

Specification
For
LTCC 3dB Hybrid Coupler

Model Name : RCP890A03

Customer :

Title:

Name :

APPROVED

By Date : _____

Signature : _____

RN2 Technologies co., Ltd.

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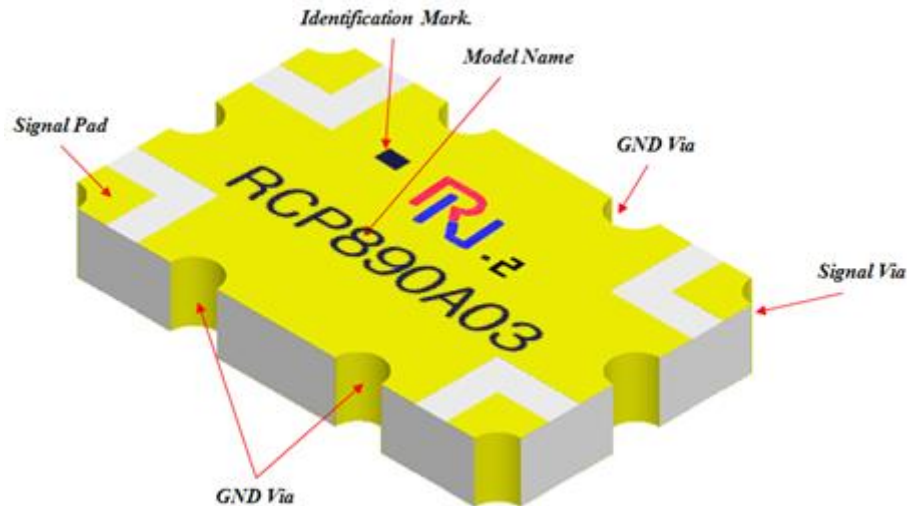
Issued Date : _____

Designed : _____

Approved : _____

1. Description

1-1. Part number: RCP890A03



1-2. Features

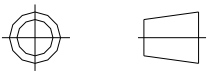
- Hybrid Coupler 3dB, 90°
- Surface mount type
- Suitable for operation frequency 815~960MHz
- **RoHS** compliance
- High stability in temperature and humidity for LTCC base
- Low loss for Silver(Ag) conductor
- Miniature size and high power capability
- Lead-free alloy solderable
- Thermal expansion corresponding with common substrate

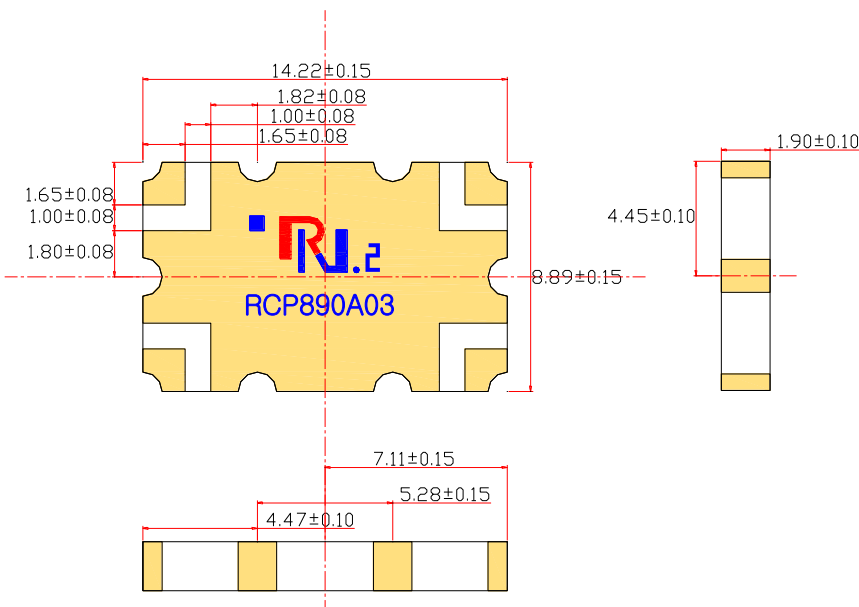
2. Electrical Specification

Freq. (MHz)	Amplitude Balance max (dB)	Isolation min (dB)	Insertion Loss max (dB)
815-960	± 0.15	-23	-0.15
VSWR Max	Phase (degrees)	Power Capacity Avg. (Watt)	Operating Temp. (°C)
1.2	90 ± 2.0	200	-55 to +125

3. Mechanical Specification

3-1. Outline Dimension

PROJECTION	NO.	DATE	REVISION & DESCRIPTION	SIGNATURE	
				REVIEWED	CHECKED
	1	2008.07.15	New-Drawing		
	2				
	3				



Note.

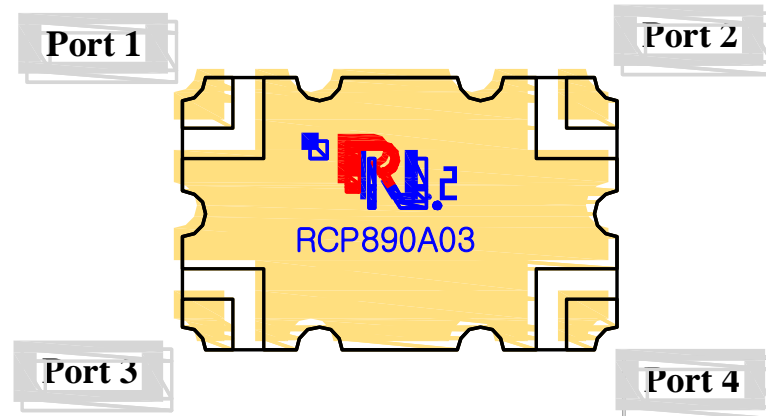
- SMD-type, Ceramic Base.
- Inner signal circuits : Silver(Ag) conductor
- Surface plating : Gold(Au) finished
- Tolerance is not cumulative.

NO.	DESCRIPTION	UNIT	TOTAL				
			QUANTITY	SCALE	1/1		
TITLE	RCP890A03-Outline	RN2 DWG NO.	08-0715-01	SCALE	1/1		
				SIZE	A4	DIMENSION	mm

3-2. Weight

- $0.68 \pm 10\%$ Grams typical

4. Port Configuration



Configuration	Port 1	Port 2	Port 3	Port 4
Case 1.	Input	Isolated	Coupling -3dB, 0°	Output -3dB, -90°
Case 2.	Isolated	Input	Output -3dB, -90°	Coupling -3dB, 0°
Case 3.	Coupling -3dB, 0°	Output -3dB, -90°	Input	Isolated
Case 4.	Output -3dB, -90°	Coupling -3dB, 0°	Isolated	Input

* Once Port 1 is determined, the other three ports are defined automatically.

5. Schematic Drawing

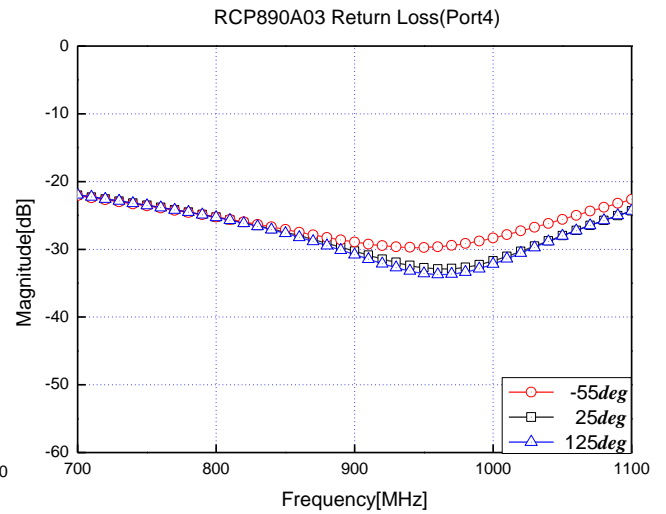
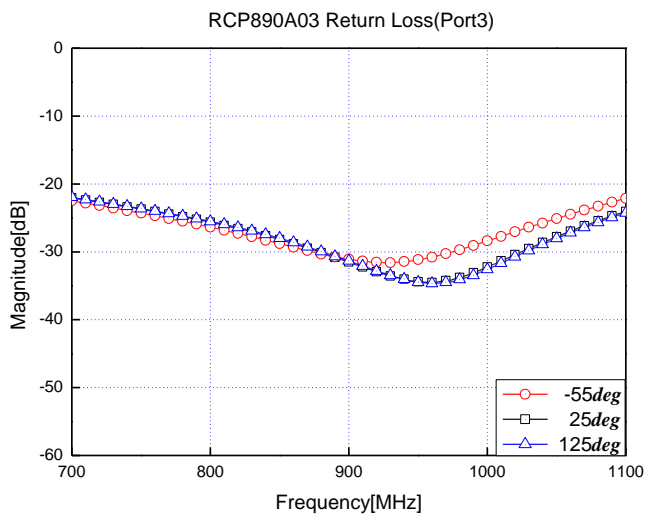
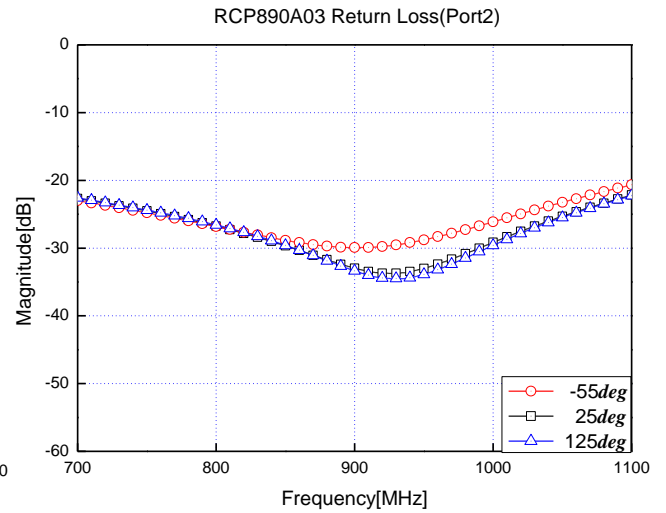
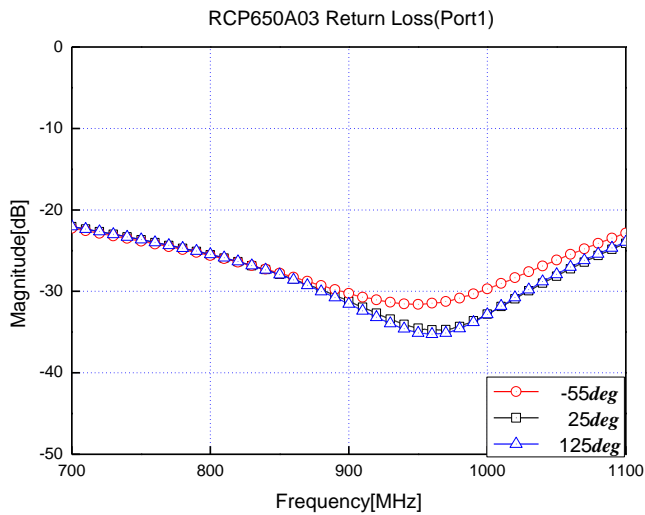


6. Typical Performance Data (25 °C)

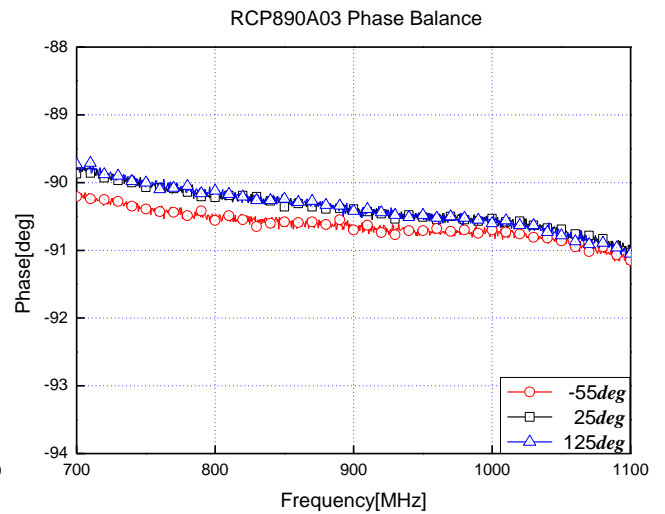
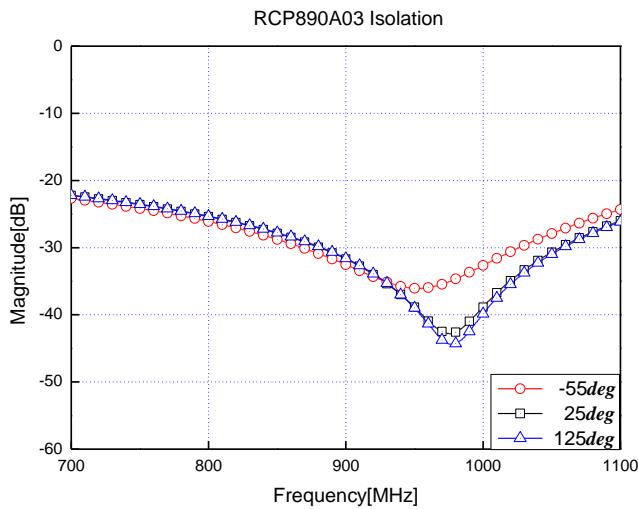
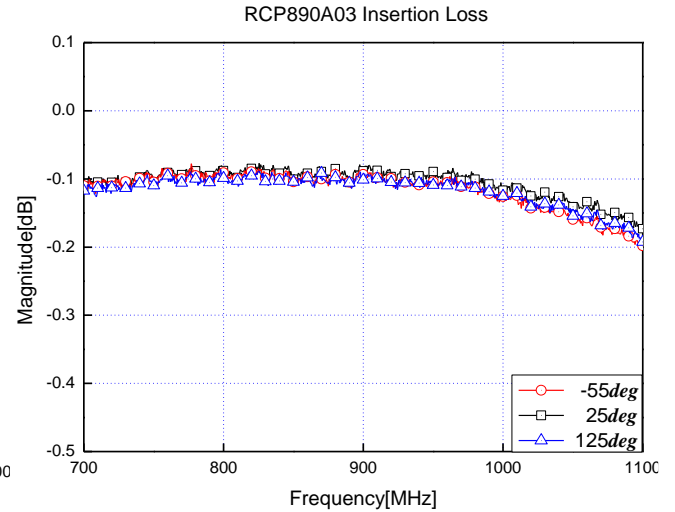
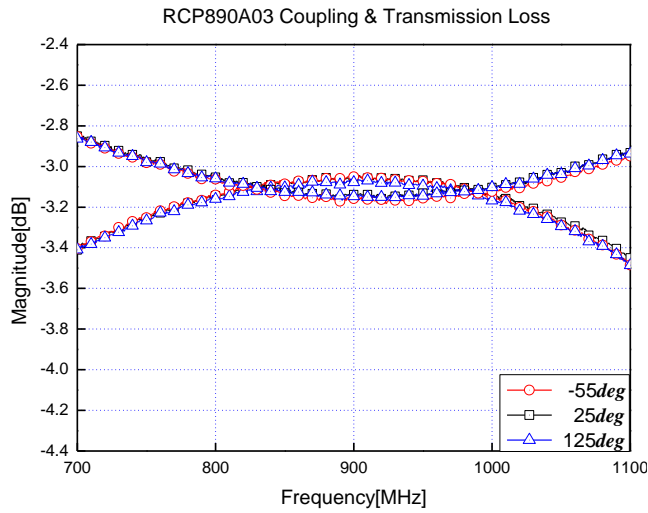
Freq. [MHz]	Coupling [dB]	Out [dB]	IL [dB]	Amp.Bal. [dB]	Phase [degree]	Return Loss [dB]			
						S11	S22	S33	S44
815	-3.12	-3.07	-0.09	±0.02	-90.22	-26.15	-27.56	-26.33	-25.85
820	-3.11	-3.08	-0.08	±0.02	-90.19	-26.37	-27.85	-26.56	-26.07
830	-3.11	-3.10	-0.09	±0.00	-90.21	-26.85	-28.42	-27.07	-26.52
840	-3.09	-3.11	-0.09	±0.01	-90.27	-27.34	-29.01	-27.61	-26.97
850	-3.09	-3.13	-0.10	±0.02	-90.36	-27.92	-29.68	-28.18	-27.47
860	-3.08	-3.13	-0.09	±0.03	-90.31	-28.50	-30.34	-28.82	-27.99
870	-3.07	-3.13	-0.09	±0.03	-90.36	-29.12	-31.06	-29.44	-28.53
880	-3.06	-3.14	-0.09	±0.04	-90.39	-29.81	-31.71	-30.12	-29.12
890	-3.07	-3.16	-0.11	±0.05	-90.38	-30.50	-32.40	-30.84	-29.72
900	-3.06	-3.14	-0.09	±0.04	-90.39	-31.22	-32.98	-31.48	-30.27
910	-3.06	-3.14	-0.09	±0.04	-90.43	-31.95	-33.45	-32.22	-30.88
920	-3.06	-3.16	-0.10	±0.05	-90.46	-32.69	-33.70	-32.94	-31.45
930	-3.06	-3.15	-0.09	±0.04	-90.54	-33.41	-33.71	-33.55	-31.92
940	-3.07	-3.14	-0.10	±0.04	-90.48	-34.05	-33.48	-34.03	-32.38
950	-3.07	-3.13	-0.09	±0.03	-90.51	-34.53	-33.00	-34.41	-32.73
960	-3.08	-3.14	-0.10	±0.03	-90.55	-34.72	-32.38	-34.50	-32.89

* Data with PCB and Connector Loss (0.89 GHz = 0.03dB)

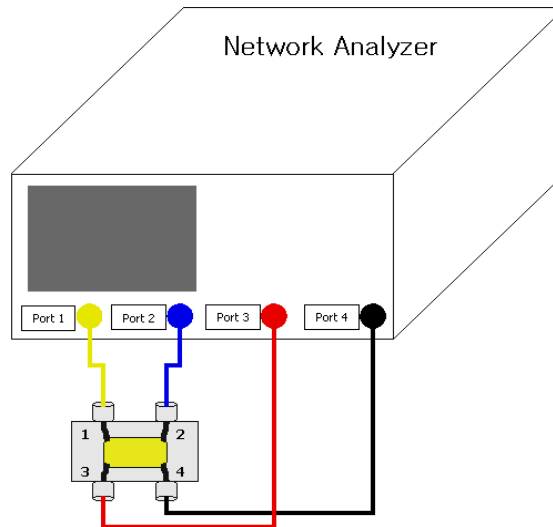
7. Operation Temperature Curve (a)



8. Operation Temperature Curve (b)



9. Test Method



- Refer to 'Case 1' of '4. Port Configuration' on page 4
- Have the network analyzer calibrated properly.
- Measure the data of **Coupling** through port 1 to port 3. (S31)
- Measure the data of **Transmission** through port 1 to port 4. (S41)
- Measure the data of **Isolation** through port 1 to port 2. (S21)
- Calculate the **Insertion Loss** and **Amplitude Balance** of coupler on the below power method formula.

	S-Parameter[dB]	Power Method[dB]
Coupling	S31	$10 \cdot \log\left(\frac{P_{cou}}{P_{in}}\right)$
Transmission Loss	S41	$10 \cdot \log\left(\frac{P_{out}}{P_{in}}\right)$
Isolation	S21	$10 \cdot \log\left(\frac{P_{iso}}{P_{in}}\right)$
Insertion Loss		$10 \cdot \log\left(\frac{P_{in}}{P_{cou} + P_{out}}\right)$
Amplitude Balance		$10 \cdot \log\left(\frac{P_{cou}}{\frac{P_{cou} + P_{out}}{2}}\right)$
Phase Balance	Phase(S31) — Phase(S41)	

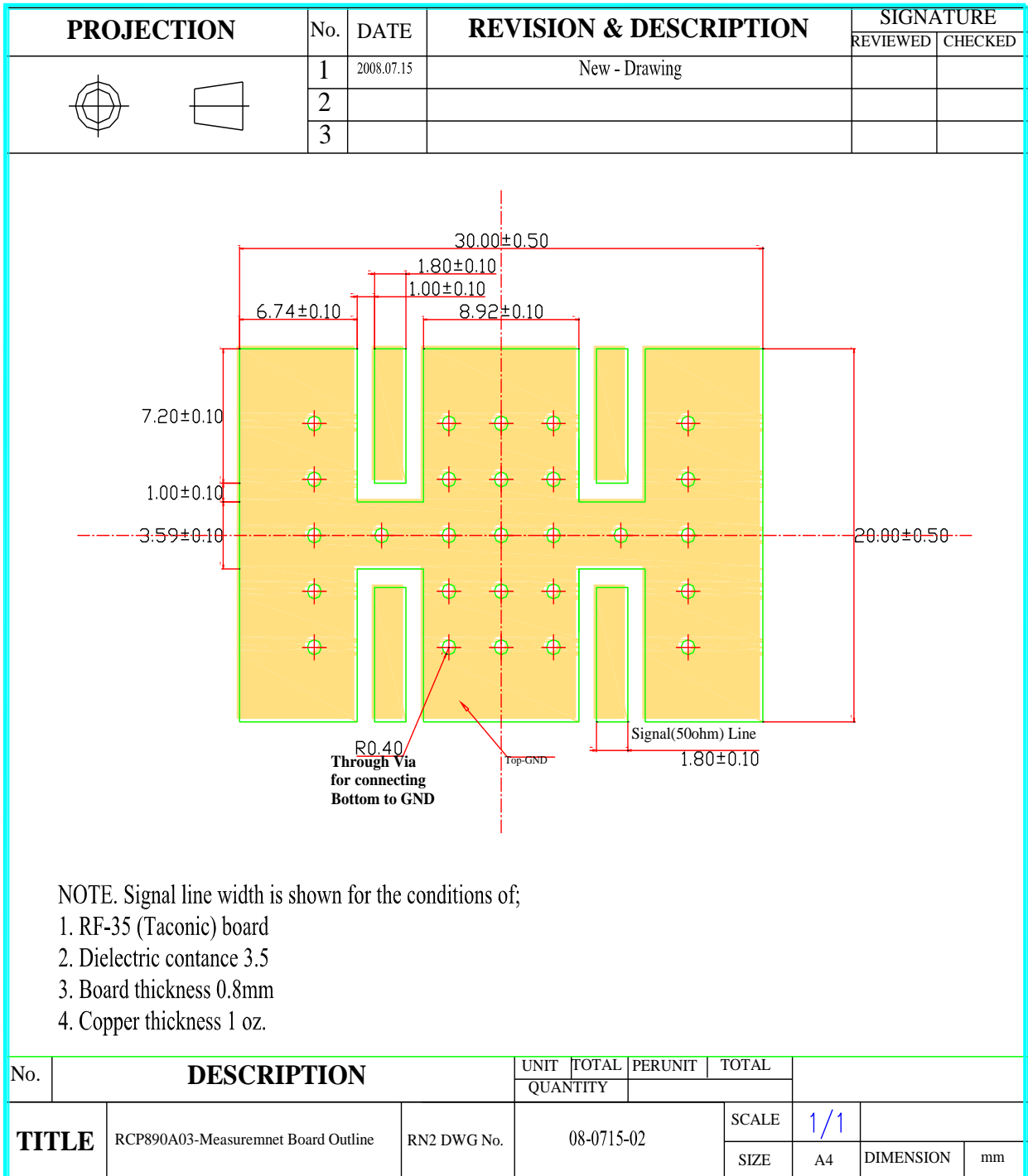
P_{in} : Power of Input Port

P_{out} : Power of Output Port

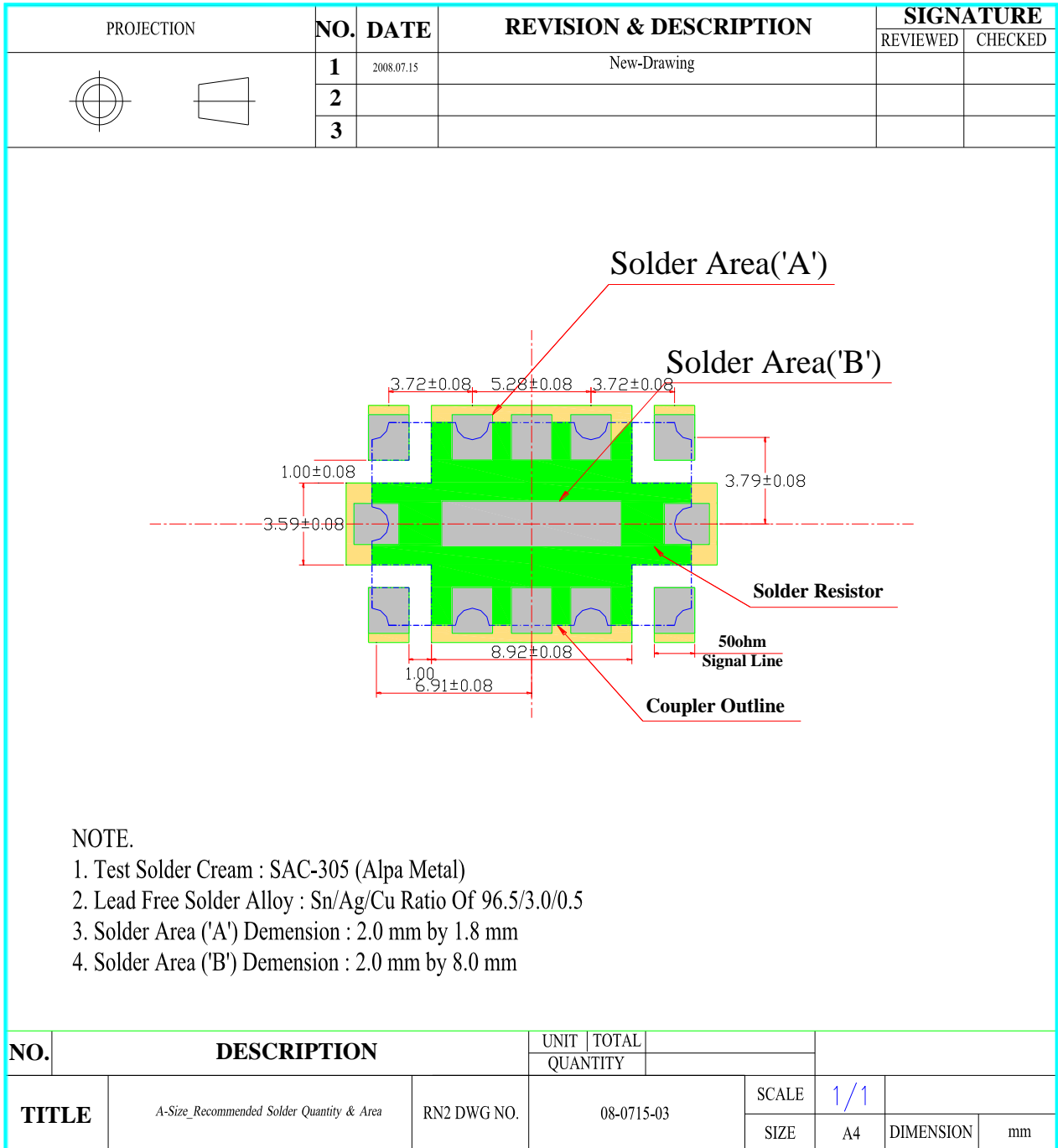
P_{cou} : Power of Coupling Port

P_{iso} : Power of Isolated Port

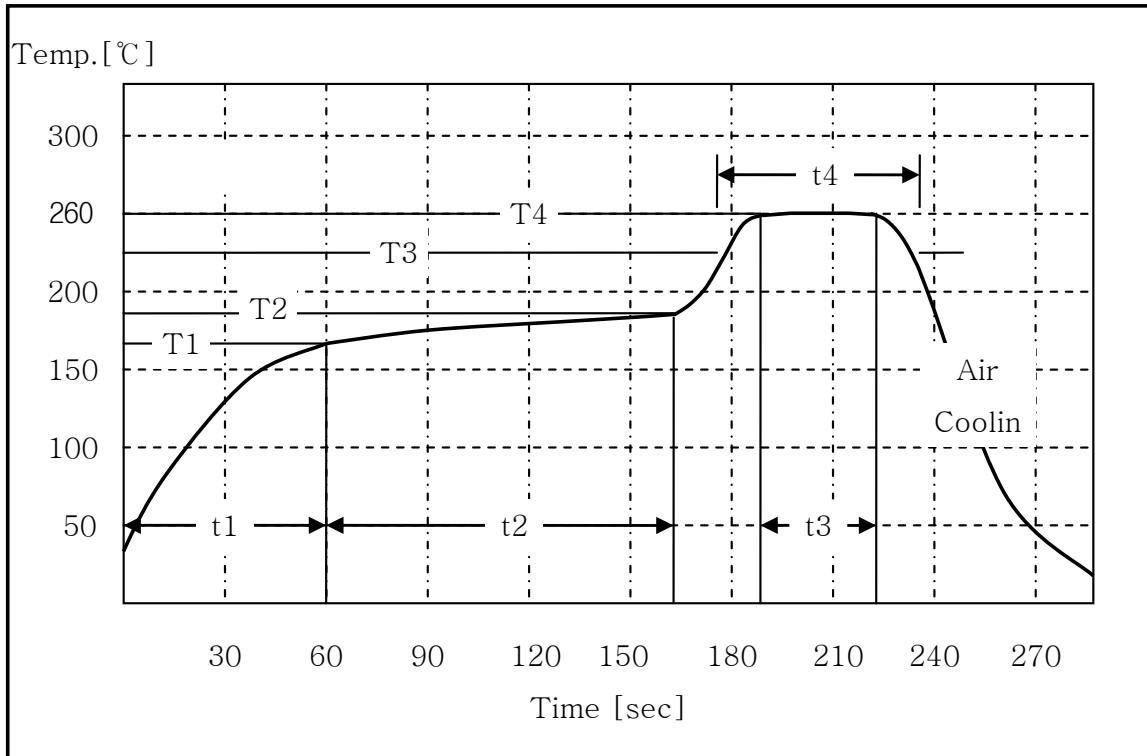
10. Measurement board layout



11. Recommended PCB layout and Solder mask pattern



12. Reflow profile



	Ramp Up	Pre-Heating	Peak	Soaking
Temp.[°C]	T1:160±5°C	T2:180±5°C	T4:260±5°C	T3:230±5°C
Time [sec]	t1:60±5sec	t2:100±15sec	t3:30±5sec	t4:60±10sec



13. Using note for LTCC Couplers

I. Be careful when transporting

- A. Excessive stress or shock may make products broken or cracked due to the nature of ceramics structure.
- B. The products cracked or damaged on terminals may have their property changed.

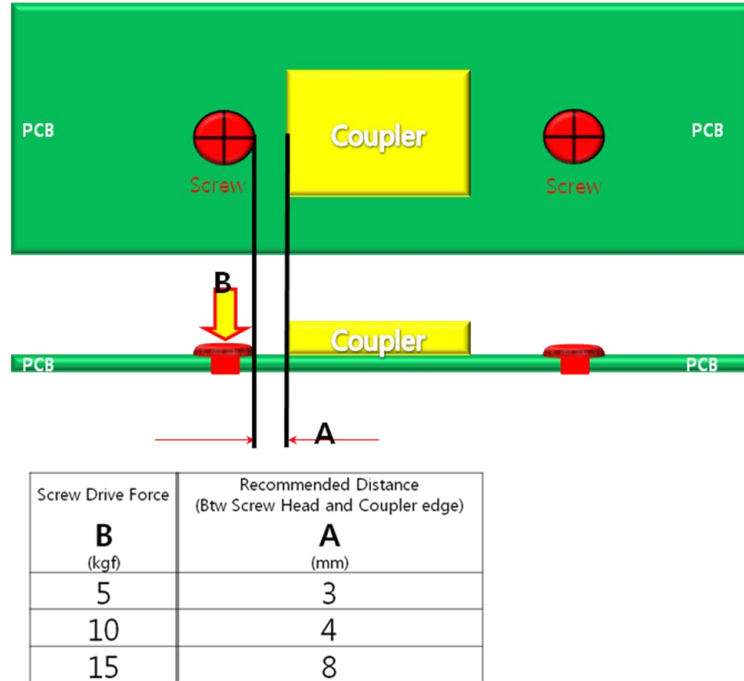
II. Be careful during storage

- A. Store the products in the temperature of $-55 \sim 125^{\circ}\text{C}$
- B. Keep the humidity at $45 \sim 75\%$ around the products.
- C. Prevent corrosive gas (Cl_2 , NH_3 , SO_x , NO_x , etc.) from contacting the products.
- D. It is recommended to use the products within 6 months of receipt. If the period exceeds 6 months, solderability may need to be verified.

III. Be careful when soldering

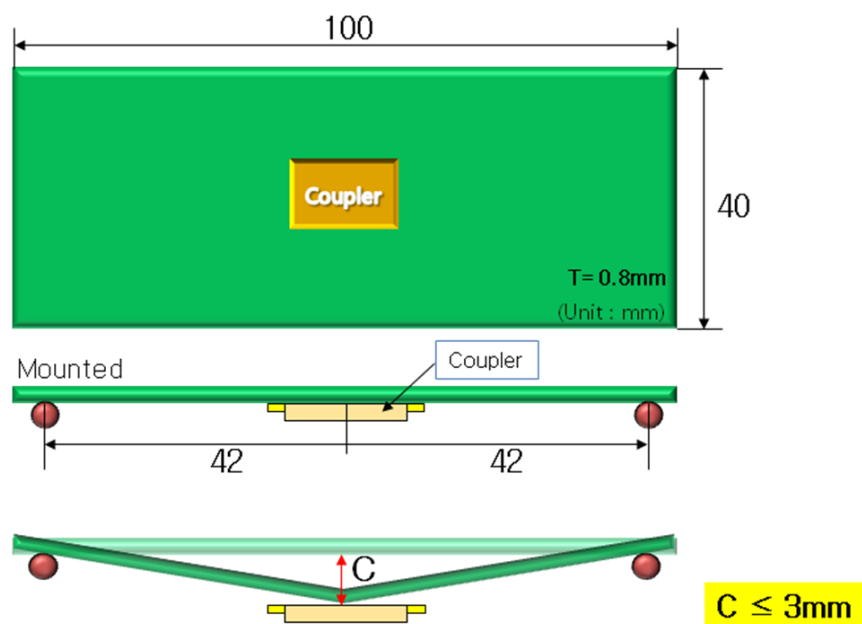
- A. All the ground terminals, IN and OUT pad of coupler should be soldered on the ground plane of the PCB.
- B. Products may be cracked or broken by uneven forces from a claw or suction device.
- C. Mechanical stress by any other devices may damage products when positioning them on PCB.
- D. A dropped product is recommended not to be used.
- E. Soldering must be carried out by the condition of specification sheet.
- F. Any couplers which are de-soldered from PCB should not be used again.

IV. Be careful when Screw

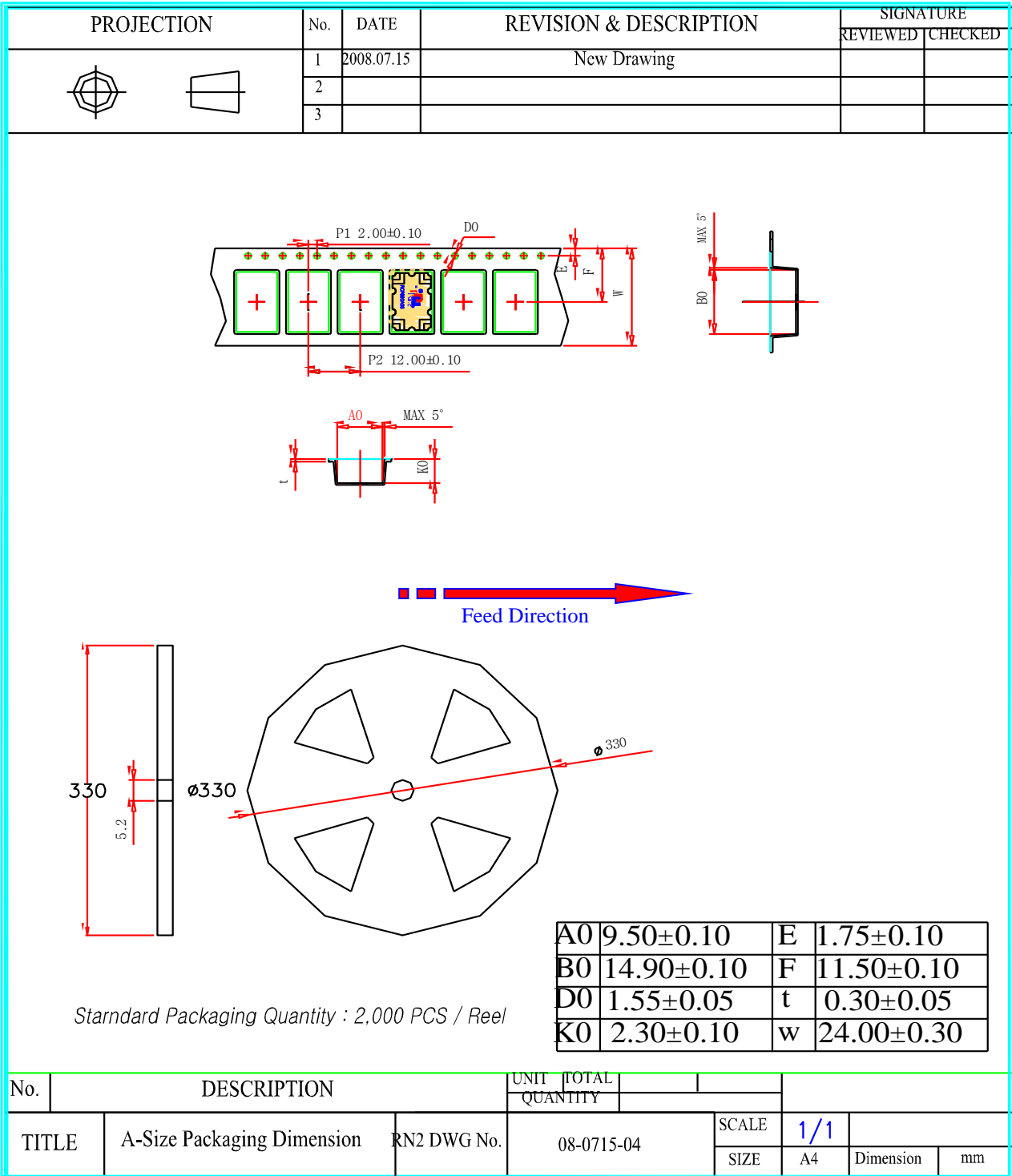


V. Be careful when SMD or Assembly

- A.** LTCC couplers require appropriate measures to avoid its base PCB from warping.
- B.** PCB excessively warping over defined standard may result in crack of LTCC couplers potentially.



14. Packaging



15. Environmental Reliability

ITEM	PROCEDURE	REQUIREMENTS/RESULT
Temperature Cycle (Thermal Shock)	1. One cycle : 30 minutes Step 1 : 125 ± 5 for 15 minutes Step 2 : -55 ± 5 for 15 minutes 2. Time to approach low or high temperature : 10 seconds 3. Number of Cycles : 100 cycles 4. Keep normal temperature for 1 hour.	1. Meet the electrical Specification after test
Solderability	1. Solder : $230 \pm 5^\circ\text{C}$ for 5 ± 1 sec.	1. More than 85% of the I/O electrode pad shall be covered with solder.
Heat Resistance	1. Temperature : $100 \pm 2^\circ\text{C}$ 2. Duration : 96 ± 2 hours	1. Meet the electrical Specification after test
Low Temp. Resistance	1. Temperature : $-55 \pm 5^\circ\text{C}$ 2. Duration : 24 ± 2 hours	1. Meet the electrical Specification after test
Vibration Resistance	1. Frequency: 5~ 15MHz 2. Acceleration : 10g 3. Sweep Time: 0.1 oct/min, 15min/axis 4. Axis : X, Y and Z direction	1. No appearance damage 2. Meet the electrical Specification after test
Humidity Resistance	1. One Cycle : Step1:increase Temperature $-25\sim 65^\circ\text{C}$ for 2hours with humidity 85% Step2:Maintain for 4 hour after increasing Humidity 90% to 95% Step3: Decrease Temperature 65°C to 25°C 2. Number of Cycles : 10 3. Maintain for 3hour after decreasing temperature -10°C	1. Meet the electrical Specification after test
Drop Shock	1. Dropped onto hard wood from height of 50 cm for 5 times; each x, y and z direction except I/O direction.	1. No appearance damage 2. Meet the electrical Specification after test

16. RoHS test result

- RN2 Technologies warrants and represents as follows.

Test Report No. F690501/LF-CTSGP06-16067

Date: June 29, 2006

Page 2 of 3

Sample No. : GP06-16067.001
Sample Description : LTCC COUPLER
Style/Item No. : N/A
Comments : Materials are ceramics, Ag.

Heavy Metals

Test items	Unit	Test Method	MDL	Results
Cadmium(Cd)	mg/kg	US EPA 3050B(1996), US EPA 6010B(1996), ICP	0.5	N.D.
Lead (Pb)	mg/kg	US EPA 3050B(1996), US EPA 6010B(1996), ICP	5	N.D.
Mercury (Hg)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	2	N.D.
Hexavalent Chromium (Cr VI)	mg/kg	US EPA 3060A(1996), US EPA 7196A(1992), UV	1	N.D.

Flame Retardants-PBBs/PBDEs

Test items	Unit	Test Method	MDL	Results
Monobromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Dibromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tribromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tetrabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Pentabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Hexabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Heptabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Octabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Nonabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Decabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Monobromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Dibromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tribromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tetrabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Pentabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Hexabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Heptabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Octabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Nonabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Decabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.

NOTE: (1) N.D. = Not detected.(<MDL)
 (2) ppm = mg/kg
 (3) MDL = Method Detection Limit
 (4) - = No regulation
 (5) ** = Qualitative analysis (No Unit)
 (6) Negative = Undetectable / Positive = Detectable

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