Specification of MEMS Microphone

(RoHS Compliance & Halogen Free)

Customer Name :

Customer Model :

Goermicro Model : SD18OB261-050

Goermicro			CUSTOMER APPROVAL
DESIGN	Zamp Wang	2022.12.16	
CHKD	Roy Wang	2022.12.16	
STANDARD	Angela Kong	2022.12.16	
APVD	Roy Wang	2022.12.16	

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

Tel : + 86 536 8521234
E- Mail : goermicro@goermicro.com
Website: http://www.goermicro.com
Address: No.268 Dongfang Road, High-Tech Industry Development District, Weifang, Shandong, P.R.C.

Restricted

1 Security Warning

The information contained in this document is the exclusive property of Goermicro Inc. and should not be disclosed to any third party without the written consent of Goermicro Inc.

2 Publication History

Version	Description	Date	Author	Approved
1.0	New Design	2018.08.31	Tyler	Sunny
2.0	Update Product Appearance	2019.07.30	Tyler	Sunny
3.0	Update Acoustical&Electrical Characteristics &Package Information	2019.11.28	Tyler	Sunny
4.0	Update Document Template	2021.03.31	Zamp	Jenny
5.0	Update Acoustical Performance and Curve in Section 3	2021.06.01	Zamp	Jenny
6.0	Update the Logo to Goermicro	2021.08.20	Pauline	Roy
7.0	Add 1.536MHz Mode Performance	2021.09.23	Pauline	Roy
8.0	Update Clock Range in Section 3.5	2022.12.16	Zamp	Roy

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, 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℃～+35℃	25％RH～75%RH	86kPa～106kPa
Basic Test Conditions	+20℃±2℃	60％RH～70%RH	86kPa～106kPa

3 Acoustical and Electrical Characteristics

3.1 Standard Performance Mode

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

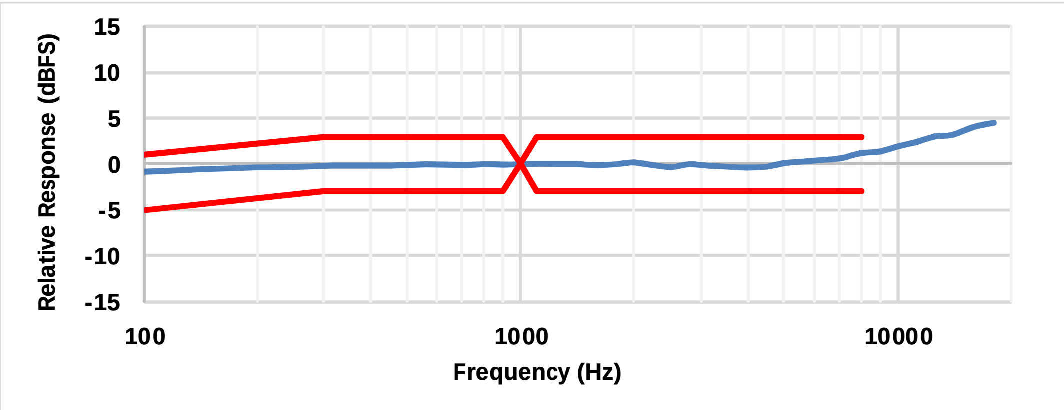
Item	Symbol	Test Conditions	Min	Typ	Max	Unit
Sensitivity	S	f=1kHz, Pin=1Pa	-27	-26	-25	dBFS (Note 1)
Current Consumption (Note 2)	I	No load	-	560	650	μA
S/N Ratio	SNR	f=1kHz, P_{in}=1Pa A-Weighted Curve	-	65	-	dB
Distortion	THD	THD<1% @1kHz	-	111	-	dB SPL
Acoustic Overload Point	AOP	10% THD @1 kHz	-	120	-	dB SPL
Power Supply Rejection	PSR	100mVpp squarewave@217Hz	-	-89	-	dBFS
Low Frequency Roll-off	LFRO	-3dB corner refrence to 1kHz sensitivity	-	40	-	Hz
High Frequency Flatness		+3dB refrence to 1kHz sensitivity	-	12.5	-	KHz

(Test Condition: V_{DD}=1.8V, f_{CLK}=1.536MHz,Decimation=64X)

Item	Symbol	Test Conditions	Min	Typ	Max	Unit
Sensitivity	S	f=1kHz, Pin=1Pa	-27	-26	-25	dBFS (Note 1)
Current Consumption (Note 2)	I	No load	-	480	580	μA
S/N Ratio	SNR	f=1kHz, P_{in}=1Pa A-Weighted Curve	-	65	-	dB
Distortion	THD	THD<1% @1kHz	-	111	-	dB SPL
Acoustic Overload Point	AOP	10% THD @1 kHz	-	120	-	dB SPL
Power Supply Rejection	PSR	100mVpp squarewave@217Hz	-	-89	-	dBFS
Low Frequency Roll-off	LFRO	-3dB corner refrence to 1kHz sensitivity	-	40	-	Hz

3.2 Frequency Response Curve and Limits

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



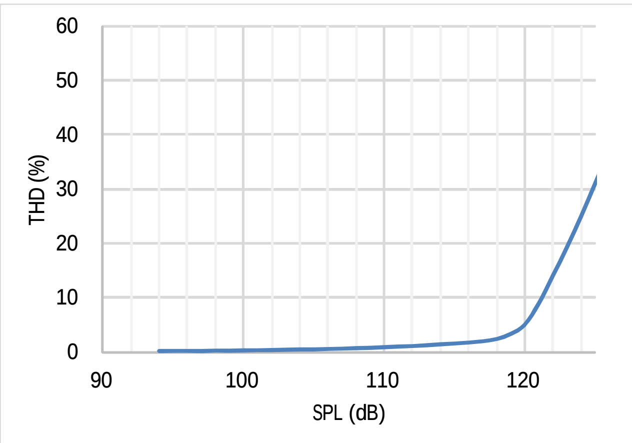
Frequency(Hz)	100	300	500	900	1100	3000	8000
Upper Limit(dBFS)	1	3	3	3	3	3	3
Lower Limit(dBFS)	-5	-3	-3	-3	-3	-3	-3

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

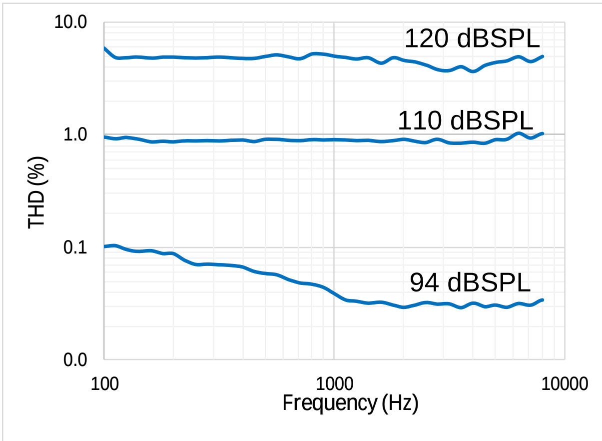
Item	Symbol	Test Conditions	Min	Typ	Max	Unit
Sensitivity	S	f=1kHz, Pin=1Pa	-27	-26	-25	dBFS (Note 1)
Current Consumption (Note 2)	I	f_{clk}=768kHz	-	230	300	μA
S/N Ratio	SNR	f=1kHz, Pin=1Pa A-Weighted Curve	-	65	-	dB
Distortion	THD	THD<1% @1kHz	-	111	-	dB SPL
Acoustic Overload Point	AOP	10% THD @1 kHz	-	119	-	dB SPL
Power Supply Rejection	PSR	100mVpp squarewave@217Hz	-	-88	-	dBFS
Low Frequency Roll-off	LFRO	-3dB corner refrence to 1kHz sensitivity	-	40	-	Hz

3.4 Performance Curve

Typical THD vs SPL
Standard Mode V_{DD}=1.8V, f_{CLK}=2.4MHz



Typical THD vs Frequency
Standard Mode V_{DD}=1.8V, f_{CLK}=2.4MHz



3.5 General Microphone Specifications

Item		Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Voltage		V_{DD}	-	1.62	1.8	3.6	V
Clock Frequency Range	Standby Mode	-	-	-	-	330	kHz
	Low Power Mode	-	-	***512***	768	850	kHz
	Standard Mode	-	-	1.38	1.536	1.7	MHz
		-	-	***2.2***	2.4	2.6	MHz
		-	-	2.9	3.072	3.3	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
VDD ramp up time			Time until VDD ≥ VDD_min.	-	-	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	-	-	50	ms

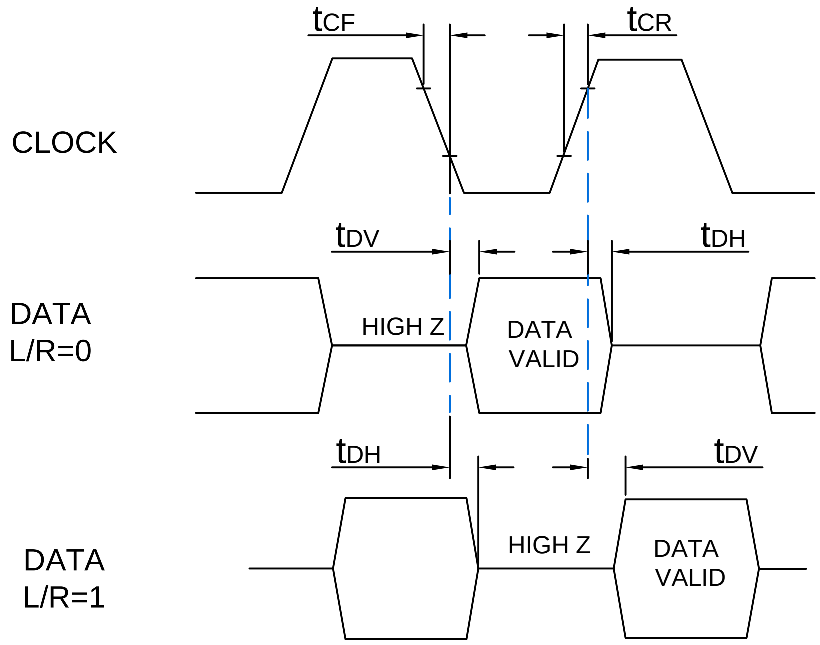
3.6 Microphone Interface Specifications

Item	Symbol	Test Conditions	Min	Typ	Max	Unit
Logic Input High	V_{IH}	-	$0.65*V_{DD}$	-	$V_{DD}+0.3$	V
Logic Input Low	V_{IL}	-	-0.3	-	$0.35\times V_{DD}$	V
Logic Output High	V_{OH}	-	$0.7*V_{DD}$	-	-	V
Logic Output Low	V_{OL}	-	-	-	$0.3\times V_{DD}$	V
Clock Duty Cycle	-	$f_{CLK} \leq 2.7MHz$	45	-	55	%
	-	$f_{CLK} > 2.7MHz$	48	-	52	%
Clock Rise/Fall Time	t_{CF}, t_{CR}	-	-	-	13	ns
Dalay Time for Valid Data (Note 3)	t_{DV} -	Max C_{LOAD} for t_{DV}	-	-	100	ns
DalayTime for High Z	t_{DH}	-	5	-	30	ns

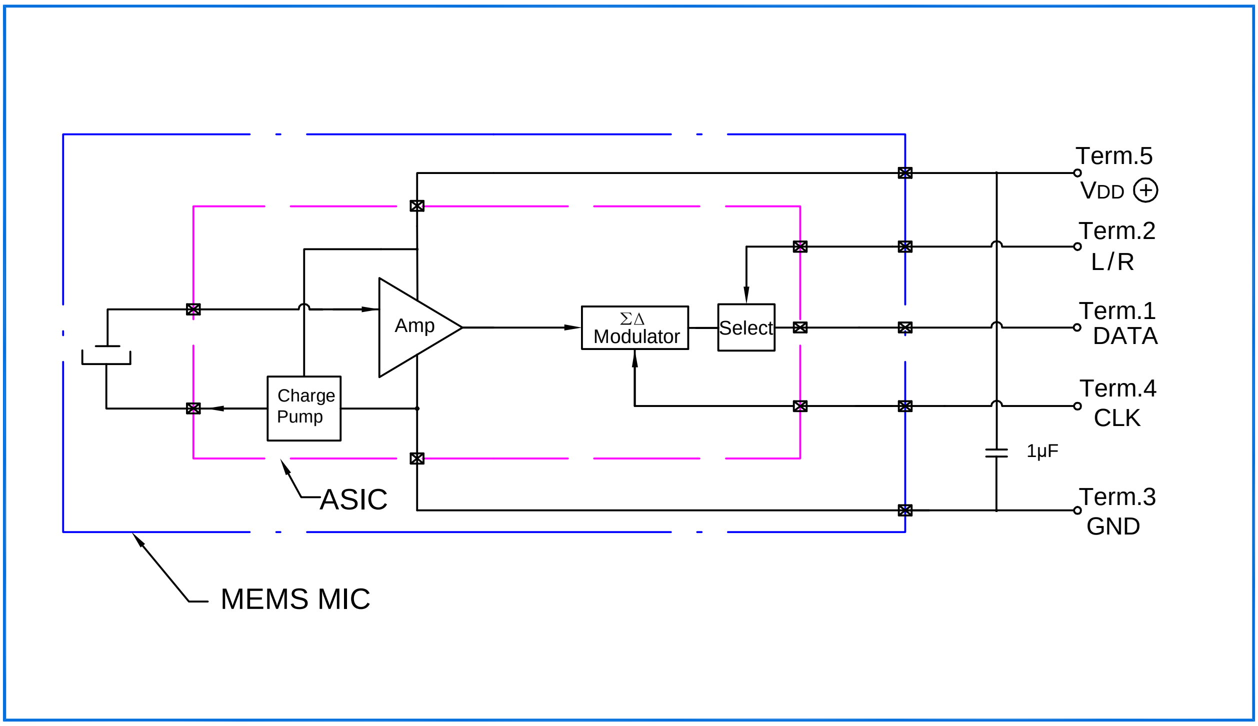
Note 1. dBFS = 20xlog (A/B) where A is the level of the signal, B is the level that corrsponds to Full-scale level.

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

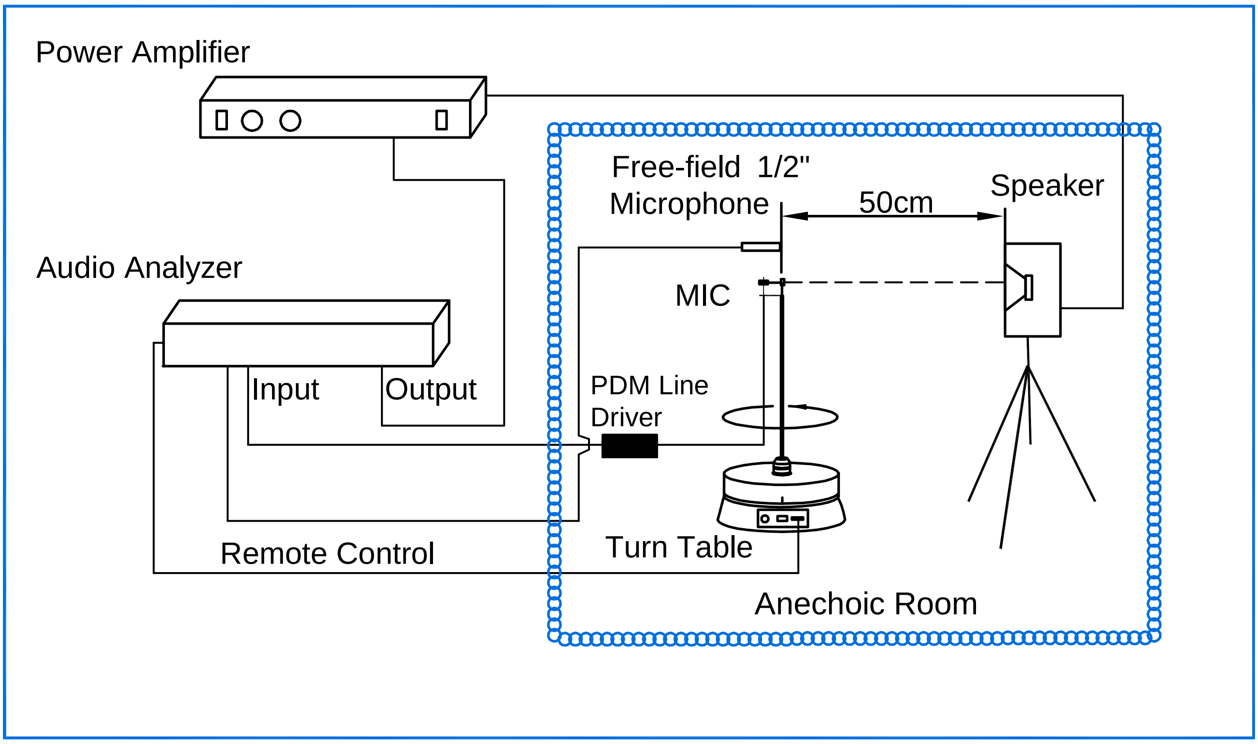
Note 3. Timing



4 Measurement Circuit

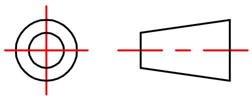


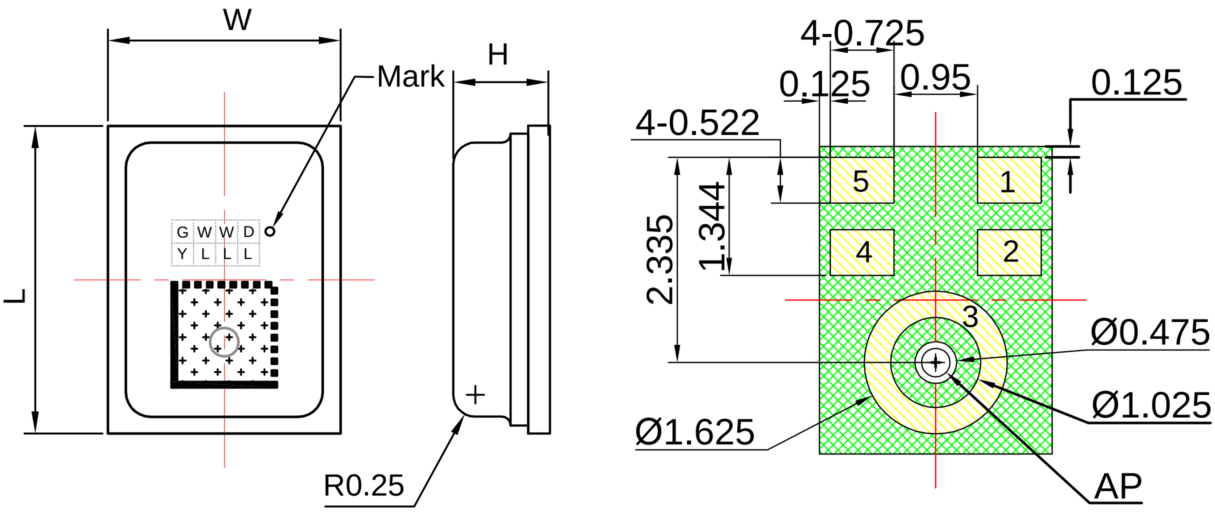
5 Test Setup Drawing



6 Mechanical Characteristics

6.1 Appearance Drawing (Unit: mm)





Top View Side View Bottom View

Pin#	Function
1	Data
2	L/R
3	GND
4	CLK
5	VDD

ITEM	DIMENSION	TOLERANCE	UNITS
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 :Lot :2D Code

6.2 Weight

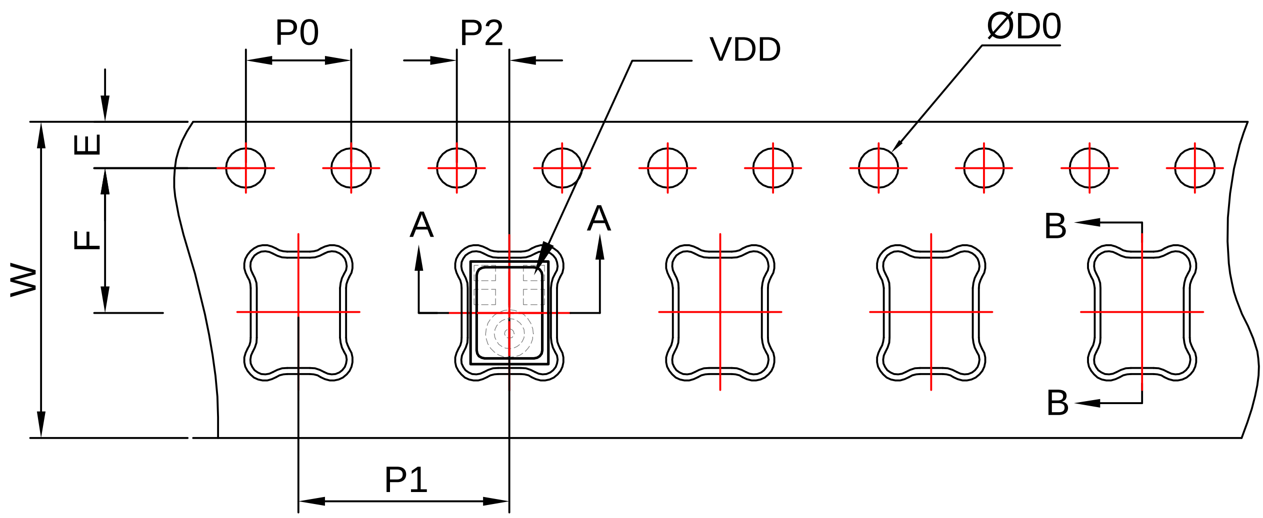
The weight of the MIC is Less than 0.05g.

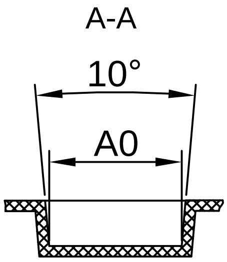
7 Reliability Test

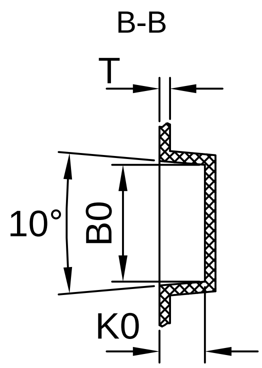
7.1 Vibration Test	To be no interference in operation after vibrations, 4 cycles, from 20 to 2,000Hz in each direction(X,Y,Z), 48 minutes, using peak acceleration of 20g, sensitivity should vary within ±3dBFS from initial sensitivity(IEC 60068-2-6:2007). (The measurement to be done after 2 hours of condition 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(IEC60068-2-31:2008). (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(IEC 60068-2-1:2007). (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(IEC 60068-2-1:2007). (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(IEC 60068-2-67:2019). (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 (IEC60068-2-27:2008). (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(IEC 60068-2-14:2009). (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(Refer to customer's request). (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 (IEC61000-4-2:2008).

8 Package

8.1 Tape Specification







The Dimensions as Follows:

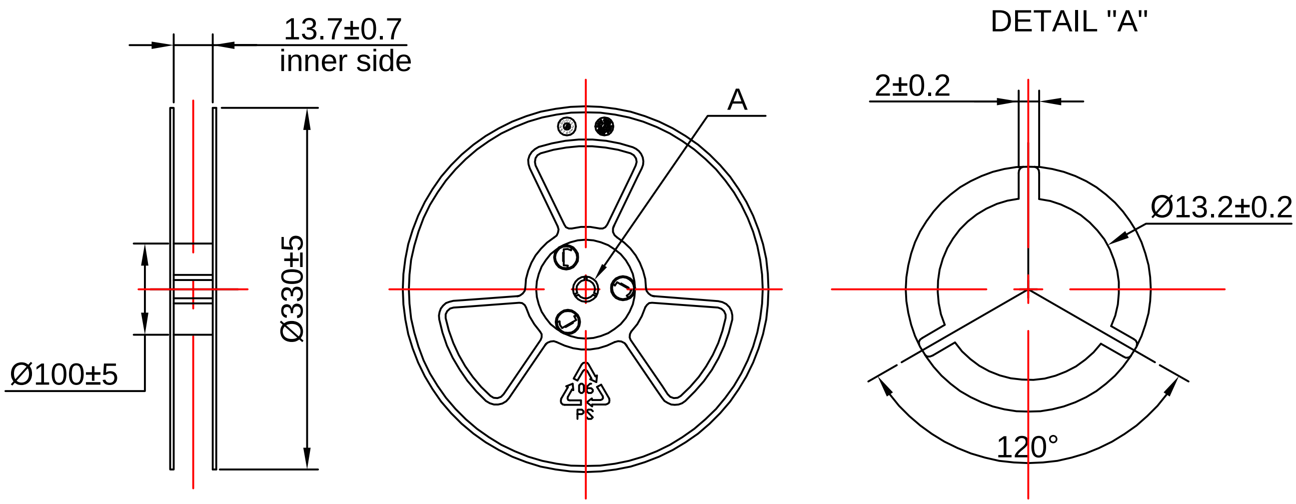
ITEM	W	E	F	ØD0	K0
DIM(mm)	12.0±0.30	1.75±0.10	5.5±0.05	$1.50^{+0.10}_{0}$	1.30±0.10
ITEM	P0	10P0	P1	A0	B0
DIM(mm)	4.00±0.10	40.00±0.20	8.00±0.10	2.85±0.05	3.75±0.05
ITEM	P2	T			
DIM(mm)	2.00±0.05	0.30±0.05			

8.2 Reel Dimension

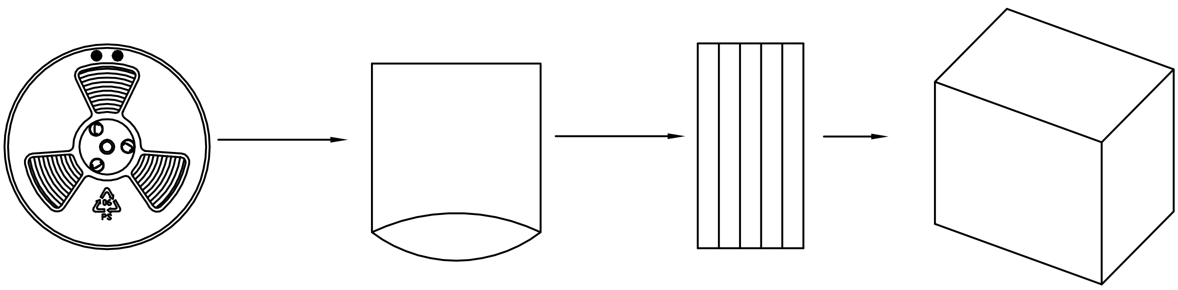
7" reel for sample stage

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)

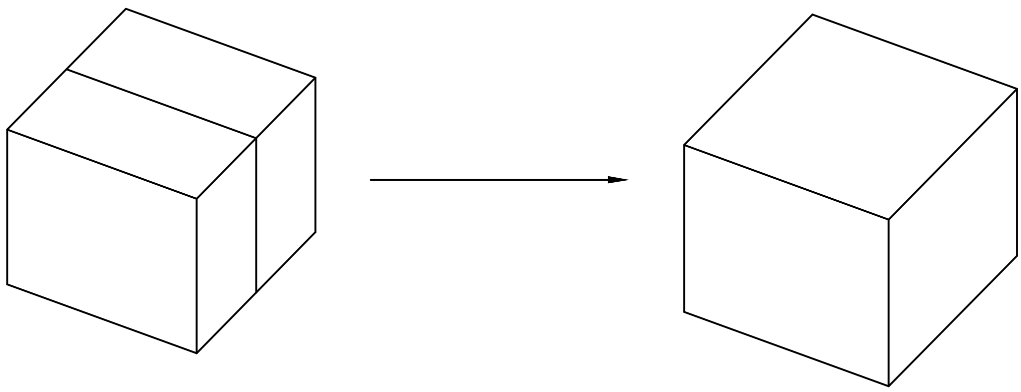


Packing (5,000PCS)

Antistatic Bag (5,000PCS)

5 Antistatic Bags (25,000PCS)

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

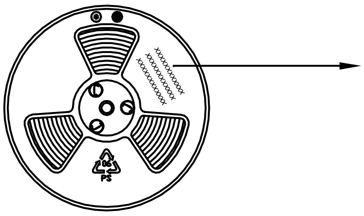


Two Inner Box(50,000PCS)

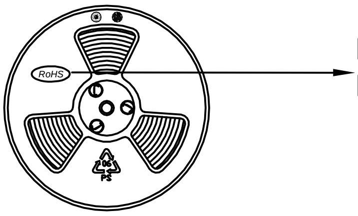
Outer Box(50,000PCS) (370mm×300mm×390mm)

8.4 Packing Explain

8.4.1 The Label Content of the Reel



8.4.2 The RoHS Label



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℃

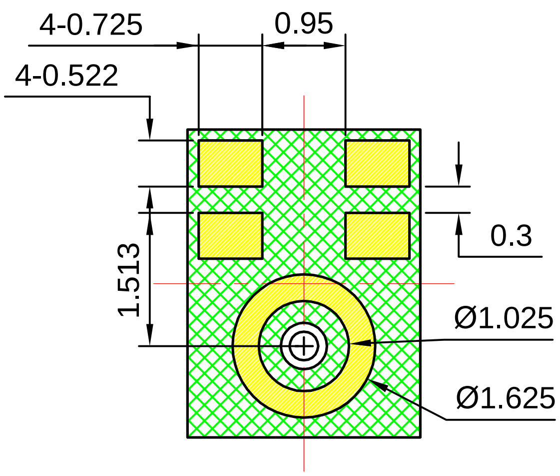
9.4 Operating Temperature Range：-40℃～+100℃

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

Note2: Static sensitive device

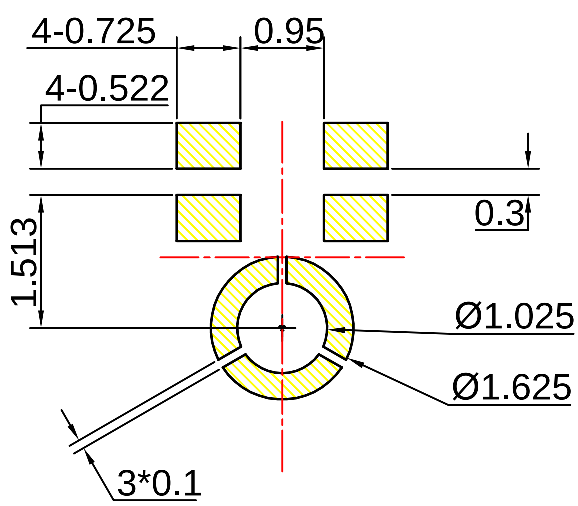
10 Land Pattern Recommendation

10.1 The Pattern of MIC Pad(Unit:mm)



10.2 Recommended Soldering Surface Land Pattern（Unit:mm)

Recommended the size of solder stencil pattern area is >80% of MIC pads, as below, and the stencil thickness suggestion is 0.1mm.

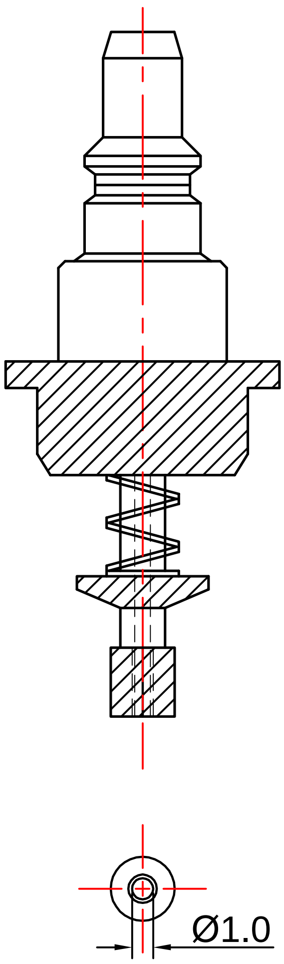


11 Soldering Recommendation

11.1 Soldering Machine Condition

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

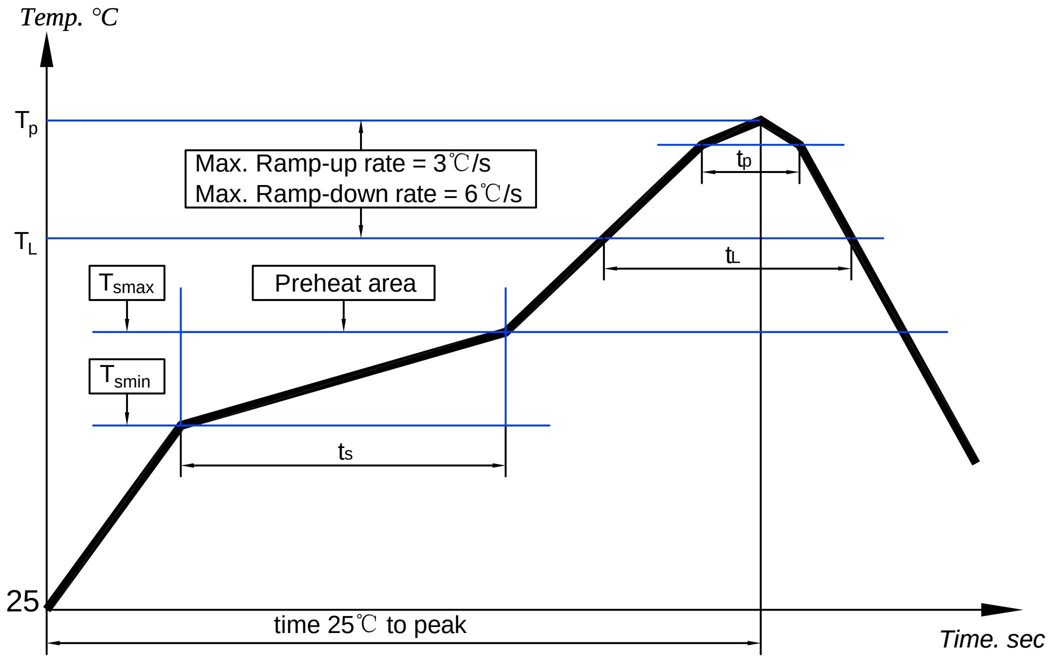
11.2 The Drawing and Dimension of Nozzle



Inside Diameter: 1.0mm;

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℃/s max.
Preheat : Temperature Min(T_{smin}) Temperature Max(T_{smax}) Time(T_{smin} to T_{smax})(t_s)	 150℃ 200℃ 60~180s
Time maintained above : Tempreature(T_L) Time(t_L)	 217℃ 60~150s
Peak Temperature(T_p)	260℃
Time within 5℃ of actual Peak Temperature(t_p) :	30~40s
Ramp-down rate(T_p to T_{smax})	6℃/s max
Time 25℃ 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.
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 MIC.

12.3 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>>.