

## Specification of MEMS Microphone (RoHS Compliance & Halogen Free)

Customer Name :

Customer Model :

GoerTek Model : S12OT421-008

| GoerTek         |                          | CUSTOMER APPROVAL |
|-----------------|--------------------------|-------------------|
| <b>DESIGN</b>   | <u>Jasen</u> 2018.07.27  |                   |
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## Restricted

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### 2 Publication History

| Version | Date       | Description | Author | Approved |
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| 1.0     | 2018.07.27 | New Design  | Jasen  | Daniel   |
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## 1 Introduction:

MEMS MIC which is able to endure reflow temperature up to 260 °C for 50 seconds can be used in SMT process. It is widely used in telecommunication and electronics device such as mobile phone, MP3, PDAs etc.

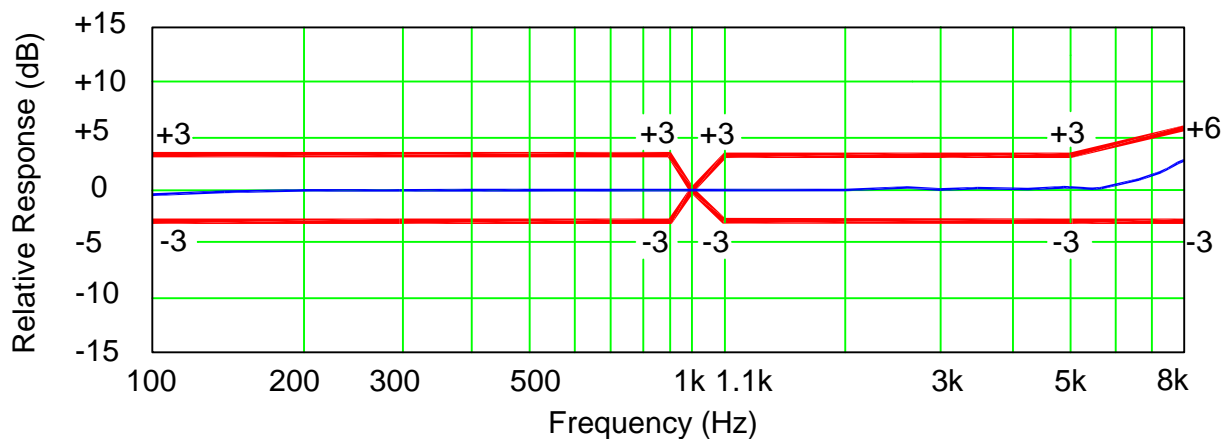
## 2 Test Condition (Vs=2.0V,L=50cm)

| StandardConditions<br>(As IEC 60268-4) | Temperature   | Humidity      | Air pressure   |
|--|---------------|---------------|----------------|
| Environment Conditions                 | +15°C ~ +35°C | 25%RH ~ 75%RH | 86kPa ~ 106kPa |
| Basic Test Conditions                  | +20±2°C       | 60%RH ~ 70%RH | 86kPa ~ 106kPa |

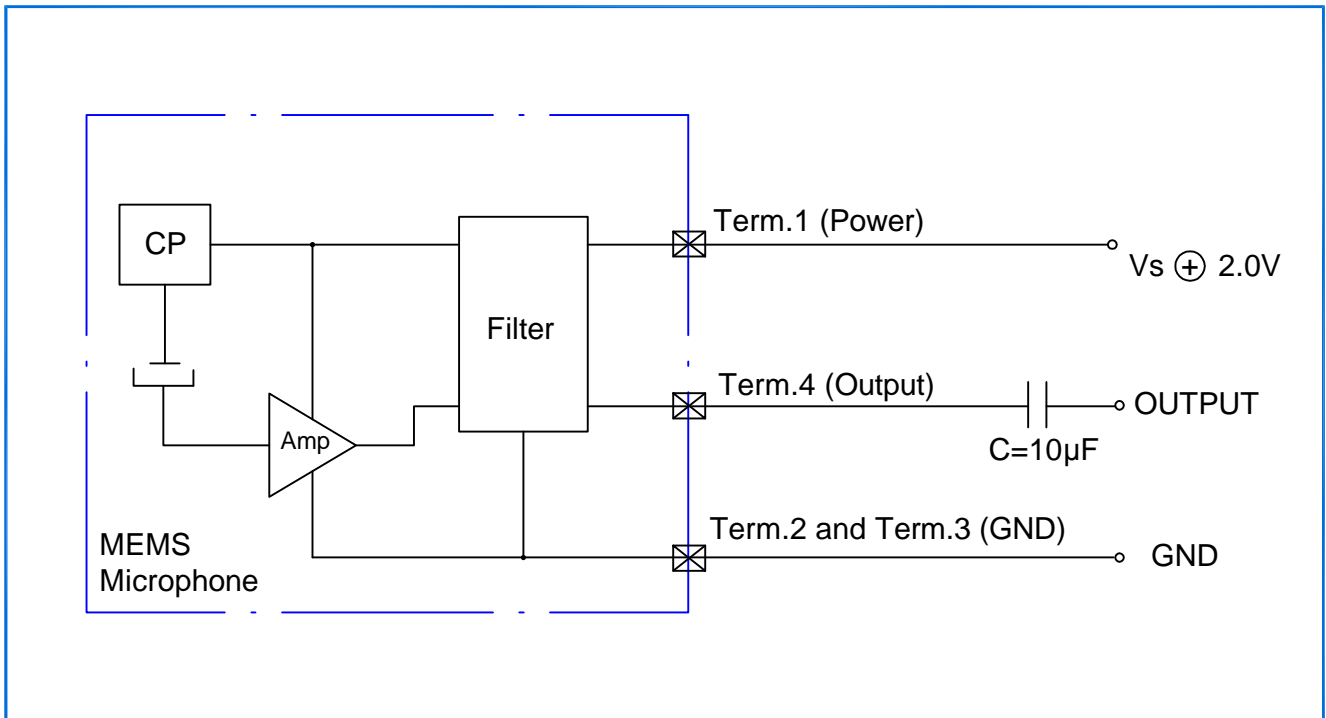
## 3 Electrical Characteristics

| Item                              | Symbol | Test Conditions                  | Min             | Typ | Max | Unit |
|-----------------------------------|--------|----------------------------------|-----------------|-----|-----|------|
| Sensitivity                       | S      | f=1kHz, Pin=1Pa                  | -43             | -42 | -41 | dB   |
| Output Impedance                  | Zout   | f=1kHz, Pin=1Pa                  |                 |     | 400 | Ω    |
| Directivity                       | D(θ)   |                                  | Omnidirectional |     |     |      |
| Current Consumption               | I      |                                  | 50              |     | 150 | μA   |
| S/N Ratio                         | S/N(A) | f=1kHz, Pin=1Pa<br>A-Weighted    |                 | 58  |     | dB   |
| Decreasing Voltage Characteristic | ΔS     | f=1kHz, Pin=1Pa<br>Vs=3.6 --1.5V | No Change       |     |     |      |
| Operating Voltage Range           | Vs     |                                  | 1.5             |     | 3.6 | V    |
| Total Harmonic Distortion         | THD    | 110dB SPL@ f=1kHz                |                 |     | 1   | %    |

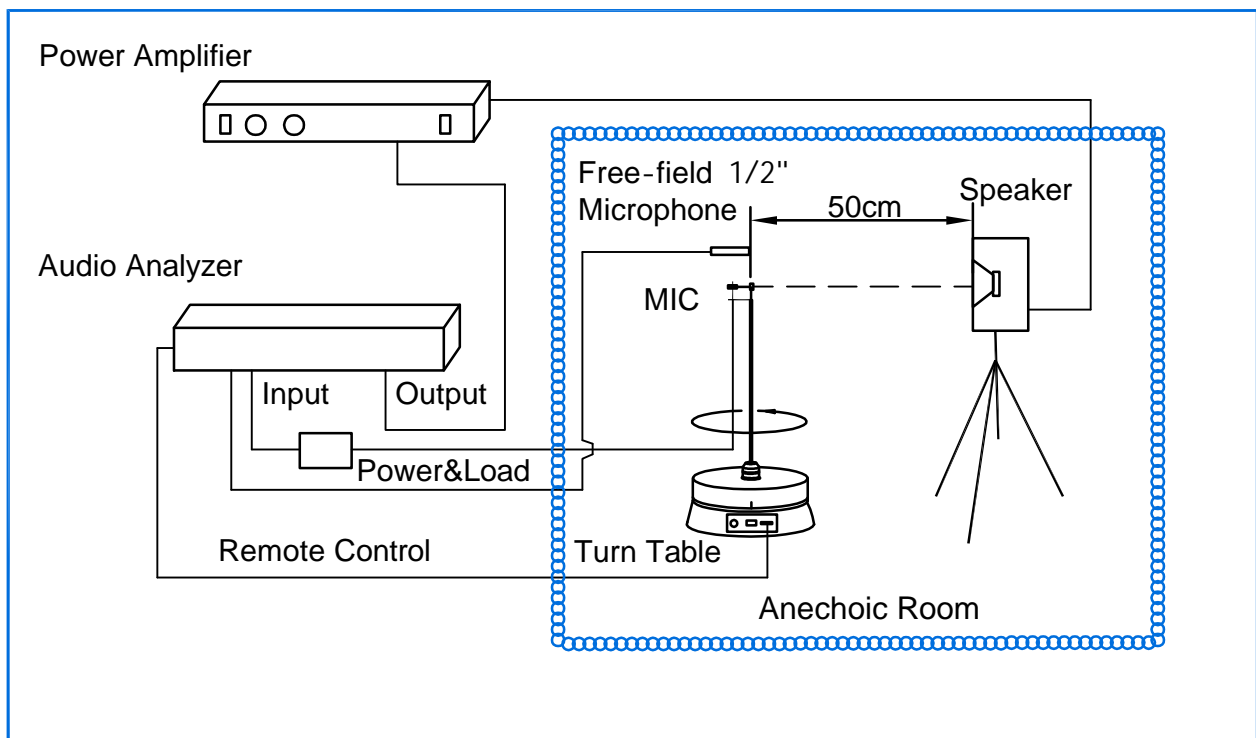
## 4 Frequency Response Curve Limits



## 5 Measurement Circuit

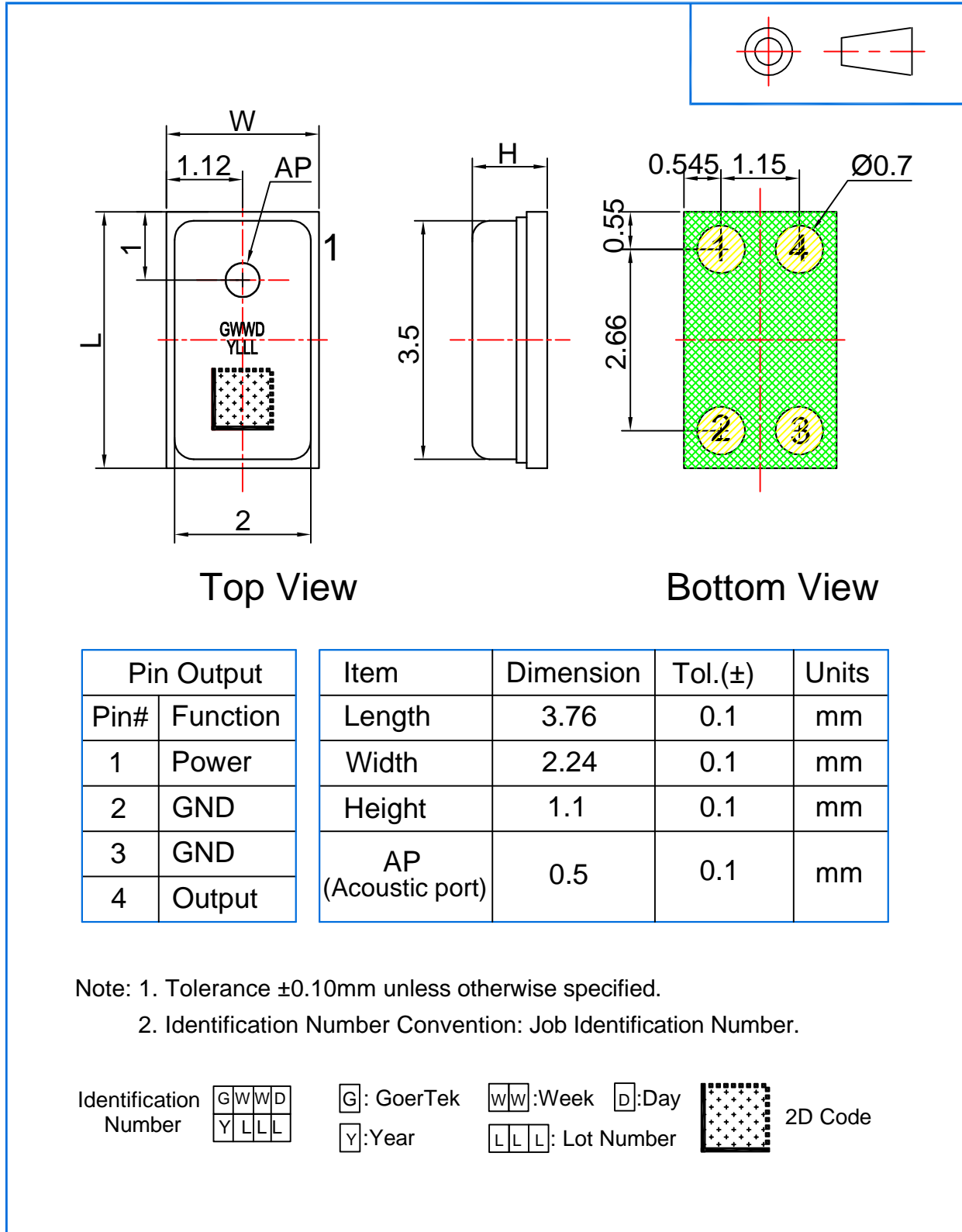


## 6 Test Setup Drawing



## 7 Mechanical Characteristics

### 7.1 Appearance Drawing (Unit: mm)



### 7.2 Weight

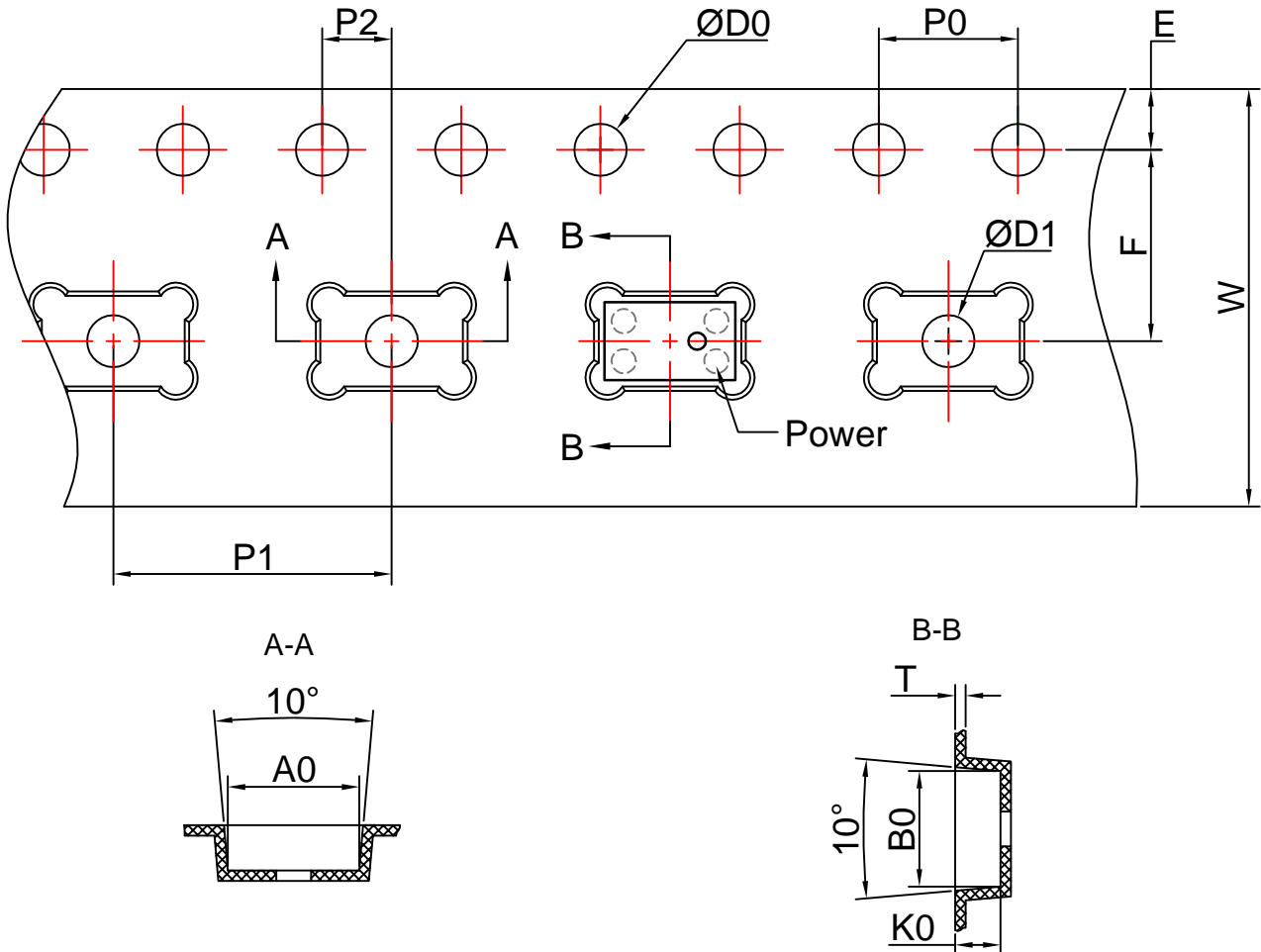
The weight of the MIC is Less than 0.04g.

## 8 Reliability

|   |  |
|---|--|
| <p>8.1<br/>Vibration<br/>Test</p>                   | <p>To be no interference in operation after vibrations, 4 cycles, from 20 to 2,000Hz in each direction(X,Y,Z), 48 minutes, using peak acceleration of 20g, sensitivity should vary within <math>\pm 3\text{dB}</math> from initial sensitivity.<br/>(The measurement to be done after 2 hours of conditioning at <math>+15^{\circ}\text{C} \sim +35^{\circ}\text{C}</math>, R.H 25%~75%)</p>   |
| <p>8.2<br/>Drop<br/>Test</p>                        | <p>To be no interference in operation after dropped to 1.0cm steel plate 18 times from 1.5 meter height, sensitivity should vary within <math>\pm 3\text{dB}</math> from initial sensitivity.<br/>(The measurement to be done after 2 hours of conditioning at <math>+15^{\circ}\text{C} \sim +35^{\circ}\text{C}</math>, R.H 25%~75%)</p>   |
| <p>8.3<br/>Temperature<br/>Test</p>                 | <p>a) After exposure at <math>+125^{\circ}\text{C}</math> for 200 hours, sensitivity should vary within <math>\pm 3\text{dB}</math> from initial sensitivity.<br/>(The measurement to be done after 2 hours of conditioning at <math>+15^{\circ}\text{C} \sim +35^{\circ}\text{C}</math>, R.H 25%~75%)<br/><br/>b) After exposure at <math>-40^{\circ}\text{C}</math> for 200 hours, sensitivity should vary within <math>\pm 3\text{dB}</math> from initial sensitivity.<br/>(The measurement to be done after 2 hours of conditioning at <math>+15^{\circ}\text{C} \sim +35^{\circ}\text{C}</math>, R.H 25%~75%)</p> |
| <p>8.4<br/>Humidity<br/>Test</p>                    | <p>After exposure at <math>+85^{\circ}\text{C}</math> and 85% relative humidity for 200 hours, sensitivity should vary within <math>\pm 3\text{dB}</math> from initial sensitivity.<br/>(The measurement to be done after 2 hours of conditioning at <math>+15^{\circ}\text{C} \sim +35^{\circ}\text{C}</math>, R.H 25%~75%)</p>   |
| <p>8.5<br/>Mechanical<br/>Shock Test</p>            | <p>Then subject samples to three one-half sine shock pulses (3000 g for 0.3 milliseconds) in each direction (for six axes in total) along each of the three mutually perpendicular axes for a total of 18 shocks, sensitivity should vary within <math>\pm 3\text{dB}</math> from initial sensitivity.<br/>(The measurement to be done after 2 hours of conditioning at <math>+15^{\circ}\text{C} \sim +35^{\circ}\text{C}</math>, R.H 25%~75%)</p>  |
| <p>8.6<br/>Thermal<br/>Shock Test</p>               | <p>After exposure at <math>-40^{\circ}\text{C}</math> for 30 minutes, at <math>+125^{\circ}\text{C}</math> for 30 minutes (change time 20 seconds) 5 cycles, sensitivity should vary within <math>\pm 3\text{dB}</math> from initial sensitivity.<br/>(The measurement to be done after 2 hours of conditioning at <math>+15^{\circ}\text{C} \sim +35^{\circ}\text{C}</math>, R.H 25%~75%)</p>   |
| <p>8.7<br/>Reflow<br/>Test</p>                      | <p>Adopt the reflow curve of item 12.3, after five reflows, sensitivity should vary within <math>\pm 2\text{dB}</math> from initial sensitivity.<br/>(The measurement to be done after 2 hours of conditioning at <math>+15^{\circ}\text{C} \sim +35^{\circ}\text{C}</math>, R.H 25%~75%)</p>  |
| <p>8.8<br/>Electrostatic<br/>Discharge<br/>Test</p> | <p>Under <math>C=150\text{pF}</math>, <math>R=330\text{ohm}</math>.<br/>Tested to <math>\pm 8\text{KV}</math> contact to the case and tested to <math>\pm 2\text{kV}</math> contact to I/O terminals.10 times.<br/>Grounding. Sensitivity should vary within <math>\pm 2\text{dB}</math> from initial sensitivity.</p>   |

## 9 Package

### 9.1 Tape Specification



The Dimensions as Follows:

|         |           |            |           |                                    |           |
|---------|-----------|------------|-----------|------------------------------------|-----------|
| ITEM    | W         | E          | F         | ØD0                                | ØD1       |
| DIM(mm) | 12.0±0.30 | 1.75±0.10  | 5.5±0.05  | 1.50 <sup>+0.10</sup> <sub>0</sub> | 1.0 MIN   |
| ITEM    | P0        | 10P0       | P1        | A0                                 | B0        |
| DIM(mm) | 4.00±0.10 | 40.00±0.20 | 8.00±0.10 | 4.10±0.10                          | 2.60±0.10 |
| ITEM    | K0        | P2         | T         |                                    |           |
| DIM(mm) | 1.35±0.10 | 2.00±0.05  | 0.30±0.05 |                                    |           |

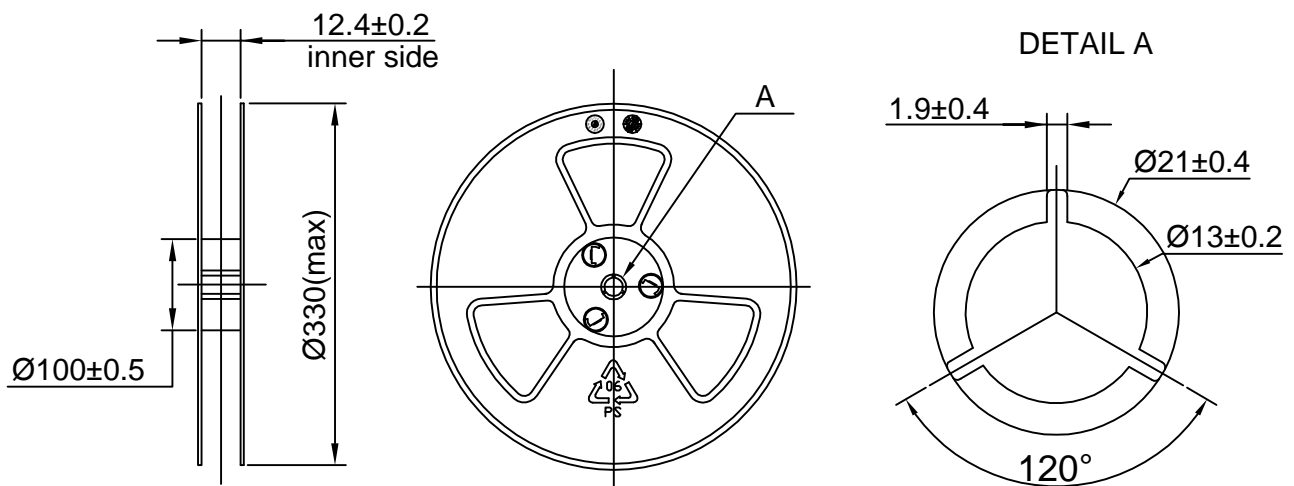


## 9.2 Reel Dimension

7" reel for sample stage

13" reel will be provided for the mass production stage

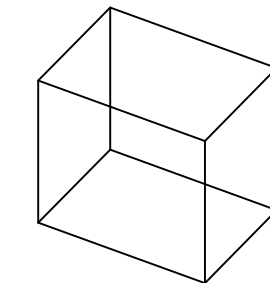
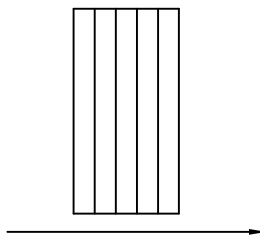
The following is 13" reel dimensions (unit:mm)



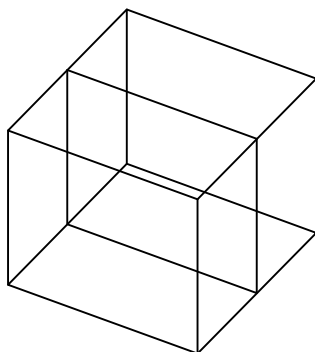
## 9.3 The Content of Box(13" reel)



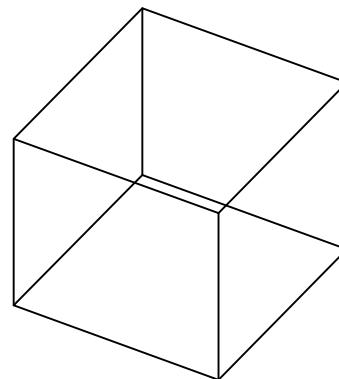
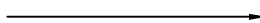
Packing (4,000PCS)



Inner Box(20,000PCS)  
(340mm×135mm×355mm)



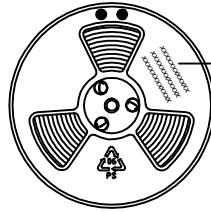
Two Inner Box(40,000PCS)



Outer Box(40,000PCS)  
(370mm×300mm×390mm)

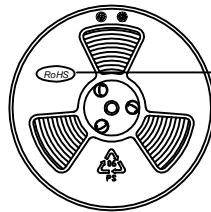
## 9.4 Packing Explain

### 9.4.1 The Label Content of the Reel



The Content Includes:  
Product type, Lot, Customer P/N;  
and other essential information such as  
Quantity, Date etc.

### 9.4.2 The RoHS Label



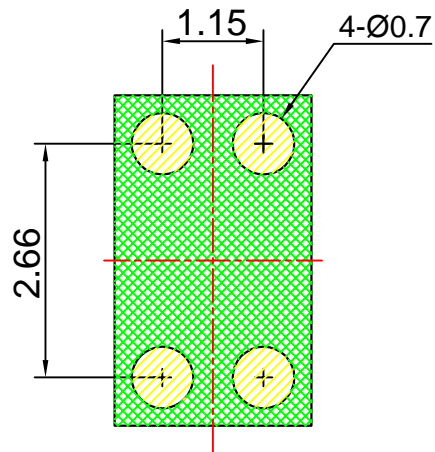
RoHS HF  
Compliance Mark

## 10 Storage and Transportation

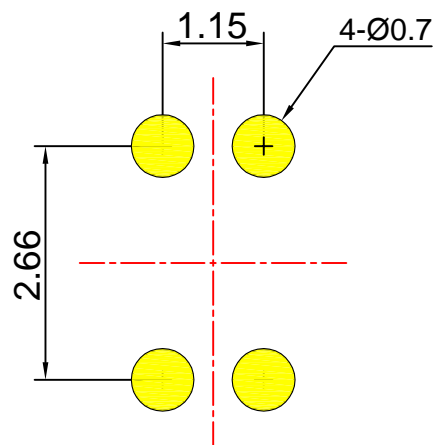
- 10.1 Keep MEMS MIC in warehouse with less than 75% humidity and without sudden temperature change, acid air, any other harmful air or strong magnetic field. Recommend storage period no more than 1 year and floor life(out of bag) at factory no more than 4 weeks.
- 10.2 The MEMS MIC with normal pack can be transported by ordinary conveyances. Please protect products against moist, shock, sunburn and pressure during transportation.
- 10.3 Storage Temperature Range :  $-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$  (Microphone units with package )
- 10.4 Operating Temperature Range :  $-40^{\circ}\text{C} \sim +100^{\circ}\text{C}$

## 11 Land Pattern Recommendation

### 11.1 The Pattern of MIC Pad(Unit:mm)



### 11.2 Recommended Soldering Surface Land Pattern

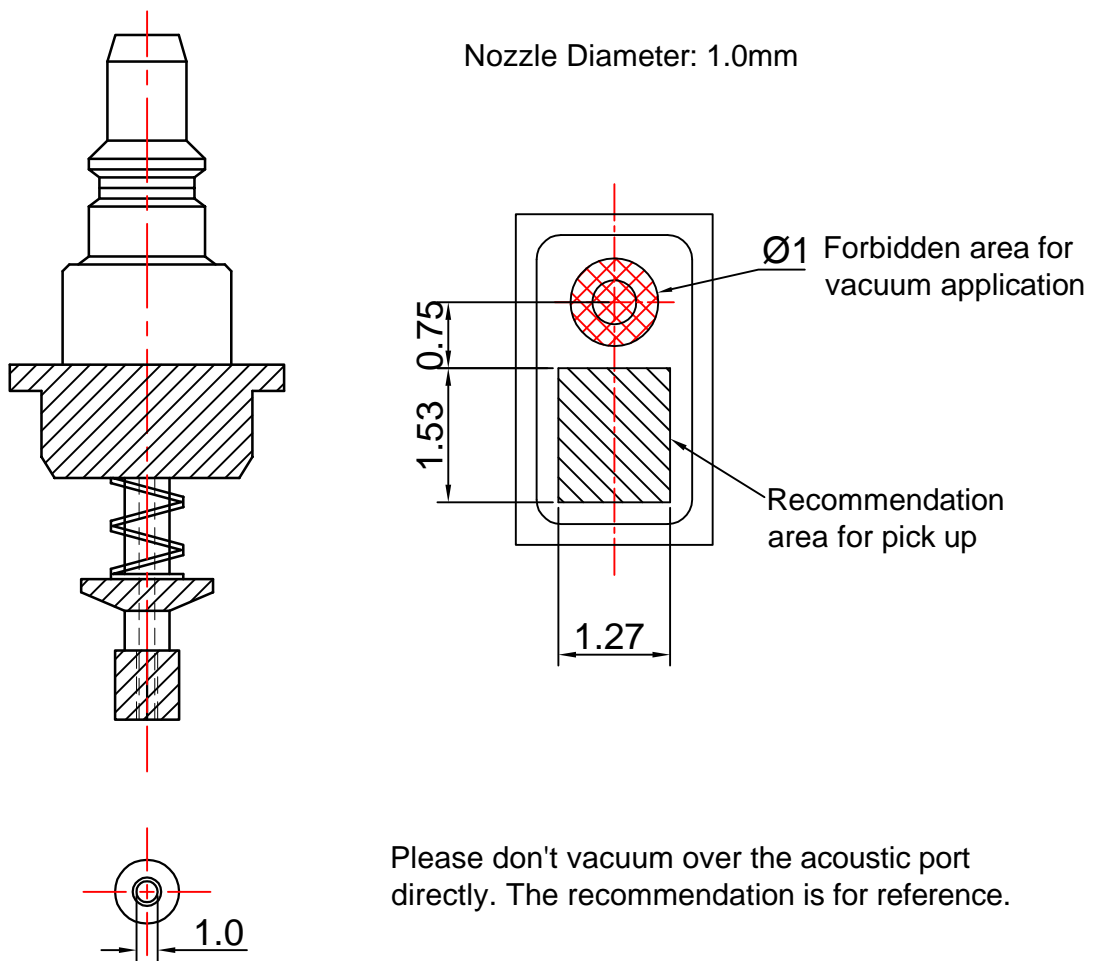


## 12 Soldering Recommendation

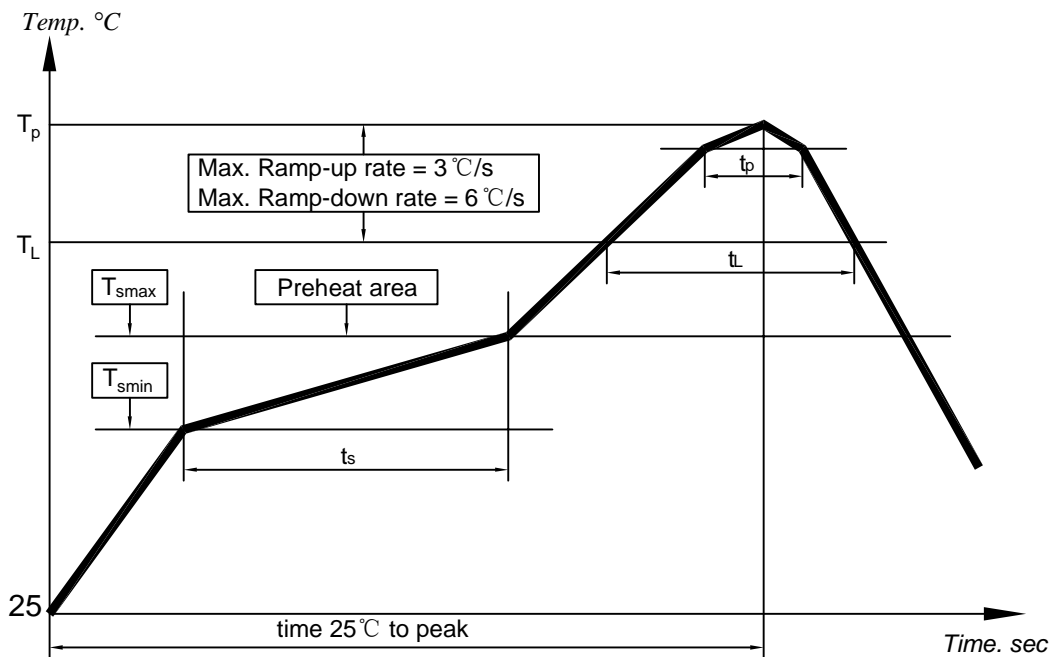
### 12.1 Soldering Machine Condition

|                     |           |
|---------------------|-----------|
| Temperature Control | 8 zones   |
| Heater Type         | Hot Air   |
| Solder Type         | Lead-free |

### 12.2 The Drawing and Dimension of Nozzle



## 12.3 Reflow Profile



### Key Features of The Profile:

|  |                           |
|--|---------------------------|
| Average Ramp-up rate( $T_{smax}$ to $T_p$ )  | 3°C/s max.                |
| Preheat :<br>Temperature Min( $T_{smin}$ )<br>Temperature Max( $T_{smax}$ )<br>Time( $T_{smin}$ to $T_{smax}$ )( $t_s$ ) | 150°C<br>200°C<br>60~180s |
| Time maintained above :<br>Temperature( $T_L$ )<br>Time( $t_L$ )   | 217°C<br>60~150s          |
| Peak Temperature( $T_p$ )  | 260°C                     |
| Time within 5°C of actual Peak Temperature( $t_p$ ) :  | 30~40s                    |
| Ramp-down rate( $T_p$ to $T_{smax}$ )  | 6°C/s max                 |
| Time 25°C to Peak Temperature  | 8min max                  |

When MEMS MIC is soldered on PCB, the reflow profile is set according to solder paste and the thickness of PCB etc.

## 12.4 Rework

- (1) 250°C~270°C, maximum 30 sec, Peak temperature 330°C.
- (2) Wind speed: 15L/m.
- (3) It is very important not to put a heatgun over the acoustic port of the microphone.

## 13 Cautions

### 13.1 Board Wash Restrictions

It is very important not to wash the PCBA after reflow process, otherwise this could damage the microphone.

### 13.2 Nozzle Restrictions

It is very important not to be put a nozzle over the acoustic hole of the microphone, otherwise this could damage the microphone.

### 13.3 Blowing Restrictions

It is very important not to blow the acoustic port of the microphone directly, otherwise this could damage the microphone.

### 13.4 Ultrasonic Restrictions

It is very important not to use ultrasonic process. otherwise this could damage the microphone.

### 13.5 Case Adaption to Pressure Restrictions

It is very important not to press the case with a force larger than 2.5kgf, otherwise this would damage the microphone.

## 14 Output Inspection Standard

Output inspection standard is executed according to <<ISO2859-1:1999>>.

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