BSE

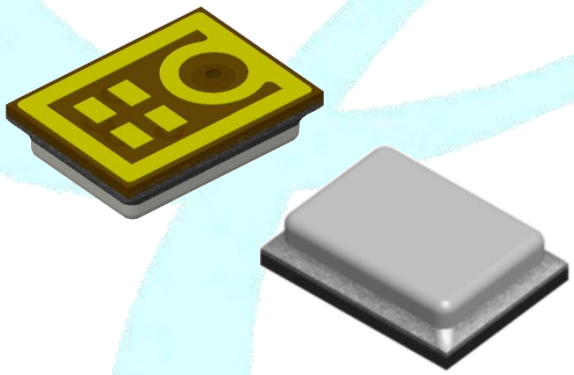
Digital
MEMS Microphone

DATA SHEET

F4-(A)HDMO-D100R26-5P

High SNR / Multiple Clock Mode
/ Narrow Sensitivity

OMNI-DIRECTIONAL
BOTTOM PORT



1. INTRODUCTION

- Digital MEMS Microphone - ½ Cycle PDM 16bit, Full Scale=120dBSPL
- Bottom Port Type – Sensitivity is Typical -26dBFS at LPM and STM
- **High Signal to Noise Ratio(SNR) – Typical 64.6dB (A-weighted, 20Hz~20kHz) at fclk=2.4MHz**
- **Multiple Clock Mode – Stand by Mode, Low-Power Mode(LPM), Standard Mode(STM)**
- **Narrow Sensitivity – +/-1dB**
- Omni-directional
- Dual Channel supported
- RF Shielded – with embedded Ground
- Compatible with Sn/Pb and Halogen-free solder process
- RoHS compliant
- SMD reflow temperature of up to 260℃ for over 30 seconds

2. APPLICATIONS

- Smartphones
- Ear-sets, Bluetooth Headsets
- Smart Speaker, Set Top Box
- Tablet Computers
- Wearable Devices
- Electrical Appliances
- Voice Recognition Systems of Appliances

3. MODEL NO.

F4-(A)HDMO-D100R26-5P

4. ABSOLUTE MAXIMUM RATINGS

Parameter	Absolute maximum rating	Units
VDD , Data to Ground	**3.6**	V
Clock to Ground	**3.6**	V
Select to Ground	**3.6**	V
Input Current	**2**	mA
Short Circuit Current to/from Data	**Infinite to Ground or VDD**	sec

Caution : Stresses above those listed in “Absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only. Functional operation at these or any other conditions beyond those indicated under “ELECTRO-ACOUSTIC CHARACTERISTICS” is not implied. Exposure beyond those indicated under “ELECTRO-ACOUSTIC CHARACTERISTICS” for extended periods may affect device reliability.

5. GENERAL MICROPHONE SPECIFICATIONS

Test Condition : 23 ± 2℃, Room Humidity = 55 ± 20 %, VDD=1.8V, fclk = 2.4㎒, SELECT Pin is grounded, no load on DATA, unless otherwise noticed

Parameter		Conditions	Min	Typ	Max	Units
*** Clock Frequency Range**	**Stand by Mode**	Max. Tolerance ±5%	**0**	**-**	**350**	㎑
	Low-Power Mode	Generally at ±10% of typical value	**512**	**768**	**850**	㎑
	Standard Mode		**1.38**	**-**	**3.3**	㎒
Standby Mode Current		f_{clk} < 350㎑	**-**	**25**	**50**	㎂
Short Circuit Current		Grounded DATA pin	**1**	**-**	**20**	㎃
Clock off Mode Current		Clock pulled low	**-**	**<1**	**35**	㎂
VDD Ramp-up Time (Power-up)		VDD ≥ VDD (min)	**-**	**-**	**50**	㎳
Startup Time		Time to start up in any mode after VDD and CLOCK applied	**-**	**-**	**50**	㎳
Reset Time		Time to start up in any mode after VDD has been off for more than10ms, while CLOCK remained on	**-**	**-**	**50**	㎳
Mode-Change Time		Time to switch between modes. VDD remains on during the mode switch	**-**	**-**	**50**	㎳

*** Note : Must be consulted when used another clock frequency without the typical clock frequencys.**

6. ELECTRO-ACOUSTIC CHARACTERISTICS

Test Condition : 23 ± 2℃, Room Humidity = 55 ± 20 %, VDD=1.8V, fclk = 2.4MHz, SELECT Pin is grounded, no load on DATA , unless otherwise noticed

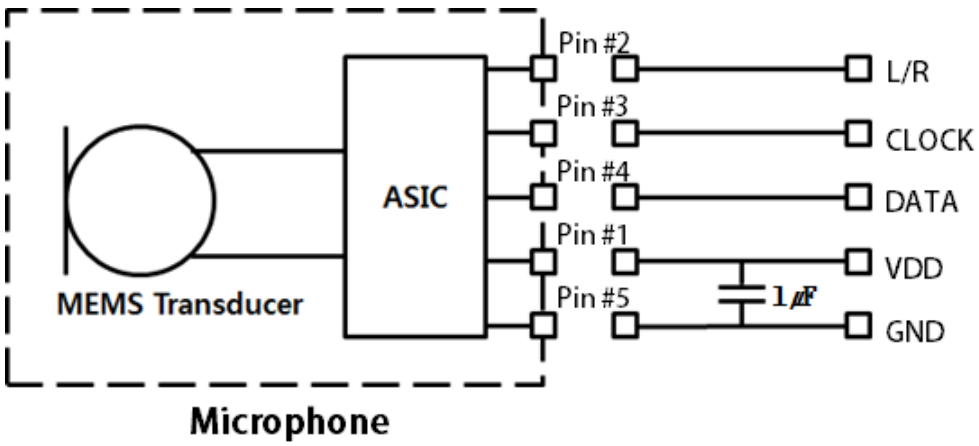
Parameter	Conditions	Min	Typ	Max	Units
Directivity		Omni-directional			
Supply Voltage (VDD)		**1.62**	**-**	**3.6**	V
Sensitivity Change across Voltage	VDD=1.62~3.6V, fclk=2.4MHz	**No change**			dB
Data Format		**½ Cycle PDM 16bit**			-
Full Scale Acoustic Level		**120**			dBSPL
Current Consumption (IDD)	fclk = 1.536MHz, load on DATA output	**450**	**-**	**650**	µA
	fclk = 2.4MHz, load on DATA output	**580**	**-**	**780**	
	fclk = 3.072MHz, load on DATA output	**690**	**-**	**890**	
● **Standard Mode** **Test Conditions : Measurement Clock Frequency=2.4MHz, VDD=1.8V**					
Sensitivity	94dB SPL at 1kHz	**-27**	**-26**	**-25**	dBFS
Signal to Noise Ratio (SNR)	94dBSPL at 1kHz, A-weighted (20Hz~20kHz)	**-**	**64.6**	**-**	dB(A)
Equivalent Input Noise (EIN)	94dBSPL at 1kHz, A-weighted (20Hz~20kHz)	**-**	**29.4**	**-**	dB(A)SPL
Total Harmonic Distortion (THD)	94dBSPL at 1kHz	**-**	**-**	**0.4**	%
	102.5dBSPL at 1kHz	**-**	**-**	**1.0**	%
	112dBSPL at 1kHz	**-**	**-**	**3.0**	%
	116dBSPL at 1kHz	**-**	**-**	**5.0**	%
Acoustic Overload Point (AOP)	THD>10%, at 1kHz	**119**	**120**	**-**	dBSPL
Power Supply Rejection Raito (PSRR)	Measured with 1kHz sine wave and broad band noise, both 200mVpp	**-**	**56**	**-**	dBV/FS
Power Supply Rejection (PSR)	Measured with 217Hz square wave and broad band noise, both 100mVpp, A-weighted	**-**	**-87.5**	**-**	dBFS(A)
● **Low Power Mode** **Test Conditions : Measurement Clock Frequency=768kHz, VDD=1.8V**					
Current consumption (IDD)	load on DATA output	**160**	**-**	**360**	µA
Sensitivity	94dB SPL at 1kHz	**-27**	**-26**	**-25**	dBFS
Signal to Noise Ratio (SNR)	94dBSPL at 1kHz, A-weighted (20Hz~8kHz)	**-**	**64**	**-**	dB(A)
Equivalent Input Noise (EIN)	94dBSPL at 1kHz, A-weighted (20Hz~8kHz)	**-**	**30**	**-**	dB(A)SPL
Total Harmonic Distortion (THD)	94dBSPL at 1kHz	**-**	**-**	**0.4**	%
	102.5dBSPL at 1kHz	**-**	**-**	**1.0**	%
	112dBSPL at 1kHz	**-**	**-**	**3.0**	%
	116dBSPL at 1kHz	**-**	**-**	**5.0**	%
Acoustic Overload Point (AOP)	THD>10%, at 1kHz	**118**	**119**	**-**	dBSPL
Power Supply Rejection Raito (PSRR)	Measured with 1kHz sine wave and broad band noise, both 200mVpp	**-**	**56**	**-**	dBV/FS
Power Supply Rejection (PSR)	Measured with 217Hz square wave and broad band noise, both 100mVpp, A-weighted	**-**	**-87.5**	**-**	dBFS(A)

* Note : A 1uF bypass capacitor should be placed close to the microphone's VDD pin to ensure best SNR performance

7. INTERFACE PARAMETER

Parameter	Conditions	Min	Typ	Max	Units
Clock Duty Cycle	f_{clk} <= 3.072MHz	**40**	**-**	**60**	%
	f_{clk} > 3.072MHz	**48**	**-**	**52**	
Input Logic Low Level		**-0.3**	**-**	**0.35 x VDD**	V
Input Logic High Level		**0.65 x VDD**	**-**	**VDD + 0.3**	V
Hysteresis Width		**0.1 x VDD**	**-**	**0.29 x VDD**	V
Output Logic Low Level		**-**	**-**	**0.3 x VDD**	V
Output Logic High Level		**0.7 x VDD**	**-**	**-**	V
Output Load Capacitance on DATA		**-**	**-**	**200**	pF
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 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) Rload, min = 100kΩ Cload, max = 100pF	**-**	**-**	**100**	ns

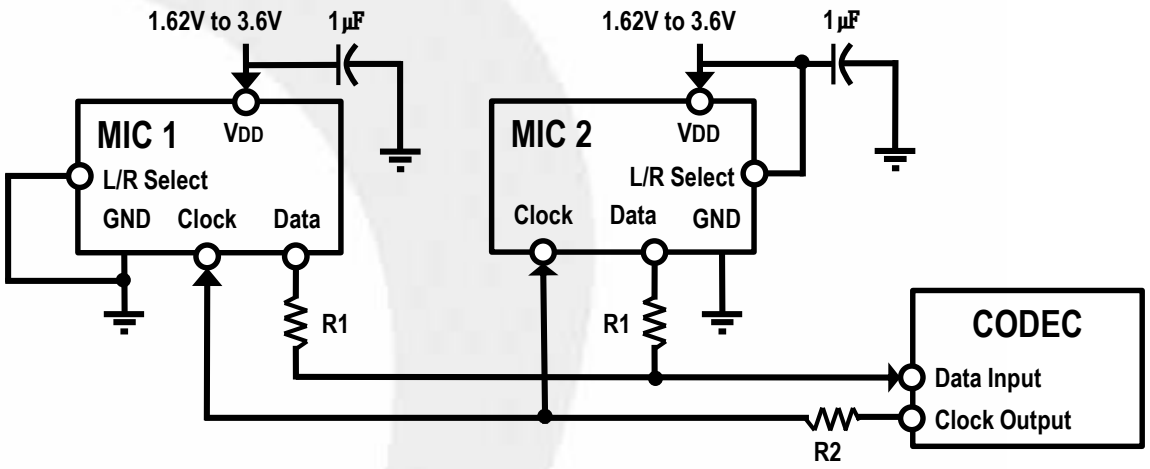
8. MEASUREMENT CIRCUIT



9. PIN DESCRIPTION

Pin Name	Description
VDD	Supply and IO voltage for the microphone
L/R Select	Left/Right (DATA2 / DATA1) Channel selection
CLOCK	Clock input to the microphone
DATA	PDM data output from the microphone
GND	Ground

10. INTERFACE CIRCUIT & CHANNEL DATA CONFIGURATION



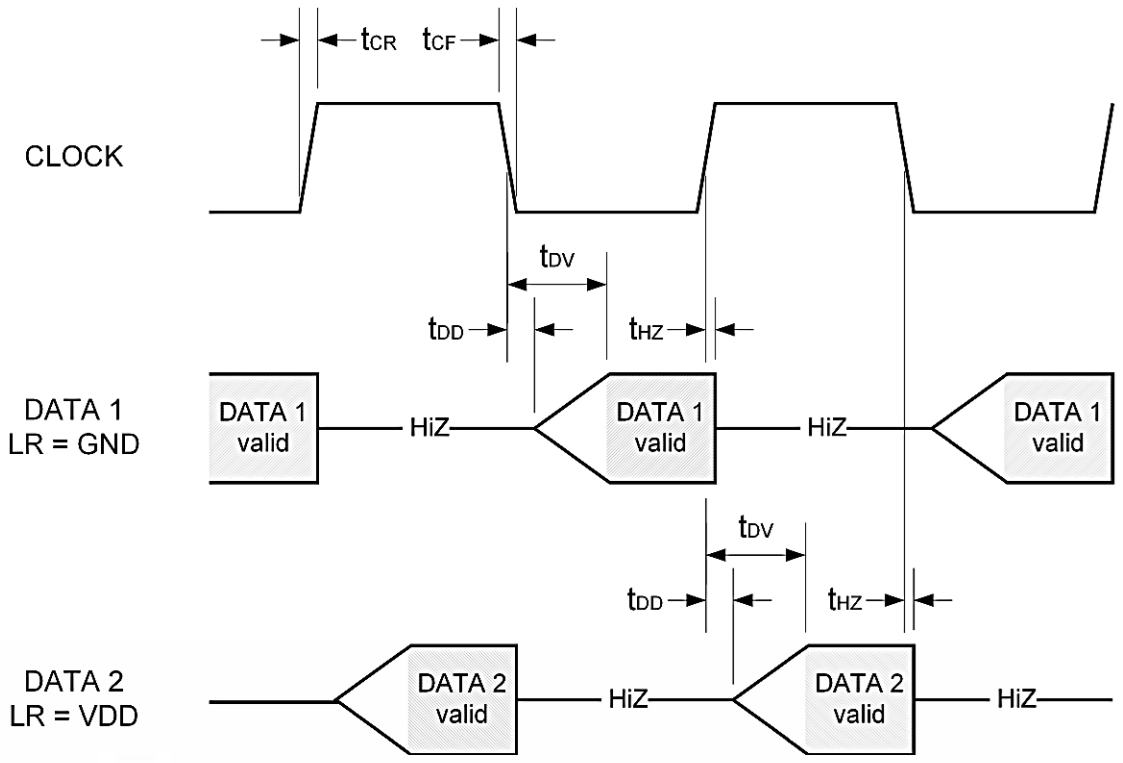
Data symbol in interface timing chart	L/R Select connected to	Data asserted at	Data sampled at
DATA1 [MIC1(Low)]	GND	Falling clock edge	Rising clock edge
DATA2 [MIC2(High)]	VDD	Rising clock edge	Falling clock edge

Note 1 : Stereo operation is accomplished by connecting the L/R Sel. pin either to VDD or GND on the phone PWB. Bypass Capacitors near each MIC. on VDD are recommended to provide maximum SNR performance.

Note 2 : R1(Data source termination Resister) should be as close as possible to each the MIC. (50Ω~100Ω)

Note 3 : R2(Clock source termination Resister) should be as close as possible to the CODEC. (50Ω~100Ω)

11. INTERFACE TIMING CHART



With defining a minimum value for t_{DD} and a maximum value for t_{HZ} it is secured that the driven DATA signals of the right and the left channel don't overlap.
A definition of a maximum value for t_{DD} is not necessary, instead t_{DV} defines the time until the driven DATA is valid.

Parameter	Conditions	Min	Typ	Max	Units
Clock Rise/Fall Time (t_{CR}, t_{CF})		-	-	**13**	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
Delay Time for DATA driven (t_{DD})	Delay time from CLOCK edge(50% V_{DD}) to DATA driven	**40**	-	**80**	ns
Delay Time for High Z (t_{HZ})	Delay time from CLOCK edge(50% V_{DD}) to DATA high impedance state	**5**	-	**30**	ns

12. TYPICAL FREQUENCY RESPONSE CURVE

Far Field Measurement Condition
Temperature : 23 ± 2 ℃
Supply Voltage : 1.8V
Clock Frequency : 2.4㎒
Acoustic stimulus : 1Pa (94dB SPL at 1㎑) at 50 ㎝ from the loud-speaker.
The loud-speaker must be calibrated to make a flat frequency response input signal.
Position : The frequency response of microphone unit measured at 50㎝ from the loud-speaker

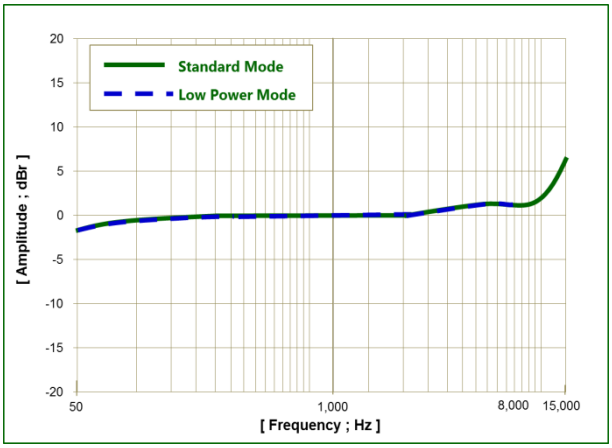


Figure 1. Typical Frequency Response, Normalized to 1㎑

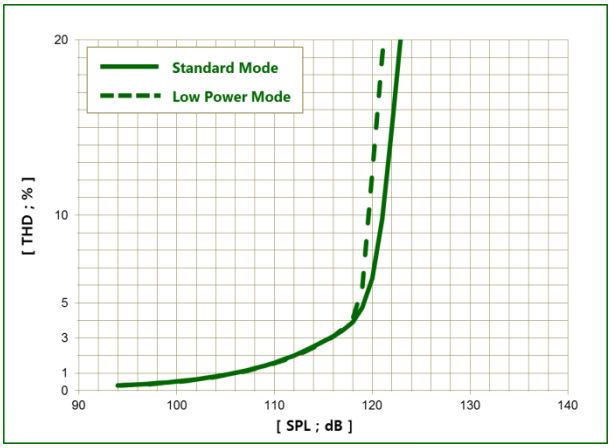


Figure 2. THD vs. Input Level, Standard and Low-Power Modes

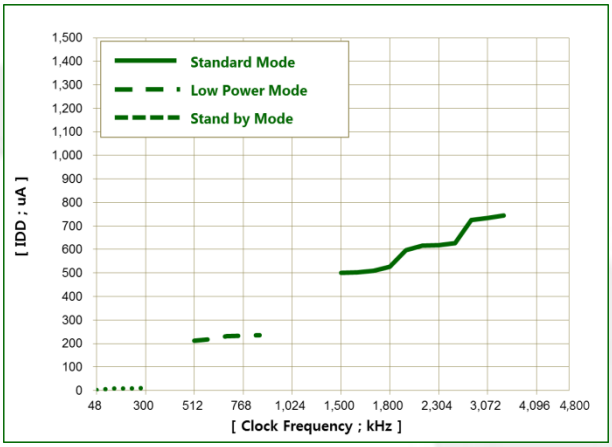


Figure 3. Typical IDD vs. Clock Frequency, All Mode

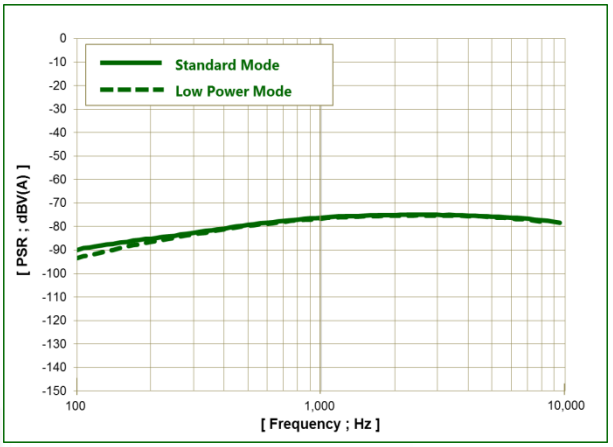


Figure 4. Typical Power Supply Rejection (PSR) vs. Frequency, Standard and Low-Power Modes

■ Frequency Mask Specification

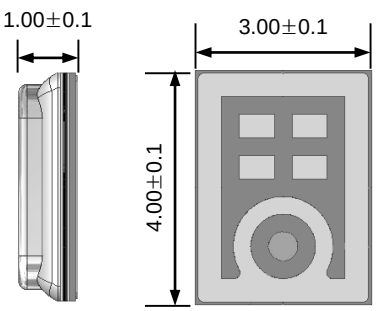
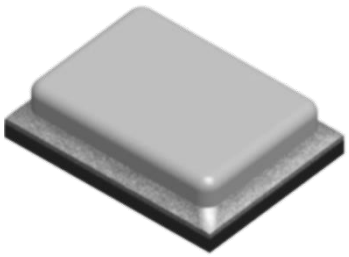
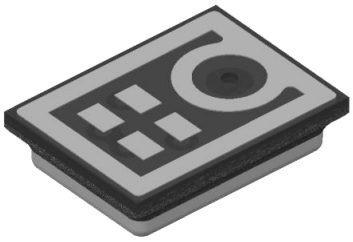
Frequency [Hz]	Lower Limit [dBr]	Upper Limit [dBr]	Note
50 ~ 1000	-2	+2	0dBr = dBFS at 1㎑
1000	0	0	
1000 ~ 5000	-2	+2	
10000	-2	+5	
15000	-2	+8	

Note : Band Frequency Range
1. Narrow Band : 300㎐ ~ 3.4㎑
2. Wide Band : 100㎐ ~ 7㎑
3. Super Wide Band : 50㎐ ~ 14㎑

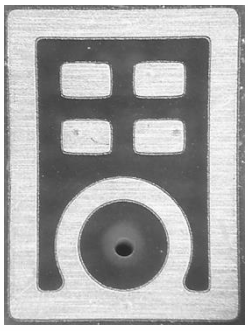
13. MECHANICAL CHARACTERISTICS

※ PCB design & Pin size can be changed by model No.

SMD Type

F4-(A)HDMO-D100R26-5P		
		

Lettering



V1.0 F 4 H

- Version1

E : Engineering Sample
P : Pre-Production
M : Mass Production

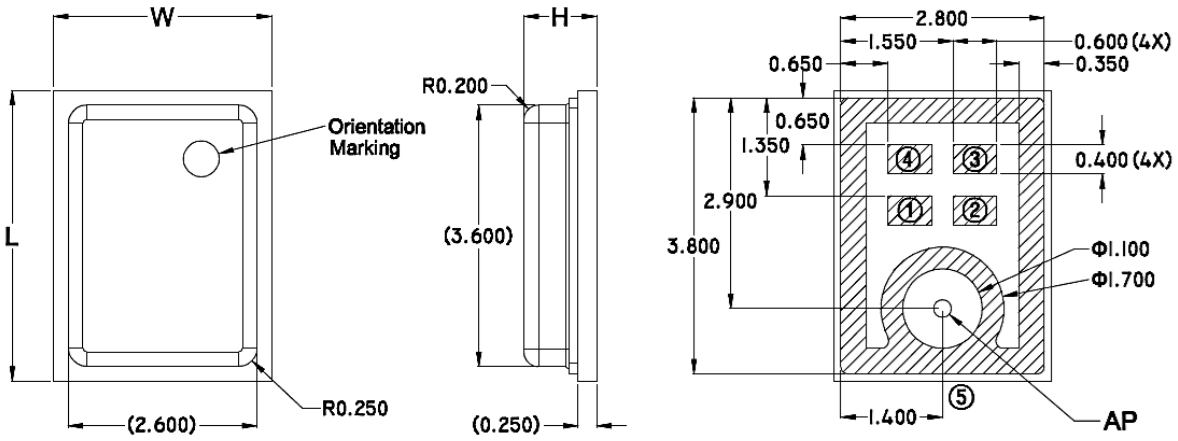
M 18 46

- Week
- Year

13. MECHANICAL CHARACTERISTICS

- Mechanical dimensions & Pad Lay-out

Dimensions (Unit : mm)



TOP VIEW SIDE VIEW BOTTOM VIEW

Item	Dimension	Tolerance (+/-)	Units
Length (L)	4.00	0.10	mm
Width (W)	3.00	0.10	mm
Height (H)	1.00	0.10	mm
Acoustic Port (AP)	Φ 0.25	0.10	mm

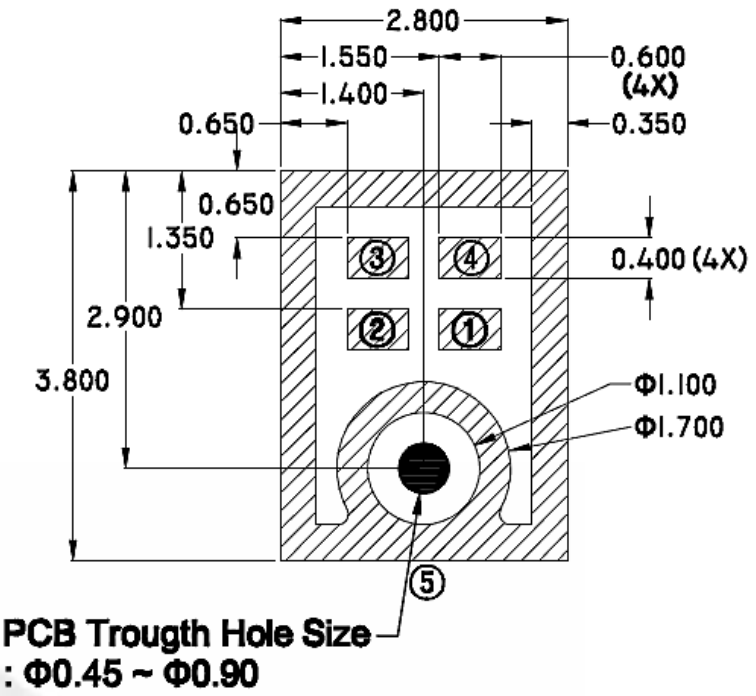
Pin #	Pin Name	Type	Description
1	VDD	Power	Supply and I/O voltage
2	L/R	L/R Select	Left/Right channel selection
3	CLK	Clock	Clock input
4	DATA	Digital O	PDM data output
5	GND	Ground	Ground

Note : All ground Pins must be connected to ground.
"3"Pin must be sealed by solder paste on the PWB.
General Tolerance ±0.08mm.

13. MECHANICAL CHARACTERISTICS

- Recommended Land Pattern & Stencil Pattern

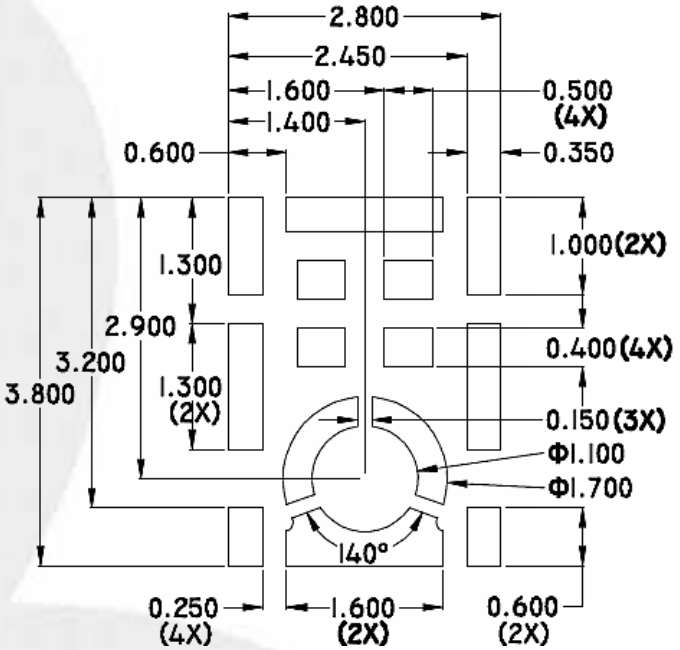
Recommended
PCB land pattern
(Unit : mm)



PCB Trougth Hole Size
: Φ0.45 ~ Φ0.90

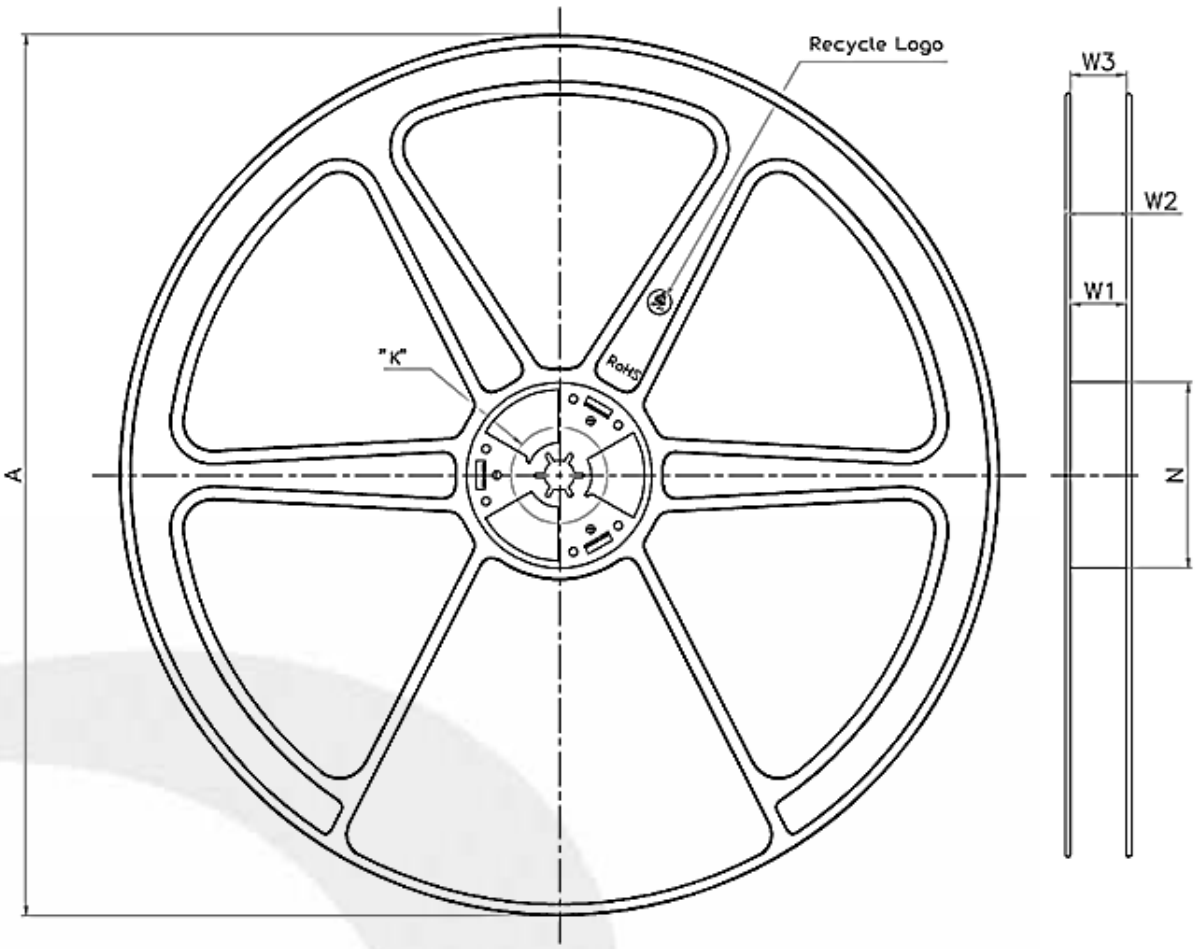
Recommended
solder stencil pattern
(Unit : mm)

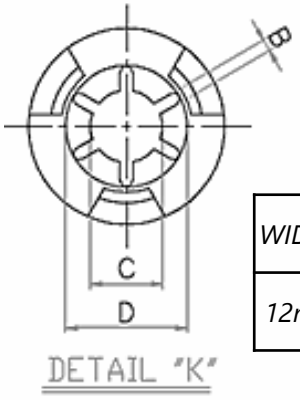
(thickness of metal mask: 0.10T)



14. PACKAGING SPECIFICATION

- Reel





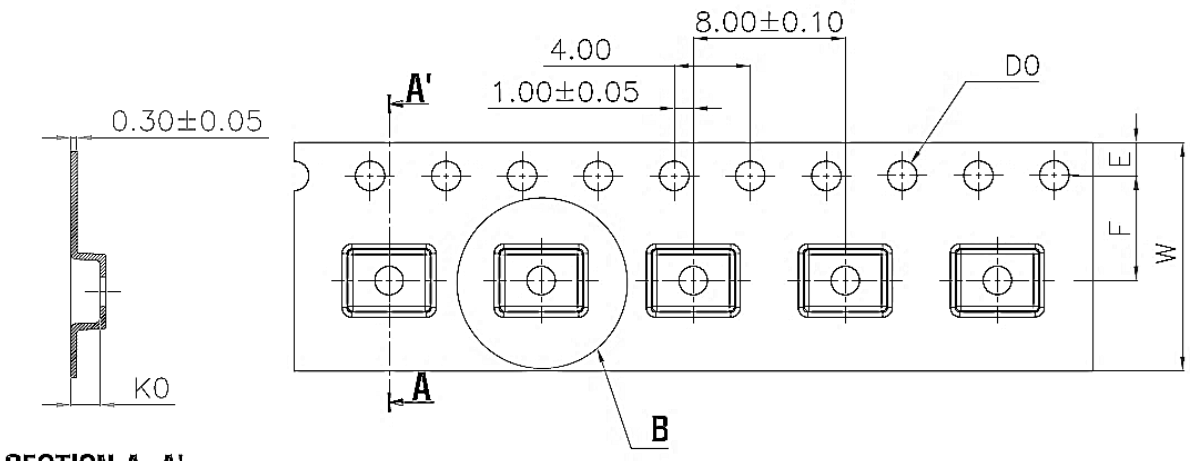
(Unit : mm)

WIDTH	A	B	C	D	N	W1	W2	W3
12mm	330 $^{+2.0}_{-2.0}$	2.0 $^{+0.5}_{-0.2}$	13 $^{+1.0}_{-0.2}$	22.5 $^{+2.0}_{-2.0}$	80 $^{+3.0}_{-1.0}$	12.4 $^{+3.0}_{-0.0}$	16.4 $^{+2.0}_{-2.0}$	13.6 $^{+2.0}_{-2.0}$

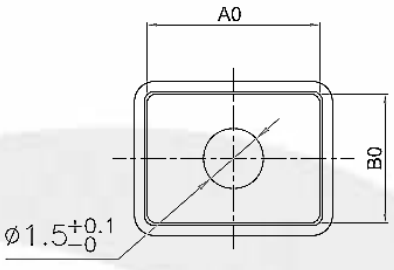
- 13” reel will be provided for the mass production stage

14. PACKAGING SPECIFICATION

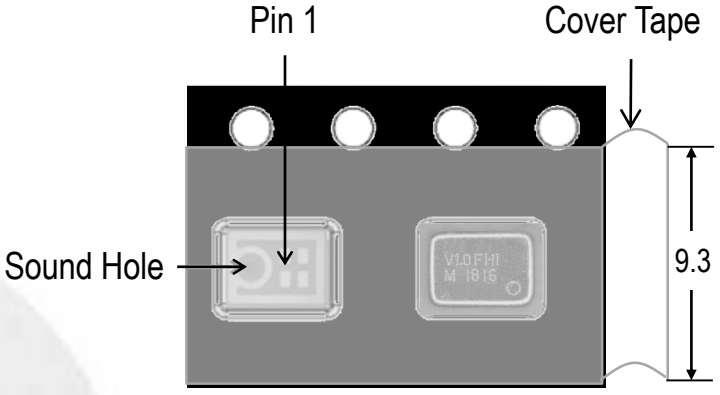
- Taping



SECTION A-A'



DETAIL B (2:1)



[Note]
1. Direction of parts : See above pictures.
2. Microphone total quantity (13" Reel) : 4,000pcs
3. Carrier Tape ESD : 10^2~$10^{10}\Omega$
4. Cover Tape Inside ESD : 10^2~$10^{10}\Omega$
5. Carrier Tape Material & Color : PS, Black
6. Thermo Compression Bonding

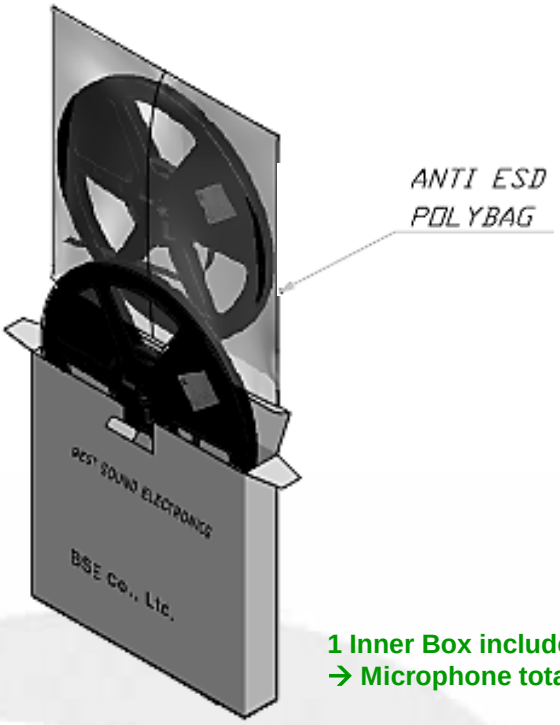
Unit : mm

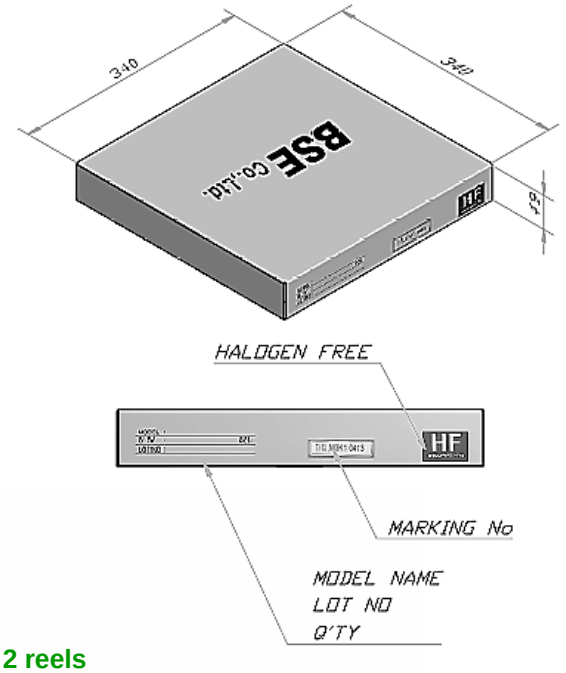
A0	4.30±0.10	E	1.75±0.10
B0	3.20±0.10	F	5.50±0.05
K0	1.30±0.10	T	0.30±0.05
D0	1.50±0.10	W	12.00±0.30

14. PACKAGING SPECIFICATION

- Packing

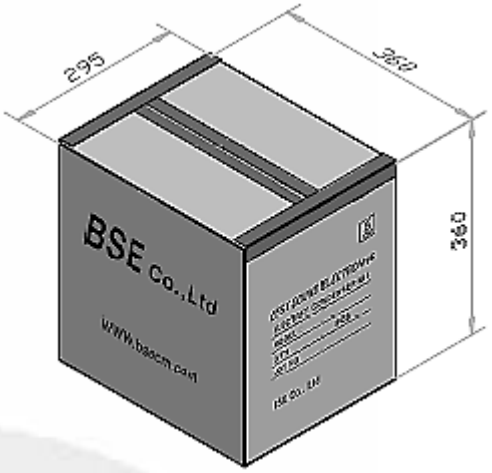
Inner Box spec.





1 Inner Box included 2 reels
→ Microphone total quantity : 8,000 pcs

Outer Box Spec.



1 Outer Box included 5 Inner Boxes
→ Microphone total quantity : 40,000 pcs

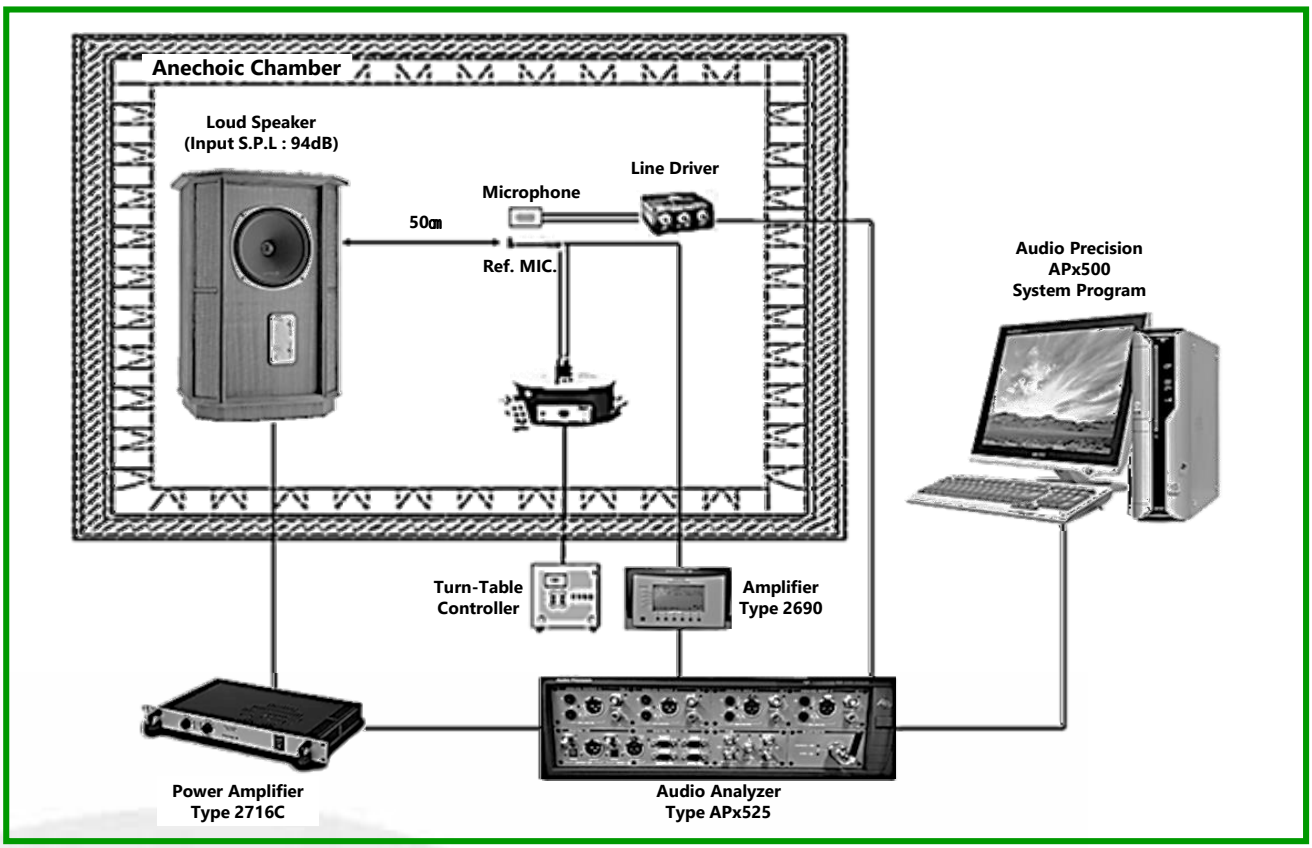
15. RELIABILITY TEST CONDITIONS

Note : After test conditions are performed, the sensitivity of the microphone shall not deviate more than ±1dB from its initial value.	
TEST	**DESCRIPTION**
TEMPERATURE STORAGE	[High Temperature Storage] +80℃±3℃ x 200hrs (The measurement to be done after 2 hours of conditioning at room temperature)
	[Low Temperature Storage] -30℃±3℃ x 200hrs (The measurement to be done after 2 hours of conditioning at room temperature)
TEMPERATURE CYCLE	(-25℃±2℃ x 30min -> +20℃±2℃ x 10min -> +70℃±2℃ x 30min -> +20℃±2℃ x 10min) x 5cycles (The measurement to be done after 2 hours of conditioning at room temperature)
THERMAL SHOCK	(+85℃±2℃ -> -40℃±2℃Change time : 20sec) x 48cycles Maintain : 60min (The measurement to be done after 2 hours of conditioning at room temperature)
HIGH TEMPERATURE AND HUMIDITY	+85℃±2, 85±%RH, Bias(3.6V) x 200hrs (The measurement to be done after 2 hours of conditioning at room temperature)
	+70℃±2, 95±%RH x 200hrs (The measurement to be done after 2 hours of conditioning at room temperature)
ESD (Electrostatic Discharge)	Air discharge : ±8kV, ±10kV, ±12kV, ±15kV VDD, Data, CLK, L/R, GND Pad each 5 times (Non-ground)
	Contact discharge : ±2kV, ±4kV, ±6kV, ±8kV VDD, Data, CLK, L/R, GND Pad each 5 times (Non-ground)
ESD-HBM ANSI/ESDA/JEDEC JS-001	target: 50V(internal interface pins to the MEMS chip) target: 2000V (external pins of the microphone module)
VIBRATION	Signal 5Hz to 500Hz, acceleration spectral density of 0.01g^2/Hz in each of 3 axes, 120 min in each axis (360min in total)
DROP	To be no interference in operation after dropped to steel floor 18 times from 1.52 meter height in state of packing (with 180g jig)
REFLOW SENSITIVITY	5 reflow cycles. Refer to reflow profile from specification item 18.

16. ENVIRONMENTAL CHARACTERISTICS AND STANDARD CONDITIONS

Item	Min	Typ	Max	Unit
Operating temperature range	-40	-	+100	℃
Storage temperature range	-40	-	+100	℃
Relative humidity	25	-	85	%
Air Pressure	860	-	1060	mBar
Standard temperature range	15	20	25	℃
Standard Relative humidity	40	-	60	%

17. MEASUREMENT SYSTEM

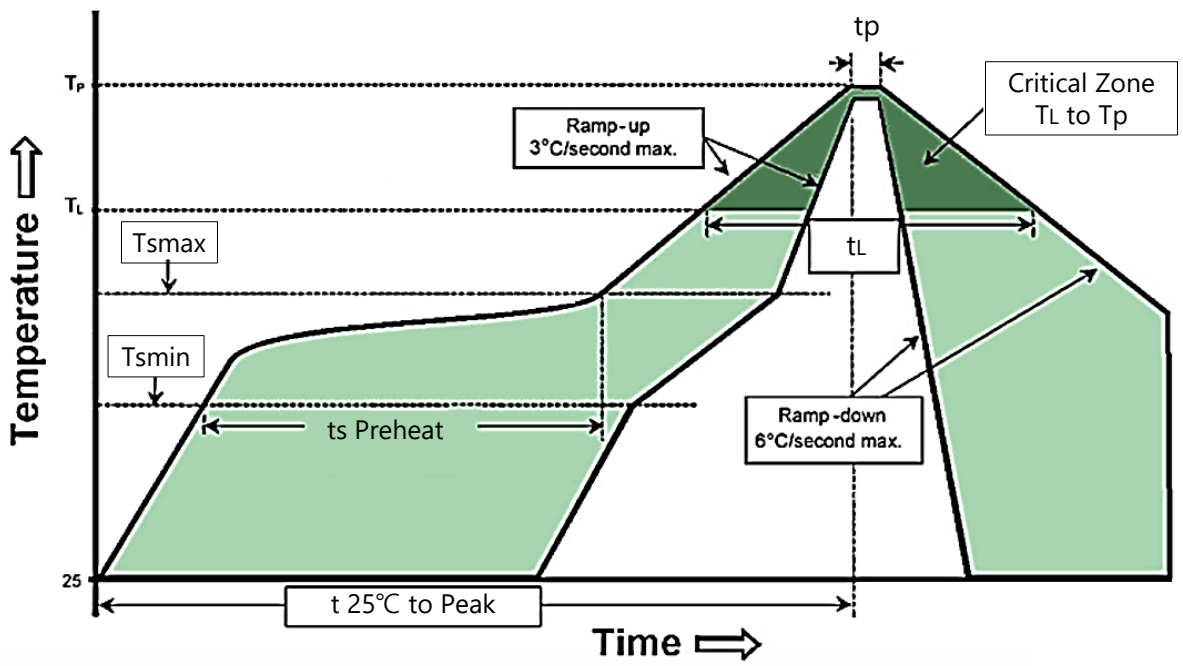


17.1 Measurement Condition

(a) Supply voltage : 1.8V
(b) Clock Frequency : 768㎑, 2.4 ㎒
(c) Acoustic stimulus : 94㏈ SPL at 1㎑
(d) Distance between MIC & SPK : 50㎝
(e) Measurement frequency : 50 (㎐) ~ 20 (㎑)

Machine	Model No	Purpose
Standard MIC	4191	Revision of input signal & SPK spec
Audio Analyzer	APX525	Audio Analysis (include Power Supply)
Loud-speaker	GRF Memory HE	SPK (Input sound Signal occur)
Power Amplifier	2716C	Power amplification
Charging Conditioning Amplifier	2690	Ref. MIC Signal Transformation
Operating Software	APx500 4.4	A-D Freq. Resp.
Sound Level Calibrator	4231	Standard MIC Calibration purpose

18. SOLDER REFLOW PROFILE



Profile Feature	Pb-Free Assembly
Preheat/Soak	
Temperature Min (Tsmin) Temperature Min (Tsmax) Time(ts) from (Tsmin to Tsmax)	150℃ 200℃ 60 ~ 120 seconds
Ramp-up rate (TL to Tp)	3℃/second max.
Liquidous temperature(TL) Time(tL) maintained above TL	217℃ 60 ~ 150 seconds
Peak package body temperature (Tp)	260℃
Time(tp) within 5℃ of the specified classification Temperature(Tc)	20 ~ 40 seconds
Ramp-down rate (Tp to TL)	6℃/second max.
Time 25℃ to peak temperature	8 minutes max.

[Notes]

1. Solder Reflow Profile based on IPC/JDEC J-STD-020 Revision D.
2. Do not pull a vacuum over the port hole of the microphone. Pulling a vacuum over the port hole can damage the device.
3. Do not board wash after the reflow process. Board washing and cleaning agents can damage the device. Do not expose to ultrasonic processing or cleaning.
4. Recommend no more than 5 cycles.
5. Shelf life : Twelve(12) months when devices are to be stored in factory supplied, unopened ESD moisture sensitive bag under maximum environmental condition of 30℃, 70% R.H.
6. Exposure : Devices should not be exposed to high humidity, high temperature environment. MSL (Moisture sensitivity level) Class 1.
7. Out of bag : Maximum of 90 days of ESD moisture sensitive bag, assuming maximum conditions of 30℃, 70% R.H.

19. RECOMMENDED PICK-UP NOZZLE CONDITIONS

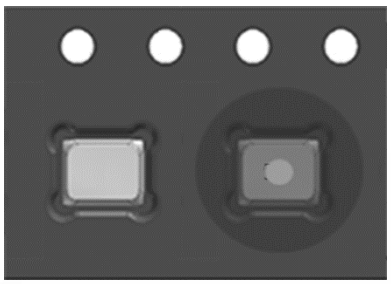
19.1. Nozzle material : Metal or Rubber, Etc.

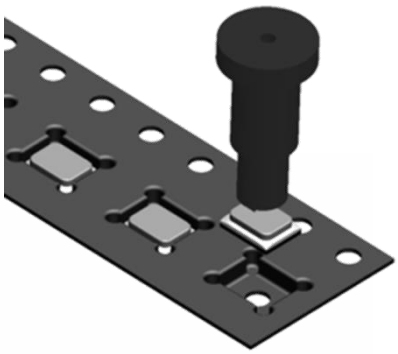
19.2. Case Weight

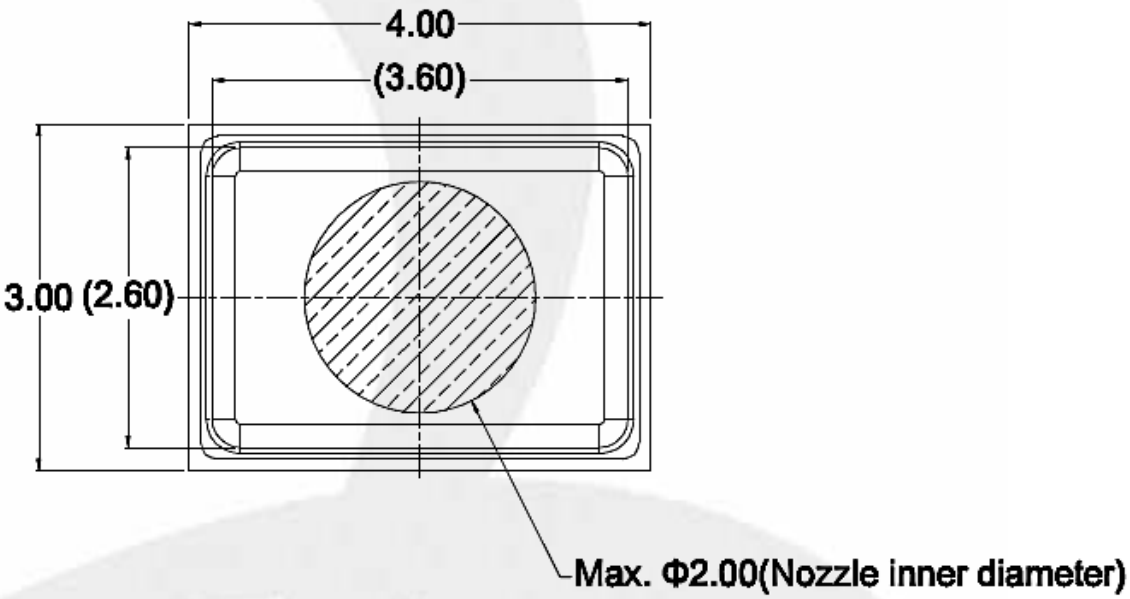
- If tool outer size is bigger than MIC. : Max. 10N
- If tool outer size is smaller than MIC. : Max. 4N

19.3. Nozzle position : The opposite side of sound hole

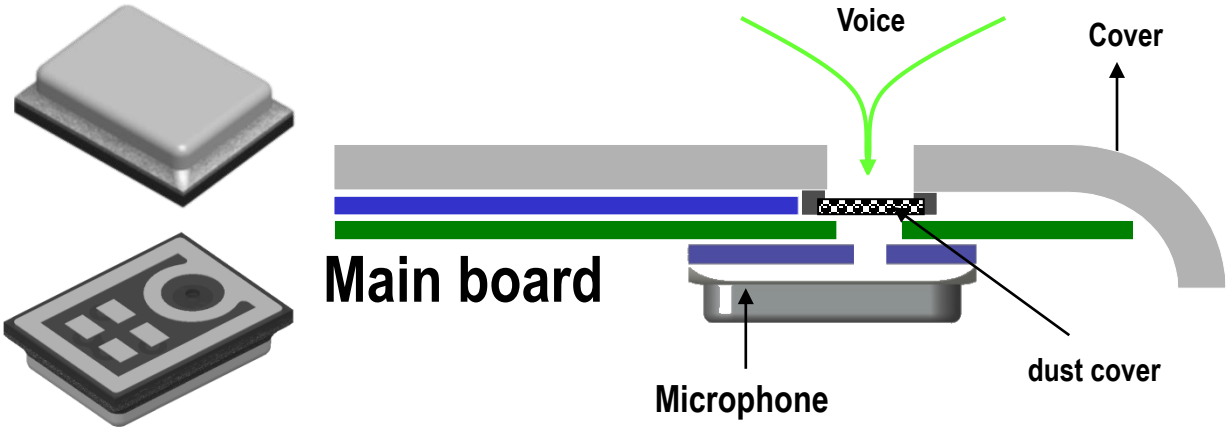
- Nozzle inner diameter size : Max. Ø2.0
- position : the MIC center

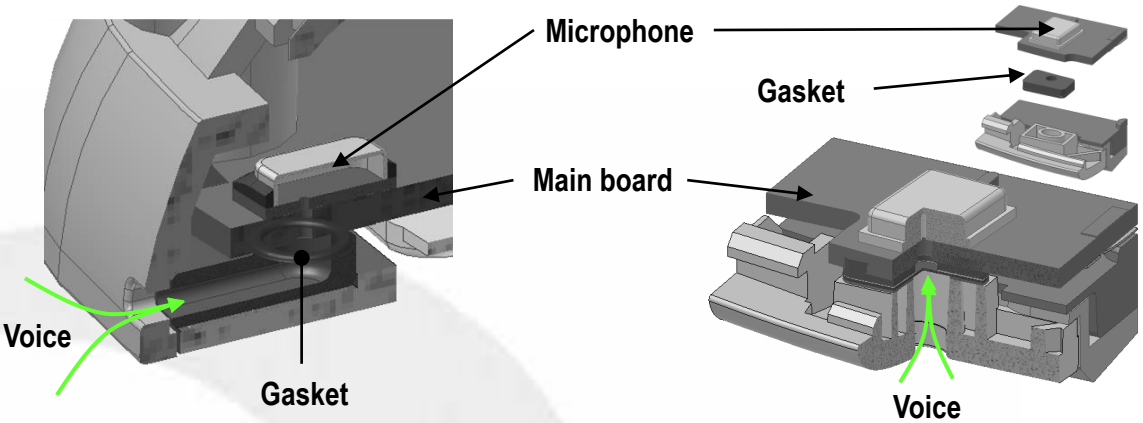






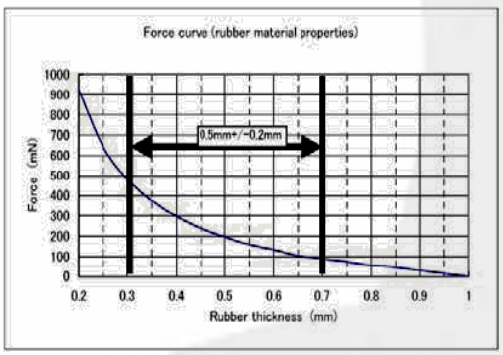
20. APPLICATION EXAMPLE





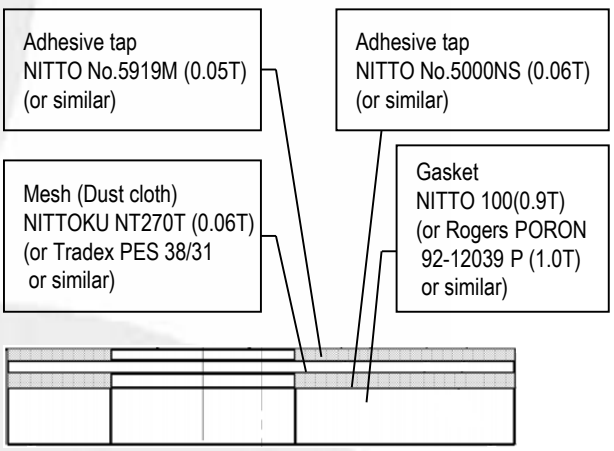
Sound Path Size at Cover or Gasket : Min Φ1.00㎜

Compression force for sealing



Gasket compression range for sealing
→ 0.5±0.2mm

Gasket Layers

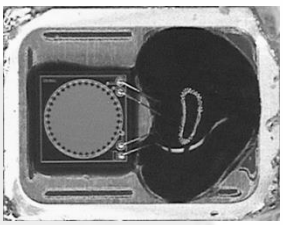
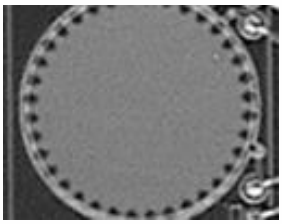


21. HANDLING GUIDE

21.1. Handling Guide of Cleaning & Foreign Matter

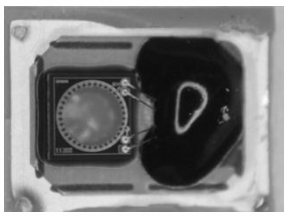
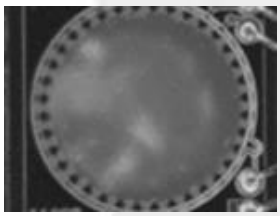
* Note 1. No Liquid or/and gas should be used for washing / cleaning.
* Note 2. No board washes should be applied after reflow
* Note 3. No foreign matter should be exposed interior microphone during cleaning or washing.
  if cleaning or washing is applied unavoidably, It must do additional prevention in area of "Microphone sound hole" to avoid foreign matter.(ex. Attached protective tape)
* Note 4. No seal sound hole of microphone should be applied during reflow process
* Note 5. No ultrasonic cleaning should be applied in case of microphone unit itself or/and after installed microphone onto board.
* Note 6. Do not reuse microphone which is defect during SMD.
  Do not wash or clean to reuse microphone which is defect during SMD.

De-cap View of Good part

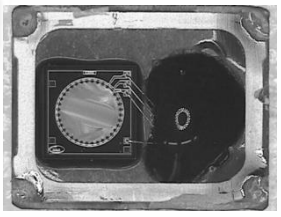
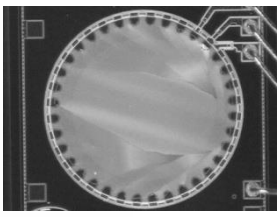



► Example) De-cap View of the NG Microphone

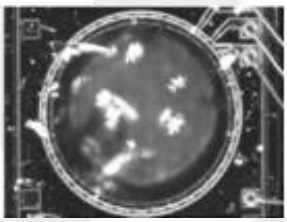
Reflow after sealing of Sound Hole

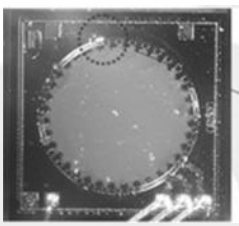
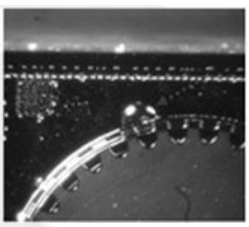
Defect view NG MIC by Pick-up

Defect view NG MIC by ultrasonic cleaning

Defect view NG MIC by liquid foreign matter

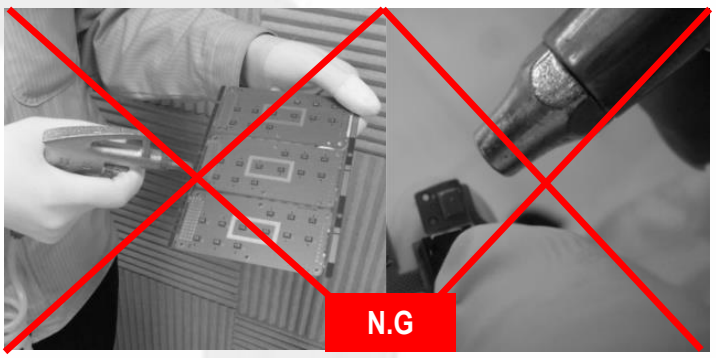



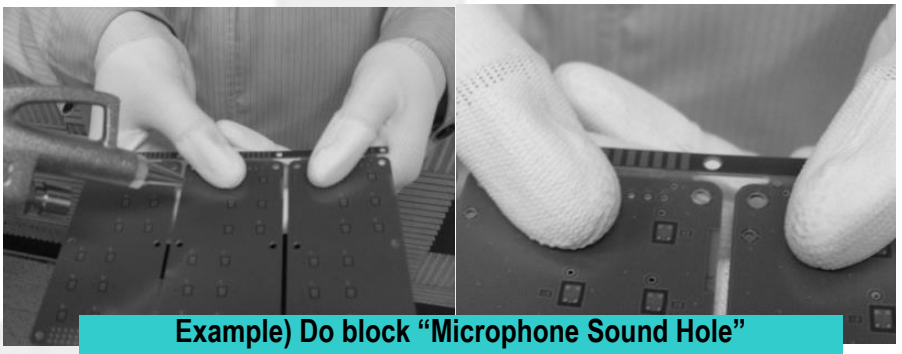
21. HANDLING GUIDE

21.2. Handling Guide of Care of Board Routing & Cutting

* Note 1. Do work maximum distance with microphone and minimum speed machining setting during Board Routing & Cutting
* Note 2. Do not wash or clean "Board" after Board Routing & Cutting
* Note 3. Do additional prevention in area of "microphone sound hole" to avoid foreign matter(ex. Attached protective tape) during Board Routing & Cutting
* Note 4. Do not use strong air flow directly in order to remove foreign matter should be applied in microphone
* Note 5. Do preventive action in area of "microphone sound hole" to avoid foreign matter(ex. Attached protective tape) or air.
(ex. Block "Microphone sound hole" by hands as below picture)

► **Example) Air Blowing Condition**





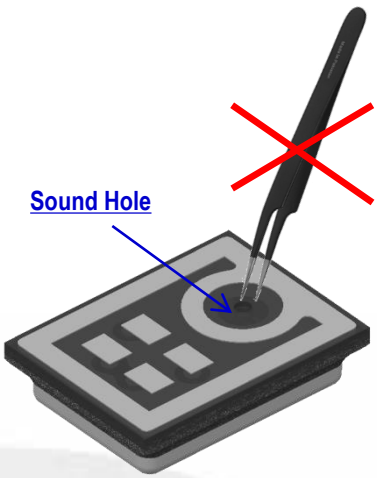
Example) Do block "Microphone Sound Hole" by hands during air blow

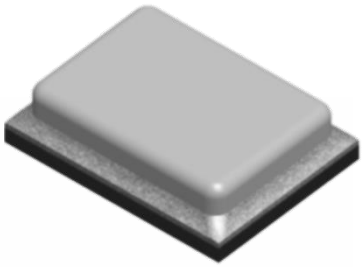
21. HANDLING GUIDE

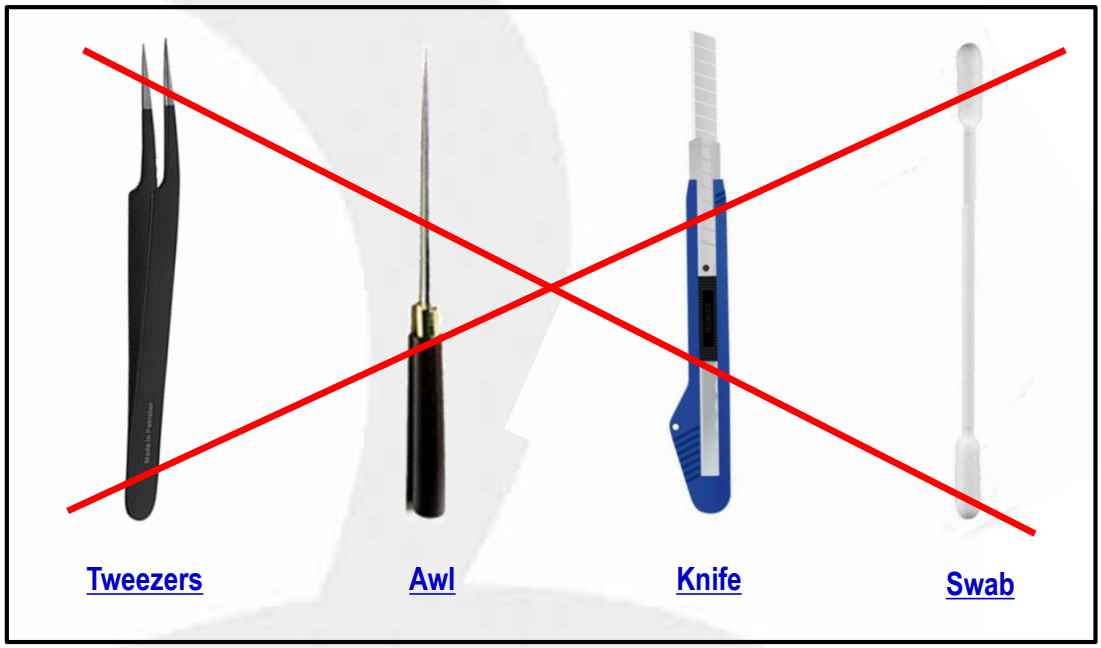
21.3. Broken Membrane & Back Plate of MEMS DIE

* Note 1. Do not touch Sound Hole by Sharp Tools. (ex. Tweezers)

* Note 2. Do not rub Sound Hole by Swab. (ex. Cloth)







21. HANDLING GUIDE

21.4. PRECAUTION for ESD

* Note 1. Wrist straps

Since the main cause of static is people, wrist-straps is very important to reduce the ESD damage. A wrist-strap, when properly grounded, keeps a person wearing it near ground potential and static charges do not accumulate. Wrist-straps should be worn by all personnel in all ESD protection areas, that is where ESD susceptible devices and end products containing them are assembled, manufactured handled and packaged.

Further ESD protection, similar to wrist-strap, involves the use of ESD protection floors in conjunction with ESD control footwear or foot-straps. Static control garments (smocks) give additional protection.

* Note 2. Work Areas

It is recommended that all areas where components that are not in ESD protective packaging are handled should be designated as ESD protective areas. Ground mats of ESD safe table surfaces is needed. These should be connected to the local ground with a 1 Mega-ohm series resistor. ESD safe floor and shoes are also needed.

* Note 3. Ionizers

In situations where we have to deal with isolated conductors that cannot be grounded and with most common plastics, air ionization can neutralize the static charge because only air is required for ionization to be effective, air ionizers can and should be used wherever it is not possible to ground everything.

21. HANDLING GUIDE

21.5. Inspection by X-Ray

* Note 1. Do inspect X-Ray after SMD.

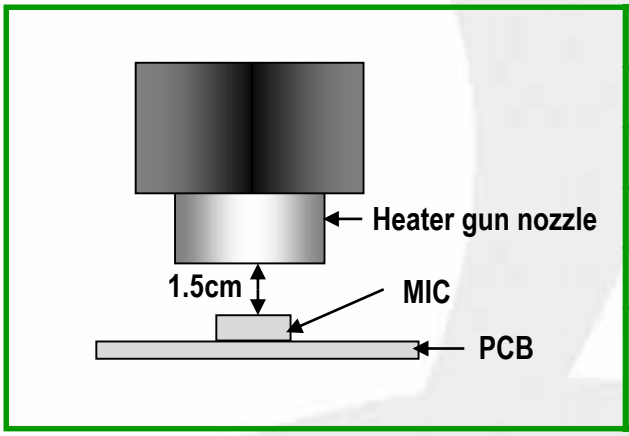
It is different X-Ray condition by applied SMD company.

22. REWORK

22.1. Recommended Heater Gun Specification

Manufacturer		**HAKKO**
Model		**850B ESD**
Temperature control		100 ~ 420
Top heater	Type	Hot air flow
	Flow rate	< 23 ℓ/min
Alignment		visual
Pick-up		Manual
Solder/flux		1. Removing or pre-heating the solder residue before mounting new part 2. Apply lead-free flux only or apply 2 ~ 3 points of solder paste instead

22.2. Recommended Heater Gun Setting Condition



Heater gun setting Temperature		300 ℃ ~ 400 ℃
Nozzle & MIC. Length		1.5 cm
Flow setting		2.0 ~
Alignment		Visual
Pick-up		Manual
Working Time	Remove	10 ~ 20 sec
	SMD	10 ~ 20 sec

* Note 1. According to the material & thickness & counts of layer for PCB, this condition will be change.

* Note 2. According to Rework M/C & Worker, this condition will be change.

22. REWORK

22.3. Rework Process Condition (using Heater Gun)

Bottom Heater	Recommend IR heater.
Alignment	Use magnifier for alignment. Note : it may difficult to do alignment by naked visual because MIC pad is located on soffit.
Temperature	Recommend temperature is “300℃”.
Time	It is the optimized working process of 1.0 ~ 2.0mm board for 10~20sec under 300℃ temp.
Nozzle	Use heater gun without nozzle
Solder/flux Process Options	1. Removing the solder residue before mounting new part - print Halogen-free solder paste on the SMD MIC terminals using mask → mounting
	2-1. Pre-heating the solder residue before mounting new part - apply Halogen-free flux onto the land pattern
	2-2. Pre-heating the solder residue before mounting new part - apply 2 ~ 3 points of Halogen-free solder paste onto the land pattern
	3. Highly recommendation process for rework. - After remove defect parts without Pre-heating, It is used Halogen-free flux or 2~3 points of Halogen-free solder. (It is most effective and fast for rework)

22. REWORK

22.4. Handling of Rework

* Note 1. Follow standard guide line of SMD company for Rework Condition
* Note 2. Rework conditions may variable by SMD companies' circumstance and working condition.
* Note 3. Do Not reuse defect microphone by SMD process.
* Note 4. Do not employ chemical board wash or cleaning, as the associated cleaning agents (such as liquid or air) can damage the device.

SPECIFICATION HISTORY

Version	Date	Comments
1.0	Dec. 11. 18	1st Submission of Electro-Acoustical specification
1.1	Oct. 02. 19	Extend of clock frequency range

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