

3SM122FZT1VA-002 MEMS Microphone IC

Product Description

The *3SM122FZT1VA-002* 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. *3SM122FZT1VA-002* 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 ± 1 dB
- Maximized RF protection
- Package type : LGA 4-pin
- Omnidirectional

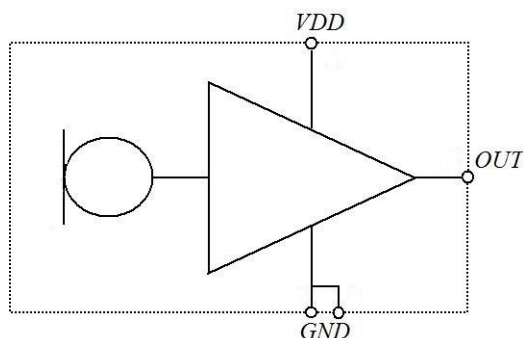
Applications

- ANC Headsets
- TWS Headsets
- Wearable Devices
- IoT Devices

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Functional Block Diagram



Pin Definition and Function

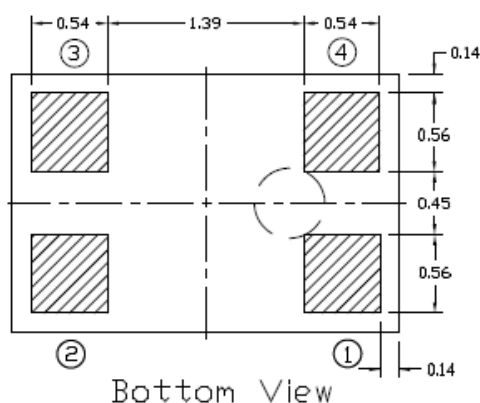


Table 1

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

Temperature Range

Table 2

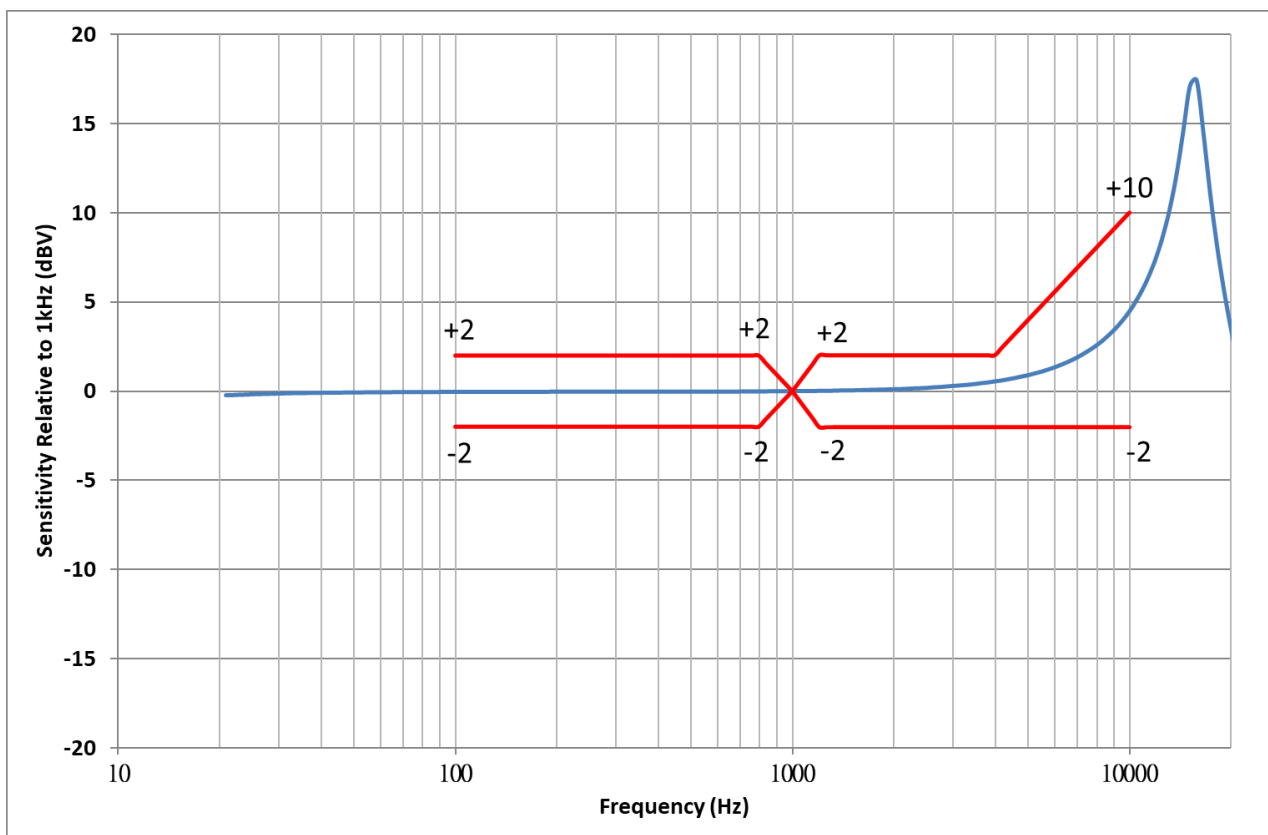
| | | |
|-----------------------------|------------------|---------------|
| Storage Temperature | T _{STG} | -40°C ~ 125°C |
| Operating Temperature Range | T _A | -40°C ~ 105°C |

Acoustical and Electrical Characteristics

Table 3 Typical test conditions are $T_A = 23\text{ }^\circ\text{C}$, $V_{DD} = 2.1\text{ V}$ 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, 94dB SPL |
| Signal to Noise Ratio | S/N | | 60 | | dB | A-weighted |
| Equivalent Noise Level | ENL | | 34 | | 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 |
| Electrical | | | | | | |
| Supply Voltage | V _{dd} | 1.6 | | 3.6 | V | |
| Current Consumption | I _{sb} | | 80 | | μA | V _{dd} =2.1V |
| | | | 80 | | μA | V _{dd} =3.6V |
| Power Supply Rejection | PSR+N | | -93 | | dBV(A) | 217Hz, 100 mV peak to peak square wave on V _{cc} 2.1V |
| Power Supply Rejection Ratio | PSRR | | 63 | | dB | 1KHz, 200 mV peak to peak sine wave on V _{cc} 2.1V |
| Output Impedance | Z _{out} | | | 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 | 4000 | 10000 |
| dB ref. 1KHz | +2 | +2 | 0 | +2 | +2 | +10 |
| 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 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

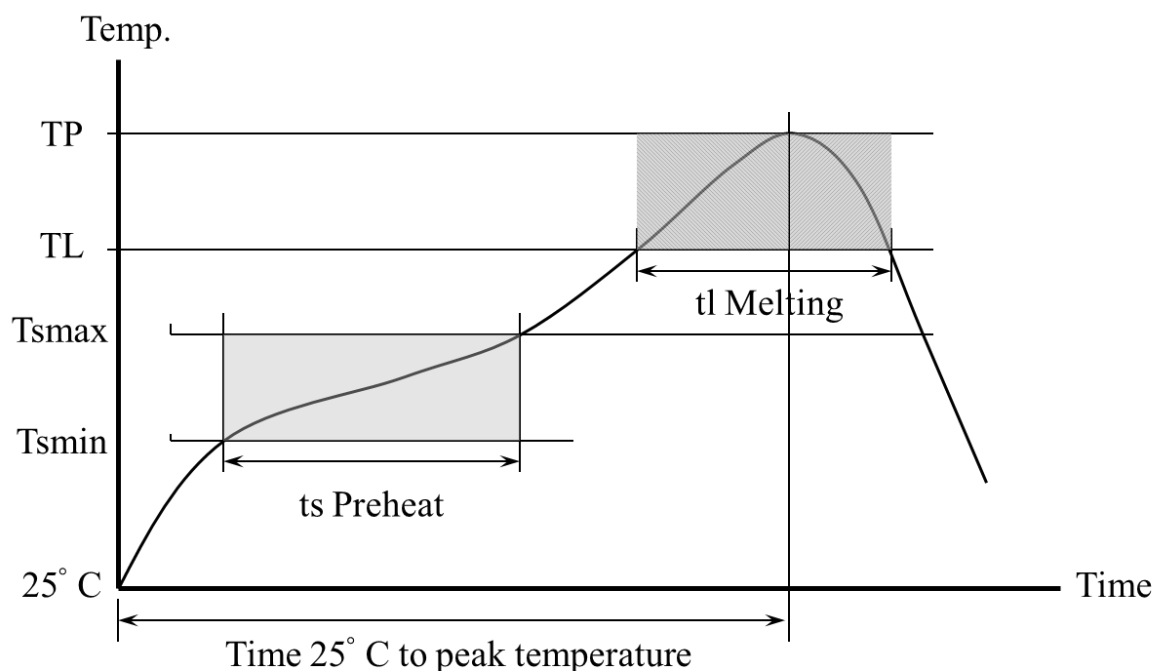


Table 5. Recommended Reflow Profile Limits

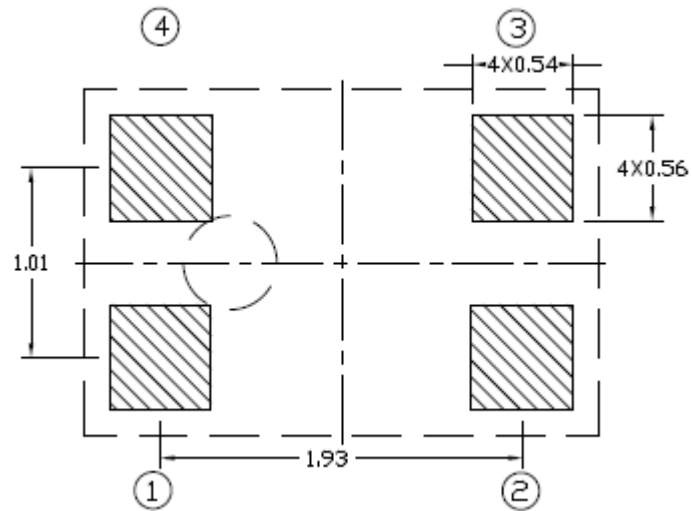
| Profile Feature | Pb-free |
|--|------------------|
| Preheat | |
| Minimum temperature (T_{smin}) | 150 °C |
| Maximum temperature (T_{smax}) | 200 °C |
| Time (t_s) | 60~180 sec |
| Average Ramp up rate (T_{smax} to T_p) | 3 °C/sec |
| Melting area | |
| Melting temperature (T_L) | 217 °C |
| Time maintained above melting (t_l) | 60~150 sec |
| Peak Temperature (T_P) | 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.

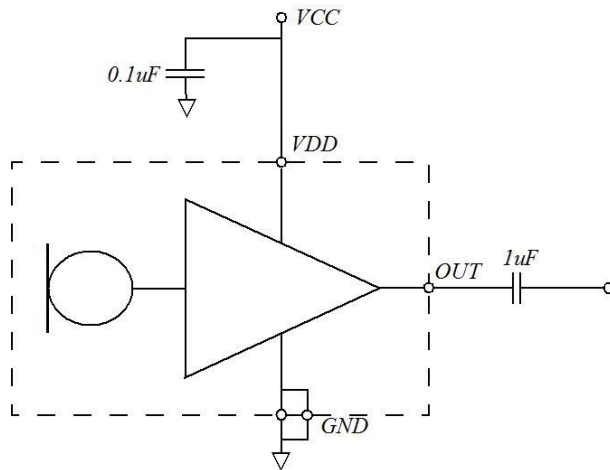
PCB Land Pattern Layout

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

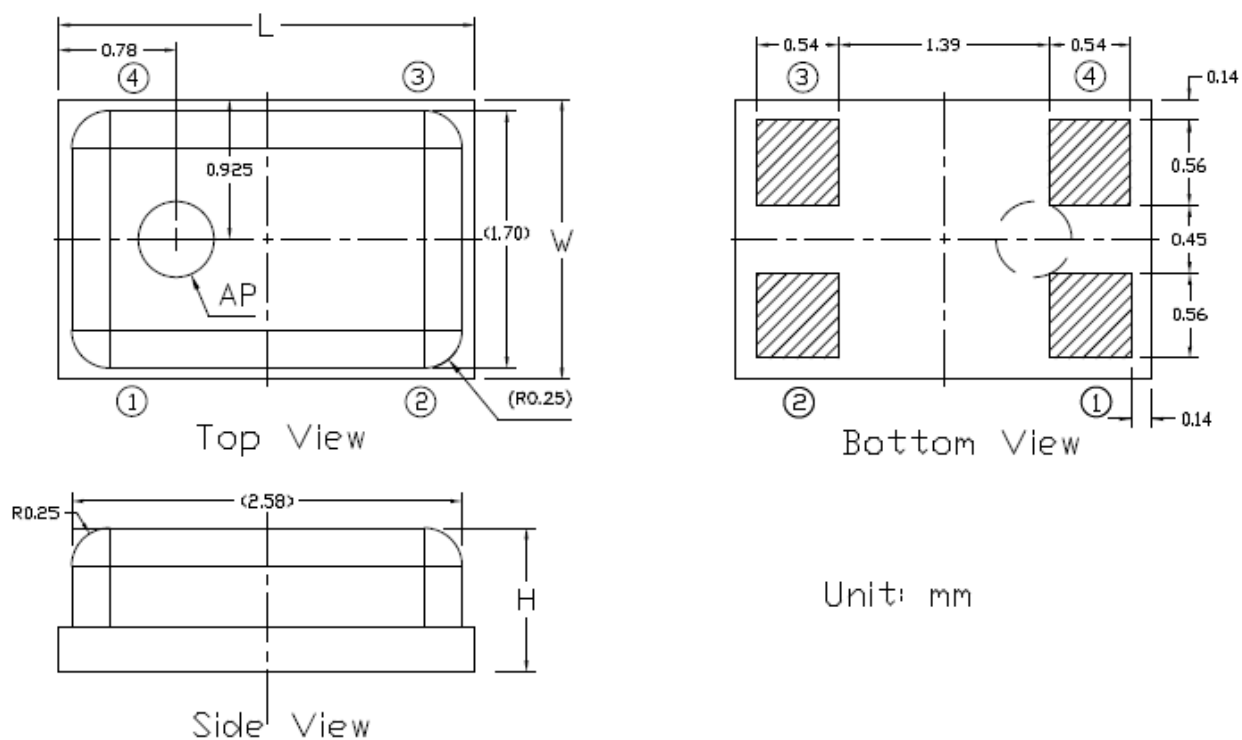
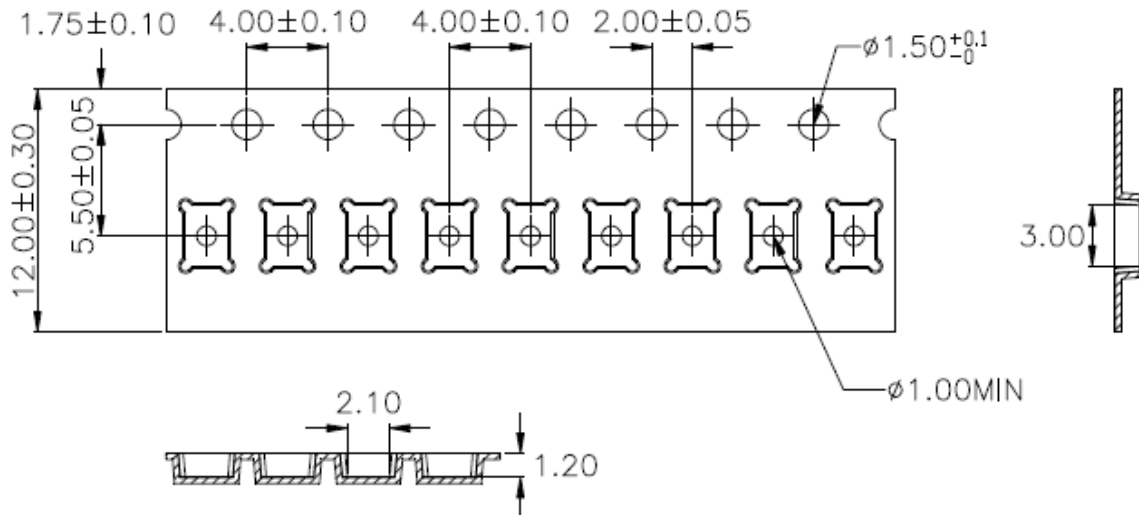


Table 6(Top View)

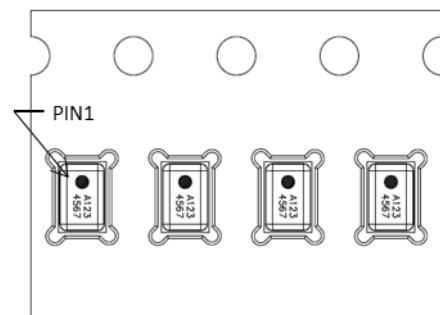
| Item | Dimension | Tolerance |
|---------------|-----------|-----------|
| Length (L) | 2.75 mm | ±0.10 mm |
| Width (W) | 1.85 mm | ±0.10 mm |
| Height (H) | 0.95 mm | ±0.10 mm |
| Acoustic Port | Φ 0.50 mm | ±0.05 mm |

Package Information

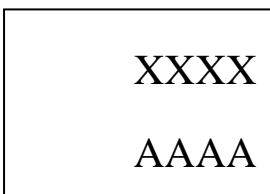
Carrier Tape:



1. 10 sprocket hole pitch cumulative tolerance ± 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.

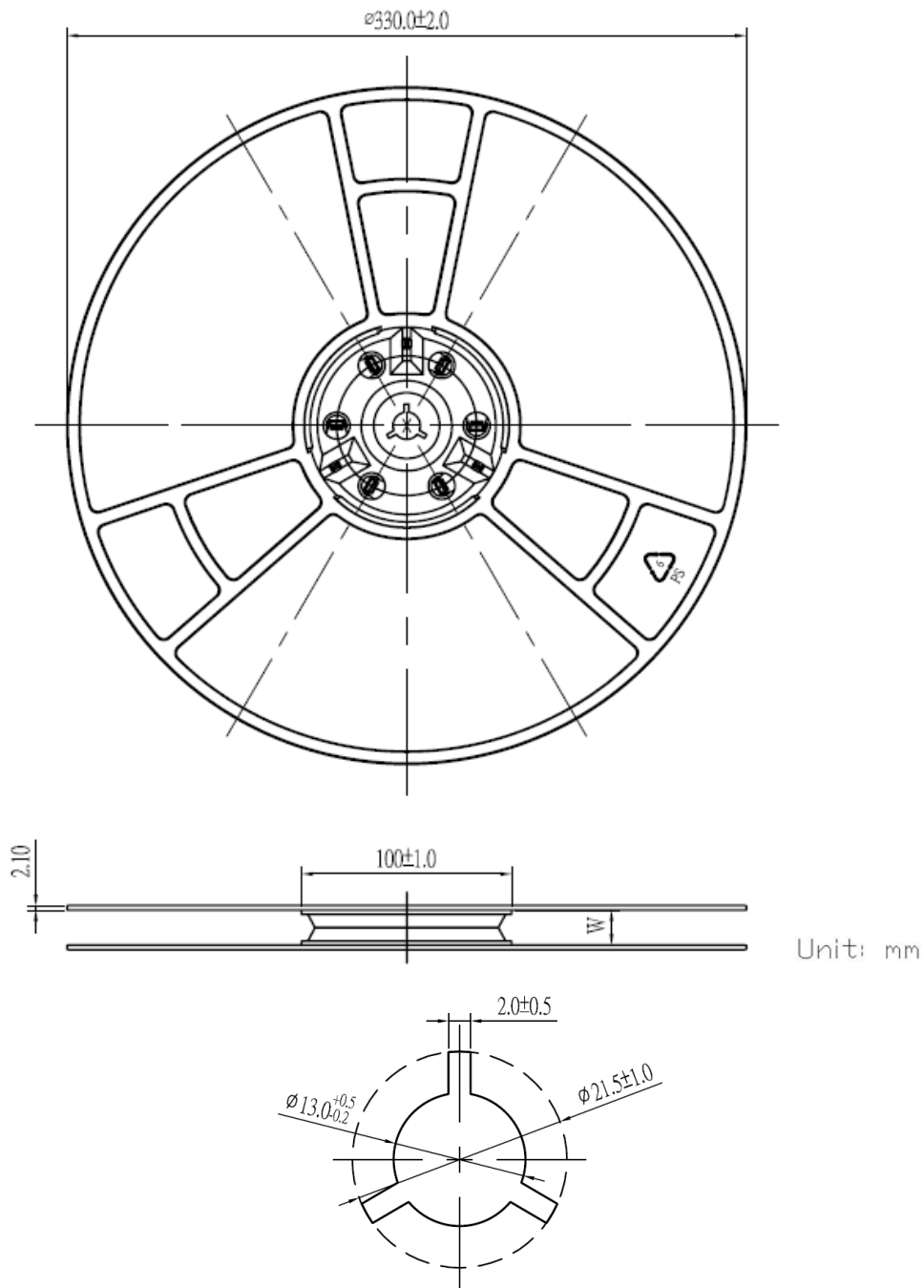


Laser Marking:



Laser marking on the top side

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

13" Tape Reel :


| Model Number | Reel Diameter | Quantity Per Reel |
|------------------|---------------|-------------------|
| 3SM122FZT1VA-002 | 13" | 5,000 |

Revision History

| Revision | Date | Description |
|-----------------|-------------|---|
| 1.0 | 2020/08/27 | Formal release |
| 1.1 | 2021/07/05 | Modify “Acoustical and Electrical Characteristics” Modify “Frequency Response” Modify “Reliability Qualifications” Modify ” Package Information” |
| 1.2 | 2022/04/25 | Modify “Frequency Response” |
| 1.3 | 2023/04/19 | Modify “Reliability Qualifications” Modify “Package Information” |