Specification of MEMS Microphone

(RoHS Compliance & Halogen Free)

Customer Name :

Customer Model :

GoerTek Model : SD18OB371-041

GoerTek			CUSTOMER APPROVAL
DESIGN	Hubery	2018.06.06	
CHECK	Jenny	2018.06.06	
STANDARD	Sweety	2018.06.06	
APPROVE	Worden	2018.06.06	

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Restricted

1 Security Warning

2 Publication History

Version	Description	Date	Author	Approved
1.0	New Design	2017.10.13	Toler	Worden
2.0	Add the lower limit of SNR in 3.1 Extend FR to 20kHz in 3.3	2017.10.27	Toler	Worden
3.0	Update the switching CLK frequencies in 3.5	2018.05.10	Rischel	Worden
4.0	Add the Performance Curves in 3.6	2018.06.06	Hubery	Worden

Contents

1 Introduction

MEMS MIC which is able to endure reflow temperature up to 260 ℃ 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 (V_{DD}=1.8V, f_{CLK}=2.4MHz/768kHz, L=50 cm)

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

3 Acoustic and Electrical Characteristics

3.1 Standard Mode

（Test Condition：V_{DD}=1.8V, f_{CLK}=2.4MHz,Decimation=64X）

Item	Symbol	Test Conditions	Min	Typ	Max	Unit
Sensitivity	S	94dBSPL@1kHz	-38	-37	-36	dBFS (Note 1)
Current Consumption (Note 2)	I	f_{CLK}=2.4MHz	-	860	1100	μA
S/N Ratio	SNR	94dBSPL@1kHz A-Weighting	63.5	65	-	dB
Distortion	THD	94dB SPL@1kHz，S=Typ	-	-	1	%
Acoustic Overload Point	AOP	10% THD@1kHz，S=Typ	-	132	-	dBSPL
Power Supply Rejection	PSR	100mVpp Squarewave @217Hz A-weighting	-	-91	-	dBFS
Low Frequency Roll-off	LFRO	-3dB corner refrence to 1kHz sensitivity	25	35	45	Hz

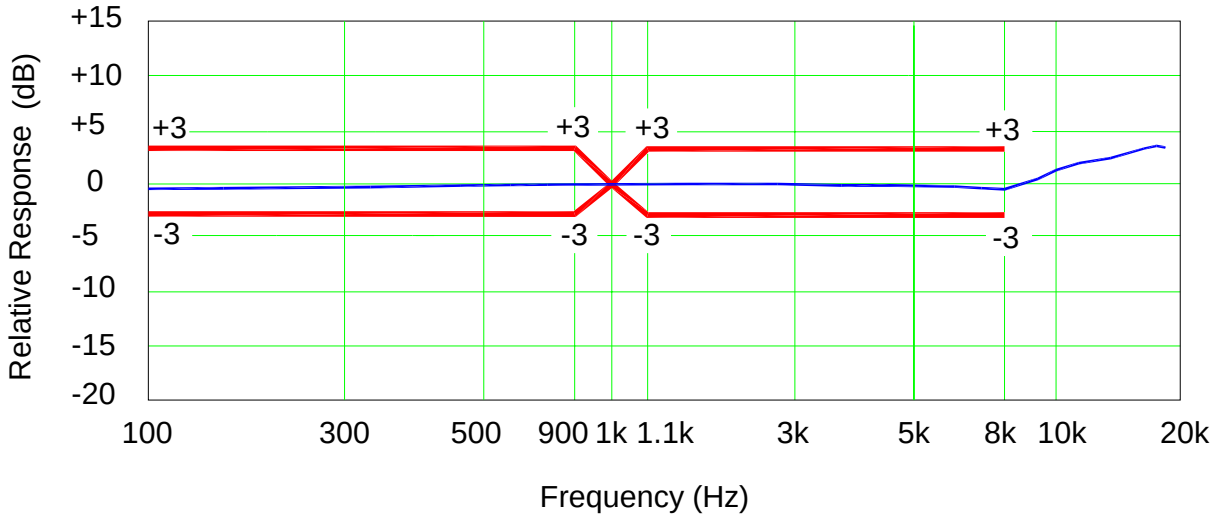
3.2 Low Power Mode

（Test Condition：V_{DD}=1.8V, f_{CLK}=768kHz,Decimation=64X）

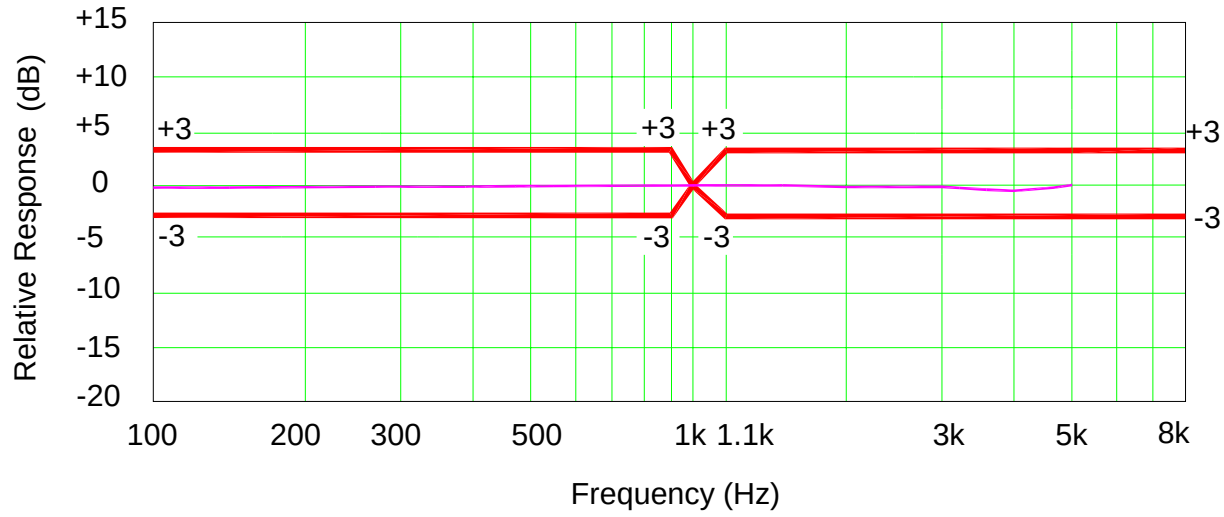
Item	Symbol	Test Conditions	Min	Typ	Max	Unit
Sensitivity	S	94dBSPL@1kHz	-22	-21	-20	dBFS (Note 1)
Current Consumption (Note 2)	I	f_{CLK}=768kHz	-	-	350	μA
S/N Ratio	SNR	94dBSPL@1kHz A-Weighting	-	63.5	-	dB
Distortion	THD	94dB SPL@1kHz，S=Typ	-	-	1	%
Acoustic Overload Point	AOP	10% THD@1kHz，S=Typ	-	117	-	dB SPL
Power Supply Rejection	PSR	100mVpp Squarewave @217Hz A-weighting	-	-75	-	dBFS

3.3 Frequency Response Curve and Limits

Typical Free Field Response
Normalized to 1kHz
Standard Mode V_{DD}=1.8V, f_{CLK}=2.4MHz, Decimation Rate=64x



Typical Free Field Response
Normalized to 1kHz
Low Power Mode V_{DD}=1.8V, f_{CLK}=768kHz, Decimation Rate=64x



3.4 Microphone Interface Specifications

Item	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Logic High Level	V_{IH}		0.65XV_{DD}	-	V_{DD}+0.3	V
Input Logic Low Level	V_{IL}		-0.3	-	0.35XV_{DD}	V
Output Logic High Level	V_{OH}		0.7XV_{DD}	-	-	V
Output Logic Low Level	V_{OL}		-	-	0.3XV_{DD}	V
Clock Duty Cycle		f_{CLK}＜3MHz	40	-	60	%
		f_{CLK}≥3MHz	48	-	52	%
Clock Rise/Fall Time			-	-	13	nS
Delay Time for Data Driven	t_{DD}	Delay time from CLOCK edge (50% VDD) to DATA driven.	40	-	80	nS
Delay Time for Data High-Z	t_{HZ}	Delay time from CLOCK edge (50% VDD) to DATA high impedance state.	5	-	30	nS
Delay Time for Data Valid	t_{DV}	Delay time from CLOCK edge (0.50 x VDD) to DATA valid (<0.30 x VDD or >0.70 x VDD)	-	-	100	nS

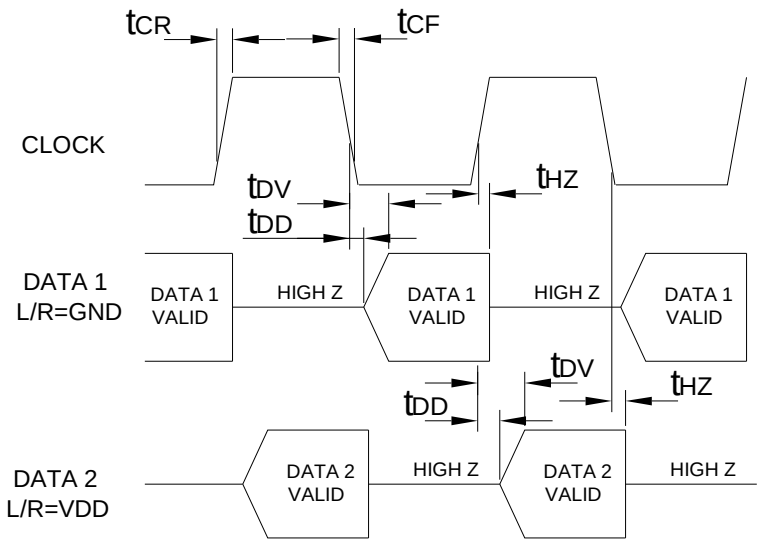
3.5 General Microphone Specifications

Item		Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Voltage		V_{DD}		1.62	-	3.6	V
Clock Frequency Range	Standby Mode			30	-	330	kHz
	Low Power Mode			450	768	850	kHz
	Standard Mode			1.38	1.536	1.7	MHz
				2.1	2.4	2.6	MHz
				2.9	3.072	4.8	MHz
Directivity				Omni-directional			
Polarity			Increasing Sound	Increasing density of 1's			
Data Format				½ Cycle PDM 1bit			
Short Circuit Current		I_{sc}	Grounded Data Pin	1	-	20	mA
Output Load Capacitance on DATA		C_{load}		-	-	100	pF
Wake-up Time			f_{CLK}≥350kHz	-	-	50	ms
Start-up Time			Time to start up in either modes (Low Power- and Normal Mode) after VDD and CLOCK have been applied.	-	-	50	ms
Mode-Change Time			Time to switch between modes (Clock Off-, Low Power-, and Normal Mode). VDD remains on during the mode switch.	-	-	50	ms

Note 1. dBFS = 20xlog (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



3.6 Performance Curves

(Test Condition： V_{DD}=1.8V, f_{CLK}=2.4MHz,SELECT grounded)

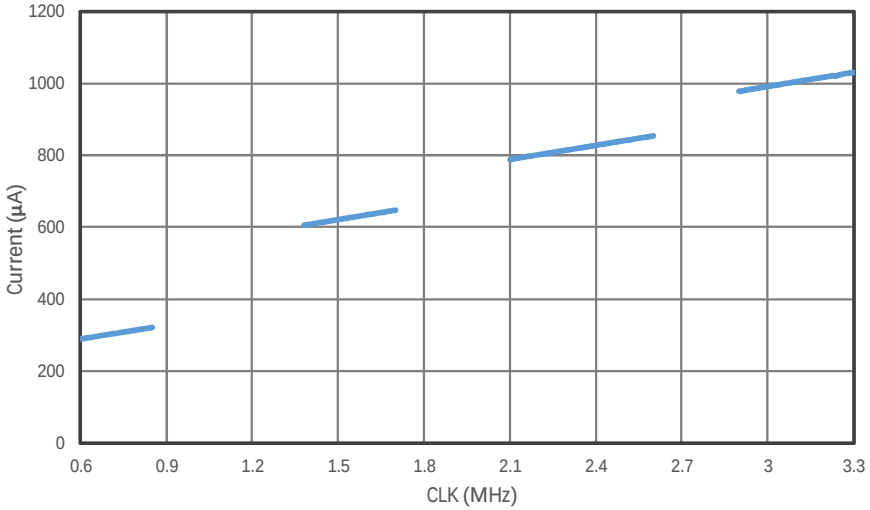


Figure 1: Typical Idd vs CLK

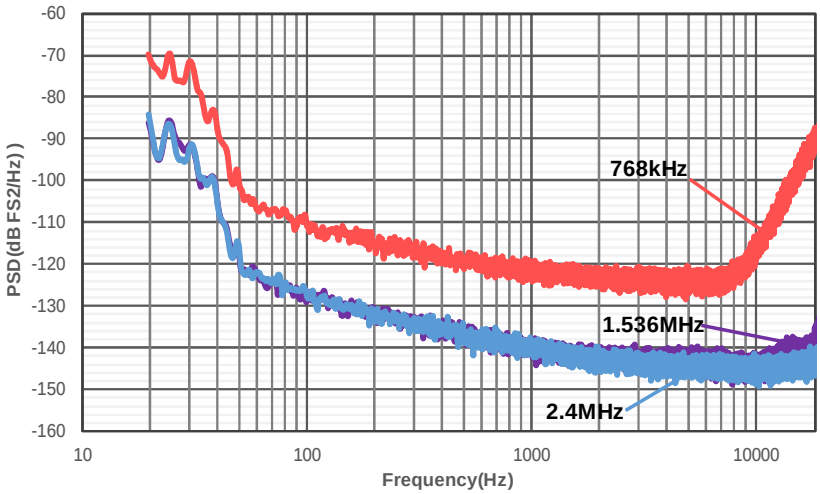


Figure 2: Noise Floor Power Spectral Density

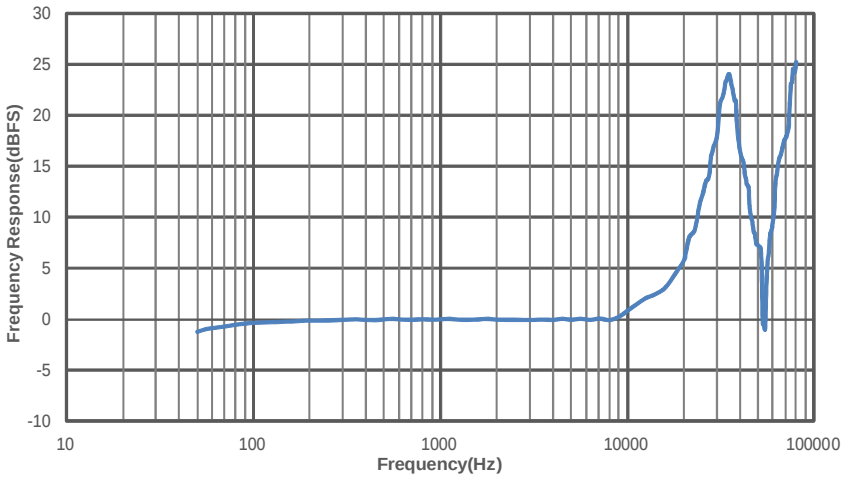
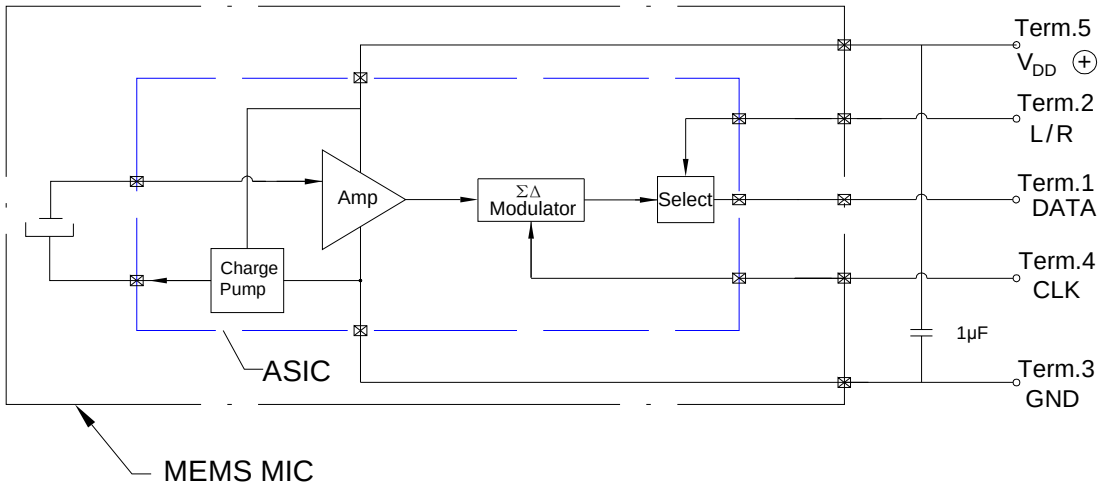
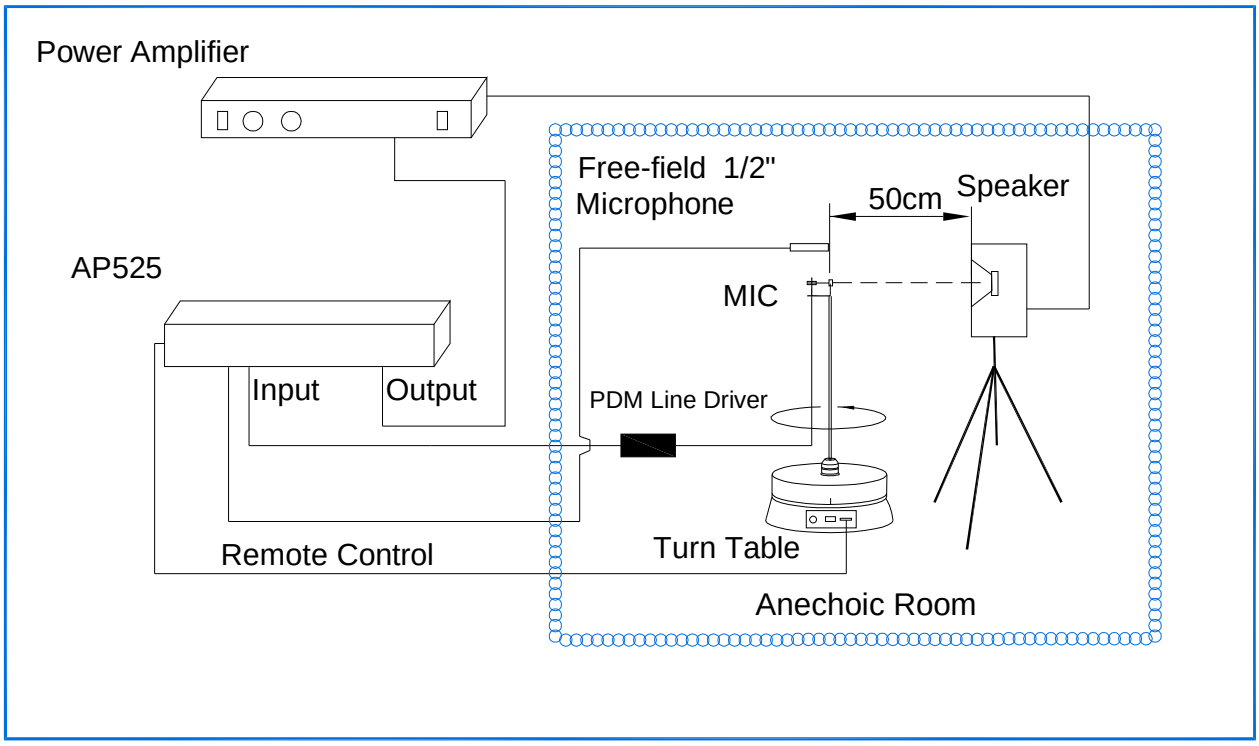


Figure 3: Frequency Response up to 80kHz (Relative to 1kHz)

4 Measurement Circuit

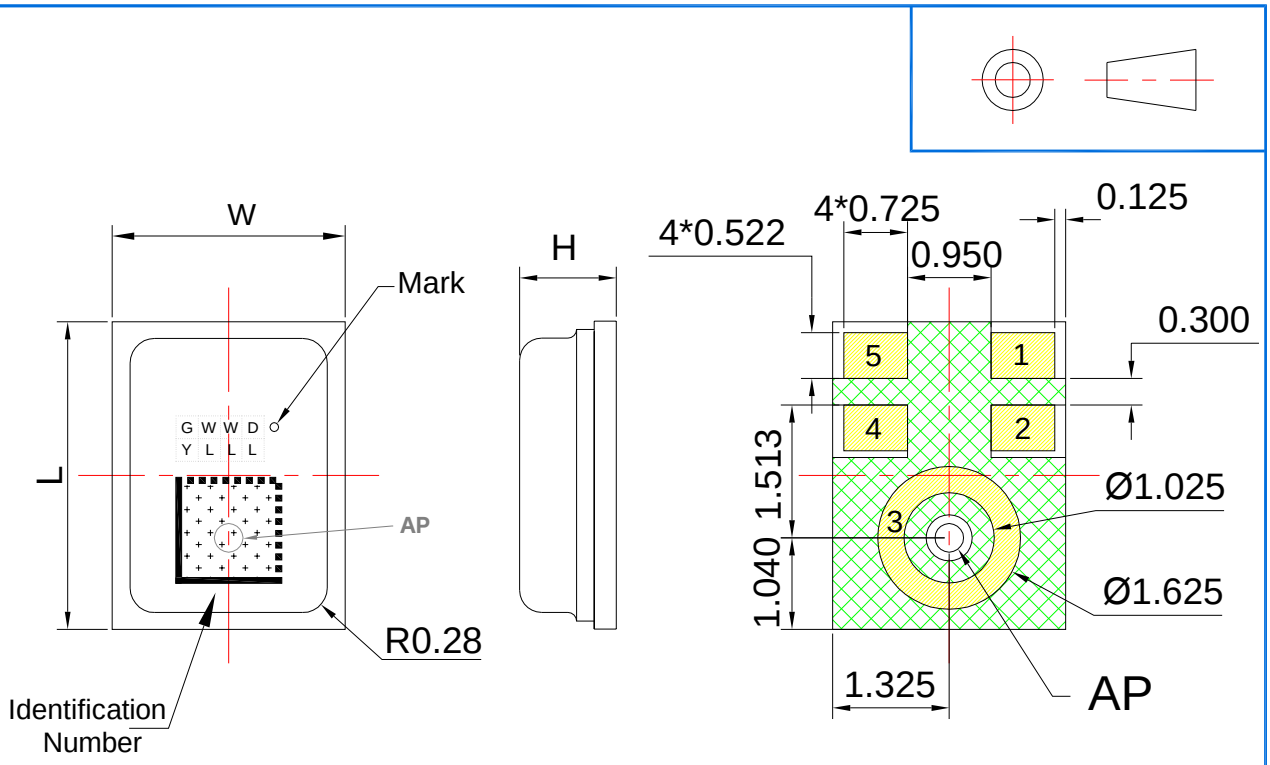


5 Test Setup Drawing



6 Mechanical Characteristics

6.1 Appearance Drawing (Unit: mm)



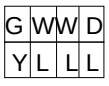
Pin Output	
Pin#	Function
1	DATA
2	L/R
3	GND
4	CLK
5	V_{DD}

ITEM	DIMENSION	TOLERANCE	UNTIS
LENGTH(L)	3.50	±0.10	mm
WIDTH(W)	2.65	±0.10	mm
HEIGHT(H)	0.98	±0.10	mm
ACOUSTIC PORT(AP)	Ø0.325	±0.05	mm

Note: 1. Tolerance ±0.1 unless otherwise specified.

2. Identification Number Convention: Job Identification Number.

Identification Number



G: GoerTek WW:Week D:Day

Y:Year LLL: Serial Number

2D Code

6.2 Weight

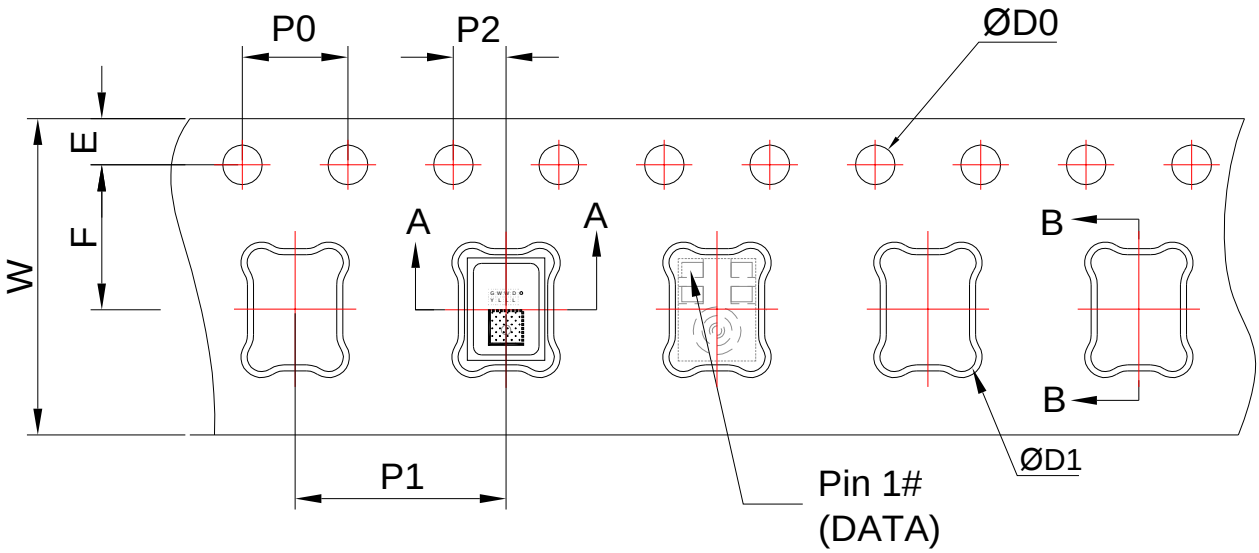
The weight of the MIC is Less than 0.05g.

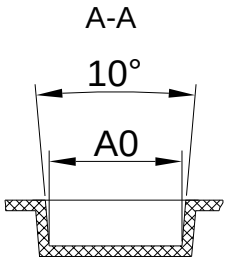
7 Reliability Test

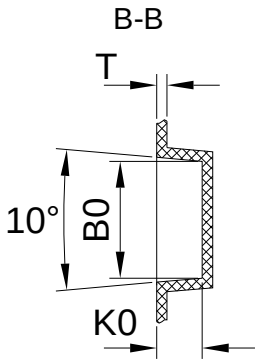
7.1 Vibration Test	To be no interference in operation after vibrations, 4 cycles, from 20 to 2,000Hz in each direction(X,Y,Z), 48 minutes, using peak acceleration of 20g, sensitivity should vary within ±3dB from initial sensitivity. (The measurement to be done after 2 hours of condition at 15℃-35℃, R.H. 25%～75%)
7.2 Drop Test	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 ±3dB from initial sensitivity. (The measurement to be done after 2 hours of condition at 15℃-35℃, R.H. 25%～75%)
7.3 Temperature Test	a) After exposure at +125℃ for 200 hours, sensitivity should vary within ±3dB from initial sensitivity. (The measurement to be done after 2 hours of condition at 15℃-35℃, R.H. 25%～75%) b) After exposure at -40℃ for 200 hours, sensitivity should vary within ±3dB from initial sensitivity. (The measurement to be done after 2 hours of condition at 15℃-35℃, R.H. 25%～75%)
7.4 Humidity Test	After exposure at +85℃ and 85% relative humidity for 200 hours, sensitivity should vary within ±3dB from initial sensitivity. (The measurement to be done after 2 hours of condition at 15℃-35℃, R.H. 25%～75%)
7.5 Mechanical Shock Test	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 ±3dB from initial sensitivity. (The measurement to be done after 2 hours of condition at 15℃-35℃, R.H. 25%～75%)
7.6 Thermal Shock Test	After exposure at -40℃ for 30 minutes, at +125℃ for 30 minutes (change time 20 seconds) 32 cycles, sensitivity should vary within ±3dB from initial sensitivity. (The measurement to be done after 2 hours of condition at 15℃-35℃, R.H. 25%～75%)
7.7 Reflow Test	Adopt the reflow curve of item 12.3, after three reflows, sensitivity should vary within ±2dB from initial sensitivity. (The measurement to be done after 2 hours of condition at 15℃-35℃, R.H. 25%～75%)
7.8 Electrostatic Discharge Test	Under C=150pF, R=330ohm. Air discharge to case with±8kV and contact discharge to I/O terminals with±2kV , 10 times, Grounding. Sensitivity should vary within ±3dB from initial sensitivity.

8 Package

8.1 Tape Specification







The Dimensions as Follows:

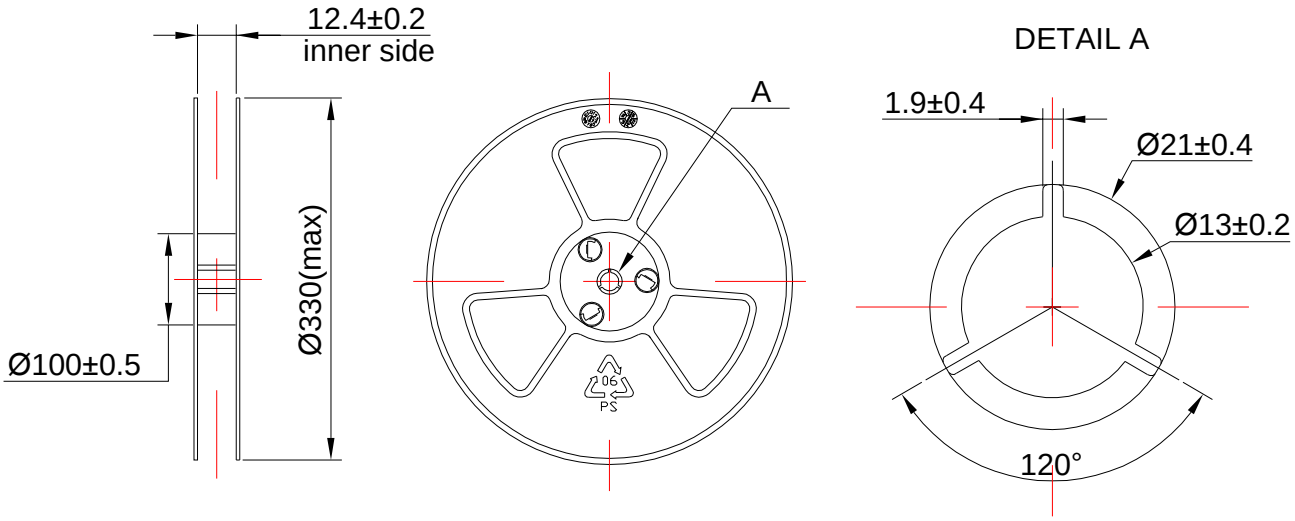
ITEM	W	E	F	ØD0	K0
DIM(mm)	12.0±0.30	1.75±0.10	5.5±0.05	$1.50^{+0.10}_{0}$	1.30±0.10
ITEM	P0	10P0	P1	A0	B0
DIM(mm)	4.00±0.10	40.00±0.20	8.00±0.10	2.85±0.05	3.75±0.05
ITEM	P2	T			
DIM(mm)	2.00±0.05	0.30±0.05			

8.2 Reel Dimension

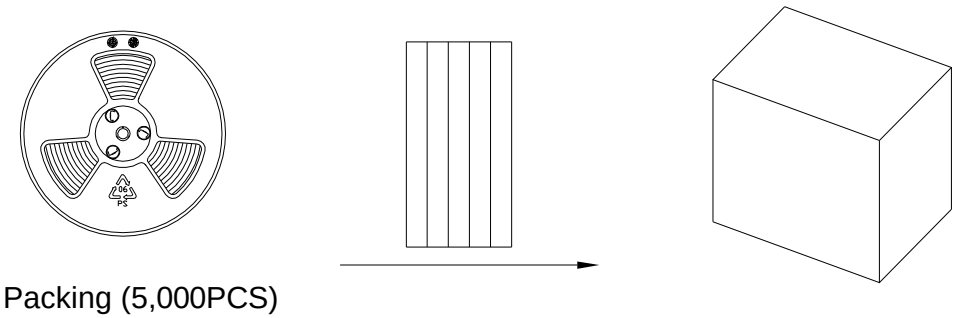
7" reel for sample stage

13" reel will be provided for the mass production stage

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

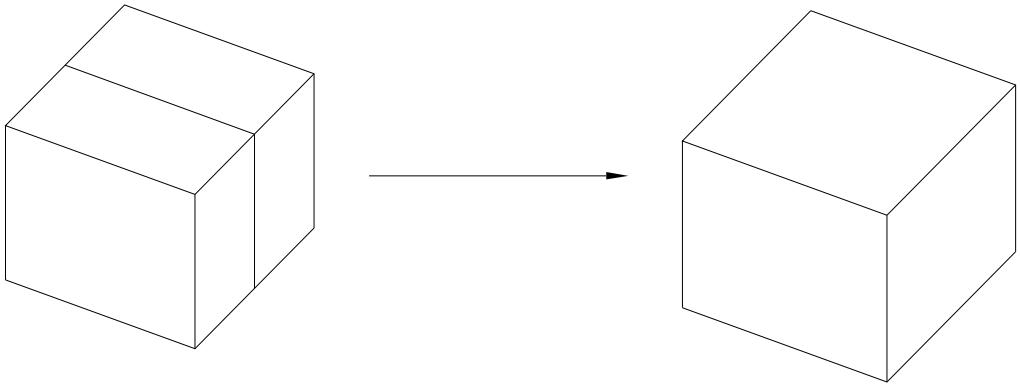


8.3 The Content of Box(13" reel)



Packing (5,000PCS)

Inner Box(25,000PCS)
(340mm×135mm×355mm)

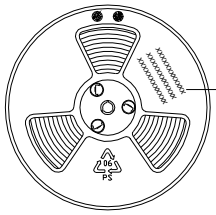


Two Inner Box(50,000PCS)

Outer Box(50,000PCS)
(370mm×300mm×390mm)

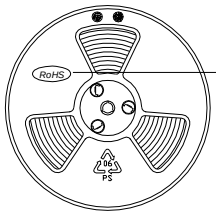
8.4 Packing Explain

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 HF
Compliance 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.

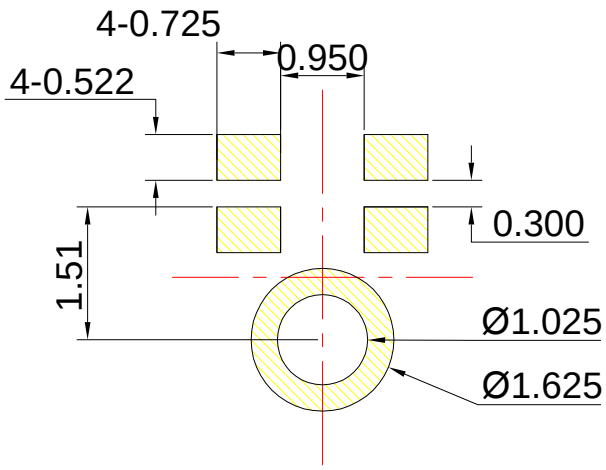
9.2 The MEMS MIC with normal pack can be transported by ordinary conveyances. Please protect products against moist, shock, sunburn and pressure during transportation.

9.3 Storage Temperature Range： -40℃～+70℃

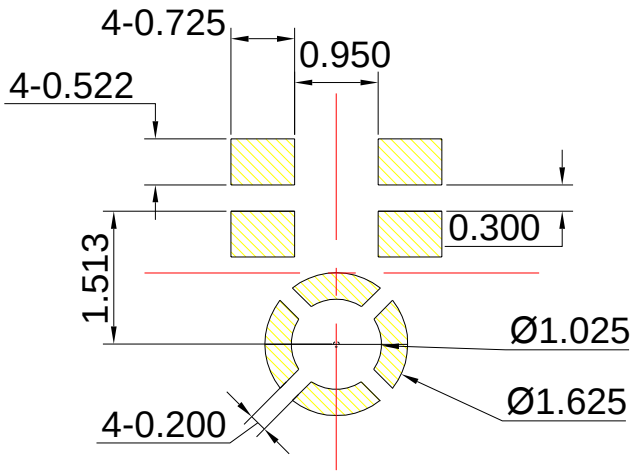
9.4 Operating Temperature Range： -40℃～+70℃

10 Land Pattern Recommendation

10.1 Recommended Land Pattern(Unit:mm)



10.2 Recommended Solder Stencil Pattern（Unit:mm)

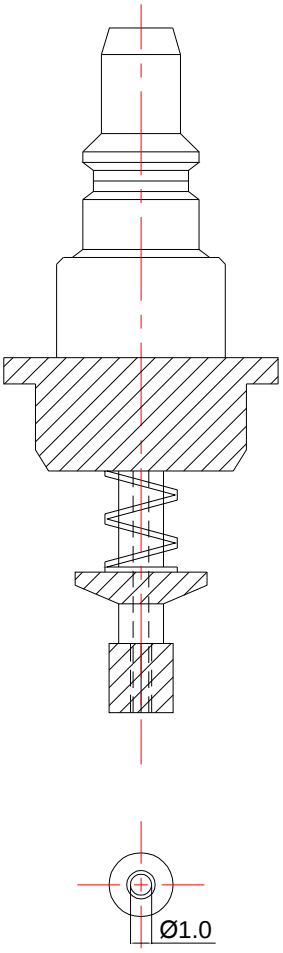


11 Soldering Recommendation

11.1 Soldering Machine Condition

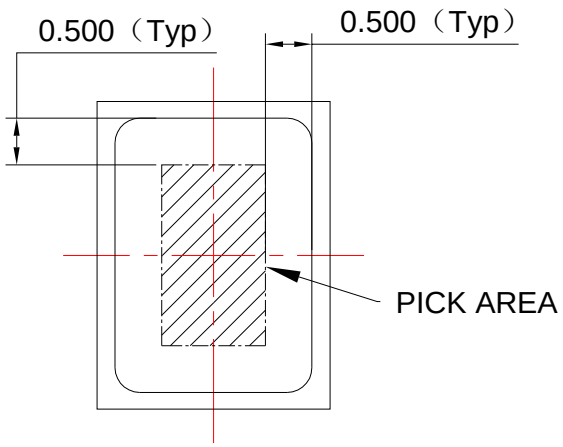
Temperature Control	8 zones
Heater Type	Hot Air
Solder Type	Lead-free

11.2 The Drawing and Dimension of Nozzle

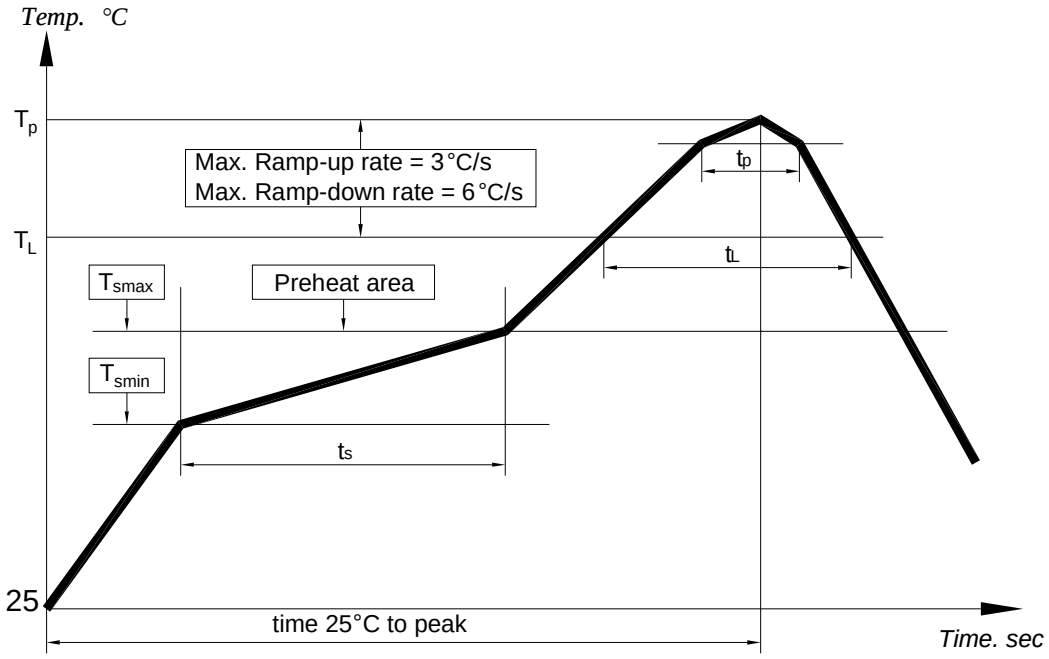


Inside Diameter: Ø1.0mm;
Acoustic Port：Ø0.325mm；
Vacuum Degree of Nozzle：-80k~-90kPa；

Please don't vacuum over the acoustic port directly.
Please don't blow the acoustic port directly.



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 : Tempreature(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

12.1 Board Wash Restrictions

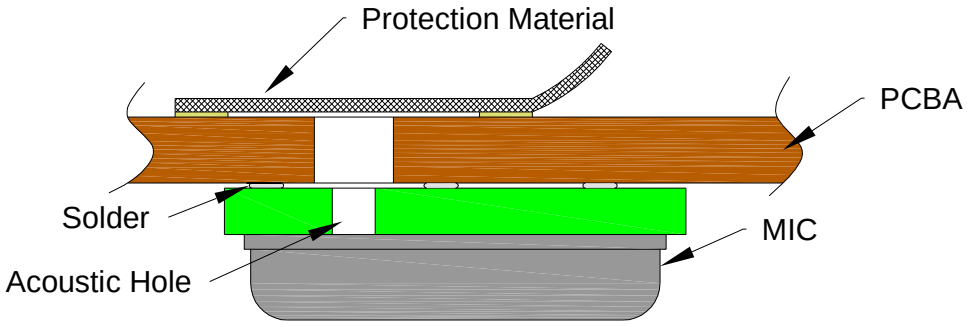
It is very important not to wash this microphone, otherwise this could damage the microphone.

12.2 Ultrasonic Restrictions

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

12.3 Acoustic Port Protection

It is very important not to operate vacuum and air blow into acoustic port(without any covering over acoustic port), otherwise this could damage the microphone.
And it is necessary to be careful about foreign substances into acoustic port .Please add protection material (e.g. PET) on the acoustic hole to protect it after SMT , refer to below pictures, take it away before test, then attach it again until the end of assembly.



13 Output Inspection Standard

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