Specification of SMD

Digital Microphone

(RoHS Compliance & Halogen Free)

Customer Name ：

Customer Model ：

Goermicro Model : SD18OB371-077

10644
ISO/TS16949:2009
2551
ISO14001:2004
2728
ISO9001:2008

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Restricted

1 Security Warning

2 Publication History

Version	Description	Date	Author	Approved
1.0	New Design	2019.07.29	Hubery	Sunny
2.0	Update the interface information in 3.4 & Note3 Update acoustic port protection in 12.3	2019.11.19	Hubery	Sunny
3.0	Add low power mode characteristics @1.024MHz in 3.2 Update Clock Rise/Fall Time in 3.4	2020.07.02	Zamp	Sunny
4.0	Update Document Template, Update THD Performance	2021.06.08	Zamp	Jenny
5.0	Update the Logo to Goermicro	2021.08.25	Enoch	Roy

Contents

1 Introduction — 4
2 Test Condition — 4
3 Acoustic and Electrical Characteristics — 4
3.1 Standard Mode — 4
3.2 Low Power Mode — 4
3.3 Frequency Response Curve and Limits — 5
3.4 Microphone Interface Specifications — 6
3.5 Genal Microphone Specifications — 6
4 Measurement Circuit — 8
5 Test Setup Drawing — 8
6 Mechanical Characteristics — 9
6.1 Appearance Drawing — 9
6.2 Weight — 9
7 Reliability Test — 10
7.1 Vibration Test — 10
7.2 Drop Test — 10
7.3 Temperature Test — 10
7.4 Humidity Test — 10
7.5 Mechanical Shock Test — 10
7.6 Thermal Shock Test — 10
7.7 Reflow Test — 10
7.8 Electrostatic Discharge Test — 10
8 Package — 11
8.1 Tape Specification — 11
8.2 Reel Dimension — 12
8.3 The Content of Box — 12
8.4 Packing Explain — 13
9 Storage and Transportation — 13
10 Land Pattern Recommendation — 14
10.1 Recommended Land Pattern — 14
10.2 Recommended Solder Stencil Pattern — 14
11 Soldering Recommendation — 15
11.1 Soldering Machine Condition — 15
11.2 The Drawing and Dimension of Nozzle — 15
11.3 Reflow Profile — 16
12 Cautions — 17
12.1 Board Wash Restrictions — 17
12.2 Ultrasonic Restrictions — 17
12.3 Acoustic Port Protection — 17
13 Output Inspection Standard — 17

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，laptop computers，and other portable electronic devices etc.

2 Test Condition (V_{DD}=1.8V, f_{CLK}=2.4MHz/768kHz/1.024MHz, 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	-	800	1000	μA
S/N Ratio	SNR	94dBSPL@1kHz A-Weighting	-	66	-	dB
Distortion	THD	1%THD@1kHz	-	127	-	dB SPL
Acoustic Overload Point	AOP	10% THD@1kHz，S=Typ	-	132	-	dB SPL
Power Supply Rejection	PSR	100mVpp Squarewave @217Hz A-weighting	-	-101	-	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）

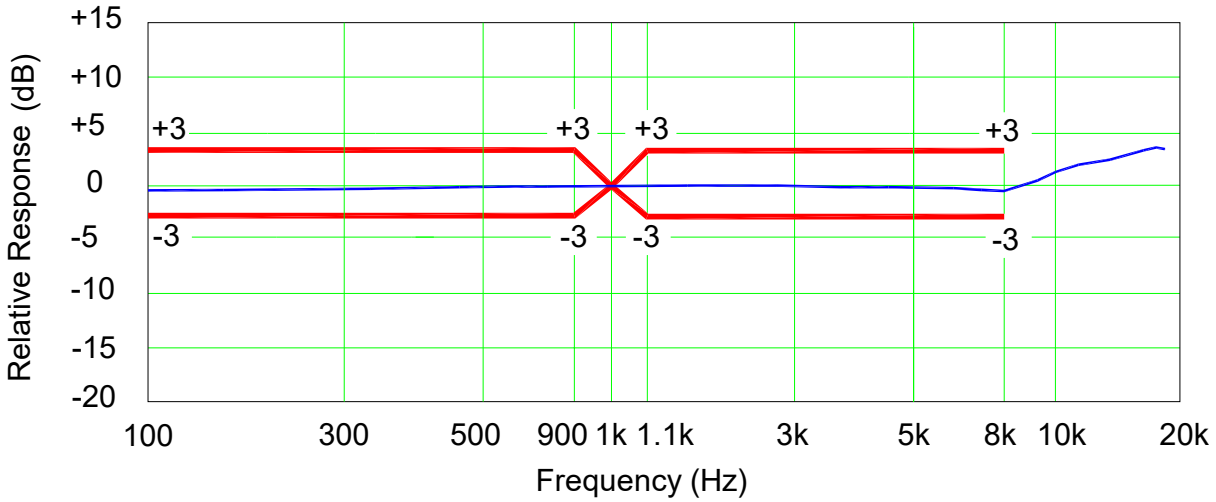
Item	Symbol	Test Conditions	Min	Typ	Max	Unit
Sensitivity	S	94dBSPL@1kHz	-22	-21	-20	dBFS (Note 1)
Current Consumption (Note 2)	I	f_{CLK}=768kHz	-	-	300	μA
S/N Ratio	SNR	94dBSPL@1kHz A-Weighting	-	66	-	dB
Distortion	THD	1%THD@1kHz	-	112		dB SPL
Acoustic Overload Point	AOP	10% THD@1kHz，S=Typ	-	117	-	dB SPL
Power Supply Rejection	PSR	100mVpp Squarewave @217Hz A-weighting	-	-83	-	dBFS

（Test Condition：V_{DD}=1.8V, f_{CLK}=1.024MHz,Decimation=64X）

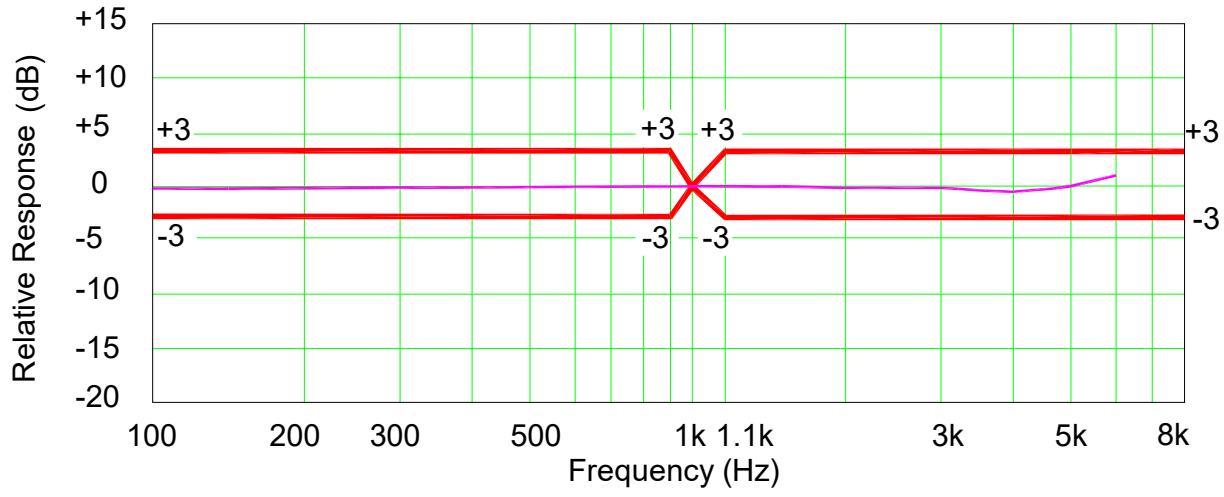
Item	Symbol	Test Conditions	Min	Typ	Max	Unit
Sensitivity	S	94dBSPL@1kHz	-22	-21	-20	dBFS (Note 1)
Current Consumption (Note 2)	I	f_{CLK}=1.024MHz	-	-	350	μA
S/N Ratio	SNR	94dBSPL@1kHz A-Weighting	-	66	-	dB
Distortion	THD	1%THD@1kHz	-	112	-	dB SPL
Acoustic Overload Point	AOP	10% THD@1kHz，S=Typ	-	117	-	dB SPL
Power Supply Rejection	PSR	100mVpp Squarewave @217Hz A-weighting	-	-83	-	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	-	0.3XV_{DD}	V
Output Logic High Level		V_{OH}		0.65XV_{DD}	-	V_{DD}+0.3	V
Output Logic Low Level		V_{OL}		-0.3	-	0.3XV_{DD}	V
Clock Duty Cycle				40	-	60	%
Clock Rise/Fall Time	Low Power Mode	t_{RF}				250	nS
	Standard Mode					50	nS
Delay Time for Data Driven, VDD = 1.8V		t_{DD}	Delay time from CLOCK edge to DATA driven.	18	-	50	nS
Delay Time for Data High-Z, VDD = 1.8V		t_{HZ}	Delay time from CLOCK edge to DATA high impedance state.	5	-	16	nS
Delay Time for Data Valid		t_{DV}	Delay time from CLOCK edge to DATA valid (<0.30 x V_{DD} or >0.70 x V_{DD})	-	-	100	nS

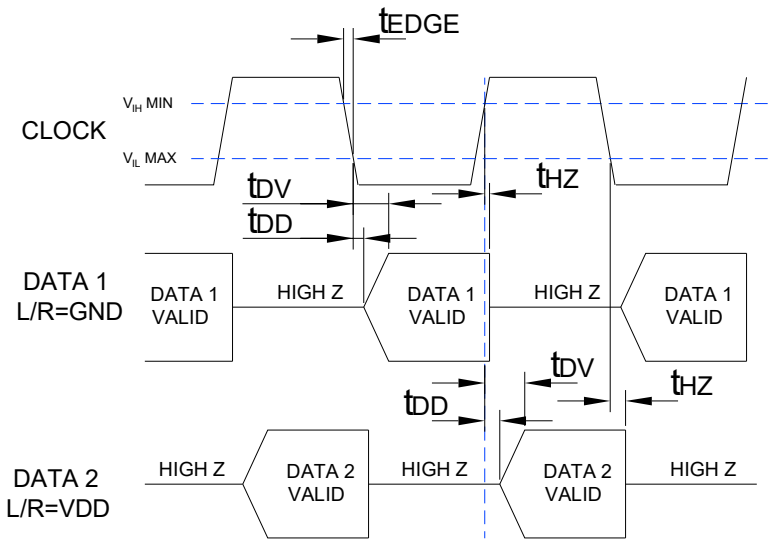
3.5 General Microphone Specifications

Item		Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Voltage		V_{DD}		1.62	-	3.6	V
Clock Frequency Range	Standby Mode			0	-	150	kHz
	Low Power Mode			0.25	0.768	1.2	MHz
	Standard Mode			1.45	-	4.8	MHz
Directivity				Omni-directional			
Polarity			Increasing Sound	Increasing density of 1's			
Data Format				½ Cycle PDM 1bit			
Short Circuit Current			Grounded Data Pin	-	-	20	mA
Output Load Capacitance on DATA		C_{load}		-	-	140	pF
Start-up Time			Time to start up in either modes (Low Power- and Normal Mode) after VDD and CLOCK have been applied.	-	-	50	ms
Restart Time			Time to start up in either modes (Low Power- and Normal Mode) after VDD has been off for more than 10ms, while CLOCK remained on.	-	-	50	ms
Mode-Switch Time			Time to switch between modes (Clock off- Low Power-, and Normal Mode). VDD remains on during the mode switch.	-	-	50	ms

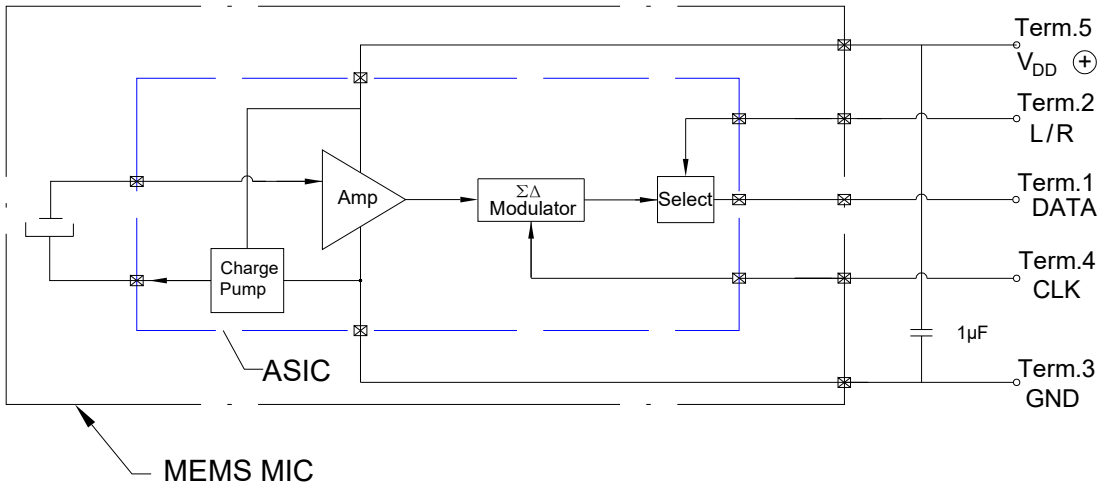
Note 1. dBFS = 20xlog (A/B) where A is the level of the signal, B is the level that corresponds to Full-scale level.

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

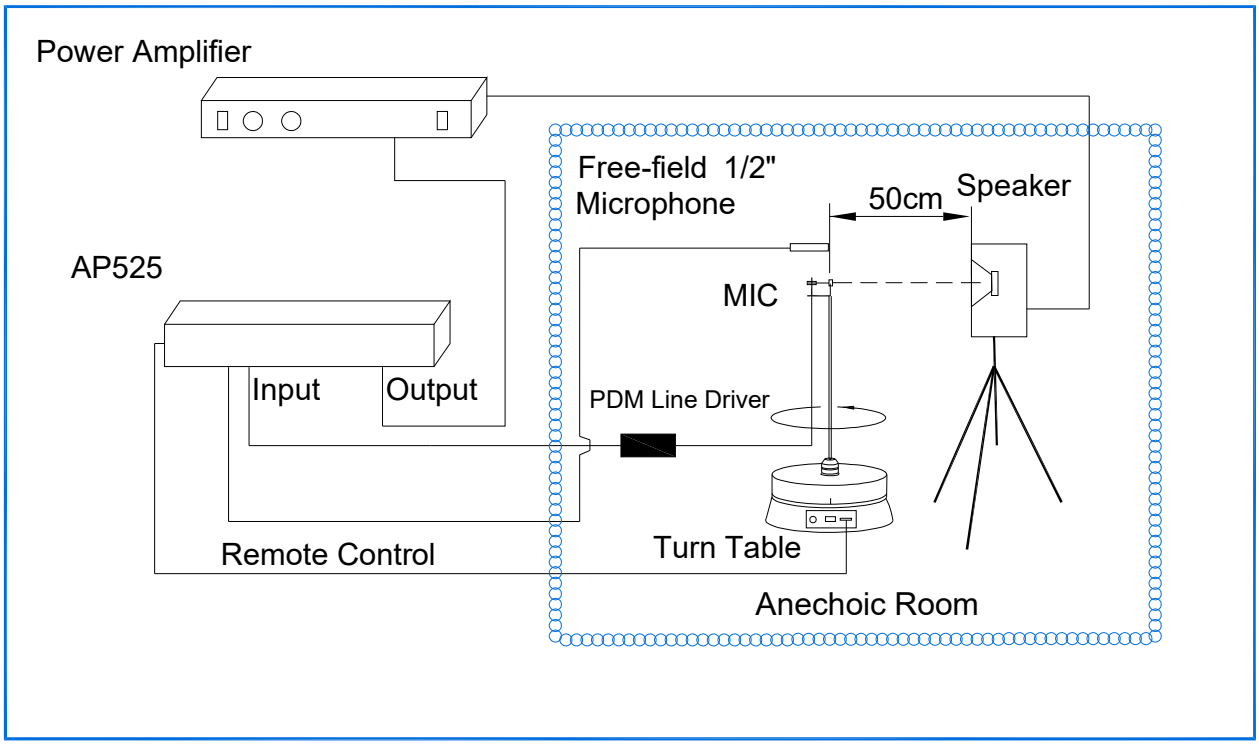
Note 3. Timing



4 Measurement Circuit

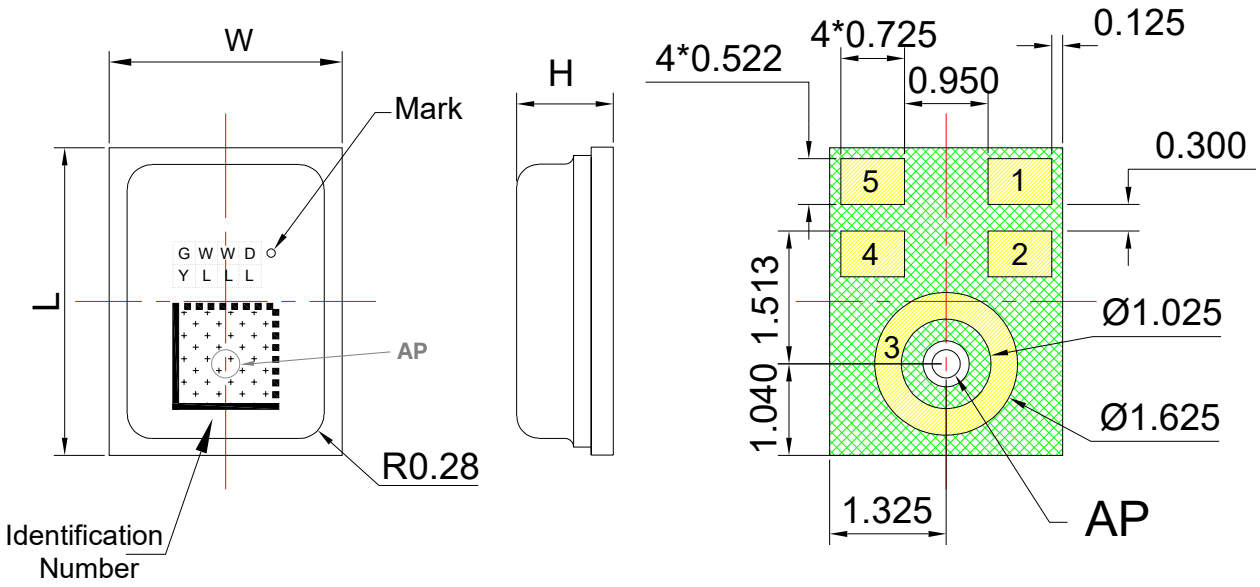


5 Test Setup Drawing



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 | W | W | D | / | Y | L | L | L |

G: Goermicro WW:Week D:Day

Y:Year LLL: Serial Number

2D Code

6.2 Weight

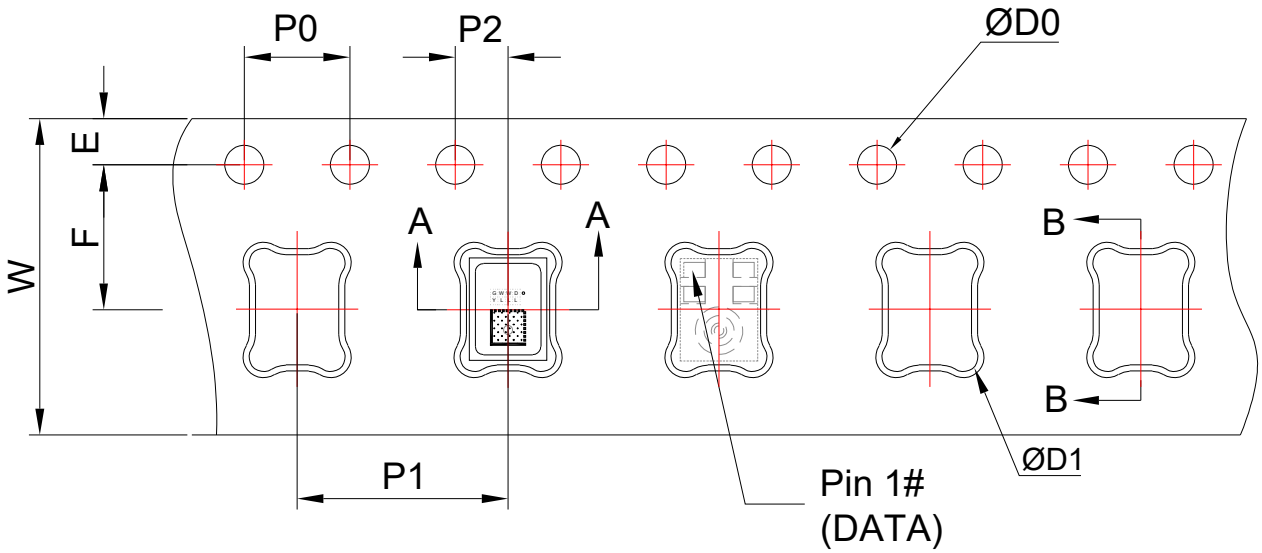
The weight of the MIC is Less than 0.05g.

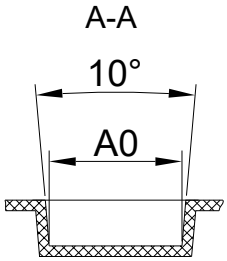
7 Reliability Test

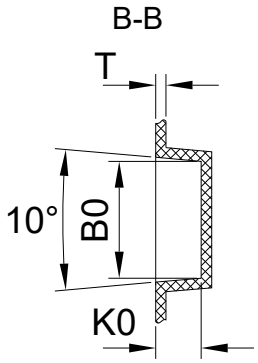
7.1 Vibration Test	To be no interference in operation after vibrations, 4 cycles, from 20 to 2,000Hz in each direction(X,Y,Z), 48 minutes, using peak acceleration of 20g, sensitivity should vary within ±3dBFS from initial sensitivity. (The measurement to be done after 2 hours of condition at 15℃-35℃, 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 ±3dBFS 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 ±3dBFS 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 ±3dBFS 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 ±3dBFS 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 ±3dBFS 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 ±3dBFS 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 ±2dBFS 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 ±3dBFS from initial sensitivity.

8 Package

8.1 Tape Specification







The Dimensions as Follows:

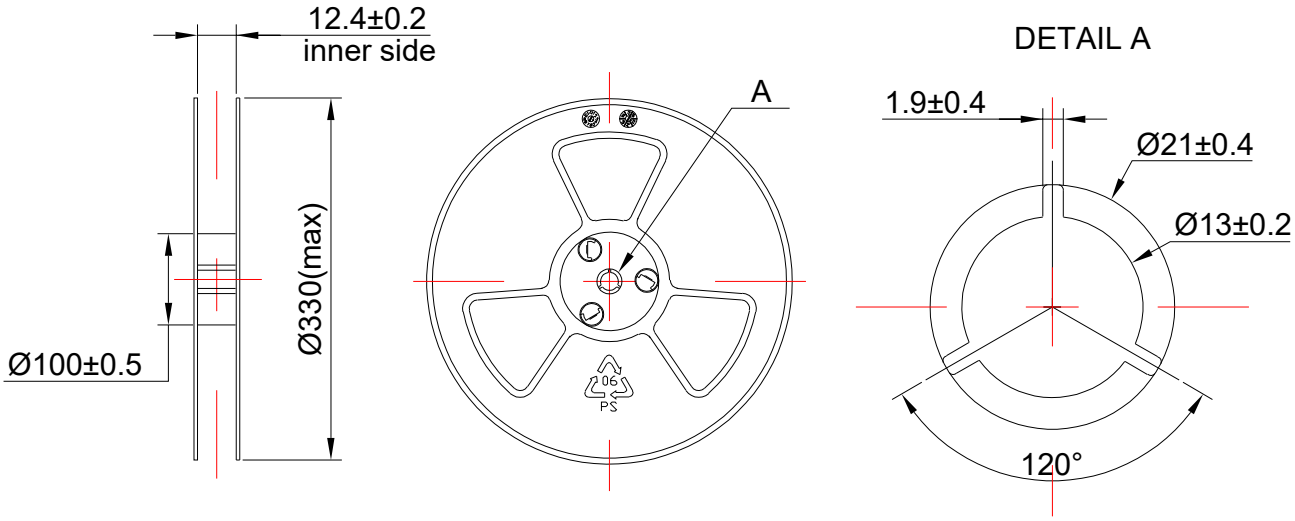
ITEM	W	E	F	ØD0	K0
DIM(mm)	12.0±0.30	1.75±0.10	5.5±0.05	$1.50^{+0.10}_{0}$	1.30±0.10
ITEM	P0	10P0	P1	A0	B0
DIM(mm)	4.00±0.10	40.00±0.20	8.00±0.10	2.85±0.05	3.75±0.05
ITEM	P2	T			
DIM(mm)	2.00±0.05	0.30±0.05			

8.2 Reel Dimension

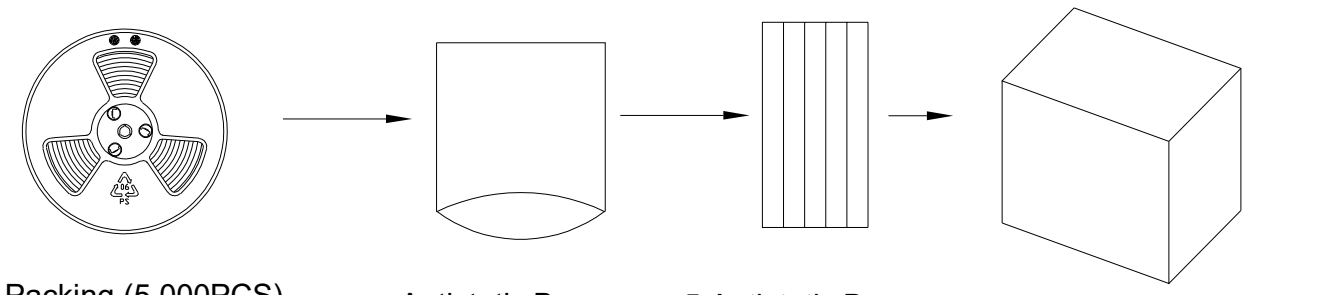
7" reel for sample stage

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)

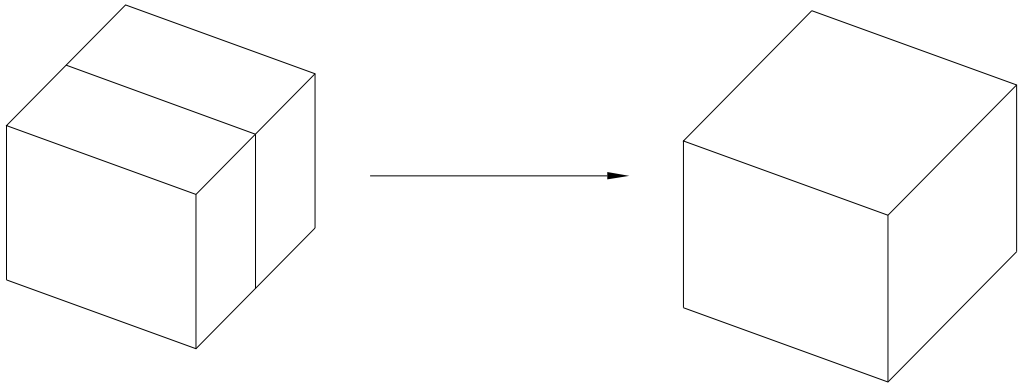


Packing (5,000PCS)

Antistatic Bag
(5,000PCS)

5 Antistatic Bags
(25,000PCS)

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

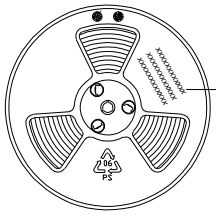


Two Inner Box(50,000PCS)

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

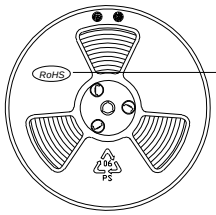
8.4 Packing Explain

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.

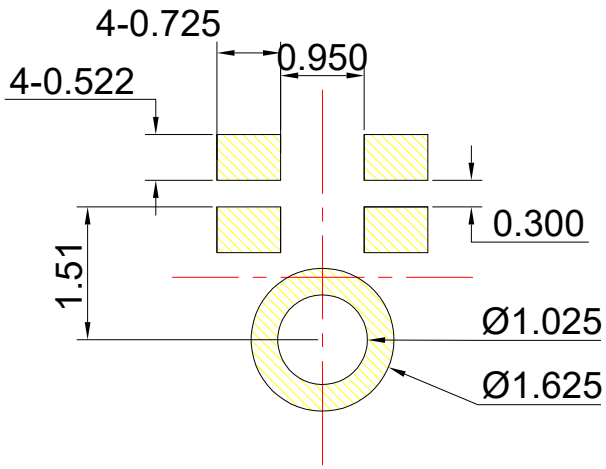
9.2 The MEMS MIC with normal pack can be transported by ordinary conveyances. Please protect products against moist, shock, sunburn and pressure during transportation.

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

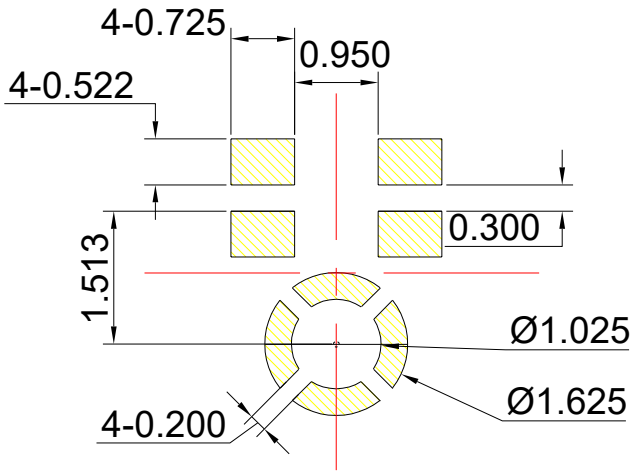
9.4 Operating Temperature Range：-40℃～+70℃

10 Land Pattern Recommendation

10.1 Recommended Land Pattern(Unit:mm)



10.2 Recommended Solder Stencil Pattern（Unit:mm)

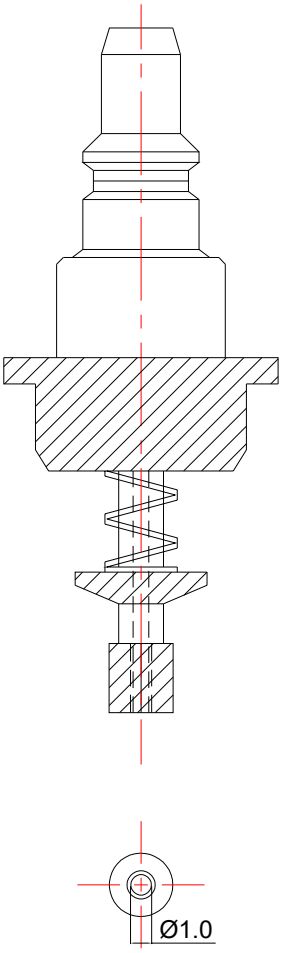


11 Soldering Recommendation

11.1 Soldering Machine Condition

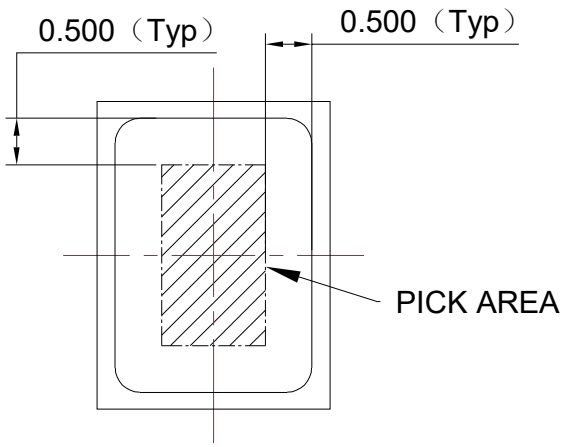
Temperature Control	8 zones
Heater Type	Hot Air
Solder Type	Lead-free

11.2 The Drawing and Dimension of Nozzle

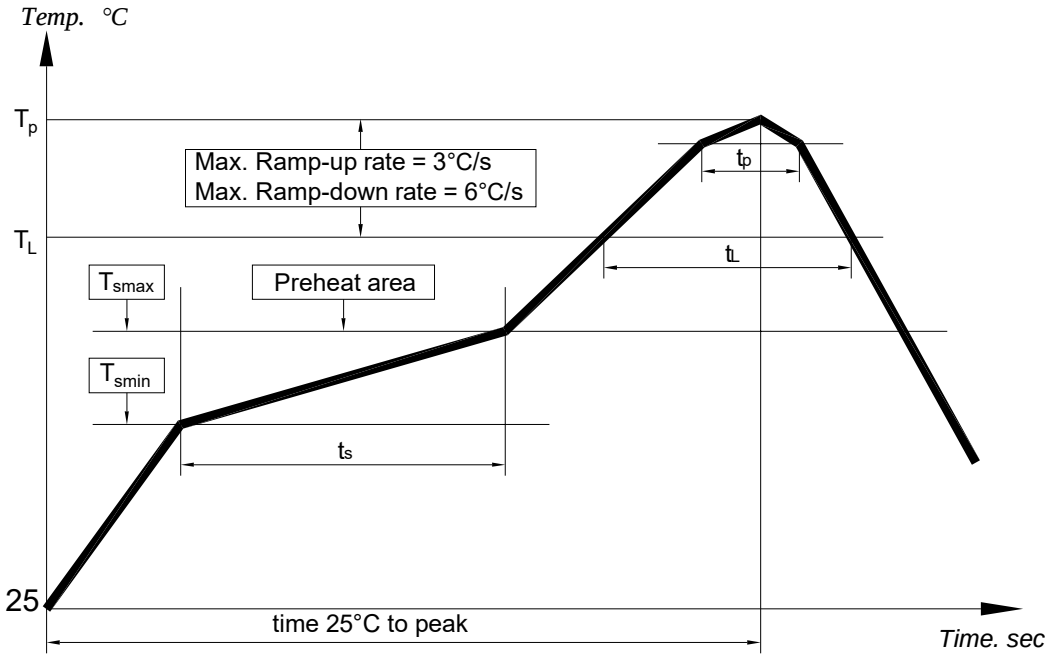


Inside Diameter: Ø1.0mm;
Acoustic Port：Ø0.325mm；
Vacuum Degree of Nozzle：-80k~-90kPa；

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

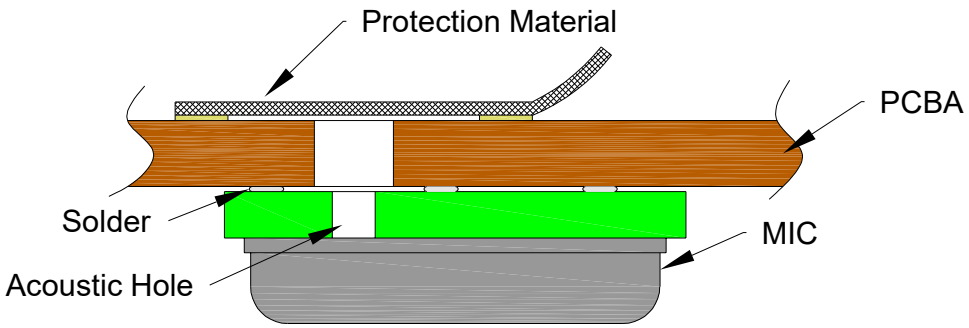
It is very important not to wash this microphone, otherwise this could damage the microphone.

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.
It is very important to keep the distance between MIC and cutting area as far as possible to avoid the cutting stive entering into MEMS, otherwise this could contaminate the microphone.



13 Output Inspection Standard

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