

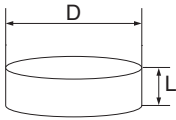
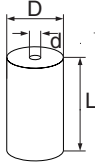
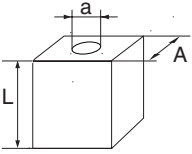
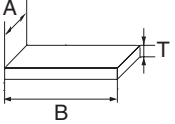
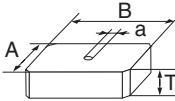
MICROWAVE DIELECTRIC CERAMICS

The microwave dielectric ceramic is used in the microwave band and is very effective for making smaller devices and improving the packaging density of microwave integrated circuits. For this reason, it is widely used for filters for mobile communication apparatuses (for base station and terminals) including cell phones, microwave transmitting circuit for receiving satellite broadcasting, GPS antenna, bluetooth, and recently for ITS (Intelligent Transportation System).

■ Features

- The specific inductive capacity (ϵ_r) is large, the microwave circuit can be made smaller, and the dielectric loss is very small so that a high Q value can be obtained in the microwave area.
- Since the frequency temperature coefficient (τ_f) is compensated, a stable circuit configuration can be made.
- Since variance in the specific inductive capacity is small (stable), a good circuit configuration can be made.
- In accordance with applications, various shapes are available to meet your requirements.

■ Major Types and Features

Material name	Dielectric resonator			Dielectric board	
	Disk type	Cylindrical type	Square cylindrical type	Square plate type	Square block type
Shape					
Characteristic	High Q value	High Q value Usable for smaller type	Usable for smaller type	High dimensional accuracy	Usable for smaller type High dimensional
Dimensions	D=50 or smaller L=30 or smaller	D= 50 or smaller d=0.5 or larger L= 30 or smaller	A= 40 or smaller a=0.5 or larger L= 30 or smaller	A, B=51 or smaller T=0.1~8.0	A, B= 25 or smaller a=0.6 or larger T= 6 or smaller
Applicable dielectric material	M20~45	M20~110	M20~110	M20~180	M20~110
Specific inductive capacity	20~45	20~110	20~110	20~200	20~110
Notes	Available to add support	AG metalization only	AG metalization only		

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■ Characteristics of materials

Material name	r	fo·Q	τf (10 ~ 50°C) (ppm/°C)	Specific gravity (g/cc)
M6.8	6.8±0.5	25000	-20± 5	3.0
M8	8.5±0.6	40000	-10± 5	3.1
*M20	20.5±0.7	50000	0± 5	3.8
M24	24.0±1.0	200000	1.5± 1	7.5
M29	29.0±1.0	170000	0± 1	7.7
M34	33.5±1.0	90000	3± 2	7.0
*M38	38.0±0.8	35000	8± 3	4.6
*M39	40.0±1.0	30000	5± 5	5.2
M45	45.0±2.0	40000	3± 1	4.7
M80	82.0±2.0	8000	5± 5	5.7
M93	93.0±2.0	6000	8± 3	5.7
M110	110.0±3.0	3300	5± 5	5.7
M130	129.0±2.0	1800	45±10	5.9
M140	134.0±4.0	2000	30±10	4.8
M180	185.0±4.0	100	14±30	4.8

MARUWA's dielectric items are classified into 3 types.

1. Coaxial resonator (TEM mode)

This is mainly used for filters for communication apparatuses (band pass filter [BPF] , duplexer [DUP]) and VCO.

2. LNB (TE018 Mode)

This is mainly used as an antenna resonator for receiving satellite broadcasting.

3. GPS, board

Antenna block is used as a plane antenna (GPS antenna) for car navigation, W-LAN, bluetooth, mobile phone antennas.
The board is used as the material for single-layer capacitors such as filters and isolators.

The using methods for 1, 2, and 3 and specific shapes are as follows.

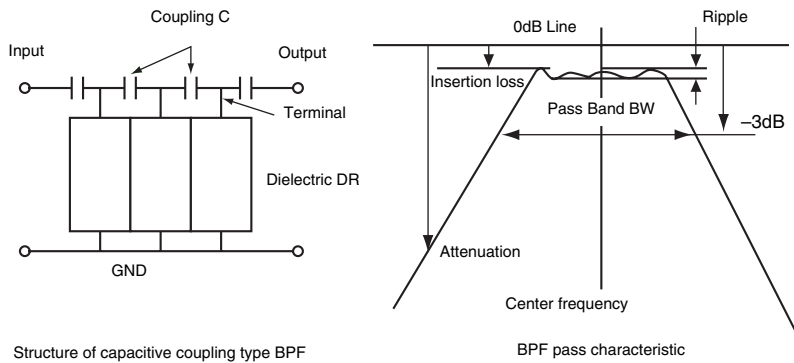


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1.Coaxial Resonator

Configuration of Dielectric BPF and Characteristics

- Dielectric BPFs are made by capacitive or inductive coupling of dielectric resonators.



Structure of capacitive coupling type BPF

BPF pass characteristic

	Dielectric TE	Dielectric TEM
• Characteristic		
Insertion	◎	○
Band width	△	○
Dielectric strength	○	○
Temperature stability	◎	◎
Vibration proof	◎	◎
• Frequency	>3GHz	0.3~3GHz
• Dimensions/weight	×	△
• Price	High	Medium
• Applications	Base station	DUP BPF

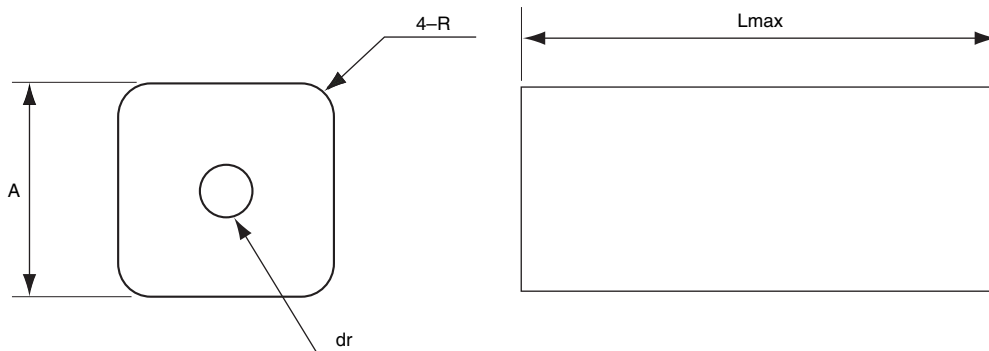
■List of Mass-Produced Shapes of Coaxial Resonator (Dimensions after Silver Coating)

Unit : mm

Product name	Outside diameter A	Inside diameter dr	Lmax	Corner R
98SS	9.85	2.95	9.00	1.50
60SS	5.90	2.13	10.00	1.00
51SS	5.05	1.95	10.00	0.15
41SS	3.93	1.50	10.00	0.50
40SS	3.90	1.20	10.00	1.00
34SS	3.40	1.15	10.00	0.20
33SS	3.35	0.75	10.00	0.20
31SS	3.05	0.93	10.00	0.30
29SS	2.85	0.95	10.00	0.40
28SS	2.90	0.80	10.00	0.30
245SS	2.50	0.90	10.00	0.20
21SS	2.05	0.75	9.00	0.30
20SS	2.05	0.80	9.00	0.30
18SS	1.85	0.75	9.00	0.20
15SS	1.55	0.40	5.00	0.20
13SS	1.20	0.55	5.00	0.20
4 × 4	4.00	1.20	20.00	0.60
6 × 6	6.00	2.44	30.00	0.90
6 × 6.5	6.0 × 6.5	2.44	30.00	1.00
6 × 7	6.0 × 7.0	2.44	30.00	1.00
12 × 12	12.00	3.50	30.00	1.80
80SS	7.95	2.60	30.00	0.50
158SS	15.85	4.95	30.00	—

* When M97 material is used, the inside diameter is 0.05mm smaller than the above value.

* The list of mass-produced shapes of coaxial resonators shows principal items. Custom-made products and high-quality items are also available.



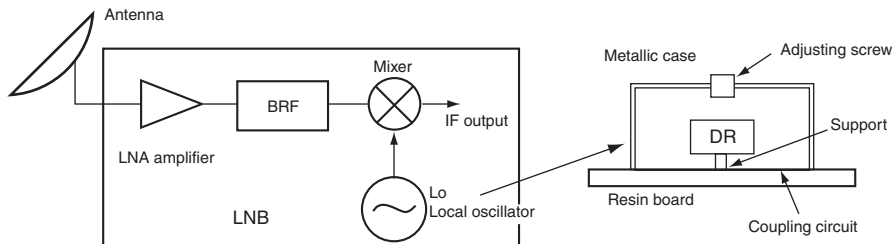
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2.LNB

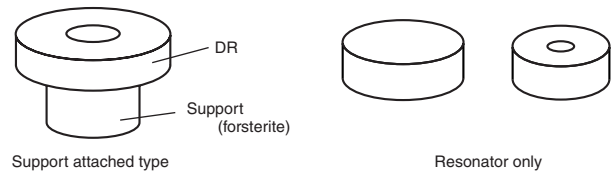
LNB

- Low Noise Box

In a system that requires to amplify in multi-stages very weak signals such as those of satellite broadcasting and satellite communication, if the entire noise is affected by the first-stage noise, and that portion requires very low noise design. For this reason, a high Q is required and a resonator of TE mode is used.



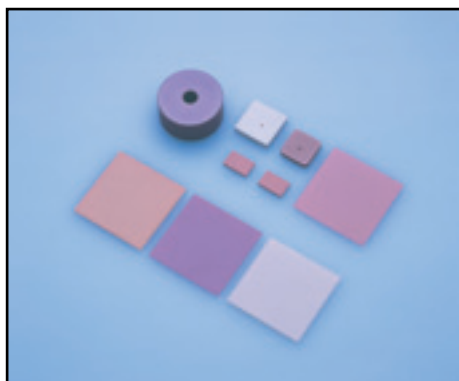
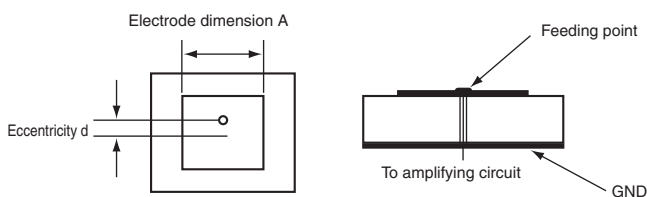
■ Shape



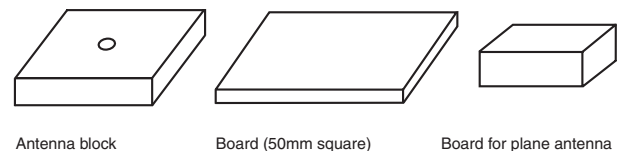
Those produced by MARUWA are in the frequency range of 4GHz to 20GHz, and there are two types, support attached type and resonator only. The size differs depending on the frequency. Materials of various temperature characteristics are available.

3. Antenna block, board

- Plain antenna for car navigation (GPS antenna). It is also called patch antenna.



■ Shape



Boards for GPS antennas for car navigation are available in 25mm square (M20, M21 material) and 20mm square (M38 material). Boards for GPS antennas for cell phone are available from 12 to 9mm square. Boards for capacitors for isolators are available in 50mm square with various types of material.