

# Specification of MEMS Microphone

(RoHS Compliance & Halogen Free)

Customer Name :  
 Customer Model :  
 Goermicro Model: SD33OT261-003

<b>Goermicro</b>	<b>CUSTOMER APPROVAL</b>
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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, laptop computers, and other portable electronic devices etc.

**2 Test Condition (L=50 cm)**

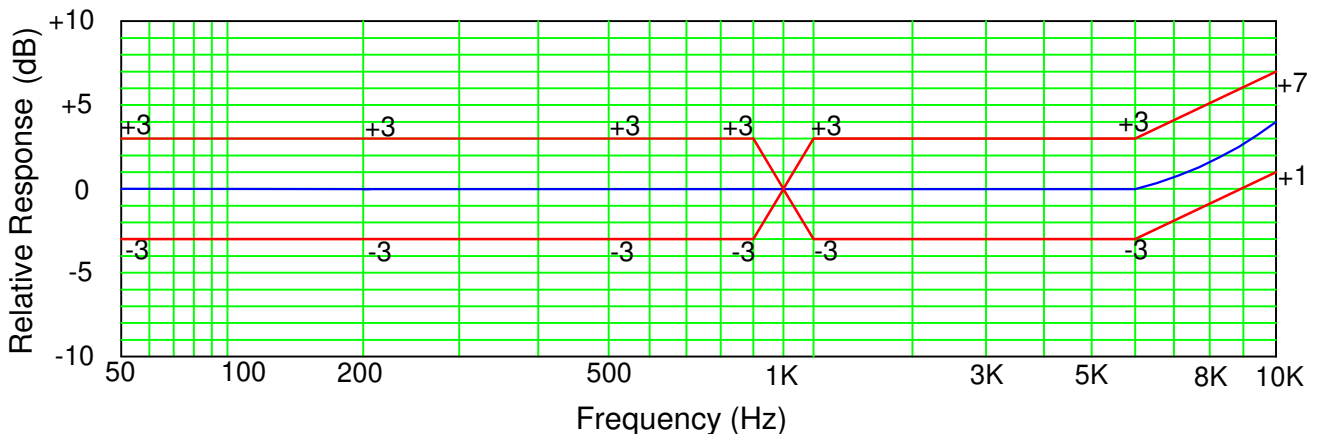
StandardConditions (As IEC 60268-4)	Temperature	Humidity	Air pressure
Environment Conditions	+15°C~+35°C	25%RH~75%RH	86kPa~106kPa
Basic Test Conditions	+20°C±2°C	60%RH~70%RH	86kPa~106kPa

**3 Acoustical and Electrical Characteristics**

**3.1 Standard Performance Mode (Test Condition: V<sub>DD</sub>=1.8V, f<sub>CLK</sub>=2.4MHz)**

Item	Symbol	Test Conditions	Min	Typ	Max	Unit
Sensitivity	S	f=1kHz, P <sub>in</sub> =1Pa	-27	-26	-25	dBFS (Note 1)
Current Consumption (Note 2)	I	f <sub>clk</sub> =2.4MHz	-	750	-	μA
S/N Ratio	SNR	f=1kHz, P <sub>in</sub> =1Pa A-Weighted Curve	-	64	-	dB
Distortion	THD	94dB SPL@ 1kHz	-	0.2	0.5	%
Acoustic Overload Point	AOP	10% THD @1 kHz	-	118	-	dB SPL
Power Supply Rejection	PSR	100mVpp squarewave@217Hz	-	-80	-	dBFS
Power Supply Rejection Ratio	PSRR	100mVpp squarewave@217Hz	-	60	-	dBFS

**3.2 Frequency Response Curve and Limits**



**3.3 Low Power Mode (Test Condition:  $V_{DD}=1.8V$ ,  $f_{CLK}=768kHz$ )**

Item	Symbol	Test Conditions	Min	Typ	Max	Unit
Sensitivity	S	f=1kHz, P <sub>in</sub> =1Pa	-27	-26	-25	dBFS (Note 1)
Current Consumption (Note 2)	I	f <sub>clk</sub> =768kHz	-	300	-	μA
S/N Ratio	SNR	f=1kHz, P <sub>in</sub> =1Pa A-Weighted Curve	-	64	-	dB
Distortion	THD	94dB SPL@ 1kHz	-	0.2	0.5	%
Acoustic Overload Point	AOP	10% THD @1 kHz	-	118	-	dB SPL
Power Supply Rejection	PSR	100mVpp squarewave@217Hz	-	-85	-	dBFS
Power Supply Rejection Ratio	PSRR	200mVpp sinewave@1KHz	-	60	-	dBFS
DC offset		long term percent of full scale		0		%

**3.4 General Microphone Specifications**

**Test Condition:  $V_{DD}=1.8V$ ,  $f_{CLK}=2.4MHz$ , select pin grounded, no load.**

Item	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Voltage	$V_{DD}$		1.62	1.8	3.6	V
Clock Frequency Range	Standby Mode		0		250	kHz
	Lower Power Mode		350	-	800	kHz
	Normal Mode		1.0	-	4.8	MHz
Sleep Current	$I_{sleep}$	F <sub>clk</sub> =0Hz, V <sub>DD</sub> =1.8V	-	3	-	μA
		F <sub>clk</sub> =0Hz, V <sub>DD</sub> =3.6V	-	6	-	μA
Directivity			Omnidirectional			
Polarity		Increasing sound pressure	Increasing density of 1's			
Data Format			1/2 cycle PDM			
Short Output Current	$I_{SC}$	Data Pin short to GND	1	-	20	mA
Output Load	$C_{load}$		-	-	140	pF
Fall Asleep Time	$T_{slp}$	F <sub>clk</sub> < 250KHz	-	5	-	us
Wake-up Time	$T_{wk}$	<b>±0.5dB sensitivity accuracy</b>	-	-	<b>20</b>	<b>ms</b>
Power-up Time	$T_{up}$	<b>±0.5dB sensitivity accuracy</b>	-	-	<b>20</b>	<b>ms</b>
Mode-Change Time	$T_{mc}$	<b>±0.5dB sensitivity accuracy</b>	-	-	<b>20</b>	<b>ms</b>
DC Output			-	0	-	%FS

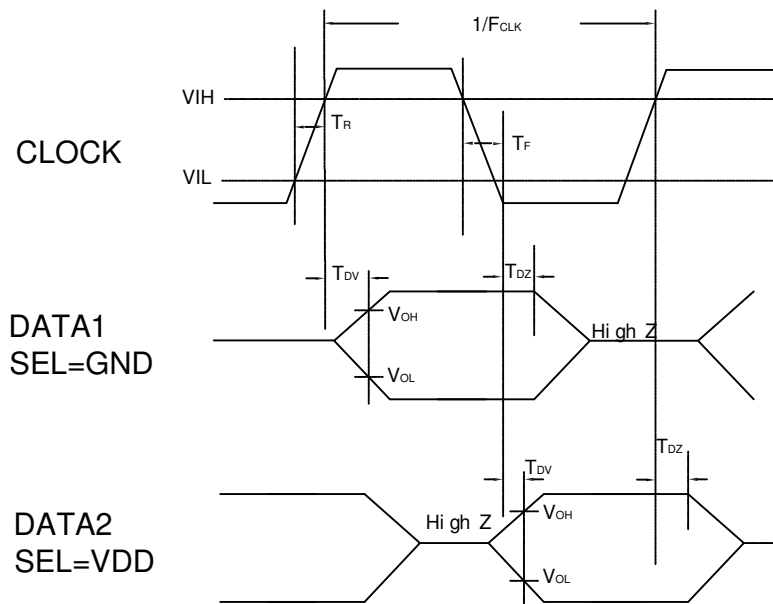
### 3.5 Microphone Interface Specifications

Item	Symbol	Test Conditions	Min	Typ	Max	Unit
Logic Input High	$V_{IH}$		$0.65 \times V_{DD}$	-	$V_{DD} + 0.3$	V
Logic Input Low	$V_{IL}$		-0.3	-	$0.35 \times V_{DD}$	V
Logic Output High	$V_{OH}$		$V_{DD} - 0.45$	-	-	V
Logic Output Low	$V_{OL}$		-	-	0.45	V
Clock Duty Cycle			40	-	60	%

Note 1.  $dBFS = 20 \times \log(A/B)$  where A is the level of the signal, B is the level that corresponds to Full-scale level.

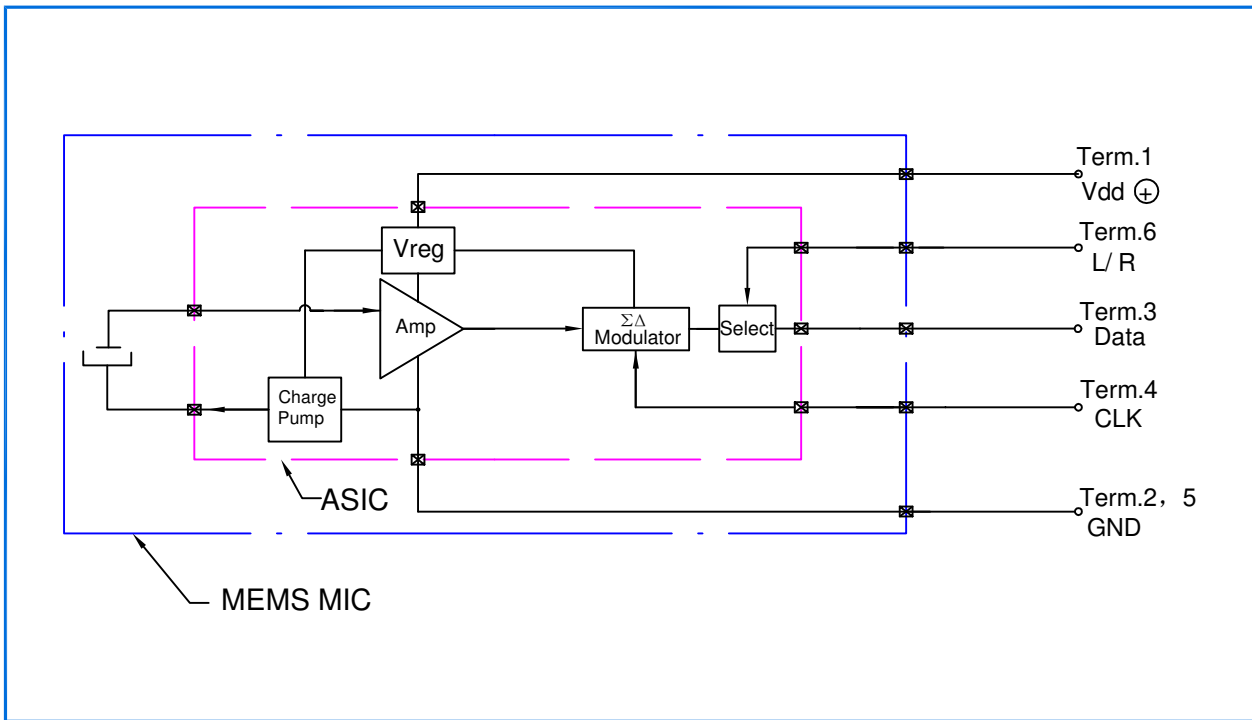
Note 2. The current consumption depends on the applied Clock Frequency and the load on the DATA output.

Note 3. Timing

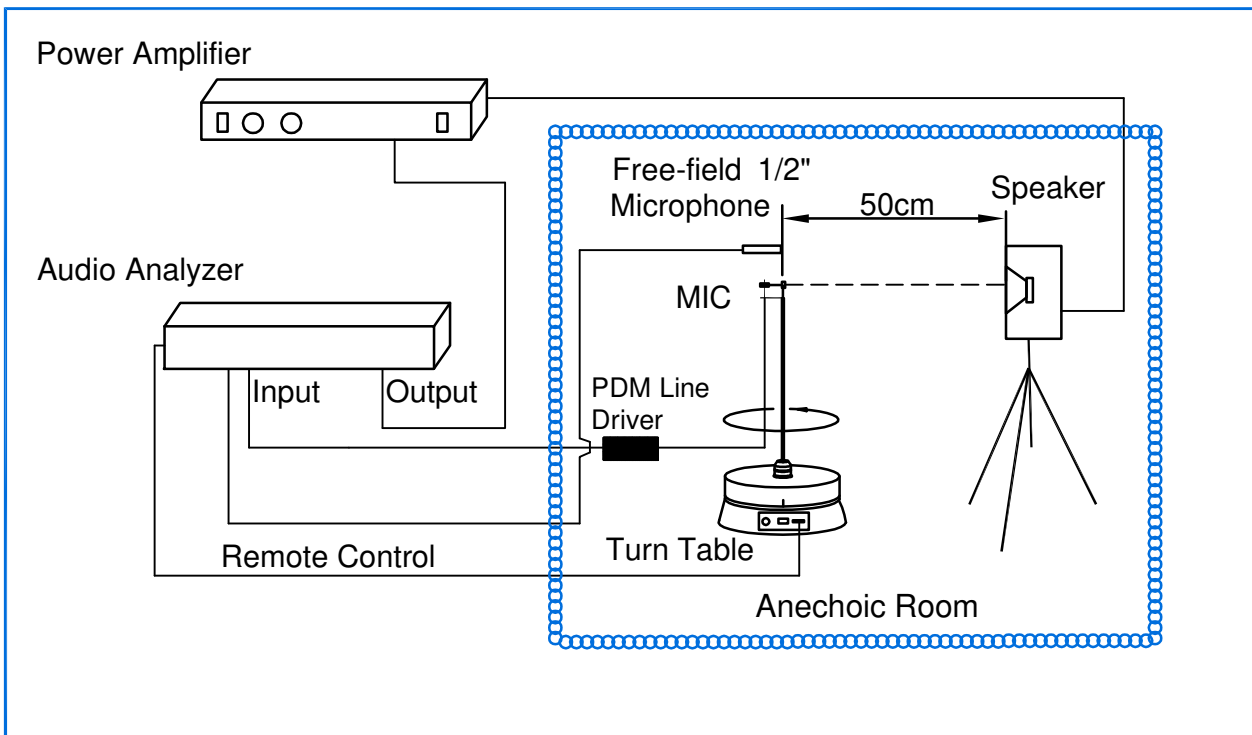


Item	Symbol	Test Conditions	Min	Typ	Max	Unit
Clock Rising Time	$T_R$	$R_L = 1M\Omega, C_L = 12pF$	-	-	15	ns
Clock Falling Time	$T_F$	$R_L = 1M\Omega, C_L = 12pF$	-	-	15	ns
Data into Hi Z time	$T_{DZ}$	$R_L = 1M\Omega, C_L = 12pF$	0	-	20	ns
Data Valid time	$T_{DV}$	$R_L = 1M\Omega, C_L = 12pF$	24	36	48	ns
Clock Jitter		Period jitter in RMS			0.5	ns
Clock Duty Cycle			40	-	60	%
Clock Frequency			350	2400	4800	KHz

### 4 Measurement Circuit

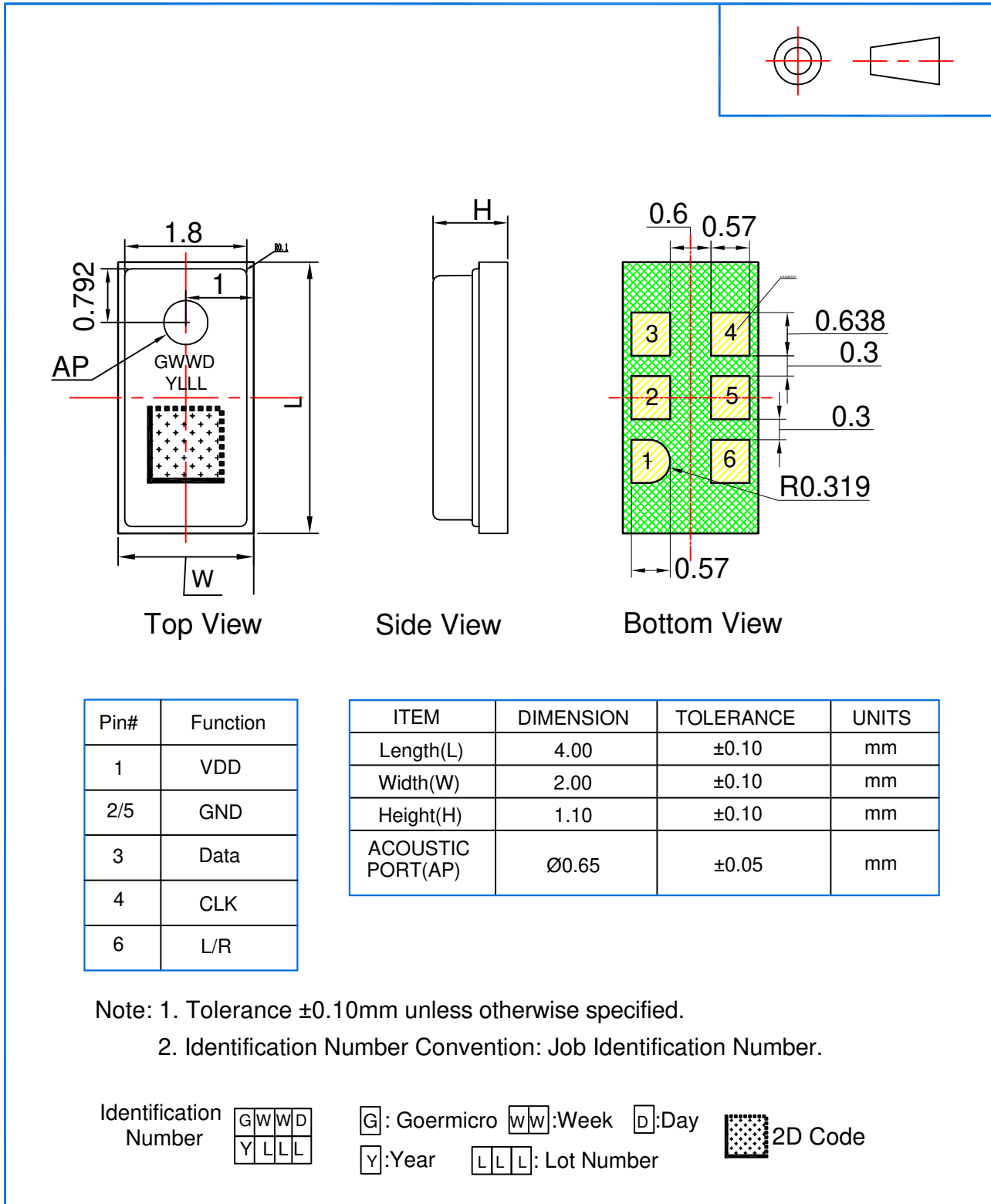


### 5 Test Setup Drawing



## 6 Mechanical Characteristics

### 6.1 Appearance Drawing (Unit: mm)



### 6.2 Weight

The weight of the MIC is Less than 0.05g.

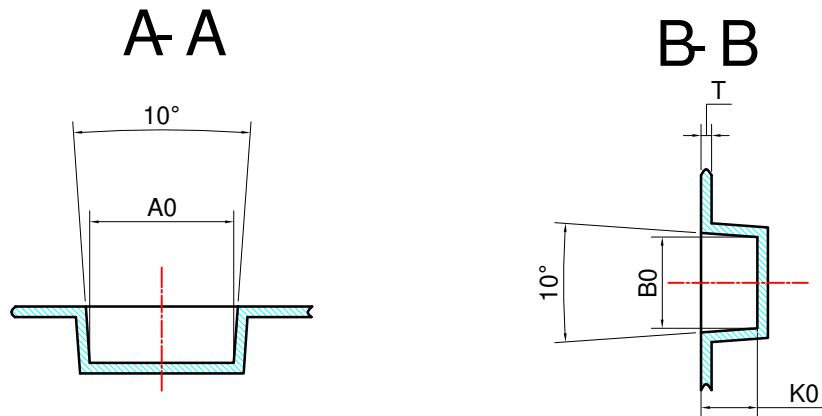
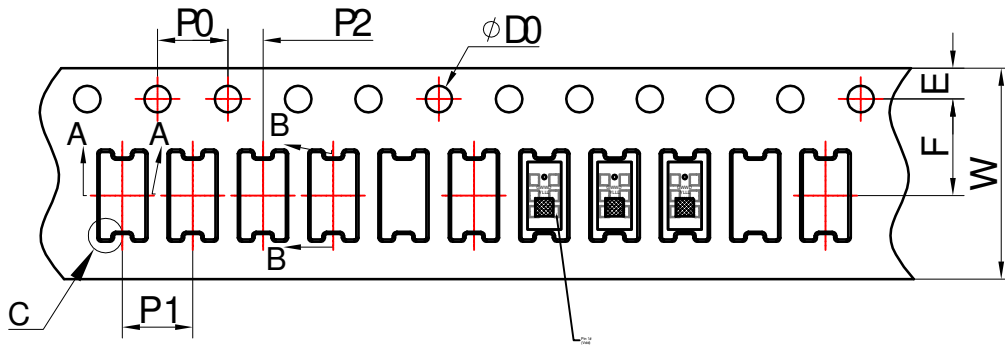


**7 Reliability Test**

<p>7.1 Vibration 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</math>dBFS from initial sensitivity(IEC 60068-2-6:2007). (The measurement to be done after 2 hours of condition at 15°C-35°C, R.H. 25%~75%)</p>
<p>7.2 Drop Test</p>	<p>To be no interference in operation after dropped to 1.0cm steel plate 12 times from 1.5 meter height in state of JIG,JIG weight of 100g, sensitivity should vary within <math>\pm 3</math>dBFS from initial sensitivity(IEC60068-2-31:2008). (The measurement to be done after 2 hours of condition at 15°C-35°C, R.H. 25%~75%)</p>
<p>7.3 Temperature Test</p>	<p>a) After exposure at +125°C for 200 hours, sensitivity should vary within <math>\pm 3</math>dBFS from initial sensitivity(IEC 60068-2-1:2007). (The measurement to be done after 2 hours of condition at 15°C-35°C, R.H. 25%~75%)  b) After exposure at -40°C for 200 hours, sensitivity should vary within <math>\pm 3</math>dBFS from initial sensitivity(IEC 60068-2-1:2007). (The measurement to be done after 2 hours of condition at 15°C-35°C, R.H. 25%~75%)</p>
<p>7.4 Humidity Test</p>	<p>After exposure at +85°C and 85% relative humidity for 200 hours, sensitivity should vary within <math>\pm 3</math>dBFS from initial sensitivity(IEC 60068-2-67:2019). (The measurement to be done after 2 hours of condition at 15°C-35°C, R.H. 25%~75%)</p>
<p>7.5 Mechanical 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</math>dBFS from initial sensitivity (IEC60068-2-27:2008). (The measurement to be done after 2 hours of condition at 15°C-35°C, R.H. 25%~75%)</p>
<p>7.6 Thermal Shock Test</p>	<p>After exposure at -40°C for 30 minutes, at +125°C for 30 minutes (change time 20 seconds) 32 cycles, sensitivity should vary within <math>\pm 3</math>dBFS from initial sensitivity(IEC 60068-2-14:2009). (The measurement to be done after 2 hours of condition at 15°C-35°C, R.H. 25%~75%)</p>
<p>7.7 Reflow Test</p>	<p>Adopt the reflow curve of item 12.3, after three reflows, sensitivity should vary within <math>\pm 2</math>dBFS from initial sensitivity(Refer to customer's request). (The measurement to be done after 2 hours of condition at 15°C-35°C, R.H. 25%~75%)</p>
<p>7.8 Electrostatic Discharge Test</p>	<p>Under C=150pF, R=330ohm. Air discharge to case with<math>\pm 8</math>kV and contact discharge to I/O terminals with<math>\pm 2</math>kV, 10 times, Grounding. Sensitivity should vary within <math>\pm 3</math>dBFS from initial sensitivity (IEC61000-4-2:2008).</p>

## 8 Package

### 8.1 Tape Specification



The Dimensions as Follows:

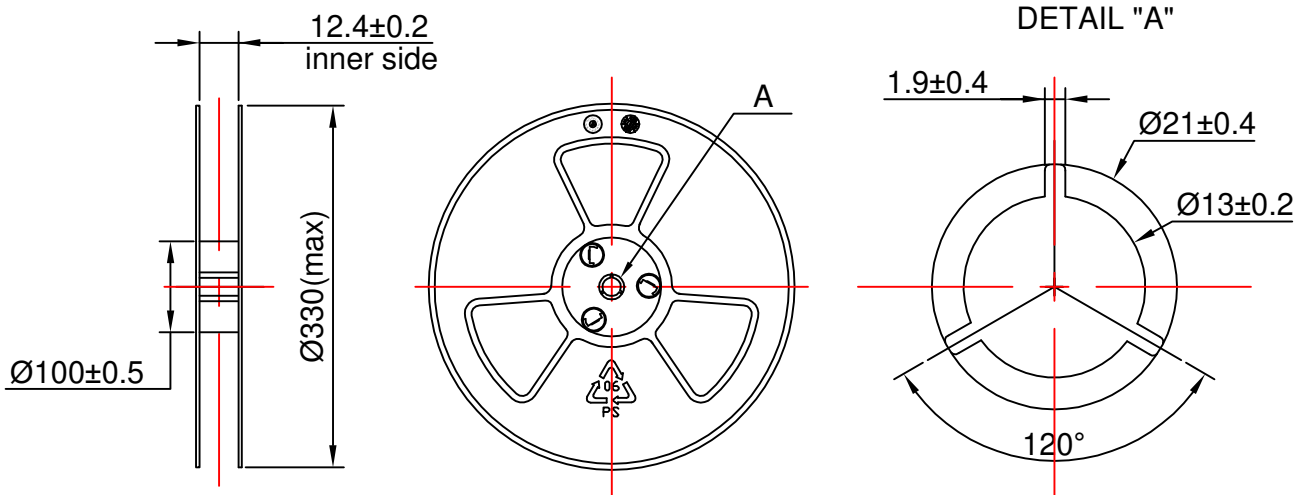
ITEM	W	E	F	$\phi D0$	P2
DI M (mm)	12.00±0.30	1.75±0.10	5.50±0.05	1.50 <sup>+0.10</sup> <sub>0</sub>	2.00±0.10
ITEM	P0	10P0	P1	A0	B0
DI M (mm)	4.00±0.10	40.00±0.20	4.00±0.10	2.60±0.05	4.10±0.05
ITEM	K0	T			
DI M (mm)	1.35±0.10	0.3±0.05			

**8.2 Reel Dimension**

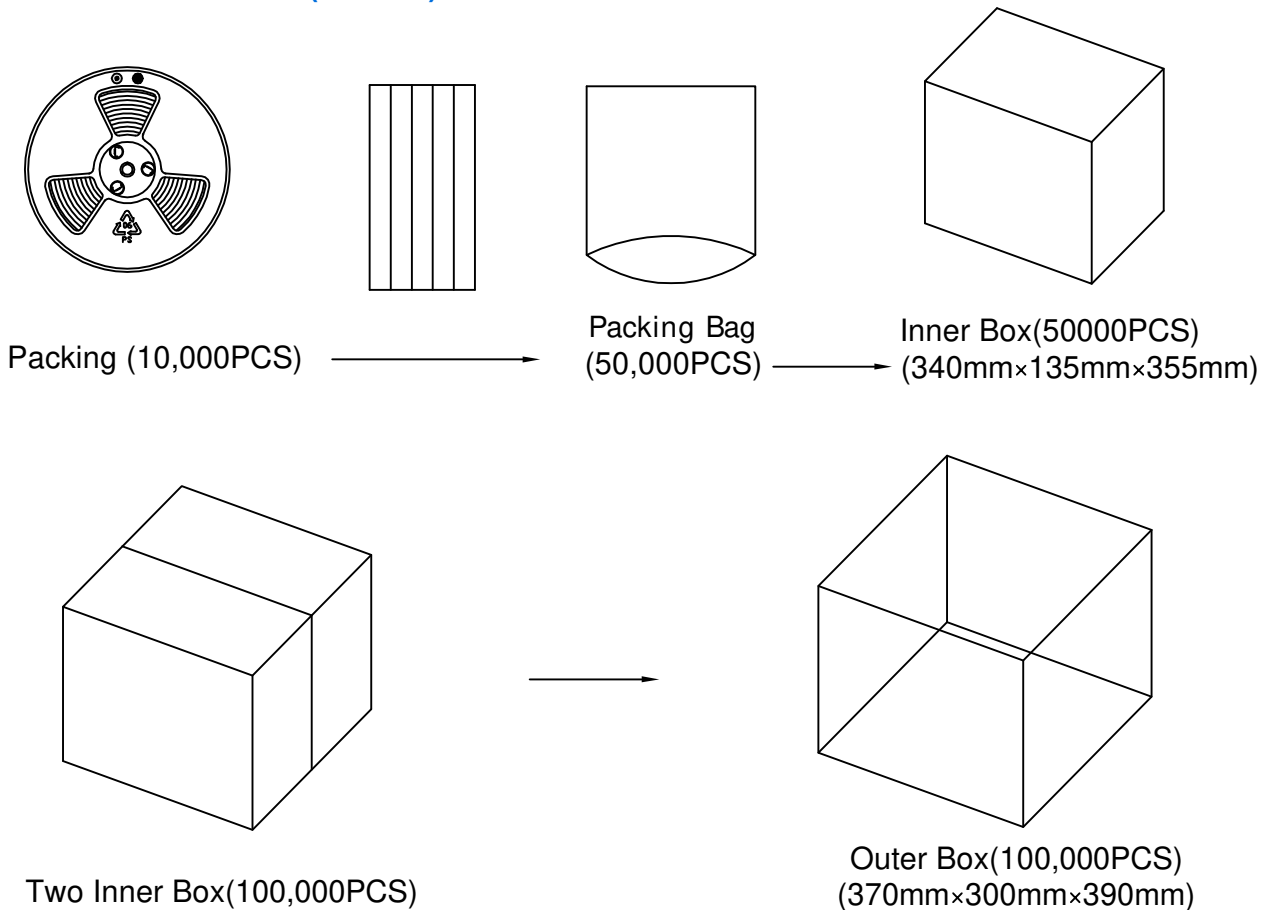
7" reel for sample stage

13" reel will be provided for the mass production stage

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

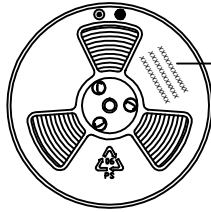


**8.3 The Content of Box(13" reel)**



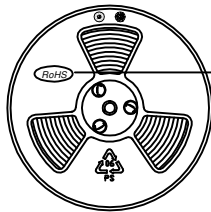
8.4 Packing Explain

8.4.1 The Label Content of the Reel



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

8.4.2 The RoHS Label



RoHS Compliance &  
Halogen Free Mark

9 Storage and Transportation

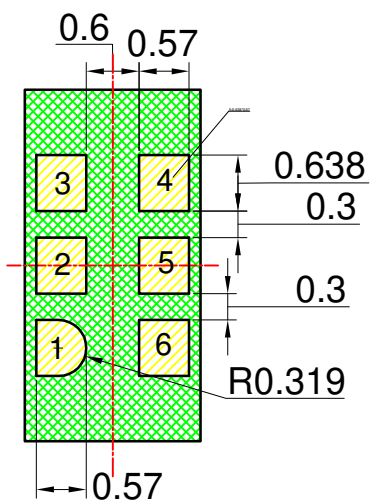
- 9.1 Keep MEMS MIC in warehouse with less than 75% humidity and without sudden temperature change, acid air, any other harmful air or strong magnetic field. Recommend storage period no more than 1 year and floor life(out of bag) at factory no more than 4 weeks.
- 9.2 The MEMS MIC with normal pack can be transported by ordinary conveyances. Please protect products against moist, shock, sunburn and pressure during transportation.
- 9.3 Storage Temperature Range: -40°C ~ +70°C
- 9.4 Operating Temperature Range: -40°C ~ +100°C

**Note1:** MSL(moisture sensitivity level) Class 1(IPC/JEDEC-J-STD-020 Revision C)

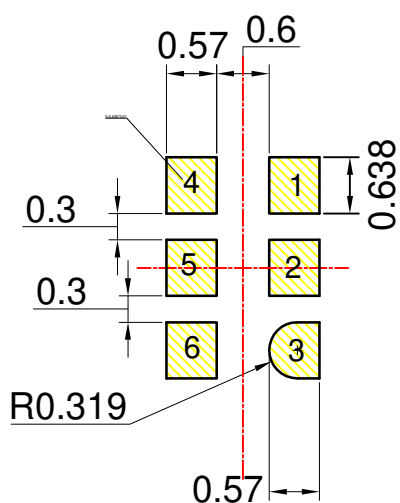
**Note2:** Static sensitive device

## 10 Land Pattern Recommendation

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



### 10.2 Recommended Soldering Surface Land Pattern( Unit:mm)

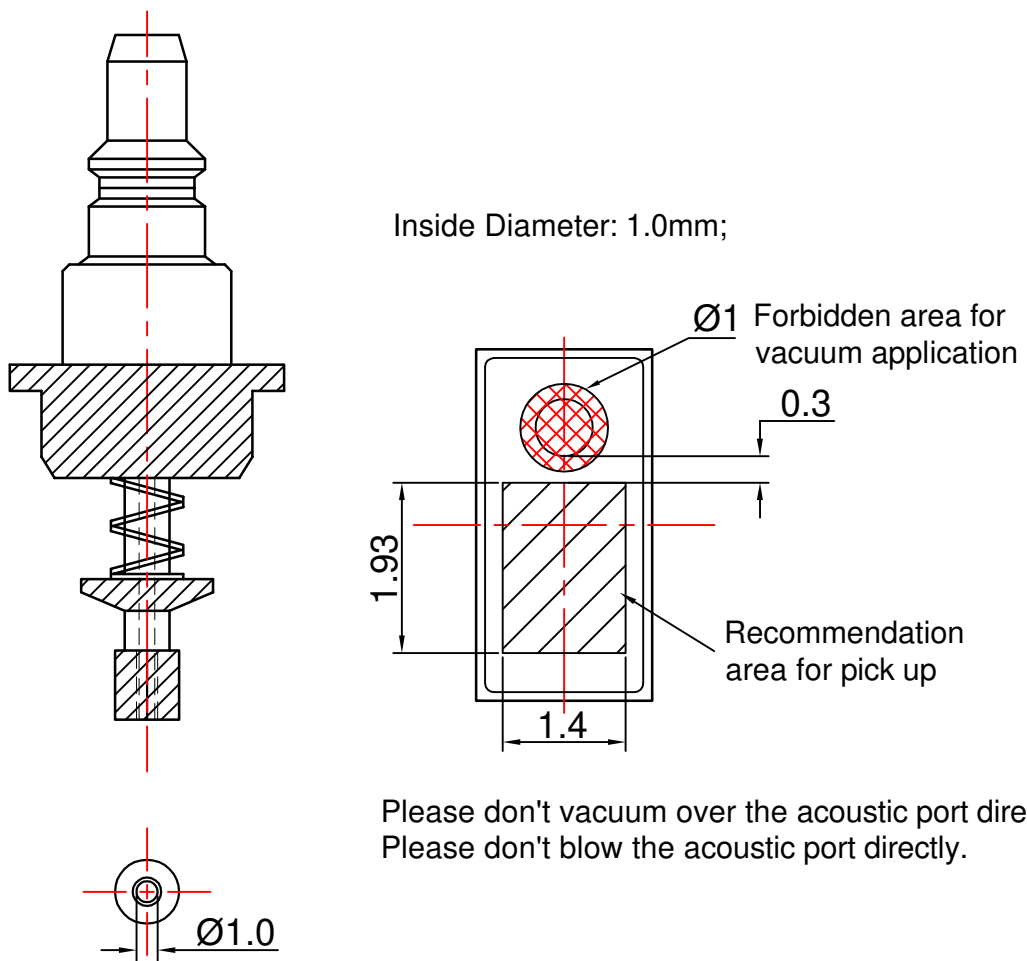


## 11 Soldering Recommendation

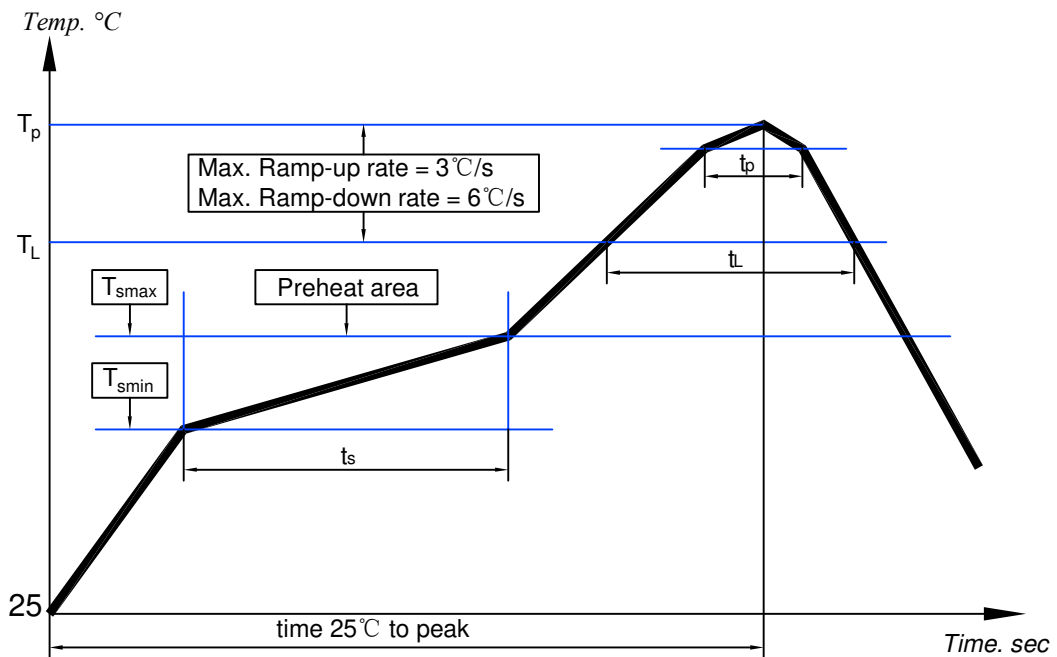
### 11.1 Soldering Machine Condition

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

### 11.2 The Drawing and Dimension of Nozzle



11.3 Reflow Profile



Key Features of The Profile:

Average Ramp-up rate( $T_{smax}$ to $T_p$ )	3°C/s max.
Preheat : Temperature Min( $T_{smin}$ ) Temperature Max( $T_{smax}$ ) Time( $T_{smin}$ to $T_{smax}$ )( $t_s$ )	150°C 200°C 60~180s
Time maintained above : Temperature( $T_L$ ) Time( $t_L$ )	217°C 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 Cautions When Using MEMS MIC

### 12.1 Board Wash Restrictions

It is very important not to wash this silicon microphone, otherwise this could damage the microphone.

### 12.2 Sound Hole Protection

It is very important not to operate vacuum and air blow into sound hole(without any covering over sound holes), otherwise this could damage the microphone. And it is necessary to be careful about foreign substances into sound hole inside silicon microphone.

### 12.3 Wire width Adaption

It is needed to adjust the dumping resistance according to the wire length and wire tod,etc. when using.

It is also necessary to insert dumping resistance in the Data line located adjacent to the microphone according to circumstances.

### 12.4 Ultrasonic Restrictions

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

## 13 Output Inspection Standard

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