Specification of MEMS Microphone

Component level IPX8 water resistant(2m,30min)

(RoHS Compliance & Halogen Free)

Customer Name :

Customer Model :

Goermicro Model : SD18OB371-075

<table>
<tr><th>Goermicro</th><th>CUSTOMER APPROVAL</th></tr>
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CHKD Hubery Zhang 2022.10.11
STANDARD Angela Kong 2022.10.11
APVD Roy Wang 2022.10.11</td><td></td></tr>
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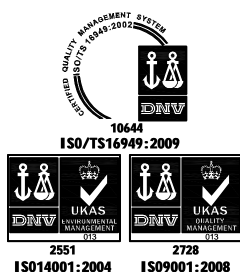

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1 Security Warning

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2 Publication History

Version	Description	Date	Author	Approved
1.0	New Design	2021.02.04	Pauline	Jenny
2.0	Update 3 Acoustical and Electrical Characteristics	2021.05.19	Pauline	Jenny
3.0	Update the Logo to Goermicro	2021.08.25	Enoch	Roy
4.0	Update 3.1 Standard Performance Mode SNR	2021.12.23	Pauline	Roy
5.0	Updated 3.1 LFRO and 20KHz Limit	2022.10.11	Pauline	Roy

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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, 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)

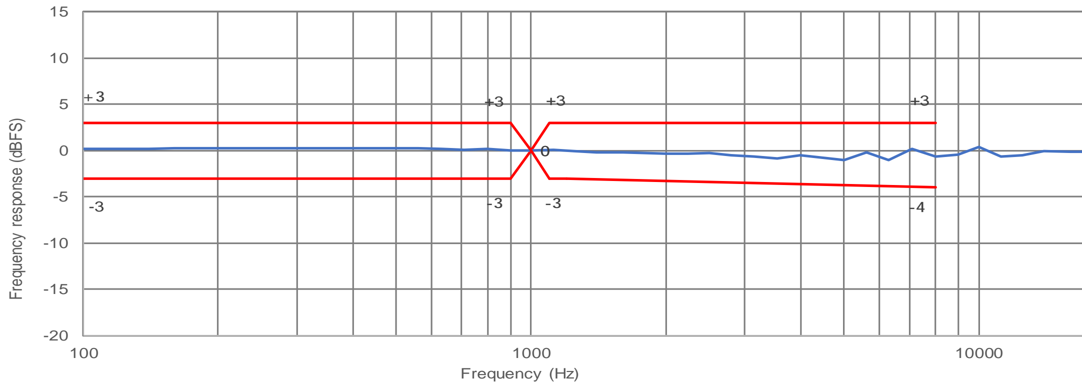
Item	Symbol	Test Conditions	Min	Typ	Max	Unit
Sensitivity	S	94dBSPL@1kHz	-38	-37	-36	dBFS (Note 1)
Current Consumption (Note 2)	I	f_{CLK}=2.4MHz	-	920	1000	μA
S/N Ratio	SNR	94dBSPL@1kHz A-Weighting	-	64	-	dB
Distortion	THD	THD<1% @1kHz	-	127	-	dB SPL
Acoustic Overload Point	AOP	10% THD@1kHz，S=Typ	-	132	-	dB SPL
Power Supply Rejection	PSR	100mVpp Squarewave @217Hz A-weighting	-	-97	-	dBFS
Power Supply Rejection Ratio	PSRR	200mVpp Sinewave@1KHz	-	89	-	dB V/FS
Low Frequency Roll-off	LFRO	Low frequency sensitivity at 28Hz referenced to nominal 1KHz sensitivity	*-6*	*-3*	*0*	dBFS
		High frequency sensitivity at 20KHz referenced to nominal 1KHz sensitivity	*-2*	*4*	*10*	dBFS

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	-	280	350	μA
S/N Ratio	SNR	94dBSPL@1kHz A-Weighting	-	65	-	dB
Distortion	THD	THD<1% @1kHz	-	115	-	dB SPL
Acoustic Overload Point	AOP	10% THD@1kHz，S=Typ	-	117	-	dB SPL
Power Supply Rejection	PSR	100mVpp Squarewave @217Hz A-weighting	-	-80	-	dBFS
Power Supply Rejection Ratio	PSRR	200mVpp Sinewave@1KHz	-	68	-	dB V/FS

3.3 Frequency Response Curve and Limits

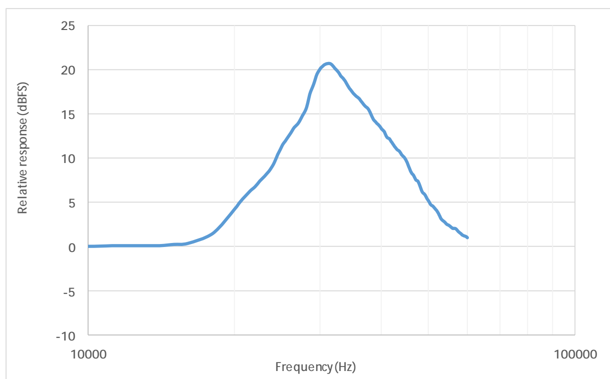
Typical Free Field Response
Normalized to 1kHz
Standard Mode V_{DD}=1.8V, f_{CLK}=2.4MHz, Decimation Rate=64x



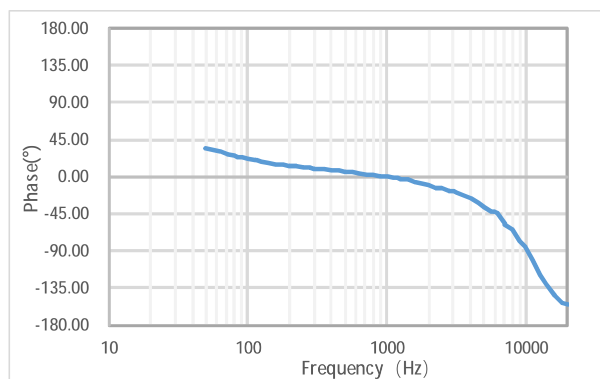
Frequency(Hz)	100	300	500	900	1100	3000	8000
Upper Limit(dBFS)	3	3	3	3	3	3	3
Lower Limit(dBFS)	-3	-3	-3	-3	-3	-3	-4

3.4 Performance Curve

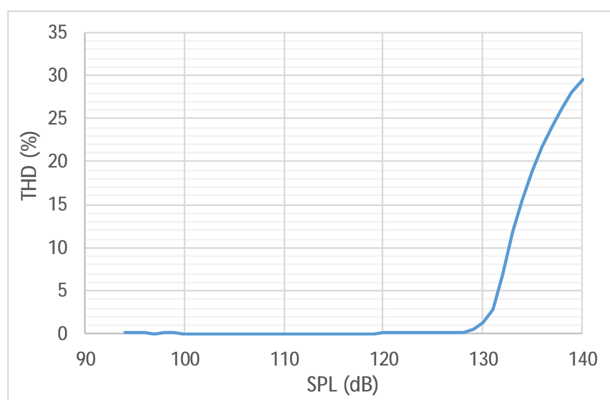
Typical Free Field Ultrasonic Response
Normalized to 1kHz
Standard Mode V_{DD}=1.8V, f_{CLK}=2.4MHz



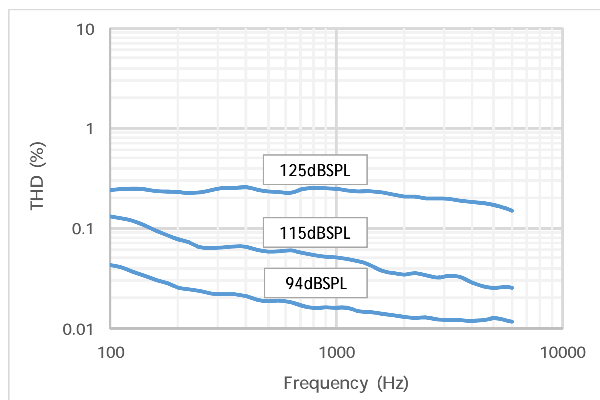
Typical Phase
Normalized to 1kHz
Standard Mode V_{DD}=1.8V, f_{CLK}=2.4MHz



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

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	-	-	-	-	350±5%	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	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}	-	-	-	150	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

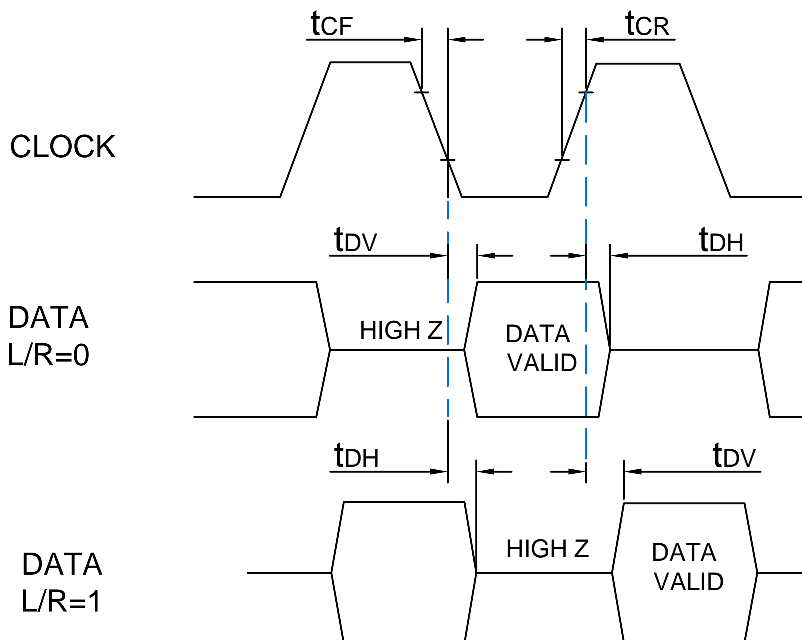
3.6 Microphone Interface Specifications

Item	Symbol	Test Conditions	Min	Typ	Max	Unit
Logic Input High	V_{IH}	-	$0.65 \times V_{DD}$	-	$V_{DD}+0.3$	V
Logic Input Low	V_{IL}	-	-0.3	-	$0.35 \times V_{DD}$	V
Logic Output High	V_{OH}	-	$0.7 \times V_{DD}$	-	-	V
Logic Output Low	V_{OL}	-	-	-	$0.3 \times V_{DD}$	V
Clock Duty Cycle	-	$f_{CLK} \leq 2.65$MHz	45	-	55	%
	-	$f_{CLK} \geqslant 2.9$MHz	48	-	52	%
Clock Rise/Fall Time	t_{CF},t_{CR}	-	-	-	13	ns
Dalay Time for Valid Data (Note 3)	t_{DV}	Max C_{LOAD}(Cload = 150pF) for max t_{DV}	-	-	100	ns
DalayTime for High Z	t_{HZ}	-	5	-	30	ns

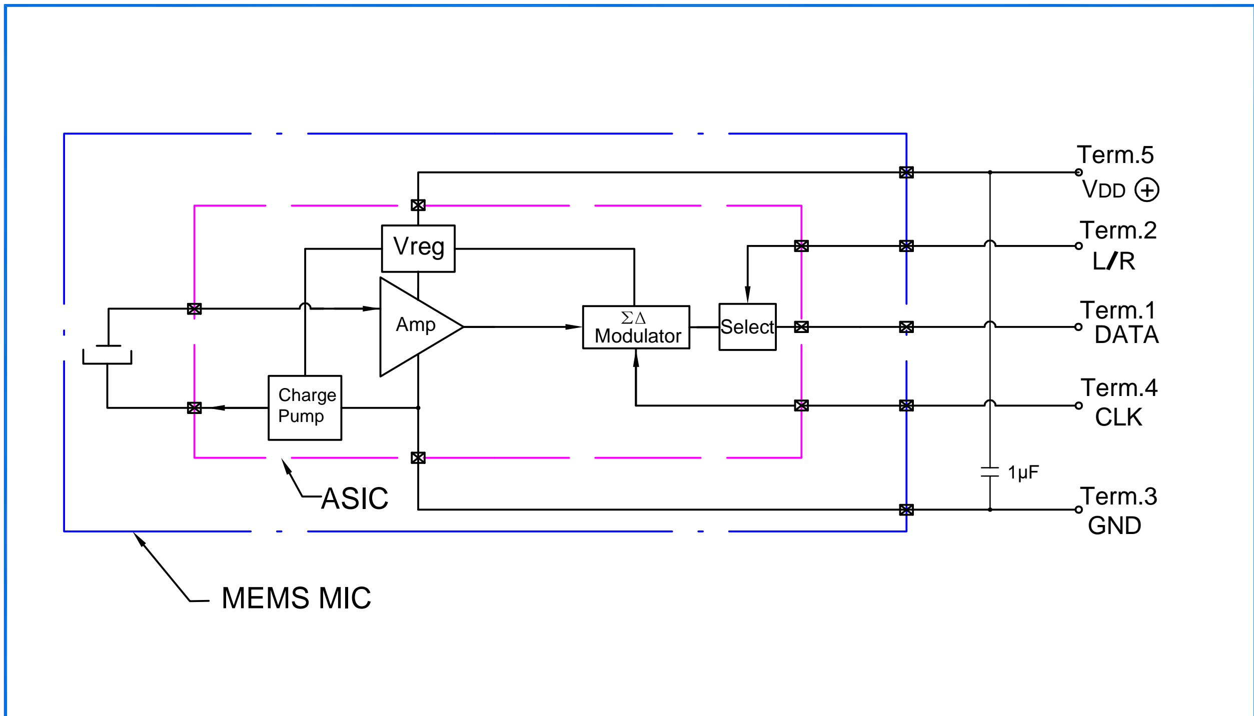
Note 1. dBFS = 20xlog (A/B) where A is the level of the signal, B is the level that corrsponds to Full-scale level.

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

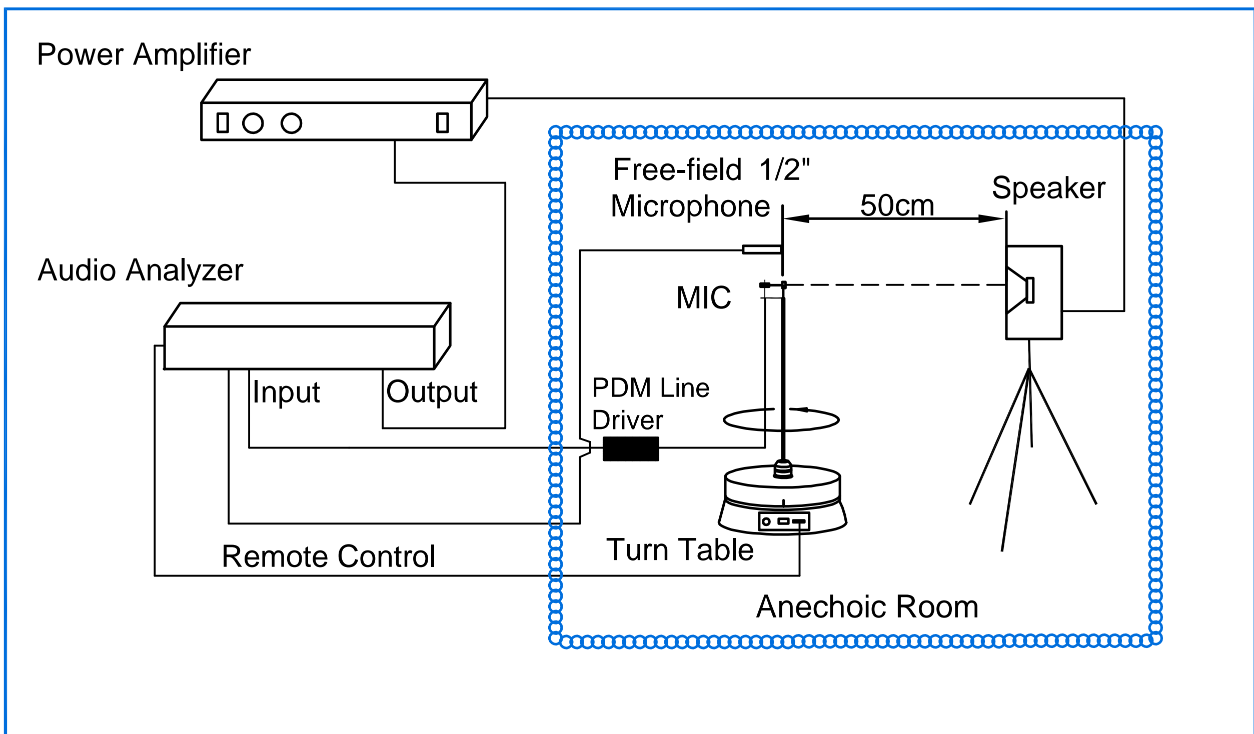
Note 3. Timing



4 Measurement Circuit

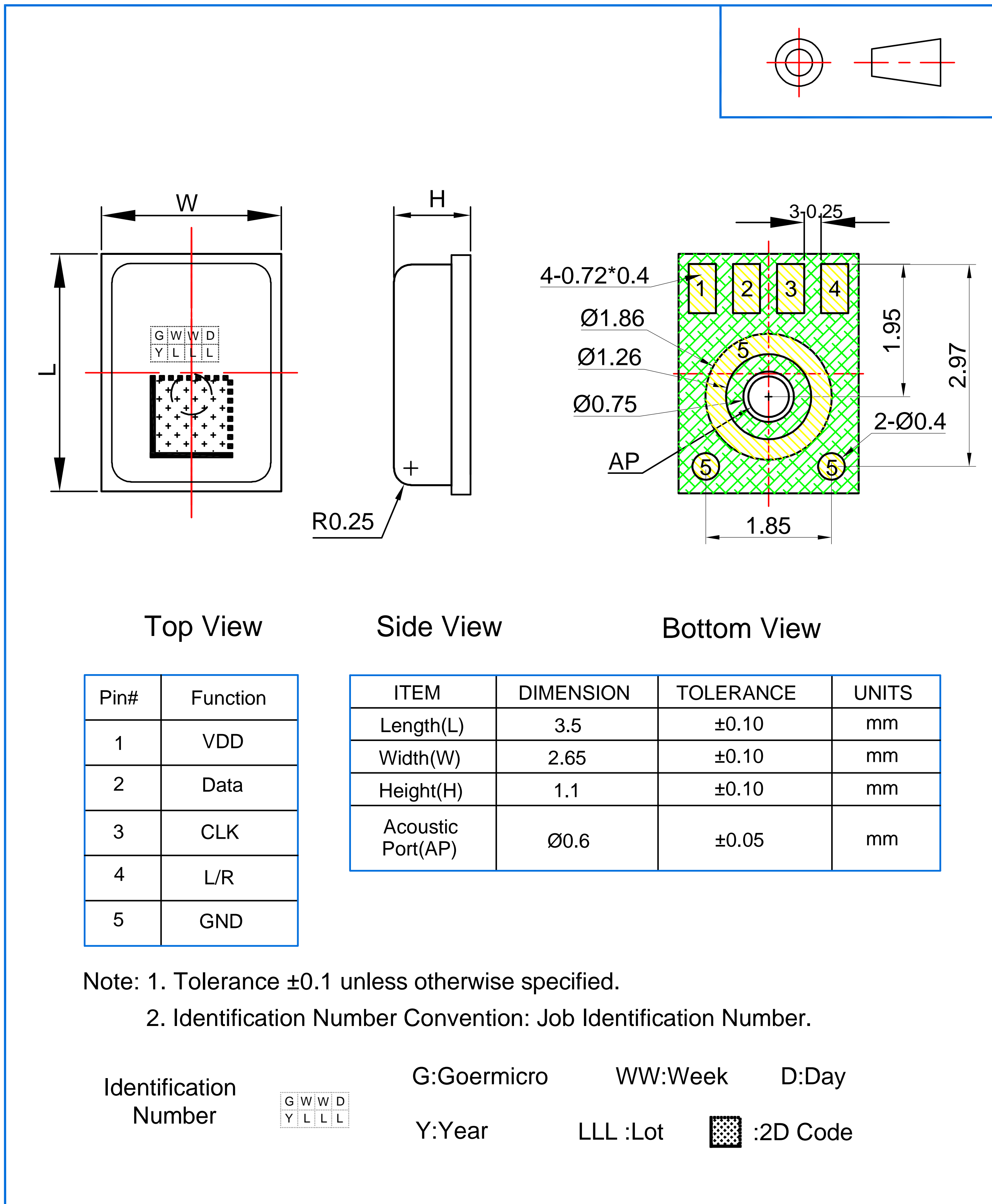


5 Test Setup Drawing



6 Mechanical Characteristics

6.1 Appearance Drawing (Unit: mm)



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

ITEM	DIMENSION	TOLERANCE	UNITS
Length(L)	3.5	±0.10	mm
Width(W)	2.65	±0.10	mm
Height(H)	1.1	±0.10	mm
Acoustic Port(AP)	Ø0.6	±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

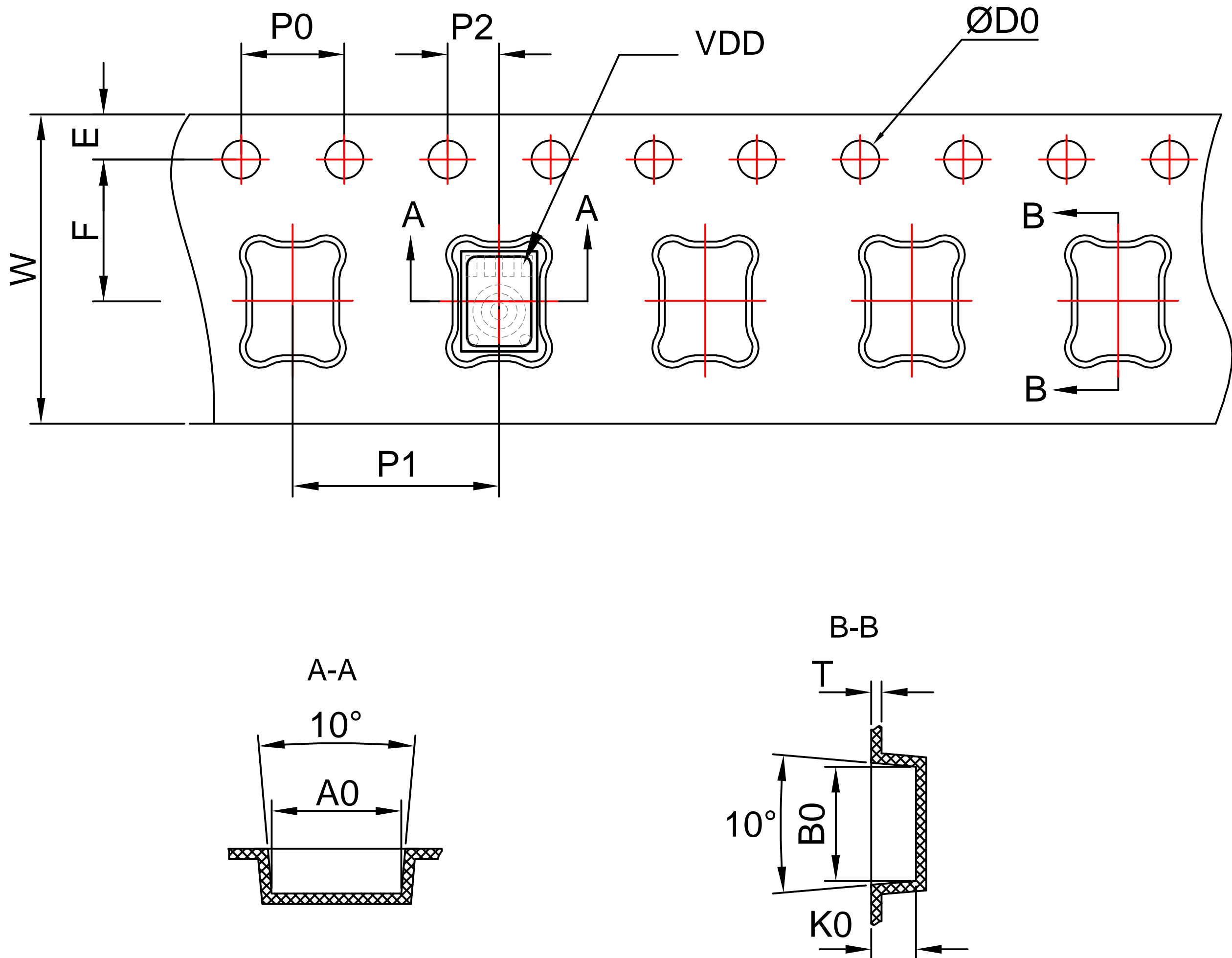
The weight of the MIC is Less than 0.05g.

7 Reliability Test

7.1 Vibration Test	To be no interference in operation after vibrations, 4 cycles, from 20 to 2000HZ in each direction (X,Y,Z), 48min, user acceleration of 20g, sensitivity should vary within ±3dBFS from initial sensitivity. (The measurement to be done after 2 hours of conditioning at +15℃～+35℃, R.H 25%～75%)
7.2 Drop Test	To be no interference in operation after dropped to 1.0 cm steel plate 12 times from 1.5 meter height in state of JIG,JIG weight of 100 g, sensitivity should vary within ±3dBFS from initial sensitivity. (The measurement to be done after 2 hours of conditioning at +15℃～+35℃, R.H 25%～75%)
7.3 Temperature Test	a) After exposure at +125℃ for 200h, sensitivity should vary within ±3dBFS from initial sensitivity. (The measurement to be done after 2h of conditioning at +15℃～+35℃, R.H 25%～75%) b) After exposure at -40℃ for 200h, sensitivity should vary within ±3dBFS from initial sensitivity. (The measurement to be done after 2 hours of conditioning 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 conditioning 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 conditioning at +15℃～+35℃, R.H 25%～75%)
7.6 Thermal Shock Test	After exposure at -40℃ for 30min, at +125℃ for 30min (change time 20 seconds) 32 cycles, sensitivity should vary within ±3dBFS from initial sensitivity. (The measurement to be done after 2 hours of conditioning at +15℃～+35℃, R.H 25%～75%)
7.7 Reflow Test	Adopt the reflow curve of item 11.3, after three reflows, sensitivity should vary within ±3dBFS from initial sensitivity. (The measurement to be done after 2 hours of conditioning at +15℃～+35℃, R.H 25%～75%)
7.8 ESD Shock Test	Under C=150pF, R=330ohm. Tested to ±8KV contact to the case and tested to ±2kV contact to I/O terminals.10 times. Grounding. Sensitivity should vary within ±3dBFS from initial sensitivity. (The measurement to be done after 2 hours of conditioning at +15℃～+35℃, R.H.25％～75%)

8 Package

8.1 Tape Specification



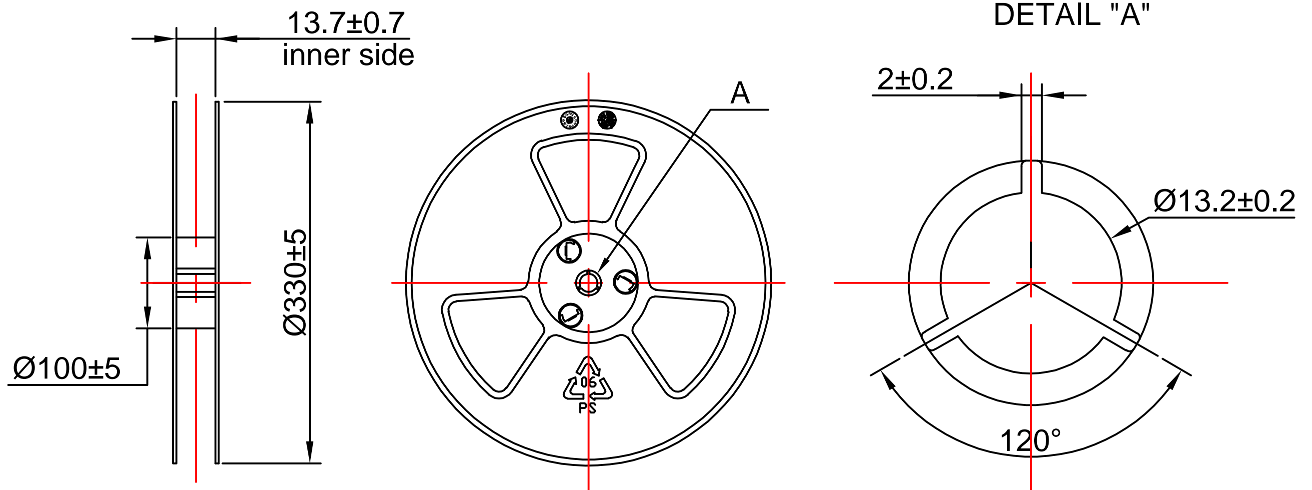
The Dimensions as Follows:

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			

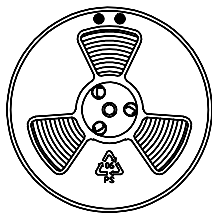
8.2 Reel Dimension

7'' reel for sample stage

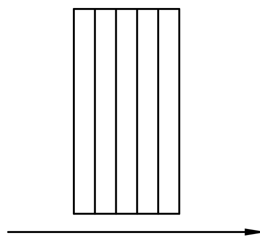
13'' reel will be provided for the mass production stage
The following is 13'' reel dimensions (unit:mm)

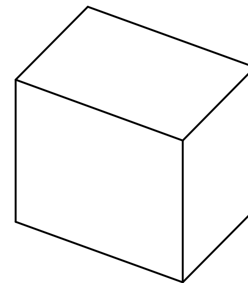


8.3 The Content of Box(13" reel)

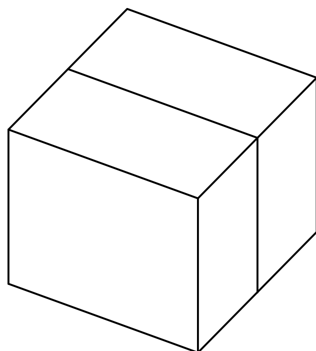


Packing (5,000PCS)

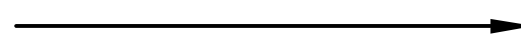


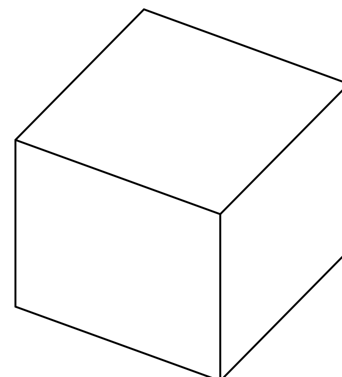


Inner Box(25,000PCS)
(340mm×135mm×355mm)



Two Inner Box(50,000PCS)

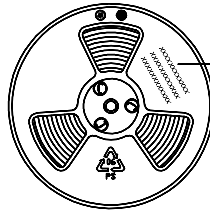




Outer Box(50,000PCS)
(370mm×300mm×390mm)

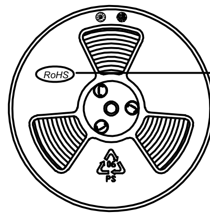
8.4 Packing Explain

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 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.

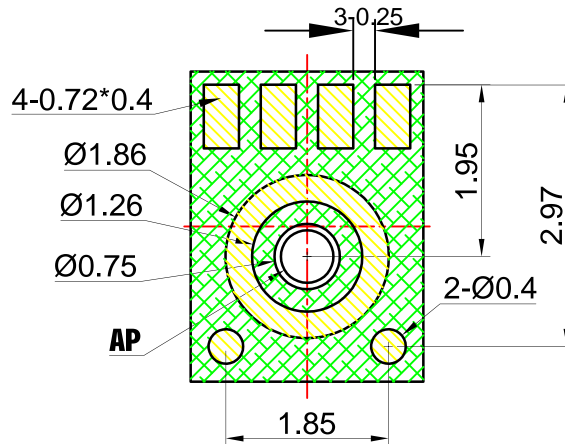
9.2 The MEMS MIC with normal pack can be transported by ordinary conveyances. Please protect products against moist, shock, sunburn and pressure during transportation.

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

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

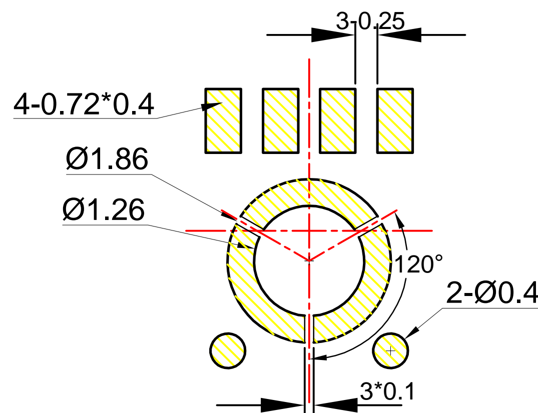
10 Land Pattern Recommendation

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.

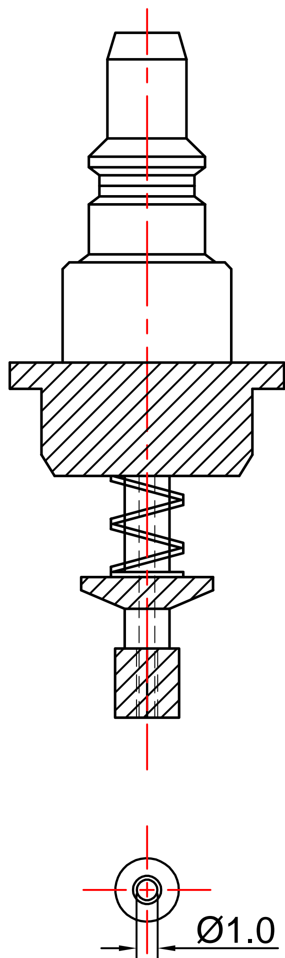


11 Soldering Recommendation

11.1 Soldering Machine Condition

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

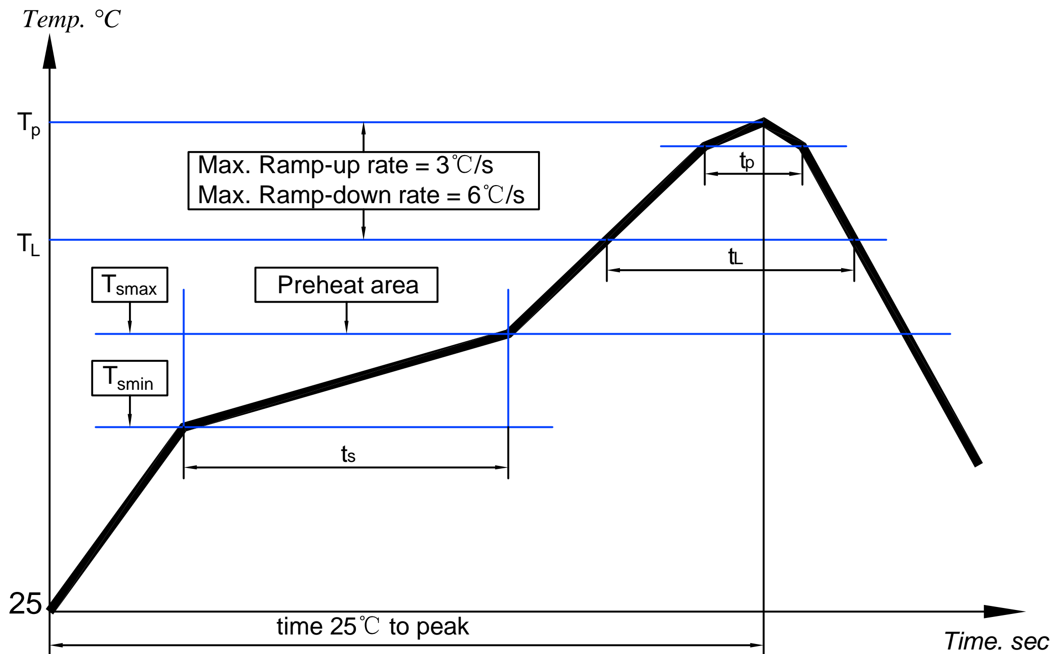
11.2 The Drawing and Dimension of Nozzle



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.

12.3 Ultrasonic Restrictions

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

12.4 Air Pressure Immunity

It is very important not to exert the air pressure at the acoustic hole with a pressure higher than 60psi,otherwise this would damage the microphone.

12.5 Metal Can Press Force Immunity

It is very important not to press the metal case with a force larger than 5kgf,otherwise this would damage the microphone.

13 Output Inspection Standard

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