

# Data Sheet

## QF1600F06A

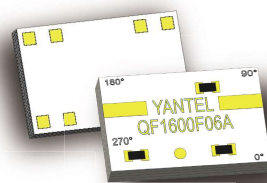
Quadrifilar Directional Coupler  
1520 MHz-1660 MHz



Rev A1.1

### Features

- Ultra Small Size (5.3×3.4mm)
- Excellent phase & amplitude balance
- Excellent repeatability
- Passive RF Component, no need external DC power supply
- Have one Input port and four Output ports that have -6dB -(0°, 90°, 180°, 270°) of phase difference
- Quadrifilar Coupler, 4-Phased Antenna Feeder, Helicaled Antenna Feeder
- Operating Temperature: -40°C to +105°C
- Tape & Reel

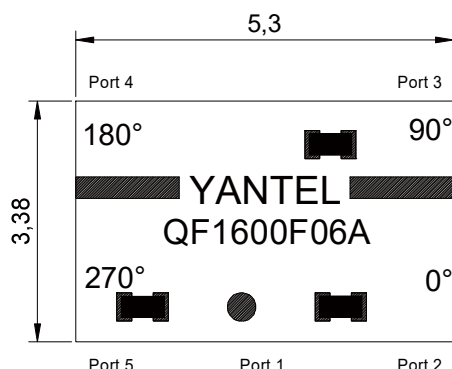


### Applications

- Realizing the World's Most Compact High Precision GNSS Antenna (GPS, Beidou, Galileo, Glonass)



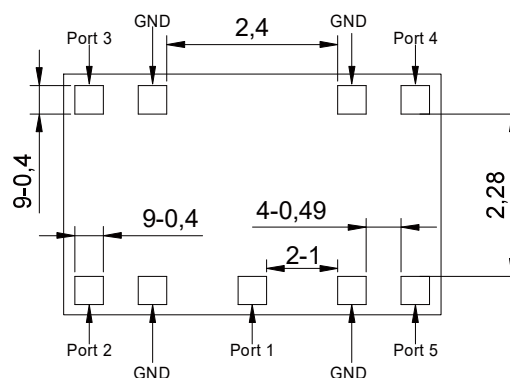
### Mechanical Outline



TOP VIEW



SIDE VIEW



BOTTOM VIEW

Port 1	Port 2	Port 3	Port 4	Port 5
Input	Output1 -6dB, 0°	Output2 -6dB, -90°	Output3 -6dB, -180°	Output4 -6dB, -270°

#### Mechanical Outline

- Dimensions are in Millimeters
- Tolerances are Non-Cumulative
- Dimension tolerance: ±0.20mm[±0.008inch]

### Electrical Specifications at 25° C

Part No.	Freq. Range (MHz) FL~FU	Power (W)	Size LxW (mm)	Return Loss Min (dB)	Insertion Loss Max (dB)	Isolation (dB)	Phase Balance (deg)	Amplitude Balance (dB)
QF1600F06A	1520-1660	5	5.3X3.4	15	0.70	20	90±6.5	±0.60

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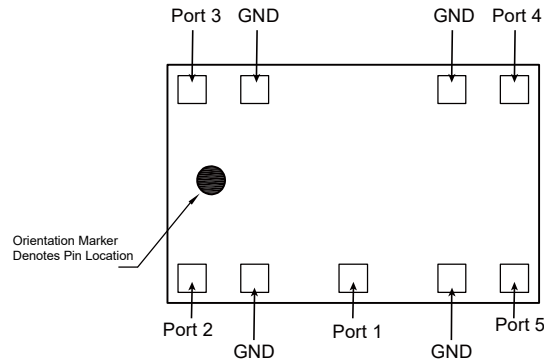
### 1520 MHz-1660 MHz



Rev A1.1

#### Hybrid Coupler Pin Configuration

The QF1600F06A has an orientation marker to denote Pin1. Once port one has been identified the other ports are known automatically. Please see the chart below for clarification:



Port 1	Port 2	Port 3	Port 4	Port 5
Input	Output1 -6dB, 0°	Output2 -6dB, -90°	Output3 -6dB, -180°	Output4 -6dB, -270°

#### Typical Performance Data (@25°C)

Frequency (MHz)	S21 (dB)	S31 (dB)	S41 (dB)	S51 (dB)	Amplitude Balance	Insertion Loss	Return Loss(dB)				
							S11	S22	S33	S44	S55
1520	-6.78	-6.79	-7.00	-6.21	0.48	-0.67	-17.38	-16.64	-21.50	-15.62	-19.96
1527	-6.76	-6.80	-7.00	-6.21	0.47	-0.66	-17.46	-16.60	-21.45	-15.61	-19.90
1534	-6.74	-6.80	-7.00	-6.21	0.47	-0.66	-17.55	-16.56	-21.42	-15.59	-19.89
1541	-6.72	-6.80	-7.00	-6.21	0.46	-0.65	-17.63	-16.52	-21.41	-15.55	-19.94
1548	-6.70	-6.80	-7.00	-6.23	0.44	-0.65	-17.71	-16.48	-21.40	-15.51	-19.99
1555	-6.67	-6.80	-7.00	-6.25	0.42	-0.65	-17.80	-16.44	-21.39	-15.47	-20.04
1562	-6.65	-6.80	-7.00	-6.28	0.40	-0.65	-17.88	-16.41	-21.38	-15.43	-20.08
1569	-6.63	-6.80	-6.99	-6.30	0.38	-0.65	-17.97	-16.37	-21.37	-15.39	-20.13
1576	-6.61	-6.80	-6.99	-6.32	0.36	-0.65	-18.03	-16.32	-21.37	-15.36	-20.12
1583	-6.59	-6.80	-6.99	-6.34	0.34	-0.65	-18.07	-16.27	-21.37	-15.34	-20.04
1590	-6.57	-6.81	-6.99	-6.36	0.32	-0.65	-18.11	-16.22	-21.37	-15.33	-19.96
1597	-6.55	-6.81	-6.99	-6.38	0.31	-0.65	-18.16	-16.17	-21.37	-15.31	-19.88
1604	-6.54	-6.81	-6.98	-6.40	0.31	-0.65	-18.20	-16.11	-21.37	-15.29	-19.80
1611	-6.52	-6.81	-6.98	-6.42	0.31	-0.66	-18.24	-16.06	-21.37	-15.27	-19.72
1618	-6.50	-6.81	-6.98	-6.43	0.30	-0.66	-18.29	-16.03	-21.34	-15.28	-19.64
1625	-6.48	-6.82	-6.98	-6.45	0.30	-0.66	-18.37	-16.04	-21.27	-15.31	-19.56
1632	-6.46	-6.82	-6.98	-6.47	0.30	-0.66	-18.44	-16.04	-21.20	-15.34	-19.48
1639	-6.44	-6.82	-6.98	-6.49	0.30	-0.66	-18.51	-16.04	-21.14	-15.37	-19.40
1646	-6.43	-6.82	-6.97	-6.51	0.30	-0.66	-18.59	-16.04	-21.07	-15.41	-19.32
1653	-6.41	-6.82	-6.97	-6.53	0.29	-0.66	-18.66	-16.04	-21.00	-15.44	-19.24
1660	-6.39	-6.83	-6.97	-6.55	0.29	-0.66	-18.76	-16.02	-20.98	-15.47	-19.19

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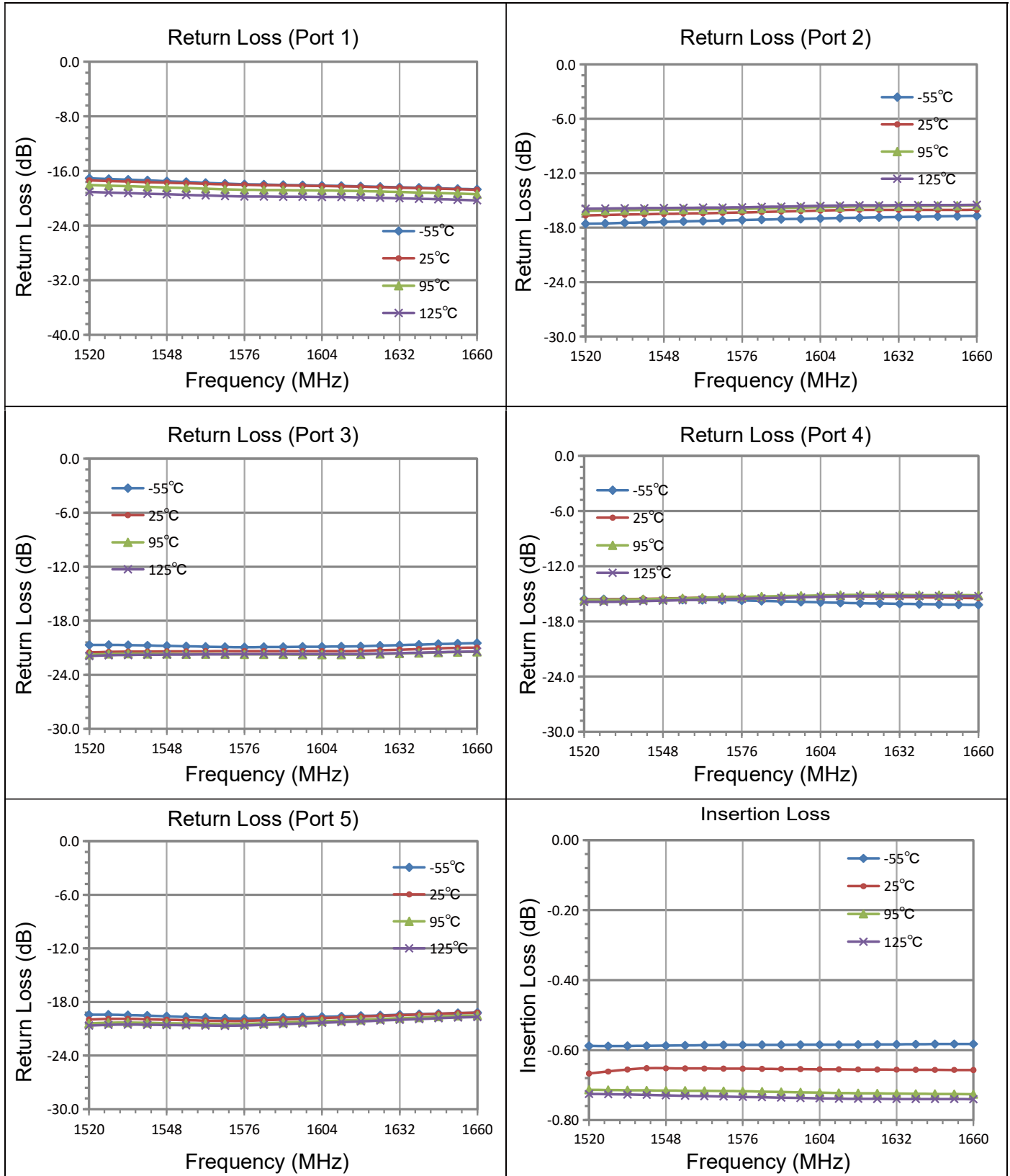
### Quadrifilar Directional Coupler

### 1520 MHz-1660 MHz



Rev A1.1

#### Typical Performance (-55°C,25°C,95°C,125°C: 1520-1660 MHz)



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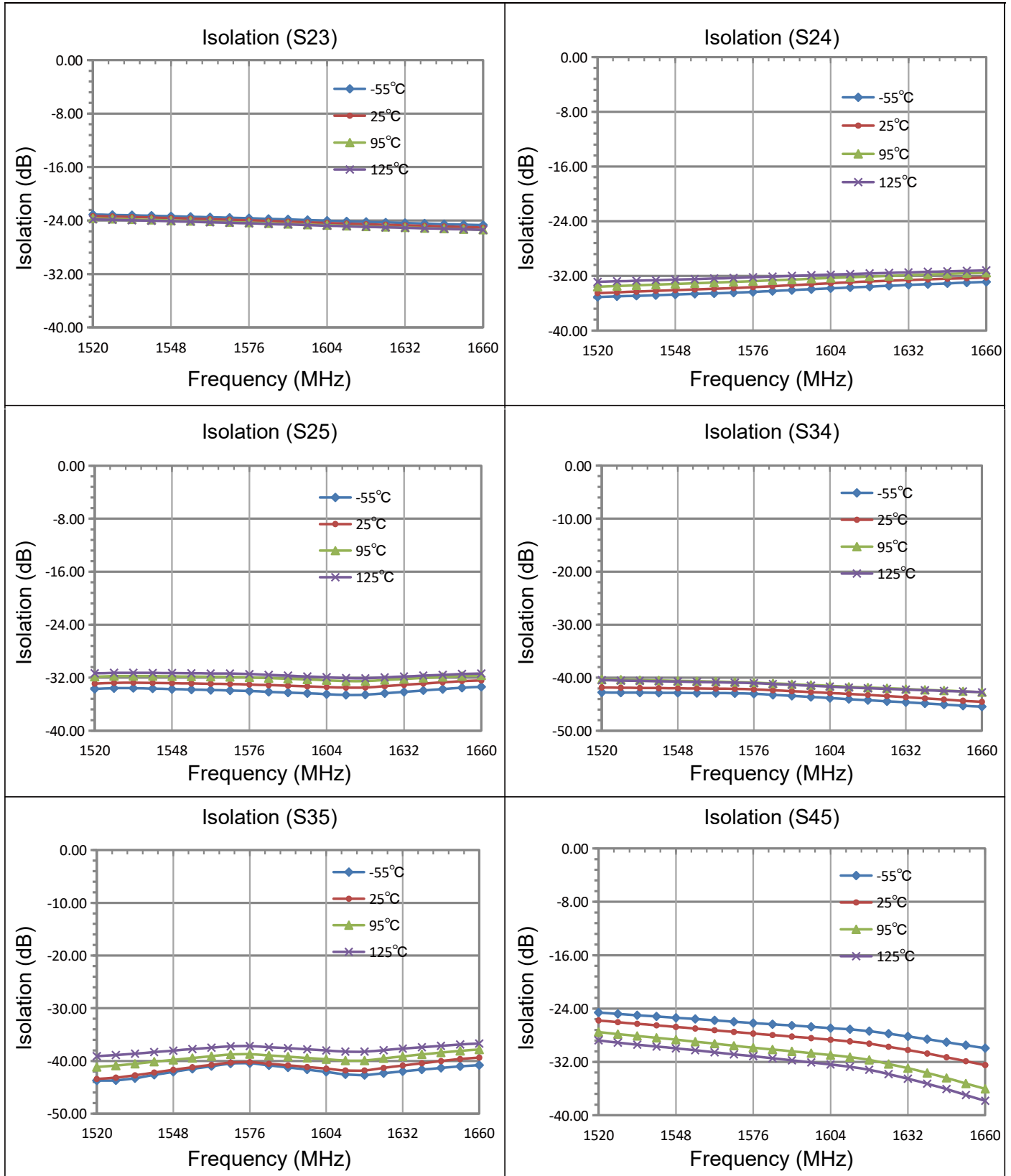
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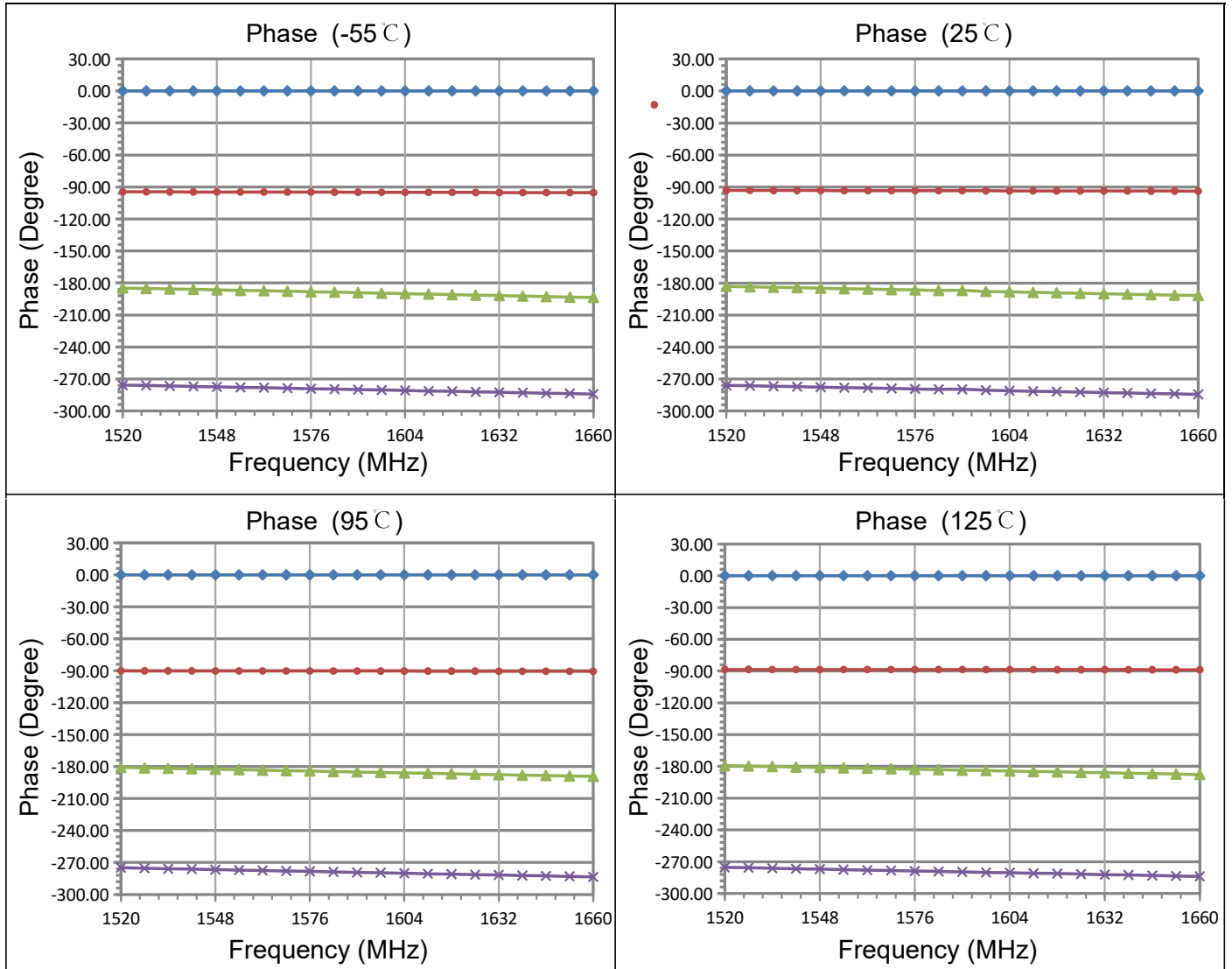
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Rev A1.1

#### Definition of Measured Specifications

	S-Parameter(dB)	Power Method[dB]
Output 1	S <sub>21</sub>	$10 \cdot \log \left( \frac{P_{out1}}{P_{in}} \right)$
Output 2	S <sub>31</sub>	$10 \cdot \log \left( \frac{P_{out2}}{P_{in}} \right)$
Output 3	S <sub>41</sub>	$10 \cdot \log \left( \frac{P_{out3}}{P_{in}} \right)$
Output 4	S <sub>51</sub>	$10 \cdot \log \left( \frac{P_{out4}}{P_{in}} \right)$
Insertion Loss		$10 \cdot \log \left( \frac{P_{in}}{P_{out1+out2+out3+out4}} \right)$
Amplitude Balance		$10 \cdot \log \left( \frac{P_{out1-out4}}{\frac{P_{out1+out2+out3+out4}}{2}} \right)$
Isolation 1	S <sub>23</sub>	$10 \cdot \log \left( \frac{P_{out3}}{P_{out2}} \right)$
Isolation 2	S <sub>24</sub>	$10 \cdot \log \left( \frac{P_{out4}}{P_{out2}} \right)$
Isolation 3	S <sub>25</sub>	$10 \cdot \log \left( \frac{P_{out5}}{P_{out2}} \right)$
Isolation 4	S <sub>34</sub>	$10 \cdot \log \left( \frac{P_{out4}}{P_{out3}} \right)$
Isolation 5	S <sub>35</sub>	$10 \cdot \log \left( \frac{P_{out5}}{P_{out3}} \right)$
Isolation 6	S <sub>45</sub>	$10 \cdot \log \left( \frac{P_{out5}}{P_{out4}} \right)$
Phase Balance 1(0°)	Phase (S <sub>21</sub> )	
Phase Balance 2(-90°)	Phase (S <sub>31</sub> ) -Phase (S <sub>21</sub> )	
Phase Balance 2(-180°)	Phase (S <sub>41</sub> ) -Phase (S <sub>21</sub> )	
Phase Balance 2(-270°)	Phase (S <sub>51</sub> ) -Phase (S <sub>21</sub> )	

$P_{in}$  : Power of Input Port1       $P_{out1}$ : Power of output Port2  
 $P_{out2}$ : Power of output Port3       $P_{out3}$ : Power of output Port4  
 $P_{out4}$ : Power of output Port5

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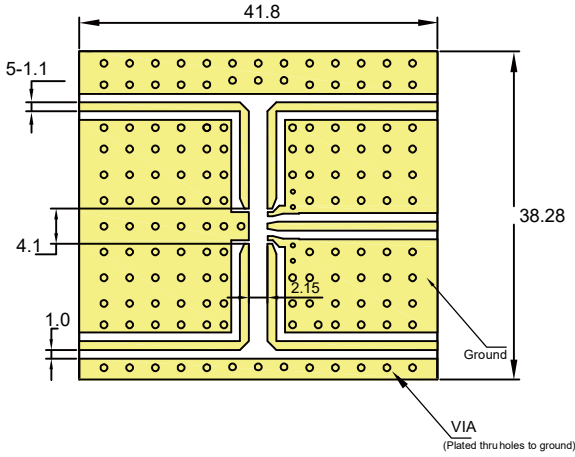
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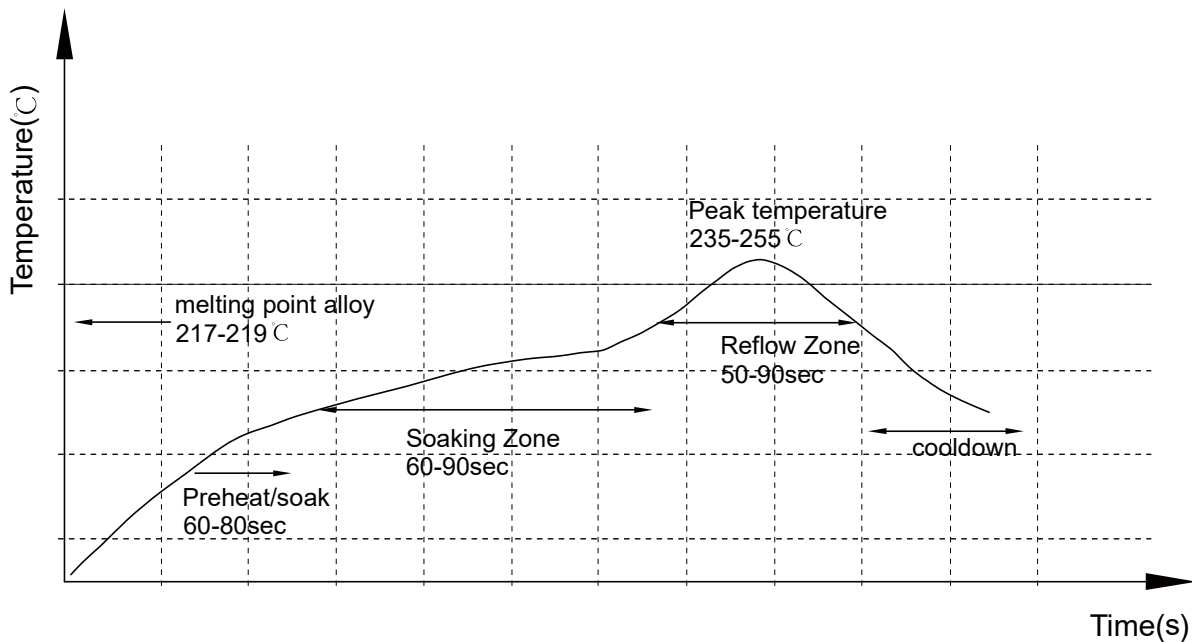
#### Recommended PCB Layout



#### NOTE:

1. 50Ω line width is shown above designing from  $Er=3.66$  THK=0.508mm copper 0.5 OZ
2. Bottom side of the PCB is continuous ground plane.
3. All dimensions shown in mm [inch].

#### Reflow Profile



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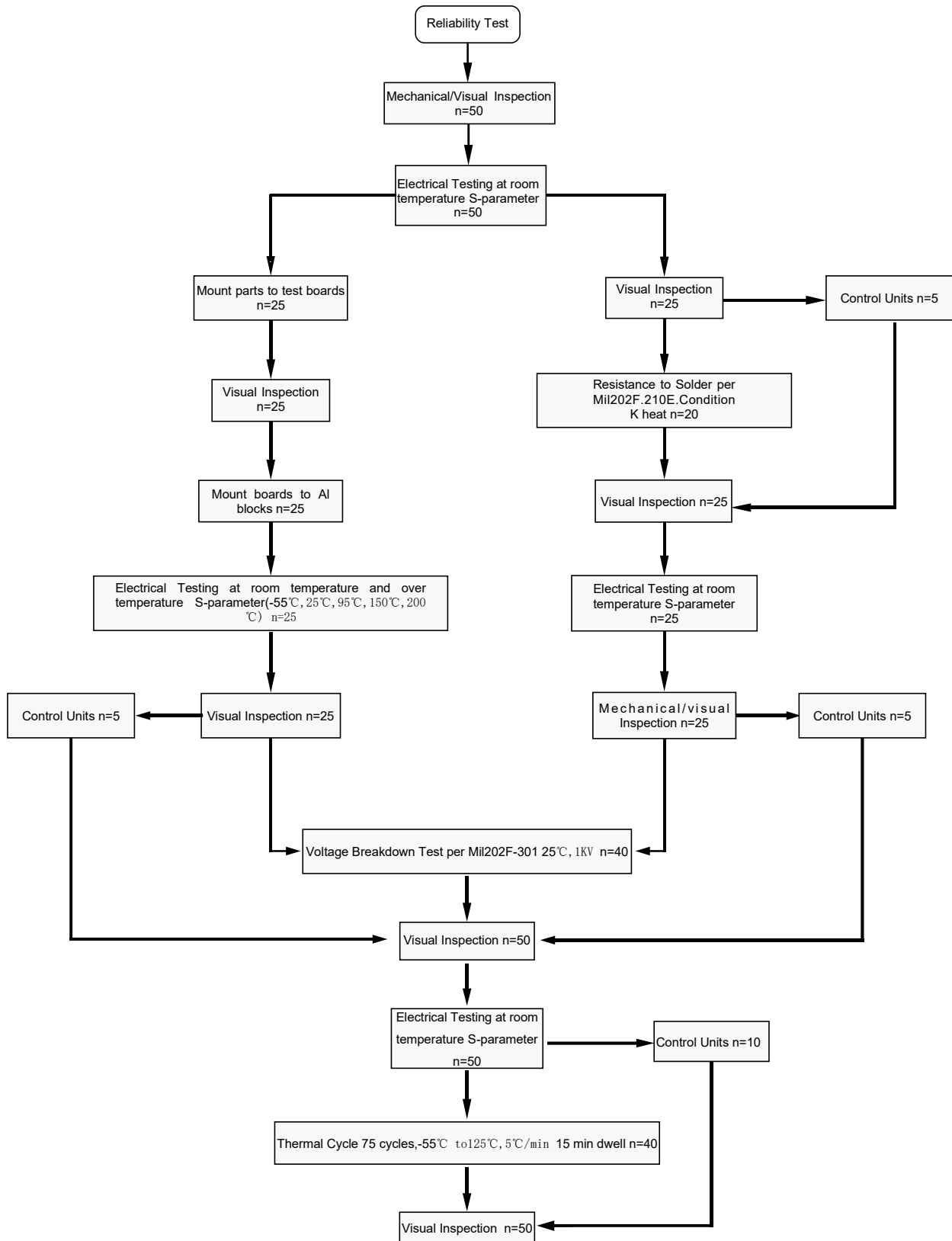
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Rev A1.1

#### Reliability Test Flow



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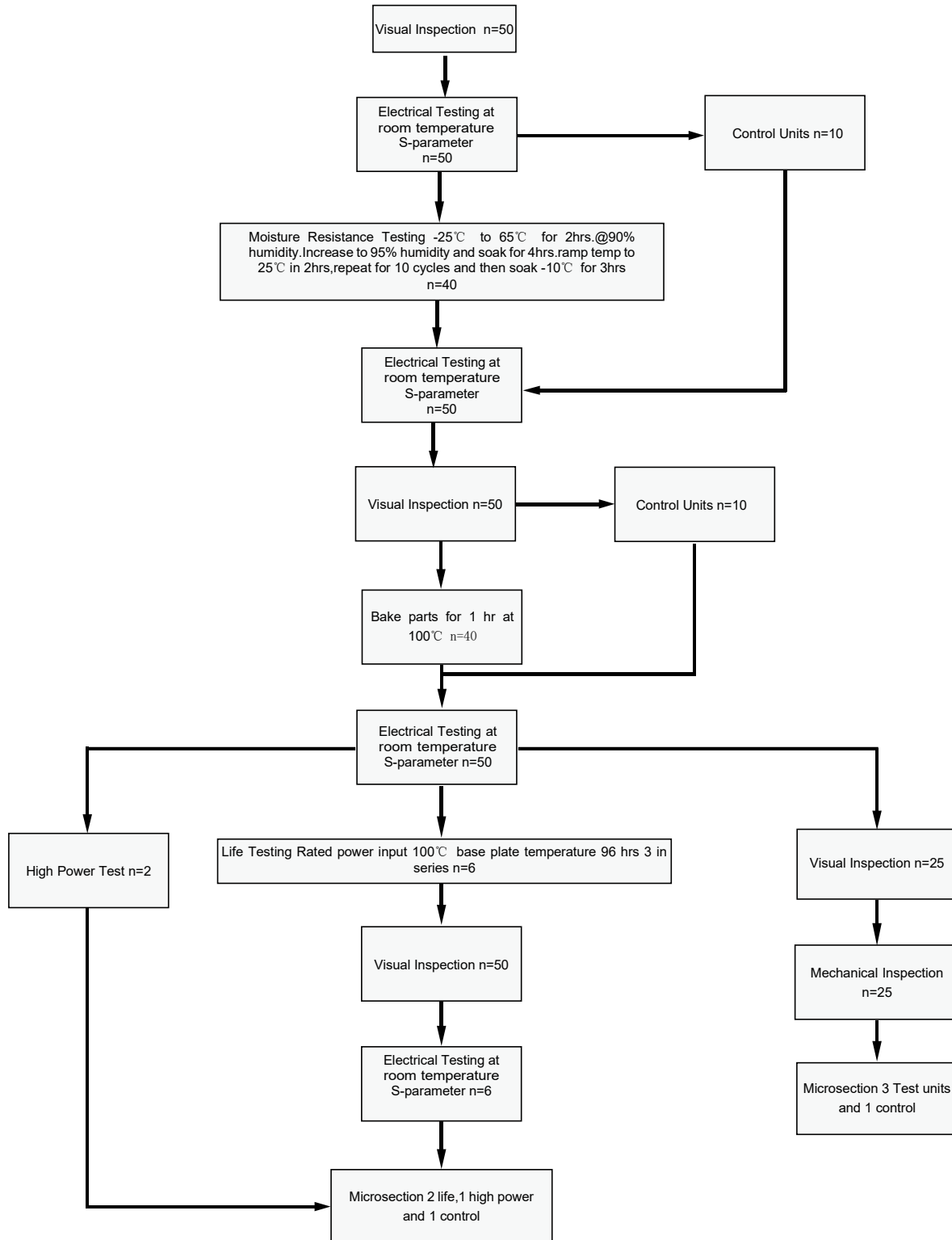
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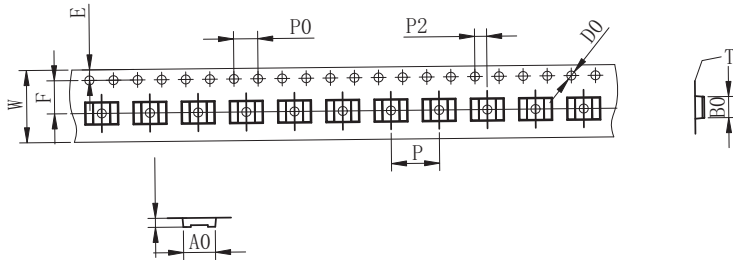
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### Tape and Reel Drawing

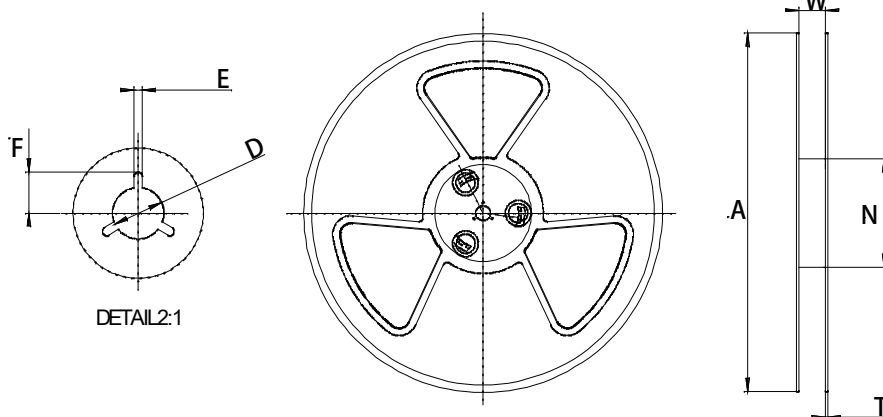
Feeding Direction



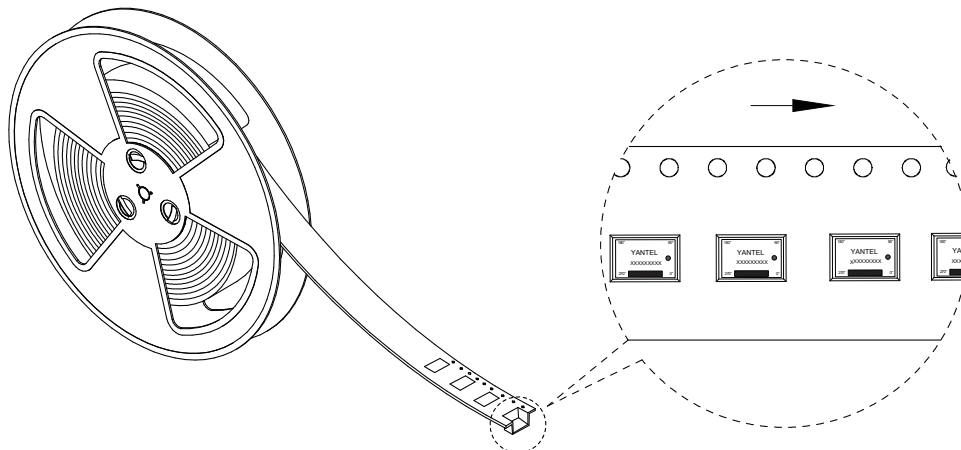
ITEM	W	A0	B0	K0	K1	P	F	E	D	P0	P2	t	13"
DIM	12.0	5.6	3.7	1.00		8	5.5	1.75	1.50	4.00	2.00	0.3	长度/盘 元件/盘
TOLE	+0.30 -0.30	+0.10 -0.10	+0.10 -0.10	+0.10 -0.10	+0.10 -0.10	+0.10 -0.10	+0.10 -0.10	+0.10 -0.10	+0.10 -0.00	+0.10 -0.10	+0.10 -0.10	+0.05 -0.05	55M 6000 PCS

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. 1000 units (maximum) / T&R



Symbol	Dimensions(mm)
W	12.5±0.4
A	177±0.5
N	63±0.3
T	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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