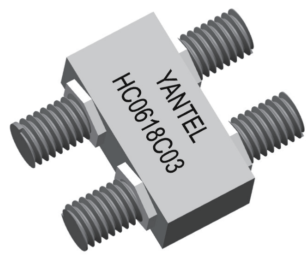
HC0618C03

Hybrid Coupler 3 dB, 90°

Rev A1

Description

3 dB quadrature mini-hybrids are the ultimate in compact, rugged high stress environment components. The crossover feature of the location of both outputs on one side allows simplicity in system or subsystem design. Multi-octave coverage of the complete frequency spectrum, along with high isolation performance, qualifies them as an asset to any system.



Features:

- 6500 –18000 MHz
- 90° Quadrature Phase
- Meets MIL-E-5400 Environments
- Non-crossover Versions Available
- RoHS Compliant

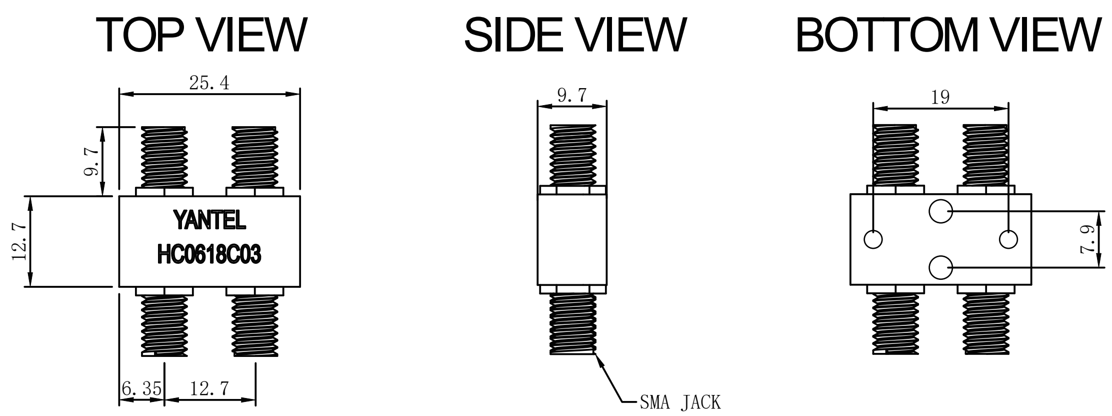
Electrical Specifications

Frequency	Isolation	Insertion Loss	VSWR	Amplitude Balance
MHz	*dB Min*	*dB Max*	*Max : 1*	*dB Max*
6500- 18000	15	0.60	1.45	± 0.50

Phase Balance	Power	Operating Temp.
Degrees	*Avg. CW Watts*	*℃*
90 ± 7.0	30	-55 to +95

Notes:
1. All the above data are based on specified demo board.
2. Insertion loss:Thru board loss has been removed.

Mechanical Outline



Notes: 1. All dimensions show in millimeters
2. RoHS Compliant in accordance with EU Directive(2011/65/EU)
3. Dimension tolerance: ±0.20

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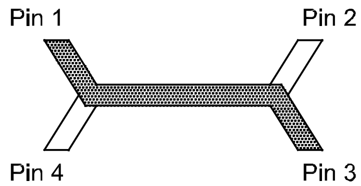
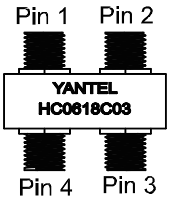
Hybrid Coupler Pin Configuration

The HC0618C03 has an orientation marker to denote Pin 1. Once port one has been identified the other ports are known automatically. Please see the chart below for clarification:





Configuration	Pin 1	Pin 2	Pin 3	Pin 4
Splitter	Input	Isolated	-3dB $\angle\theta-90$	-3dB $\angle\theta$
Splitter	Isolated	Input	-3dB $\angle\theta$	-3dB $\angle\theta-90$
Splitter	-3dB $\angle\theta-90$	-3dB $\angle\theta$	Input	Isolated
Splitter	-3dB $\angle\theta$	-3dB $\angle\theta-90$	Isolated	Input
***Combiner**	A $\angle\theta-90$	A $\angle\theta$	Isolated	Output
***Combiner**	A $\angle\theta$	A $\angle\theta-90$	Output	Isolated
***Combiner**	Isolated	Output	A $\angle\theta-90$	A $\angle\theta$
***Combiner**	Output	Isolated	A $\angle\theta$	A $\angle\theta-90$

*Note: "A" is the amplitude of the applied signals. When two quadrature signals with equal amplitudes are applied to the coupler as described in the table, they will combine at the output port. If the amplitudes are not equal, some of the applied energy will be directed to the isolated port.

Typical Performance Data (@25℃)

Frequency (MHz)	Coupling (dB)	Transmission (dB)	Insertion Loss (dB)	Isolation (dB)	Amplitude Balance (dB)	Phase (degree)	Return Loss(dB)			
							S11	S22	S33	S44
6500	-3.18	-3.34	-0.25	-16.71	0.08	85.38	-18.61	-15.50	-15.50	-15.69
7075	-3.12	-3.37	-0.23	-15.91	0.12	85.08	-18.61	-16.31	-16.31	-16.08
7650	-3.09	-3.41	-0.24	-16.22	0.16	85.74	-18.95	-17.96	-17.96	-17.30
8225	-3.04	-3.50	-0.25	-17.80	0.23	86.49	-20.01	-19.87	-19.87	-19.05
8800	-2.97	-3.60	-0.26	-20.31	0.30	86.67	-21.02	-19.40	-19.40	-18.94
9375	-2.92	-3.66	-0.26	-20.84	0.35	86.23	-20.28	-17.37	-17.37	-17.25
9950	-2.91	-3.68	-0.27	-18.31	0.37	85.22	-19.09	-16.14	-16.14	-16.14
10525	-2.98	-3.60	-0.27	-16.36	0.30	84.20	-19.26	-16.33	-16.33	-16.16
11100	-3.12	-3.48	-0.28	-15.90	0.18	84.27	-20.89	-17.76	-17.76	-17.46
11675	-3.18	-3.45	-0.31	-17.15	0.13	85.40	-23.99	-20.89	-20.89	-20.74
12250	-3.18	-3.52	-0.34	-20.58	0.17	85.72	-30.75	-22.92	-22.92	-26.04
12825	-3.16	-3.51	-0.32	-24.15	0.17	85.26	-51.02	-20.78	-20.78	-21.52
13400	-3.15	-3.50	-0.31	-20.37	0.17	84.64	-31.60	-20.45	-20.45	-17.68
13975	-3.22	-3.47	-0.34	-17.06	0.12	83.73	-26.90	-24.67	-24.67	-17.05
14550	-3.37	-3.34	-0.35	-15.98	-0.02	83.60	-20.90	-30.68	-30.68	-19.90
15125	-3.47	-3.30	-0.37	-16.90	-0.08	85.92	-17.12	-23.27	-23.27	-27.03
15700	-3.38	-3.49	-0.42	-20.51	0.06	87.67	-16.47	-19.65	-19.65	-24.40
16275	-3.35	-3.50	-0.41	-31.02	0.08	86.06	-31.70	-18.97	-18.97	-15.09
16850	-3.29	-3.56	-0.41	-30.26	0.13	87.03	-22.36	-21.47	-21.47	-21.34
17425	-3.34	-3.46	-0.39	-19.30	0.06	86.90	-30.20	-29.75	-29.75	-25.64
18000	-3.40	-3.51	-0.44	-15.38	0.06	88.25	-17.78	-21.21	-21.21	-20.45

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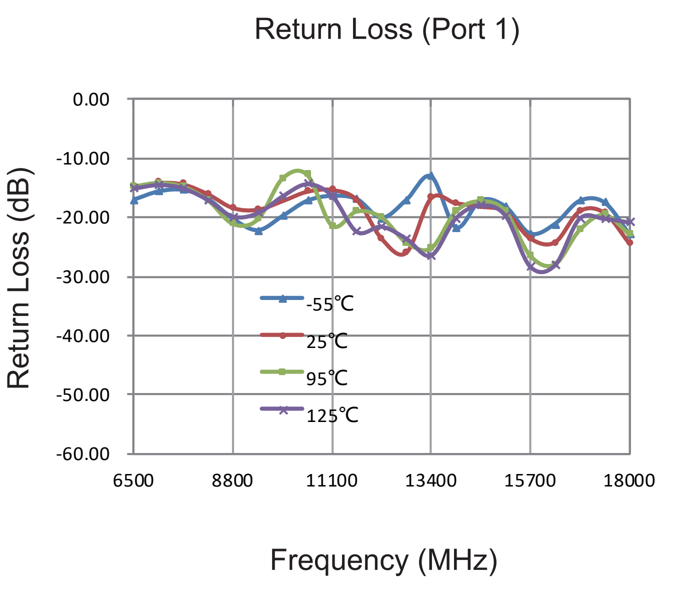
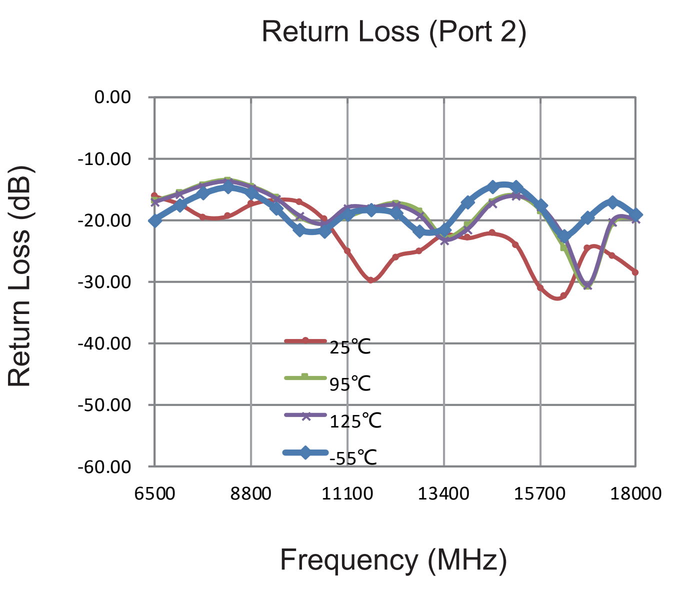
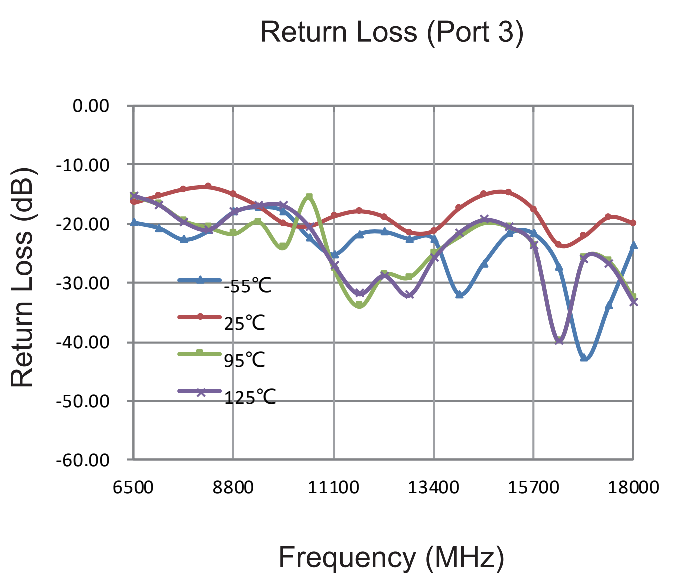
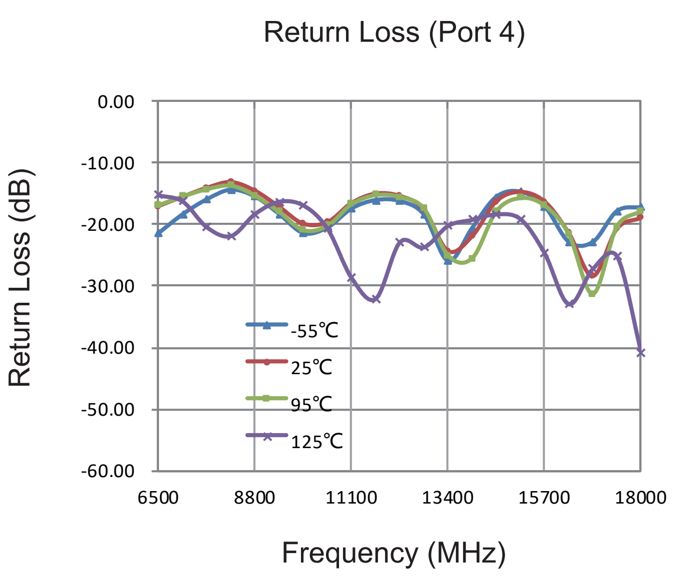
Typical Performance (-55°C,25°C,95°C,125°C: 6500-18000 MHz)









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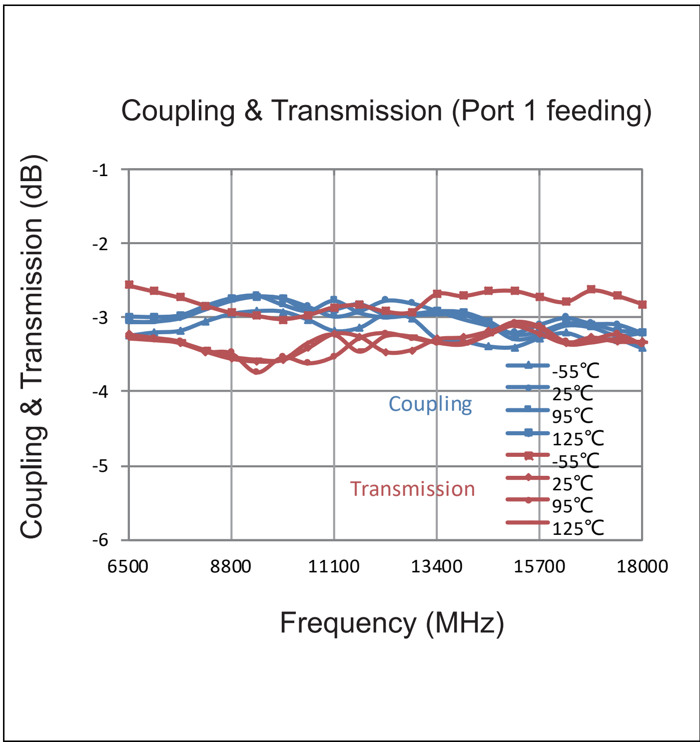

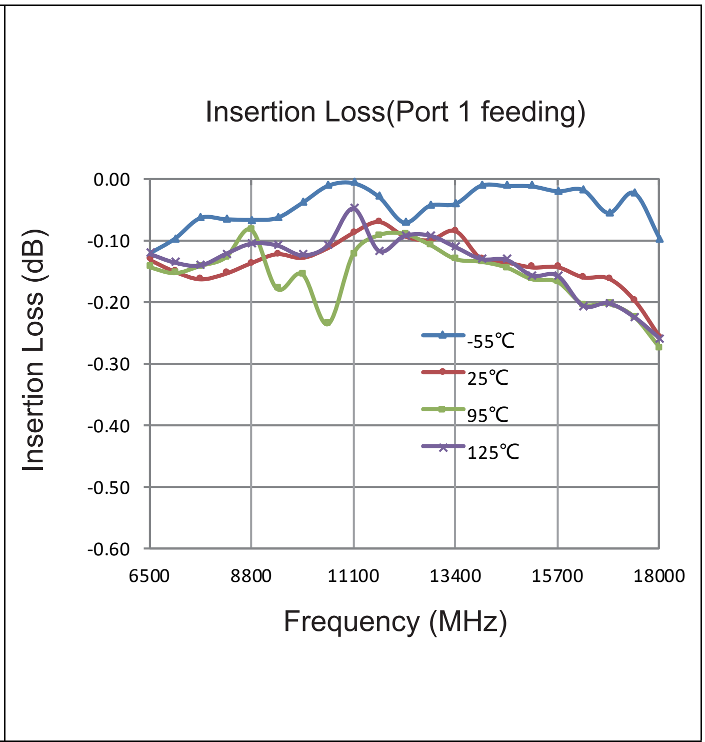

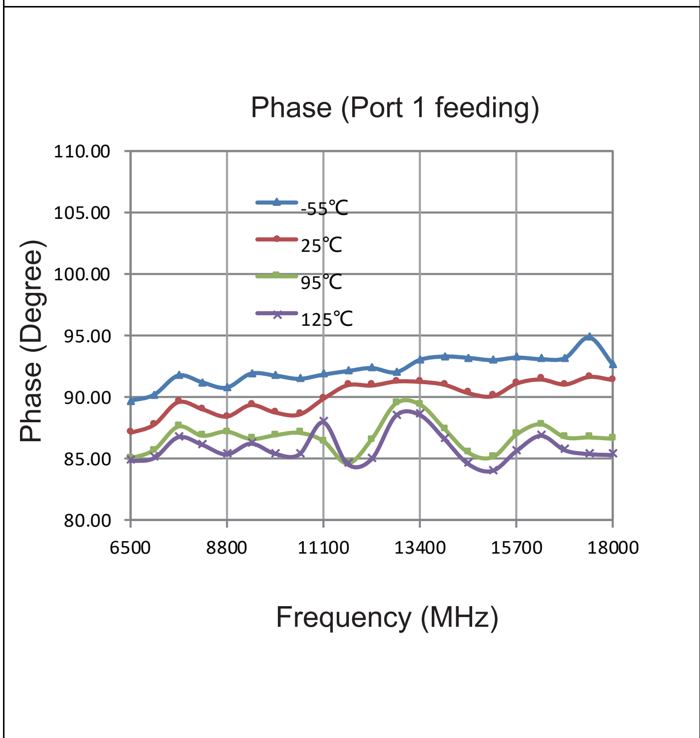

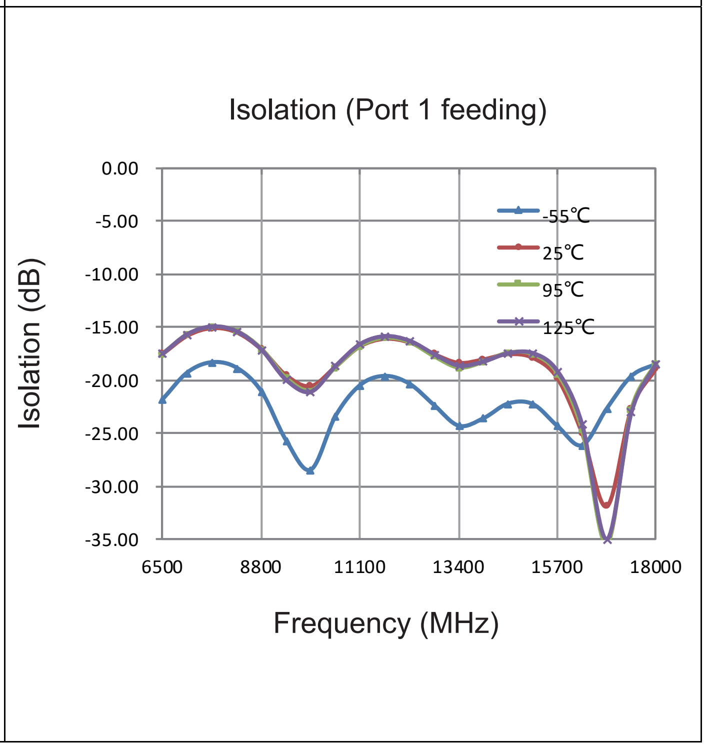

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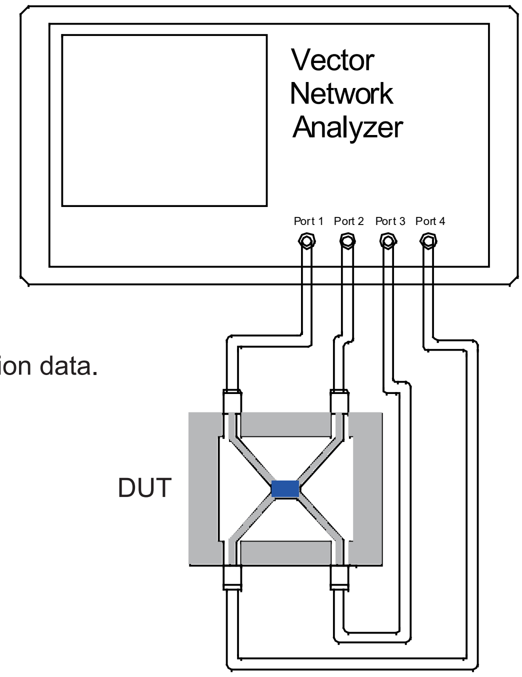
Definition of Measured Specifications

Parameter	Definition	Mathematical Representation
VSWR (Voltage Standing Wave Ratio)	The impedance match of the coupler to a 50Ω system. A VSWR of 1:1 is optimal.	VSWR = $\frac{V_{max}}{V_{min}}$ Vmax = voltage maxima of a standing wave Vmin = voltage minima of a standing wave
Return Loss	The impedance match of the coupler to a 50Ω system. Return Loss is an alternate means to express VSWR.	Return Loss (dB)= 20log $\frac{VSWR+1}{VSWR-1}$
Insertion Loss	The input power divided by the sum of the power at the two output ports.	Insertion Loss(dB)= 10log $\frac{P_{in}}{P_{cpl}+P_{transmission}}$
Isolation	The input power divided by the power at the isolated port.	Isolation(dB)= 10log $\frac{P_{in}}{P_{iso}}$
Phase Balance	The difference in phase angle between the two output ports.	Phase at coupled port – Phase at transmisson port
Amplitude Balance	The power at each output divided by the average power of the two outputs.	10log $\frac{P_{cpl}}{\left(\frac{P_{cpl}+P_{transmission}}{2}\right)}$ and 10log $\frac{P_{transmission}}{\left(\frac{P_{cpl}+P_{transmission}}{2}\right)}$

Test Method

1. Calibrating your vector network analyzer.
2. Connect the VNA 4 Port to DUT respectively.
3. Measure the data of coupling through port 1 to port 4(S41).
4. Measure the data of transmission through port 1 to port 3(S31).
5. Measure the data of isolation through port 1 to port 2(S21).
6. Measure the data of phase port 4 & port 3(port 1 feeding).
7. Measure the data of return loss port 1, port 2, port 3 & port 4.
8. According to the above data to calculate insertion loss, amplitude balance & phase.



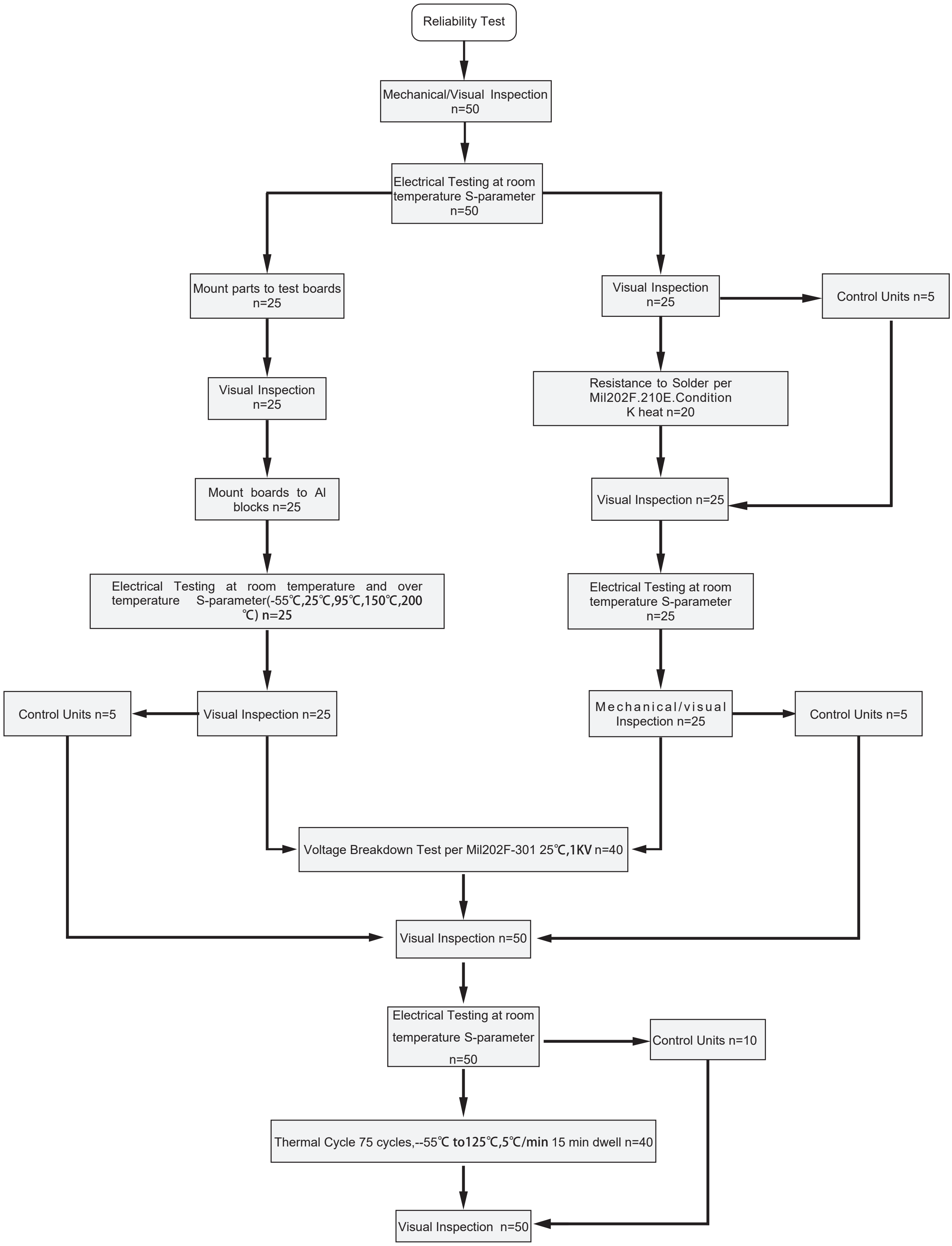
Note:

1. When calculating insertion loss at room temperature, demo board loss should be removed from both coupling & transmission data.

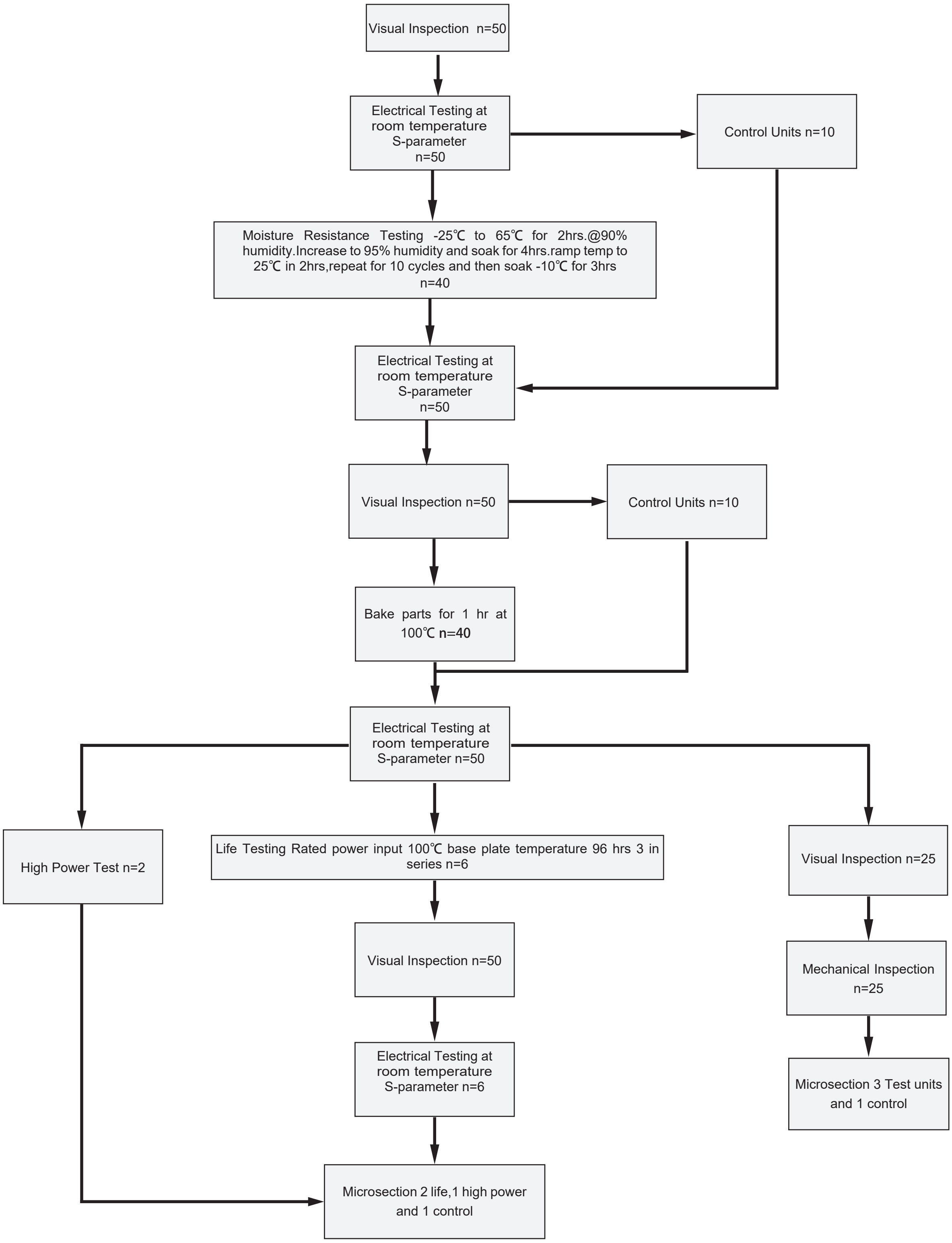
Please refer to the below table for demo board loss :

Frequency Range(MHz)	Demo Board Loss (dB) @25℃
470-860	0.07
800-1000	0.10
1200-1700	0.15
1700-2000	0.15
2000-2300	0.20
2300-2700	0.25

Reliability Test Flow



Reliability Test Flow



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