Patch Antenna

AMO
AMOTECH

Approval Sheet

Type : Stacked Patch Antenna
AMOTECH Part No. : ASPA-A13A-D1000
Customer Part No. : GNSS+SDARS Stacked patch antenna

	Designed	Checked		Approved
-				
Date	. .	. .	. .	. .

Revision no	Content	Page	Date	Name
0	First, documented	-	2017.10.26	W. H Lee

RoHS

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Designed	Checked		Approved
. .	. .	. .	. .

1. Specification

1.1 Electrical characteristic

No	Item	Specification		Unit	Remarks
1	Frequency(fc)	SDARS	2332.50 ± 12.50	MHz	Notes : 1)
		GNSS	1559.00 ~ 1610.00	MHz	
		SDARS	2329.61 ± 7.00	MHz	Notes : 2)
		GNSS	1588.69 ± 3.00	MHz	
2	Return-Loss	SDARS	Min. 15	dB	Notes : 1)
		GNSS	Min. 7	dB	
		SDARS	Min. 15	dB	Notes : 2)
		GNSS	Min. 15	dB	
3	Axial Ratio	SDARS	vide page 4	dB	Notes : 1)
		GNSS	vide page 3	dB	
4	Gain	SDARS	vide page 4	dBic	Notes : 1)
		GNSS	vide page 3	dBic	
5	Polarization	SDARS	LHCP	-	-
		GNSS	RHCP	-	-
6	Impedance	-	50	Ω	-
7	Operating Temperature	-	-40 / +90	℃	-

※ Notes: 1) Measured on Dia. 1000mm ground plane with adhesive tape. (Stack state)

Notes: 2) Measured on AMOTECH FR4 ground plane with adhesive tape and release liner. (Stack state)

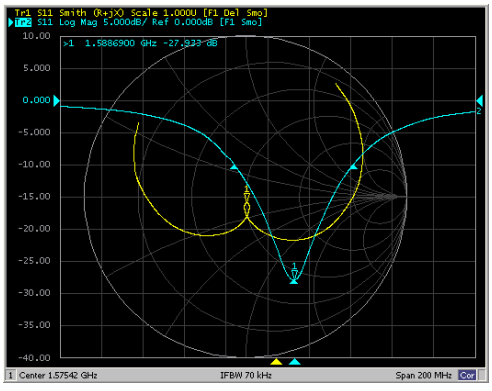
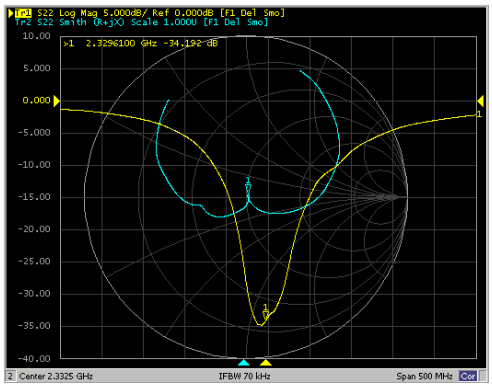
- Fc is mid Point of loop/cusp in smith chart.

- All Products in Mass Production Pass through the Inspection Process (100%)

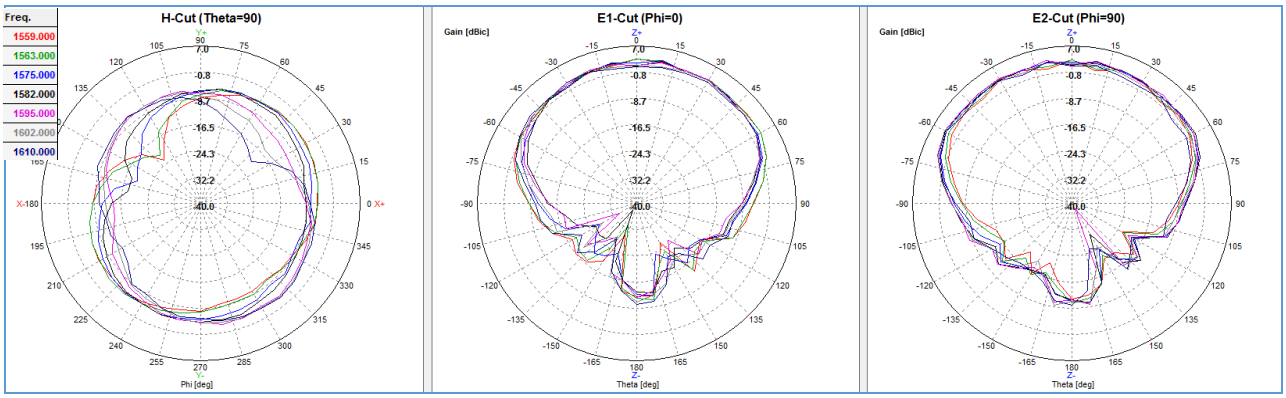
➔ Inspection List : Frequency(MHz), Return Loss(-dB)

1.2 Typical S11 (Log mag & Smith chart)

※ Measured on Dia. 1000mm ground plane with adhesive tape

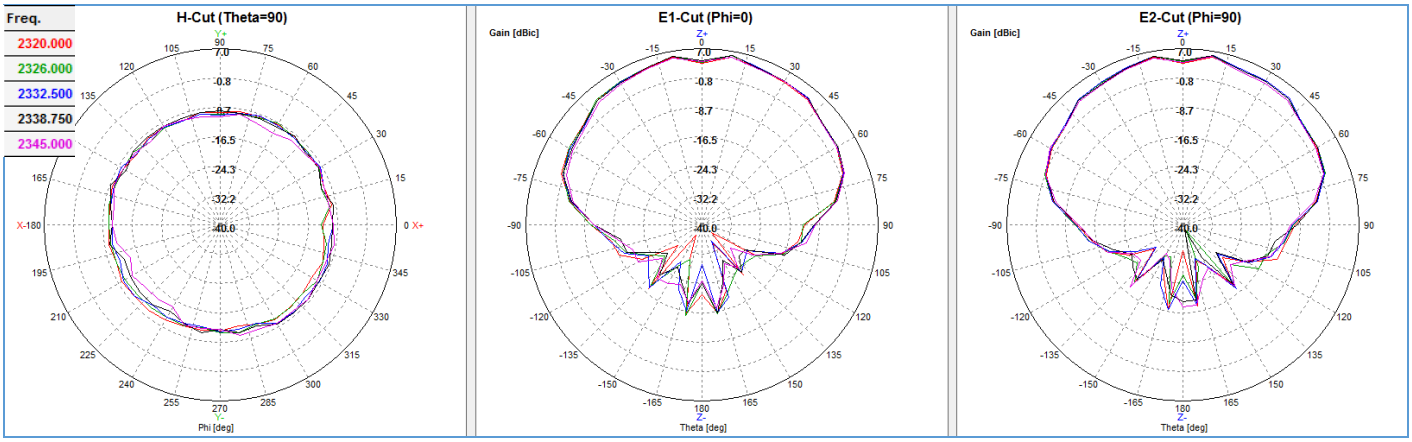
GNSS	SDARS
	

1.3.1 GNSS RHCP Gain (Measured on Dia. 1000mm ground plane with adhesive tape)



Freq. [MHz]	Eff.[%]	Avg. [dBic]	Peak [dBic]	Zenith [dBic]	Overall Gain [dBic]	Zenith AR [dB]
1559.00	52.22	-2.82	3.24	2.94	2.07	12.78
1563.00	55.15	-2.58	3.49	3.18	2.31	11.57
1575.00	55.50	-2.56	3.57	2.13	2.19	9.19
1582.00	55.70	-2.54	3.50	1.29	2.01	8.82
1595.00	57.73	-2.39	4.01	1.52	2.08	10.83
1602.00	54.14	-2.66	3.82	1.52	1.76	12.74
1610.00	50.13	-3.00	3.67	0.88	1.24	14.81

1.3.2 SDARS In Band LHCP Gain & VP Gain (Measured on Dia. 1000mm ground plane with adhesive tape)



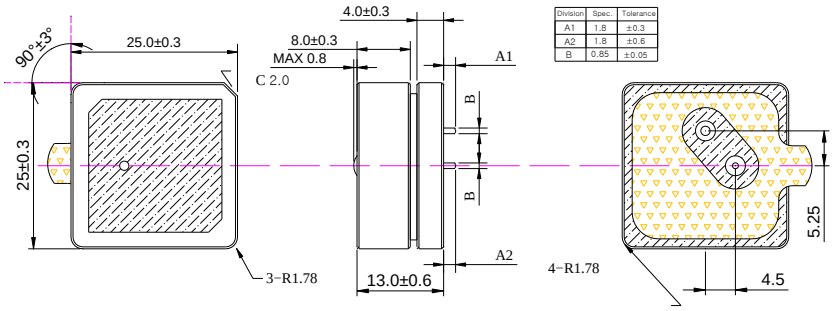
Polarization	unit	Spec.	degree	2320 MHz			2326 MHz			2332.5 MHz			2338.75 MHz			2345 MHz		
				Ava Gain	MAX Gain	MIN Gain	Ava Gain	MAX Gain	MIN Gain	Ava Gain	MAX Gain	MIN Gain	Ava Gain	MAX Gain	MIN Gain	Ava Gain	MAX Gain	MIN Gain
LHCP	dBic	2↑	90	3.01	3.22	2.83	3.38	3.56	3.19	3.72	3.87	3.37	3.70	3.87	3.49	3.43	3.65	3.16
			80	5.42	5.63	5.18	5.63	5.80	5.38	5.76	5.97	5.51	5.69	5.94	5.37	5.32	5.67	5.00
			70	4.32	4.65	4.07	4.46	4.76	4.16	4.51	4.73	4.26	4.35	4.64	4.00	4.09	4.48	3.69
		4↑	60	3.87	4.32	3.55	3.96	4.31	3.53	4.03	4.44	3.57	3.88	4.34	3.27	3.55	4.04	2.98
			50	3.69	4.03	3.39	3.75	4.10	3.21	3.75	4.23	3.23	3.59	4.10	2.76	3.21	3.82	2.41
		2↑	40	1.59	2.08	0.86	1.61	2.10	0.78	1.61	2.19	0.80	1.52	2.05	0.70	1.19	1.82	0.25
			30	1.06	1.70	0.40	1.09	1.74	0.26	1.15	1.91	0.17	1.05	1.87	0.02	0.75	1.71	-0.72
		0.5↑	20	-0.30	0.84	-1.25	-0.26	0.38	-1.23	-0.22	0.53	-1.40	-0.28	0.91	-1.83	-0.57	0.68	-2.82
VPOL	dBi	-3 ~ -1	10	-3.51	-1.76	-5.19	-3.38	-2.09	-4.89	-3.32	-2.23	-5.29	-3.47	-2.09	-6.38	-3.81	-1.78	-7.51
			0	-8.54	-6.48	-10.88	-8.61	-6.80	-10.42	-8.61	-6.64	-10.50	-8.55	-6.97	-11.51	-9.10	-7.00	-14.27
	dB	4↓	VPP	3.43			2.80			3.06			4.29			5.72		

1.3.3 SDARS Out of Band VP Gain (Measured on Dia. 1000mm ground plane with adhesive tape)

	spec	698.0	796.0	894.0	spec	1710.0	1732.5	1755.0	spec	1850.0	1920.0	1990.0	spec	2110.0	2132.5	2155.0	spec	2400.0	2442.0	2484.0	spec	2496.0	2523.0	2550.0	spec	2640.0	2690.0
0	-19	-28.93	-27.94	-24.80	-12	-17.15	-16.51	-16.69	-11	-15.12	-14.93	-15.22	-9	-12.69	-12.68	-12.62	-4	-9.31	-9.86	-10.44	-7	-10.43	-11.31	-11.35	-7	-12.54	-12.48
30	-14	-23.54	-23.11	-18.74	-7	-10.55	-9.71	-9.87	-6	-8.31	-7.77	-7.77	-5	-5.73	-5.73	-5.70	-1	-1.50	-2.82	-3.41	-2	-3.91	-5.26	-5.64	-2	-7.45	-7.73
60	-22	-29.91	-26.39	-25.92	-12	-13.38	-13.07	-12.84	-11	-11.95	-11.36	-11.04	-7	-7.10	-6.73	-6.58	0	-0.99	-1.16	-2.69	-1	-3.09	-4.57	-4.61	-5	-6.03	-6.15

2. Mechanical Outline

2.1 Dimension



<TOP> <SIDE> <BOTTOM>

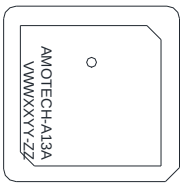
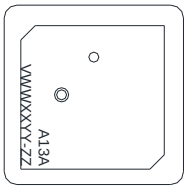
* NOTE
1. UNIT : mm
2. All Around Both sides Typ. 0.3 Chamfer
   (Chamfer 0.2mm, Land 0.1mm)
3. Attach the Antenna on PCB without tape Release Liner

2.2 Tuning : Top & Bottom (According to Procedure of AMOTECH document)

2.3 Mechanical characteristic

No	Item	Specification		Unit	Remarks
1	Dielectric constant	GNSS	20.5 ± 0.5	-	Ceramic
		SDARS	8.8 ± 0.5		
2	Electrode	-	Silver	-	-
3	Probe	-	brass	-	-
4	Tape	GNSS	Double sided adhesive tape	-	Thickness = 1.0mm
		SDARS	Double sided adhesive tape	-	3M-468MP

2.4 Marking

GNSS	SDARS
	

- V : Line section
- WW : Year
- XX : Month
- YY : Day
- ZZ : Serial number of daily

3. Reliability Test

No	Item	Test condition	Requirement
1	Drop Test	1. Place antenna on set 2. 1.5m height 3. Drop 5 times	1. No Visible defect 2. S11 change rate (Δfc < 0.2 %)
2	Vibration Test	1. 5-55-5 Hz, 1 Octave/min, Amp.=1.5mm, acceleration=2g, Crossover Freq.=18 Hz, Hold time = 2H.R	1. No Visible defect 2. S11 change rate (Δfc < 0.2 %)
3	Humidity	1. 60℃, 95%RH, 96Hr	1. No Visible defect 2. S11 change rate (Δfc < 0.2 %)
4	Thermal Shock	1. +80℃(30min) → -40℃ (30min) 2. 10 cycle	1. No Visible defect 2. S11 change rate (Δfc < 0.2 %)
5	High Temperature Resistance	1. +90℃, 96Hr	1. No Visible defect 2. S11 change rate (Δfc < 0.2 %)
6	Low Temperature Resistance	1. -40℃, 96Hr	1. No Visible defect 2. S11 change rate (Δfc < 0.2 %)
7	Adhesion Strength of Soldering	1. Used of pull push gauge.	1. Spec(min. 5kgf)

※ The sample must satisfy Requirement after 24 hours of test

※ Be base on IEC Climatic category (IEC68-1) -40℃ / +90℃ / 56h

4. Soldering Condition

- Wettability to IEC 68-2-58 :≥75%(After Aging)

4.1 Manual Soldering(By Iron) – Pb free

- Soldering Temperature : 360℃ ± 5℃, 5sec max.
  (Solder : Sn/Ag/Cu:96.5/3.0/0.5)
- Must comply with above soldering condition to prevent from degradation of antenna performance.

5. Caution and Warranty

5.1 Electrode metallizations are unprotected silver and will tarnish during storage due to sulphuric compounds (namely H2S) in the atmosphere. Elevated temperature and humidity will accelerate this process. Human skin contact, wool etc. also cause tarnishing. This has no effect whatsoever on the electrical performance of the patches. Tarnishing of the silver plated feed pins may affect solderability. Because of this normal and to be expected process, AMOTECH accepts no warranty claims for tarnished products.

AMOTECH uses vacuum packaging to reduce atmospheric influence and to extend shelf life.

5.2 Patch Antennas must avoid shock and drop, to prevent cracking of the antenna.

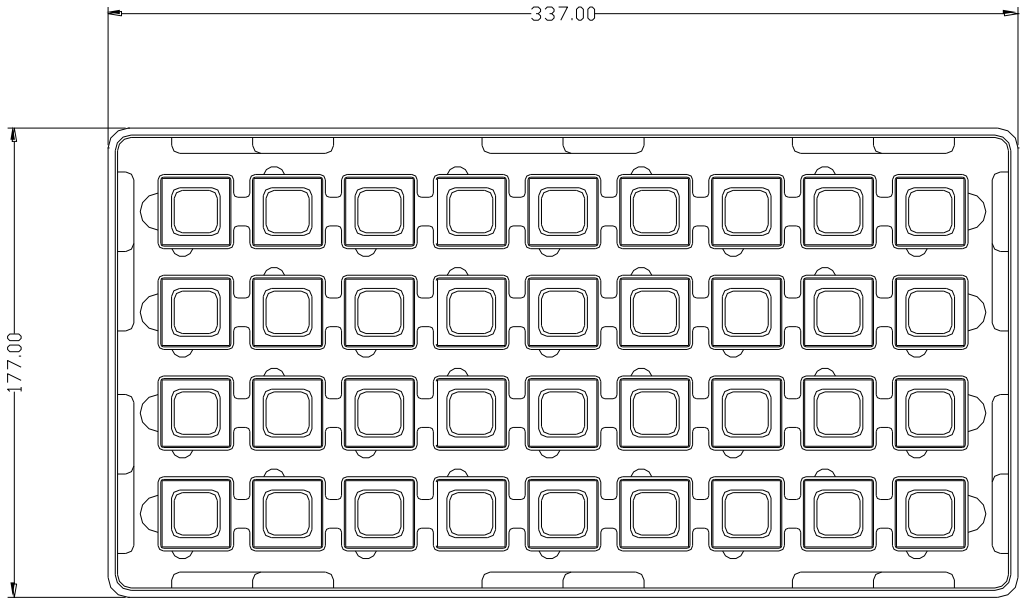
5.3 Patch Antennas should be used within 6 months after delivery, antennas older than 6 months should be checked for solderability before using.

5.4 if you plan to re-use the products that be taken out from packaging. Suggest to re-pack them within 48 hours by re-seal to prevent discoloration.

6. Package

6.1 Tray

6.1.1 Quantity



- 36ea/tray

6.2 Box package

6.2.1 Inner box

- Dimension: 370 (W) x 195 (D) x 130 (T) (mm)
- Quantity : 5 tray (36ea/ tray ×5 tray ＝ 180ea)

6.2.2 Outer box

- Dimension : 390 (W) x 620 (D) x 150 (T) (mm)
- Quantity : 3 inner box (180ea/ inner box ×3 inner box ＝ 540ea)

DOC. No.	15-Tuning Boundary-001
Standard process	Mearsurement process
Product	Ceramic Patch Antenna
Written by	Q.A PART
Original Date	2015. 12. 14

(25 by 25 type = Ceramic Patch) Manual top tuning procedure

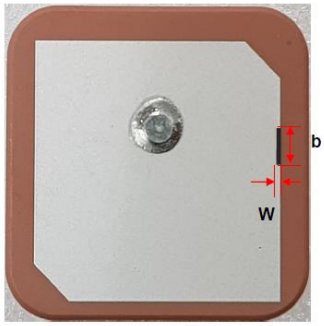
Written by	Checked by	Approved by

Rev. No.	1	Rev. Date	2018. 02. 07	Page	1/1

Top Tuning method 1

◆ Tuning standard
- Tuning Point: Max 4 points only with method1
- Tuning Length : a ≤ 2.00mm
- Tuning Wide: W1 ≤ 1.00mm.

Top Tuning method 2



◆ Tuning standard
- Tuning Point: Max 4 points only with method2
- Tuning Length: b ≤ 4.00mm
- Tuning Wide: W2 ≤ 1.00mm

Top Tuning method 3

◆ Tuning standard
- Tuning Point: Max 2 points only with method3
- Tuning Wide: W3 ≤ 1.00mm

◆ The above criteria is for only tuning which is the manual mark by worker. The tuning made in Ag printing process is not applied to the above criteria.
◆ Total tuning points with all above 3 methods : Max 4 points
◆ Criteria of defective parts
- If tuned antennas do not meet above standard, Amotech will regard them as defective part

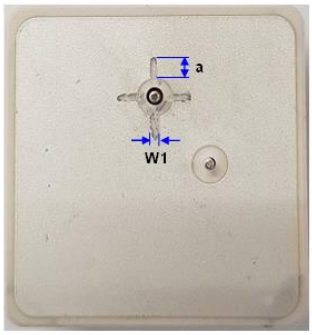
Doc No.	10Patch-Boundary-001
Process	Appearance Inspect
Product	25 by 25 type = Ceramic Patch
Write Dept	Quality Dept.
Origin Date	2017. 07. 18

(25 by 25 type = Ceramic Patch) Manual Bottom tuning procedure

Written by	Checked by	Approved by

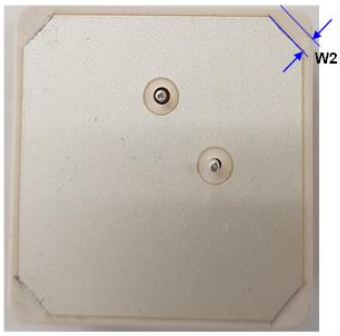
Rev. No.	0	Rev. Date	-	Page	1/1

Bottom Tuning method 1



◆ Tuning standard
- Tuning Point : Max 4 points only with method1
- Tuning Length : a ≤ 3.0mm
- Tuning Wide : W1 ≤ 1.0mm

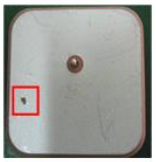
Bottom Tuning method 2



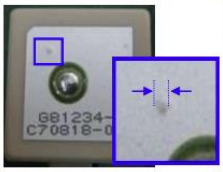
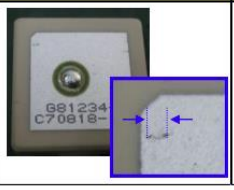
◆ Tuning standard
- Tuning Point: Max 4 points only with method2
- Tuning Wide: W2 ≤ 2.50mm

◆ The above criteria is for only tuning which is the manual mark by worker. The tuning made in Ag printing process is not applied to the above criteria.
◆ Total tuning points with all above 2 methods : Max 4 points
◆ Criteria of defective parts
- If tuned antennas do not meet above standard, AMOTECH will regard them as defective part.

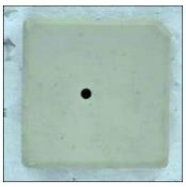
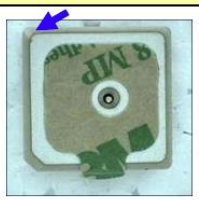
Doc No.	10Patch-Boundary-001	Limited Boundary (No Printing / Scratch)				Write	Check	Approve
Process	Appearance Inspect							
Product	All Model							
Write Dept	Quality Dept.							
Origin Date	2010. 02. 08	Revision Date	2022.10.31	Revision No	3	Page	1 / 4	

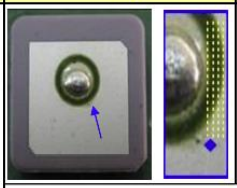
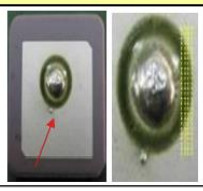
Item	OK	NG	Etc
No Printing			
	No printing must have entered allow SPEC. [SPEC : No limit on the number of size≤1mm / 1mm <size≤ 2mm:Allow Q'ty:2ea / 2mm <size:NG]		
Item	OK	NG	Etc
Scratch			
	Handle badness if there is shape that rake with picture.		
Noted items			

Doc No.	10Patch-Boundary-001	Limited Boundary (Foreign body)					
Process	Appearance Inspect						
Product	All Model						
Write Dept	Quality Dept.						
Origin Date	2010. 02. 08	Revision Date	2022.10.31	Revision No	3	Page	2 / 4

Item	OK	NG	Etc
Foreign body (Bottom)			
	The protruding foreign body is NG, and the non-protruding Foreign body must have entered allow SPEC [W, L SPEC : No limit on the number of size≤2mm / 2mm<size≤ 3mm:Allow Q'ty:2ea / 3mm<size:NG] [H SPEC : If the Foreign Body is thicker than the Tape(Adhesive + Release Liner)Thickness, treat them as defective]		
Item	OK	NG	Etc
Foreign body (Top)	 		
	Foreign body must have entered allow SPEC. [SPEC : No limit on the number of size≤1mm / 1mm<size≤ 2mm:Allow Q'ty:2ea / 2mm<size:NG]		
Noted items			

Doc No.	10Patch-Boundary-001	Limited Boundary (Chipping / Solder ball)					
Process	Appearance Inspect						
Product	All Model						
Write Dept	Quality Dept.						
Origin Date	2010. 02. 08	Revision Date	2022.10.31	Revision No	3	Page	3 / 4

Item	O K		N G		Etc
Chipping					
	Chipping must have entered allow SPEC. [SPEC : No limit on the number of chipping≤1mm / 1mm<chipping size≤ 2mm:Allow Q'ty:2ea / 2mm<chipping:NG]				

Item	O K	N G	N G	Etc
Solder ball				
	Solder vall must have entered allow SPEC. [SPEC : Solder ball ≤ 0.3mm]		Solder ball of GND size irrelatively badness.	

Noted items