






Analog MEMS Microphone Approval

| | | |
|----------------|--|--|
| Part number | AM4311T42A0 (Front-type, 3.76X2.95X1.10t) |  |
| USER | TDB | |
| User CODE | TDB | |
| REVISION | 00 | |
| Producing area | Partron (Yantai, China) | |

| | | | | |
|--|---|--|-------------------|----------|
| LEAD FREE | BFRS-Free, Halogen-free, Beryllium-free | | | |
|  |  |  | | |
| |  | | | |
| Partron | | | | |
| Approval | Drawing-up | Evaluation | Quality agreement | Decision |
| | D.Y. Park | Y.P. LEE | N.S. Min | J.M. Kim |
| | Electronic approval | | | |
| | 9/03 | 9/03 | 9/03 | 9/03 |

Partron

22-7 Seokwoo-dong, Hwasung-shi, Gyeonggi-do, Korea
 Tel. 031-201-7700. Fax. 031.201.7800

. We are not supposed to ask the partners to provide the technical Document without valid reason.
 The acquired Technical Document should not be used elsewhere.

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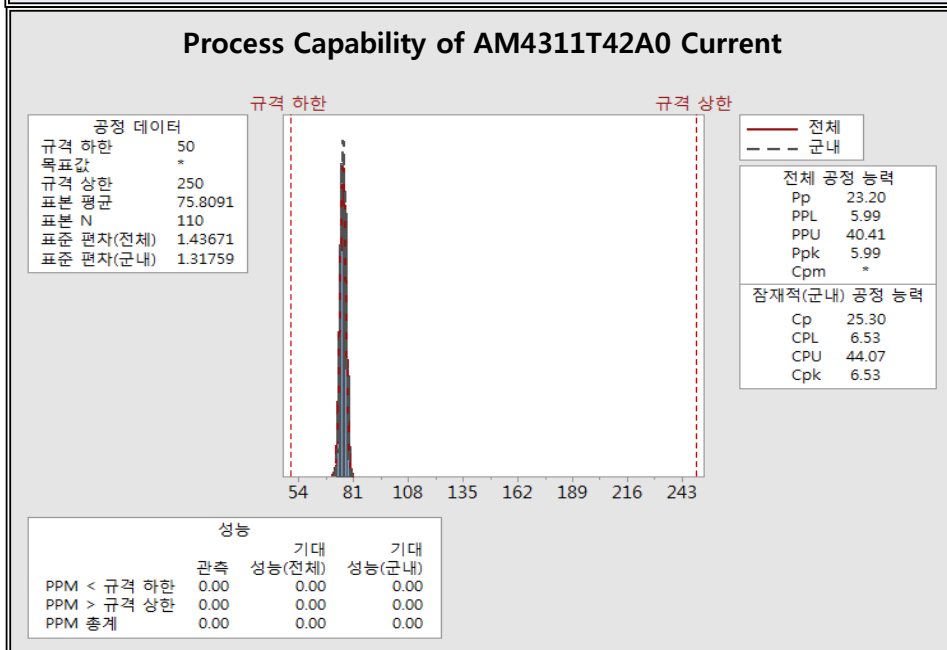
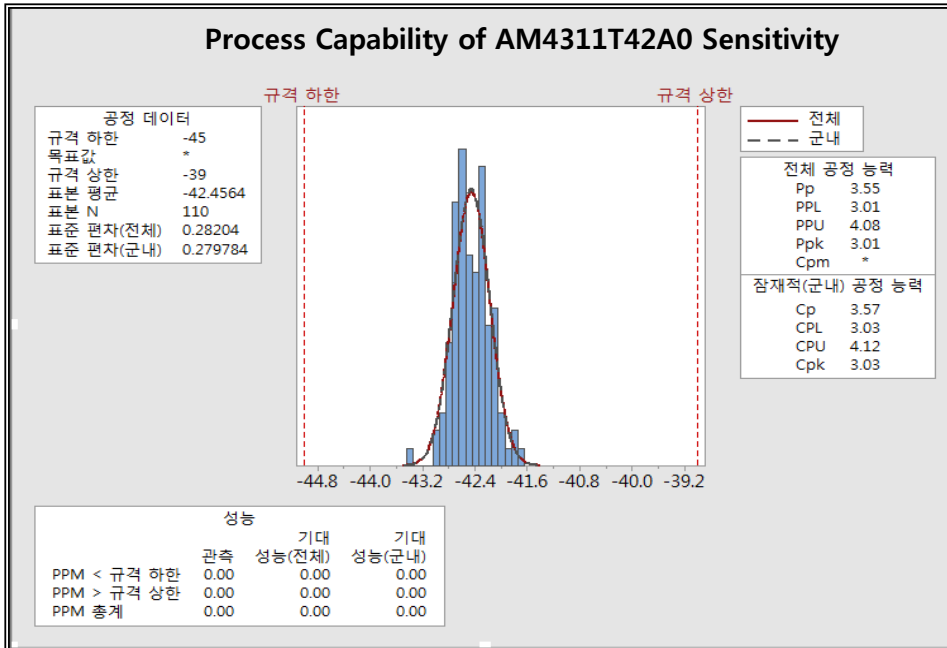
1. Revision history

| Rev | Date | Revision history | Page |
|-----|------------|--|------|
| 00 | 2012.08.01 | Initial Release. | |
| 01 | 2014.08.14 | - Datasheet Revision Revision : Rework Method Addition : Handling with care of MEMS Microphone | |
| 02 | 2015.09.07 | - ASIC revision Revision : NJU72084W | |
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2. CTF (Critical To Factor/ Function)

2-1 Electrical characteristic specification

| Item | Limitation | C _{PK} | Remark |
|-------------|---------------|-----------------|--------|
| Sensitivity | -45.0~-39.0dB | 3.03 | |
| Current | 50~150μA | 6.53 | |



2. CTF (Critical To Factor/ Function)

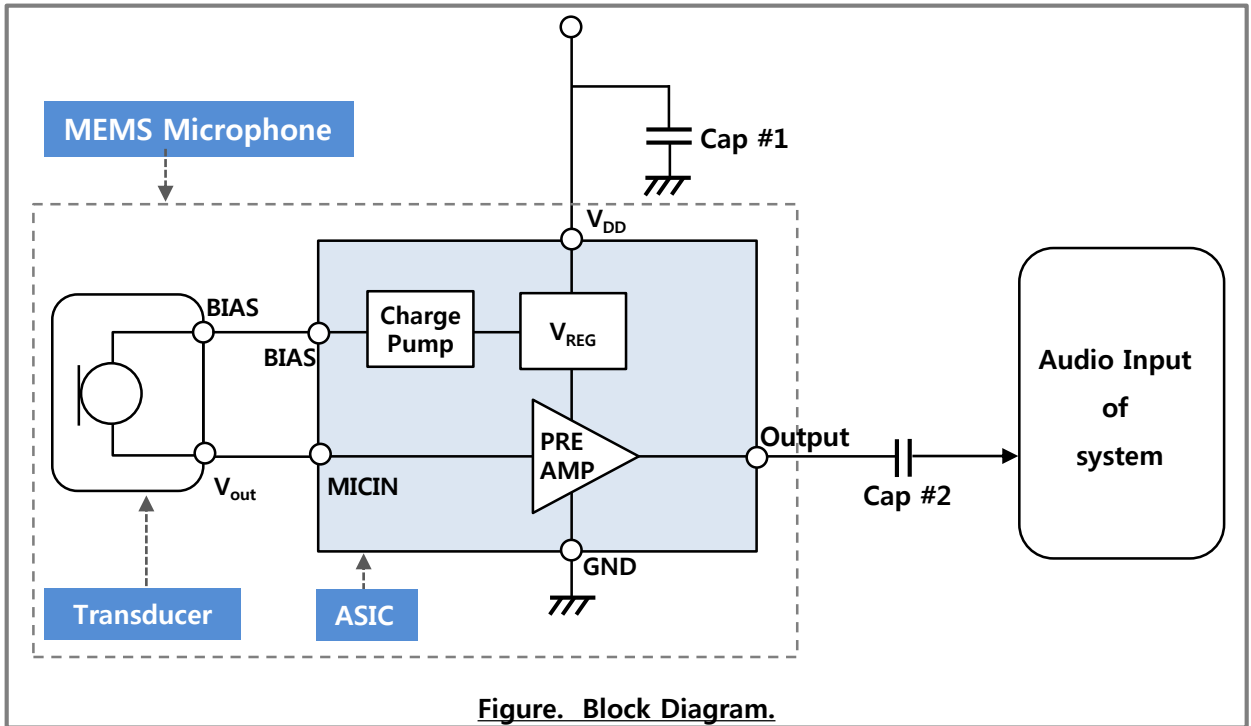
2-2 Appearance specification

| ITEM | Unit | DIMENSION | C _{PK} | Remark |
|-----------------|------|--------------|-----------------|--------|
| WIDTH | mm | 2.95 ±0.10 | 3.33 | |
| LENGTH | mm | 3.76 ±0.10 | 3.71 | |
| HEIGHT | mm | 1.10 ±0.10 | 2.80 | |
| Acoustic port | mm | Φ 0.50 ±0.05 | 1.89 | |
| Loop height | mm | 0.45 ±0.15 | 1.52 | |
| Wire pull | gf | Min 3 | 1.65 | |
| Wire ball Shear | gf | Min 23 | 1.38 | |
| Coplanarity | mm | Max 0.08 | 3.12 | |

※ Sampling test C_{PK} : Circuit > 1.33 , Structure > 1.0

3. Electrical characteristic

3-1. Recommended Interface Circuit



| No. | Parts | Function |
|-----|--------------------------------------|--------------------------------------|
| 1 | Charge pump | Supply of voltage |
| 2 | V _{REG} (Voltage regulator) | Voltage stabilization |
| 3 | Preamp | Impedance matching |
| 4 | Capacitor #1 | AC decoupling, Voltage stabilization |
| 5 | Capacitor #2 | DC decoupling |

3. Electrical characteristic

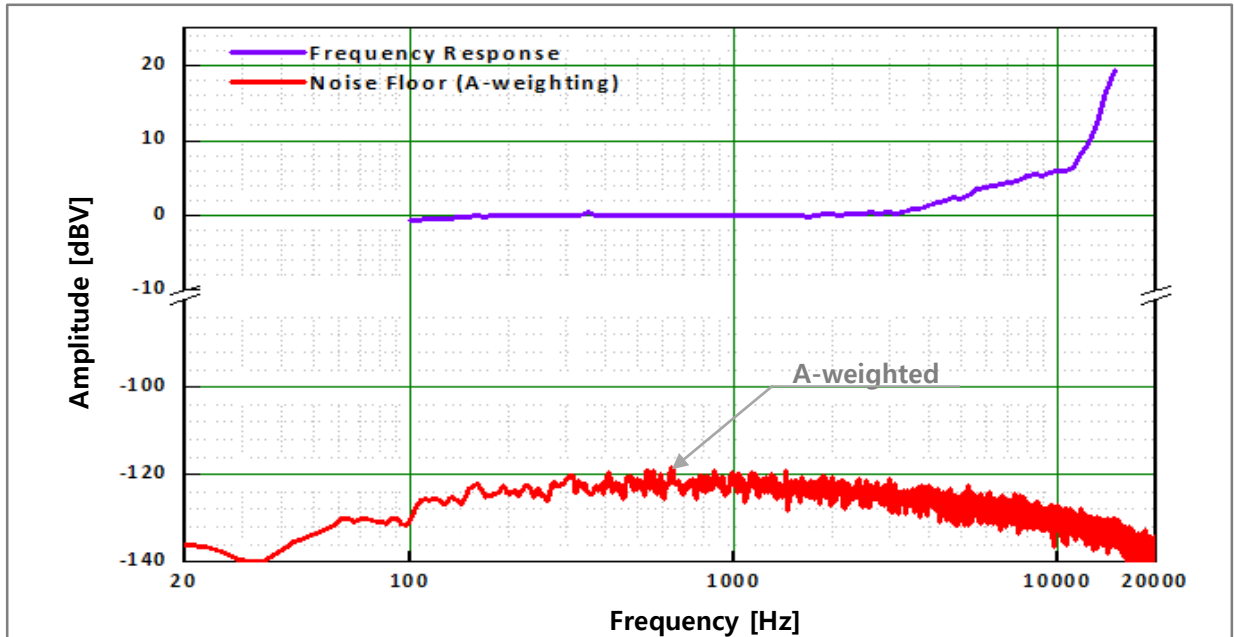
3-2. Acoustic & Electrical Specifications

| No | Parameter | Symbol | Condition | Limits | | | Unit | | |
|---------------------------------|----------------------------------|------------|---|---------|-----|-----|--------------|------|---|
| | | | | Min | Typ | Max | | | |
| ▶ Performance | | | | | | | | | |
| 1 | Directionality | | Omni-directional | - | - | - | - | | |
| 2 | Sensitivity | S | Freq= 1kHz, $V_{DD} = 2V$ Sound pressure level = 94dB SPL | -45 | -42 | -39 | dBV | | |
| 3 | Sensitivity variation | | 94dB SPL @1kHz, V_{DD} Range : 1.5~3.6V | -0.5 | - | 0.5 | dB | | |
| 4 | Signal to Noise Ratio | SNR | Summation : 20Hz~20kHz, A-weighted | - | 59 | - | dB(A) | | |
| 5 | Equivalent Input Noise | EIN | A-weighted | - | 35 | - | dB(A) SPL | | |
| 6 | Dynamic Range | | Derived from EIN and max acoustic Input | - | 85 | - | dB | | |
| 7 | Total Harmonic Distortion | THD | 94dB SPL | @ 315Hz | - | - | 5.0 | % | |
| | | | | @ 500Hz | - | - | 2.0 | % | |
| | | | | @ 1kHz | - | - | 1.0 | % | |
| | | | | @ 2kHz | - | - | 2.0 | % | |
| | | | 115dB SPL @ 1kHz | | | - | - | 5.0 | % |
| | | | 120dB SPL @ 1kHz | | | - | - | 10.0 | % |
| 8 | Power Supply Rejection | PSR | $V_{DD} = 2V$, 100mVp-p with 217Hz Square wave Check the 217Hz level | - | - | -70 | dBV | | |
| ▶ Power Supply | | | | | | | | | |
| 9 | Operating Voltage | V_{DD} | | 1.5 | 2.0 | 3.6 | V_{DC} | | |
| 10 | Current Consumption | I_S | $V_{DD} = 2V$ | 50 | 80 | 150 | μA | | |
| ▶ Output Characteristics | | | | | | | | | |
| 11 | Output Impedance | Z_{out} | Freq= 1kHz, $V_{DD} = 2V$ | - | - | 400 | Ω | | |
| 12 | Output DC Offset | | | - | 0.7 | - | V | | |

7. Electrical characteristic

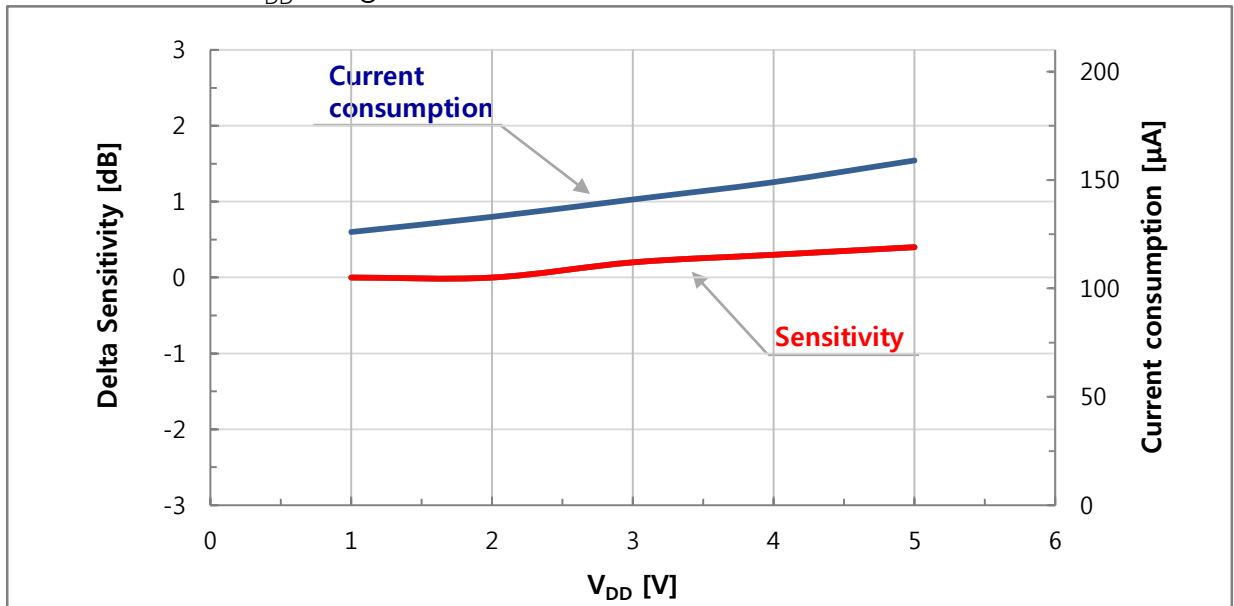
3-3. Frequency response characteristic curve

▶ Test condition - Temp : $23 \pm 2^\circ\text{C}$, 60~70% R.H, $V_{DD}=2.0\text{V}$, Range : 80Hz~20kHz



3-4. Change of sensitivity and current value depending on input voltage

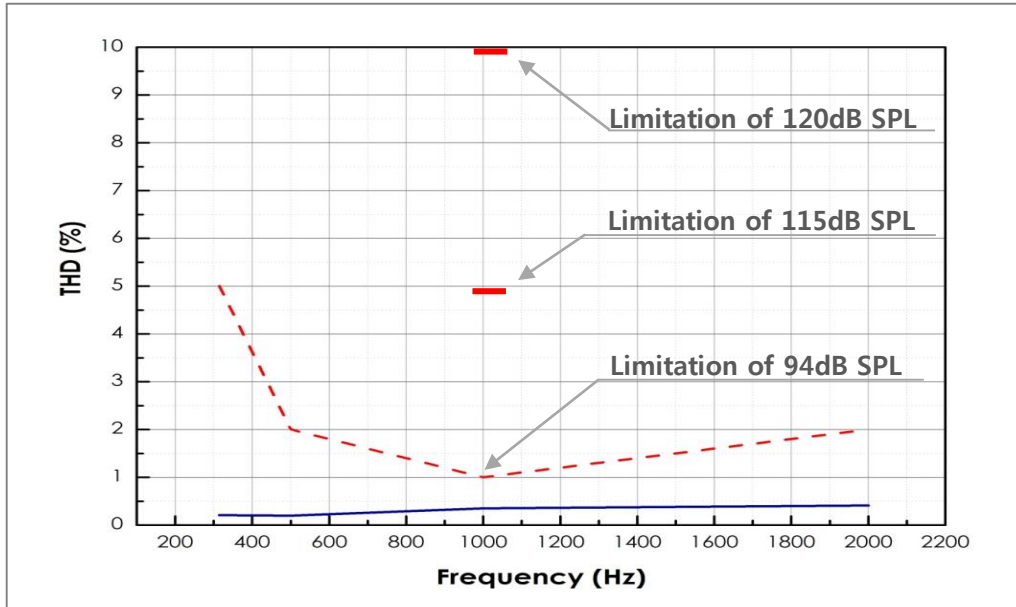
▶ Test condition - V_{DD} Range : 1.5~3.6V



3-5. Total harmonic distortion

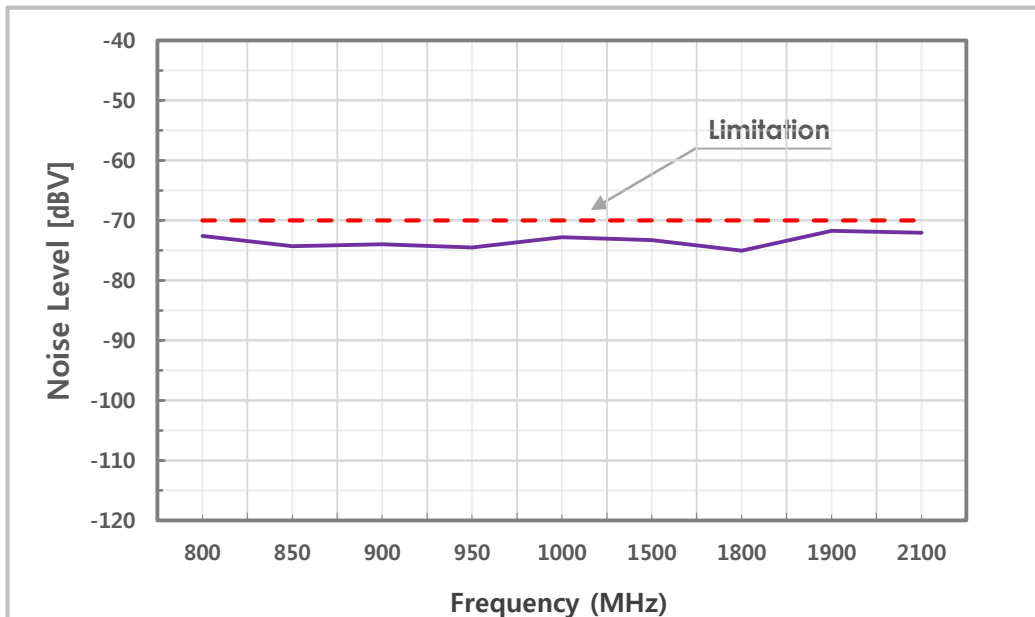
► Test condition and check point

- 1) 94dB SPL ; check the harmonic percentage level at 315Hz, 500Hz, 1kHz, 2kHz
- 2) 115dB SPL ; check the harmonic percentage level at 1kHz
- 3) 120dB SPL ; check the harmonic percentage level at 1kHz



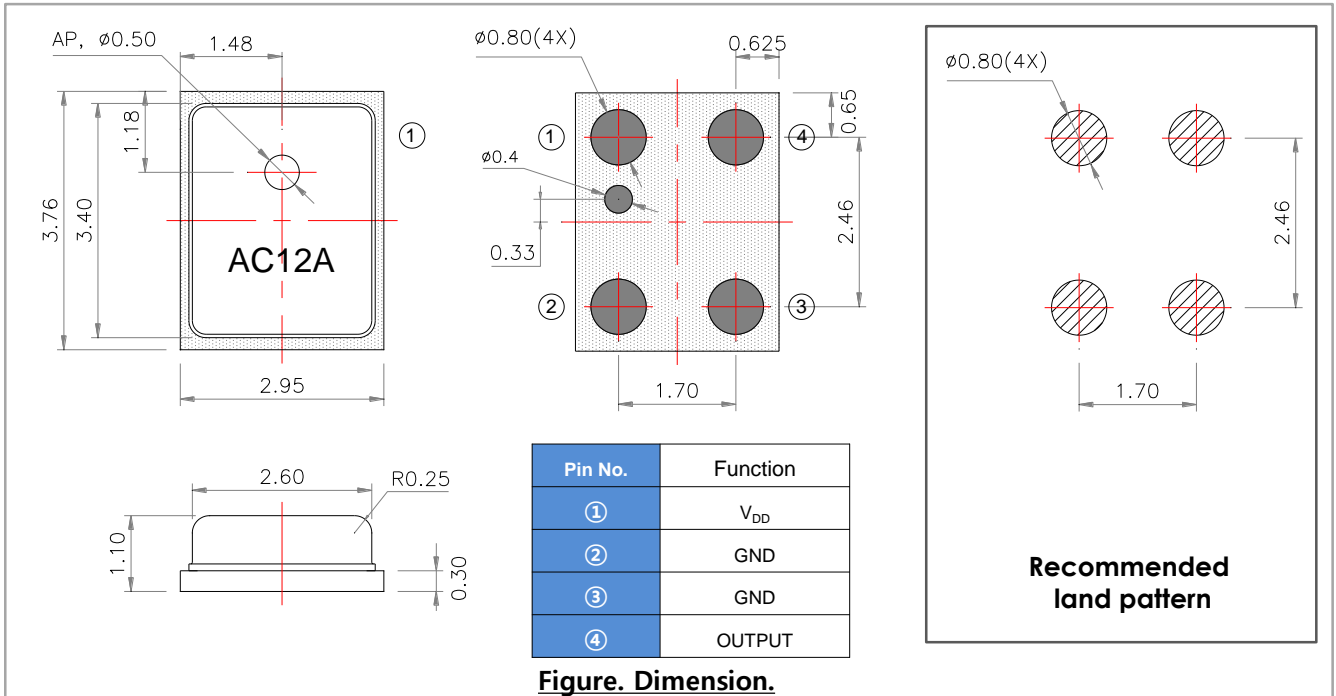
3-6. RF noise immunity

- 1) **Test condition** : Input signal = RF power -5dBm with 217Hz AM modulation Depth 80%
- 2) **Test method** : RF output power directly conducted at V_{DD} pin



4. Appearance

4-1 Mechanical Specification and recommended land pattern



| ITEM | Unit | DIMENSION | C _{PK} | Measurement |
|-----------------|------|--------------|-----------------|--|
| WIDTH | mm | 2.95 ±0.10 | 3.33 | n=24 (Optical 3D measuring instrument) |
| LENGTH | mm | 3.76 ±0.10 | 3.71 | n=24 (Optical 3D measuring instrument) |
| HEIGHT | mm | 1.10 ±0.10 | 2.80 | n=24 (Optical 3D measuring instrument) |
| Acoustic port | mm | Φ 0.50 ±0.10 | 1.89 | n=24 (Optical 3D measuring instrument) |
| Loop height | mm | 0.45 ±0.15 | 1.52 | n=24 (Optical 3D measuring instrument) |
| Wire pull | gf | 3 | 1.65 | n=24 (Optical 3D measuring instrument) |
| Wire ball Shear | gf | 23 | 1.38 | n=24 (Optical 3D measuring instrument) |
| Coplanarity | mm | Max 0.08 | 3.12 | n=24 (Optical 3D measuring instrument) |

4. Appearance

4-2 Component lay-out and materials

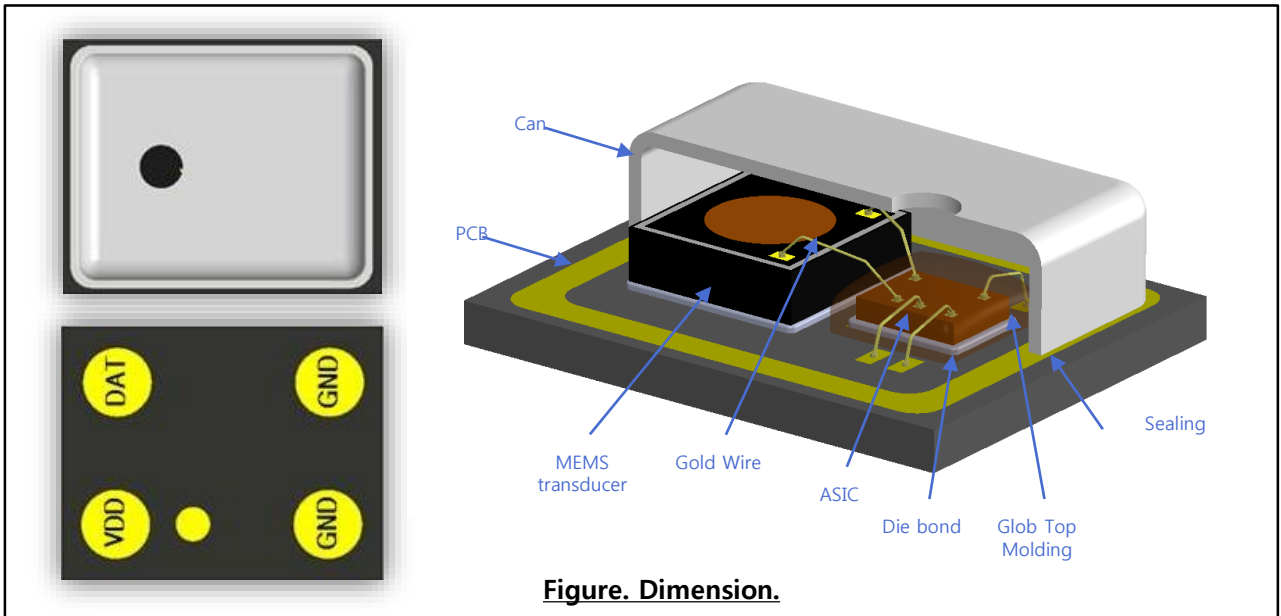


Figure. Dimension.

| | Parts | Material | Remark |
|---|------------------|--------------|-------------------------|
| 1 | ASIC | Silicon | 0.595 x 0.780 x 0.20 mm |
| 2 | MEMS Transducer | Silicon | 1.3 x 1.3 mm |
| 3 | Gold wire | Au | 0.9mil |
| 4 | Glob top molding | Epoxy | Silicon |
| 5 | PCB | FR-4, Copper | - |
| 6 | CAN | Brass | 3.3×2.6×0.8T |
| 7 | Sealing | Solder | - |
| 8 | Bonding parts | Epoxy | - |

5. Marking

5-1. Marking standards

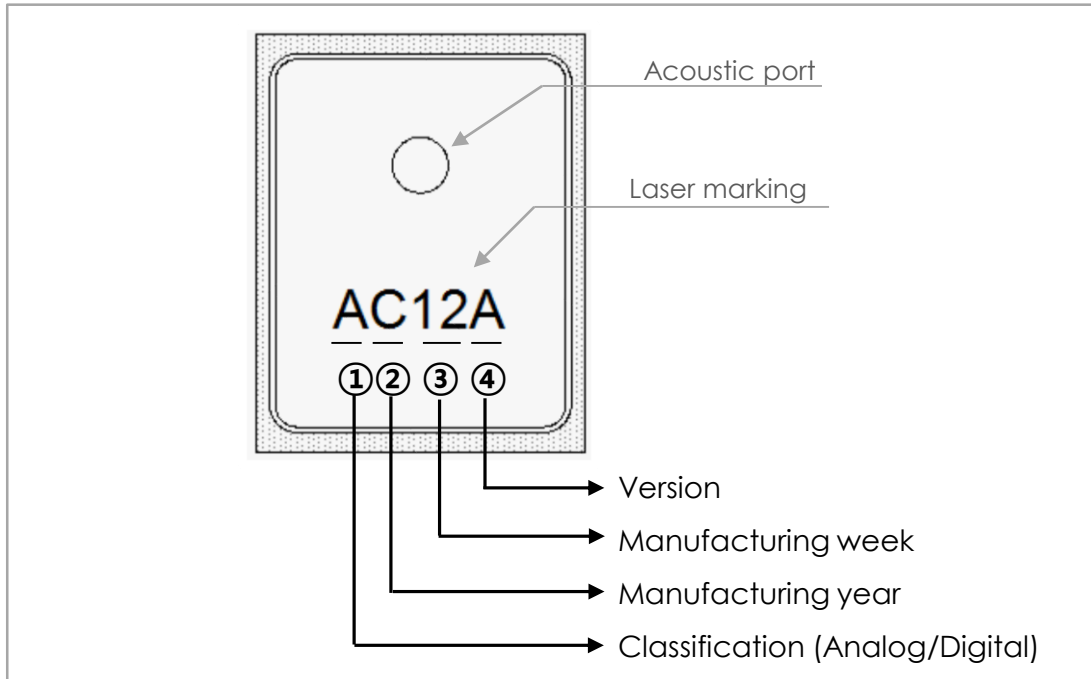


Figure. marking code.

Table. Marking standards.

| No | Code | Description |
|----|------|--|
| ① | A | Type (Analog MEMS mic- A , Digital MEMS mic - B) |
| ② | C | Year (2010- A , 2011- B , 2012- C , 2013- D ...) |
| ③ | 12 | Week (first week- 01 , Second week- 02 , ...) |
| ④ | A | <p>Low pass filter & Environmental barrier</p> <p>A : Embedded capacitor +No E.B, B : _____ C : _____</p> <p>D : Embedded capacitor +E.B, E : _____ F : _____</p> |

5. Marking

5-2. Part number

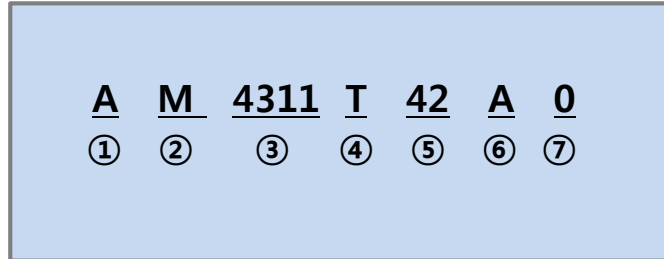


Figure. Part numbering code.

Table. Part numbering standards.

| No | Code | Description |
|----|------|--|
| ① | A | Output (A : Analog, D : Digital PDM) |
| ② | M | Item (M : MEMS Microphone) |
| ③ | 4311 | Dimension (4311 : 3.76 x 2.95 x 1.1mm, 3210 : 3.25 x 2.5 x 1.0mm, ...) |
| ④ | T | Type (T : Front[Top], R : Rear [Zero Height]) |
| ⑤ | 42 | Sensitivity (42 → -42dBV, 38 → -38dBV, ...) |
| ⑥ | A | Low pass filter & Environmental barrier A : Embedded capacitor +No ※E.B, B : _____ C : _____ D : Embedded capacitor + ※E.B, E : _____ F : _____ |
| ⑦ | 0 | Rev No. |

※ **E.B** : Environmental Barrier

6. Service environment

6-1. Environment conditions

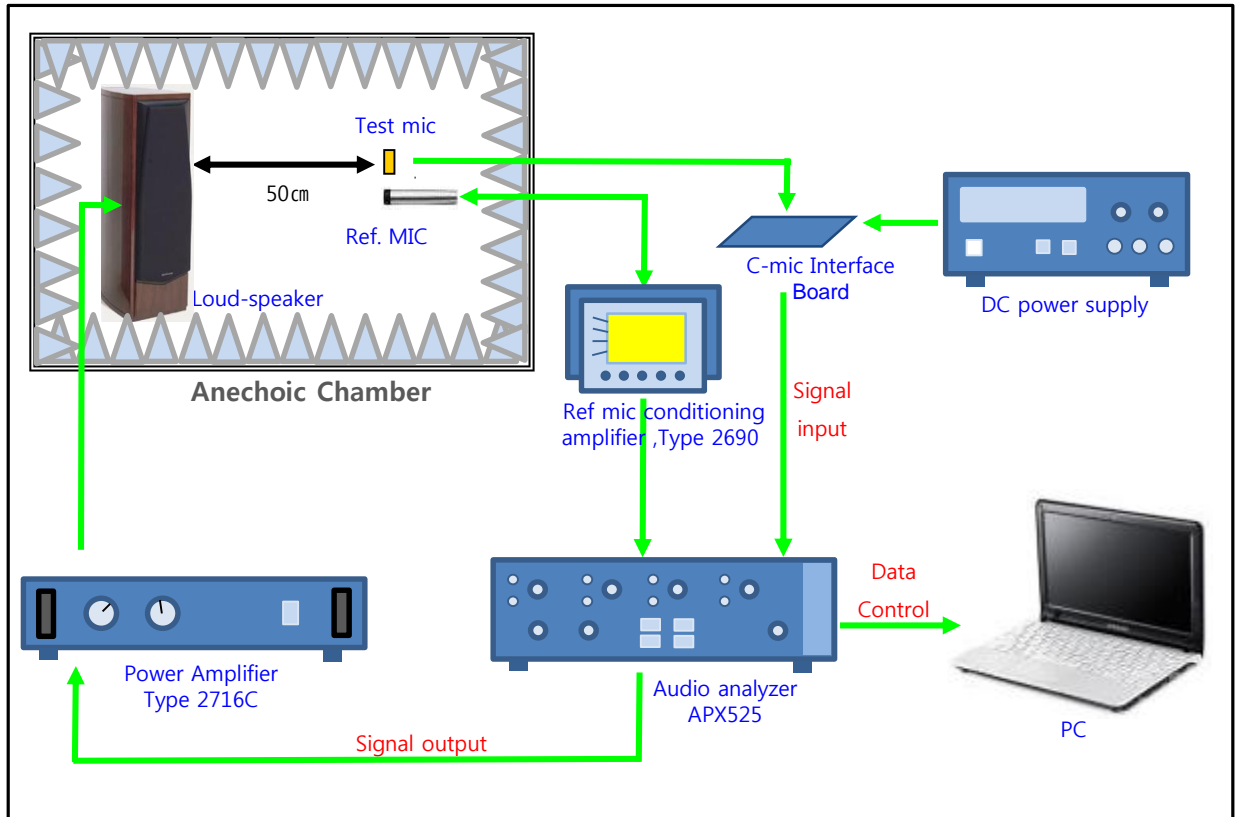
- 6-1-1. Storage temperature : -40°C ~ 100°C
- 6-1-2. Operating temperature : -40°C ~ 100°C
- 6-1-3. Measurement temperature : 23±2°C, (65±5% R.H)

6-2. Cleaning foreign substance

- 6-2-1. It is not allowed to clean foreign substance with cloth or cotton swab on acoustic port directly (Ingress of dust → Sensitivity is getting down)
- 6-2-2 It is not allowed to airbrush toward acoustic port → Membrane damage.

7. Measurement system

7-1. Measurement equipment lay-out



7-2. Measurement equipment list

| Item | Model | Maker | Function |
|------------------------|----------|---------------------|---|
| Reference microphone | 4191 | Bruel & Kjaer | Loud speaker calibration |
| Audio analyzer | APX525 | Audio Precision | Signal generating & analyzing |
| Power amplifier | 2716C | Bruel & Kjaer | Signal amplitude |
| NEXUS | 2690 | Amplifier | Ref mic conditioning amplifier |
| Loud speaker | Stirling | Tannoy | Output signal generate |
| Sound level calibrator | 4231 | Bruel & Kjaer | Reference microphone check |
| DC power supplier | E3631A | Agilent | DC power input |
| Mic interface board | - | - | Supply voltage and load resistor to test microphone |
| Anechoic chamber | - | 4-dimensions ENG | Free sound field room |

8. Reflow condition

8-1. Reflow Temperature Profile (Guaranteed Maximum Reflow Condition)

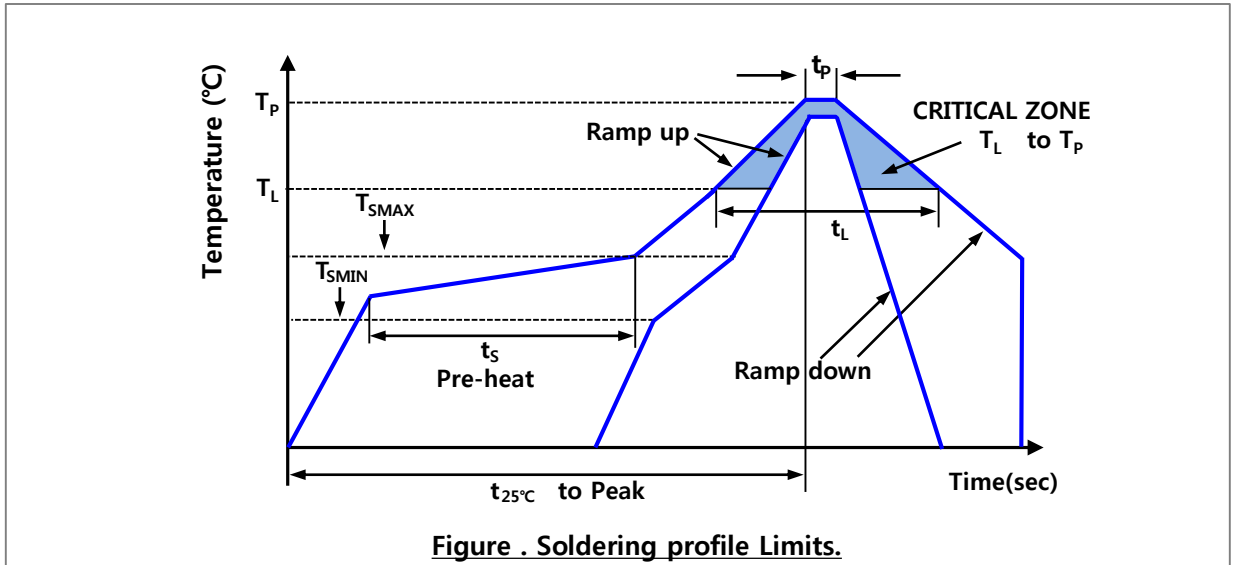


Figure . Soldering profile Limits.

Table . Soldering Profile Limits.

| | Profile Feature | Symbol | Condition (Pb-free) |
|---|--|---------------------|---------------------|
| 1 | Average Ramp Rate | T_L to T_P | 1.25°C/sec maximum |
| 2 | Pre heat | | |
| | Minimum Temperature | T_{SMIN} | 150°C |
| | Maximum Temperature | T_{SMAX} | 200°C |
| | Time (T_{SMIN} to T_{SMAX}) | t_s | 60 sec to 75 sec |
| 3 | Ramp up Rate | T_{SMAX} to T_L | 1.25°C/sec |
| 4 | Time Maintained Above Liquidous | t_L | ~50 sec |
| | Liquidous Temperature | T_L | 217°C |
| 5 | Peak Temperature | T_P | 245°C + 0°C/-5°C |
| 6 | Time within 5°C of Actual Peak Temperature | t_p | 20 sec to 30 sec |
| 7 | Ramp-Down Rate | | 3°C/sec maximum |
| 8 | Time 25°C(125°C)to Peak Temperature | | 5 minute maximum |

※ Note

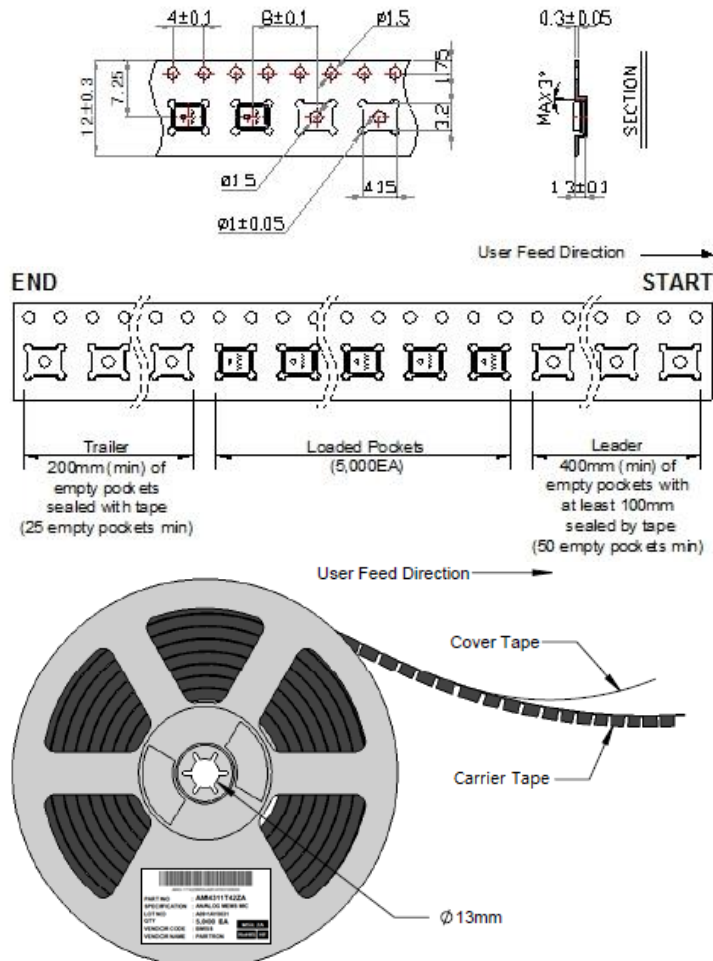
1. Pre-heat, ramp up and ramp down conditions according to IPC/JEDEC J-STD-020D.1
2. Do not wash after reflow, this may damage the membrane of microphone

9. Packing condition

9-1. Reel packing material

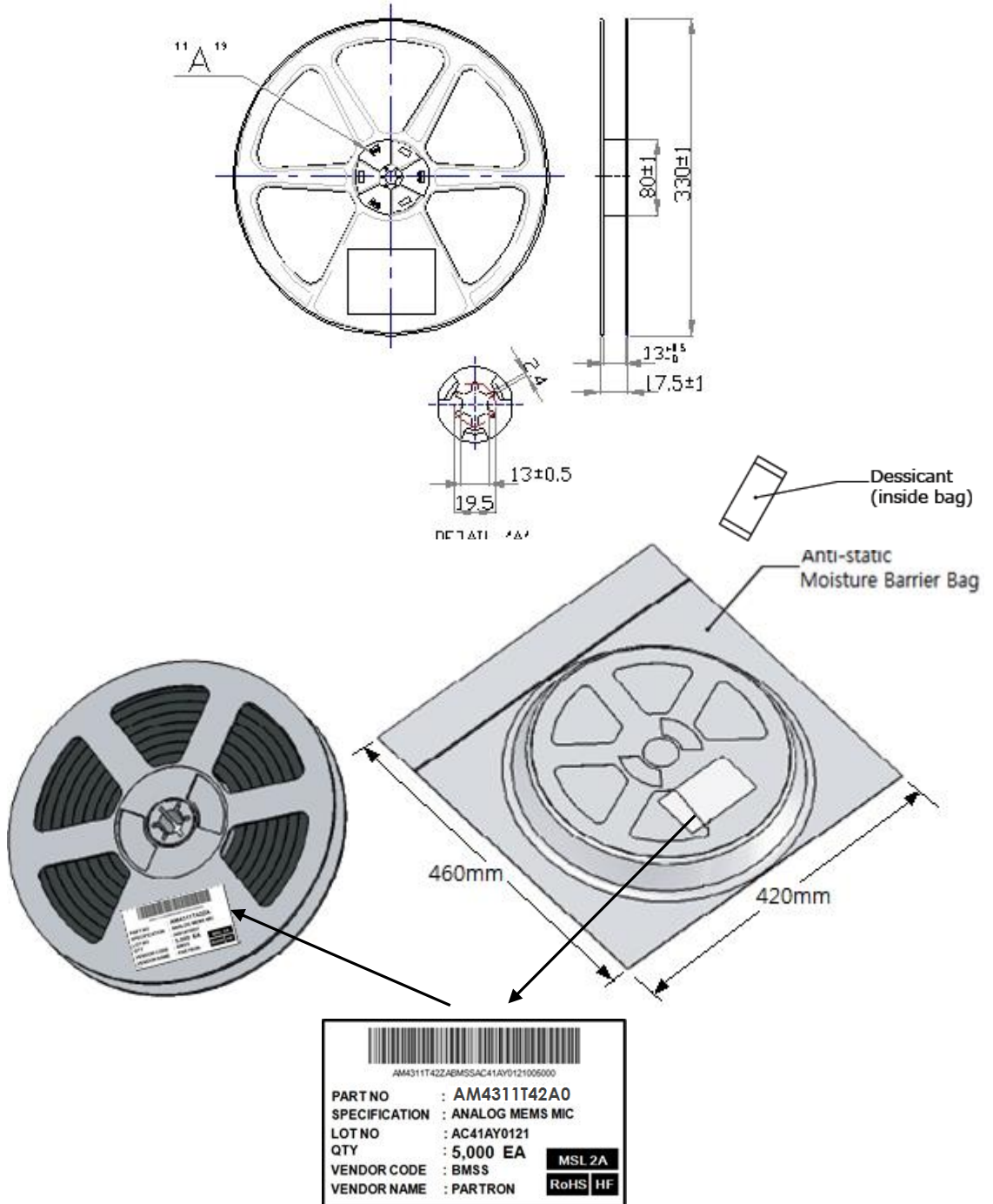
| Method | Material | Spec. (mm) | Quantity (EA) |
|----------------------------------|---|---------------|---------------|
| Cover Tape | Styrene-Butadiene Copolymer | - | - |
| Carrier Tape | Styrene-Butadiene Copolymer | 12mm Tape | - |
| Reel | Poly-Styrene | 330x17.5, 13" | 5,000 EA/Reel |
| Dessicant | Silica-Gel | - | 1 EA/Bag |
| Anti-static Moisture Barrier Bag | PET layer + Metalized layer + Antistatic-PE | 460x420 | 1 Reel/Bag |

9-2. Carrier tape Information (unit : mm)



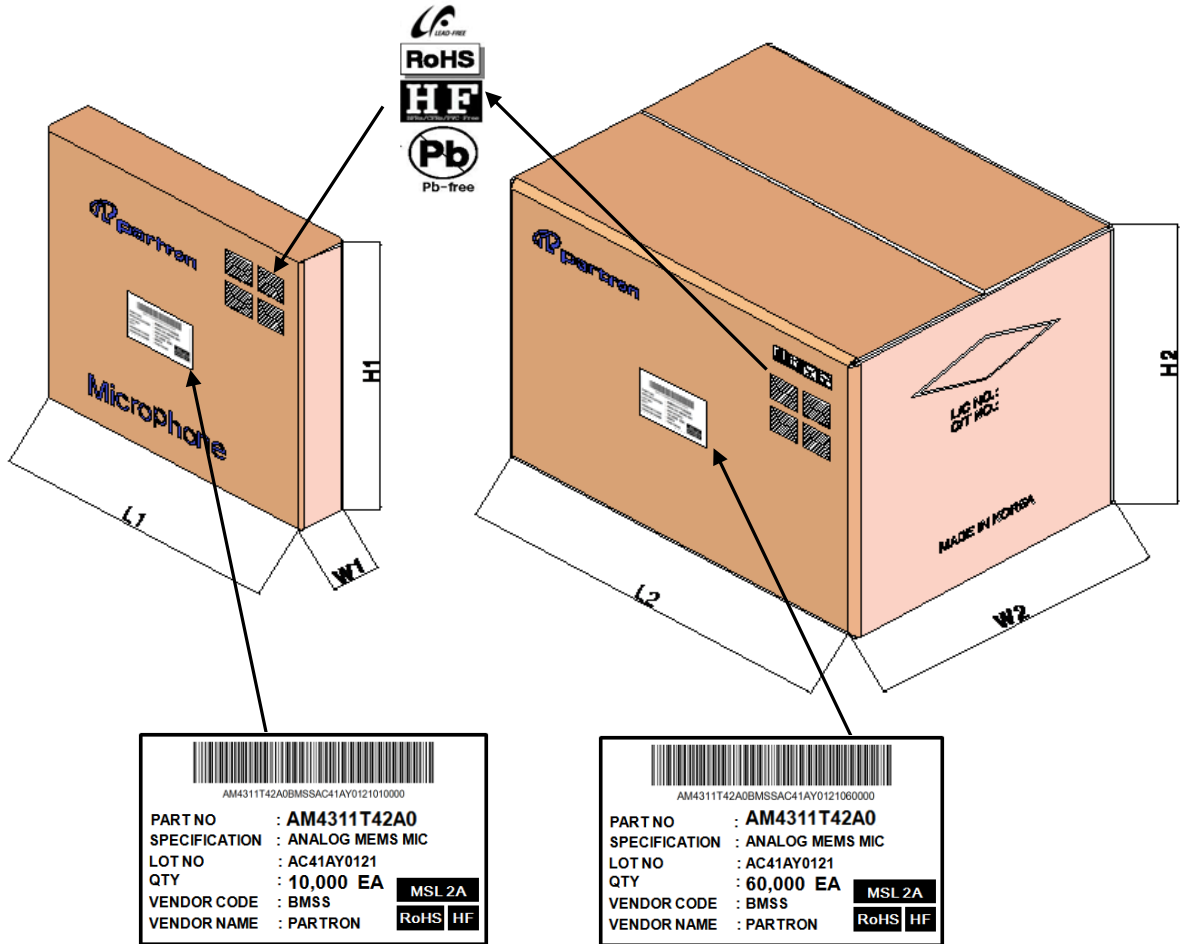
9. Packing condition

9-3. Reel & Bag Information (unit : mm)



9. Packing condition

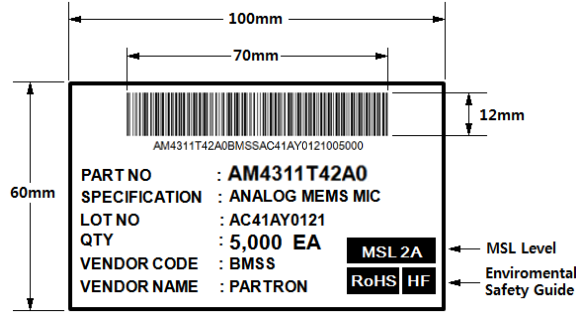
9-4. Inner, outer box Information



| Item | Inner Box | | Out Box | |
|-------------------|----------------------|-----------|-----------------------------|-----------|
| | Mark | Dimension | Mark | Dimension |
| Size | L1 | 330 mm | L2 | 360 mm |
| | W1 | 54 mm | W2 | 360 mm |
| | H1 | 330 mm | H2 | 360 mm |
| Material | Corrugated Cardboard | | Corrugated Cardboard | |
| Quantity | 10,000EA (Reel*2set) | | 60,000EA (Inner Box * 6set) | |
| Weight (with Mic) | 1.24 kg | | 8.4 kg | |

9. Packing condition

9-5. Label information



9-5-1. Barcode system : 128 Standard type (Font 0.3mm)



| NO | CODE | Description |
|----|-------------|-----------------------|
| 1 | AM4311T42A0 | PART NO (section 2)) |
| 2 | BMSS | VENDER CODE |
| 3 | AC41AY0121 | LOT NO |
| 4 | 005000 | Q'TY |

9-5-2. PART NO (11 digit) : Partron or Customer Part No

9-5-3. SPECIFICATION : Partron or Customer Product Name

9-5-4. LOT NO (10 digit) : A C 41 A Y 0001

① ② ③ ④ ⑤ ⑥

| NO | CODE | Description |
|----|------|---|
| 1 | A | Product Type (Analog MEMS mic) |
| 2 | C | Year (2010-A,2011-B,2012-C,2013-D.....) |
| 3 | 41 | Weak (1week-01,2week-02,.....) |
| 4 | A | Product Version (A,B,C,.....) |
| 5 | Y | Manufacturing (Yantai-Y,.....) |
| 6 | 0121 | Serial number (0001,0002,.....) |

9. Packing condition

9-5. Label information

9-5-5 QTY (6 digit)

9-5-6 VENDOR CODE (4 digit) : Customer Vendor Code

9-5-7 VENDOR NAME : PARTRON

9-6 Additional Packaging Information

9-6-1 Partron's Microphones are shipped from the factory in anti-static moisture barrier bags.

9-6-2 Shelf life : 12months when devices are to be stored in factory supplied, unopened anti-static moisture barrier bag under environmental conditions of 30°C, 60% R.H.

9-6-3 MSL 2A (IPC/JEDEC J-STD-020C)

| LEVEL | FLOOR LIFE | | SOAK REQUIREMENTS | |
|-------|------------|--------------|-------------------|-------------|
| | TIME | CONDITIONS | TIME | CONDITIONS |
| 2A | 4 weeks | ≤30°C/60% RH | 696+5/-0 hours | 30°C/60% RH |

9-6-4 Exposure : Devices should not be exposed to high humidity, high temperature environment. Customer should follow standard baking times as stated in IPC/JEDEC J-STD-033B, reference Class 2A.

9-6-5 Resistivity Information on Carrier Tape and Reels (in ohms)

- Carrier Tape = 10^{12}
- Cover Tape = 10^{12}
- 13" Reel = 10^9

10. Reliability test condition and report

10-1. Reliability test items and condition.

- Limitation : The change in sensitivity must be less than 3dB ($V_{DD}=2.0V$; Sensitivity at 1kHz)
[Test was performed after a lapse of two hours.]

| | Test | Condition & Description |
|---|--|--|
| - | Precondition | +85°C/85% R.H., 120hr → 3 reflow cycles (max. 260°C) |
| 1 | Temperature & Humidity Resistance | +85°C/85% R.H., 120 hours |
| 2 | Thermal Shock | -40±2°C(30 min.) → +125°C±2°C(30 min.), 300 cycles (JESD22-A106) |
| 3 | Low Temperature Resistance | -40(-10/+0)°C, 1,000 hours (JESD22-A119) |
| 4 | High Temperature Resistance | +125(-0/+10)°C, 1,000 hours (JESD22-A103) |
| 5 | Temperature Cycle | -25±2°C(30 min.) → +20°C±2°C(10 min.) → + 70°C±2°C(30min) → +20°C±2°C(10min.), 5 cycles |
| 6 | ESD | HBM(Human Body Model) 1000V or above (JESD22-A114) |
| | | CDM(Charge Device Model) 500V or above (JESD22-C101) |
| | | MM(Machine Model) < 200V (Class A) (JESD22-A115) |
| | | Contact to Lid(can) - GND : ~±8kV, 3discharges (IEC 61000-4-2) |
| | | Contact to I/O Pin - GND : ~ ±2kV (MIL 883E, Method 3015.7) |
| 7 | UHAST | +130°C/85% R.H., 33.3 psi, 96 hours (JESD22-A118) |
| 8 | Vibration | 4 cycles lasting 12 minutes from 20Hz to 2kHz in X, Y, Z direction with peak acceleration of 20g. (MIL 883E, Method 2007.2,A) |
| 9 | Drop | 1.5 m, Steel plate, 12 times |
| 10 | Solder heat | +350°C, 5 sec., each pad(4-point) respectively |
| 11 | Reflow | 5 reflow cycles with peak temperature of +260°C (JEDEC J-STD-020D) |
| - | MSL | MSL 2A (IPC/JEDEC's J-STD-20) |
| ♦ Test item of acoustic specification : Sensitivity ♦ Before test, Samples for experiment should be pre-conditioned. | | |

10. Reliability test condition and report

10-2. Test report

| Reliability test item | MIC no | Step1 --> Initial | | Step2 --> PRECONDITION (+85°C/85%) | | difference | | Step3 --> PRECONDITION (Reflow 3times) | | difference | | Step4 --> Reliability Test | | difference | |
|--|--------|-------------------|-------|------------------------------------|------|------------|-------|--|------|------------|-------|----------------------------|------|------------|-----|
| | | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur |
| Reliability Test 1 High Temperature & Humidity Resistance | 1 | -41.3 | 79 | -41.5 | 80 | -0.2 | 1 | -41.4 | 80 | -0.1 | 1 | -41.2 | 80 | 0.1 | 1 |
| | 2 | -41.0 | 80 | -41.1 | 80 | -0.1 | 0 | -40.9 | 80 | 0.1 | 0 | -40.8 | 81 | 0.2 | 1 |
| | 3 | -41.1 | 82 | -41.3 | 80 | -0.2 | -2 | -41.1 | 79 | 0.0 | -3 | -40.9 | 81 | 0.2 | -1 |
| | 4 | -40.9 | 81 | -41.0 | 81 | -0.1 | 0 | -40.9 | 81 | 0.0 | 0 | -40.8 | 78 | 0.1 | -3 |
| | 5 | -41.5 | 80 | -41.5 | 80 | 0.0 | 0 | -41.4 | 81 | 0.1 | 1 | -41.3 | 81 | 0.2 | 1 |
| | 6 | -41.2 | 81 | -41.3 | 80 | -0.1 | -1 | -41.2 | 80 | 0.0 | -1 | -41.4 | 80 | -0.2 | -1 |
| | 7 | -41.1 | 81 | -41.0 | 80 | 0.1 | -1 | -41.1 | 79 | 0.0 | -2 | -40.9 | 81 | 0.2 | 0 |
| | 8 | -41.3 | 79 | -41.4 | 82 | -0.1 | 3 | -41.2 | 80 | 0.1 | 1 | -41.0 | 79 | 0.3 | 0 |
| | 9 | -41.2 | 80 | -41.1 | 80 | 0.1 | 0 | -41.2 | 79 | 0.0 | -1 | -41.2 | 81 | 0.0 | 1 |
| | 10 | -41.6 | 80 | -41.8 | 83 | -0.2 | 3 | -41.6 | 80 | 0.0 | 0 | -41.4 | 83 | 0.2 | 3 |
| | 11 | -41.1 | 82 | -41.1 | 83 | 0.0 | 1 | -41.1 | 79 | 0.0 | -3 | -40.9 | 80 | 0.2 | -2 |
| | 12 | -41.0 | 81 | -40.8 | 80 | 0.2 | -1 | -41.0 | 83 | 0.0 | 2 | -40.7 | 81 | 0.3 | 0 |
| | 13 | -41.0 | 81 | -41.2 | 82 | -0.2 | 1 | -41.0 | 81 | 0.0 | 0 | -40.9 | 81 | 0.1 | 0 |
| | 14 | -41.0 | 83 | -41.2 | 79 | -0.2 | -4 | -41.1 | 82 | -0.1 | -1 | -40.9 | 84 | 0.1 | 1 |
| | 15 | -41.1 | 82 | -41.3 | 81 | -0.2 | -1 | -41.1 | 82 | 0.0 | 0 | -41.0 | 80 | 0.1 | -2 |
| | 16 | -41.4 | 79 | -41.4 | 79 | 0.0 | 0 | -41.4 | 81 | 0.0 | 2 | -41.2 | 80 | 0.2 | 1 |
| | 17 | -41.0 | 83 | -41.0 | 80 | 0.0 | -3 | -40.9 | 82 | 0.1 | -1 | -40.8 | 85 | 0.2 | 2 |
| | 18 | -41.1 | 80 | -41.1 | 81 | 0.0 | 1 | -41.1 | 83 | 0.0 | 3 | -41.0 | 82 | 0.1 | 2 |
| | 19 | -41.3 | 83 | -41.4 | 82 | -0.1 | -1 | -41.3 | 81 | 0.0 | -2 | -41.1 | 84 | 0.2 | 1 |
| | 20 | -41.0 | 81 | -41.1 | 82 | -0.1 | 1 | -40.9 | 81 | 0.1 | 0 | -40.8 | 79 | 0.2 | -2 |
| min | -41.6 | 79 | -41.8 | 79 | -0.2 | -4 | -41.6 | 79 | -0.1 | -3 | -41.4 | 78 | -0.2 | -3 | |
| max | -40.9 | 83 | -40.8 | 83 | 0.2 | 3 | -40.9 | 83 | 0.1 | 3 | -40.7 | 85 | 0.3 | 3 | |
| avg | -41.2 | 80.9 | -41.2 | 80.8 | -0.1 | -0.2 | -41.1 | 80.7 | 0.0 | -0.2 | -41.0 | 81.1 | 0.2 | 0.2 | |
| Reliability Test 2 Thermal Shock | 1 | -41.0 | 81 | -41.0 | 80 | 0.0 | -1 | -41.0 | 81 | 0.0 | 0 | -41.1 | 81 | -0.1 | 0 |
| | 2 | -41.2 | 78 | -41.5 | 79 | -0.3 | 1 | -41.3 | 82 | -0.1 | 4 | -41.2 | 82 | 0.0 | 4 |
| | 3 | -41.3 | 80 | -41.0 | 83 | 0.3 | 3 | -41.3 | 81 | 0.0 | 1 | -41.3 | 81 | 0.0 | 1 |
| | 4 | -41.2 | 82 | -40.9 | 79 | 0.3 | -3 | -41.3 | 80 | -0.1 | -2 | -41.3 | 81 | -0.1 | -1 |
| | 5 | -41.2 | 80 | -40.9 | 81 | 0.3 | 1 | -41.1 | 79 | 0.1 | -1 | -41.1 | 81 | 0.1 | 1 |
| | 6 | -41.3 | 81 | -41.5 | 80 | -0.2 | -1 | -41.2 | 80 | 0.1 | -1 | -41.3 | 83 | 0.0 | 2 |
| | 7 | -40.9 | 79 | -40.7 | 83 | 0.2 | 4 | -40.9 | 79 | 0.0 | 0 | -40.9 | 80 | 0.0 | 1 |
| | 8 | -41.2 | 81 | -40.9 | 81 | 0.3 | 0 | -41.2 | 84 | 0.0 | 3 | -41.2 | 79 | 0.0 | -2 |
| | 9 | -41.7 | 83 | -41.4 | 80 | 0.3 | -3 | -41.9 | 81 | -0.2 | -2 | -41.9 | 79 | -0.2 | -4 |
| | 10 | -41.1 | 81 | -40.8 | 81 | 0.3 | 0 | -41.0 | 80 | 0.1 | -1 | -41.1 | 80 | 0.0 | -1 |
| | 11 | -41.0 | 82 | -41.0 | 81 | 0.0 | -1 | -41.0 | 80 | 0.0 | -2 | -41.2 | 82 | -0.2 | 0 |
| | 12 | -40.6 | 83 | -40.3 | 83 | 0.3 | 0 | -40.5 | 80 | 0.1 | -3 | -40.7 | 81 | -0.1 | -2 |
| | 13 | -40.9 | 80 | -40.8 | 80 | 0.1 | 0 | -40.9 | 80 | 0.0 | 0 | -40.9 | 84 | 0.0 | 4 |
| | 14 | -41.3 | 81 | -41.1 | 79 | 0.2 | -2 | -41.3 | 81 | 0.0 | 0 | -41.3 | 79 | 0.0 | -2 |
| | 15 | -41.4 | 80 | -41.5 | 78 | -0.1 | -2 | -41.2 | 81 | 0.2 | 1 | -41.4 | 81 | 0.0 | 1 |
| | 16 | -41.3 | 82 | -41.0 | 82 | 0.3 | 0 | -41.3 | 80 | 0.0 | -2 | -41.4 | 81 | -0.1 | -1 |
| | 17 | -40.9 | 81 | -40.6 | 84 | 0.3 | 3 | -41.0 | 81 | -0.1 | 0 | -41.0 | 81 | -0.1 | 0 |
| | 18 | -41.4 | 79 | -41.2 | 80 | 0.2 | 1 | -41.3 | 81 | 0.1 | 2 | -41.4 | 81 | 0.0 | 2 |
| | 19 | -41.7 | 78 | -41.6 | 80 | 0.1 | 2 | -41.7 | 79 | 0.0 | 1 | -41.7 | 81 | 0.0 | 3 |
| | 20 | -40.9 | 80 | -40.6 | 81 | 0.3 | 1 | -40.8 | 78 | 0.1 | -2 | -40.8 | 81 | 0.1 | 1 |
| min | -41.7 | 78 | -41.6 | 78 | -0.3 | -3 | -41.9 | 78 | -0.2 | -3 | -41.9 | 79 | -0.2 | -4 | |
| max | -40.6 | 83 | -40.3 | 84 | 0.3 | 4 | -40.5 | 84 | 0.2 | 4 | -40.7 | 84 | 0.1 | 4 | |
| avg | -41.2 | 80.6 | -41.0 | 80.8 | 0.2 | 0.2 | -41.2 | 80.4 | 0.0 | -0.2 | -41.2 | 81.0 | 0.0 | 0.4 | |

10. Reliability test condition and report

10-2. Test report

| Reliability test item | MIC no | Step1 --> Initial | | Step2 –> PRECONDITION (+85°C/85%) | | difference | | Step3 --> PRECONDITION (Reflow 3times) | | difference | | Step4 --> Reliability Test | | difference | |
|---|--------|-------------------|-------|-----------------------------------|------|------------|-------|--|------|------------|-------|----------------------------|------|------------|-----|
| | | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur |
| Reliability Test 3 Low Temperature Resistance | 1 | -41.1 | 81 | -40.9 | 80 | 0.2 | -1 | -41.1 | 81 | 0.0 | 0 | -41.2 | 80 | -0.1 | -1 |
| | 2 | -40.9 | 81 | -40.7 | 82 | 0.2 | 1 | -40.9 | 79 | 0.0 | -2 | -40.9 | 79 | 0.0 | -2 |
| | 3 | -41.3 | 82 | -41.6 | 82 | -0.3 | 0 | -41.4 | 80 | -0.1 | -2 | -41.3 | 80 | 0.0 | -2 |
| | 4 | -41.1 | 80 | -40.5 | 81 | 0.6 | 1 | -41.2 | 81 | -0.1 | 1 | -41.2 | 81 | -0.1 | 1 |
| | 5 | -40.8 | 82 | -40.5 | 80 | 0.3 | -2 | -40.9 | 79 | -0.1 | -3 | -40.8 | 83 | 0.0 | 1 |
| | 6 | -41.5 | 80 | -41.1 | 82 | 0.4 | 2 | -41.4 | 81 | 0.1 | 1 | -41.3 | 82 | 0.2 | 2 |
| | 7 | -40.9 | 81 | -40.5 | 81 | 0.4 | 0 | -40.9 | 79 | 0.0 | -2 | -40.8 | 81 | 0.1 | 0 |
| | 8 | -41.2 | 83 | -41.8 | 80 | -0.6 | -3 | -41.3 | 80 | -0.1 | -3 | -41.2 | 81 | 0.0 | -2 |
| | 9 | -41.3 | 84 | -41.1 | 81 | 0.2 | -3 | -41.0 | 83 | 0.3 | -1 | -41.0 | 82 | 0.3 | -2 |
| | 10 | -41.4 | 82 | -41.1 | 80 | 0.3 | -2 | -41.5 | 81 | -0.1 | -1 | -41.4 | 84 | 0.0 | 2 |
| | 11 | -41.4 | 81 | -41.3 | 83 | 0.1 | 2 | -41.4 | 82 | 0.0 | 1 | -41.4 | 79 | 0.0 | -2 |
| | 12 | -41.1 | 84 | -40.5 | 80 | 0.6 | -4 | -41.0 | 81 | 0.1 | -3 | -41.0 | 80 | 0.1 | -4 |
| | 13 | -41.1 | 81 | -40.7 | 82 | 0.4 | 1 | -40.9 | 80 | 0.2 | -1 | -40.9 | 82 | 0.2 | 1 |
| | 14 | -41.0 | 81 | -40.2 | 81 | 0.8 | 0 | -40.9 | 80 | 0.1 | -1 | -40.9 | 81 | 0.1 | 0 |
| | 15 | -41.3 | 83 | -40.5 | 82 | 0.8 | -1 | -41.3 | 81 | 0.0 | -2 | -41.3 | 79 | 0.0 | -4 |
| | 16 | -41.1 | 79 | -40.9 | 83 | 0.2 | 4 | -41.1 | 80 | 0.0 | 1 | -41.0 | 81 | 0.1 | 2 |
| | 17 | -41.2 | 80 | -41.4 | 81 | -0.2 | 1 | -41.2 | 80 | 0.0 | 0 | -41.2 | 81 | 0.0 | 1 |
| | 18 | -41.1 | 82 | -40.4 | 82 | 0.7 | 0 | -41.0 | 80 | 0.1 | -2 | -40.9 | 83 | 0.2 | 1 |
| | 19 | -41.2 | 81 | -40.8 | 81 | 0.4 | 0 | -41.1 | 78 | 0.1 | -3 | -41.1 | 80 | 0.1 | -1 |
| | 20 | -41.1 | 81 | -40.1 | 85 | 1.0 | 4 | -41.2 | 80 | -0.1 | -1 | -41.1 | 80 | 0.0 | -1 |
| min | -41.5 | 79 | -41.8 | 80 | -0.6 | -4 | -41.5 | 78 | -0.1 | -3 | -41.4 | 79 | -0.1 | -4 | |
| max | -40.8 | 84 | -40.1 | 85 | 1.0 | 4 | -40.9 | 83 | 0.3 | 1 | -40.8 | 84 | 0.3 | 2 | |
| avg | -41.2 | 81.5 | -40.8 | 81.5 | 0.3 | 0 | -41.1 | 80.3 | 0.0 | -1.2 | -41.1 | 81.0 | 0.1 | -0.5 | |
| Reliability Test 4 High Temperature Resistance | 1 | -41.1 | 81 | -41.6 | 81 | -0.5 | 0 | -41.0 | 80 | 0.1 | -1 | -41.0 | 80 | 0.1 | -1 |
| | 2 | -41.8 | 81 | -42.6 | 81 | -0.8 | 0 | -41.8 | 80 | 0.0 | -1 | -41.8 | 82 | 0.0 | 1 |
| | 3 | -40.9 | 81 | -40.3 | 82 | 0.6 | 1 | -40.8 | 81 | 0.1 | 0 | -40.8 | 80 | 0.1 | -1 |
| | 4 | -41.1 | 79 | -40.7 | 82 | 0.4 | 3 | -41.1 | 84 | 0.0 | 5 | -41.1 | 82 | 0.0 | 3 |
| | 5 | -41.3 | 81 | -40.9 | 81 | 0.4 | 0 | -41.2 | 81 | 0.1 | 0 | -41.1 | 80 | 0.2 | -1 |
| | 6 | -41.4 | 80 | -41.0 | 83 | 0.4 | 3 | -41.2 | 82 | 0.2 | 2 | -41.2 | 80 | 0.2 | 0 |
| | 7 | -41.7 | 82 | -42.4 | 82 | -0.7 | 0 | -41.7 | 83 | 0.0 | 1 | -41.7 | 83 | 0.0 | 1 |
| | 8 | -41.5 | 82 | -41.4 | 80 | 0.1 | -2 | -41.4 | 80 | 0.1 | -2 | -41.6 | 79 | -0.1 | -3 |
| | 9 | -41.4 | 83 | -40.8 | 81 | 0.6 | -2 | -41.3 | 82 | 0.1 | -1 | -41.5 | 85 | -0.1 | 2 |
| | 10 | -41.3 | 82 | -40.7 | 81 | 0.6 | -1 | -41.2 | 80 | 0.1 | -2 | -41.1 | 82 | 0.2 | 0 |
| | 11 | -41.3 | 81 | -40.7 | 83 | 0.6 | 2 | -41.2 | 81 | 0.1 | 0 | -41.2 | 81 | 0.1 | 0 |
| | 12 | -41.2 | 84 | -40.5 | 80 | 0.7 | -4 | -41.0 | 82 | 0.2 | -2 | -41.0 | 81 | 0.2 | -3 |
| | 13 | -41.5 | 81 | -41.4 | 82 | 0.1 | 1 | -41.5 | 80 | 0.0 | -1 | -41.5 | 82 | 0.0 | 1 |
| | 14 | -41.3 | 82 | -41.0 | 80 | 0.3 | -2 | -41.3 | 80 | 0.0 | -2 | -41.4 | 82 | -0.1 | 0 |
| | 15 | -41.0 | 83 | -40.2 | 82 | 0.8 | -1 | -41.0 | 80 | 0.0 | -3 | -41.0 | 80 | 0.0 | -3 |
| | 16 | -41.3 | 81 | -41.9 | 83 | -0.6 | 2 | -41.4 | 81 | -0.1 | 0 | -41.3 | 80 | 0.0 | -1 |
| | 17 | -40.9 | 81 | -40.1 | 80 | 0.8 | -1 | -40.8 | 82 | 0.1 | 1 | -40.8 | 80 | 0.1 | -1 |
| | 18 | -41.3 | 82 | -40.9 | 81 | 0.4 | -1 | -41.2 | 80 | 0.1 | -2 | -41.2 | 82 | 0.1 | 0 |
| | 19 | -41.1 | 82 | -41.2 | 81 | -0.1 | -1 | -41.1 | 81 | 0.0 | -1 | -41.1 | 81 | 0.0 | -1 |
| | 20 | -41.4 | 81 | -41.0 | 85 | 0.4 | 4 | -41.4 | 83 | 0.0 | 2 | -41.4 | 80 | 0.0 | -1 |
| min | -41.8 | 79 | -42.6 | 80 | -0.8 | -4 | -41.8 | 80 | -0.1 | -3 | -41.8 | 79 | -0.1 | -3 | |
| max | -40.9 | 84 | -40.1 | 85 | 0.8 | 4 | -40.8 | 84 | 0.2 | 5 | -40.8 | 85 | 0.2 | 3 | |
| avg | -41.3 | 81.5 | -41.1 | 81.6 | 0.2 | 0.1 | -41.2 | 81.2 | 0.1 | -0.4 | -41.2 | 81.1 | 0.0 | -0.4 | |

10. Reliability test condition and report

10-2. Test report

| Reliability test item | MIC no | Step1 --> Initial | | Step2 --> PRECONDITION (+85°C/85%) | | difference | | Step3 --> PRECONDITION (Reflow 3times) | | difference | | Step4 --> Reliability Test | | difference | |
|---|--------|-------------------|-------|------------------------------------|------|------------|-------|--|------|------------|-------|----------------------------|------|------------|-----|
| | | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur |
| Reliability Test 5 Temperature Cycle | 1 | -41.0 | 83 | -40.4 | 80 | 0.6 | -3 | -41.0 | 82 | 0 | -1 | -41.1 | 85 | -0.1 | 2 |
| | 2 | -41.3 | 80 | -40.5 | 81 | 0.8 | 1 | -41.0 | 83 | 0.3 | 3 | -41.1 | 82 | 0.2 | 2 |
| | 3 | -41.4 | 83 | -42.4 | 82 | -1.0 | -1 | -41.3 | 81 | 0.1 | -2 | -41.4 | 84 | 0.0 | 1 |
| | 4 | -41.1 | 81 | -40.4 | 82 | 0.7 | 1 | -41.0 | 81 | 0.1 | 0 | -41.2 | 79 | -0.1 | -2 |
| | 5 | -41.2 | 80 | -41.2 | 83 | 0.0 | 3 | -41.1 | 81 | 0.1 | 1 | -41.3 | 81 | -0.1 | 1 |
| | 6 | -41.5 | 82 | -41.3 | 79 | 0.2 | -3 | -41.4 | 80 | 0.1 | -2 | -41.5 | 81 | 0.0 | -1 |
| | 7 | -40.9 | 80 | -40.8 | 81 | 0.1 | 1 | -41.0 | 79 | -0.1 | -1 | -41.0 | 81 | -0.1 | 1 |
| | 8 | -41.0 | 81 | -41.6 | 80 | -0.6 | -1 | -40.9 | 80 | 0.1 | -1 | -41.2 | 83 | -0.2 | 2 |
| | 9 | -41.4 | 79 | -41.7 | 82 | -0.3 | 3 | -41.3 | 80 | 0.1 | 1 | -41.4 | 79 | 0.0 | 0 |
| | 10 | -41.0 | 80 | -40.8 | 80 | 0.2 | 0 | -41.0 | 79 | 0 | -1 | -41.0 | 81 | 0.0 | 1 |
| | 11 | -41.0 | 81 | -41.0 | 79 | 0.0 | -2 | -41.0 | 81 | 0 | 0 | -41.1 | 79 | -0.1 | -2 |
| | 12 | -41.1 | 80 | -41.8 | 78 | -0.7 | -2 | -41.1 | 81 | 0 | 1 | -41.2 | 81 | -0.1 | 1 |
| | 13 | -41.0 | 82 | -41.0 | 82 | 0.0 | 0 | -41.0 | 80 | 0 | -2 | -41.1 | 81 | -0.1 | -1 |
| | 14 | -41.5 | 80 | -41.4 | 80 | 0.1 | 0 | -41.5 | 81 | 0 | 1 | -41.5 | 81 | 0.0 | 1 |
| | 15 | -41.4 | 81 | -41.3 | 80 | 0.1 | -1 | -41.3 | 80 | 0.1 | -1 | -41.4 | 80 | 0.0 | -1 |
| | 16 | -40.9 | 80 | -40.9 | 83 | 0.0 | 3 | -40.8 | 80 | 0.1 | 0 | -40.9 | 83 | 0.0 | 3 |
| | 17 | -41.3 | 82 | -40.4 | 83 | 0.9 | 1 | -41.0 | 79 | 0.3 | -3 | -41.1 | 80 | 0.2 | -2 |
| | 18 | -41.0 | 81 | -40.5 | 80 | 0.5 | -1 | -40.9 | 83 | 0.1 | 2 | -41.0 | 81 | 0.0 | 0 |
| | 19 | -41.2 | 81 | -40.9 | 82 | 0.3 | 1 | -41.0 | 81 | 0.2 | 0 | -41.2 | 81 | 0.0 | 0 |
| | 20 | -41.0 | 83 | -41.4 | 80 | -0.4 | -3 | -41.0 | 82 | 0 | -1 | -41.2 | 85 | -0.2 | 2 |
| min | -41.5 | 79 | -42.4 | 78 | -1.0 | -3 | -41.5 | 79 | -0.1 | -3 | -41.5 | 79 | -0.2 | -2 | |
| max | -40.9 | 83 | -40.4 | 83 | 0.9 | 3 | -40.8 | 83 | 0.3 | 3 | -40.9 | 85 | 0.2 | 3 | |
| avg | -41.2 | 81 | -41.1 | 80.9 | 0.1 | -0.2 | -41.1 | 80.7 | 0.1 | -0.3 | -41.2 | 81.4 | 0.0 | 0.4 | |
| Reliability Test 6 ESD | 1 | -41.0 | 80 | -40.3 | 81 | 0.7 | 1 | -41.0 | 83 | 0.0 | 3 | -41.2 | 82 | -0.2 | 2 |
| | 2 | -41.3 | 83 | -41.1 | 82 | 0.2 | -1 | -41.2 | 81 | 0.1 | -2 | -41.3 | 84 | 0.0 | 1 |
| | 3 | -41.2 | 81 | -40.6 | 82 | 0.6 | 1 | -41.1 | 81 | 0.1 | 0 | -41.2 | 79 | 0.0 | -2 |
| | 4 | -41.0 | 81 | -41.4 | 84 | -0.4 | 3 | -40.9 | 81 | 0.1 | 0 | -41.1 | 81 | -0.1 | 0 |
| | 5 | -41.0 | 81 | -41.4 | 80 | -0.4 | -1 | -40.9 | 79 | 0.1 | -2 | -41.0 | 81 | 0.0 | 0 |
| | 6 | -41.0 | 81 | -41.3 | 80 | -0.3 | -1 | -40.9 | 81 | 0.1 | 0 | -41.2 | 81 | -0.2 | 0 |
| | 7 | -41.4 | 80 | -41.8 | 80 | -0.4 | 0 | -41.4 | 80 | 0.0 | 0 | -41.5 | 84 | -0.1 | 4 |
| | 8 | -41.0 | 79 | -40.4 | 80 | 0.6 | 1 | -40.8 | 80 | 0.2 | 1 | -40.9 | 80 | 0.1 | 1 |
| | 9 | -41.0 | 80 | -40.6 | 80 | 0.4 | 0 | -40.9 | 80 | 0.1 | 0 | -41.0 | 81 | 0.0 | 1 |
| | 10 | -41.1 | 82 | -40.1 | 80 | 1.0 | -2 | -41.1 | 79 | 0.0 | -3 | -41.2 | 81 | -0.1 | -1 |
| | 11 | -41.2 | 81 | -40.2 | 81 | 1.0 | 0 | -41.0 | 81 | 0.2 | 0 | -41.2 | 78 | 0.0 | -3 |
| | 12 | -41.3 | 80 | -41.7 | 80 | -0.4 | 0 | -41.2 | 81 | 0.1 | 1 | -41.4 | 81 | -0.1 | 1 |
| | 13 | -41.2 | 81 | -41.3 | 80 | -0.1 | -1 | -41.2 | 80 | 0.0 | -1 | -41.4 | 80 | -0.2 | -1 |
| | 14 | -41.4 | 80 | -40.5 | 83 | 0.9 | 3 | -41.4 | 80 | 0.0 | 0 | -41.5 | 83 | -0.1 | 3 |
| | 15 | -41.1 | 82 | -41.5 | 83 | -0.4 | 1 | -41.0 | 79 | 0.1 | -3 | -41.3 | 80 | -0.2 | -2 |
| | 16 | -41.4 | 81 | -42.1 | 80 | -0.7 | -1 | -41.3 | 83 | 0.1 | 2 | -41.4 | 81 | 0.0 | 0 |
| | 17 | -41.3 | 81 | -42.2 | 82 | -0.9 | 1 | -41.2 | 81 | 0.1 | 0 | -41.3 | 81 | 0.0 | 0 |
| | 18 | -41.2 | 83 | -40.9 | 79 | 0.3 | -4 | -41.0 | 82 | 0.2 | -1 | -41.2 | 84 | 0.0 | 1 |
| | 19 | -41.5 | 82 | -41.6 | 81 | -0.1 | -1 | -41.5 | 82 | 0.0 | 0 | -41.5 | 80 | 0.0 | -2 |
| | 20 | -41.2 | 79 | -41.2 | 79 | 0.0 | 0 | -41.2 | 81 | 0.0 | 2 | -41.4 | 80 | -0.2 | 1 |
| min | -41.5 | 79 | -42.2 | 79 | -0.9 | -4 | -41.5 | 79 | 0.0 | -3 | -41.5 | 78 | -0.2 | -3 | |
| max | -41.0 | 83 | -40.1 | 84 | 1.0 | 3 | -40.8 | 83 | 0.2 | 3 | -40.9 | 84 | 0.1 | 4 | |
| avg | -41.2 | 80.9 | -41.1 | 80.9 | 0.1 | -0.1 | -41.1 | 80.8 | 0.1 | -0.2 | -41.3 | 81.1 | -0.1 | 0.2 | |

10. Reliability test condition and report

10-2. Test report

| Reliability test item | MIC no | Step1 --> Initial | | Step2 --> PRECONDITION (+85°C/85%) | | difference | | Step3 --> PRECONDITION (Reflow 3times) | | difference | | Step4 --> Reliability Test | | difference | |
|---------------------------------|--------|-------------------|-------|------------------------------------|------|------------|-------|--|------|------------|-------|----------------------------|-----|------------|-----|
| | | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur |
| | | | | | | | | | | | | | | | |
| Reliability Test 7 UFAST | 1 | -41.0 | 80 | -40.8 | 81 | 0.2 | 1 | -41.0 | 80 | 0.0 | 0 | -40.8 | 81 | 0.2 | 1 |
| | 2 | -41.2 | 82 | -40.5 | 82 | 0.7 | 0 | -41.1 | 80 | 0.1 | -2 | -41.0 | 83 | 0.2 | 1 |
| | 3 | -41.3 | 81 | -41.3 | 81 | 0.0 | 0 | -41.3 | 78 | 0.0 | -3 | -41.1 | 80 | 0.2 | -1 |
| | 4 | -41.7 | 81 | -41.6 | 85 | 0.1 | 4 | -41.4 | 80 | 0.3 | -1 | -41.2 | 80 | 0.5 | -1 |
| | 5 | -41.3 | 81 | -41.1 | 82 | 0.2 | 1 | -41.3 | 81 | 0.0 | 0 | -41.2 | 80 | 0.1 | -1 |
| | 6 | -41.6 | 79 | -41.7 | 82 | -0.1 | 3 | -41.4 | 84 | 0.2 | 5 | -41.3 | 82 | 0.3 | 3 |
| | 7 | -41.5 | 81 | -41.9 | 81 | -0.4 | 0 | -41.5 | 81 | 0.0 | 0 | -41.4 | 80 | 0.1 | -1 |
| | 8 | -41.1 | 80 | -40.7 | 83 | 0.4 | 3 | -41.0 | 82 | 0.1 | 2 | -40.8 | 80 | 0.3 | 0 |
| | 9 | -41.4 | 83 | -41.9 | 80 | -0.5 | -3 | -41.3 | 80 | 0.1 | -3 | -41.1 | 81 | 0.3 | -2 |
| | 10 | -41.0 | 84 | -41.3 | 81 | -0.3 | -3 | -41.0 | 83 | 0.0 | -1 | -40.9 | 82 | 0.1 | -2 |
| | 11 | -41.3 | 82 | -40.3 | 80 | 1.0 | -2 | -41.3 | 80 | 0.0 | -2 | -41.2 | 82 | 0.1 | 0 |
| | 12 | -41.1 | 83 | -40.5 | 82 | 0.6 | -1 | -41.0 | 80 | 0.1 | -3 | -40.9 | 80 | 0.2 | -3 |
| | 13 | -41.1 | 81 | -41.7 | 83 | -0.6 | 2 | -41.0 | 81 | 0.1 | 0 | -40.9 | 80 | 0.2 | -1 |
| | 14 | -41.3 | 82 | -41.8 | 80 | -0.5 | -2 | -41.2 | 79 | 0.1 | -3 | -41.1 | 83 | 0.2 | 1 |
| | 15 | -41.2 | 80 | -41.8 | 82 | -0.6 | 2 | -41.2 | 81 | 0.0 | 1 | -41.1 | 82 | 0.1 | 2 |
| | 16 | -41.0 | 82 | -40.9 | 80 | 0.1 | -2 | -40.8 | 81 | 0.2 | -1 | -40.6 | 84 | 0.4 | 2 |
| | 17 | -41.1 | 81 | -41.0 | 83 | 0.1 | 2 | -40.9 | 82 | 0.2 | 1 | -40.8 | 79 | 0.3 | -2 |
| | 18 | -41.6 | 84 | -42.1 | 80 | -0.5 | -4 | -41.4 | 81 | 0.2 | -3 | -41.4 | 80 | 0.2 | -4 |
| | 19 | -41.2 | 81 | -40.3 | 82 | 0.9 | 1 | -41.1 | 80 | 0.1 | -1 | -41.0 | 82 | 0.2 | 1 |
| | 20 | -41.1 | 80 | -41.6 | 81 | -0.5 | 1 | -41.1 | 80 | 0.0 | 0 | -40.9 | 81 | 0.2 | 1 |
| min | -41.7 | 79 | -42.1 | 80 | -0.6 | -4 | -41.5 | 78 | 0.0 | -3 | -41.4 | 79 | 0.1 | -4 | |
| max | -41.0 | 84 | -40.3 | 85 | 1.0 | 4 | -40.8 | 84 | 0.3 | 5 | -40.6 | 84 | 0.5 | 3 | |
| avg | -41.3 | 81.4 | -41.2 | 81.6 | 0.0 | 0.2 | -41.2 | 80.7 | 0.1 | -0.7 | -41.0 | 81.1 | 0.2 | -0.3 | |
| Reliability Test 8 Vibration | 1 | -41.9 | 82 | -41.9 | 82 | 0.0 | 0 | -41.4 | 80 | 0.5 | -2 | -41.2 | 83 | 0.7 | 1 |
| | 2 | -41.5 | 81 | -41.6 | 81 | -0.1 | 0 | -41.6 | 78 | -0.1 | -3 | -41.1 | 80 | 0.4 | -1 |
| | 3 | -41.2 | 81 | -41.2 | 85 | 0.0 | 4 | -41.2 | 80 | 0.0 | -1 | -40.9 | 80 | 0.3 | -1 |
| | 4 | -41.8 | 81 | -41.6 | 80 | 0.2 | -1 | -41.6 | 82 | 0.2 | 1 | -41.4 | 80 | 0.4 | -1 |
| | 5 | -42.5 | 81 | -42 | 81 | 0.5 | 0 | -42 | 79 | 0.5 | -2 | -41.7 | 81 | 0.8 | 0 |
| | 6 | -41.6 | 81 | -41.4 | 81 | 0.2 | 0 | -41.3 | 80 | 0.3 | -1 | -41 | 80 | 0.6 | -1 |
| | 7 | -41.6 | 81 | -41.4 | 82 | 0.2 | 1 | -41.4 | 80 | 0.2 | -1 | -41.1 | 82 | 0.5 | 1 |
| | 8 | -41.7 | 81 | -41.9 | 80 | -0.2 | -1 | -41.5 | 81 | 0.2 | 0 | -41.3 | 80 | 0.4 | -1 |
| | 9 | -41.1 | 81 | -41.3 | 82 | -0.2 | 1 | -41.4 | 79 | -0.3 | -2 | -41 | 79 | 0.1 | -2 |
| | 10 | -41.3 | 82 | -41.3 | 82 | 0.0 | 0 | -41.4 | 80 | -0.1 | -2 | -40.9 | 80 | 0.4 | -2 |
| | 11 | -41.0 | 80 | -41.1 | 81 | -0.1 | 1 | -40.8 | 81 | 0.2 | 1 | -40.8 | 81 | 0.2 | 1 |
| | 12 | -41.2 | 82 | -41.6 | 80 | -0.4 | -2 | -41.1 | 79 | 0.1 | -3 | -41 | 83 | 0.2 | 1 |
| | 13 | -41.8 | 80 | -41.7 | 82 | 0.1 | 2 | -41.8 | 81 | 0.0 | 1 | -41 | 82 | 0.8 | 2 |
| | 14 | -41.7 | 82 | -41.6 | 80 | 0.1 | -2 | -41.4 | 81 | 0.3 | -1 | -41.3 | 84 | 0.4 | 2 |
| | 15 | -41.3 | 81 | -41.1 | 83 | 0.2 | 2 | -41.2 | 82 | 0.1 | 1 | -41.1 | 79 | 0.2 | -2 |
| | 16 | -41.2 | 84 | -41.1 | 80 | 0.1 | -4 | -41.1 | 81 | 0.1 | -3 | -40.8 | 80 | 0.4 | -4 |
| | 17 | -41.0 | 81 | -41.3 | 82 | -0.3 | 1 | -41.1 | 80 | -0.1 | -1 | -41 | 82 | 0.0 | 1 |
| | 18 | -41.5 | 81 | -41.4 | 81 | 0.1 | 0 | -41.4 | 80 | 0.1 | -1 | -41.2 | 81 | 0.3 | 0 |
| | 19 | -42.0 | 83 | -41.9 | 82 | 0.1 | -1 | -41.7 | 81 | 0.3 | -2 | -41.4 | 79 | 0.6 | -4 |
| | 20 | -41.8 | 79 | -41.5 | 83 | 0.3 | 4 | -41.5 | 80 | 0.3 | 1 | -41.2 | 81 | 0.6 | 2 |
| min | -42.5 | 79 | -42.0 | 80 | -0.4 | -4 | -42.0 | 78 | -0.3 | -3 | -41.7 | 79 | 0.0 | -4 | |
| max | -41.0 | 84 | -41.1 | 85 | 0.5 | 4 | -40.8 | 82 | 0.5 | 1 | -40.8 | 84 | 0.8 | 2 | |
| avg | -41.5 | 81.3 | -41.5 | 81.5 | 0.0 | 0.3 | -41.4 | 80.3 | 0.1 | -1 | -41.1 | 80.9 | 0.4 | -0.4 | |

10. Reliability test condition and report

10-2. Test report

| Reliability test item | MIC no | Step1 --> Initial | | Step2 --> PRECONDITION (+85°C/85%) | | difference | | Step3 --> PRECONDITION (Reflow 3times) | | difference | | Step4 --> Reliability Test | | difference | |
|------------------------------------|--------|-------------------|------|------------------------------------|------|------------|------|--|------|------------|------|----------------------------|------|------------|-----|
| | | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur |
| Reliability Test 9 Drop | 1 | -41.3 | 81 | -41.5 | 80 | -0.2 | -1 | -41.6 | 81 | -0.3 | 0 | -41.4 | 81 | -0.1 | 0 |
| | 2 | -41.5 | 80 | -41.6 | 80 | -0.1 | 0 | -41.6 | 79 | -0.1 | -1 | -41.4 | 81 | 0.1 | 1 |
| | 3 | -41.7 | 79 | -41.8 | 80 | -0.1 | 1 | -41.7 | 81 | 0.0 | 2 | -41.3 | 78 | 0.4 | -1 |
| | 4 | -41.2 | 80 | -41.3 | 80 | -0.1 | 0 | -41.6 | 80 | -0.4 | 0 | -41.3 | 81 | -0.1 | 1 |
| | 5 | -41.4 | 82 | -41.6 | 80 | -0.2 | -2 | -41.7 | 80 | -0.3 | -2 | -41.3 | 80 | 0.1 | -2 |
| | 6 | -41.1 | 81 | -41.1 | 81 | 0.0 | 0 | -41.1 | 80 | 0.0 | -1 | -41.3 | 83 | -0.2 | 2 |
| | 7 | -41.4 | 80 | -41.3 | 80 | 0.1 | 0 | -41.6 | 79 | -0.2 | -1 | -41.4 | 80 | 0.0 | 0 |
| | 8 | -41.5 | 81 | -41.5 | 80 | 0.0 | -1 | -41.7 | 81 | -0.2 | 0 | -41.4 | 81 | 0.1 | 0 |
| | 9 | -41.1 | 80 | -40.7 | 83 | 0.4 | 3 | -41.1 | 81 | 0.0 | 1 | -41 | 81 | 0.1 | 1 |
| | 10 | -41.6 | 82 | -41.9 | 83 | -0.3 | 1 | -41.8 | 80 | -0.2 | -2 | -41.5 | 84 | 0.1 | 2 |
| | 11 | -41.1 | 81 | -41.1 | 80 | 0.0 | -1 | -41.2 | 80 | -0.1 | -1 | -41.2 | 80 | -0.1 | -1 |
| | 12 | -41.4 | 80 | -41.2 | 78 | 0.2 | -2 | -41.4 | 79 | 0.0 | -1 | -41.1 | 81 | 0.3 | 1 |
| | 13 | -41.3 | 82 | -41.3 | 82 | 0.0 | 0 | -41.5 | 83 | -0.2 | 1 | -41.4 | 81 | -0.1 | -1 |
| | 14 | -41.6 | 80 | -41.5 | 80 | 0.1 | 0 | -41.7 | 80 | -0.1 | 0 | -41.3 | 81 | 0.3 | 1 |
| | 15 | -41.4 | 81 | -41.2 | 80 | 0.2 | -1 | -41.3 | 80 | 0.1 | -1 | -41.7 | 80 | -0.3 | -1 |
| | 16 | -41.4 | 80 | -41.4 | 83 | 0.0 | 3 | -41.5 | 79 | -0.1 | -1 | -41.4 | 83 | 0.0 | 3 |
| | 17 | -41.3 | 82 | -41.4 | 83 | -0.1 | 1 | -41.6 | 83 | -0.3 | 1 | -41.3 | 80 | 0.0 | -2 |
| | 18 | -41.0 | 81 | -40.9 | 80 | 0.1 | -1 | -40.8 | 81 | 0.2 | 0 | -41.3 | 81 | -0.3 | 0 |
| | 19 | -41.3 | 81 | -41.2 | 82 | 0.1 | 1 | -41.5 | 82 | -0.2 | 1 | -41.6 | 81 | -0.3 | 0 |
| | 20 | -41.0 | 83 | -40.8 | 80 | 0.2 | -3 | -41.4 | 81 | -0.4 | -2 | -41.6 | 85 | -0.6 | 2 |
| | min | -41.7 | 79 | -41.9 | 78 | -0.3 | -3 | -41.8 | 79 | -0.4 | -2 | -41.7 | 78 | -0.6 | -2 |
| | max | -41.0 | 83 | -40.7 | 83 | 0.4 | 3 | -40.8 | 83 | 0.2 | 2 | -41.0 | 85 | 0.4 | 3 |
| | avg | -41.3 | 80.9 | -41.3 | 80.8 | 0.0 | -0.1 | -41.5 | 80.5 | -0.1 | -0.4 | -41.4 | 81.2 | 0.0 | 0.3 |
| Reliability Test 10 Solder heat | 1 | -42.3 | 80 | -41.8 | 81 | -0.5 | 1 | -41.9 | 81 | -0.4 | 1 | -41.7 | 81 | -0.6 | 1 |
| | 2 | -41.2 | 83 | -41.1 | 82 | -0.1 | -1 | -40.9 | 81 | -0.3 | -2 | -40.8 | 83 | -0.4 | 0 |
| | 3 | -41.9 | 81 | -41.7 | 82 | -0.2 | 1 | -42.0 | 80 | 0.1 | -1 | -41.5 | 83 | -0.4 | 2 |
| | 4 | -41.7 | 81 | -41.6 | 84 | -0.1 | 3 | -41.6 | 80 | -0.1 | -1 | -41.4 | 80 | -0.3 | -1 |
| | 5 | -41.2 | 81 | -41.2 | 80 | 0.0 | -1 | -41.2 | 79 | 0 | -2 | -41.0 | 81 | -0.2 | 0 |
| | 6 | -41.2 | 81 | -41.1 | 80 | -0.1 | -1 | -41.2 | 83 | 0 | 2 | -40.9 | 80 | -0.3 | -1 |
| | 7 | -41.7 | 80 | -41.8 | 80 | 0.1 | 0 | -41.8 | 81 | 0.1 | 1 | -41.3 | 83 | -0.4 | 3 |
| | 8 | -41.1 | 80 | -41.0 | 81 | -0.1 | 1 | -41.3 | 82 | 0.2 | 2 | -40.7 | 80 | -0.4 | 0 |
| | 9 | -41.5 | 83 | -41.6 | 82 | 0.1 | -1 | -41.6 | 80 | 0.1 | -3 | -41.2 | 81 | -0.3 | -2 |
| | 10 | -41.5 | 81 | -41.3 | 82 | -0.2 | 1 | -41.5 | 79 | 0 | -2 | -41.0 | 79 | -0.5 | -2 |
| | 11 | -41.5 | 80 | -41.5 | 83 | 0.0 | 3 | -41.7 | 80 | 0.2 | 0 | -41.3 | 81 | -0.2 | 1 |
| | 12 | -41.3 | 82 | -41.5 | 79 | 0.2 | -3 | -41.6 | 80 | 0.3 | -2 | -41.1 | 79 | -0.2 | -3 |
| | 13 | -41.3 | 80 | -41.1 | 81 | -0.2 | 1 | -41.6 | 79 | 0.3 | -1 | -41.1 | 81 | -0.2 | 1 |
| | 14 | -41.3 | 81 | -41.1 | 80 | -0.2 | -1 | -41.5 | 80 | 0.2 | -1 | -41.0 | 81 | -0.3 | 0 |
| | 15 | -41.6 | 79 | -41.4 | 82 | -0.2 | 3 | -41.5 | 80 | -0.1 | 1 | -41.3 | 81 | -0.3 | 2 |
| | 16 | -41.5 | 80 | -41.5 | 80 | 0.0 | 0 | -41.8 | 79 | 0.3 | -1 | -41.1 | 80 | -0.4 | 0 |
| | 17 | -41.1 | 81 | -41.1 | 79 | 0.0 | -2 | -41.5 | 81 | 0.4 | 0 | -41.0 | 81 | -0.1 | 0 |
| | 18 | -41.5 | 80 | -41.5 | 78 | 0.0 | -2 | -41.4 | 81 | -0.1 | 1 | -41.3 | 84 | -0.2 | 4 |
| | 19 | -41.5 | 82 | -41.4 | 82 | -0.1 | 0 | -41.6 | 82 | 0.1 | 0 | -41.2 | 80 | -0.3 | -2 |
| | 20 | -41.3 | 80 | -41.2 | 80 | -0.1 | 0 | -41.4 | 81 | 0.1 | 1 | -41.0 | 80 | -0.3 | 0 |
| | min | -42.3 | 79 | -41.8 | 78 | -0.5 | -3 | -42.0 | 79 | -0.4 | -3 | -41.7 | 79 | -0.6 | -3 |
| | max | -41.1 | 83 | -41.0 | 84 | 0.2 | 3 | -40.9 | 83 | 0.4 | 2 | -40.7 | 84 | -0.1 | 4 |
| | avg | -41.5 | 80.8 | -41.4 | 80.9 | -0.1 | 0.1 | -41.5 | 80.5 | 0.1 | -0.4 | -41.1 | 81.0 | -0.3 | 0.2 |

10. Reliability test condition and report

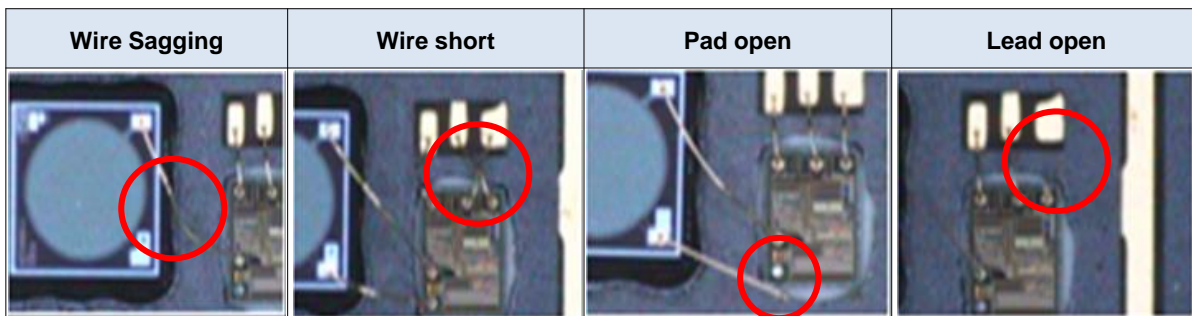
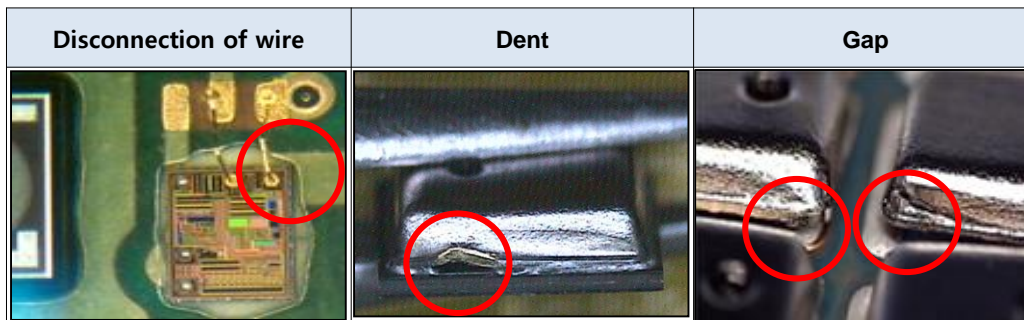
10-2. Test report

| Reliability test item | MIC no | Step1 --> Initial | | Step2 --> PRECONDITION (+85°C/85%) | | difference | | Step3 --> PRECONDITION (Reflow 3times) | | difference | | Step4 --> Reliability Test | | difference | |
|-----------------------------------|--------|-------------------|------|------------------------------------|------|------------|------|--|------|------------|------|----------------------------|------|------------|------|
| | | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur | Sens. | Cur |
| Reliability Test 11 Reflow | 1 | -41.5 | 81 | -41.5 | 81 | 0.0 | 0 | -41.6 | 80 | 0.1 | -1 | -41.3 | 80 | -0.2 | -1 |
| | 2 | -41.5 | 81 | -41.6 | 82 | 0.1 | 1 | -41.6 | 78 | 0.1 | -3 | -41.2 | 80 | -0.3 | -1 |
| | 3 | -41.3 | 81 | -41.2 | 80 | -0.1 | -1 | -41.5 | 80 | 0.2 | -1 | -41.0 | 80 | -0.3 | -1 |
| | 4 | -41.9 | 81 | -41.8 | 82 | -0.1 | 1 | -41.9 | 82 | 0 | 1 | -41.5 | 81 | -0.4 | 0 |
| | 5 | -41.4 | 81 | -41.3 | 82 | -0.1 | 1 | -41.5 | 79 | 0.1 | -2 | -41.2 | 80 | -0.2 | -1 |
| | 6 | -41.4 | 82 | -41.5 | 81 | 0.1 | -1 | -41.6 | 80 | 0.2 | -2 | -41.2 | 82 | -0.2 | 0 |
| | 7 | -41.5 | 80 | -41.4 | 80 | -0.1 | 0 | -41.5 | 80 | 0 | 0 | -41.0 | 80 | -0.5 | 0 |
| | 8 | -41.6 | 82 | -41.4 | 82 | -0.2 | 0 | -41.6 | 81 | 0 | -1 | -41.0 | 79 | -0.6 | -3 |
| | 9 | -41.4 | 80 | -41.7 | 80 | 0.3 | 0 | -41.6 | 79 | 0.2 | -1 | -41.2 | 80 | -0.2 | 0 |
| | 10 | -41.7 | 82 | -41.5 | 83 | -0.2 | 1 | -41.6 | 80 | -0.1 | -2 | -41.3 | 81 | -0.4 | -1 |
| | 11 | -41.3 | 81 | -41.3 | 80 | 0.0 | -1 | -41.2 | 81 | -0.1 | 0 | -41.1 | 83 | -0.2 | 2 |
| | 12 | -41.0 | 84 | -41.4 | 82 | 0.4 | -2 | -41.4 | 79 | 0.4 | -5 | -41.2 | 82 | 0.2 | -2 |
| | 13 | -41.4 | 81 | -41.3 | 81 | -0.1 | 0 | -41.4 | 81 | 0 | 0 | -41.2 | 84 | -0.2 | 3 |
| | 14 | -41.7 | 82 | -41.9 | 82 | 0.2 | 0 | -41.6 | 79 | -0.1 | -3 | -41.3 | 79 | -0.4 | -3 |
| | 15 | -41.3 | 80 | -41.4 | 82 | 0.1 | 2 | -41.3 | 81 | 0 | 1 | -41.1 | 82 | -0.2 | 2 |
| | 16 | -42.1 | 82 | -41.9 | 80 | -0.2 | -2 | -41.9 | 81 | -0.2 | -1 | -41.7 | 84 | -0.4 | 2 |
| | 17 | -41.5 | 81 | -41.5 | 83 | 0.0 | 2 | -41.5 | 82 | 0 | 1 | -41.3 | 79 | -0.2 | -2 |
| | 18 | -41.7 | 84 | -41.4 | 80 | -0.3 | -4 | -41.5 | 81 | -0.2 | -3 | -41.2 | 80 | -0.5 | -4 |
| | 19 | -41.6 | 81 | -41.6 | 82 | 0.0 | 1 | -41.5 | 80 | -0.1 | -1 | -41.7 | 82 | -0.2 | 1 |
| | 20 | -41.1 | 80 | -41.1 | 81 | 0.0 | 1 | -41.0 | 80 | -0.1 | 0 | -41.2 | 81 | 0.1 | 1 |
| min | | -42.1 | 80 | -41.9 | 80 | -0.3 | -4 | -41.9 | 78 | -0.2 | -5 | -41.7 | 79 | -0.6 | -4 |
| max | | -41.0 | 84 | -41.1 | 83 | 0.4 | 2 | -41.0 | 82 | 0.4 | 1 | -41.0 | 84 | 0.2 | 3 |
| avg | | -41.5 | 81.4 | -41.5 | 81.3 | 0.0 | -0.1 | -41.5 | 80.2 | 0.0 | -1.2 | -41.2 | 81.0 | -0.3 | -0.4 |

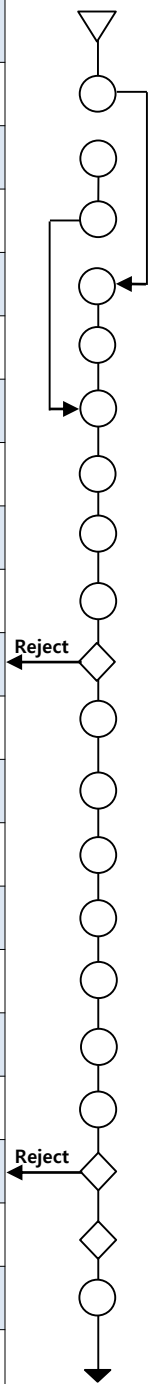
11. CTQ (Critical To Quality)

| Process | Appointment reason | Control item | Control specification | Periodic time of Inspection |
|--------------|---|---------------------|-----------------------------------|---|
| Wire bonding | Prevent of contact between wire and can Prevent of welding fault at wire bonding process | Loop Height | 300 μ m \pm 50 μ m (TR) | Loop Height : 2Wire |
| | | Ball Shear | Min 10g | 5ea/Lot |
| | | Wire pull | Min 3g | |
| Sawing | Prevent of size fault by sawing blade abrasion | Burr condition | Dimension specification | 2ea / 1 Lot Measurement dimension of product |
| Can Attach | Can attachment condition : direction, gap, twist, appearance. After can aligning if is attached by reverse direction, those are all faults | Gap, Pollution | No gap, scratch pollution | Reflow : at the beginning of process |
| | | Reflow temp | Reflow temp profile | |
| Measurement | At sensitivity measurement process, it should be classified outgoing ranks with considering of equipment tolerance. | Sensitivity Current | -42 \pm 3dB 50~250 μ A | 100% sampling test |

► Examples



12. Process control

| Process Name | Process Order | Control Methods | Material | Machine/Tool |
|--------------------------------------|--|---|------------------------|--|
| Incoming inspection (HPCB, TR, ASIC) |  | Plating, Appearance, dimension, Pad discoloration | Transducer, ASIC, HPCB | Optical microscope(40x) |
| Wafer sawing | | Pad oxidation, dimension, crack, dent | ASIC | Optical microscope(40x) |
| Stealth Dicing & Expanding | | Crack, dent | Transducer | Optical microscope(40x) |
| UV lightening | | Intensity of illumination and radiation, time | Transducer | Manual inspection |
| Die Attach (ASIC) | | Attachment position | ASIC, Epoxy | Die Attach: ASM AD830 |
| Oven Cure | | Die Shear | - | Dage serise 4000 |
| Die Attach (TR) | | Attachment position | Transducer, Epoxy | Die Attach: ASM AD830 |
| Oven Cure | | Die Shear | - | Dage serise 4000 |
| Plasma Cleaning | | Bonding pad pollution | - | PLASMA CLEANER SOLESPECS600 |
| Wire Bonding (CTQ) | | Ball Shear, Wire Pull, Loop Height | Au Wire | Dage serise 4000 |
| Visual Inspection | | Wire Bonding condition | - | Optical microscope(40x) |
| Glob Top | | Wire Bonding Pad condition, Height | Silicon | Dispenser M/C |
| Oven Cure | | Wire Bonding Pad condition, Height | - | Naked eyes |
| Dispensing | | Dispensing Width | Solder | Dispenser M/C |
| CAN Attach (CTQ) | | Gap, pollution, Reflow temp | - | Reflow |
| Laser Marking | | Marking condition | - | - |
| Sawing(CTQ) | | Init size, burr condition | UV Tape | Disco |
| Measurement (CTQ) | | Sensitivity, current | - | MIC Auto Test M/C |
| Appearance inspection | | Assembled condition, Appearance | - | Optical microscope(40x) |
| Outgoing inspection | | Appearance, sensitivity, current | - | Optical microscope(40x), Manual Tester |
| Packing | Reel direction check | Reel, Cover Tape | - | |
| Final outgoing | Quantity, label | Out box, Barcode Label | - | |

13. Rework method



| Working condition | | | |
|-------------------|-------------------------------------|---|--------------|
| 1 | Temperature | | 300 °C |
| 2 | Working time | pre-heating (PWB) / Remove (microphone) | 15 sec |
| | | Mounting new one | 3 sec |
| 3 | Distance between product and nozzle | | 3 cm |
| 4 | Angle of nozzle | | 45 ° to 90 ° |
| 5 | Amount of air flow | | Level 5.5 |



CAUTION

- These condition can also change due to thickness of PWB, worker or room temperature, etc

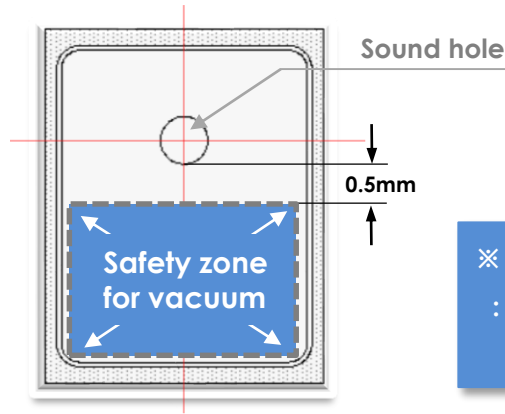
Rework Process

| | |
|---------------|--|
| Step 1 | Place the nozzle near the defective microphone and remove. |
| Step 2 | <p><u>Rear type</u> : No sound hole on rear type can → No need of heat-resistant tape</p> <p><u>Front type</u> : Attach heat-resistant tape on sound hole of microphone for preventing inner parts damage by hot air flow.</p> <p>※ Except heat-resistant tape attachment, all process are the same between rear type and front type</p> |
| Step 3 | Place the nozzle near the solder on PWB and melt solder down. |
| Step 4 | Place and align the new one on PWB manually. Before solder sets into a solid mass, press lightly with tweezers. |
| Step 5 | Pull away a heat-resisting tape from sound hole. |

14. Handling with care of MEMS microphone

14-1. Recommended vacuum position

→ Membrane damage.



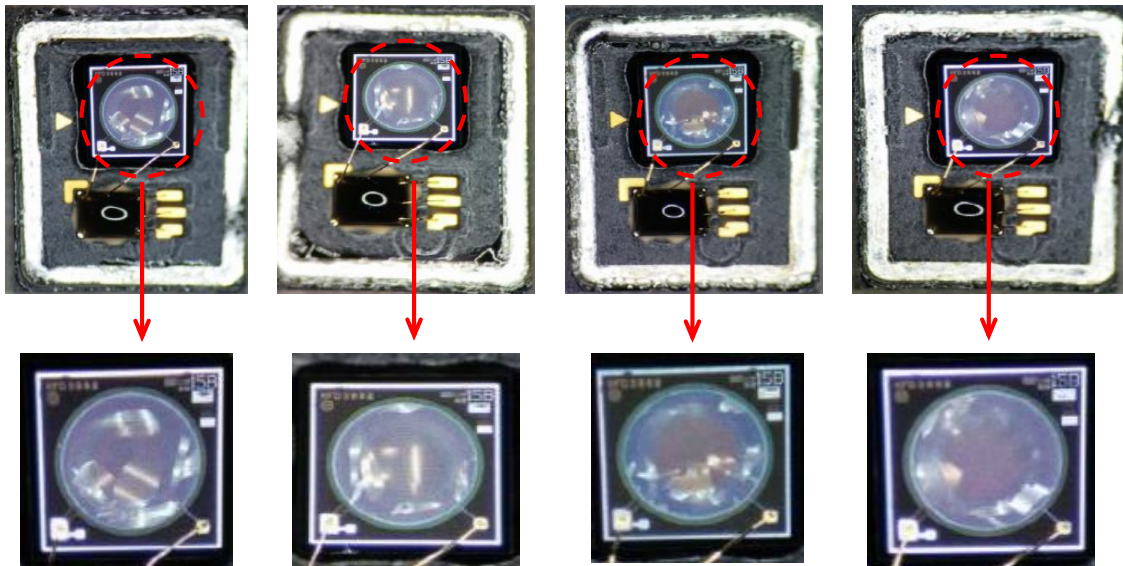
※ **Note**

: Do not pull vacuum over sound hole.
It may cause damage the microphone.

14-2. It is not allowed to airbrush(air-blow) toward acoustic port

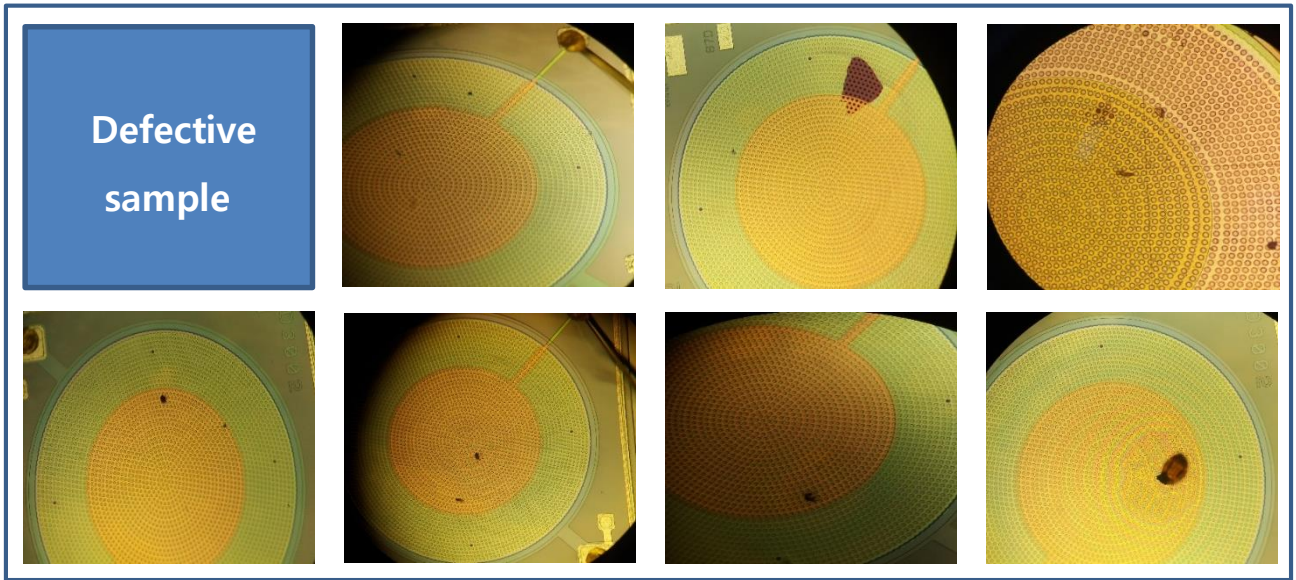
→ Membrane damage.

Broken membrane film



14-3. Cleaning foreign substance

14-3-1. It is not allowed to clean foreign substance with cloth or cotton swab on acoustic port directly (Ingress of dust → Sensitivity is getting down)



14-3-2. It is not allowed to use brush for removing solder ball
→ gold wire cutting, the circuit trip out.

