SPECIFICATION

Part No.   :   **PA.23**

Product Name   :   **Cellular GSM Dielectric PIFA Antenna**

Description   :   Tri-band - 880~960MHz, 1710~2170MHz, 0dB Gain
                        Size: 31mm*6mm*3.2mm
                        RoHS ✓

1. Introduction

This specification is for a Tri-band GSM + UMTS/WCDMA Dielectric Monopole Antenna for internal SMT mounting.

This antenna is suited to tri-band GSM Telematics devices and is in use in ETSI approved GSM 900/1800Mhz devices. The PA.23 is only suitable to be placed on a cleared end of a ground-plane(approx 115mm long). There can be no metal in a 270 degree area around the antenna (except towards the main-board).

Note: this antenna cannot be used for PTCRB or for the US and devices that use it would not pass US network TPR/TIS testing.

2. Electrical Specifications

The antenna has the electrical characteristics given in Table 1 under the Taoglas standard installation conditions as shown in the Evaluation Board

No.	Parameter	Specification
1	Frequency	880~960 MHz , 1710~2170 MHz
2	Dimensions	31*6*3.2mm mm
3	Impedance	50 Ω
4	VSWR	3 max (depends on environment)
5	Polarization	Linear
6	Operating Temperature	-30°C~+85°C
7	Termination	Ag (Environmentally Friendly Lead- Free)

* Data is measured on Taoglas Standard Reference PCB.
**Quad-band GSM 850 band is attainable with appropriate matching circuit design

2.1   S11 Response Curve
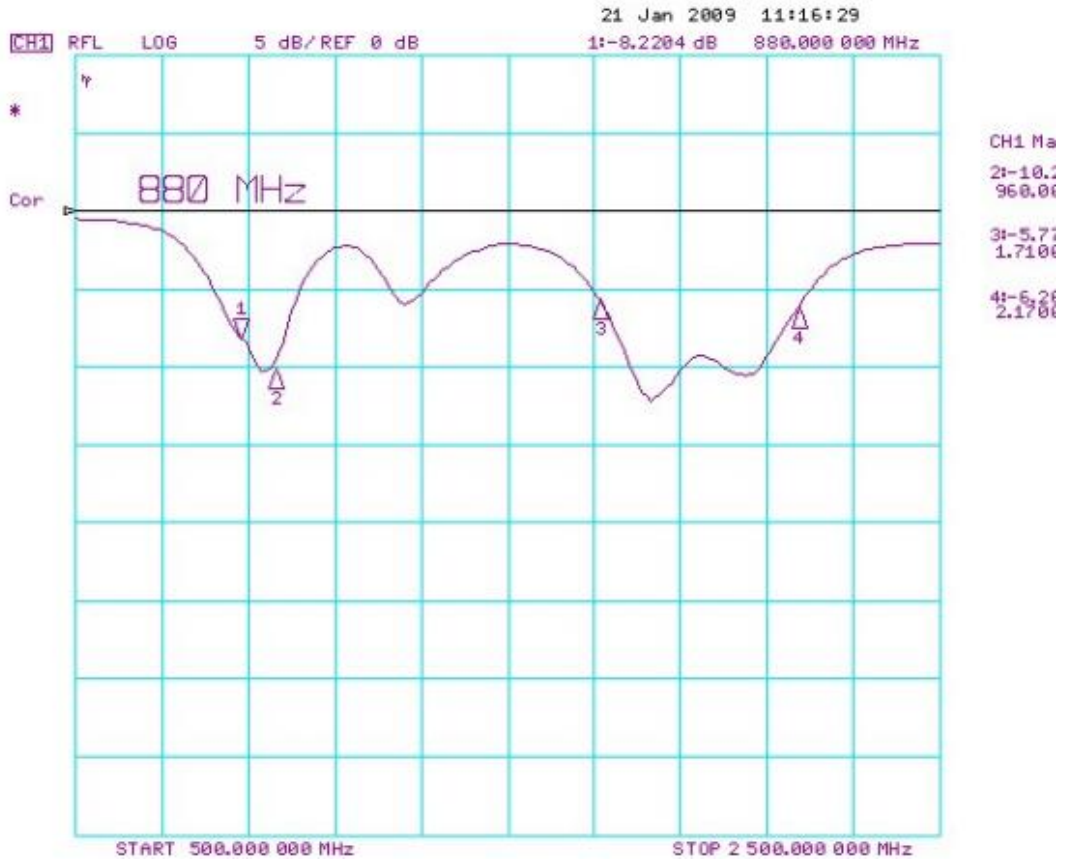
2.2 Gain & Efficiency

GSM900

Frequency (MHz)		Gain (dBi)	Efficiency (%)
TX	880.2	-4.86	13.56
	890.2	-4.04	16.84
	902.4	-3.36	21.49
	914.8	-3.03	25.34
RX	925.2	-2.86	28.15
	935.2	-3.48	26.97
	947.4	-4.03	26.58
	959.8	-4.13	25.96

GSM1800

Frequency (MHz)		Gain (dBi)	Efficiency (%)
TX	1710.2	-2.37	21.83
	1747.6	-1.24	26.58
	1784.8	0.30	35.56
RX	1805.2	0.08	35.66
	1842.6	0.64	42.69
	1879.8	1.95	54.14

GSM1900

Frequency (MHz)		Gain (dBi)	Efficiency (%)
TX	1850.2	0.74	45.08
	1880.0	1.96	54.15
	1909.8	2.19	52.97
RX	1930.2	2.59	56.90
	1960.0	3.23	65.51
	1989.8	3.37	68.75

WCDMA BAND I

Frequency (MHz)		Peak Gain (dBi)	Efficiency (%)
TX	1920.0	2.49	56.02
	1950.0	3.08	63.41
	1980.0	3.34	67.71
RX	2110.0	3.14	61.52
	2140.0	2.25	49.16
	2170.0	2.19	49.62

2.3   Power Average Gain

GSM900

Frequency (GHz)		Plane	Average Gain (dBi)
TX	880.2	XY plane	-9.287
		YZ plane	-11.033
		XZ plane	-7.586
	890.2	XY plane	-8.908
		YZ plane	-10.112
		XZ plane	-6.617
	902.4	XY plane	-6.725
		YZ plane	-9.069
		XZ plane	-5.530
	914.8	XY plane	-5.715
		YZ plane	-8.334
		XZ plane	-4.849
RX	925.2	XY plane	-5.003
		YZ plane	-7.868
		XZ plane	-4.469
	935.2	XY plane	-4.962
		YZ plane	-8.104

		XZ plane	-4.727
		XY plane	-4.743
	947.4	YZ plane	-8.156
		XZ plane	-4.924
		XY plane	-4.639
	959.8	YZ plane	-8.189
		XZ plane	-5.144

GSM1800

	Frequency (GHz)	Plane	Average Gain (dBi)
TX	**1710.2**	XY plane	-7.043
		YZ plane	-8.732
		XZ plane	-5.841
	1747.6	XY plane	-6.152
		YZ plane	-7.859
		XZ plane	-4.855
	1784.8	XY plane	-4.967
		YZ plane	-6.257
		XZ plane	-3.583
RX	**1805.2**	XY plane	-5.167
		YZ plane	-6.076
		XZ plane	-3.721
	1842.6	XY plane	-4.654
		YZ plane	-5.008
		XZ plane	-3.330
	1879.8	XY plane	-4.226
		YZ plane	-3.645
		XZ plane	-2.678

GSM1900

Frequency (GHz)		Plane	Average Gain (dBi)
TX	1850.2	XY plane	-4.516
		YZ plane	-4.685
		XZ plane	-3.175
	1880.0	XY plane	-4.232
		YZ plane	-3.653
		XZ plane	-2.680
	1909.8	XY plane	-5.047
		YZ plane	-3.658
		XZ plane	-2.917
RX	1930.2	XY plane	-5.338
		YZ plane	-3.268
		XZ plane	-2.687
	1960.0	XY plane	-5.369
		YZ plane	-2.658
		XZ plane	-2.159
	1989.8	XY plane	-5.747
		YZ plane	-2.572
		XZ plane	-2.098

WCDMA BAND I

|	Frequency (GHz)		Plane	Average Gain (dBi)
TX	1920.0		XY plane	-5.133
			YZ plane	-3.368
			XZ plane	-2.719
	1950.0		XY plane	-5.289
			YZ plane	-2.782
			XZ plane	-2.263
	1980.0		XY plane	-5.640

			YZ plane	-2.590
			XZ plane	-2.125
RX	2110.0		XY plane	-5.833
			YZ plane	-2.788
			XZ plane	-2.789
	2140.0		XY plane	-6.159
			YZ plane	-3.663
			XZ plane	-4.043
	2170.0		XY plane	-5.415
			YZ plane	-3.527
			XZ plane	-4.304

2.2 Radiation Pattern
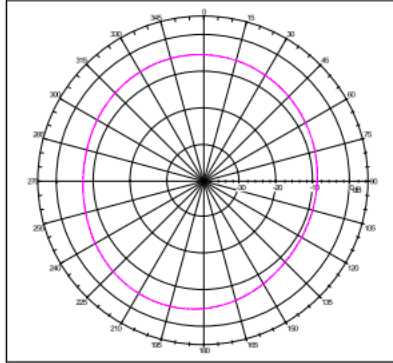
GSM900
Frequency :902.4MHz

Far-field Power Distribution on X-Z Plane(E-Plane of L3 Pol Sense)
Gain=-3.36 dBi; Total Radiating Efficiency: 21.49%@0.90240 GHz
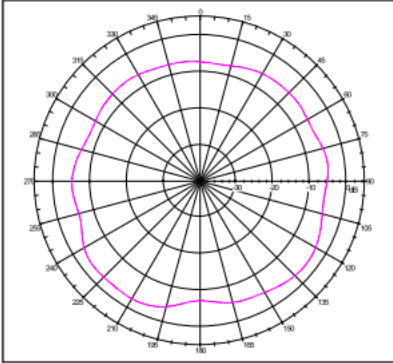
Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)
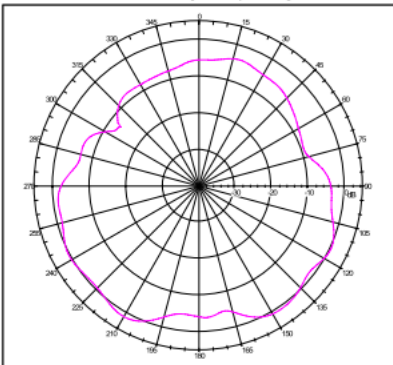Gain=-3.36 dBi; Total Radiating Efficiency: 21.49%@0.90240 GHz
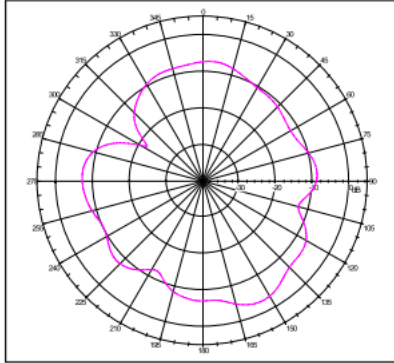
Far-field Power Distribution on X-Y Plane
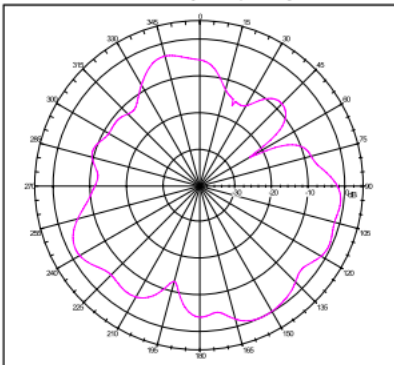Gain=-3.36 dBi; Total Radiating Efficiency: 21.49%@0.90240 GHz

GSM1800
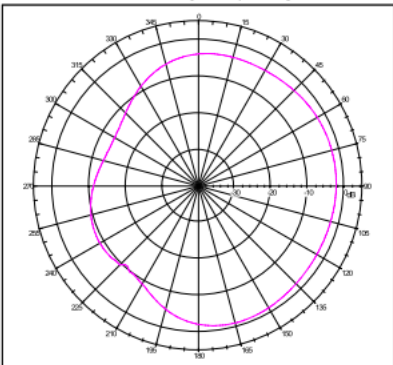**Frequency :1805.2 MHz**

Far-field Power Distribution on X-Z Plane(E-Plane of L3 Pol Sense)
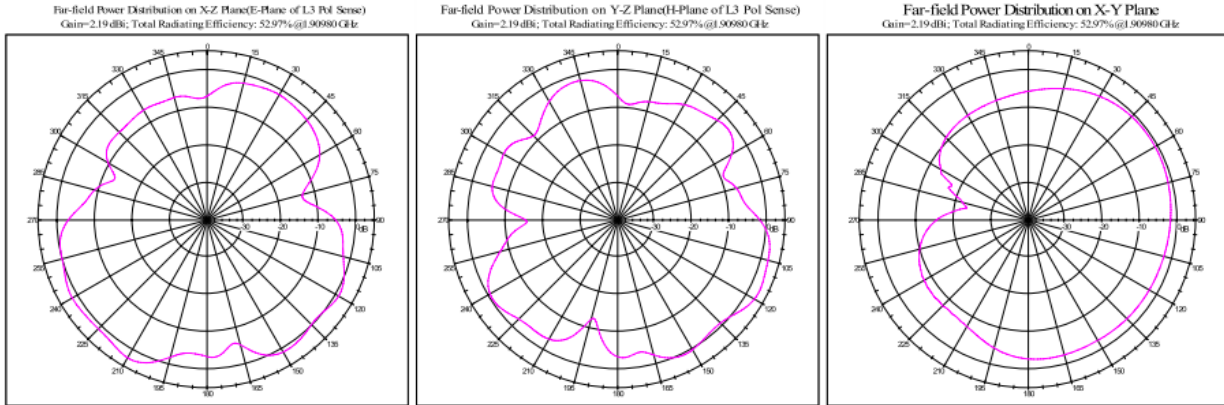Gain=0.08 dBi; Total Radiating Efficiency: 35.66%@1.80520 GHz

Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)
Gain=0.08 dBi; Total Radiating Efficiency: 35.66%@1.80520 GHz

Far-field Power Distribution on X-Y Plane
Gain=0.08 dBi; Total Radiating Efficiency: 35.66%@1.80520 GHz

GSM1900
Frequency :1909.8 MHz

Far-field Power Distribution on X-Z Plane(E-Plane of L3 Pol Sense)
Gain=2.19 dBi; Total Radiating Efficiency: 52.97%@1.90980 GHz

Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)
Gain=2.19 dBi; Total Radiating Efficiency: 52.97%@1.90980 GHz

Far-field Power Distribution on X-Y Plane
Gain=2.19 dBi; Total Radiating Efficiency: 52.97%@1.90980 GHz

WCDMA BAND I
Frequency :2110.0 MHz

Far-field Power Distribution on X-Z Plane(E-Plane of L3 Pol Sense)
Gain=3.14 dBi; Total Radiating Efficiency: 61.52%@2.11000 GHz

Far-field Power Distribution on Y-Z Plane(H-Plane of L3 Pol Sense)
Gain=3.14 dBi; Total Radiating Efficiency: 61.52%@2.11000 GHz

Far-field Power Distribution on X-Y Plane
Gain=3.14 dBi; Total Radiating Efficiency: 61.52%@2.11000 GHz
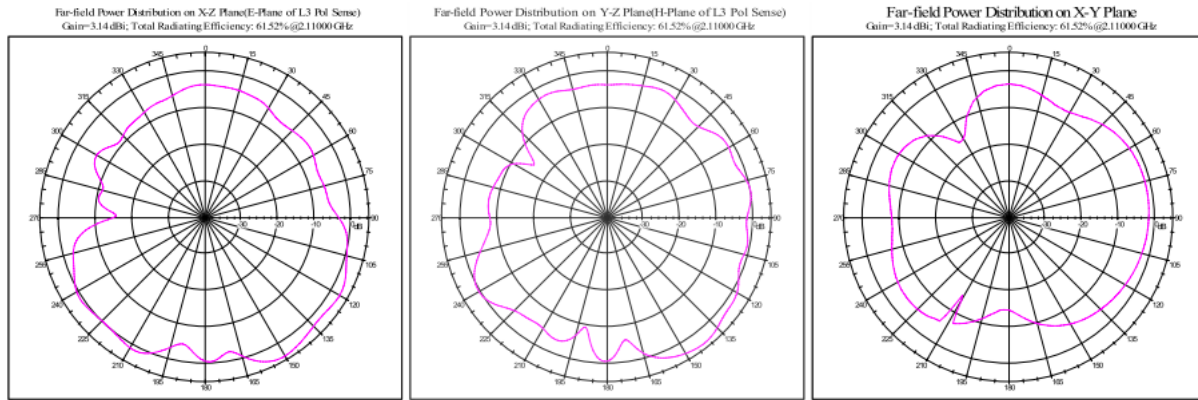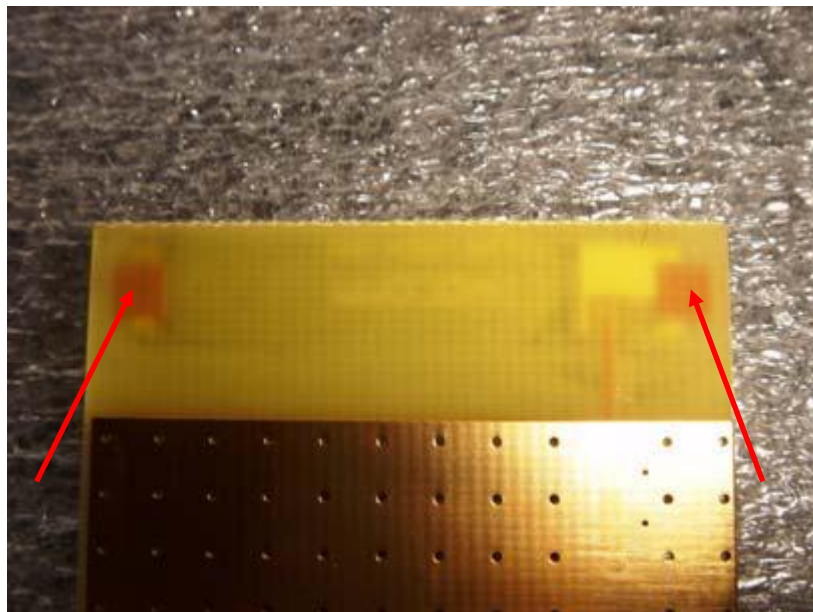
3. Mechanical Dimensions

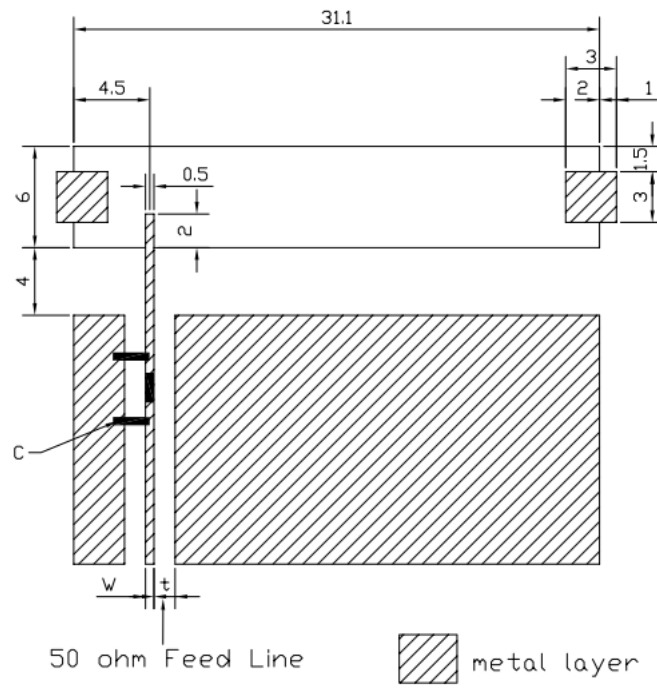## 3.1   PA.23 Antenna Outline Dimensions
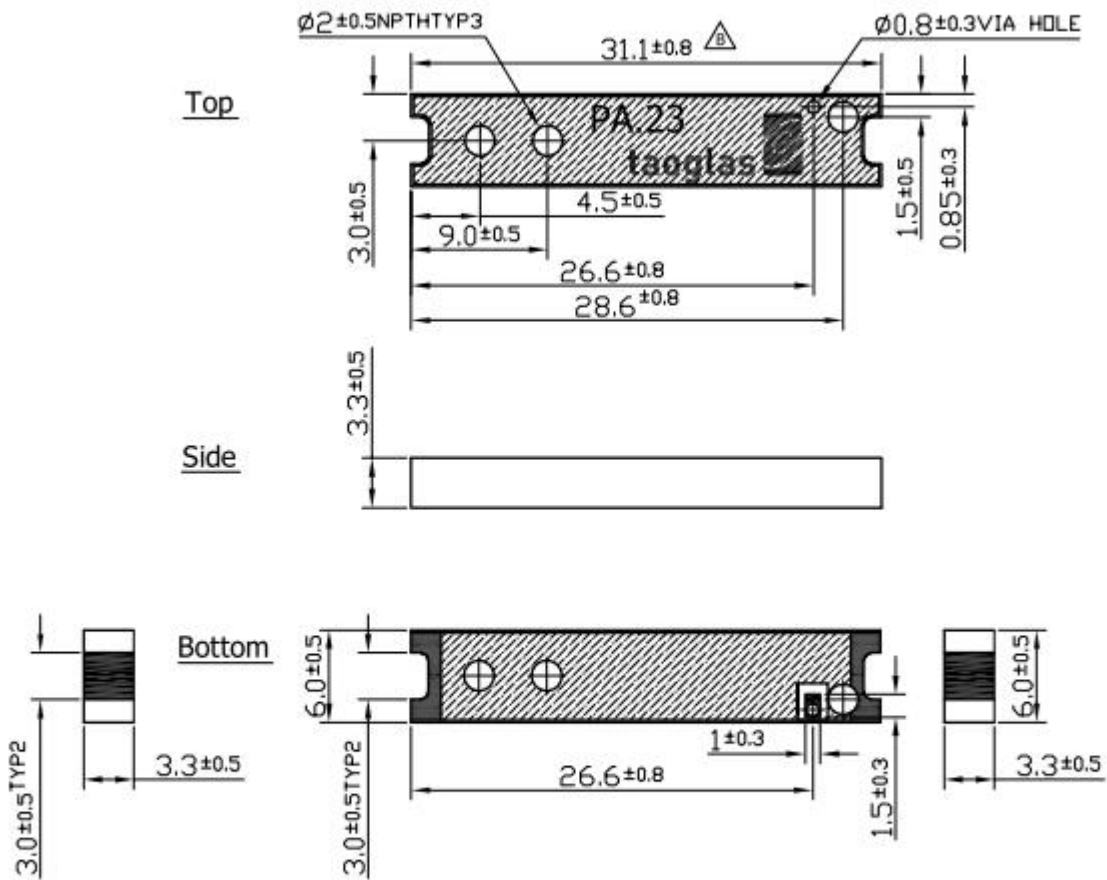
3.2 Evaluation board dimensions
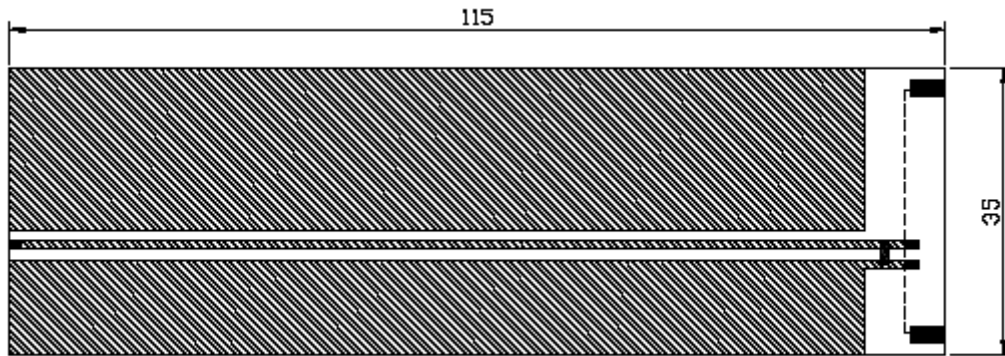
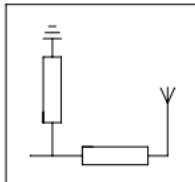## 3.3 Recommended layout (as per Taoglas evalution board)

View from underneath board – note solder pads either side – laid out on non metal area
Layout dimensions - Allow 6mm clearance all around if possible (minimum 4mm)
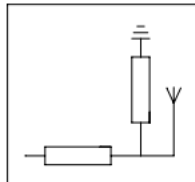
50 ohm Feed Line   metal layer

3.4 Recommended Transmission Line and Matching Network

Typical config.1

Typical config.2

Component types

Inductor

Capacitor

Module

Strip line

DC Block

Component
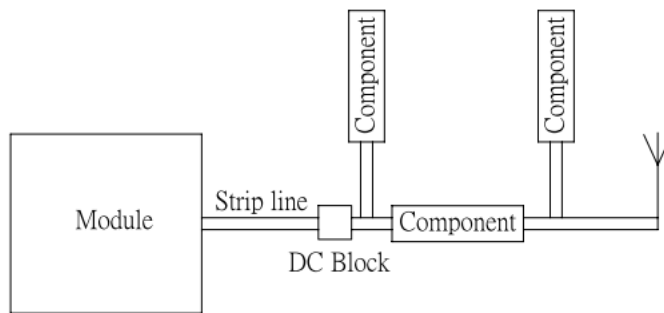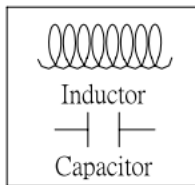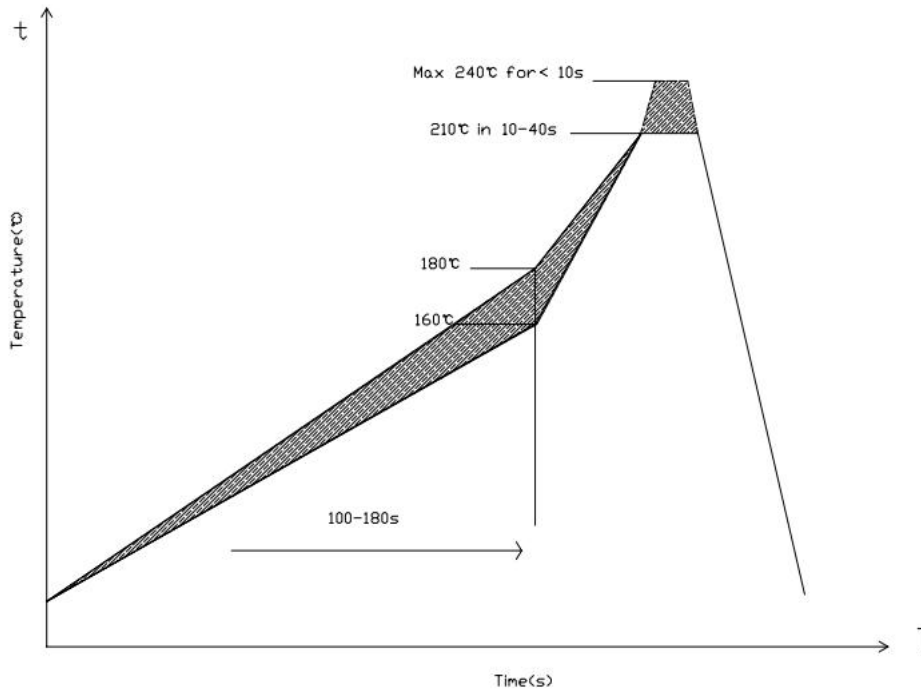
Component

Component

The matching network has to be individually designed using one, two or three components.

4. Recommended Reflow Temperature Profile

General attention to soldering:

● High soldering temperatures and long soldering times can cause leaching of the termination, decrease in adherence strength, and the change of characteristic may occur.

● For soldering, please refer to the soldering curves above. However, please keep exposure to temperatures exceeding 200°C to under 50 seconds.

● Please use a mild flux (containing less than 0.2wt% Cl). Also, if the flux is water soluble, be sure to wash thoroughly to remove any residue from the underside of components that could affect resistance.

Cleaning:

When using ultrasonic cleaning, the board may resonate if the output power is too high. Since this vibration can cause cracking or a decrease in the adherence of the termination, we recommend that you use the conditions below.

- Frequency: 40 kHz max.
- Output power: 20W/Iiter
- Cleaning time: 5minutes max.