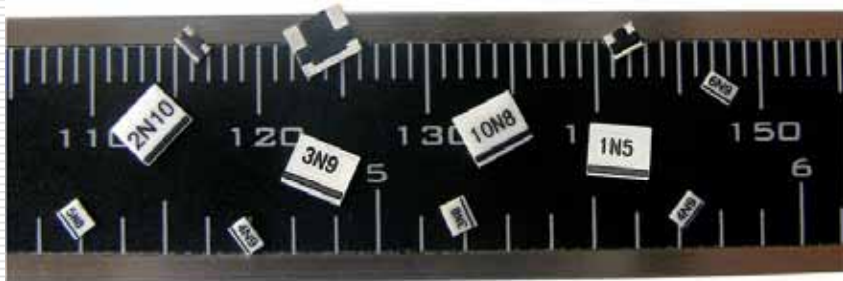




# Temperature Compensation Attenuator---TCA Series

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## High Reliability Test Report



ISO9001-2008

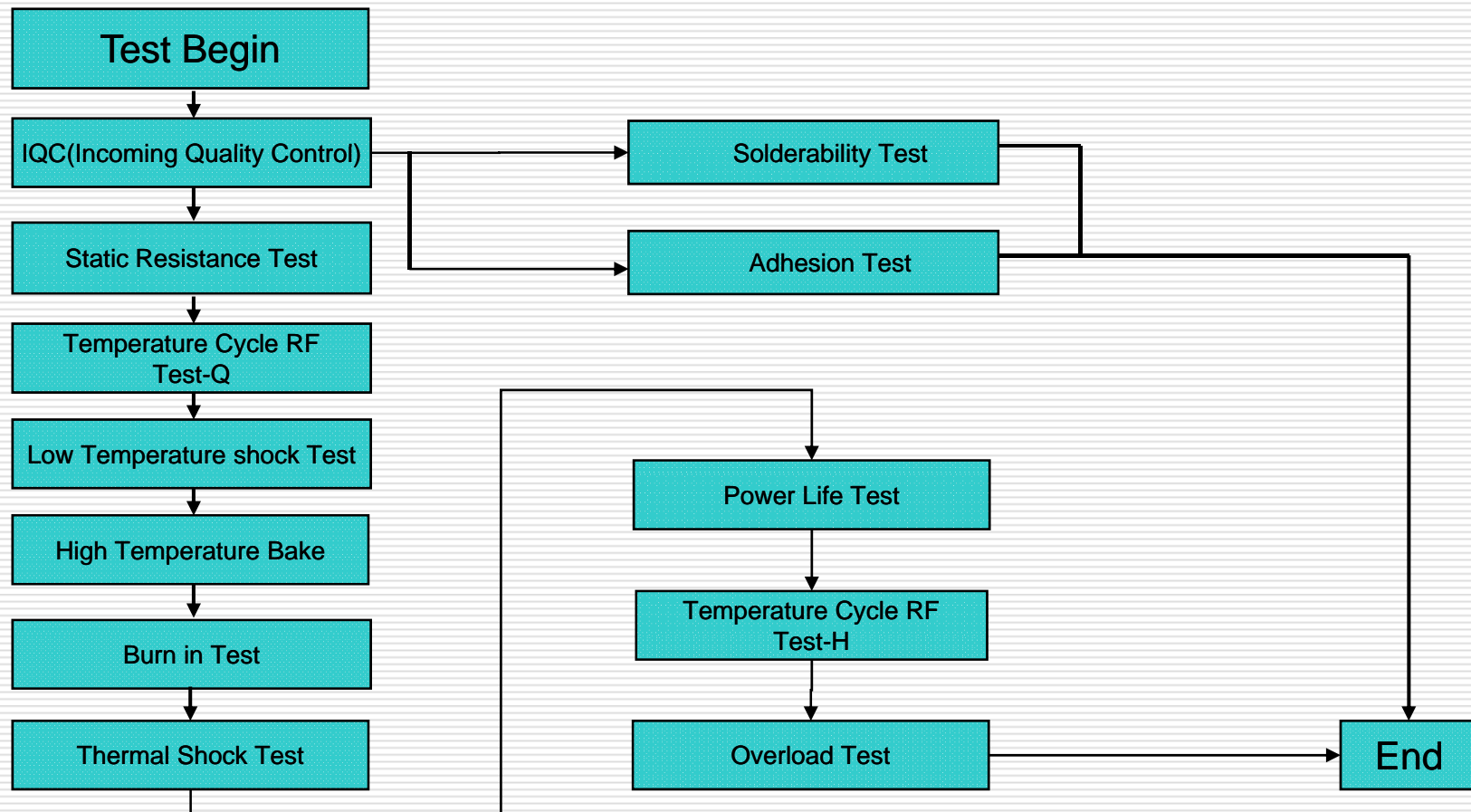
### Yantel Corporation

Add:2nd Floor,Building 2,Gaofa Tebnoogy Park  
Longjng,Nanshan,Shenzhen,China.PC 518055

Tel:86-755-8355-1886 FAX:86-755-8355-2533

Website:WWW.YANTEL-CORP.COM

# TCA Series High Reliability Test Flow



# IQC Report-TCA Series

Inspection Date: 2008-11-11

Sample Inspection:  Fully Inspection:

Product Name	3 dB STCA	Spec/Model No.	TCA0603N9			Lot No.	Y08797D615			Inspection Total Amount	715 PCS
NO. Inspection	Items	Front & Reverse Side Direction	Silkscreen Legibility	Silkscreen Position	Electrode declivity	Stain	Electrode Dimensions	Length Width Thickness	Remarks		
1 Description		OK OK		OK	2PCS	OK	OK	OK			
2 Total	Total Failures (pcs)	2PCS									
3	Failure Rate (%)	0.28%									

# Static Resistance Test

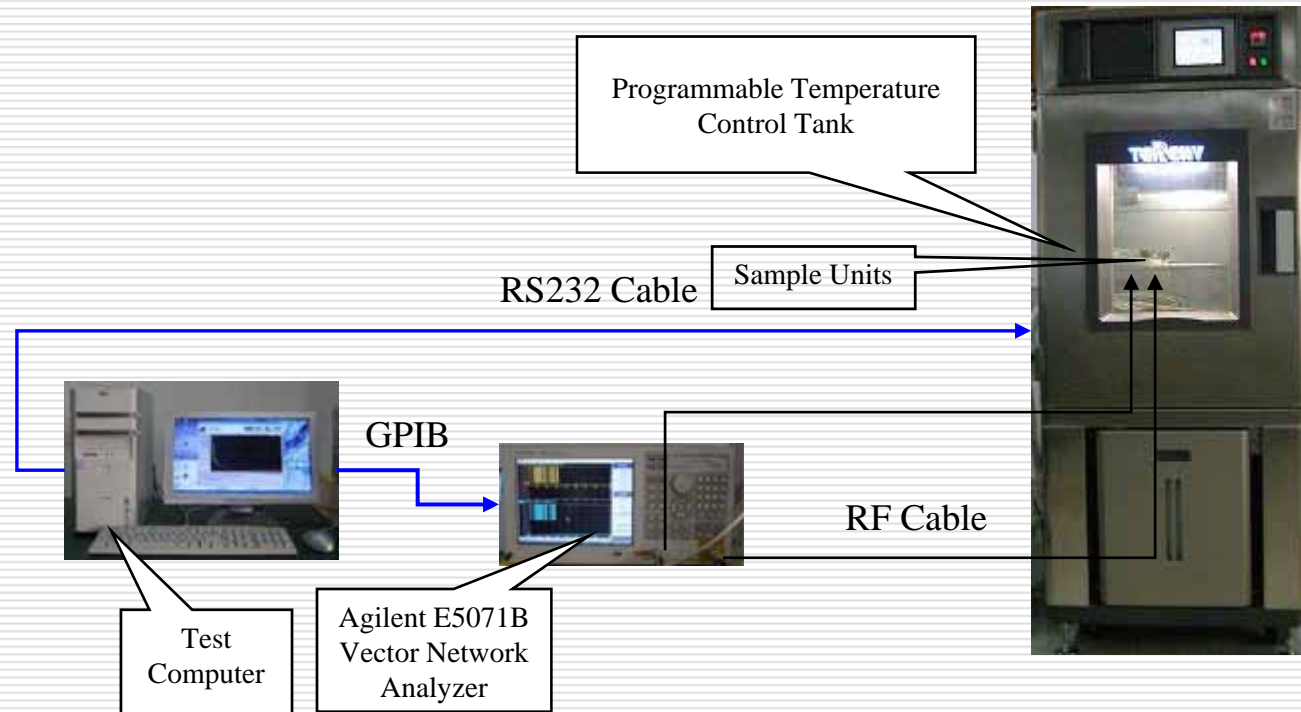
Model No.:TCA060XNX Lot No.: XXX Before Meltallization Test Date: 2008/11/13

After Meltallization Test Date: 2008/11/26

Acceptance Range 25°C	Before Meltallization Test Parameter					After Meltallization Test Parameter					Remarks
	DC Test (R12/R13) 25°C		RF Test (R12/R13) 25°C		Judgement	DC Test (R12/R13) 25°C		RF Test (R12/R13) 25°C		Judgement	
	Resistance (Ω)	Amount (pcs)	Resistance (Ω)	Attenuation (dB)		Resistance (Ω)	Amount (pcs)	Resistance (Ω)	Attenuation (dB)		
Omit	16	11				15	1				
	16.1	13				15.8	1				
	16.2	67				16	185				
	16.3	39				16.1	195				
	16.4	145				16.2	245				
	16.5	48				16.3	166				
	16.6	88				16.4	180				
	16.9	8				16.5	1422				
	17.2	26				16.6	204				
	Omit	Omit				16.7	226				
	End					16.8	47				
						16.9	82				
						17	48				
						Omit	Omit				
						End					

# Temperature Cycle RF Test –shown in chart below

Put sample units into programmable temperature control tank for temperature cycle RF test



# Temperature Cycle RF Test Report-Q

## Temperature Cycle RF Test Report-Q

Test Type: Sampling

Test No.: YT/T-0001

Conducted by: Test Dept

Tested by: Du Qingyun

Part No.	TCA0602N5, TCA0602N7, TCA0603N7, TCA0603N9, TCA0604N7, TCA0604N9, TCA0606N9.	Lot No.	11110802 ,Y08797D615, 30090801, 26120802, Y08789D616, Y08826D657, Y08684D533
Sampling Qty	6PCS per Part No.	Sample No.	(01~06)*7
Sample Status	Normal		
Tested Date	Same as the Date in Test Report		
Reported Date	Same as the Date in Test Report		
Test Item	Main Test Environment	Test Result	Note
Temperature Cycle RF Test-Q	<ol style="list-style-type: none"> <li>1) Allow samples to stabilize for 30 minutes every over the temperature range from -35 °C to +105 °C. Measure attenuation and VSWR by network analyzer from DC to 6GHz.</li> <li>2) Calculate, using linear regression, the slope of curve.</li> <li>3) Calculate temp coefficient using formula: temp coefficient= Slope/Attenuation@25°C.</li> </ol>	RF Test Result as Shown in Next Page	Acceptance limits: Nominal temp coefficient±0.001dB/dB /°C

# Temperature Cycle RF Test Report-1

Attachment: Temperature Cycle RF Test Report before Reliability Test

## Yantel Corporation

Tel:86-755-8355 1886 Fax:86-755-8355 2533 www.yantel-corp.com

### Temperature Compensation Attenuator Test Report 1

Date: 2008-12-05 Part No.:TCA0603N9 Lot No.:Y08797D615  
Attenuation: 3dB Target of Temperature Coefficient Code:N9  
Customer: Customer Order#: Invoice #:  
Drawing / Specification P/N# : Quantity Shipped : 6PCS Products Code: 01Q

Attenuation								
Temperature / Frequency	-35°C	-15°C	5°C	25°C	45°C	65°C	85°C	105°C
3M	5.57	4.38	3.56	2.96	2.54	2.18	1.97	1.78
1G	5.28	4.27	3.56	3.02	2.65	2.30	2.11	1.93
2G	5.15	4.24	3.57	3.06	2.69	2.37	2.18	2.00
3G	5.09	4.29	3.67	3.19	2.85	2.52	2.35	2.17
6G	4.84	4.35	3.87	3.49	3.23	2.96	2.77	2.63

#### Conclusion

1. Attenuation accuracy @ 25°C@1GHz:  $\pm$  0.02 dB **Passed**

2. The computed results of temperature coefficient code

Positive temperature(+25°C to 105°C): N 4.98  
Negative temperature(-35°C to +25°C): N 14.70  
The entire temperature range(-35°C to +105°C): N 9.15

# Temperature Cycle RF Test Report-2

Attachment: Temperature Cycle RF Test Report before Reliability Test

## Yantel Corporation

Tel:86-755-8355 1886 Fax:86-755-8355 2533 www.yantel-corp.com

### Temperature Compensation Attenuator Test Report 2

Date: 2008-12-05

Part No.:TCA0603N9

Lot No.:Y08797D615

Attenuation:

3dB

Target of Temperature Coefficient Code:

N9

Customer:

Customer Order#:

Invoice #:

Drawing / Specification P/N# :

Quantity Shipped : 6PCS

Products Code: 01Q

Max VSWR: 1								
Temperature / Frequency	-35°C	-15°C	5°C	25°C	45°C	65°C	85°C	105°C
3M	1.28	1.14	1.05	1.00	1.04	1.08	1.09	1.11
1G	1.30	1.18	1.12	1.10	1.11	1.13	1.14	1.15
2G	1.44	1.32	1.25	1.22	1.20	1.19	1.18	1.18
3G	1.54	1.44	1.37	1.32	1.29	1.27	1.26	1.24
6G	1.62	1.50	1.42	1.33	1.27	1.23	1.21	1.18

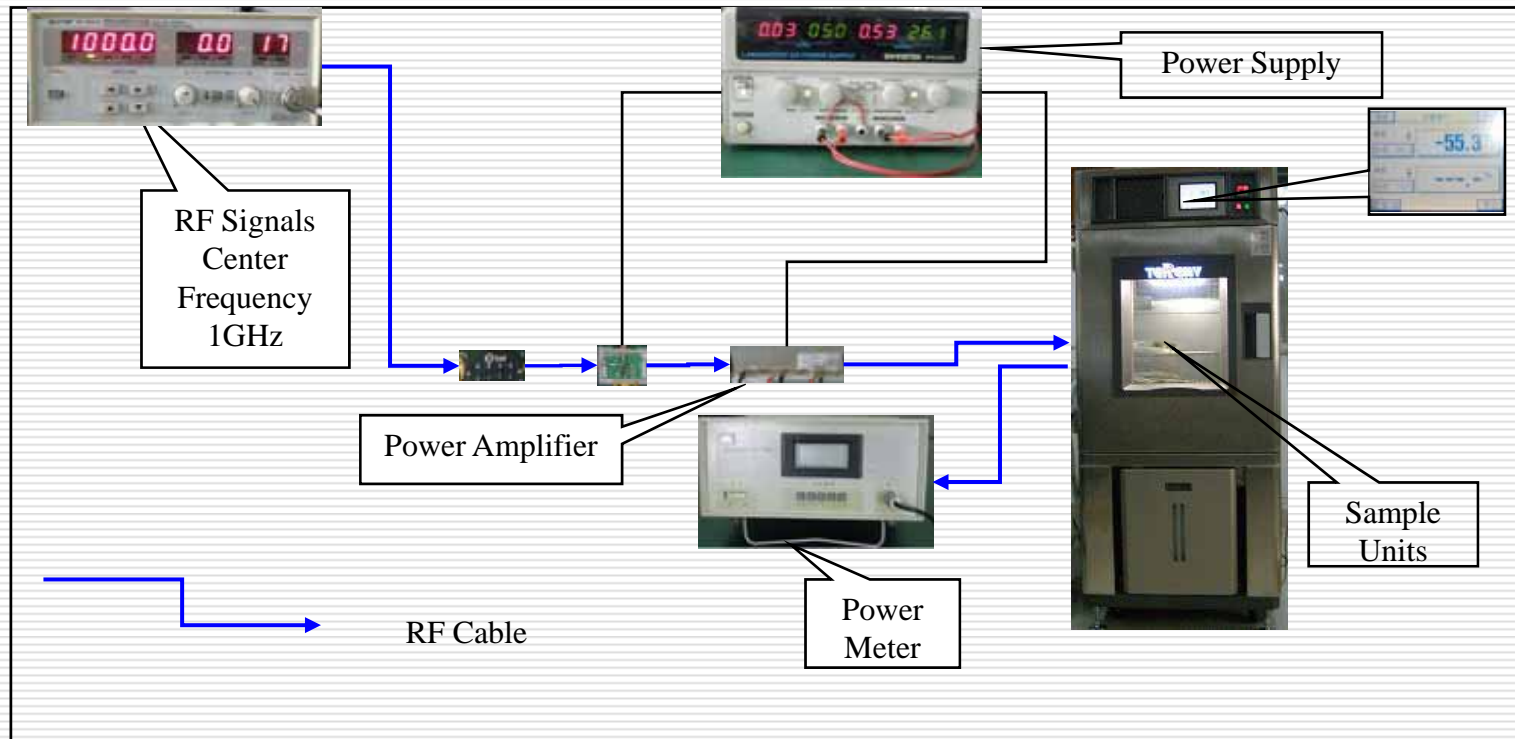
#### Conclusion:

Max VSWR:1 1.00 @3MHz@25°C PASS  
Max VSWR:1 1.10 @1GHz@25°C PASS  
Max VSWR:1 1.22 @2GHz@25°C PASS  
Max VSWR:1 1.32 @3GHz@25°C PASS  
Max VSWR:1 1.33 @6GHz@25°C PASS



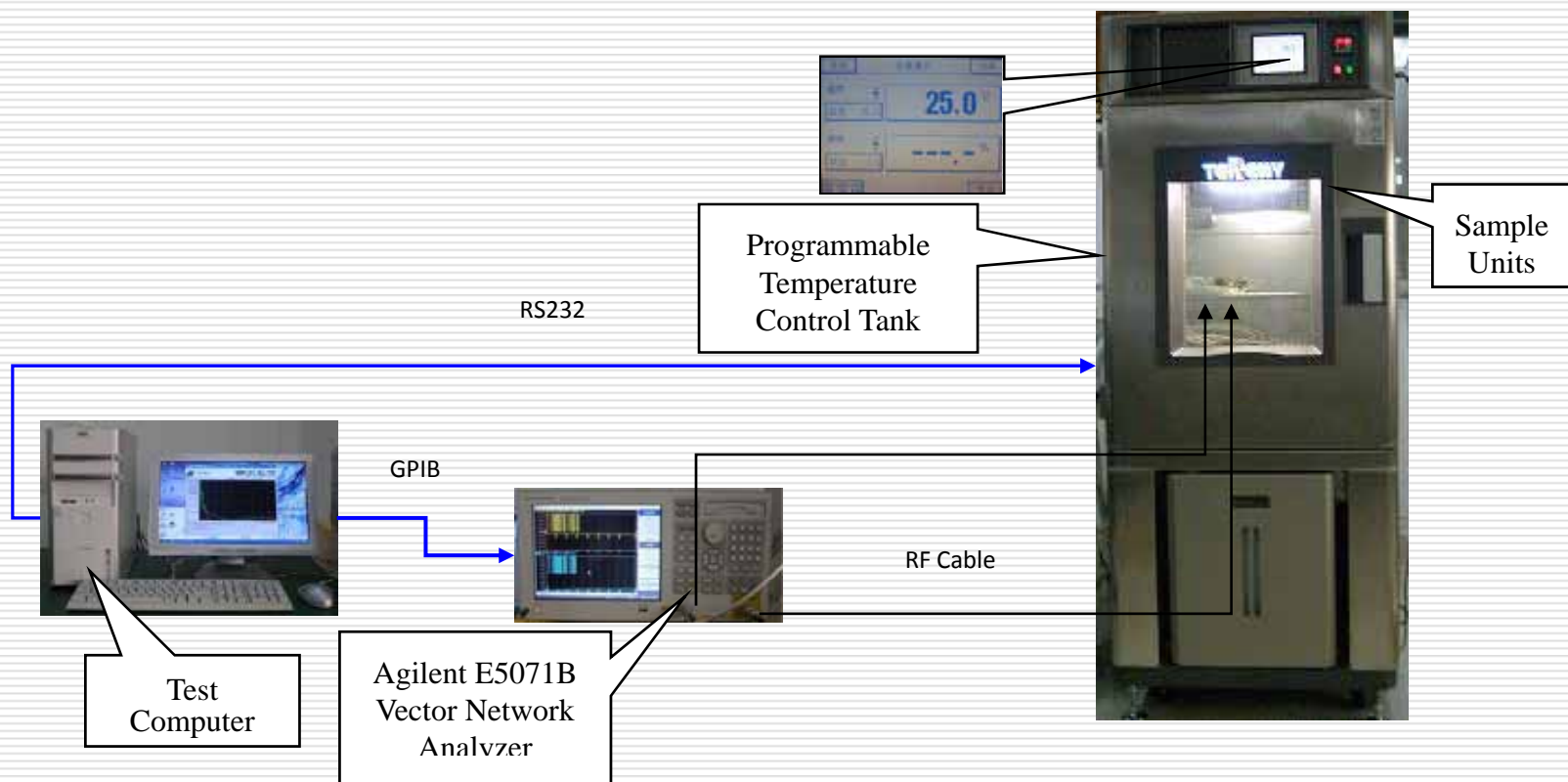
# Low Temperature Shock Test-1

1. Allow sample units to stabilize at -55 for one hour. Dissipate rated power(2W) at low temperature for one hour.



# Low Temperature Shock Test-2

2. After one hour, allow units to stabilize at  $25 \pm 5$  for two hours. Measure attenuation and VSWR from DC to 6GHz @  $25$ .



# Low Temperature Shock Test Report

## Low Temperature RF Test Report

Test Type: Sampling

Test No.: YT/T-0002

Conducted by: Test Dept

Tested by: Du Qingyun

Part No.	TCA0602N5, TCA0602N7, TCA0603N7, TCA0603N9, TCA0604N7, TCA0604N9, TCA0606N9,	Lot No.	11110802 ,Y08797D615, 30090801, 26120802, Y08789D616, Y08826D657, Y08684D533
Sampling Qty	6PCS per part No.	Sample No.	(01~06)*7
Sample status	OK		
Test Date	Same as date in test report Date		
Report Date	Same as date in test report Date		
Test Item	Test Environment	Test Result	Remarks
Low Temperature RF Test	<ol style="list-style-type: none"> <li>Allow sample units to stabilize at -55 °C for one hour. Dissipate rated power(2W) ,frequency (1GHz)at low temperature for one hour.</li> <li>Then allow units to stabilize at 25°C±5°C for two hours. Measure attenuation and VSWR from DC to 6GHz @25 °C.</li> </ol>	RF Test Result @25°C as Shown in Attachments Report	Acceptance limits: ±0.2dB.

# Test Result Comparison of Low Temperature RF Test

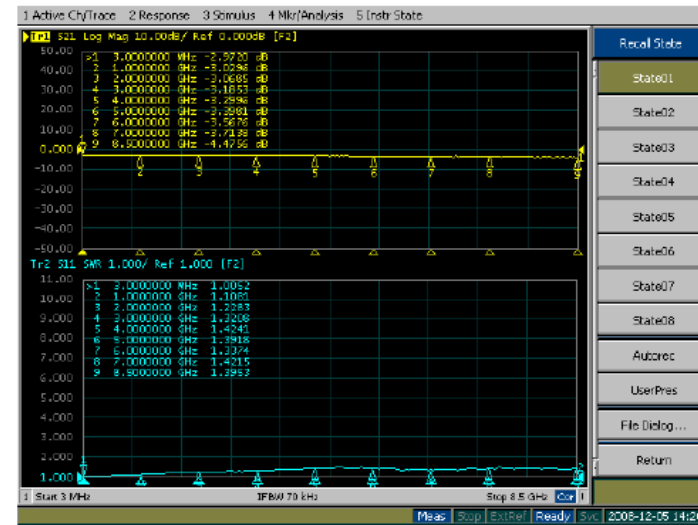
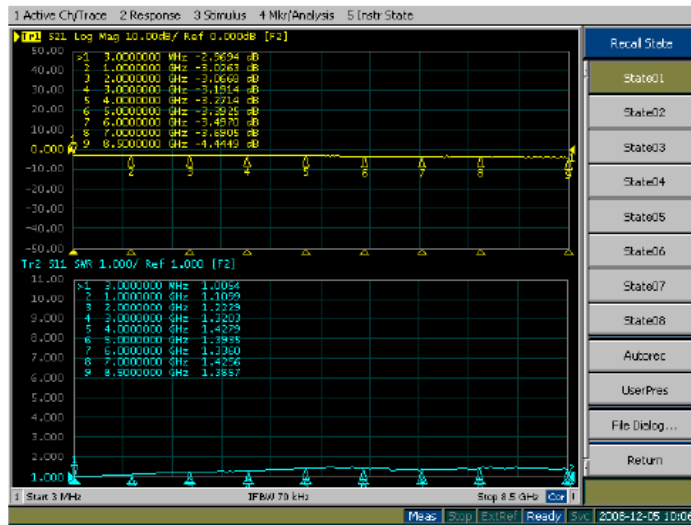
## Low Temperature RF Test Report

Attachment: Comparison of RF test result @25°C

Model No.:TCA0603N9 Sample No.:02

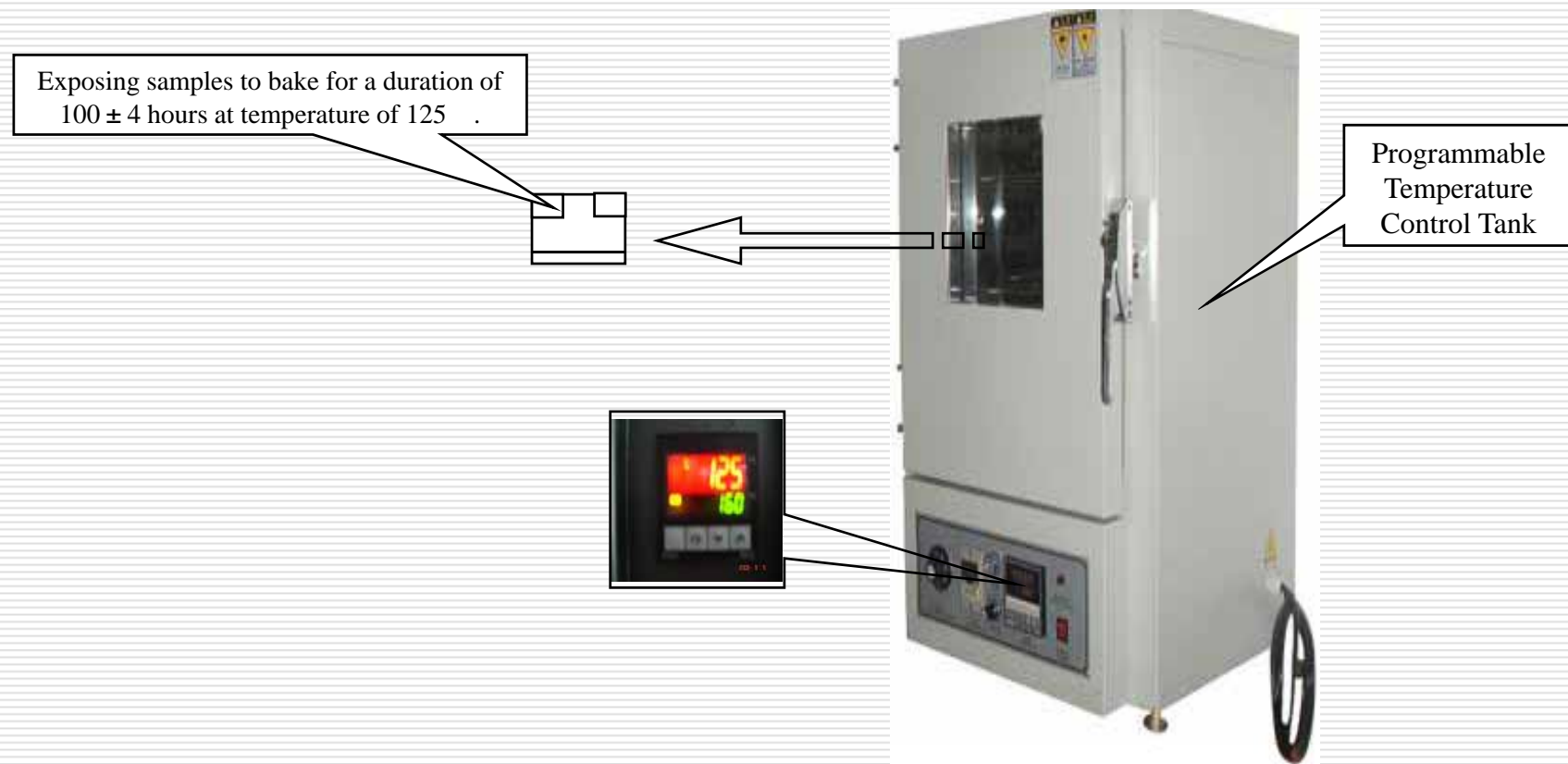
Before Test

After Test



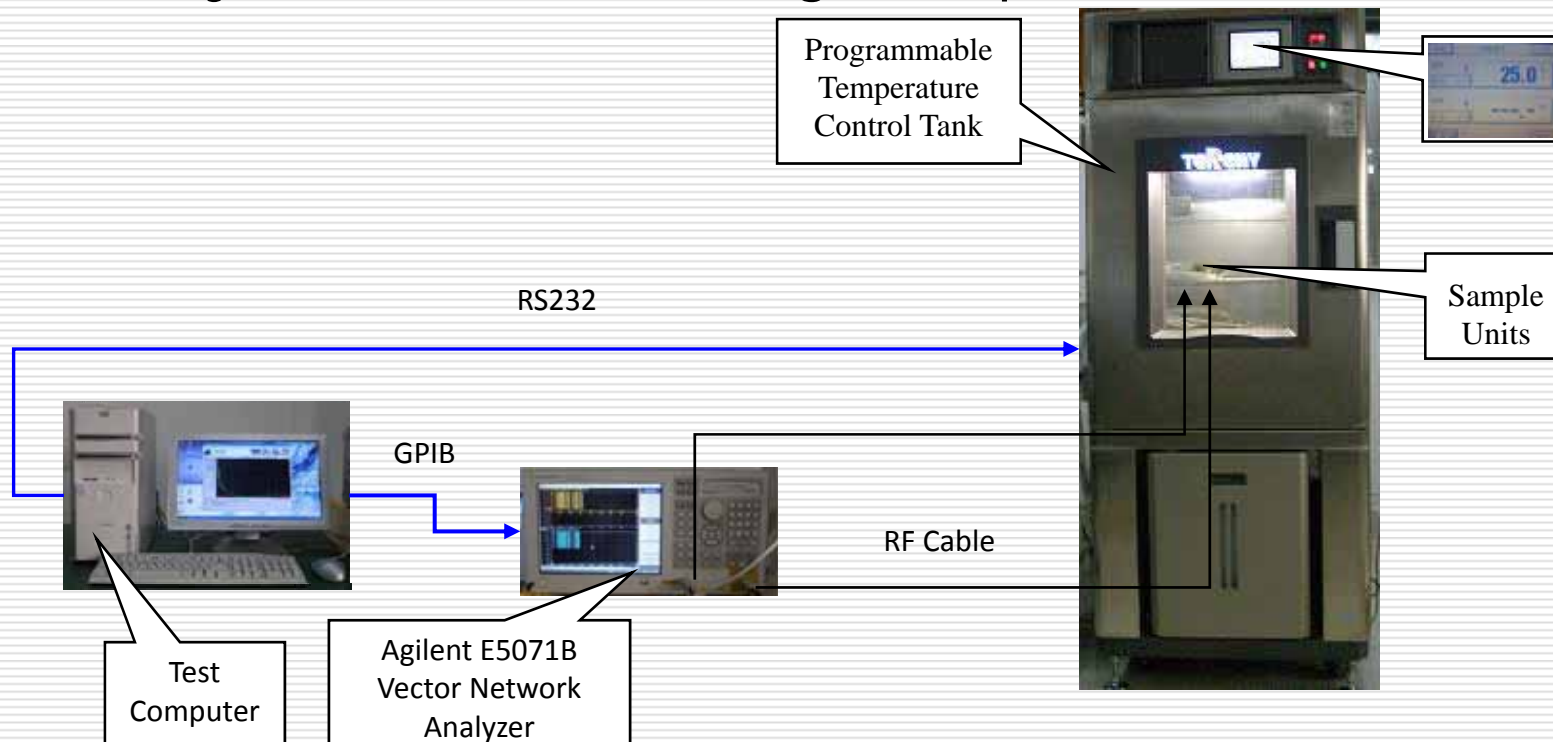
# High Temperature Bake –shown in chart below-1

1. Allow sample units to stabilize at 125 for  $100 \pm 4$  hours.



# High Temperature Bake –shown in chart below-2

2. Measure and record attenuation & VSWR at 25 respectively before and after high temperature Bake test.



# High Temperature Bake Test Report

## High Temperature Bake Test Report

Test Type: Sampling

Test No.: YT/T-0003

Conducted by: Test Dept

Tested by: Du Qingyun

Part No.	TCA0602N5, TCA0602N7, TCA0603N7, TCA0603N9, TCA0604N7, TCA0604N9, TCA0606N9	Lot No.	11110802 ,Y08797D615, 30090801, 26120802, Y08789D616, Y08826D657, Y08684D533
Sampling Qty	6PCS per part No.	Sample No.	(01~06)*7
Sample status	normal		
Test Date	Same as date in test report date		
Report Date	Same as date in test report date		
Test Item	Test Environment	Test Result	Remarks
High Temperature Bake Test	Allow sample units to stabilize at 125°C for 100±4 hours. Then stabilize at 25°C±5°C measure attenuation and VSWR from DC to 6GHz @25 °C.	RF test result @25°C as shown in attachments report	Acceptance limits: ±0.2dB@25°C.

# Test Results Comparison Before –and after High Temperature Bake

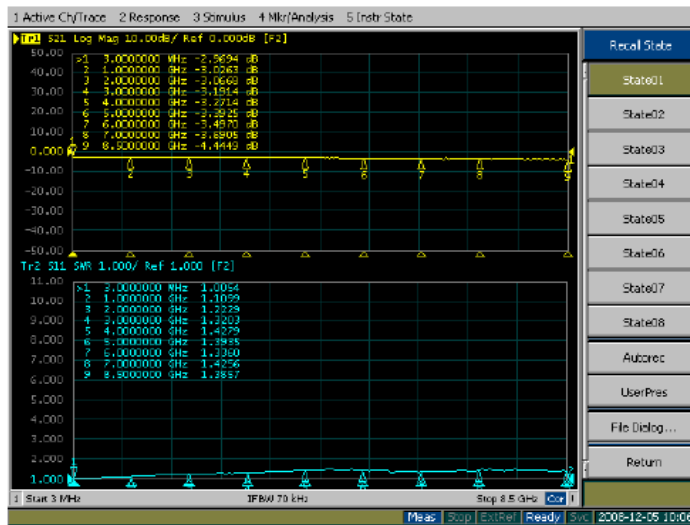
## High Temperature Bake Test Report

### Comparison of RF test result @25°C

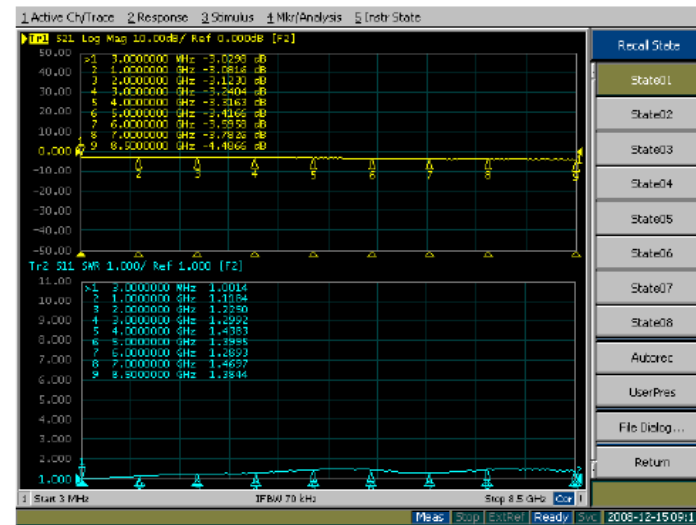
Model No.:TCA0603N9

Sample No.:07

#### Before Test



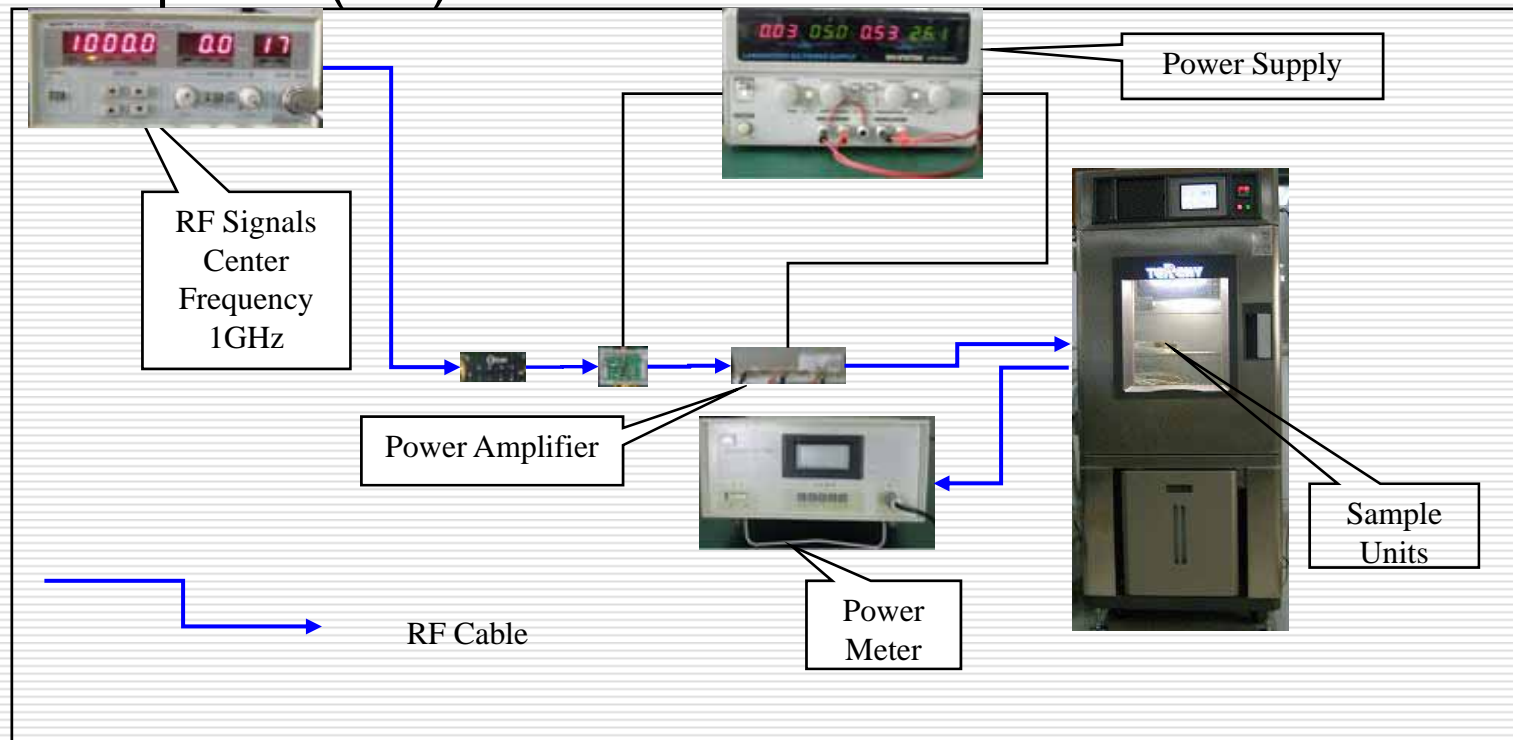
#### After Test





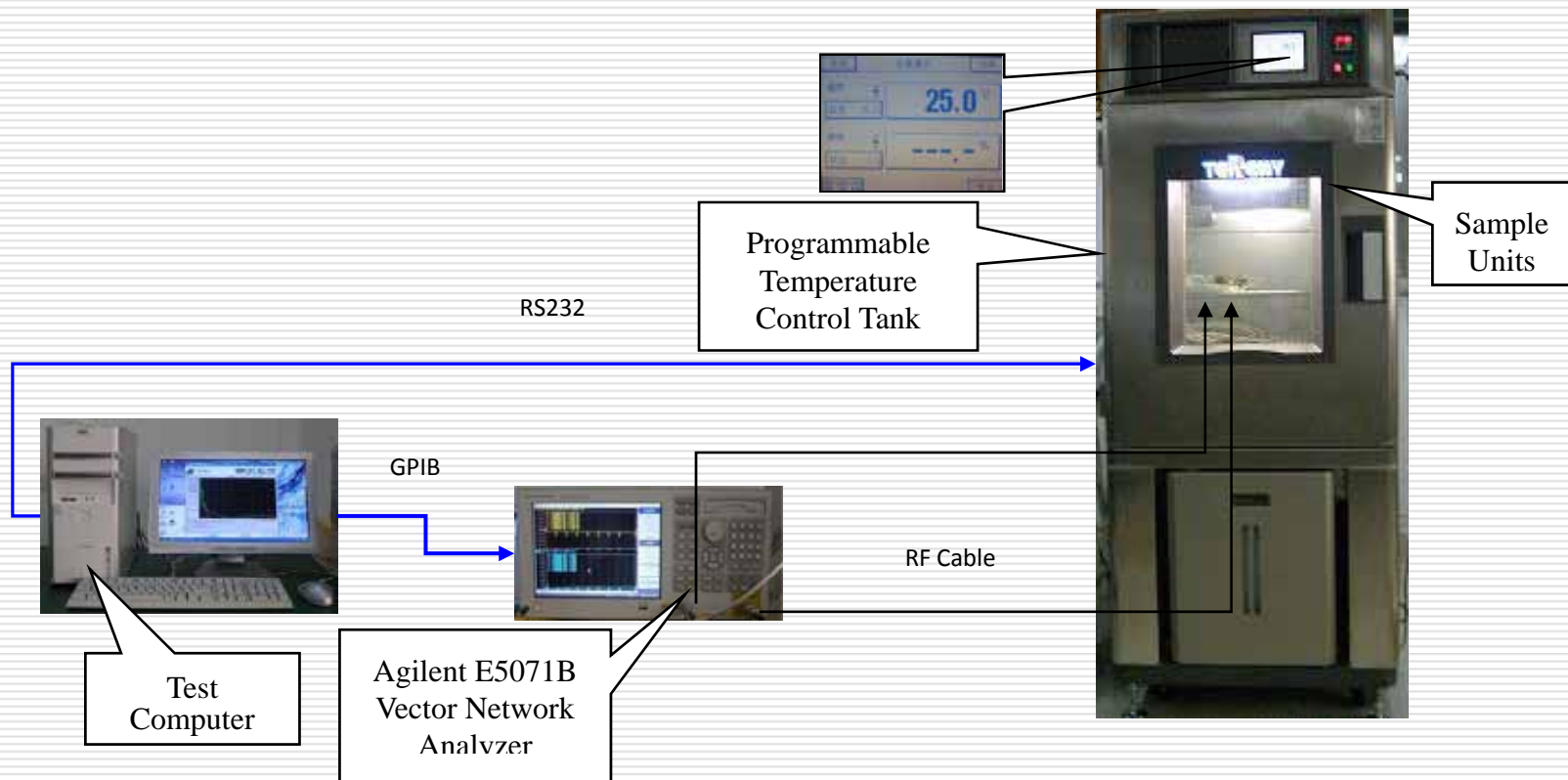
# Burn in

1. Burn-in at 125°C for a duration of 168 hours with the dissipated power (2W).



# Burn in

2. After one hour, allow units to stabilize at  $25 \pm 5$  for two hours. Measure attenuation and VSWR from DC to 6GHz @  $25$ .



# Burn in

## Burn in Test Report

Test Type: Sampling

Test No.: YT/T-0002

Conducted by: Test Dept

Tested by: Du Qingyun

Part No.	TCA0602N5, TCA0602N7, TCA0603N7, TCA0603N9, TCA0604N7, TCA0604N9, TCA0606N9,	Lot No.	11110802 ,Y08797D615, 30090801, 26120802, Y08789D616, Y08826D657, Y08684D533
Sampling Qty	6PCS per part No.	Sample No.	(01~06)*7
Sample status	OK		
Test Date	Same as test report date		
Report Date	Same as test report date		
Test Item	Test Environment	Test Result	Remarks
Low Temperature RF Test	<ol style="list-style-type: none"><li>Burn-in at 125°C for a duration of 168 hours with the dissipate rated power (2W).</li><li>Then allow units to stabilize at 25°C±5°C for two hours. Measure attenuation and VSWR from DC to 6GHz @25 °C.</li></ol>	RF test result @25°C as shown in attachments report	Acceptance limits: ±0.2dB.

# Test Results Comparison Before –and after High Temperature Bake

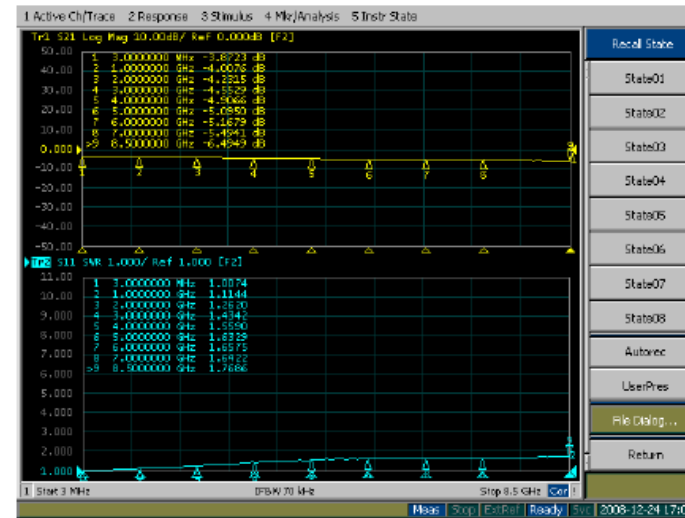
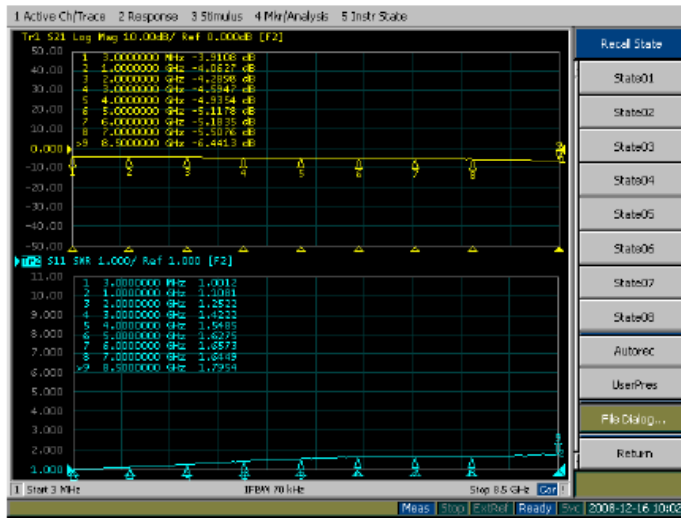
## Burn in Test Report

Comparison of RF test result @25°C

Model No.:TCA0603N9 Sample No.:06

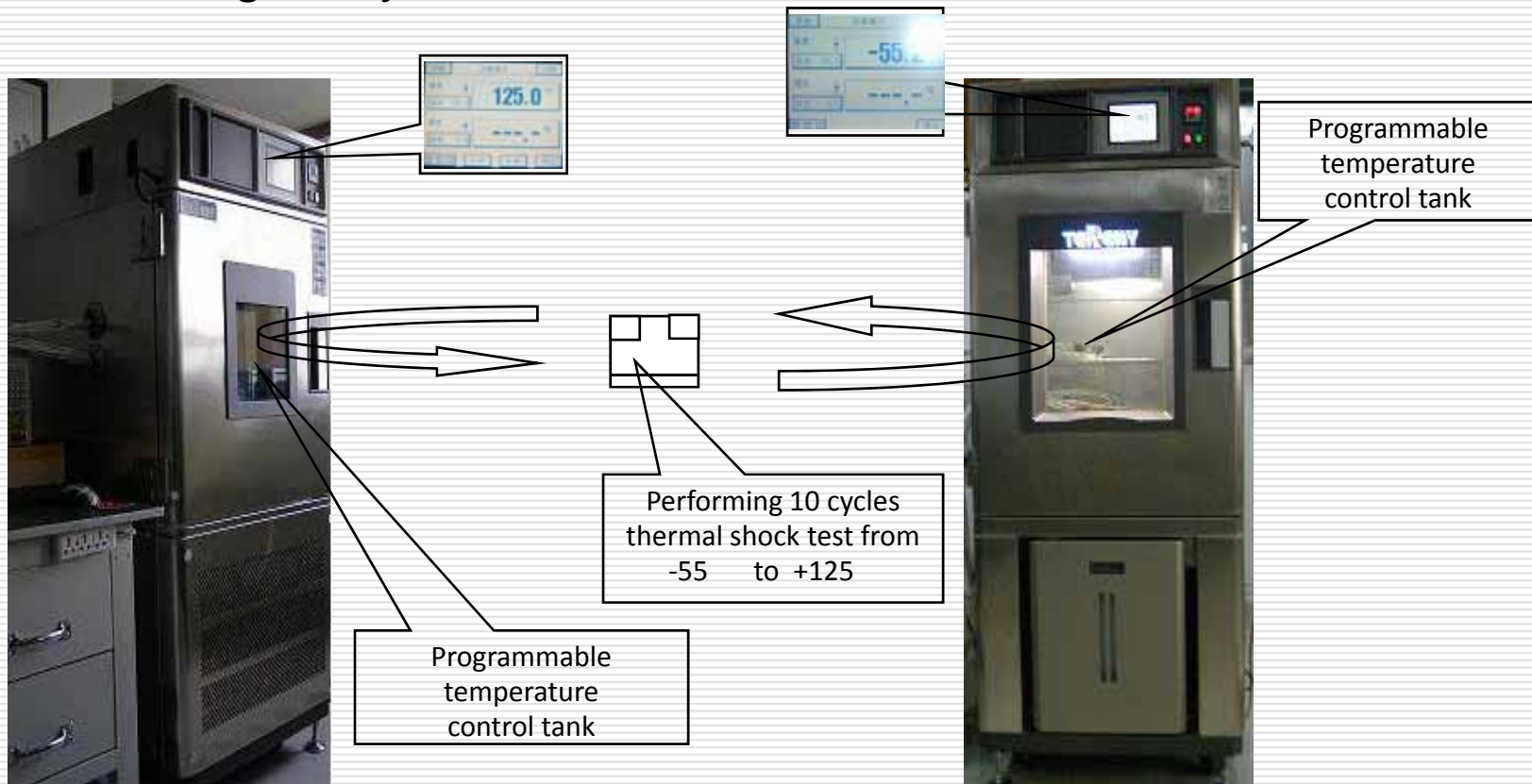
Before test

After test



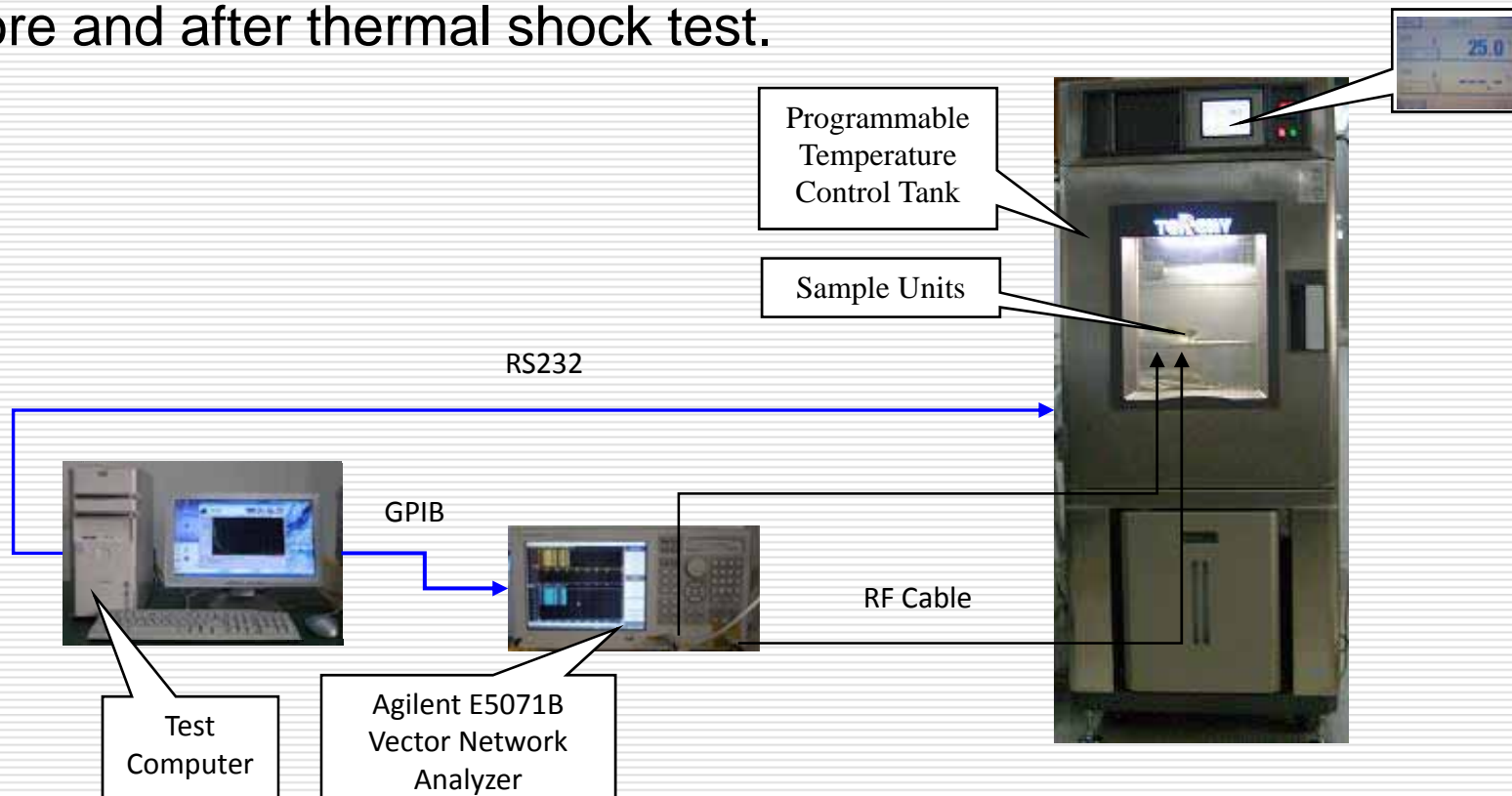
# Thermal Shock Test –shown in chart below

1. Performing 10 cycles thermal shock test from -55 to +125 .



# Thermal Shock Test –shown in chart below

2. Measure and record attenuation & VSWR at 25 respectively before and after thermal shock test.



# Thermal Shock Test Report

## Thermal Shock Test Report

Test Type: Sampling

Test No.: YT/T-0006

Conducted by: Test Dept

Tested by: Du Qingyun

Part No.	TCA0602N5, TCA0602N7, TCA0603N7, TCA0603N9, TCA0604N7, TCA0604N9, TCA0606N9	Lot No.	11110802 ,Y08797D615, 30090801, 26120802, Y08789D616, Y08826D657, Y08684D533
Sampling Qty	6PCS per part No.	Sample No.	(01~06)*7
Sample status	normal		
Test Date	Same as date in test report date		
Report Date	Same as date in test report date		
Test Item	Test Environment	Test Result	Remarks
Thermal Shock Test	Performing 10 cycles thermal shock test from -55°C to +125°C, Measure and record attenuation and VSWR from DC to 6GHz.	RF test result @25°C as shown in attachments report	acceptance limits: ±0.2dB@25°C.

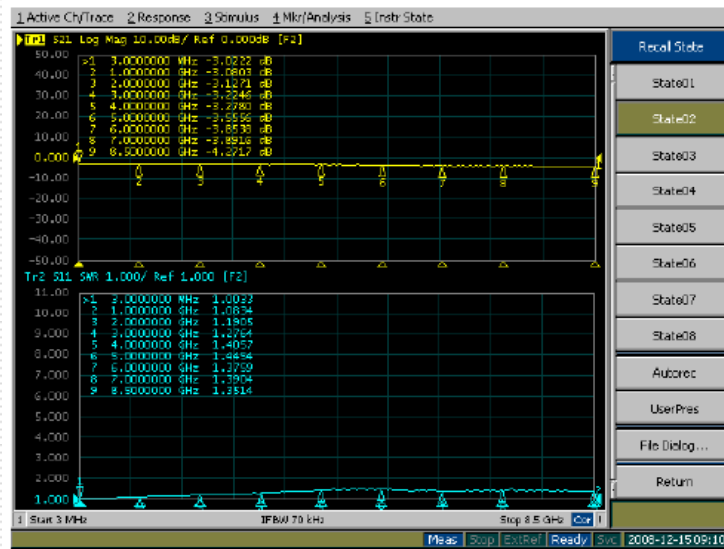
# Test Result Comparison -Before -and -After Thermal Shock Test

## Thermal Shock Test Report

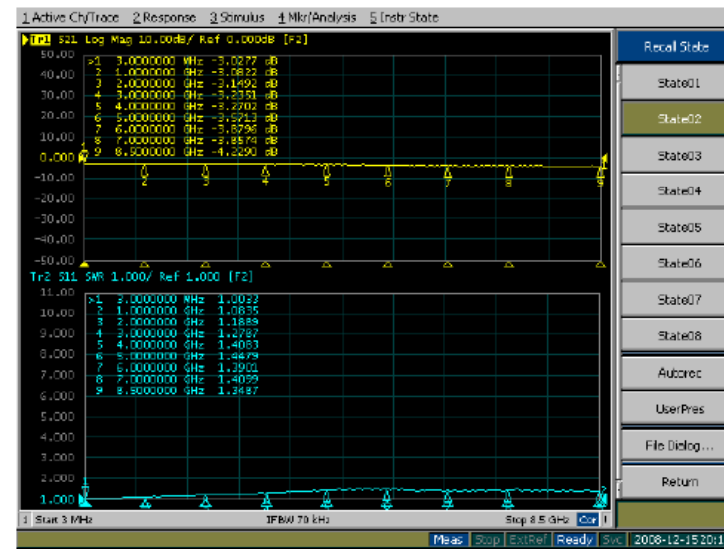
### Comparison of RF test result @25°C

Model No.:TCA0603N9 Sample No.:02

Before Test



After Test

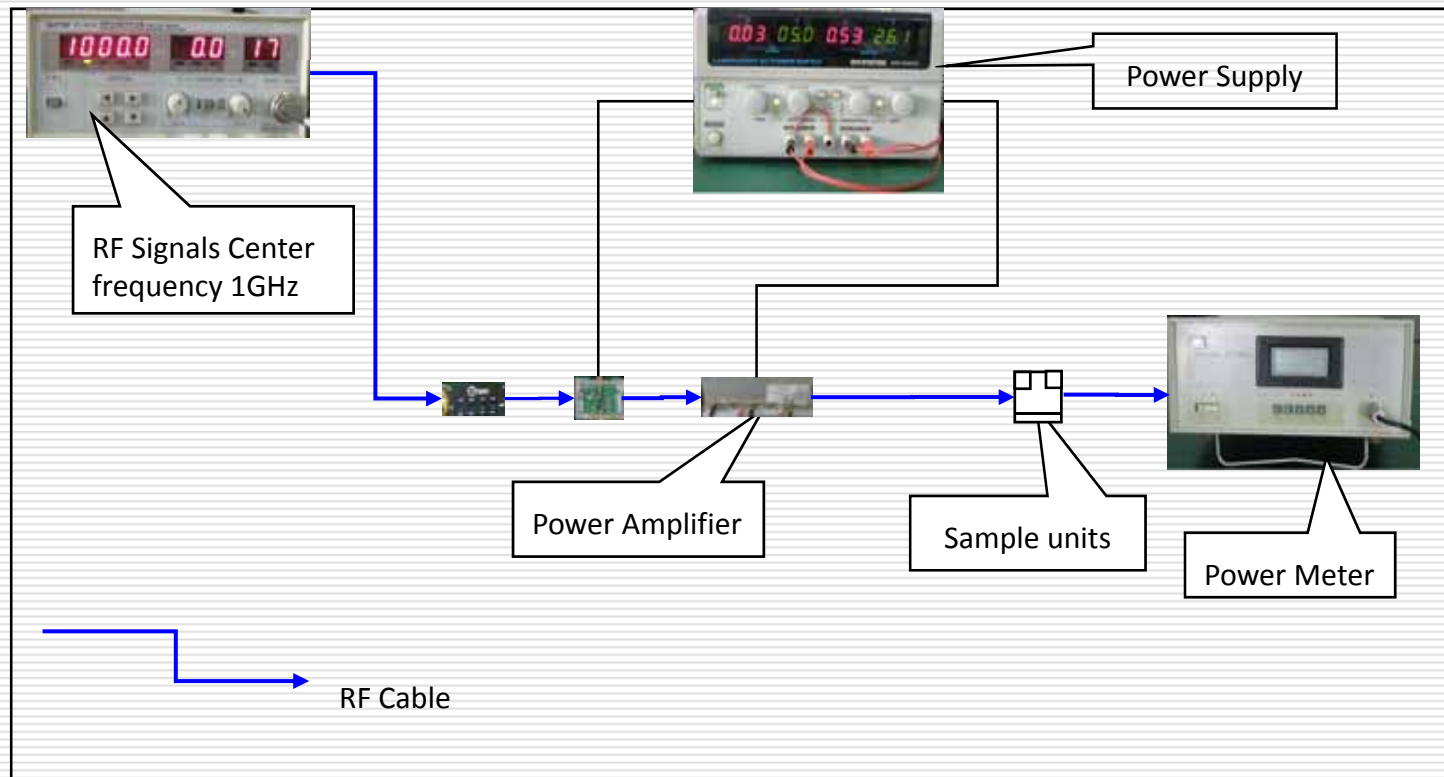




# Power Life Test

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Power life test per testing requirements:



# Power Life Test Report

## Power Life Test Report

Test Type: Sampling

Test No.: YT/T-0005

Conducted by: Test Dept

Tested by: Du Qingyun

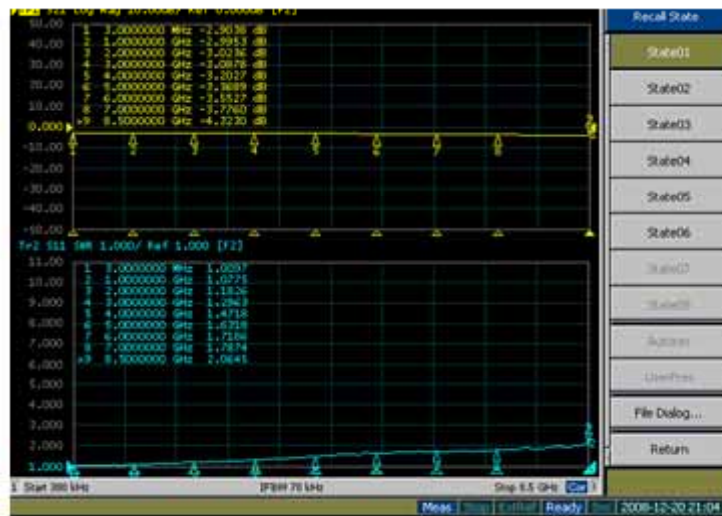
Part No.	TCA0603N9	Lot No.	Y08797D615
Sampling Qty	6PCS	Sample No.	01~06
Sample status	Normal		
Starting Test Date	2008-12-20	Test Duration	2008-12-20~2009-01-20; 2009-02-02~2009-02-20
Report Date	2009-2-21		
Test Item	Test Environment	Test Result	Remarks
Power Life Test	<ol style="list-style-type: none"><li>Operate sample units for continues 1000 hours at 70°C with 2W input power (at 1GHz), 90 minutes on, 30 minutes off.</li><li>Stabilizing sample units at 25°C, then measure and record VSWR &amp; attenuation at 25°C after above test.</li></ol>	See the test result comparison in next page	Acceptance limits: ±0.2dB.

# Test Results Comparison of Power Life Test

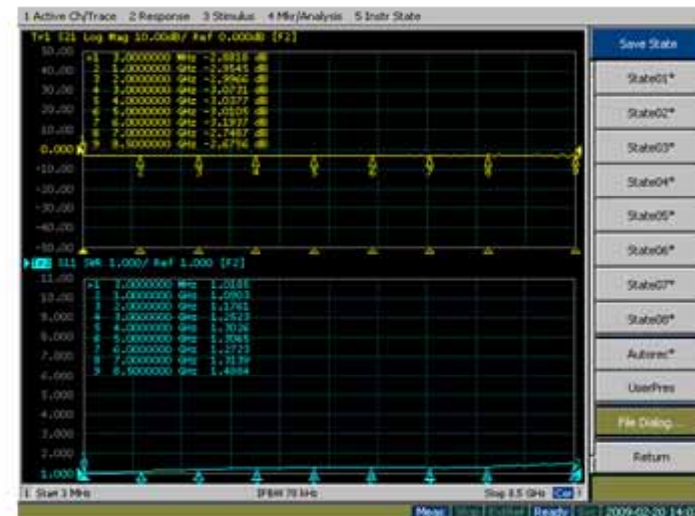
## Power Life Test Report

Attachment : Comparison of RF Test Result@25°C

Before Test

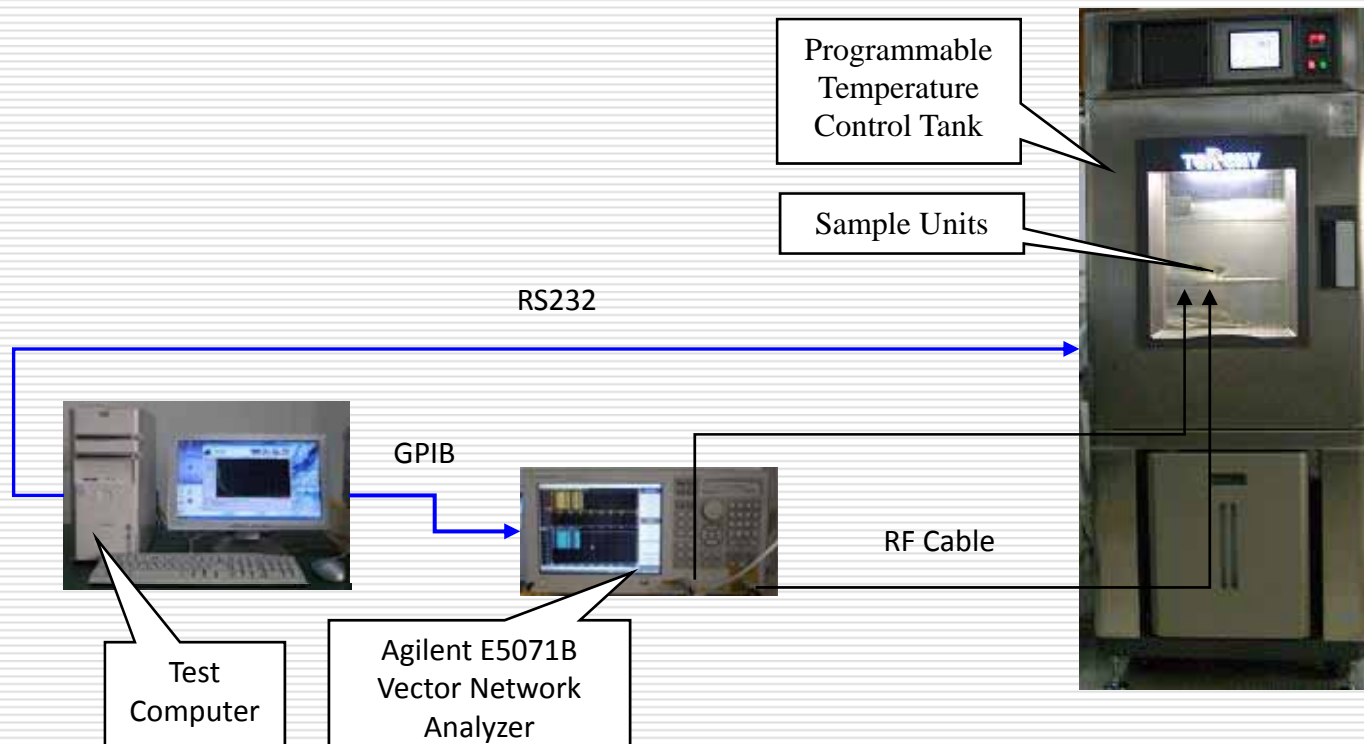


After Test



# Temperature Cycle Test -as shown in chart below

Products are subjected to temperature cycle test after reliability testing completed.



# Test Report --- Temperature Cycle RF Test after Reliability Test

## Temperature Cycle RF Test Report-H

Test Type: Sampling

Test No.: YT/T-0006

Conducted by: Test Dept

Tested by: Du Qingyun

Part No.	TCA0602N5, TCA0602N7, TCA0603N7, TCA0603N9, TCA0604N7, TCA0604N9, TCA0606N9.	Lot No.	11110802 ,Y08797D615, 30090801, 26120802, Y08789D616, Y08826D657, Y08684D533
Sampling Qty	6PCS per Part No.	Sample No.	(01~06)*7
Sample status	Normal		
Test Date	See Attach Test Report Date		
Report Date	See Attach Test Report Date		
Test Item	Test Environment	Test Result	Remarks
Temperature Cycle RF Test-H	<ol style="list-style-type: none"> <li>1) Allow samples to stabilize for 30 minutes every over the temperature range from -35 °C to +105 °C. Measure attenuation and VSWR by network analyzer from DC to 6GHz.</li> <li>2) Calculate, using linear regression, the slope of curve.</li> <li>3) Calculate temp coefficient using formula: temp coefficient= Slope/Attenuation@25°C.</li> </ol>	RF Test Result as Shown in Attached Report	Acceptance limits: Nominal temp coefficient=±0.001dB/dB /°C

# Report-1 Test after temperature Cycle

Attachment: Temperature Cycle RF Test Report before Reliability Test

## Yantel Corporation

Tel:86-755-8355 1886 Fax:86-755-8355 2533 www.yantel-corp.com

### Temperature Compensation Attenuator Test Report 1

Date: 2009-2-16

Part No.:TCA0603N9

Lot No.:Y08797D615

Attenuation:

3dB

Target of Temperature Coefficient Code:N9

Customer:

Customer Order#:

Invoice #:

Drawing / Specification P/N# :

Quantity Shipped : 6PCS

Products Code: 01H

#### Attenuation

Temperature / Frequency	-35°C	-15°C	5°C	25°C	45°C	65°C	85°C	105°C
3M	5.64	4.44	3.59	3.01	2.57	2.23	1.99	1.79
1G	5.36	4.31	3.61	3.06	2.66	2.35	2.11	1.93
2G	5.21	4.28	3.60	3.08	2.71	2.41	2.18	1.99
3G	5.10	4.29	3.69	3.19	2.84	2.57	2.35	2.16
6G	4.95	4.43	3.96	3.53	3.27	3.02	2.80	2.64

#### Conclusion

1. Attenuation accuracy @ 25°C@1GHz: \_\_\_\_\_ ± 0.06 dB Passed

2. The computed results of temperature coefficient code

Positive temperature(+25°C to 105°C): N 5.07

Negative temperature(-35°C to +25°C): N 14.56

The entire temperature range(-35°C to +105°C) : N 9.14

# Report-2 Test after temperature Cycle

Attachment: Temperature Cycle RF Test Report before Reliability Test

## Yantel Corporation

Tel:86-755-8355 1886 Fax:86-755-8355 2533 www.yantel-corp.com

### Temperature Compensation Attenuator Test Report 2

Date: 2009-2-16

Part No.:TCA0603N9

Lot No.:Y08797D615

Attenuation:

3dB

Target of Temperature Coefficient Code: N9

Customer:

Customer Order#:

Invoice #:

Drawing / Specification P/N# :

Quantity Shipped : 6PCS

Products Code: 01H

Max VSWR: 1								
Temperature / Frequency	-35°C	-15°C	5°C	25°C	45°C	65°C	85°C	105°C
3M	1.29	1.15	1.06	1.00	1.04	1.07	1.09	1.11
1G	1.30	1.20	1.14	1.12	1.11	1.12	1.13	1.15
2G	1.47	1.34	1.27	1.22	1.20	1.19	1.18	1.18
3G	1.50	1.39	1.32	1.28	1.28	1.27	1.26	1.25
6G	1.57	1.45	1.36	1.26	1.27	1.24	1.21	1.19

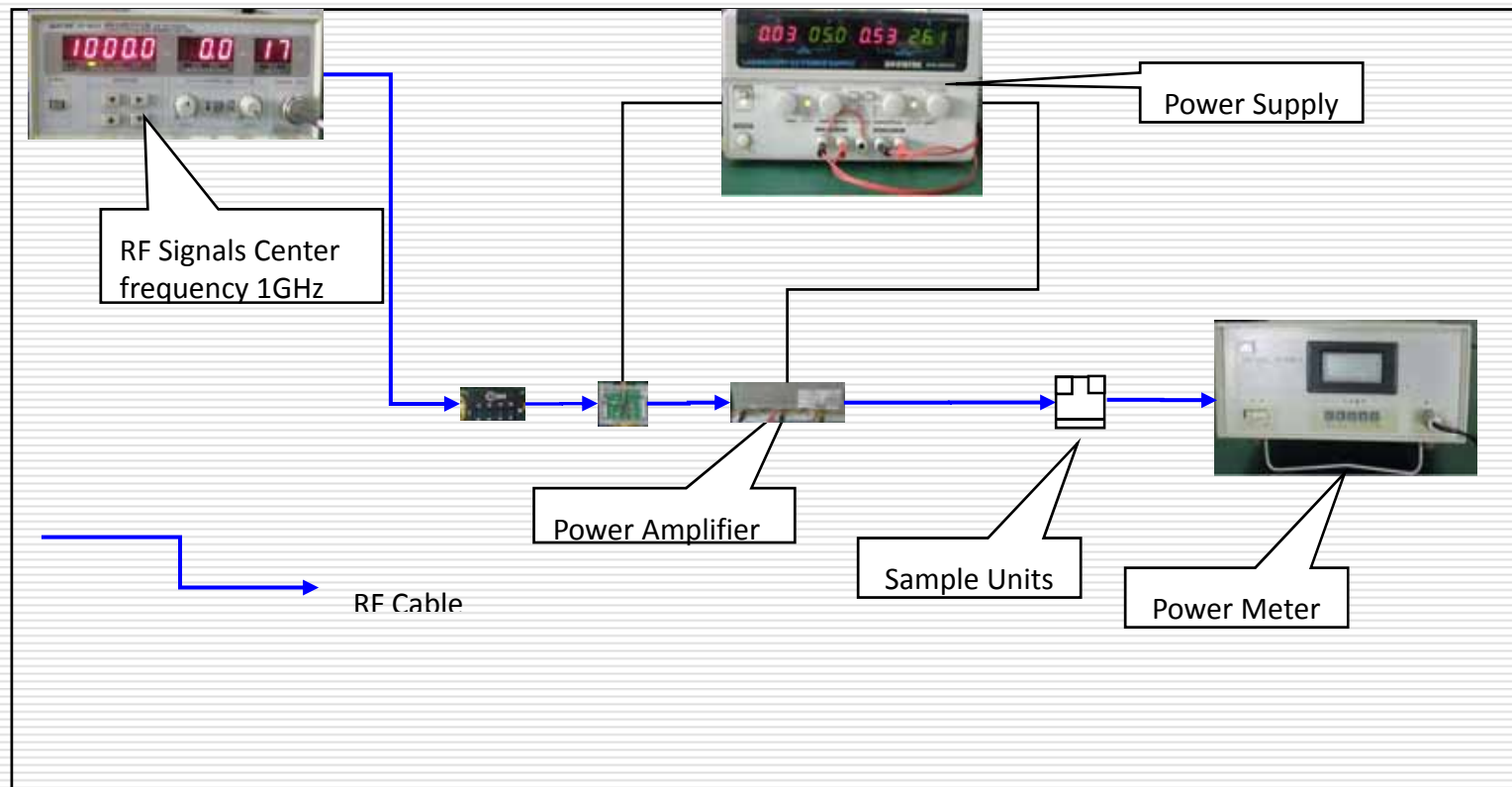
#### Conclusion:

Max VSWR:1 1.00 @3MHz@25°C PASS  
Max VSWR:1 1.12 @1GHz@25°C PASS  
Max VSWR:1 1.22 @2GHz@25°C PASS  
Max VSWR:1 1.28 @3GHz@25°C PASS  
Max VSWR:1 1.26 @6GHz@25°C PASS

# Overload Test

---

Overload test per testing requirements:





# Overload Test Report

## Overload Test Report

Test Type: Sampling

Test No.: YT/T-0007

Conducted by: Test Dept

Tested by: Du Qingyun

Part No.	TCA0602N5, TCA0602N7, TCA0603N7, TCA0603N9, TCA0604N7, TCA0604N9, TCA0606N9,	Lot No.	11110802 ,Y08797D615, 30090801, 26120802, Y08789D616, Y08826D657, Y08684D533
Sampling Qty	6PCS per Part No.	Sample No.	(01~06)*7
Sample status	Normal		
Tested Date	Same as Date in Test Report		
Reported Date	Same as Date in Test Report		
Test Item	Test Environment	Test Result	Remarks
Over Load Test	1. Operate sample units at normal temperature with 5W input power (at 1GHz), 90 minutes on, 30 minutes off. 2. After 3 cycles, measure and record vswr & attenuation at 25°C	RF Test Result @25°C as Shown in Next Page.	Acceptance limits: ±0.2dB.

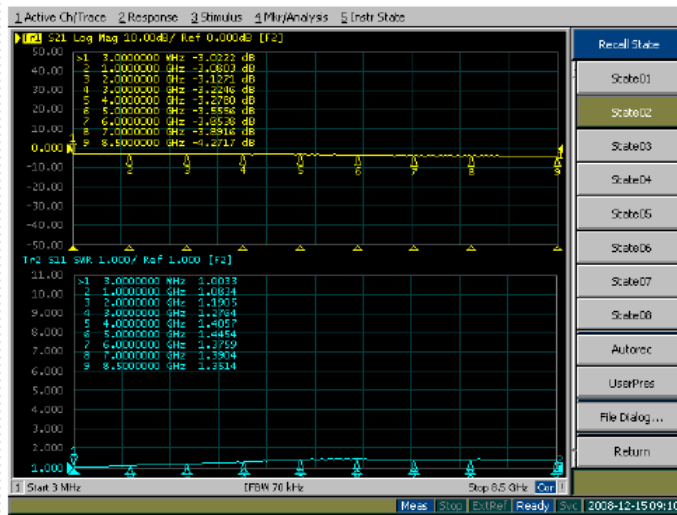
# Comparison of Pre- and-Post Overload Test

## Overload Test Report

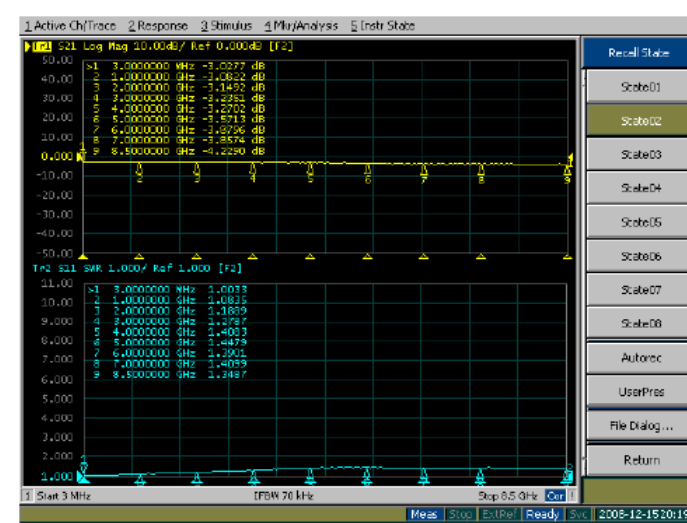
### Comparison of RF Test Result@25°C

Part No.:TCA0603N9

Before Test



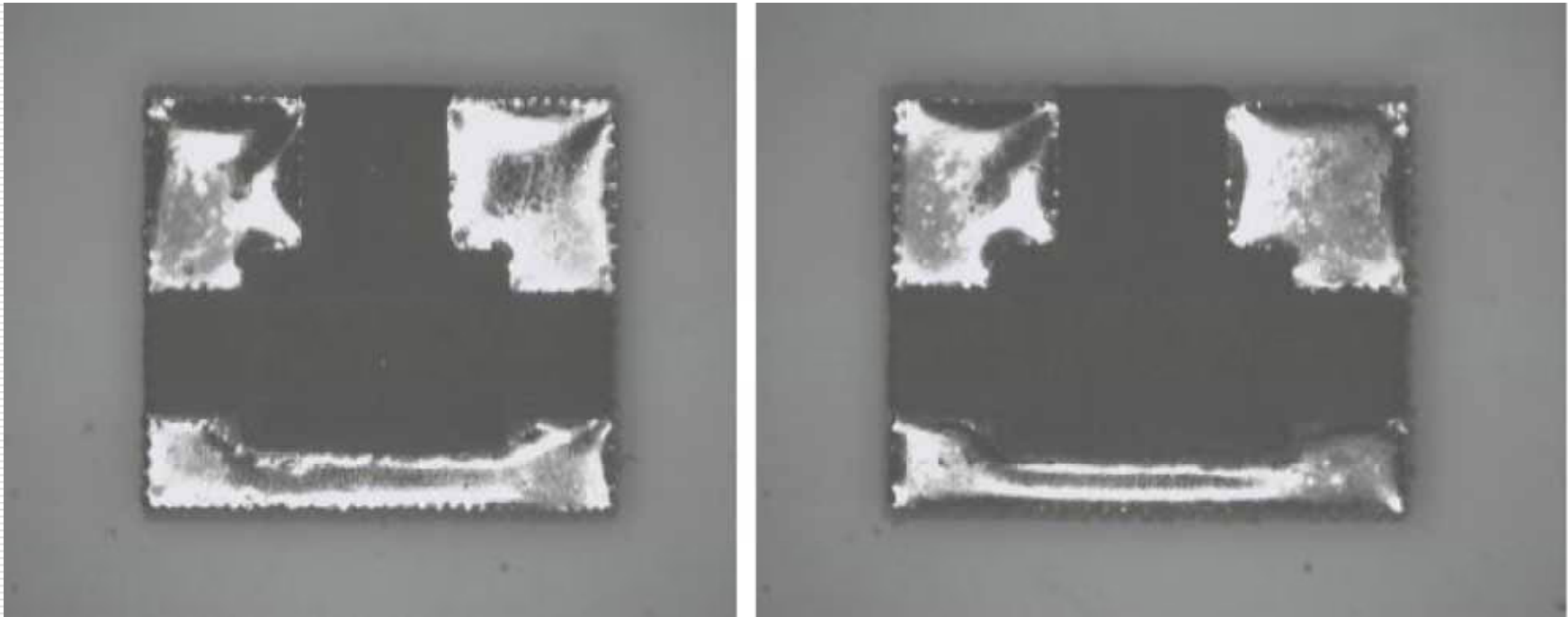
After Test



# Solderability Test

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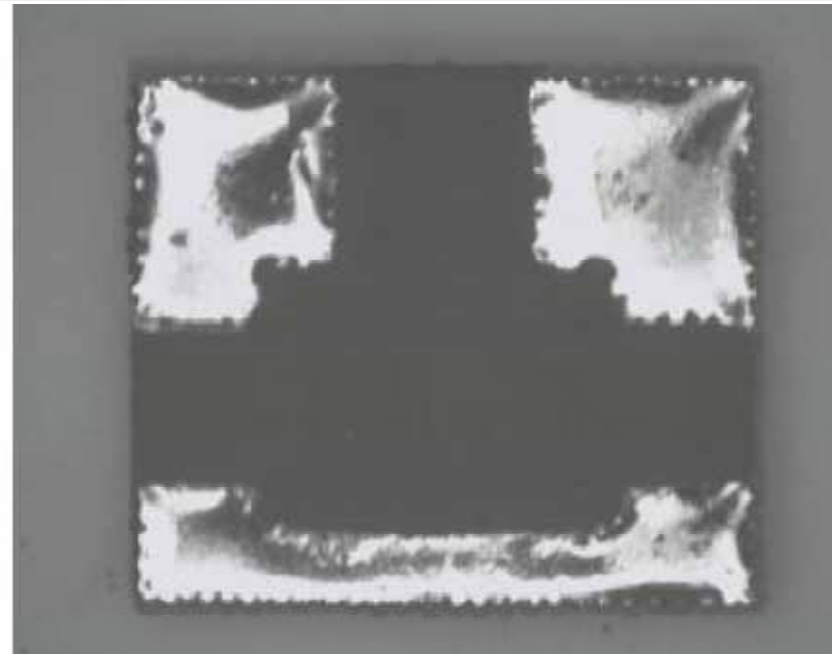
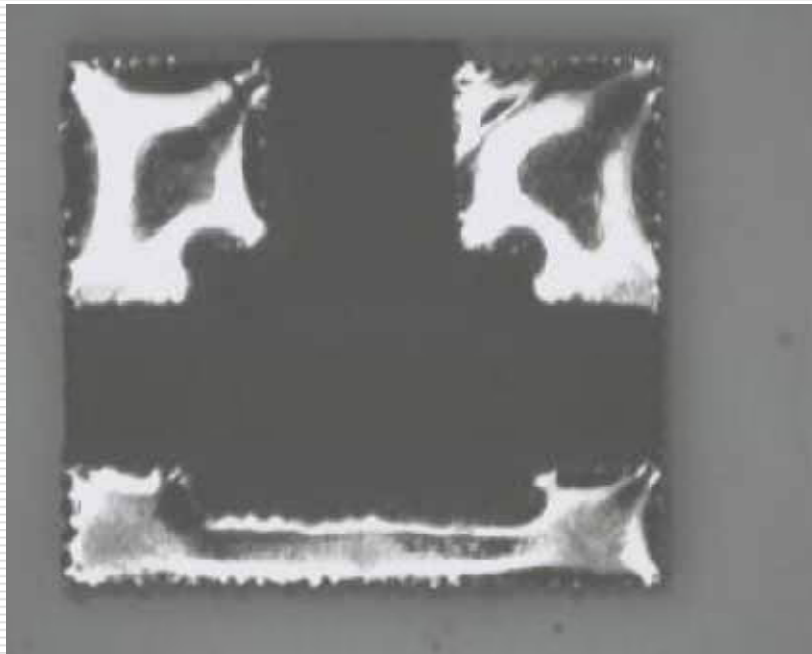
Solder dip once



# Solderability Test

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Solder dip twice



# Solderability Test Report

Products are subjected to one –time solder dip in the solder pot held at  $250 \pm 5$  , no defects are allowed .

## Solderability Test Report

Test Type: Sampling

Test No.: YT/T-0007

Conducted by: Test Dept

Tested by: Du Qingyun

Part No.	TCA060XNX	Lot No.	XXX
Sampling Qty	6PCS	Sample No.	01~06
Sample status	Normal		
Test Date	2008-12-15	Test duration	2008-12-18
Report Date	2008-12-20		
Test Item	Test Environment	Test Result	Remarks
Solderability Test	Immerse each sample for 5 seconds in liquid solder held at $260 \pm 5^{\circ}\text{C}$ .	Solder once: solder coverage is over 95%.	No Failure Allowed

# Adhesion Test-1

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Pic. 1: Set pull meter to zero, ready for testing.



Pic. 2: In testing

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# Adhesion Test-2

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# Adhesion Test Report

## Adhesion Test

Test Type: Sampling

Test No.: YT/T-0009

Conducted by: Test Dept

Tested by: Du Qingyun

Part No.	TCA060XNX	Lot No.	XXX
Sampling Qty	6PCS	Sample No.	01~06
Sample status	Normal		
Starting Test Date	2008-12-15		
Report Date	2008-12-20		

Test Item	Test Condition	Test Results	Remarks																								
Adhesion	Adhesion Requirements (>1000 grams, detailed in table below)	<ol style="list-style-type: none"> <li>Apply 1000grams to the planar W1&amp;W3 of solder pad, electrode and wire would not be away from W1&amp;W3.</li> <li>The pull above is able to separate the electrode.</li> </ol>	No failure allowed																								
	<table border="1"> <thead> <tr> <th>Testing Point</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> <th>Avg. pull</th> </tr> </thead> <tbody> <tr> <td>Pull(kg)</td> <td>1.2</td> <td>1.1</td> <td>1.8</td> <td>1.6</td> <td>1.4</td> <td>1.6</td> <td>1.3</td> <td>1.6</td> <td>1.1</td> <td>1.2</td> <td>1.39</td> </tr> </tbody> </table>			Testing Point	1	2	3	4	5	6	7	8	9	10	Avg. pull	Pull(kg)	1.2	1.1	1.8	1.6	1.4	1.6	1.3	1.6	1.1	1.2	1.39
	Testing Point			1	2	3	4	5	6	7	8	9	10	Avg. pull													
Pull(kg)	1.2	1.1	1.8	1.6	1.4	1.6	1.3	1.6	1.1	1.2	1.39																
Testing Gadget	ALGOL Pull meter、0.5mm wire																										