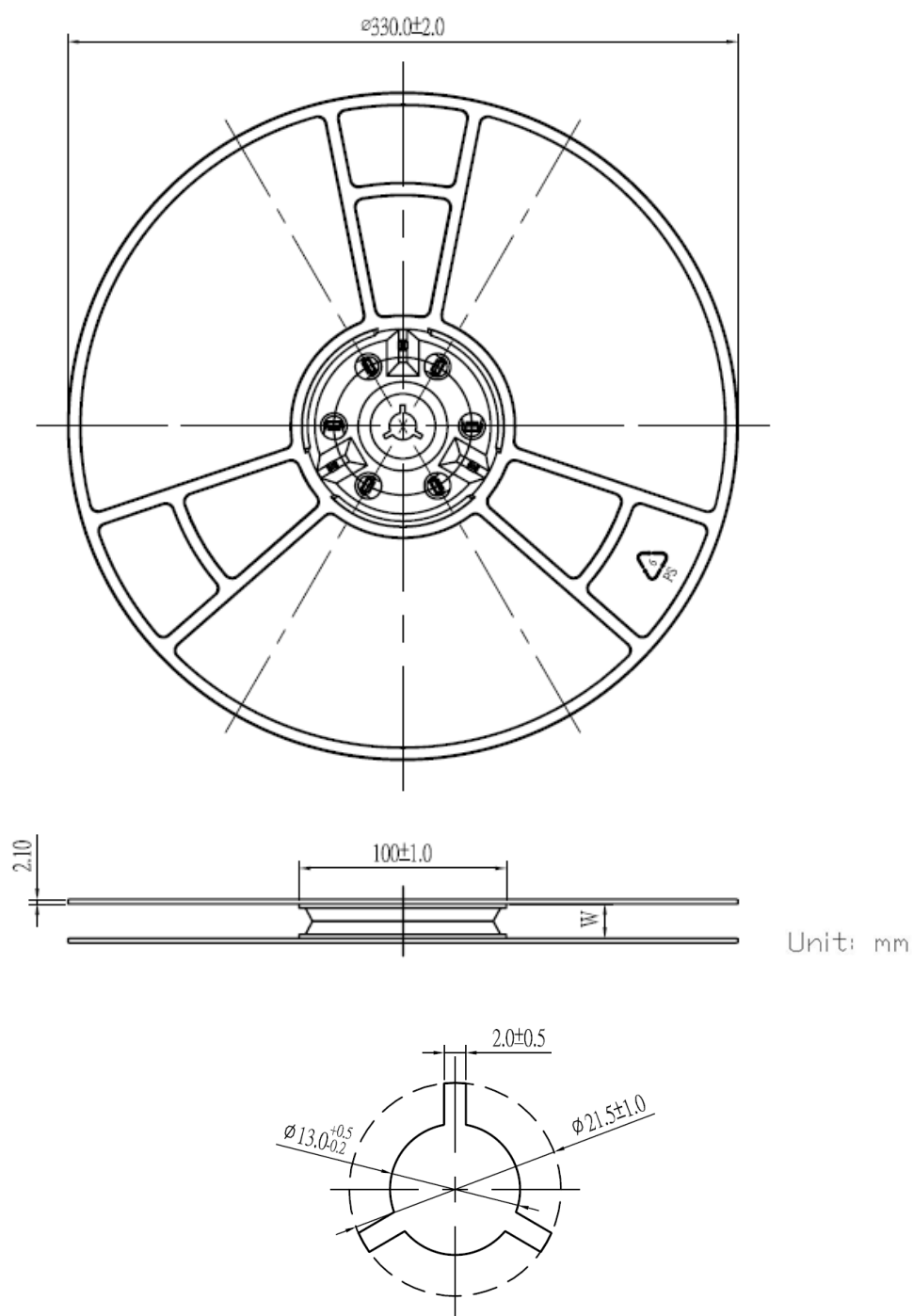


### Laser Marking:



### Laser marking on the top side

|      |                        |
|------|------------------------|
| XXXX | Internal Tracking Code |
| AAAA | Lot Tracking Code      |

**13" Tape Reel :**


| Model Number | Reel Diameter | Quantity Per Reel |
|--------------|---------------|-------------------|
| 3SM123GZB1VA | 13"           | 5,000             |

## Revision History

| Revision | Date       | Description                                                                                                                                                                                              |
|----------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.0      | 2019/09/05 | Formal release                                                                                                                                                                                           |
| 1.1      | 2020/01/21 | Modify “Applications”<br>Modify “Frequency Response”                                                                                                                                                     |
| 1.2      | 2020/07/08 | Modify “Features”<br>Modify “Acoustical and Electrical Characteristics”<br>Modify “Frequency Response”<br>Modify “Reliability Qualifications”<br>Modify “Reflow Profile”<br>Modify “Package Information” |
| 1.3      | 2021/06/29 | Modify “Acoustical and Electrical Characteristics”<br>Modify “Frequency Response”<br>Modify “Reliability Qualifications”<br>Modify “Package Information”                                                 |
| 1.4      | 2023/04/20 | Modify “Reliability Qualifications”<br>Modify “Package Information”                                                                                                                                      |
| 1.5      | 2025/08/26 | Modify “Acoustical and Electrical Characteristics”                                                                                                                                                       |