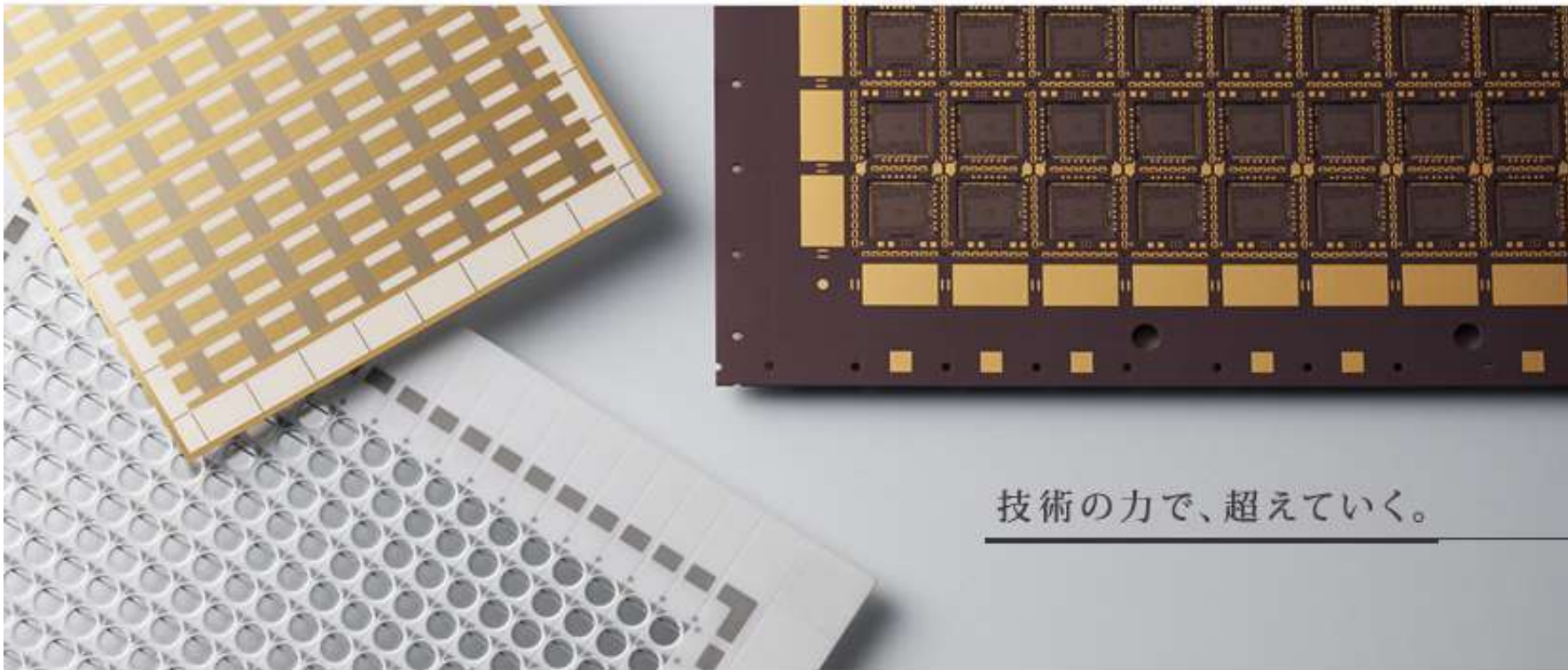
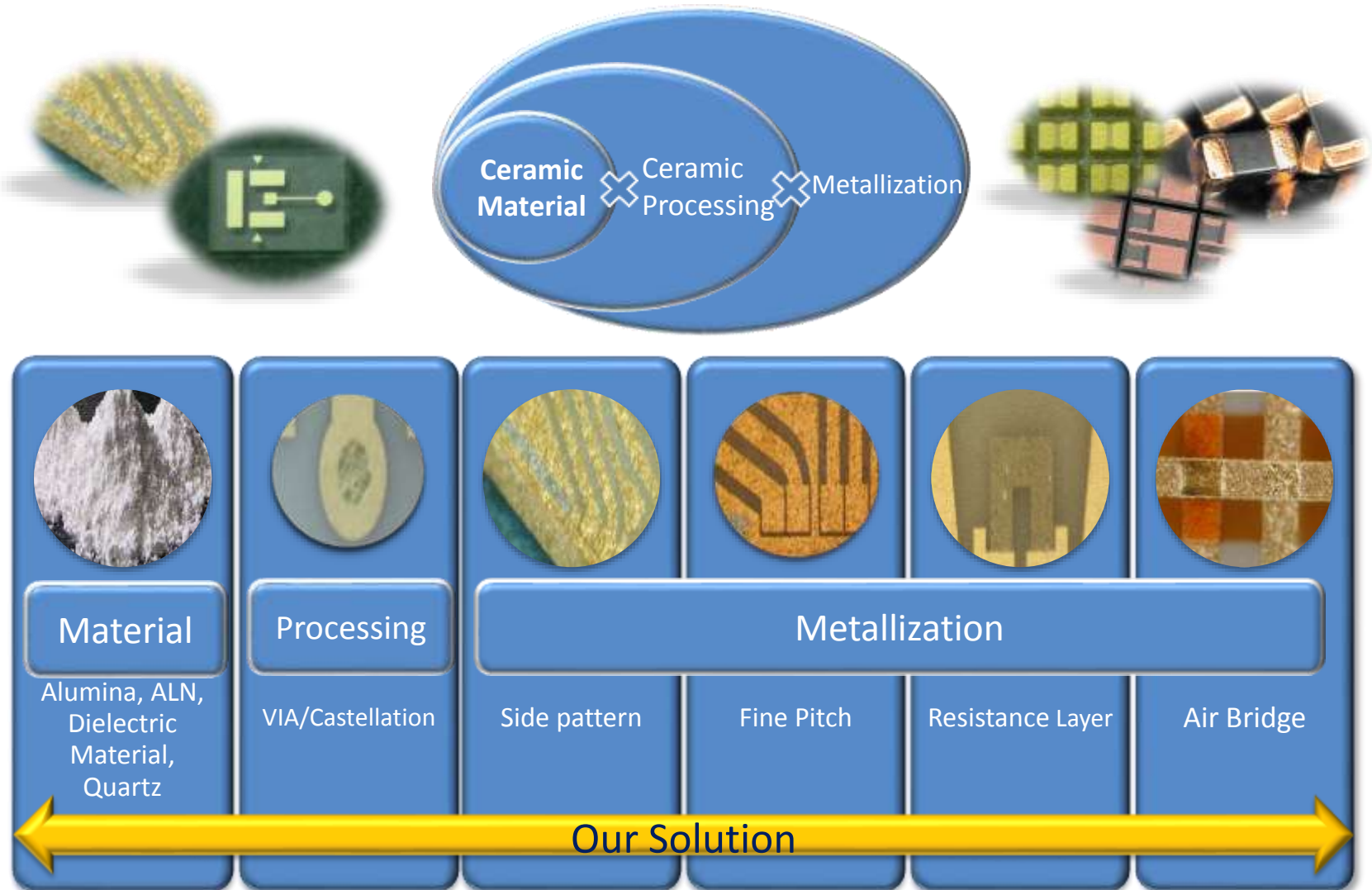




Our Technology

We can provide custom made ceramic products.



Wire bonding Components

◆ SLC type, MLCC type, corresponding to match the custom type and needs

◆ ϵ_r : 3000、27,000、^{NEW} 45,000

◆ Application

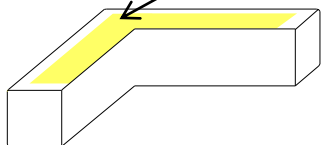
- Optical communication

CAPACITOR

SLC



Terminal electrode

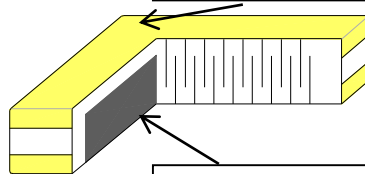


MLCC type



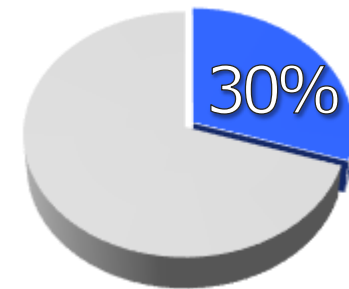
Terminal electrode

Internal electrode



30% Share in the world

Stable quality and good properties under strict control



※Optical communication limited

Custom-made.

Array type



Custom pattern corresponding

Er : 45,000 Introduction



Er:45,000 Introduction

ϵ_r

27,000 $\Rightarrow$ **45,000** (1.6times)

【Area : -38% or Cap : 1.6times】

Market : Optical communication (10~400Gbps)

Respond to needs

- Small size
- Large capacity



Size/Cap

※Unit: pF

		Size(□mm)					
		0.25	0.38	0.5	0.63	0.76	1.00
T Size	0.15	150	330	560	1,000	1,500	2,700
	0.25	-	220	330	560	1,000	1,500

Er : 45,000 Line-up



t : 0.12mm Voltage : 10V

容量	標準寸法	□0.25mm	□0.38mm	□0.50mm	□0.63mm	□0.76mm	□1.00mm
100							
150							
220	0.26	SL02X7S1A221M12H					
330	0.32						
470	0.38		SL03X7S1A471M12H				
680	0.45						
1,000	0.55			SL05X7S1A102M12H			
1,500	0.67				SL06X7S1A152M12H		
2,200	0.81					SL07X7S1A222M12H	
3,300	1.00						SL10X7S1A332M12H

t : 0.15mm Voltage : 25V

容量	標準寸法	□0.25mm	□0.38mm	□0.50mm	□0.63mm	□0.76mm	□1.00mm
100							
150	0.24	SL02X7S1E151M15H					
220	0.29						
330	0.35		SL03X7S1E331M15H				
470	0.42						
680	0.51			SL05X7S1E681M15H			
1,000	0.61				SL06X7S1E102M15H		
1,500	0.76					SL07X7S1E152M15H	
2,200	0.91						
3,300	1.11						

t : 0.25mm Voltage : 50V

容量	標準寸法	□0.25mm	□0.38mm	□0.50mm	□0.63mm	□0.76mm	□1.00mm
100							
150							
220	0.37		SL03X7S1H221M25H				
330	0.46						
470	0.54			SL05X7S1H471M25H			
680	0.65				SL06X7S1H681M25H		
1,000	0.79					SL07X7S1H102M25H	
1,500	0.97						SL10X7S1H152M25H
2,200	1.17						
3,300	1.44						

Wire-Bonding Type Multilayer Ceramic Capacitors

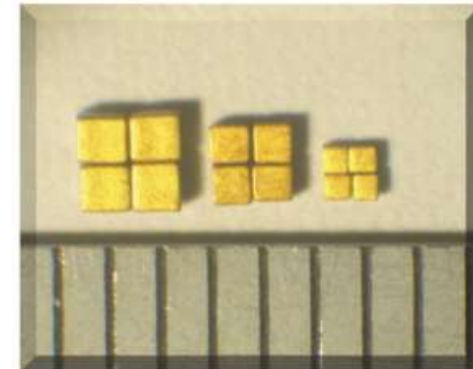


■ Features

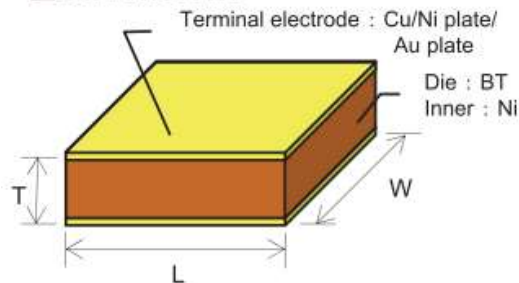
- Wire bondable
- The best for the high density package in IC package
- Custom designs
- Impedance has the low outstanding high frequency characteristic.

■ Application

- IC / Optical Device for telecommunication / Measurement equipments / Medical equipment / etc.



■ Dimensions



■ Range of Use

Temperature Characteristics	EIA Symbol	Capacitance Change	Temperature Range	Capacitance Tolerance
X5R	X5R	±15%	-55~+85°C	M (±20%)

■ Size

Type	L	W	T
Y0303	0.38±0.1	0.38±0.1	0.3±0.1
Y0503	0.5±0.1	0.5±0.1	0.35±0.1
Y0805	0.8±0.1	0.8±0.1	0.5±0.1
Y1006	1.0±0.1	1.0±0.1	0.6±0.1

■ Capacitance MAP

Type (Size)		Y0303 (□0.38)		Y0503 (□0.5)				Y0805 (□0.8)				Y1006 (□1.0)			
Rated voltage		16Vdc	6.3Vdc	16Vdc	25Vdc	50Vdc	100Vdc	16Vdc	25Vdc	50Vdc	100Vdc	16Vdc	25Vdc	50Vdc	100Vdc
Capacitance (nF)		(1C)	(0J)	(1C)	(1E)	(1H)	(2A)	(1C)	(1E)	(1H)	(2A)	(1C)	(1E)	(1H)	(2A)
101	0.10						0.35								
221	0.22						0.35								
471	0.47					0.35									
102	1	0.30		0.35							0.50				
222	2.2			0.35							0.50				
472	4.7									0.50					0.60
103	10			0.35					0.50					0.60	
223	22							0.50						0.60	
473	47												0.60		
104	100		0.35									0.60			

Wire-Bonding Type Single Ceramic Capacitor



■ Features

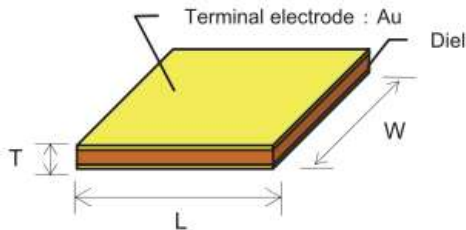
- Wire bondable
- The best for the high density package in IC package
- Custom designs
- Impedance has the low outstanding high frequency characteristic.

■ Application

- IC / Optical Device for telecommunication / Measurement equipments / Medical equipment / etc.



■ Dimensions



■ Range of Use

Temperature Characteristics	EIA Symbol	Capacitance Change	Temperature Range	Capacitance Tolerance
X7R	X7R	± 15%	-55~+125°C	M (± 20%)

■ Size

Type	L	W	T
02	0.25±0.13	0.25±0.13	【10V】 0.12±0.025mm
03	0.38±0.13	0.38±0.13	
05	0.50±0.13	0.50±0.13	【25V】 0.15±0.025mm
06	0.63±0.13	0.63±0.13	
07	0.76±0.13	0.76±0.13	【50V】 0.25±0.025mm
10	1.00±0.13	1.00±0.13	

■ Capacitance MAP

Type (Size)	SL02 (□0.25mm)			SL03 (□0.38mm)			SL05 (□0.50mm)			SL06 (□0.63mm)			SL07 (□0.76mm)			SL10 (□1.00mm)		
Rated voltage	10Vdc	25Vdc	50Vdc	10Vdc	25Vdc	50Vdc	10Vdc	25Vdc	50Vdc	10Vdc	25Vdc	50Vdc	10Vdc	25Vdc	50Vdc	10Vdc	25Vdc	50Vdc
Capacitance (pF)	(1A)	(1E)	(1H)	(1A)	(1E)	(1H)	(1A)	(1E)	(1H)	(1A)	(1E)	(1H)	(1A)	(1E)	(1H)	(1A)	(1E)	(1H)
101 100		0.15				0.25												
151 150		0.15																
221 220	0.12				0.15	0.25			0.25									
331 330					0.15													
471 470				0.12				0.15	0.25			0.25						
681 681								0.15				0.25						
102 1,000							0.12				0.15			0.15	0.25			0.25
152 1,500										0.12				0.15				0.25
222 2,200													0.12					
332 3,300																0.12		

Array Line-up



Voltage : 50V

Series		502	703	1005	1206	1507
M2	Chip Size (LxW)	0.5 x 0.25	0.76 x 0.38	1.00 x 0.50	1.27 x 0.63	1.52 x 0.76
	Normal Spacing	0.05	0.09	0.10	0.10	0.10



Voltage : 50V

Series		1002	1503	2005	2506	3007
M4	Chip Size (LxW)	1.00 x 0.25	1.52 x 0.38	2.00 x 0.50	2.54 x 0.63	3.04 x 0.76
	Normal Spacing	0.05	0.08	0.10	0.10	0.10



M2	Size				
Cap	502	703	1005	1206	1507
82					
100					
120					
150					
180					
220					
270					
330					
390					
470					
560					
680					

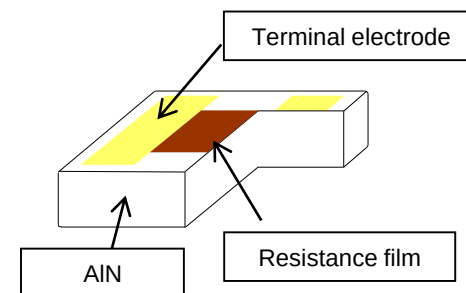
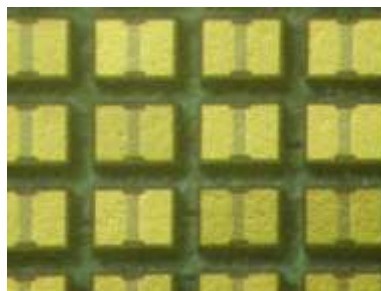
M4	Size				
Cap	1002	1503	2005	2506	3007
82					
100					
120					
150					
180					
220					
270					
330					
390					
470					
560					
680					

Thin film resistor

- ◆ AlN substrate is used
- ◆ High powered
- ◆ Small size.
- ◆ Application
 - Optical communication

RESISTOR

Thin film resistor

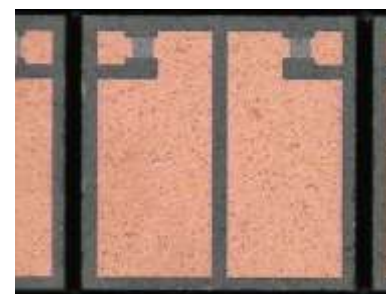


RESISTOR + CAPACITOR

Size/Cap/Resist

Type	Size	Cap	Resist
SF88X7R2A101M15T500MS1	□0.8	100pF	50Ω
SLM-MTB16001	□0.8	470pF	50Ω

Custom-made.

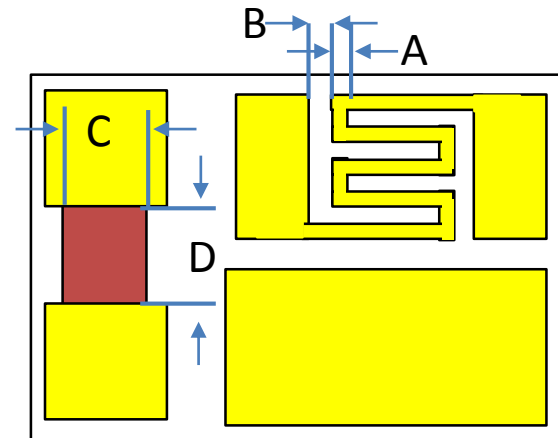


※Manufacture other than line-up is also possible

Pattern size

◆ Line & Space 10 μ m : 2017/1~

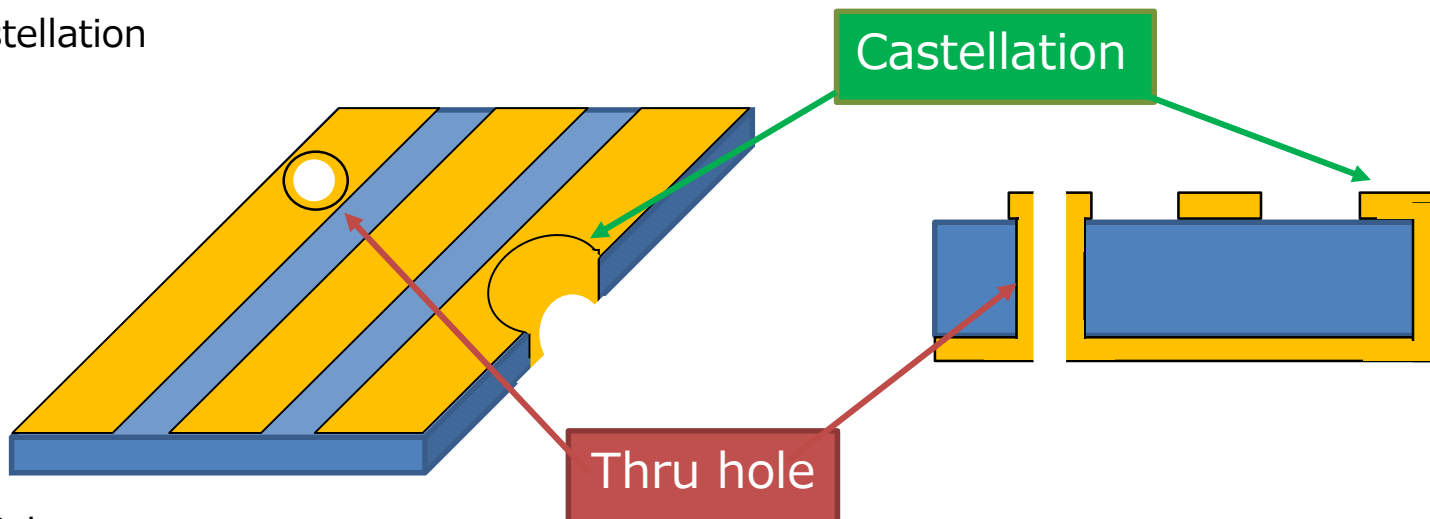
Item	Minimum size
A) Conductor size	0.010 mm
B) Pattern interval	0.010 mm
C) Resistance body size (Width)	0.050 mm
D) Resistance body size (Length)	0.050 mm
E) Substrate neighborhood-Pattern	0.050 mm



Processing technology

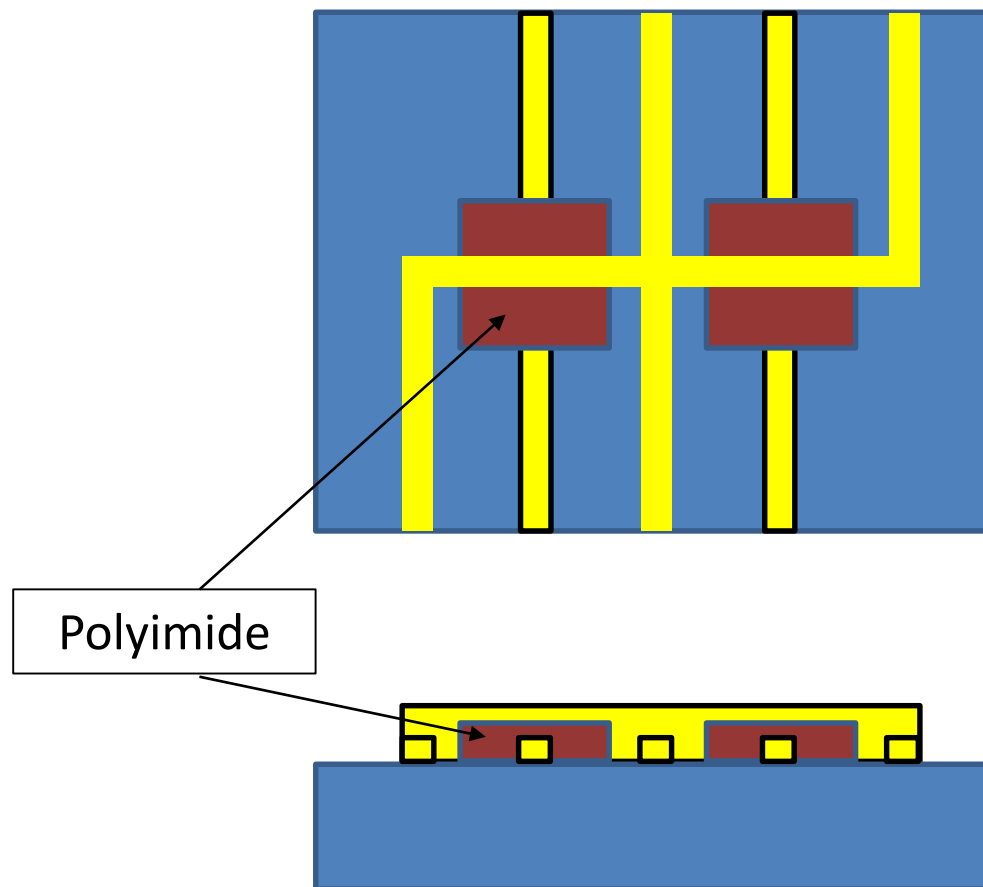
◆ Via processing

◆ Castellated



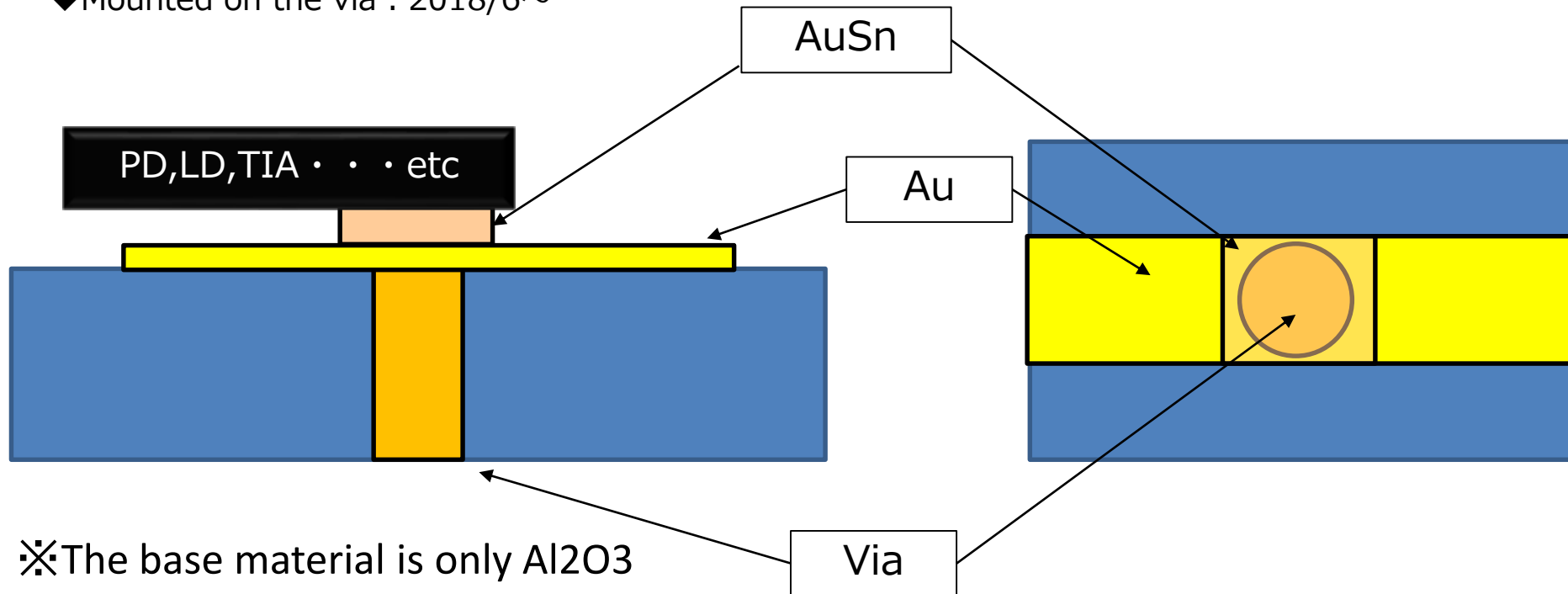
Processing technology

◆ Air Bridge



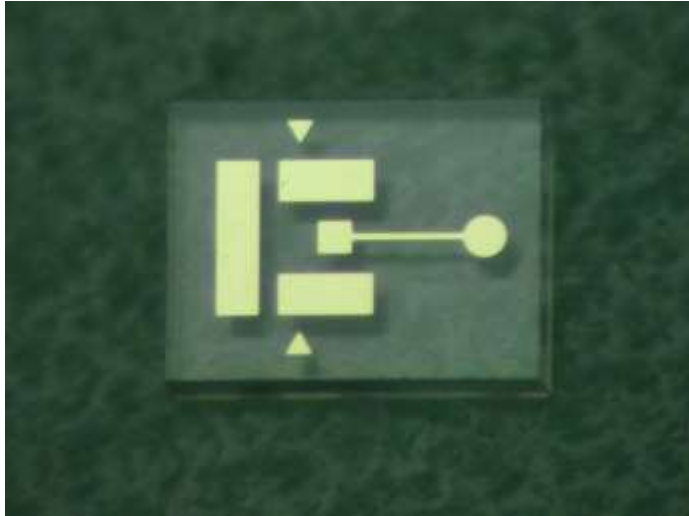
Processing technology

◆ Mounted on the via : 2018/6~



※The base material is only Al₂O₃

It becomes unnecessary to implement avoiding Via.
Ideal characteristics can be obtained (Improvement of reflection point).

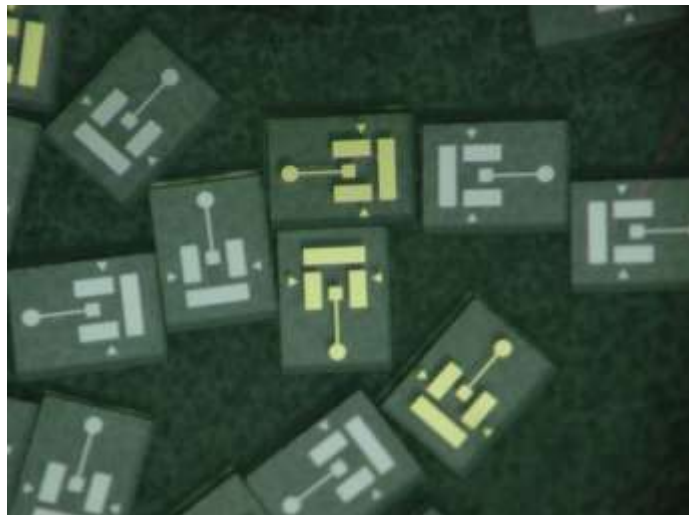


Quartz glass with a film

- ◆ Heat insulator in the circuit
- ◆ Reduction in capacitance for a high frequency
- ◆ Material : Fused Silica
Dielectric Constant (ϵ_r) : 3.8
- ◆ Application
 - Optical communication

Specification

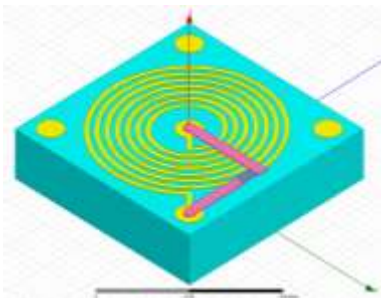
Item		Standard specification
Substrate material	Dielectric Constant	ϵ_r : 3.8
	Thermal Conductivity	1.4 W/(m·K)
	Thickness	Min : 0.15mm*
	Work size	Min : 0.25x0.25mm
Film specification 【Conductor】	Film composition (Thickkness)	Au (0.6-1.2um) *





Features)

- Small chip size: 0.635~1.270 mm square
- Wire bond assembly (Bond pad material: Au)
- High Q, Low DCR
- High frequency resonace (Low capacitance)
- Operating temperature: -55~+125°C

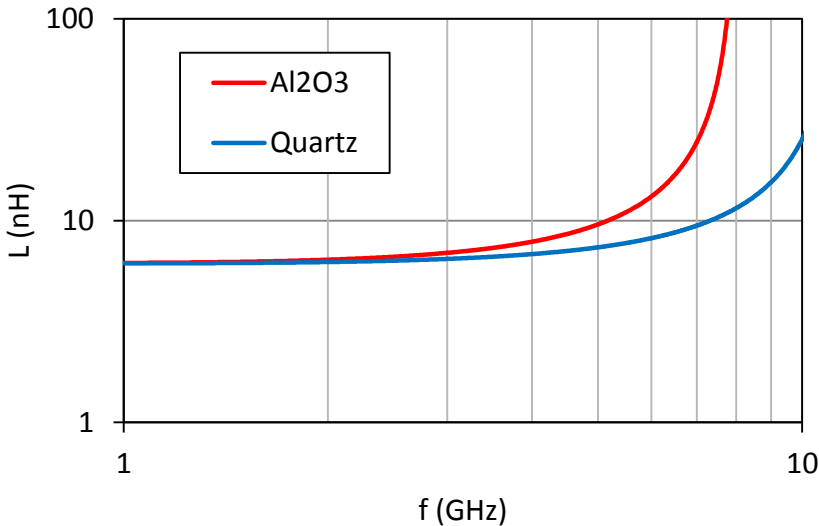


Applications)

- RF choke in DC supplies
- RF matching
- Filters
- Amplifiers

Characteristics)

Part number	Inductance	Q	DCR	fo
	(nH)	at 1 GHz	(mΩ)	(MHz)
SIQ07-ES1	6	12	0.6	11.7
SIQ07-ES2	15	15	1.4	6.6
SIQ07-ES3	30	18	2.5	4.5



*Maruwa can make Custom designed Inductor and Sub-mount

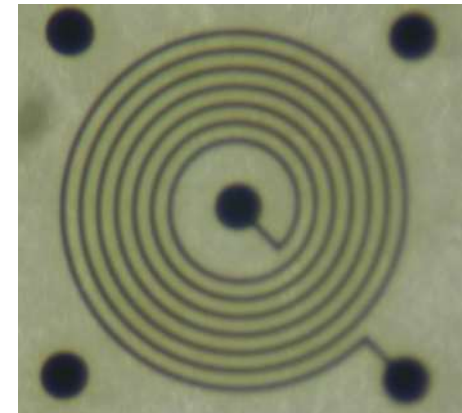
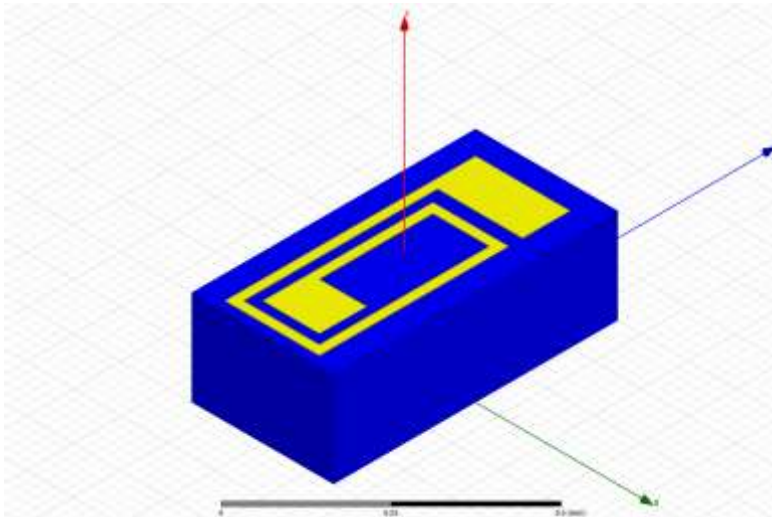
Performance of glass inductor

1. It operates up to several tens of GHz.
2. It is the closest packaging by wire bonding.

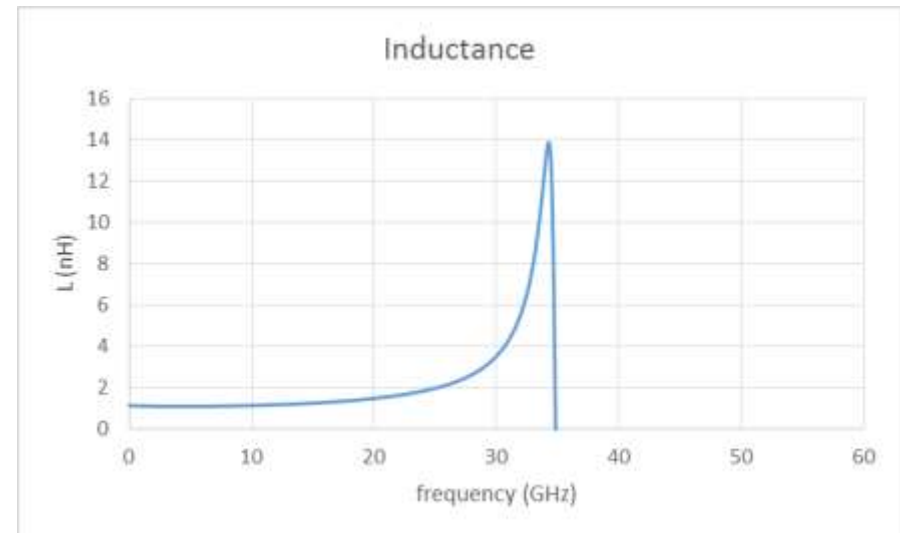
Simulation

Size : 0.6mm × 0.3mm

Inductance : 1.1nH



Glass inductor



MLCC of Au plating for DC block



Features)

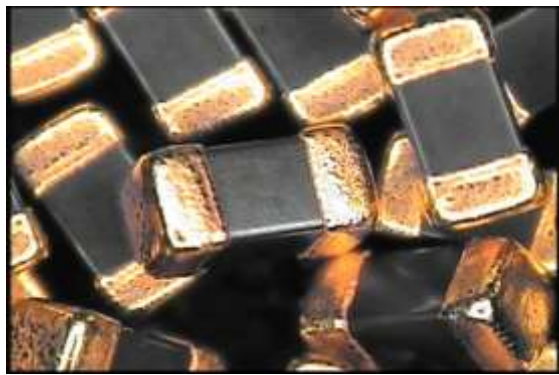
- Small chip size:
- The excellent high frequency performance

Applications)

- Optical communication module

Characteristics)

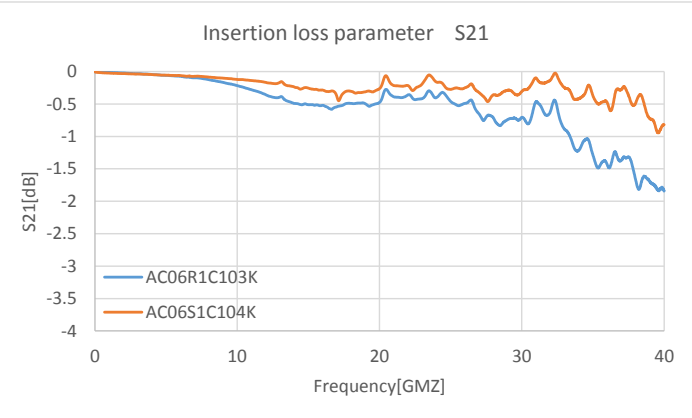
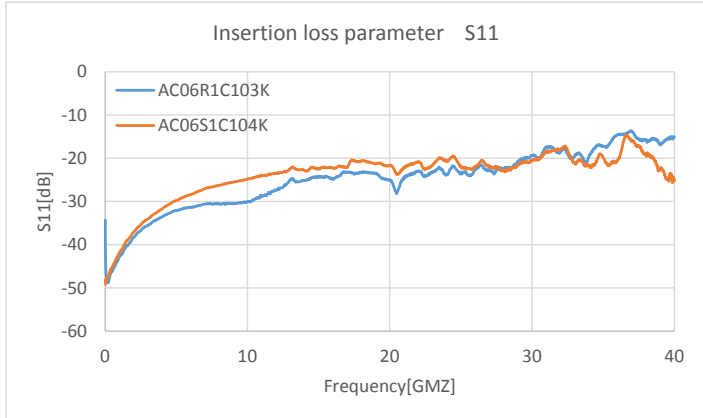
Part number	L (mm)	W (mm)	T (mm)	Cap	Rated volt	Temperature range	Terminal
AC06R1C103K	0.6 ±0.03	0.3 ±0.03	0.3 ±0.03	0.01μF (±10%)	16V	X7R	Au plating
AC06S1C104K				0.1μF (±10%)		X6S	



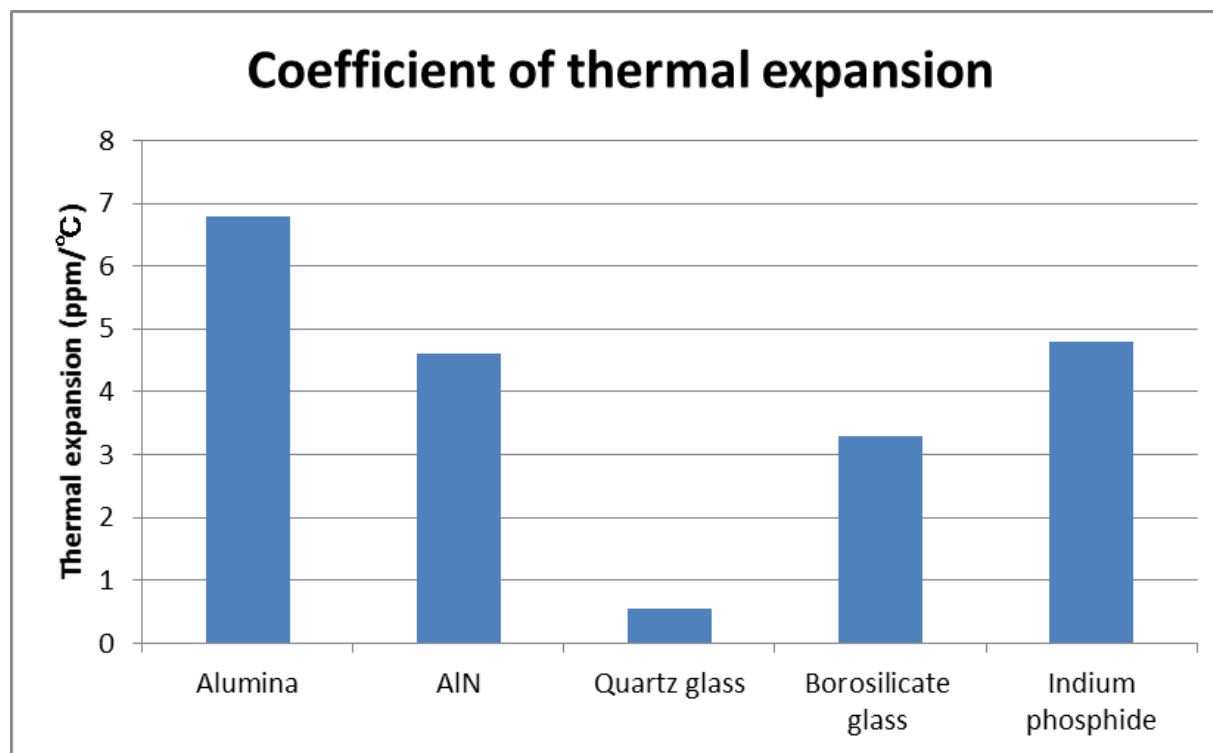
Recommended terms of use)

- An applied voltage : Rated voltage × 60% maximum. * The environmental temperature includes self-fever.
- Environmental temperature : Product of operating temperature 105℃ : 85℃ max
Product of operating temperature 125℃ : 100℃ max

Frequency characteristic) ✖reference



Material	Alumina	AlN	Quartz glass	Borosilicate glass	Indium phosphide
Composition	99.6%-Al ₂ O ₃	AN-170	SiO ₂	Na ₂ O-B ₂ O ₃ -SiO ₂	InP
Thermal conductivity	29 W/(m·K)	180 W/(m·K)	1.4 W/(m·K)	1.0 W/(m·K)	68 W/(m·K)
Dielectric constant	9.9	8.7	3.75	4.6	—
Dielectric loss	0.02%	0.02%	0.04%	0.50%	—
Coefficient of thermal expansion	6.8 ppm/°C	4.6 ppm/°C	0.55 ppm/°C	3.3 ppm/°C	4.8 ppm/°C



Thank you

Design rule-1

Material

Material	Dielletric Constant (ϵ_r)	F0 × Q	f (GHz)	Q (1/tanδ)	τ f (ppm/°C)
Quartz	3.8	-	-	-	-
AlN (AN-170)	9.0	-	-	-	-
Al2O3 (HA-996)	9.9	-	-	5,000(@1MHz)	-
M21A	21	35,400	6	5,900	-
M38	38	45,000	4	11,250	-
M45	45	48,000	4	12,000	17
M93	93	5,100	3	1,700	89
M110	110	3,300	3	1,100	-89
3K	3,000	-	-	-	(X7R)
16K	16,000	-	-	-	(X7R)
27K	27,000	-	-	-	(X7R)
45K	45,000	-	-	-	(X7S)

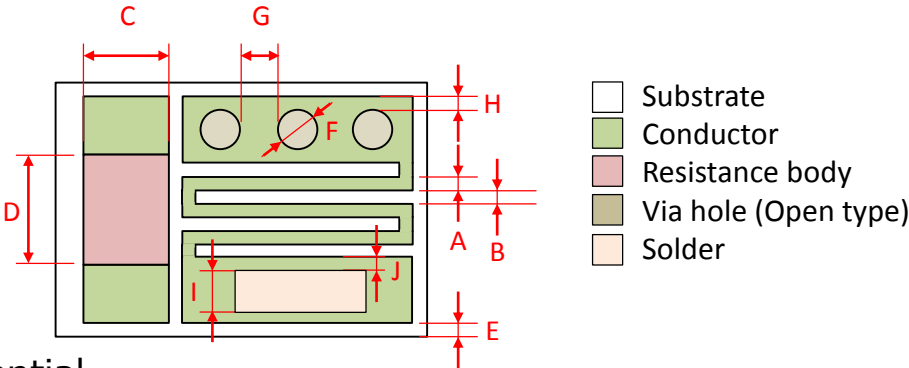
Design rule-2-1 (except quartz)

Specilication

Item		Standard specification
Substrate material	Thickness	Min : 0.15mm Max : 0.60mm
	Work size	Min : □0.25mm
Conductor	Film composition (Thikkness)	Au 【Ti/TiW/Cr/Ni/Pt】 (Au : 0.6-8μm)
Resistance body	Seat resistance (T.C.R)	25,50,100Ω/□ (TCR : -100±100ppm/°C)
	Film composition	TaN
Solder	Solder composition (Thikkness)	AuSn (Au : 1.5-6μm)

Pattern size

Item	Minimum size
A) Conductor size※1	0.020 mm
B) Pattern interval※1	0.020 mm
C) Resistance body size (Width)	0.100 mm
D) Resistance body size (Length)	0.050 mm
E) Substrate neighborhood-Pattern	0.050 mm
F) Via hole	0.100 mm(>Thickness)
G) Via hole interval	0.250 mm
H) Via hole – Pattern interval	0.100 mm
I) Solder size	0.050mm
J) Solder– Pattern interval	0.050mm



※1 L/Sに関しては、パターンAu厚1μm以下であれば0.01mmまで対応可能です。

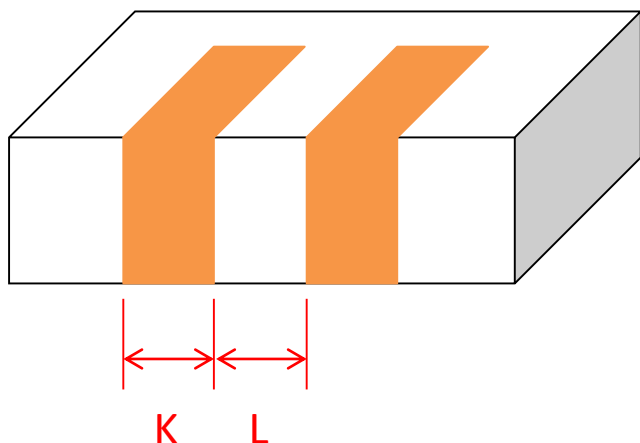
Design rule-2-2 (except quartz)

Side Pattern size

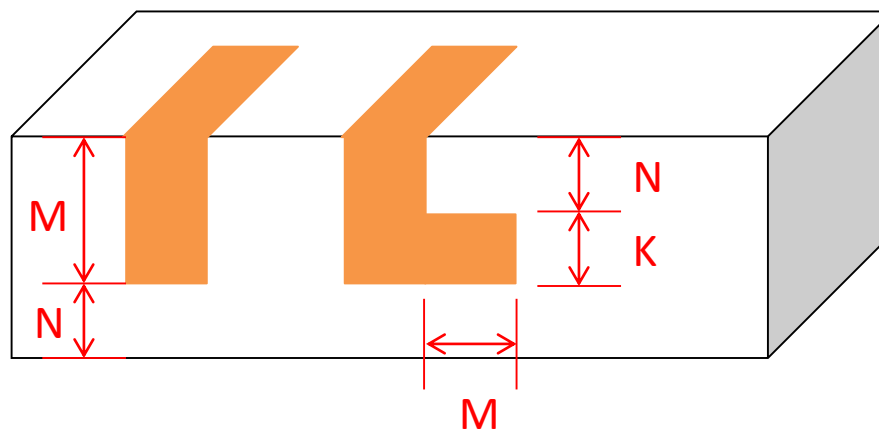
Item	Minimum size
K) Conductor size	$0.200 \pm 0.050\text{mm}$
L) Pattern interval	$0.200 \pm 0.050\text{mm}$
M) Pattern length	$0.200 \pm 0.050\text{mm}$
N) Substrate margin	$0.200 \pm 0.050\text{mm}$

If there is a margin, the thickness of the board is required to be 0.4 mm or more.

《No margin》 **Easier**



《margin》



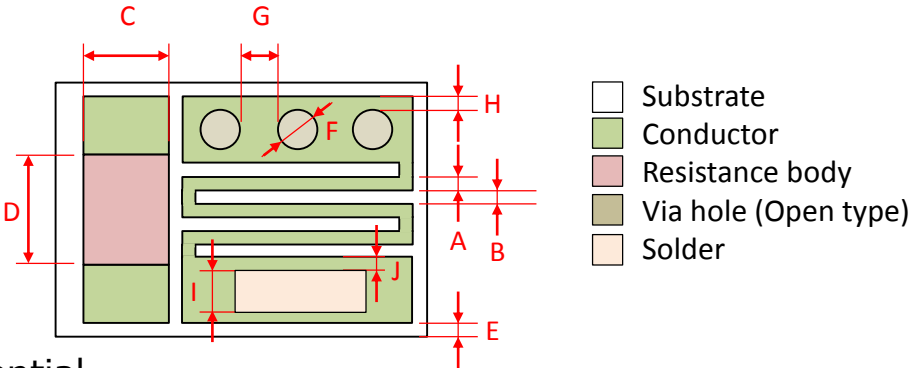
Design rule-3-1 (quartz)

Specilication

Item		Standard specification
Substrate material	Thickness	Min : 0.25mm Max : 0.60mm
	Work size	Min : □0.40mm
Conductor	Film composition (Thikkness)	Au 【Ti/Pt】 (Au : 0.6-1μm)
Resistance body	Seat resistance (T.C.R)	25,50,100Ω/□ (TCR : -100±100ppm/°C)
	Film composition	TaN
Solder	Solder composition (Thikkness)	AuSn (Au : 1.5-6μm)

Pattern size

Item	Minimum size
A) Conductor size	0.025 mm
B) Pattern interval	0.025 mm
C) Resistance body size (Width)	0.100 mm
D) Resistance body size (Length)	0.050 mm
E) Substrate neighborhood-Pattern	0.050 mm
F) Via hole	0.100 mm(>Thickness)
G) Via hole interval	0.250 mm
H) Via hole – Pattern interval	0.100 mm
I) Solder size	0.050mm
J) Solder– Pattern interval	0.050mm



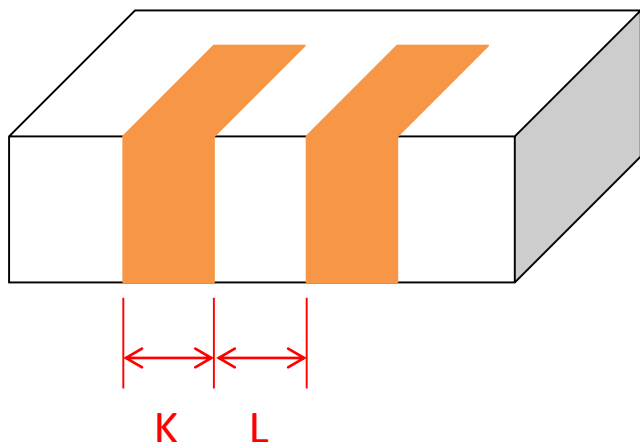
Design rule-3-2 (quartz)

Side Pattern size

Item	Minimum size
K) Conductor size	$0.200 \pm 0.050\text{mm}$
L) Pattern interval	$0.200 \pm 0.050\text{mm}$
M) Pattern length	$0.200 \pm 0.050\text{mm}$
N) Substrate margin	$0.200 \pm 0.050\text{mm}$

If there is a margin, the thickness of the board is required to be 0.4 mm or more.

《No margin》 **Easier**



《margin》

