

Approval Sheet

Document No. :

Antenna Type : Ceramic Chip Antenna

Model : HWL-C21A

Amotech P/N : AMAN802012ST02

Customer P/N : 4210-A00001

Faurecia Clarion	Plan	Evaluation	Decision
Date	/	/	/



Approval	Written	Reviewed		Approved
Name	AH Ga	KM Lee	TH Kim	HJ Kwon
Date	2024. 04. 05	2024. 04. 05	2024. 04. 05	2024. 04. 05

2024. 04. 05

AMOTECH Co., Ltd.

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1. Revision history

Rev No.	Date	Content	Page
0	2024.04.05	New	

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2. Specifications

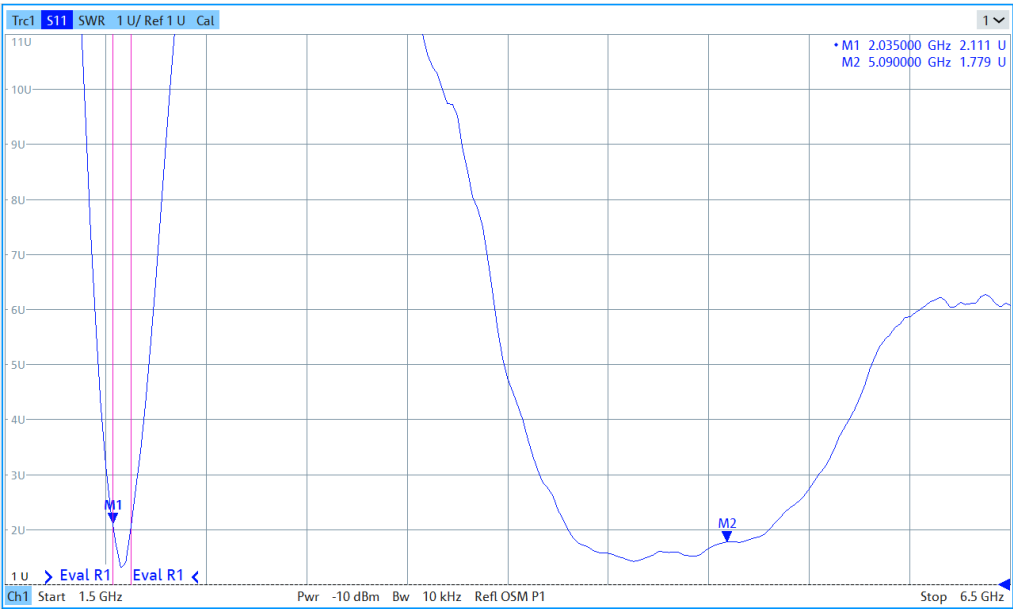
2.1 Electrical specifications

Division	Item	Specification			Remark
1	VSWR 1	Max 4:1 @ 2080 ± 45 MHz			On the Jig
		Max 3:1 @ 4740 ± 350 MHz			
2	VSWR 2	Max 6.0:1 @ 2442 ± 42 MHz			On the SET
		Max 4.0:1 @ 5500 ± 350 MHz			
3	Radiation Gain	Average [dBi]	2442 MHz	Typical. -6.0	
			5500 MHz	Typical. -4.0	
		Efficiency [%]	2442 MHz	Typical. 25	
			5500 MHz	Typical. 40	
		Peak Gain [dBi]	2442 MHz	Typical. -0.5	
			5500 MHz	Typical. 1.5	
4	Radiation Pattern	Omni-directional			-
5	Polarization	Linear			-
6	Impedance	Nominal 50			Ω

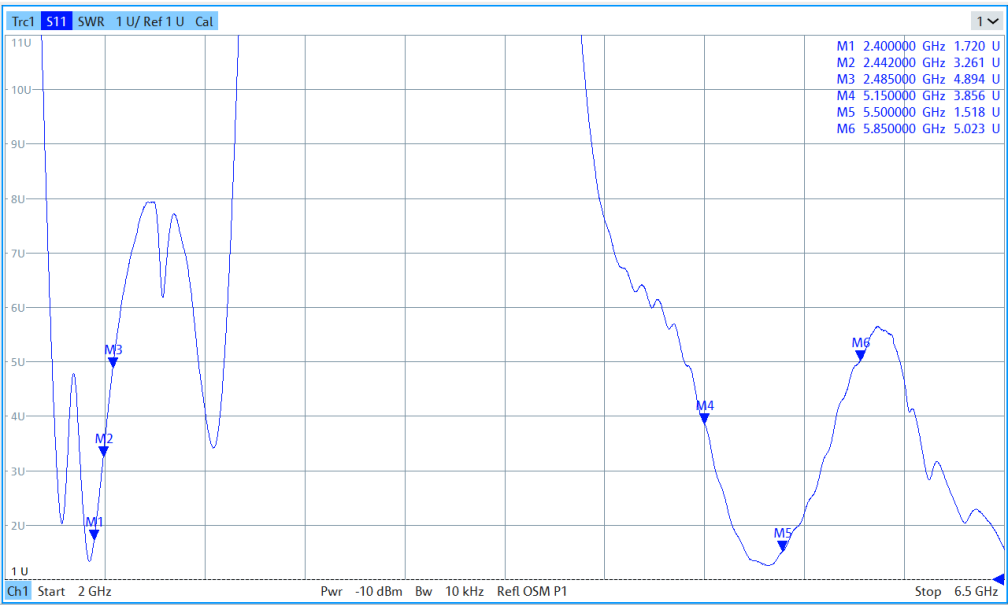
※ The radiation gain was measured in the Customer's SET.

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- Measured results



[VSWR1 : On the Jig]

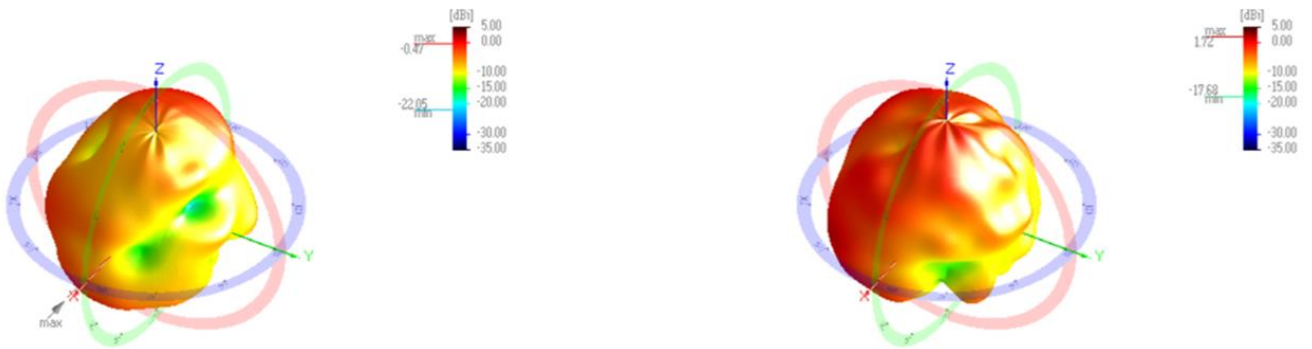


[VSWR2 : On the Customer's SET]

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Generation 2.5			
Frequency [MHz]	Efficiency [%]	Average gain [dBi]	Peak gain [dBi]
2400	40.77	-3.90	1.84
2442	27.49	-5.61	-0.56
2485	22.82	-6.42	-1.30
5150	44.00	-3.57	1.43
5500	46.76	-3.30	1.66
5850	27.89	-5.54	-0.10

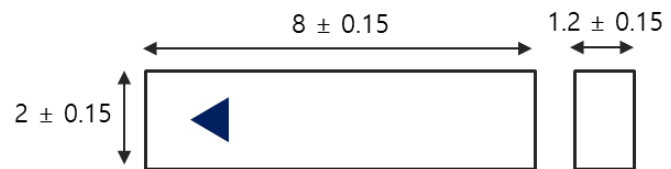
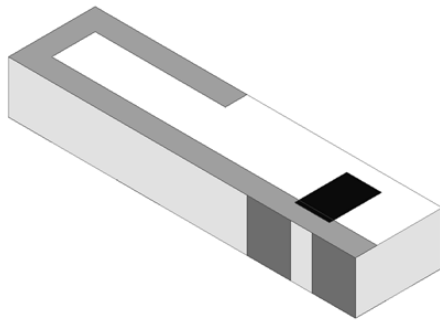
[Antenna gain table : On the Customer's SET]



[3D radiation patterns : On the Customer's SET]

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2.2 Mechanical specification

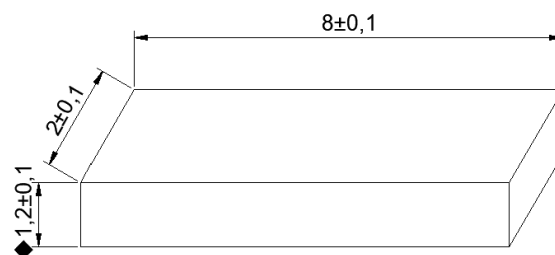


Antenna Top & Side

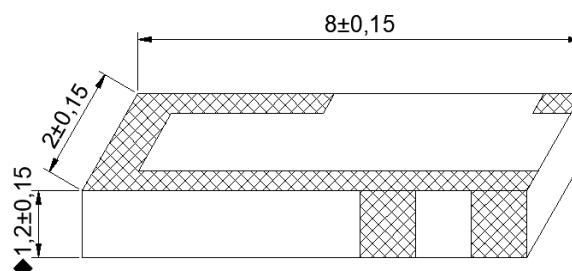
[unit : mm]

No	Item	Spec.	Remark
1	Dimensions (L * W * H)	8.0 * 2.0 * 1.2 mm ³	
2	Unit Weight	Typ. 65 mg	
3	Operating Temperature	-40 ~ +125 °C	

2.2.1 Ceramic body drawing



2.2.2 Product drawing



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2.3 Part No. and Lot No.

Model : AMAN 802012 ST 02
 (1) (2) (3) (4)

(1) : AMOTECH Antenna

(2) : Antenna size (L x W x H)

(3) : Standard

(4) : Product No.

Lot : XX XX X X XX
 (1) (2) (3) (4) (5)

(1) : Year of forming corpuscle

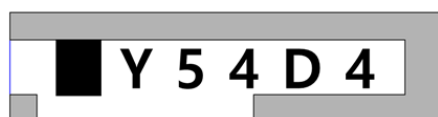
(2) : Month of forming corpuscle

(3) : Dielectric constant ex) 1: 9.5, 2: 20.5

(4) : Chip size ex) A: 542012, B:542015, C:903012, D:903015, U:1003030, S:1003015

(5) : Production number of month

2.4 Marking



Y5 4 D 4
(1) (2) (3) (4)

(1) : Model

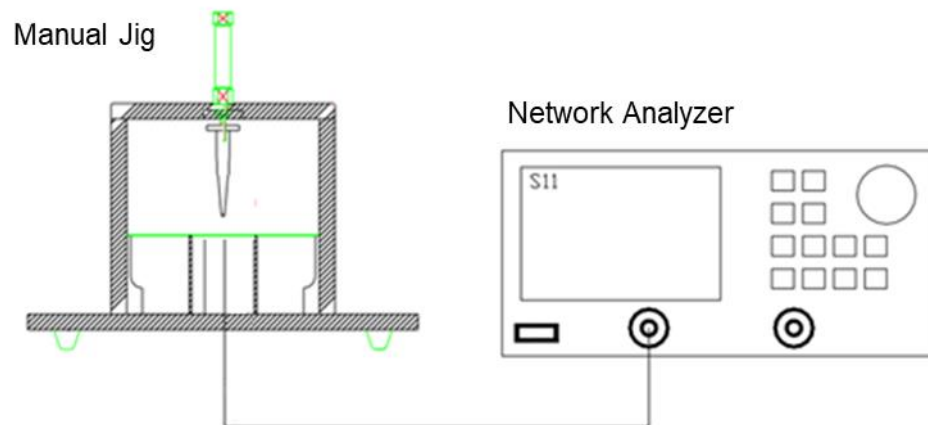
(2) : Year of manufacture

(3) : Month of manufacture ex) A:January, B:February, C:March

(4) : Date of manufacture ex) 1~9: 1~9day, A~W: 10~31day

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3. Test method



A) Calibrate Network Analyzer Port

- Refer to electrical specification
- Start 1500 MHz, Stop 6500 MHz, Number of point : 801
- Calibrate RF cable

B) Connect Antenna cable to the manual jig

B-1) Set FORMAT of network analyzer in VSWR (SWR)

B-2) Read the value of VSWR, after setting MARKER1, MARKER2

※ Marker 1 is the VSWR max value in the low band.

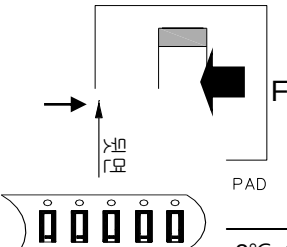
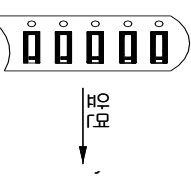
※ Marker 2 is the VSWR max value in the high band.

C) Verify that the value of VSWR is within specification

※ If the product is defective, [Fail] message will be appears on the display.

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4. Reliability test condition

Division	Item	Test Condition	Requirements
1	Adhesion strength	1. SMT PCB in the sample fell, Until the power Increase 	1. No mechanical damage by forces Applied on the right 2. Strength $F > 5 \text{ kgf}$
2	Thermal shock	1 : 3°C , 30min  2 : $5 \pm 3^{\circ}\text{C}$, 30min	1. No damage on appearance - There should be no crack in the pattern and the body. 2. Meet the specification (VSWR)
3	High temp. resistance	1. Temperature: $+125 \pm 5^{\circ}\text{C}$ 2. Time : $1,000 \pm 24 \text{ hours}$	1. No damage on appearance - There should be no crack in the pattern and the body. 2. Meet the specification (VSWR)
4	High temp.& humidity : Steady Condition	1. Humidity : 85 % RH 2. Temperature : $+85 \pm 3^{\circ}\text{C}$ 3. Time : $1,000 \pm 24 \text{ hours}$	1. No damage on appearance - There should be no crack in the pattern and the body. 2. Meet the specification (VSWR)
5	ESD	1. ESD Level : 8KV 2. Mode : Contact discharge 3. Test Count : 100	1. No damage on appearance - There should be no crack in the pattern and the body. 2. Meet the specification (VSWR)
6	Mechanical Shock	1. Peak Value 100g's, Duration 6ms, 3 directions each 3 times ※ MIL-STD-202 METHOD 213 Condition C	1. No damage on appearance - There should be no crack in the pattern and the body. 2. Meet the specification (VSWR)
7	Vibration	.5-55-5Hz, 1 Octave/min, Amp.=1.5mm Acceleration=2g, Crossover Freq.=18Hz	1. No damage on appearance - There should be no crack in the pattern and the body. 2. Meet the specification (VSWR)

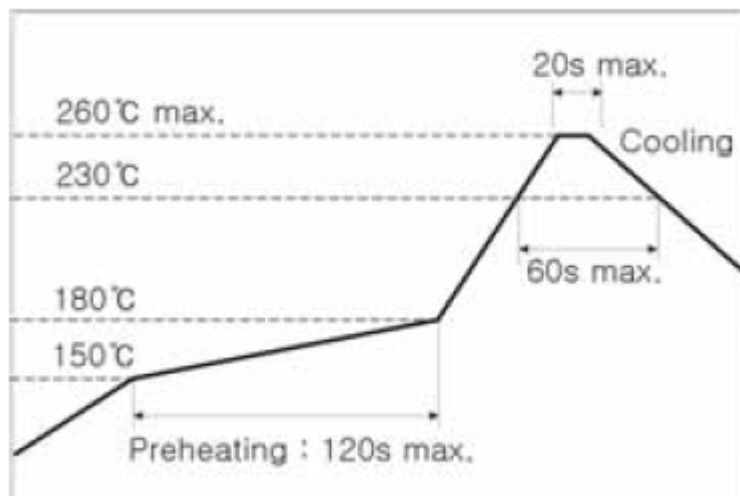
※ Test conditions are selected in accordance with AEC-Q200

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5. Recommendations Soldering Conditions

5.1 Unleaded soldering temperature conditions (Pb-free)

Solder paste : Ag/Sn/Cu(3.0/96.0/0.5)

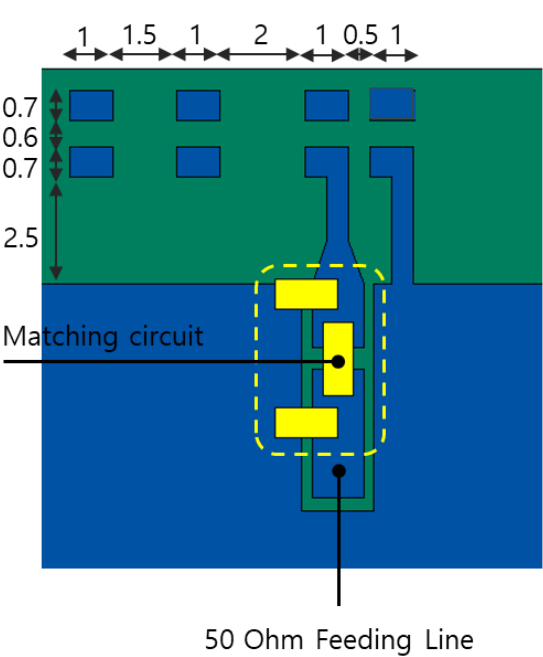


※ In order to prevent degradation of antenna characteristics, soldering conditions must be observed below.

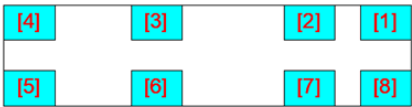
- This product is designed for reflow soldering only. Do not use flow (wave) soldering.
- Use non-activated flux (CL content 0.2% max.)
- Reflow-cycle is max, 3 times.

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5.2 PCB Pattern design terms (Recommendations)



Antenna top



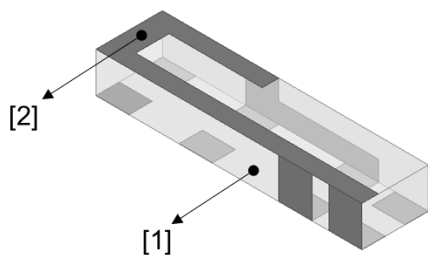
Antenna bottom

No.	Pin assignment
[1]	N/C
[2]	N/C
[3]	N/C
[4]	N/C
[5]	N/C
[6]	N/C
[7]	Feeding
[8]	GND

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6. Structure and Material

6.1 Material



[1]	Antenna body	Magnesium oxide-based ceramic
[2]	Electrode	Ag

6.2 Equivalent Circuit



7. Notice

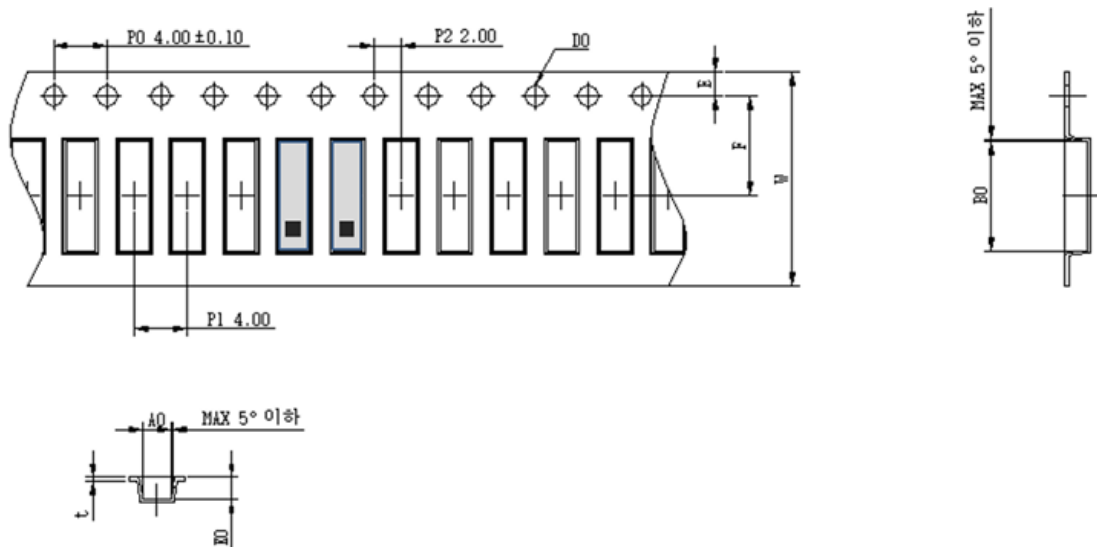
- Storage environment of parts must be at ambient temperatures of 5 to 40 °C and maximum 60% RH humidity.
- Dielectric chip antenna must avoid high temperature & humidity, sulfur and chlorine gas leading to weaken solder-ability of electrode
- Dielectric chip antenna must avoid any mechanical stress leading to crack of ceramic.
- The parts should be used within 6 months from the time of delivery.
If stored for over 6 months, check for solder ability before use.
- Tarnishing of the antenna pattern (Ag) before or after SMT process cannot any impact on the product performance, so AMOTECH accepts no warranty for tarnished product.

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8. Packing

8.1 Carrier tape

8.1.1 Size



A0	2.20±0.10	P0	4.00±0.10	E	1.75±0.10
B0	8.20±0.10	P1	4.00±0.10	F	7.50±0.10
K0	1.65±0.10	P2	2.00±0.10	W	16.00±0.30
D0	1.55±0.05			t	0.30±0.05

Unit : mm

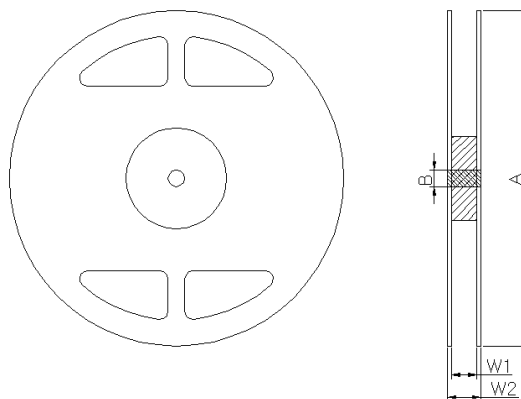
8.1.2 Material surface resistance

- 1) Carrier tape : Max $10^{11}\Omega/\square$
- 2) Cover tape : Max $10^{11}\Omega/\square$
- 3) Reel : Max $10^{11}\Omega/\square$

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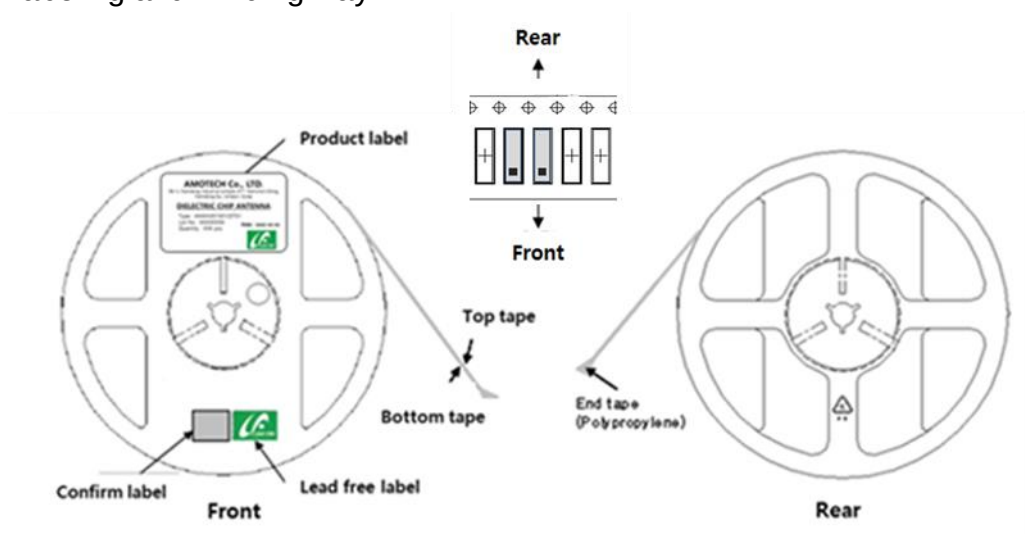
8.2 Reel

8.2.1 Size



A	180 ± 0.5	W1	$17 \pm 0.5 \text{ mm}$
B	13 ± 0.2	W2	$13 \pm 0.5 \text{ mm}$

8.2.2 Labeling and winding way



8.2.3 Materials

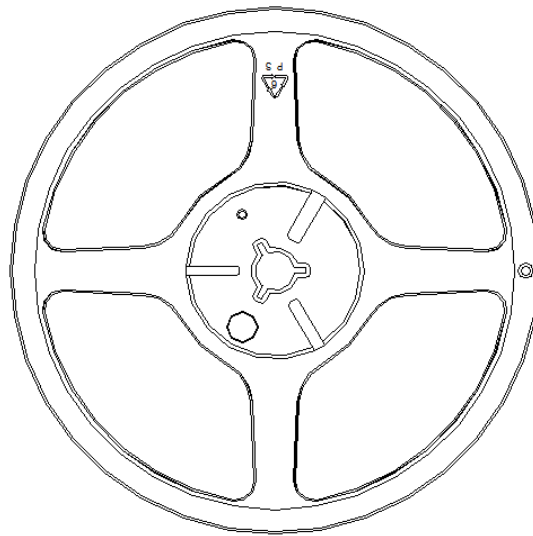
- 1) Plastic reel : GPPS (General Purpose Poly Styrene) resin

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8.3 Box packaging specification

8.3.1 Reel

- 1) Size : 178 x 16 [mm]
- 2) Quantities : 2,000 ea



8.3.2 Inner box



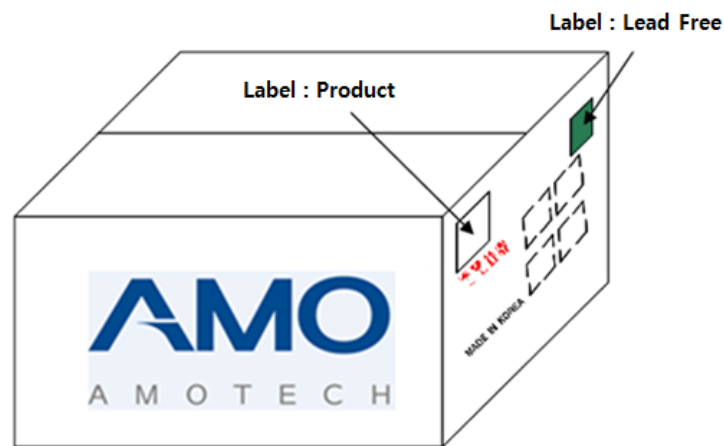
- 1) Size : 183 (W) x 70 (D) x 185 (H) [mm]
- 2) Quantities : 6,000 (3 reel)

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8.3.3 Outer box

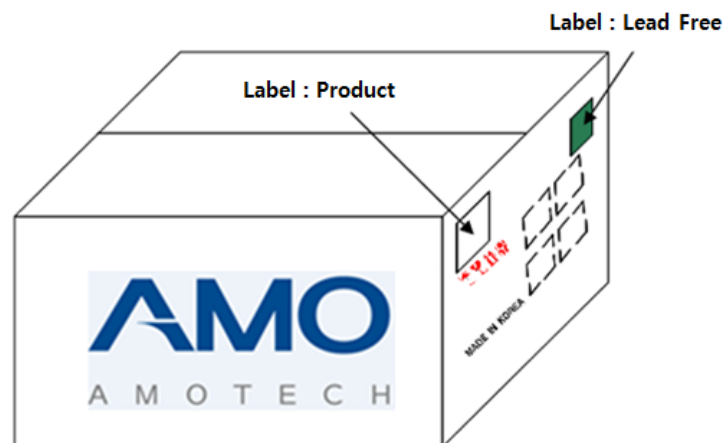
1-1) Size : 365 (W) x 200 (D) x 200 (H) [mm]

1-2) Quantities : 30,000 ea (5 Inner Box)



2-1) Size : 390 (W) x 390 (D) x 280 (H) [mm]

2-2) Quantities : 60,000 ea (10 Inner Box)



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8.4 Packing label

AMOTECH Co., Ltd.

5BL-1Lot, 617, Namchon-Dong, Namdong-Gu, Incheon, Korea

Dielectric Chip Antenna

P/N : AMAN802012ST02

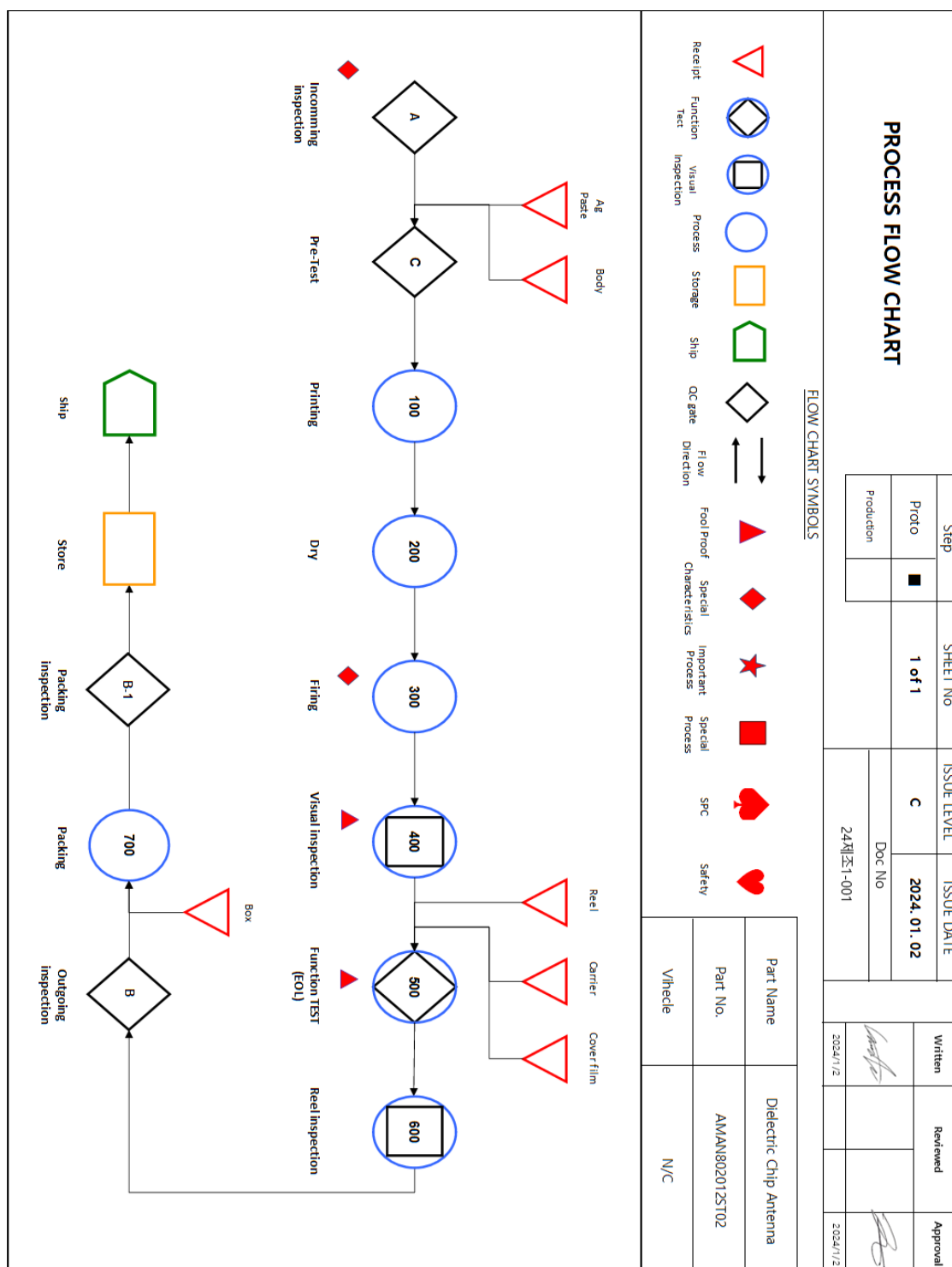
Lot No :

Quantity : 2,000 pcs Date : YYYY/MM/DD

9. Manufacture Site

Product	Manufacturer	Factory Location
AMAN802012ST02	AMOTECH	KOREA
		VIETNAM

10. Process Flow Chart



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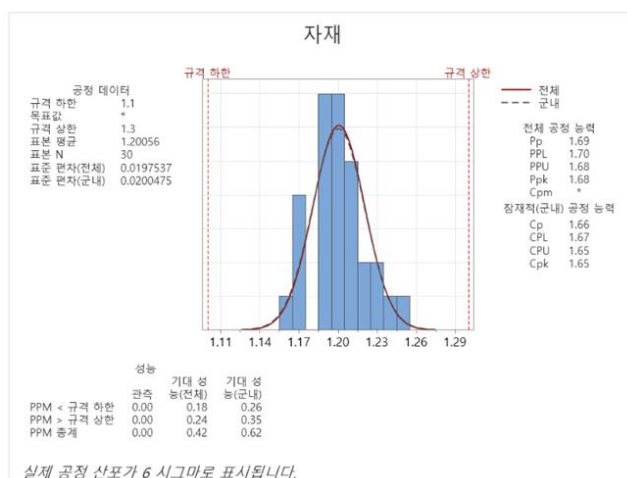
11. Cpk Data

11.1 Ceramic body

Specification		1.2±0.1	
No.	Ceracmic Body	No.	Ceracmic Body
1	1.19	16	1.20
2	1.23	17	1.17
3	1.23	18	1.22
4	1.20	19	1.19
5	1.20	20	1.19
6	1.21	21	1.16
7	1.20	22	1.25
8	1.19	23	1.17
9	1.22	24	1.19
10	1.20	25	1.21
11	1.21	26	1.21
12	1.24	27	1.19
13	1.17	28	1.17
14	1.19	29	1.20
15	1.20	30	1.21

(unit : mm)

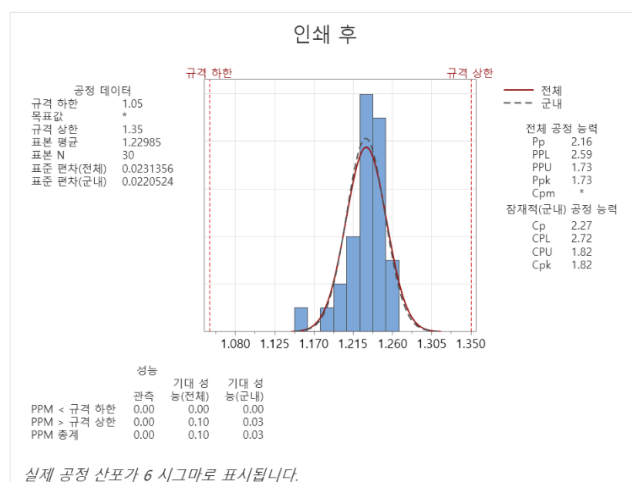
Avg	1.20
Min	1.16
Max	1.25
Cpk	1.65



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11.2 Product

Specification		1.2±0.15	
No.	Product	No.	Product
1	1.16	16	1.21
2	1.26	17	1.23
3	1.20	18	1.26
4	1.19	19	1.24
5	1.24	20	1.24
6	1.23	21	1.25
7	1.22	22	1.25
8	1.25	23	1.23
9	1.24	24	1.21
10	1.21	25	1.24
11	1.22	26	1.20
12	1.25	27	1.23
13	1.23	28	1.25
14	1.27	29	1.23
15	1.23	30	1.25
Avg		1.23	
Min		1.16	
Max		1.27	
Cpk		1.82	



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12. Material Data Declaration Sheet

Part Number	Supplier Vdndor	WEIGHT (g)	No	Raw material name (Homogeneous material)	Raw material vendor	WEIGHT (g)	WEIGHT (%)	Substance material name (Chemical formulary)	Material's Cas-No	WEIGHT (mg)	Type
											Organic / Inorganic
AMAN802012ST02	Amotech	0.061	1	POWDER_Alumina	Amotech	0.061	100%	Alumina	1344-28-1	0.0610	Inorganic
	Daejoo	0.002	1	AgPaste_DNF8010C	Daejoo	0.002	12.0%	(BUTOXYETHOXY)ETHANOL	112-34-5	0.0002	Inorganic
			2				80.0%	Silver	7440-22-4	0.0016	
			3				3.0%	Ethyl ether cellulose	9004-57-3	0.0001	
			5				5.0%	Transene Glass Composition	65997-17-3	0.0001	

13. MSDS & CAS No.

It is attached as a separate document.

14. Halogen Free & RoHs Data

It is attached as a separate document.

15. Conflict Minerals (CMRT & EMRT)

It is attached as a separate document.

16. Reliability Test Report

It is attached as a separate document.