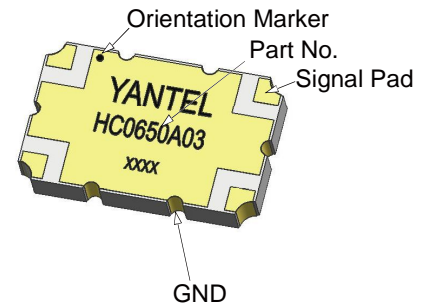


### Description

The HC0650A03 is a low profile, high performance 3dB hybrid coupler in a new easy to use, manufacturing friendly surface mount package. It is designed for CMMB band applications. The HC0650A03 is designed particularly for balanced power and low noise amplifiers, plus signal distribution and other applications where low insertion loss and tight amplitude and phase balance is required. It can be used in high power applications up to 150 Watts.

Parts have been subjected to rigorous qualification testing and they are manufactured using materials with coefficients of thermal expansion (CTE) compatible with common substrates such as FR4, G-10, RF-35, RO4350 and polyimide.



### Features:

- 470 –860 MHz
- CMMB
- High Power
- Very Low Loss
- Tight Amplitude Balance
- High Isolation
- Low VSWR
- Good Repeatability
- CTE compatible with FR4, G-10, RF-35, RO4350B and polyimide
- Immersion gold, prevent surface oxidation & scratch
- RoHS Compliant
- Tape & Reel Package available

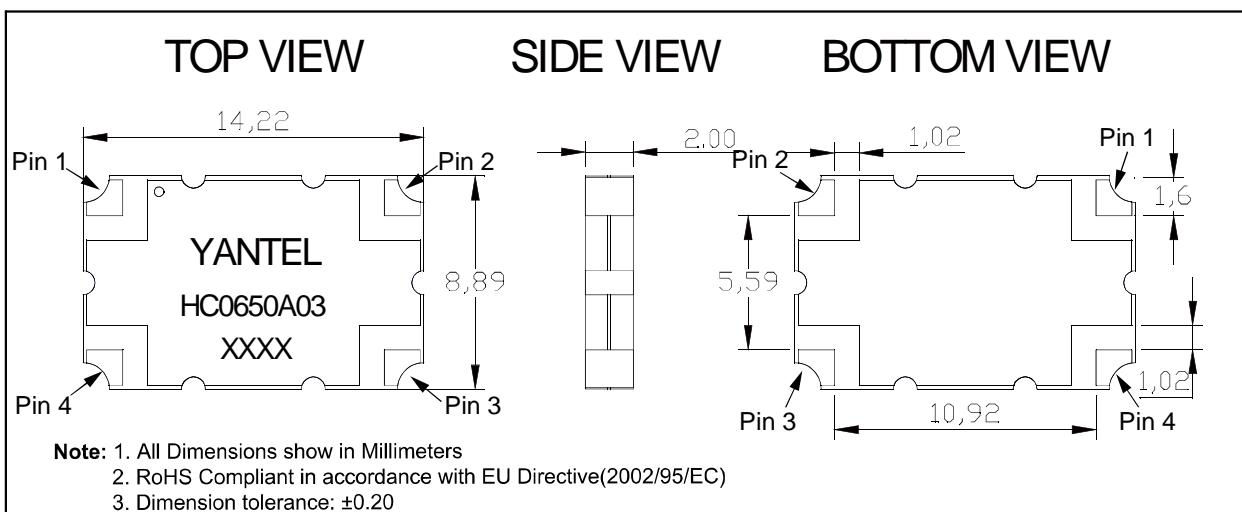
### Electrical Specifications

Frequency	Isolation	Insertion Loss	VSWR	Amplitude Balance
MHz	dB Min	dB Max	Max : 1	dB Max
470- 860	17	0.30	1.32	± 0.80
<b>Phase Balance</b>		<b>Power</b>		<b>Operating Temp.</b>
Degrees	Avg. CW Watts	°C		
90 ± 2.5	150	-55 to +95		

Note:

1. All above test data resulting from specify demo board.
2. Insertion loss has removed the thru board loss.

### Mechanical Outline

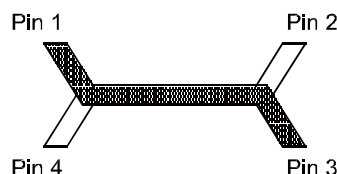


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### Hybrid Coupler Pin Configuration

The HC0650A03 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
<b>Splitter</b>	Input	Isolated	-3dB $\angle \theta - 90$	-3dB $\angle \theta$
<b>Splitter</b>	Isolated	Input	-3dB $\angle \theta$	-3dB $\angle \theta - 90$
<b>Splitter</b>	-3dB $\angle \theta - 90$	-3dB $\angle \theta$	Input	Isolated
<b>Splitter</b>	-3dB $\angle \theta$	-3dB $\angle \theta - 90$	Isolated	Input
<b>*Combiner</b>	A $\angle \theta - 90$	A $\angle \theta$	Isolated	Output
<b>*Combiner</b>	A $\angle \theta$	A $\angle \theta - 90$	Output	Isolated
<b>*Combiner</b>	Isolated	Output	A $\angle \theta - 90$	A $\angle \theta$
<b>*Combiner</b>	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°C)

Frequency (MHz)	Coupling (dB)	Transmission (dB)	Insertion Loss (dB)	Isolation (dB)	Amplitude Balance (dB)	Phase (degree)	Return Loss(dB)			
							S11	S22	S33	S44
465	-3.71	-2.91	-0.28	-17.73	-0.80	88.34	-18.82	-17.49	-17.53	-17.62
485	-3.57	-2.97	-0.25	-17.99	-0.60	88.59	-19.46	-17.99	-17.99	-17.96
505	-3.47	-3.06	-0.25	-18.29	-0.41	88.80	-20.21	-18.53	-18.50	-18.34
525	-3.39	-3.11	-0.23	-18.63	-0.28	89.00	-20.99	-19.12	-19.05	-18.72
545	-3.28	-3.17	-0.22	-18.98	-0.11	89.28	-21.87	-19.78	-19.63	-19.14
565	-3.22	-3.23	-0.22	-19.49	0.01	89.39	-22.83	-20.51	-20.27	-19.55
585	-3.16	-3.30	-0.22	-19.94	0.14	89.44	-23.88	-21.20	-20.94	-19.99
605	-3.11	-3.32	-0.20	-20.40	0.21	89.52	-25.08	-21.89	-21.63	-20.39
625	-3.09	-3.37	-0.21	-20.96	0.28	89.68	-26.43	-22.64	-22.41	-20.85
645	-3.07	-3.39	-0.22	-21.49	0.32	89.78	-28.04	-23.47	-23.27	-21.36
665	-3.05	-3.39	-0.21	-22.14	0.34	89.86	-29.81	-24.39	-24.23	-21.90
685	-3.03	-3.37	-0.19	-22.76	0.35	90.03	-31.96	-25.46	-25.33	-22.55
705	-3.04	-3.38	-0.19	-23.44	0.34	90.10	-34.60	-26.68	-26.46	-23.25
725	-3.07	-3.38	-0.21	-24.12	0.31	90.20	-36.89	-28.13	-27.65	-24.02
745	-3.07	-3.33	-0.19	-24.74	0.26	90.36	-36.97	-29.74	-28.98	-24.77
765	-3.10	-3.30	-0.19	-25.35	0.20	90.51	-34.65	-31.50	-30.42	-25.63
785	-3.15	-3.22	-0.18	-25.73	0.07	90.45	-31.79	-33.18	-31.57	-26.63
805	-3.24	-3.18	-0.20	-25.87	-0.06	90.60	-29.28	-34.51	-32.18	-27.68
825	-3.36	-3.14	-0.24	-25.73	-0.22	90.78	-27.20	-34.69	-31.68	-28.52
845	-3.50	-3.09	-0.28	-25.21	-0.41	90.98	-25.40	-33.19	-30.16	-28.77
865	-3.59	-2.99	-0.26	-24.49	-0.60	91.24	-23.81	-30.95	-28.29	-28.29

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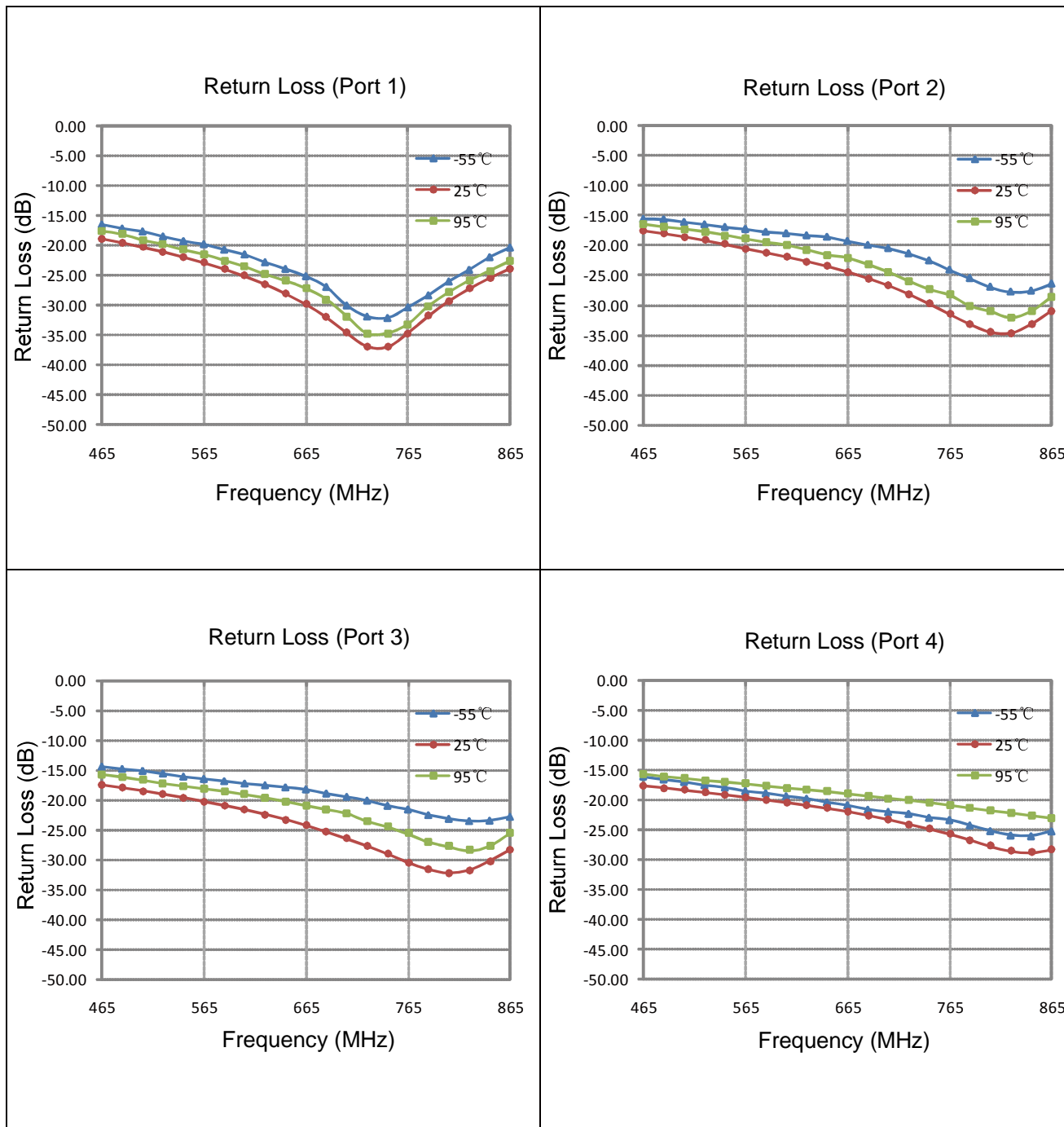
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# HC0650A03

Hybrid Coupler 3 dB, 90°

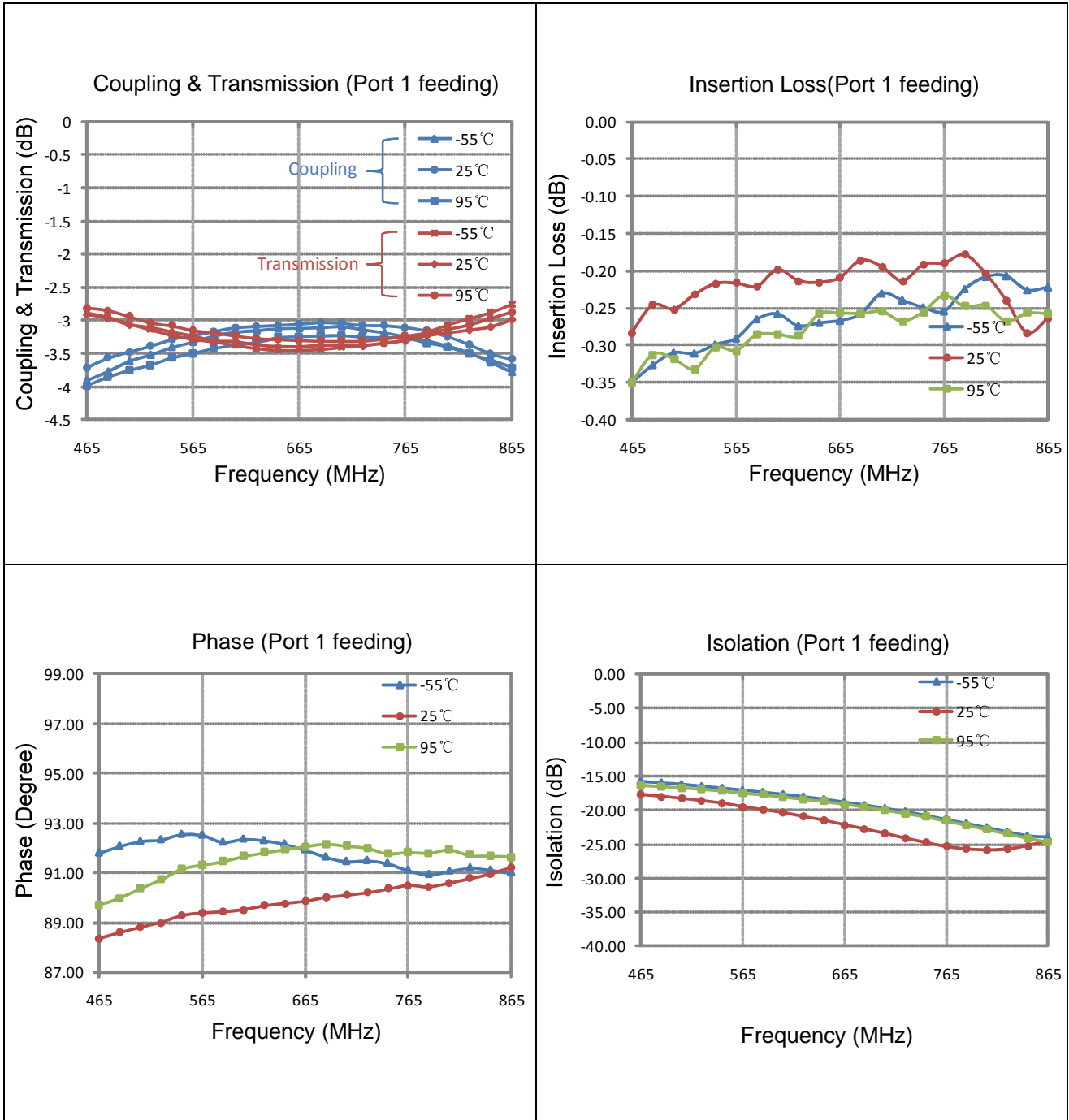
Typical Performance (-55°C, 25°C, 95°C: 470-860 MHz)



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**Typical Performance (-55°C, 25°C, 95°C: 470-860 MHz)**



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### Description of Measured Specifications

Parameter	Description
<b>VSWR</b>	Voltage standing wave ratio, the impedance match to 50 $\Omega$ , the ideal value is 1:1.
<b>Return Loss</b>	Loss of signal power resulting from the reflection caused by discontinuity of transmission line.
<b>Insertion Loss</b>	The input power divided by sum of power at the coupling port & transmission port.
<b>Coupling</b>	The input power divided by the power at coupling port.
<b>Transmission</b>	The input power divided by the power at transmission port.
<b>Directivity</b>	The power at the coupling port divided by the power at the isolated.

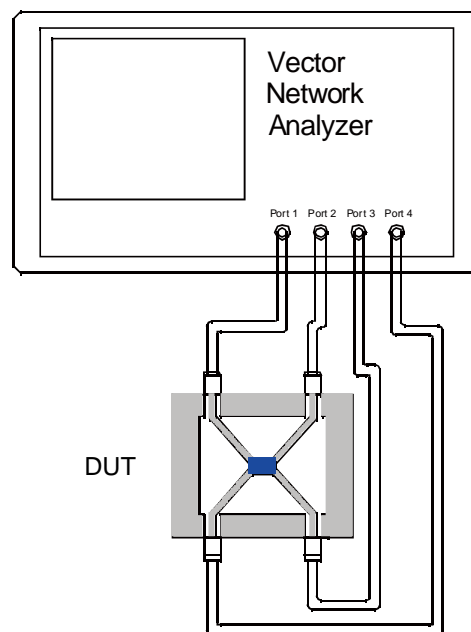
### Test Method

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 2(S21).
5. Measure the data of isolation through port 1 to port 3(S31).
6. Measure the data of return loss port 1, port 2, port 3 & port 4.
7. According to the above data to calculate insertion loss, directivity.

#### Note:

1. When calculating insertion loss at room temperature, coupling & transmission data both need remove demo board loss. Please see demo board loss data below the table :

Frequency Range(MHz)	Demo Board Loss (dB) @25°C
<b>470-860</b>	0.06~0.10
<b>800-1000</b>	0.10~0.15
<b>1200-1700</b>	0.15~0.20
<b>1700-2000</b>	0.20~0.25
<b>2000-2300</b>	0.20~0.25
<b>2300-2700</b>	0.25~0.30



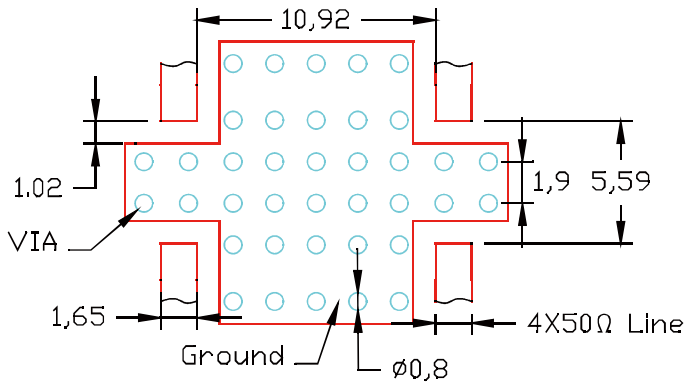
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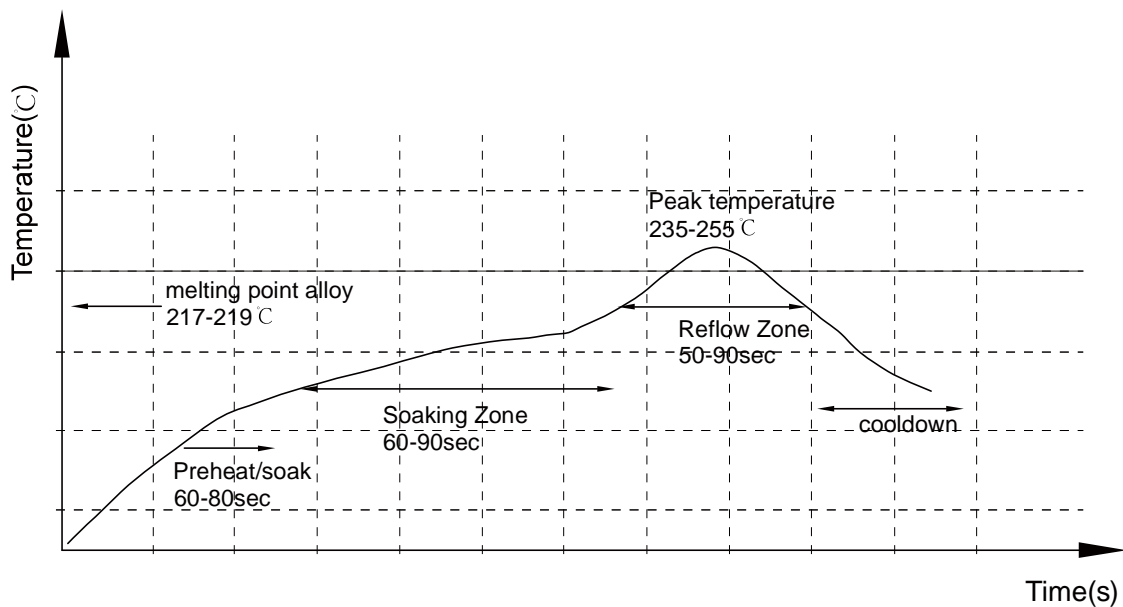
### Recommended PCB Layout



**NOTE:**

1. 50  $\Omega$  line width is shown above designing from RO4350B dielectric thickness 0.762mm; copper 1 OZ
2. Bottom side of the PCB is continuous ground plane.
3. All dimensions shown in mm.

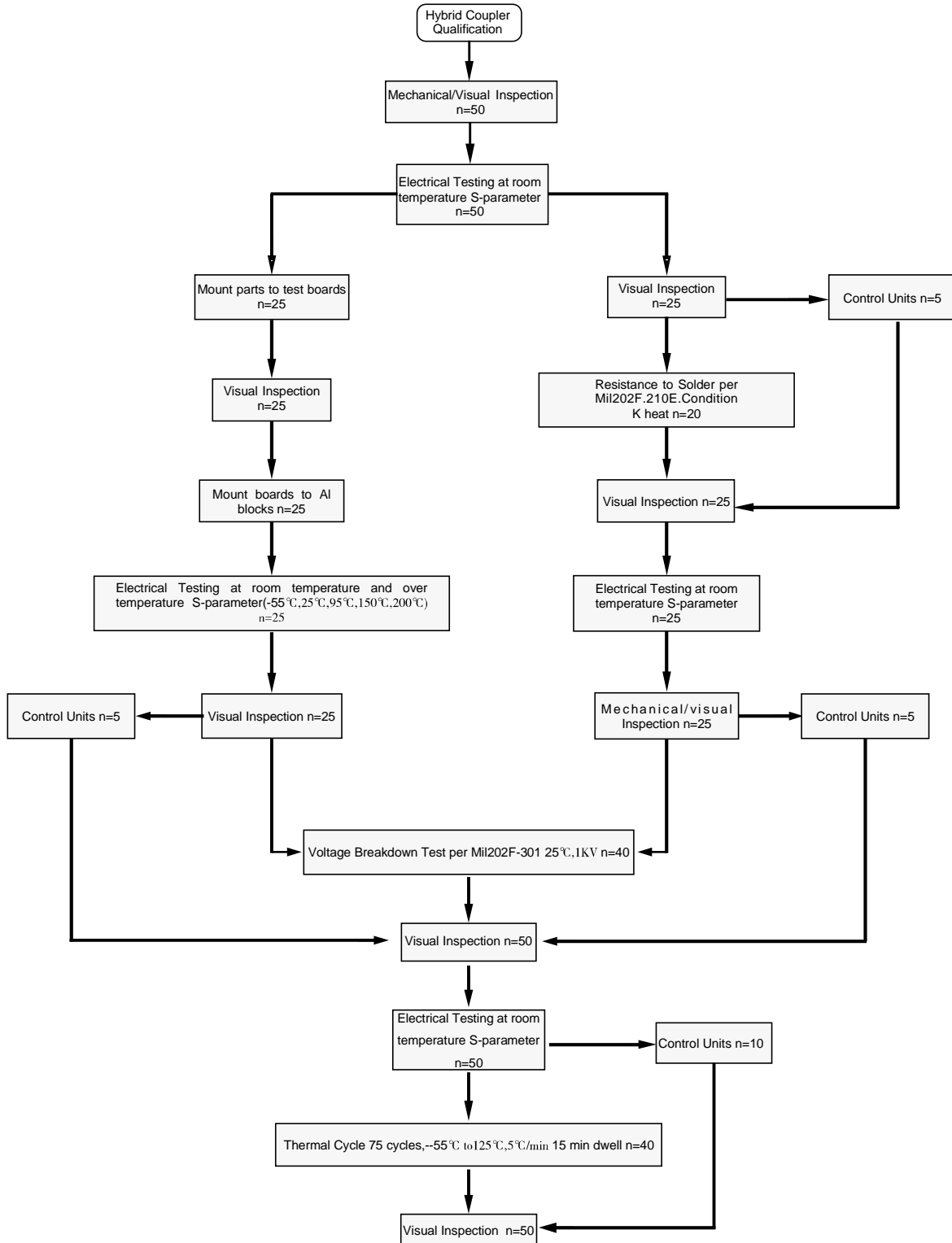
### Reflow Profile



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### Reliability Test Flow



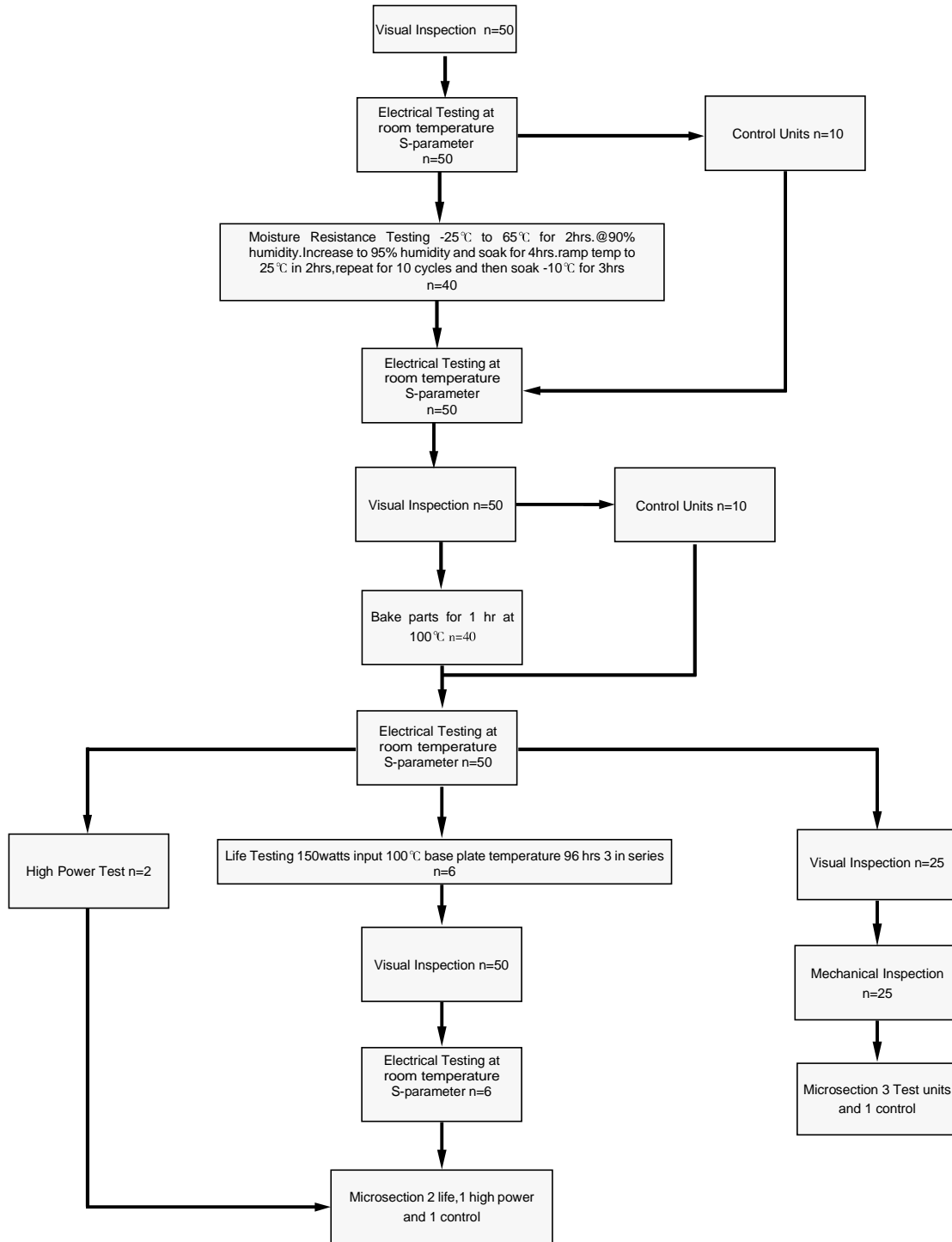
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**Reliability Test Flow**



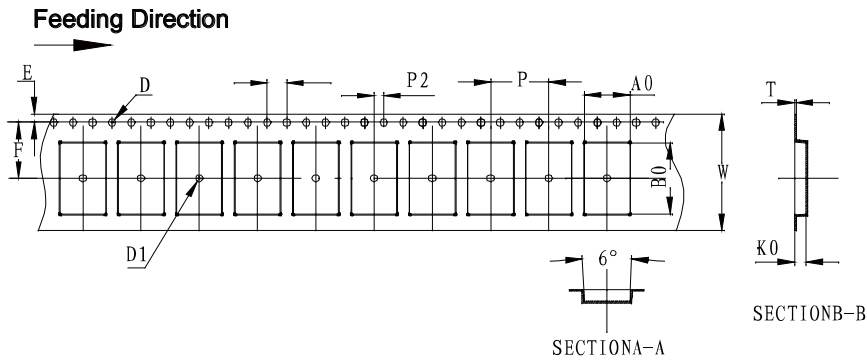
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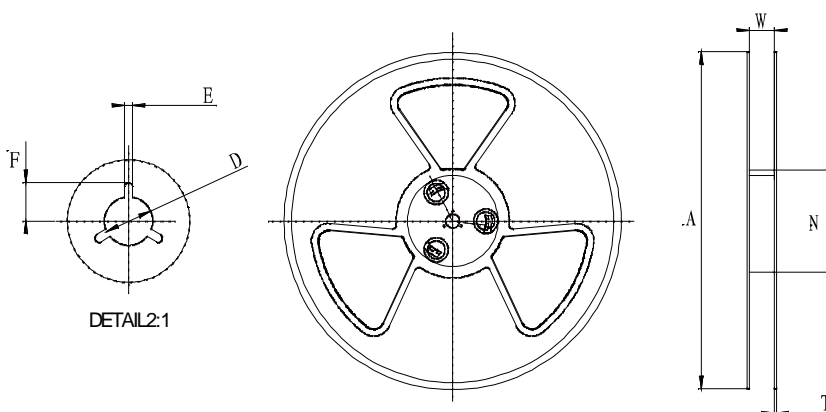
### Tape and Reel Drawing



Notice:

- A. 10 Sprocket hole pitch cumulative tolerance is 0.2mm.
- B. Carrier camber shall be not more than 1mm per 100mm through a length of 250mm.
- C. All dimensions meet EIA-418-B requirements
- D. A0 & B0 measured as indicated.
- E. K0 measured from a place on the inside bottom of the pocket to top surface of carrier.
- F. Material: PE 100
- G. Thickness: 0.30±0.05mm
- H. 2000 units (maximum) / T&R

ITEM	W	A0	B0	K0	P	F	E	D	D1	P0	P2	T	13"	
DIM(mm)	24.00	9.30	14.70	2.40	12.00	11.50	1.75	1.50	1.50	4.00	2.00	0.30	M/R	P/R
TOLE	+0.30 -0.30	+0.10 -0.10	+0.10 -0.10	+0.10 -0.10	+0.10 -0.10	+0.10 -0.10	+0.10 -0.10	+0.10 -0.00	+0.10 -0.00	+0.10 -0.10	+0.10 -0.10	+0.05 -0.05	25.2MR	2000pcs



Symbol	Dimensions(mm)
W	24.5±0.4
A	330±0.5
T	100±0.3
N	1.8±0.2
E	2.1±0.3
F	10.75±0.3
D	13.5+0.5/-0.2

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