

Y-TECH LTCC

DESIGN RULES FOR Chip Components

Revision 2023 v1.0



Y-TECH

Material Properties

Specifications	Units	* YL-5		** YL-8	YL-20	YL-40
		1MHz	60GHz	1MHz	1MHz	1MHz
Dielectric constant		6.2	5.9	8.3	19.6	42.5
		0.0009	0.002	0.0038	0.0012	0.0024
Loss tangent		0.0009	0.002	0.0038	0.0012	0.0024
Thermal co-efficient expansion	ppm/°C	5.8		7.1	10	15
Thermal conductivity	W/mK	2.0		2.5	7.6	3.4
Thermal conductivity For thermal via	W/mK	20				
Flexural strength	MPa	>230		>260	>200	>200
Conductor material		Ag				
Plating	um	Ni : 2~5 Au : 0.02 (If wire-bonding is required, Au 0.1)				

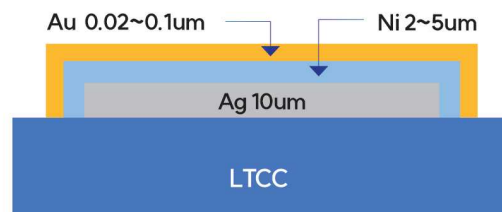
* YL-5W is suited for applications with operating frequencies for mm-Wave AiP (Antenna in Package), modules and chip components. Testing has been performed up to 90 GHz with outstanding results.

** YL-8W is designed for resistance device, communication parts.

Plating & LTCC Array Features

Plating

General thickness of Au plating is Min. 0.02 um.
When special use is required,
the thickness of the gold can be as thick as 0.1 um.

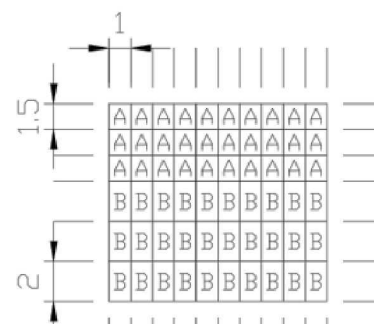


LTCC Array Features

In the LTCC process, multiple models can be arrayed at the same time.

At this time, it is possible when the dimensions of X or Y are unified
(and the Thickness must be the same)

- ▶ Depending on the number of models, they may be variation in the estimate.
(1 / 2~3 / 4~5 / more than 5kinds)



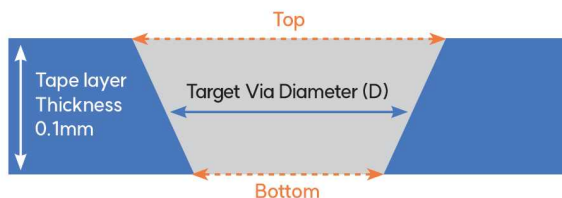
<Example of Concurrent Array >

Via Forming

The Shape of Laser Via Forming

The laser via forming can create the ground vias as well as the registration holes. The inlet surface on which the laser is directly emitted is larger than the outlet surface because of the laser focus.

When the via size is 100um, the via size of dotted line is between 120um(Top) to 80um(Bottom).



Location	Implementable Via Diameter (D)			
	*0.08	0.1	0.15	0.2
D on Top	0.1	0.12	0.17	0.22
D on Bottom	0.06	0.08	0.13	0.18

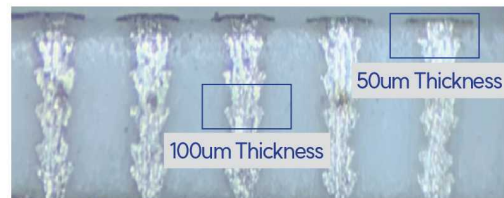
Unit : mm

The Thickness of Layer

General tape layer thickness is possible in 0.05mm units

(and we can Implement up to 20um layer thickness for micro products like 2012, 1608 size case)

Based on a 100 um thickness sheet, It has a deviation of $\pm 5\mu\text{m}$ compared to the original size, the surface on which the laser is perforated is larger than where the laser exits. Via size $\pm 10\mu\text{m}$ is the tolerance of position represented by the dotted line on the picture.



Shrinkage Consideration

Consideration about LTCC Shrinkage

If the distribution of the metal in the layer is not balanced, serious warpage may occur after sintering. (Figure A' is an exaggerated example of A after sintering.)

If you want to prevent this kind of warpage, A dummy layer can be added on the product and the product can be adjusted to the thickness of about 0.8mm or more. (These contents correspond to products larger than about 5X5mm. Micro products are not applicable in this case)

The case of figure B that has a uniform distribution of metal both up and down, in this case the product shrinks uniformly and warpage is significantly reduced when compared to A.

- It is recommended to distribute the metal pattern evenly inside and outside to prevent warpage.

Design Rules of Chip Components

Design Rules for LTCC Chip Components

Design Feature	Rule	Tolerance
Product Size	Min. 1005 Size	$\pm 0.2\text{mm}$
*Product Thickness	**0.4 ~ 3.0 mm	$\pm 5\%$
Printing layer Count	Max. 31 layers	-
Pad Size	Min. 0.08 mm	$\pm 7.5\%$
Camber	Max. 0.10mm	-

* The thickness of the product is based on the dielectric thickness and does not include the metal thickness of 7(inner) to 10um(outer) of each printing layer.

** 0.1mm is standard thickness for each tape layer, other layer thickness such as 0.02 or 0.05mm is partially possible by consultation

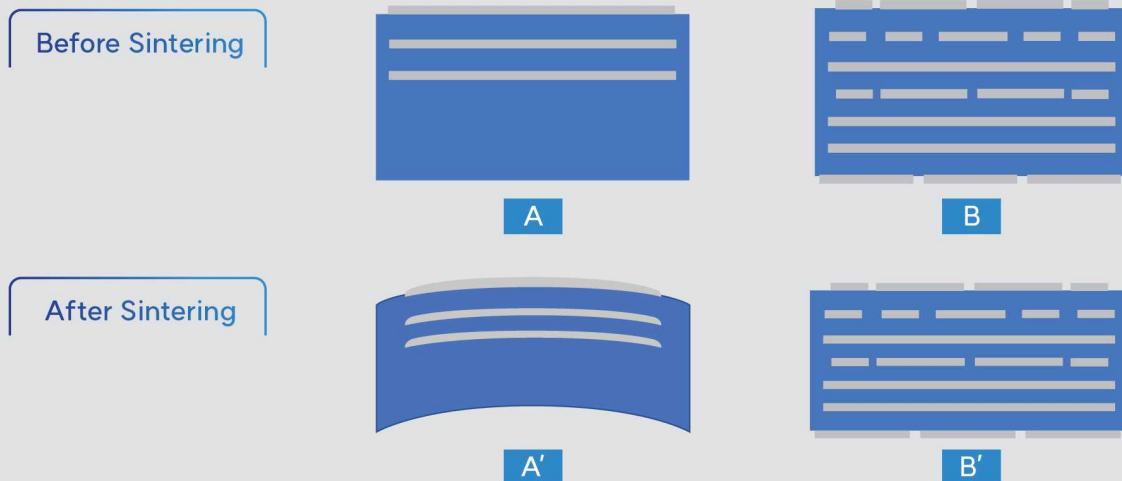


<Example of RF Chip Components >

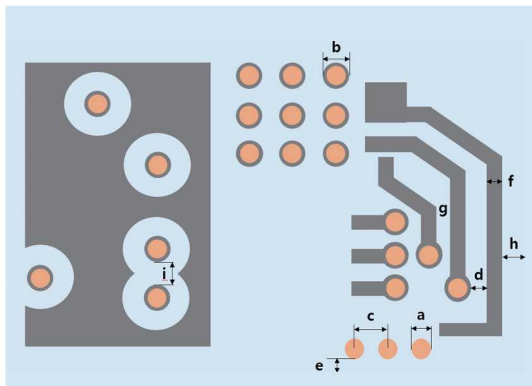
Design rules for Chip Components which include Micro Products. This picture is example of RF components after plating

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* Side view of the product



Design Rules of Circuit Pattern

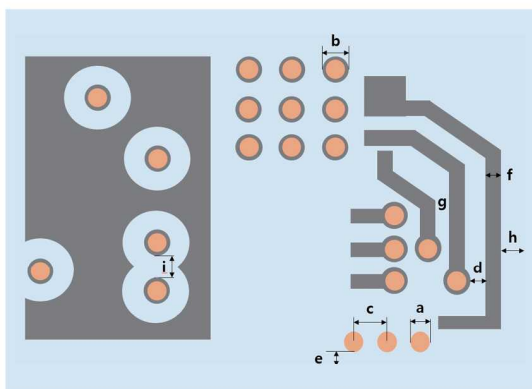


Unit : mm

No.	Basic structural sizes	Rule
a	Via Diameter*	0.08 ~ 0.3
b	Cover Pad Diameter	Min. 1.2*A
c	Via Pitch	Min. 2.5*A
d	Via Pad to Line	Min. 0.08
e	Via Pad to Substrate Edge	Min. 0.1
f	Line Width	Min. 0.08
g	Line Spacing/DC Pad spacing	Min. 0.1
h	Line to Edge	Min. 0.1
i	Isolation Gap	Min. 0.1

* Standard Via Diameter is 0.1mm for tape layer 0.1mm thickness and other Via Diameter such as 0.08 ~ 0.25 can be specified by consultation with Y-Tech engineers

Special Design Rules Circuit Pattern



Unit : mm

No.	Basic structural sizes	Rule
a	Via Diameter*	0.05 ~ 0.20
b	Cover Pad Diameter	Min. 1.2*A
c	Via Pitch	Min. 2.5*A
d	Via Pad to Line	Min. 0.08
e	Via Pad to Substrate Edge	Min. 0.10
f	Line Width	Min. 0.05
g	Line Spacing/DC Pad spacing	Min. 0.08
h	Line to Edge	Min. 0.08
i	Isolation Gap	Min. 0.08
	Tape layer thickness	Min. 0.02
	Product thickness	Min. 0.40

When considering micro products, Size less than 2X2mm, We need an unusual special rules

We can provide special criteria as shown in the table below and for the side termination structure, simple pattern such as GND and Line patterns can be applied up to 1005 size.

(At this time, the position tolerance is guaranteed up to 30um)

* After reviewing the drawing, it is possible to proceed after partially approving it in consultation with Y-Tech.



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