# *3SM102EHT13B* MEMS Microphone

## Product Description

The ***3SM102EHT13B*** is a monolithic MEMS top performing miniature analog microphone based on CMOS foundry process. By integrating an acoustic transducer and an analog amplifier circuit into a single chip, it eliminates the inter-die wire bonds, resulting in a smaller and more reliable package. Being monolithic in form, the tiny ***3SM102EHT13B*** is ideal in many compact portable consumer electronic devices such as cellular phone, headset and other space limited applications that require high performance.

## Features

- High performance single chip analog CMOS MEMS microphone
- High stability - no risk of membrane aging
- Suitable for automatic pick-and-place handler and SMT process
- Analog microphone with a footprint of only 4.32mm$^2$
- Miniature dimension 2.40mm x 1.80mm x 1.10mm
- Low current consumption 120uA
- RoHS/Green Compliant
- Sensitivity deviation within ±1dB
- Package type : LGA 4-pin

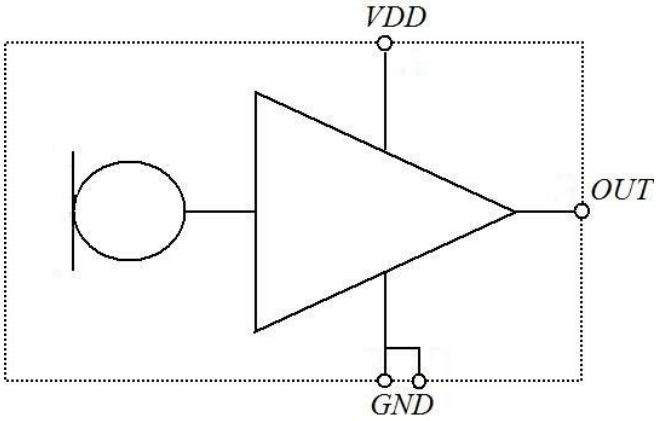
## Applications

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

# Table of Contents

Product Description …… P.1
Features ……..…….. P.1
Applications …… P.1
Table of Contents……...……. P.2
Functional Block Diagram ……. P.3
Acoustical and Electrical Characteristics..... P.3
Temperature Range …..……... P.4
Reliability Qualifications ……..... P.4
Reflow Profile ……..... P.5
Pin Definition and Function ……..... P.6
Frequency Response …… …….. P.7
PCB Land Pattern Layout …...…… P.8
Application Circuit …….. P.9
Handling Instructions ……..... P.10
Dimensions …… P.11
Package Information…….....……... P.12
Revision History …… P.14

## Functional Block Diagram




## Acoustical and Electrical Characteristics

*Table 1 Typical test conditions are TA = 23 °C, VDD = 2.1 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 | -23 | -22 | -21 | dBV/Pa | 1kHz, 94dB SPL |
| Signal to Noise Ratio | S/N | | 59 | | dBA | A-weighted |
| Equivalent Noise Level | ENL | | 35 | | dBA | A-weighted |
| Total Harmonic Distortion | THD | | 0.2 | | % | 94dB SPL |
| Acoustic Overload Point | AOP | | 114 | | dBSPL | |
| Electrical | | | | | | |
| Supply Voltage | Vdd | 1.2 | | 3.6 | V | |
| Current Consumption | Isb | | 120 | | μA | |
| Power Supply Rejection | PSR+N | | -78 | | dBA | 217Hz, 100 mV peak to peak square wave superimposed on Vcc 2.1V |
| Power Supply Rejection Ratio | PSRR | | 63 | | dB | 217Hz, 200 mV peak to peak sine wave superimposed on Vcc 2.1V |
| Output Impedance | Zout | | | 200 | Ω | |
| Output DC Offset | | | 0.93 | | V | |

## Temperature Range

*Table 2*

| | | |
|---|---|---|
| Storage Temperature | $T_{STG}$ | -40℃ ~ 100℃ |
| Operating Temperature Range | $T_A$ | -40℃ ~ 85℃ |

## Reliability Qualifications

*Table 3*

| Test Item | Description |
|---|---|
| High Temperature Storage | Storage at 105℃ for 1,000 hours<br>IEC 60068-2-2 Test Ba |
| Low Temperature Storage | Storage at -40℃ for 1,000 hours<br>IEC 60068-2-1 Test Aa |
| High Temperature Operation Bias | Under Bias at 105℃ for , 1,000 hours<br>IEC 60068-2-2 Test Ba |
| Low Temperature Operation Bias | Under Bias at -40℃ for , 1,000 hours<br>IEC 60068-2-1 Test Aa |
| Temperature Humidity Bias | Under Bias at 85℃/85%RH for 1,000 hours<br>JESD22-A101-B |
| Thermal Shock | Thermal Shock 100 cycles from -40℃~125℃, 100 cycles<br>IEC 60068-2-14 |
| Reflow | 5 reflow cycles with peak 260℃<br>J-STD-020D |
| Vibration | 4 cycles lasting 12 minutes from 20 to 2,000Hz in X, Y and Z with peak acceleration of 20G<br>MIL 883E, Method 2007.2, A |
| Shock | 3 pulses 10,000G in X,Y and Z<br>IEC 60068-2-27, Test Ea |
| ESD | HBM: 3KV, MM:300V, CDM:500V<br>JESD22-A114(HBM);<br>JESD22-A115(MM) |

## Reflow Profile

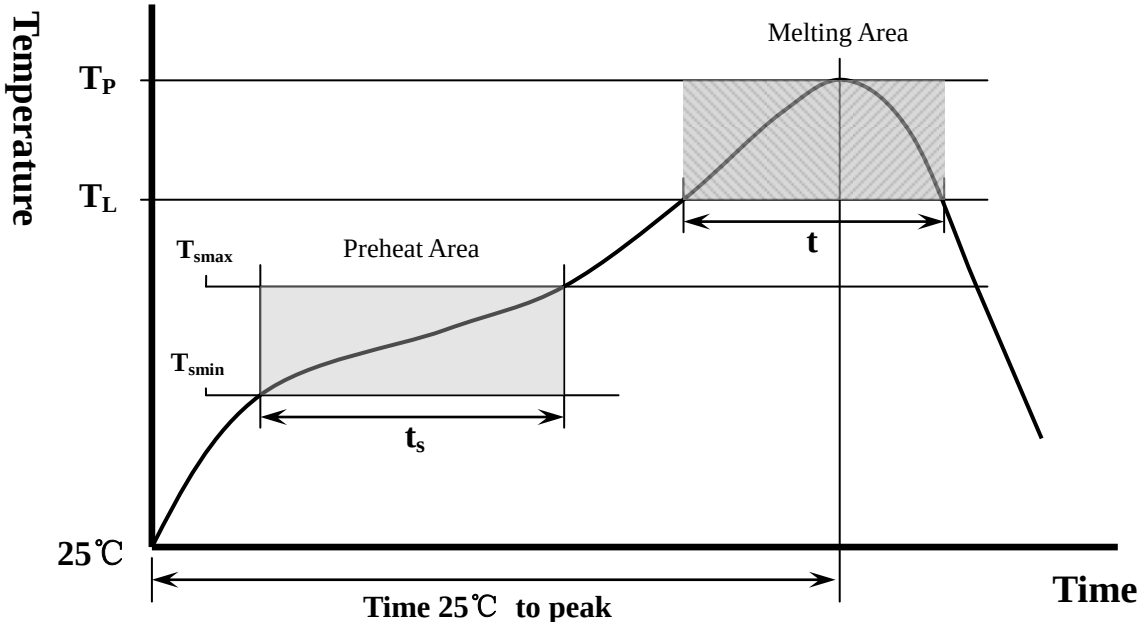



*Table 4. Recommended Reflow Profile Limits*

| Profile Feature | Pb-free |
|---|---|
| Preheat | |
| Minimum temperature (Tsmin) | 150 ℃ |
| Maximum temperature (Tsmax) | 200 ℃ |
| Time (ts) | 60~180 sec |
| Average Ramp up rate (Tsmax to Tp) | 3 ℃/sec |
| Melting area | |
| Melting temperature ($T_L$) | 217 ℃ |
| Time maintained above melting (t) | 60~150 sec |
| Peak Temperature ($T_P$) | 260 ℃ |
| Time within 5℃ of actual peak temperature | 20~40 sec |
| Ramp down rate | 6 ℃/sec maximum |
| Time 25℃ to peak temperature | 8 minute maximum |

## Pin Definition and Function

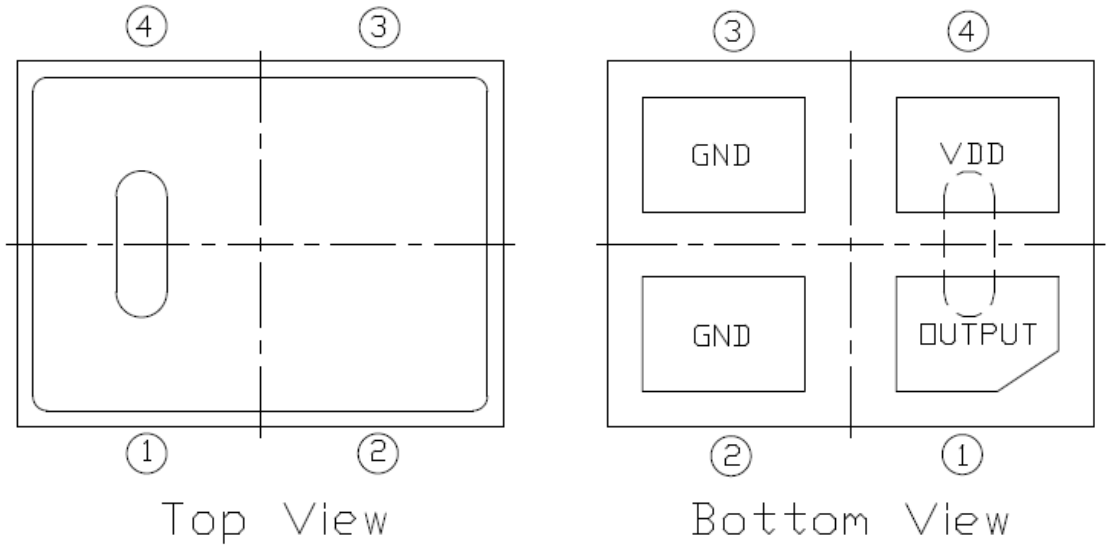
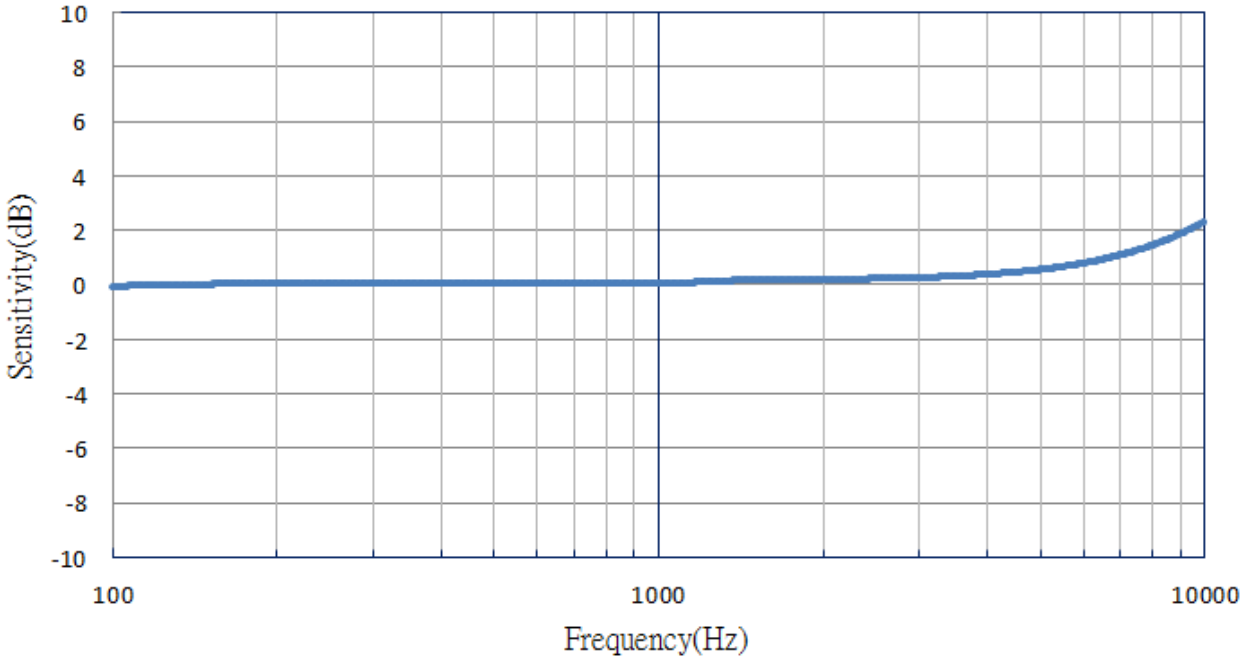



*Table 5*

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

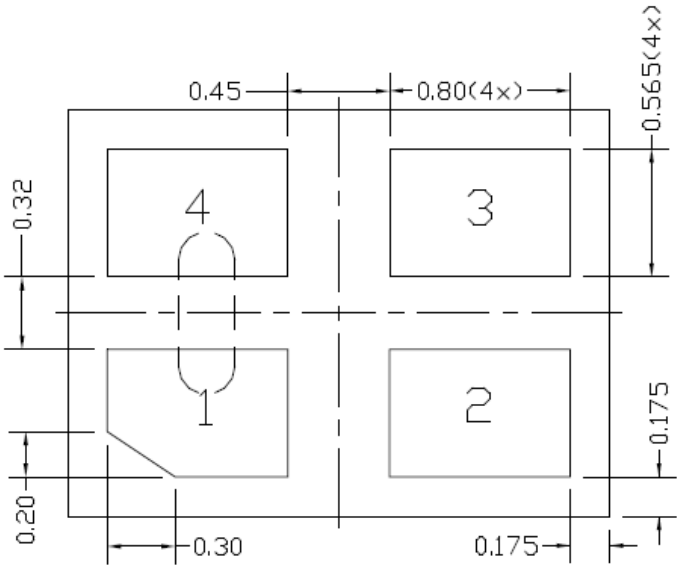
# Frequency Response




*Typical frequency response normalized to 1KHz (Measured)*

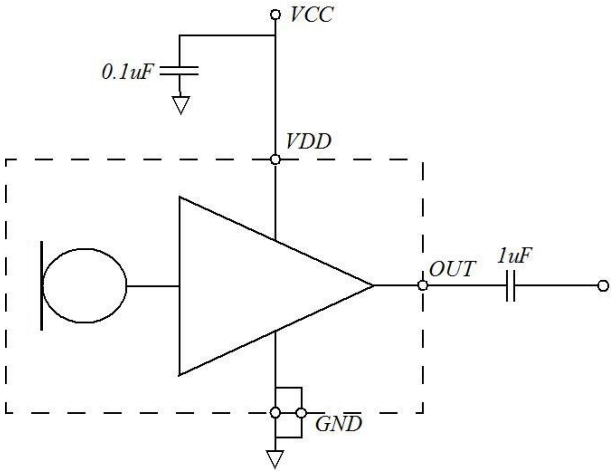
# PCB Land Pattern Layout

**Recommended Land Pattern**

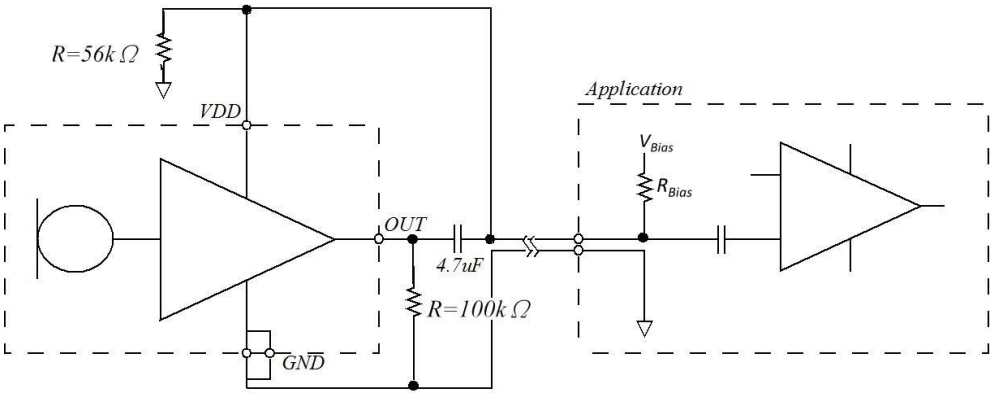


# Application Circuit

**Typical Application:**



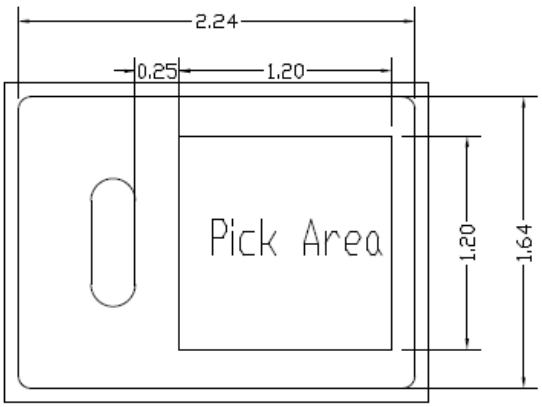

**2-Wire Microphone Circuit application:**



# Handling Instructions

The MEMS microphone can be handled using standard pick-and-place and chip-shooting equipment. Care should be taken to avoid damage to the MEMS microphone 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 MEMS Microphone 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.



# Dimensions

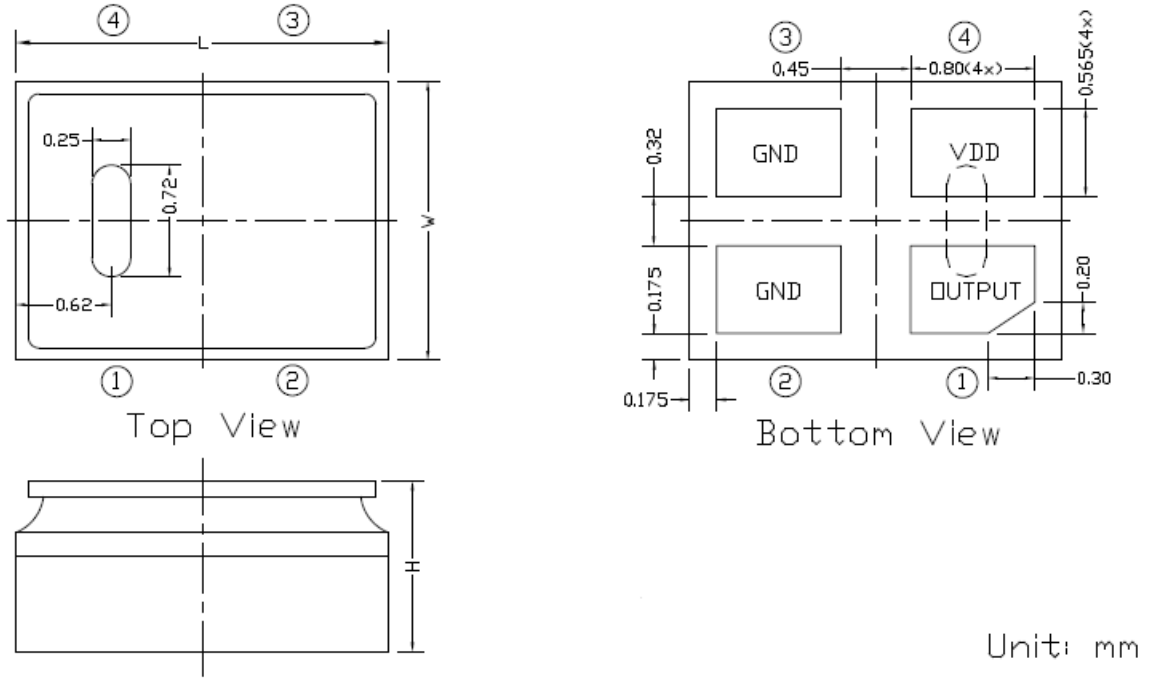
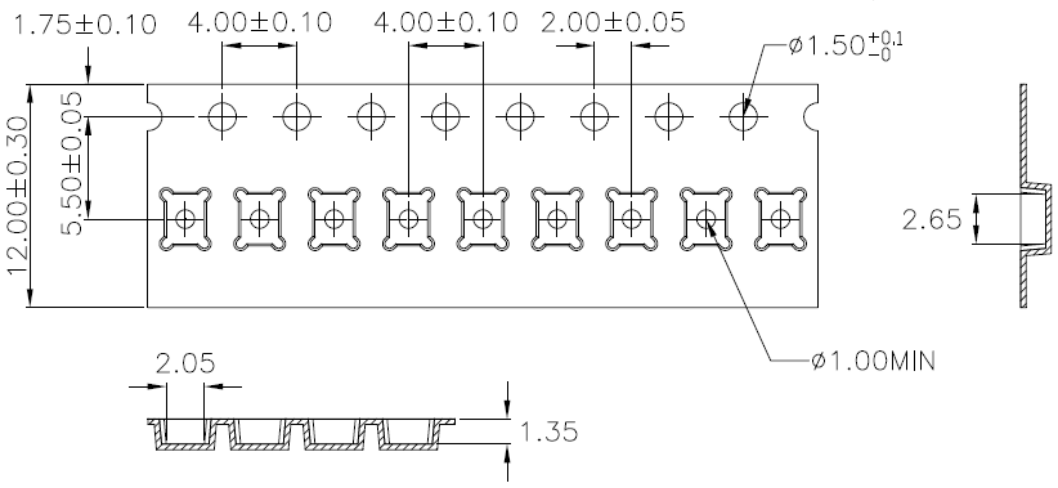



*Table 6(Top View)*

| Item | Dimension | Tolerance |
|---|---|---|
| Length (L) | 2.40 mm | ±0.10 mm |
| Width (W) | 1.80 mm | ±0.10 mm |
| Height (H) | 1.10 mm | ±0.10 mm |

# Package Information

**Carrier Tape:**



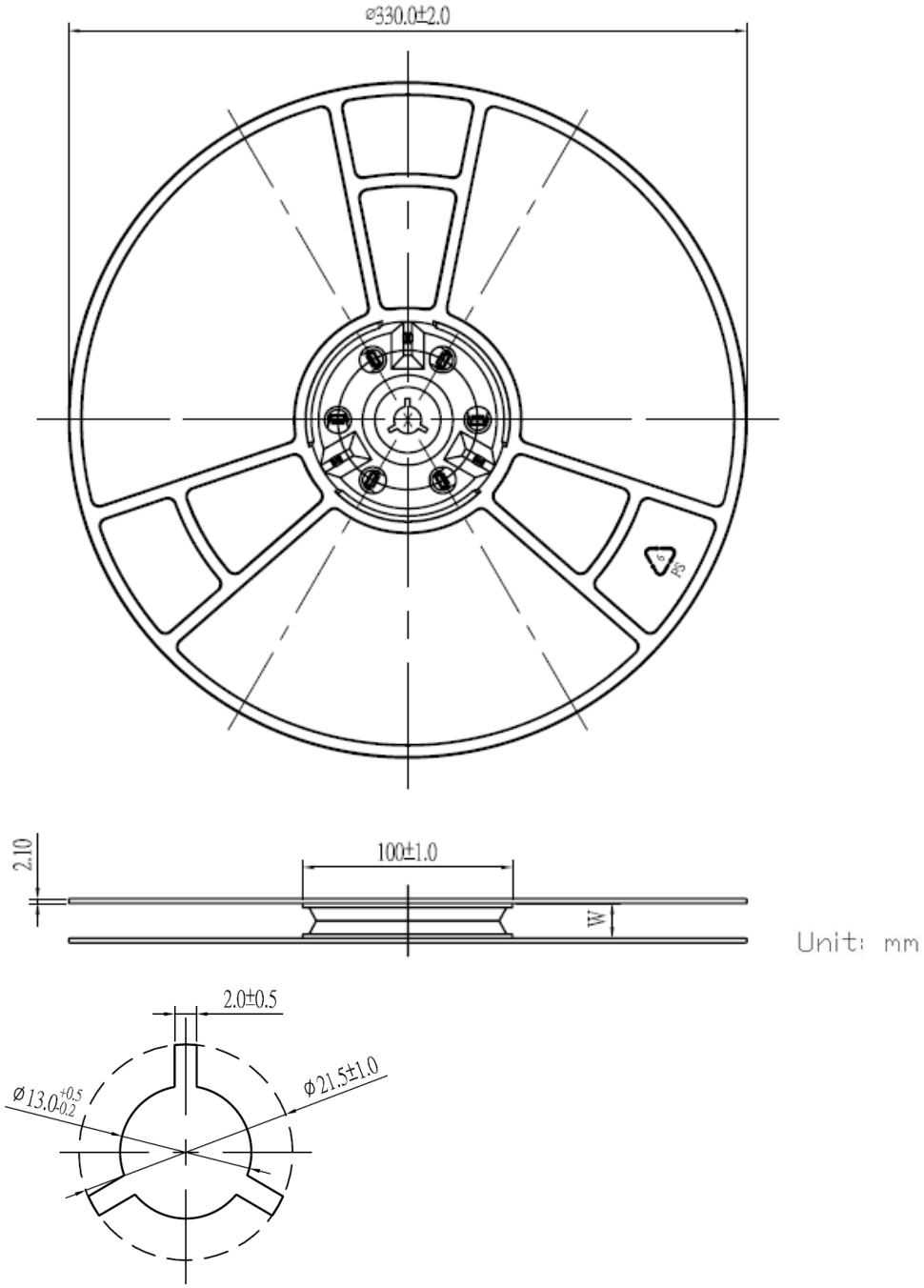

1. 10 sprocket hole pitch cumulative tolerance ±0.20.
2. Carrier camber is within 1 mm in 250 mm.
3. Material : Black Conductive Polystyrene Alloy.
4. All dimensions meet EIA-481-D requirements.
5. Thickness : 0.30±0.05mm.

Unit: mm

Note:

1. MSL(Moisture sensitivity level) Class1.

**13” Tape Reel :**



# Revision History

| Revision | Date | Description |
|---|---|---|
| 1.0 | 2016/10/13 | Formal release |
| 1.1 | 2018/05/30 | Modify ”Applications” |