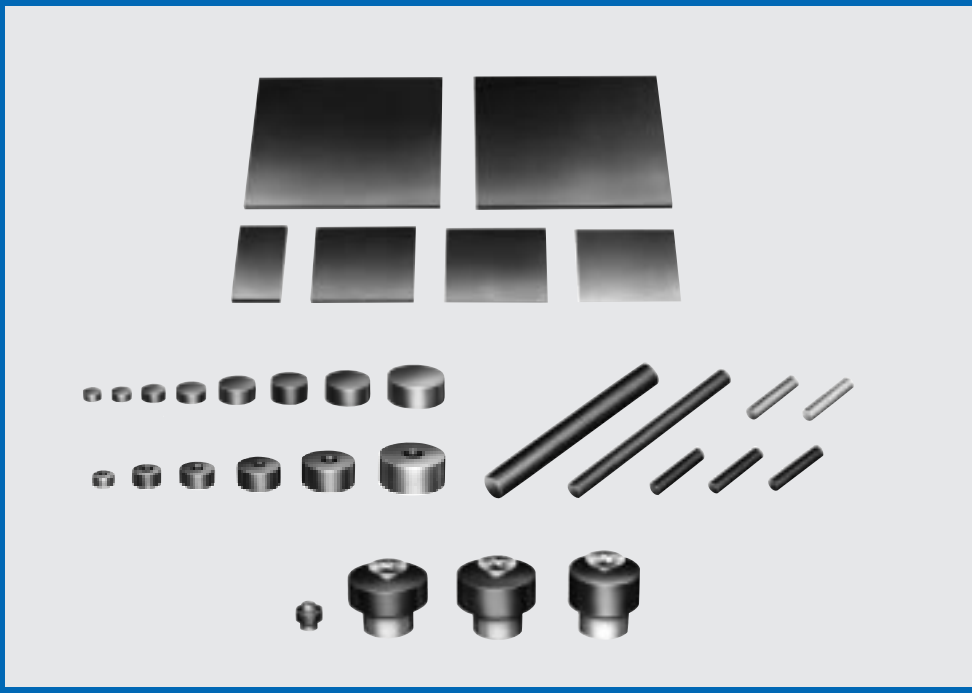
This is the PDF file of catalog No.O95E-7.

Dielectric Resonator (RESOMICS®)

RESOMICS®



muRata Innovator in Electronics

Murata
Manufacturing Co., Ltd.

Cat.NoO95E-7

Index

RESOMICS®

Dielectric Resonator (RESOMICS®)

Reduces the size of microwave devices
Low loss and high dielectric constant

■FEATURES

1. High-purity, high-density ceramics minimize loss.
2. High dielectric constant makes possible the miniaturization of microwave circuits. Temperature-compensated dielectric constant enables stable microwave oscillators.
3. The high-purity and smooth surface of the ceramics make them ideal for MIC applications.
4. A variety of shapes are available for custom application requirements.

■APPLICATIONS

- TVRO (SHF TV Down Converters)
- Burglar alarms
- Multi-channel microwave communication system
- Radar system
- Speed guns
- Mobile phone system
- CATV converters
- Measuring equipment

■CIRCUIT APPLICATION

- Microwave oscillators (DRO)
- MIC (Microwave Integrated Circuits)
- Discriminators
- Filters
- Tank circuits

■ELECTRICAL AND PHYSICAL CHARACTERISTICS OF DIELECTRIC RESONATORS

Material Code	U	M	V	R	B	E	F
Dielectric Constant (εr)	36 to 40	37 to 40	33 to 36	29 to 31	27 to 29	24 to 25	23 to 24
Temp. Coefficient (ppm/℃)	τf*=−4 to 10	τf*=0 to 6	τf*=0 to 8	τf*=0 to 6	τf*=0 to 6	τf*=0 to 6	τf*=0 to 4
Q (=1/tan δ)	6000min. (at 7GHz)	7000min. (at 7GHz)	10000min. (at 10GHz)	12000min. (at 10GHz)	15000min. (at 10GHz)	20000min. (at 10GHz)	35000 (at 10GHz)
Ins. Resistance (Ω·cm)	1×10^{13}min.	1×10^{13}min.	1×10^{13}min.	1×10^{13}min.	1×10^{13}min.	1×10^{14}min.	1×10^{13}min.
Expansion Coefficient (ppm/℃)	6 to 7	6 to 7	12 to 13	10.7	11.0	10.7	11.0
Thermal Conductivity (W/℃)	1.93	1.93	2.81	2.14	2.56	3.23	4.20
Specific Heat (J/kg·℃)	630	630	382	210	302	323	328
Density (g/cm³)	5.0	5.0	6.5	7.7	7.6	7.5	7.5
Water absorption (%)	0.01max.	0.01max.	0.01max.	0.01max.	0.01max.	0.01max.	0.01max.
Vicker's Hardness Number	900	900	600	700	700	800	700
Bend Strength (MPa)	98	98	98	88	108	118	108

* τf denotes temperature coefficient of resonant frequency

■ISO9002 QUALITY RECOGNITION

Plant	Certified Date	Organization	Registration No.
Murata Manufacturing Co., Ltd. Yokaichi Plant	7. 29, '92	RCJ (*) ISO9002	RCJ-86 M-04A

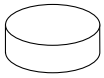
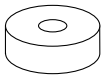
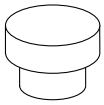
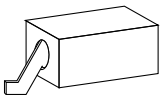
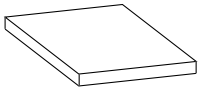
· Manufacturing Plant of these products in this catalog has obtained the ISO9002 quality

■ELECTRICAL AND PHYSICAL CHARACTERISTICS OF DIELECTRIC SUBSTRATES AND SUPPORTS

Applications	Dielectric substrates			Support
Material Code	H	P	K	Z
Dielectric Constant (Ɛr)	38±1	21.4±1	92±1	6.4±0.6
Temp. Coefficient (ppm/℃)	τε*=−30±30	τε*=−30±30	τε*=−30±30	τε*=−30±30
Q (=1/tan δ)	8000min. (at 3GHz)	9000min. (at 3GHz)	1500min. (at 3GHz)	2000min. (at 7GHz)
Ins. Resistance (Ω·cm)	1×10^{13}min.	1×10^{13}min.	1×10^{13}min.	1×10^{13}min.
Expansion Coefficient (ppm/℃)	6 to 7	8 to 9	8 to 9	to 10
Thermal Conductivity (W/m·℃)	1.93	7.14	1.64	1.76
Specific Heat (J/kg·℃)	630	840	546	840
Density (g/cm^3)	5.0	3.7	5.7	2.7
Water absorption (%)	0.01max.	0.01max.	0.01max.	0.01max.
Vicker's Hardness Number	900	800	700	800
Bend Strength (MPa)	98	147	147	147

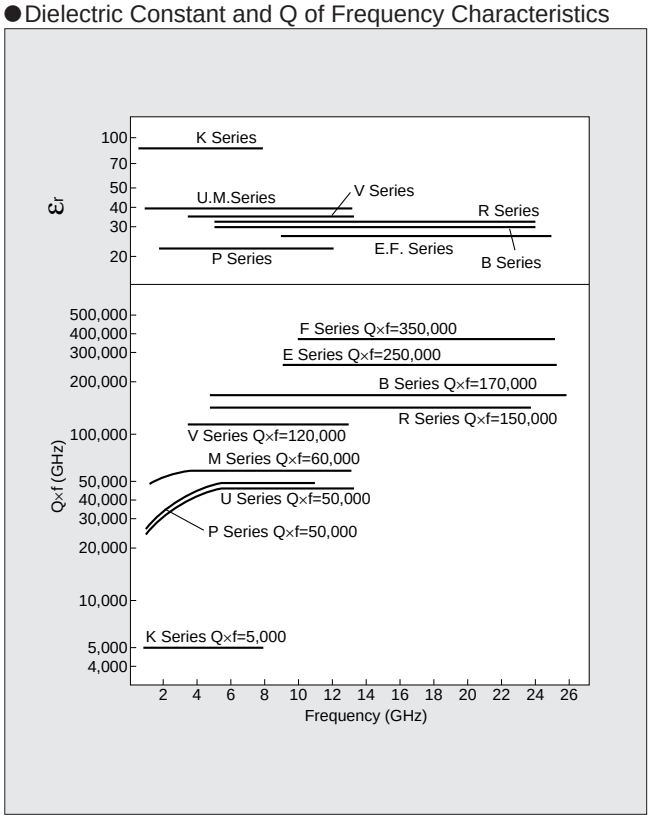
* τε denotes temperature coefficient of dielectric constant

■DIELECTRIC ELEMENT/CONFIGURATION

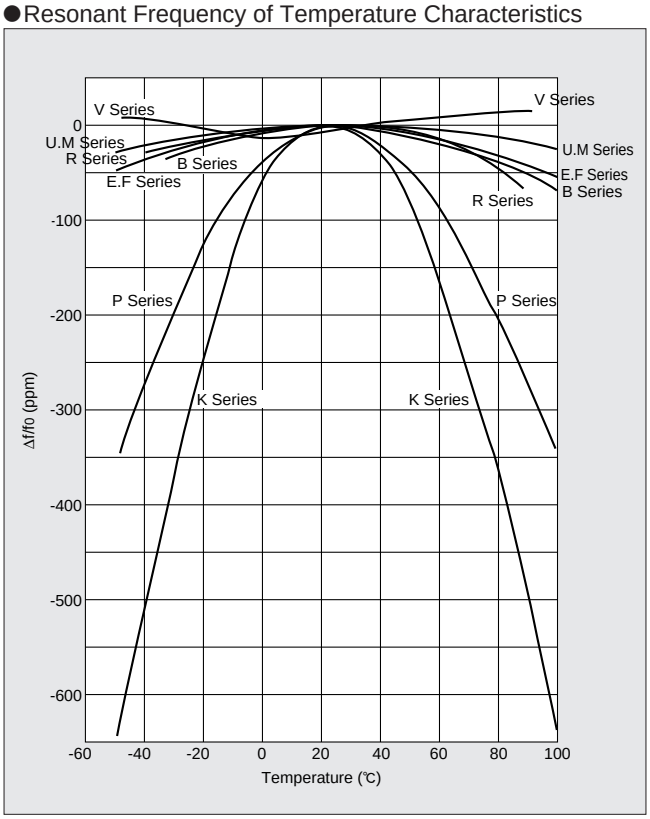
Kind	Types	Configuration	Features and Applications
Dielectric Resonator (RESOMICS®)	DRD	Disc 	Disc type with simple configuration. Used for stabilizing frequency in microwave oscillators
	DRT	Coaxial cylinder 	The resonator with a hole improves spurious response without degrading Q. It can be mounted using a screw.
	DRBD	Disc Type with support 	Disc type resonator with support. The resonator's Q is not influenced by metal case.
	DRR	TEM mode Resonator of rod 	High dielectric constant and high Q makes possible the miniaturization of microwave circuits. (ex. : VCO)
Dielectric Substrate	DBR	Substrate 	High dielectric constant and high Q reduces the size of MIC. Three grades of surface finish are available.
Support	DRZ	Coaxial Cylinder 	The support, which has a low dielectric constant and high Q, minimizes induced losses to the resonator.

■CHARACTERISTICS

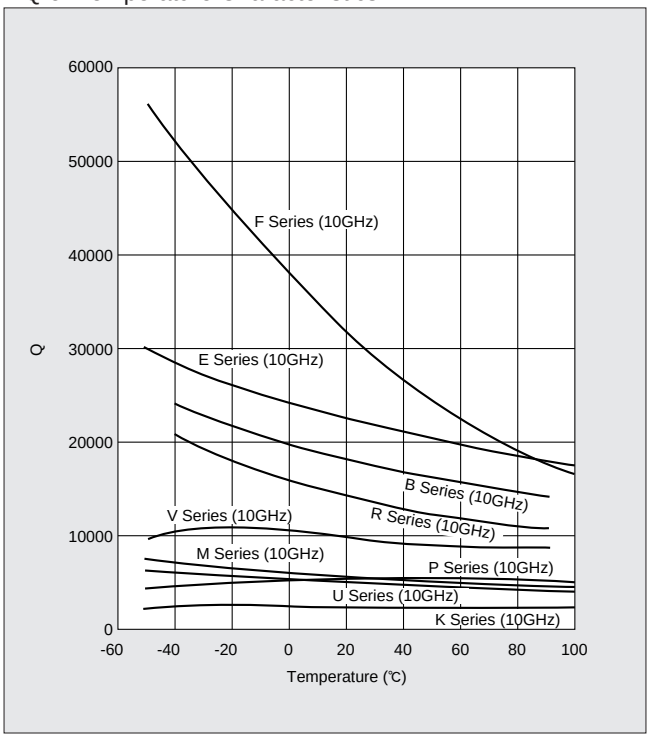
●Dielectric Constant and Q of Frequency Characteristics



●Resonant Frequency of Temperature Characteristics



●Q of Temperature Characteristics

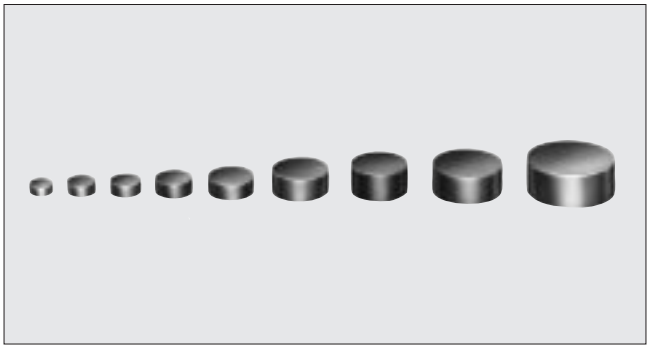


RESOMICS®

Dielectric Resonator **U** Series (DRD Type)

■FEATURES

1. A low loss ceramic with a high dielectric constant (εr≒38) has made these compact, high Q, dielectric resonators possible.
2. The resonant frequency temperature coefficient can be chosen from −4 to 10ppm/℃. Tolerance of the frequency temperature coefficient can be chosen from ±0.5, ±1 and ±2 ppm/℃.
3. Accurate and repeatable dielectric constant simplifies circuit designing.
4. Resonant frequency can be chosen from 1.6 to 12GHz.



■PART NUMBERING

(Please specify the part number when ordering.)

(Ex.) DRD | 055 | U | E | 024 | A

❶ ❷ ❸ ❹ ❺ ❻

❶Configuration : DRD denotes disc type RESOMICS®

❷Outer Diameter : Outer diameter is designated in units of 1/10mm using 3 digits.

❸Material : U designates the kind of material.

❹Characteristic Code : The temperature coefficient of the resonant frequency is designated by the codes shown in Table 1.

❺Thickness : Thickness is designated in units of 1/10mm using 3 digits.

❻Special Code : The temperature coefficient tolerance of the resonant frequency is denoted by the codes shown in Table 2.

Table 1. Characteristic codes and electrical specifications

Characteristic Code	Frequency Temperature Coefficient (τf) (ppm/℃)	Dielectric Constant (εr)	Q (at 7GHz)
A	−4	36.6±0.5	6,000 min.
B	−2	37.0±0.5	
C	0	37.4±0.5	
D	2	37.7±0.5	
E	4	38.0±0.5	
F	6	38.3±0.5	
G	8	38.6±0.5	
H	10	38.9±0.5	

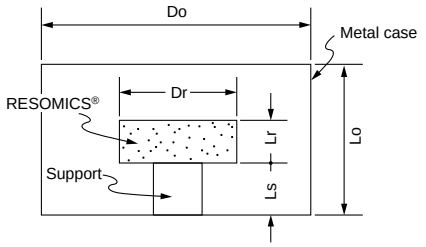
Frequency characteristic of Q value

$$Q \geqq \frac{100{,}000}{2.0 \times f_0 + 2.6}$$ f_0 : [GHz]

Table 2. Special codes

Special Code	Tolerance of the frequency Temperature Coefficient (ppm/℃)
No code	±2
A	±1
B	±0.5

■TEST SET-UP OF RESOMICS®



Get the resonant frequency of the rating when Lo/Lr=Do/Dr=3

■RATINGS

Part Number	Dr±0.05 (mm)	Lr±0.05 (mm)	Resonant Frequency Range (GHz)
DRD046U□021	4.65	2.06	11.46 to 12.45
DRD051U□022	5.06	2.24	10.54 to 11.46
DRD055U□024	5.50	2.44	9.69 to 10.54
DRD060U□027	5.98	2.65	8.91 to 9.69
DRD065U□029	6.50	2.88	8.20 to 8.91
DRD071U□031	7.07	3.14	7.54 to 8.20
DRD077U□034	7.69	3.41	6.93 to 7.54
DRD084U□037	8.36	3.71	6.38 to 6.93
DRD091U□040	9.09	4.03	5.87 to 6.38
DRD099U□044	9.88	4.38	5.40 to 5.87
DRD107U□048	10.75	4.77	4.96 to 5.40
DRD117U□052	11.68	5.18	4.56 to 4.96
DRD127U□056	12.70	5.63	4.20 to 4.56
DRD138U□061	13.81	6.13	3.86 to 4.20
DRD150U□067	15.02	6.66	3.55 to 3.86
DRD163U□072	16.33	7.24	3.27 to 3.55
DRD178U□079	17.76	7.88	3.00 to 3.27
DRD193U□086	19.31	8.56	2.76 to 3.00
DRD210U□093	21.00	9.31	2.54 to 2.76
DRD228U□101	22.83	10.13	2.34 to 2.54
DRD248U□110	24.82	11.01	2.15 to 2.34
DRD270U□120	26.99	11.97	1.98 to 2.15
DRD293U□130	29.35	13.02	1.82 to 1.98
DRD319U□142	31.91	14.15	1.67 to 1.82
DRD347U□154	34.70	15.39	1.54 to 1.67

RESOMICS®

Dielectric Resonator **U** Series (DRT Type)

■FEATURES

1. A low loss ceramic with a high dielectric constant (εr≒38) has made these compact, high Q, dielectric resonators possible.
2. The resonant frequency temperature coefficient can be chosen from −4 to 10ppm/℃. Tolerance of the frequency temperature coefficient can be chosen from ±0.5, ±1 and ±2 ppm/℃.
3. Accurate and repeatable dielectric constant simplifies circuit designing.
4. The hole in the center improves spurious response above that of the DRD series.
5. Any of the DRT series can be mounted with a plastic screw in combination with a DRZ support.

■PART NUMBERING

(Please specify the part number when ordering.)

(Ex.) DRT ❶ | 055 ❷ | U ❸ | 020 ❹ | C ❺ | 024 ❻ | B ❼

❶Configuration : DRT denotes coaxial cylindrical RESOMICS®
❷Outer Diameter : Outer diameter is designated in units of 1/10mm using 3 digits.
❸Material : U designates the kind of material.
❹Inner Diameter : Inner diameter is designated in units of 1/10mm using 3 digits.
❺Characteristic Code : The temperature coefficient of the resonant frequency is designated by the codes shown in Table 3.
❻Thickness : Thickness is designated in units of 1/10mm using 3 digits.
❼Special Code : The temperature coefficient tolerance of the resonant frequency is denoted by the codes shown in Table 4.

Table 3. Characteristic codes and electrical specifications

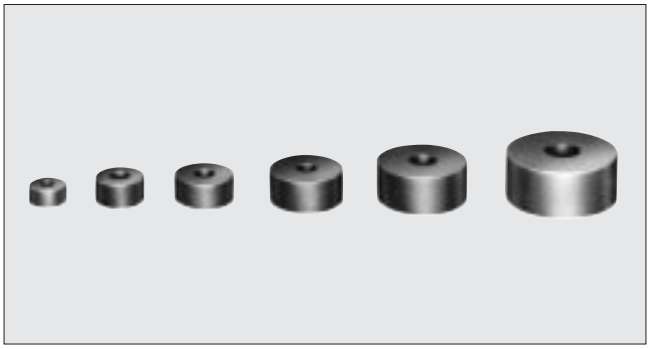
Characteristic Code	Frequency Temperature Coefficient (τf) (ppm/℃)	Dielectric Constant (εr)	Q (at 7GHz)
A	−4	36.6±0.5	6,000 min.
B	−2	37.0±0.5	
C	0	37.4±0.5	
D	2	37.7±0.5	
E	4	38.0±0.5	
F	6	38.3±0.5	
G	8	38.6±0.5	
H	10	38.9±0.5	

Frequency characteristic of Q value

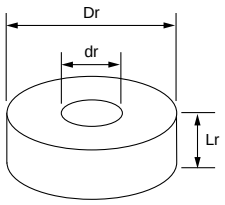
$$Q \geqq \frac{100{,}000}{2.0 \times f_0 + 2.6} \qquad f_0 : [\mathrm{GHz}]$$

Table 4. Special codes

Special Code	Tolerance of the frequency Temperature Coefficient (ppm/℃)
No code	±2
A	±1
B	±0.5



■EXTERNAL DIMENSIONS



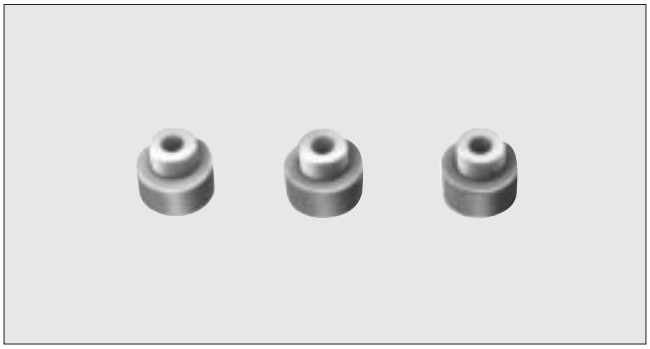
Get the resonant frequency of the rating when Lo/Lr=Do/Dr=3

■RATINGS

Part Number	Dr±0.05 (mm)	dr±0.1 (mm)	Lr±0.05 (mm)	Resonant Frequency Range (GHz)
DRT051U020□022	5.06	2.0	2.24	10.54 to 11.45
DRT055U020□024	5.50		2.44	9.69 to 10.54
DRT060U020□027	5.98		2.65	8.91 to 9.69
DRT065U020□029	6.50		2.88	8.20 to 8.91
DRT071U020□031	7.07		3.14	7.54 to 8.20
DRT077U020□034	7.69		3.41	6.93 to 7.54
DRT084U030□037	8.36	3.0	3.71	6.38 to 6.93
DRT091U030□040	9.09		4.03	5.87 to 6.38
DRT099U030□044	9.88		4.38	5.40 to 5.87
DRT105U030□046	10.50		4.60	5.08 to 5.40
DRT107U040□048	10.75	4.0	4.77	4.96 to 5.08
DRT117U040□052	11.68		5.18	4.56 to 4.96
DRT127U040□056	12.70		5.63	4.20 to 4.56
DRT138U040□061	13.81		6.13	3.86 to 4.20
DRT150U040□067	15.02		6.66	3.55 to 3.86
DRT163U040□072	16.33		7.24	3.27 to 3.55
DRT178U040□079	17.76		7.88	3.00 to 3.27
DRT193U040□086	19.31		8.56	2.76 to 3.00
DRT200U040□086	20.00		8.63	2.67 to 2.76
DRT200U060□086	20.00	6.0	8.63	2.66 to 2.88

RESOMICS®

Dielectric Resonator with Support U Series (DRBD Type)



■FEATURES

1. A low loss ceramic with a high dielectric constant (εr≒38) has made these compact, high Q, dielectric resonators possible.
2. The resonant frequency temperature coefficient can be chosen from −4 to 10ppm/℃. Tolerance of the frequency temperature can be chosen from ±0.5, ±1 and ±2 ppm/℃.
3. Accurate and repeatable dielectric constant simplifies circuit designing.
4. The shape is a dielectric resonator with a support. And the resonator's Q is not influenced by metal case.
5. These resonator are suitable for Ku band oscillator.

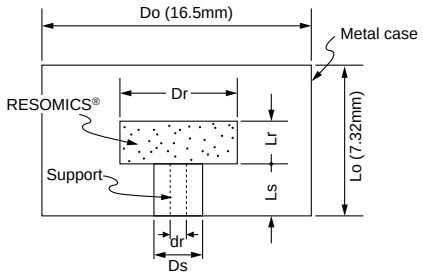
■PART NUMBERING

(Please specify the part number when ordering.)

(Ex.) DRBD ❶ | 055 ❷ | U ❸ | D ❹ | 024 ❺ | B ❻

❶Configuration : DRBD denotes disc type resonator with support.
❷Outer Diameter : Outer diameter is designated in units of 1/10mm using 3 digits.
❸Material : U designates the kind of material.
❹Characteristic Code : The temperature coefficient of the resonant frequency is designated by the codes shown in Table 5.
❺Thickness : Thickness is designated in unit of 1/10mm using 3 digits.
❻Special Code : The temperature coefficient tolerance of the resonant frequency is denoted by the codes shown in Table 6.

■EXTERNAL DIMENSIONS



■RATING

Part Number	Dielectric Resonator		Support			✻ Resonant Frequency Range (GHz)
	Dr±0.05 (mm)	Lr±0.05 (mm)	Ds±0.1 (mm)	dr±0.1 (mm)	Ls±0.05 (mm)	
DRBD046U□021	4.65	2.06	3.6	2.0	1.5	11.46 to 12.45
DRBD051U□022	5.06	2.24	3.6	2.0	1.5	10.54 to 11.46
DRBD055U□024	5.50	2.44	3.6	2.0	1.5	9.69 to 10.54
DRBD060U□027	5.98	2.65	3.6	2.0	1.5	8.91 to 9.69

✻ Frequency Range : Get the resonant frequency of the rating when measuring with above TEST SET-UP OF RESOMICS®.

Table 5. Characteristic codes and electrical specifications

Characteristic Code	Frequency Temperature Coefficient (τf) (ppm/℃)	Dielectric Constant (εr)	Q (at 7GHz)
A	−4	36.6±0.5	6,000 min.
B	−2	37.0±0.5	
C	0	37.4±0.5	
D	2	37.7±0.5	
E	4	38.0±0.5	
F	6	38.3±0.5	
G	8	38.6±0.5	
H	10	38.9±0.5	

Frequency characteristic of Q value

$$Q \geqq \frac{100{,}000}{2.0 \times f_0 + 2.6} \qquad f_0 : [\mathrm{GHz}]$$

Table 6. Special codes

Special Code	Tolerance of the frequency Temperature Coefficient (ppm/℃)
No code	±2
A	±1
B	±0.5

● Please contact us when you need the shape except for above resonator or support size.

RESOMICS®

Dielectric Resonator **M** Series

Dielectric Resonator with Improved Q on U-series Highly Improved Q Especially for Frequency below 4GHz

■FEATURES

1. High Q of 15,000 at 4GHz.
2. High dielectric constant : $\varepsilon r \fallingdotseq 38$
3. Resonant frequency temperature coefficient can be chosen from 0 to 6ppm/℃. Tolerance of the frequency temperature coefficient can be chosen from ±0.5, ±1 and ±2 ppm/℃.

■PART NUMBERING

(Please specify the part number when ordering.)

(Ex.) DRD ❶ | 055 ❷ | M ❸ | D ❹ | 024 ❺ | A ❻

❶Configuration : DRD denotes disc type, DRT denotes cylindrical type.

❷Outer Diameter : Outer diameter is designated in units of 1/10mm using 3 digits.

❸Material : M designates the kind of material.

❹Characteristic Code : The temperature coefficient of the resonant frequency. Designated by the codes shown in Table 7.

❺Thickness : Designated in units of 1/10mm using 3 digits.

❻Special Code : The temperature coefficient tolerance of the resonant frequency is denoted by the codes shown in Table 8.

Table 7. Characteristic codes and electrical specifications of dielectric resonator

Characteristic Code	Frequency Temperature Coefficient (τf) (ppm/℃)	Dielectric Constant (εr)		Q (at 7GHz)
		①	②	
C	0	38.5±1.0	37.7±1.0	7,400min.
D	2	38.7±1.0	37.9±1.0	7,200min.
E	4	38.9±1.0	38.2±1.0	7,100min.
F	6	39.2±1.0	38.4±1.0	7,000min.

Frequency characteristic of Q value

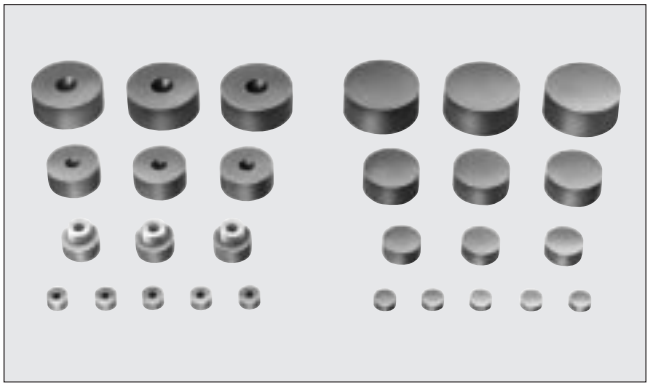
$$Q \geqq \frac{100{,}000}{1.95 \times f_0 + 0.117 \times \tau f - 0.15}$$

f_0 : [GHz]

τf : [ppm/℃]

Table 8. Special codes

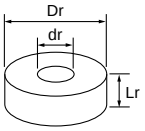
Special Code	Tolerance of the frequency Temperature Coefficient (ppm/℃)
No code	±2
A	±1
B	±0.5



■RATING (DRD Type)

Part Number	Dr±0.05 (mm)	Lr±0.05 (mm)	Resonant Frequency Range (GHz)	Dielectric Constant
DRD046M□021	4.65	2.06	11.46 to 12.45	Table-7 ①
DRD051M□022	5.06	2.24	10.54 to 11.46	
DRD055M□024	5.50	2.44	9.69 to 10.54	
DRD060M□027	5.98	2.65	8.91 to 9.69	
DRD065M□029	6.50	2.88	8.20 to 8.91	
DRD071M□031	7.07	3.14	7.54 to 8.20	
DRD077M□034	7.69	3.41	6.93 to 7.54	
DRD084M□037	8.36	3.71	6.38 to 6.93	
DRD091M□040	9.09	4.03	5.87 to 6.38	
DRD099M□044	9.88	4.38	5.40 to 5.87	
DRD107M□048	10.75	4.77	4.96 to 5.40	
DRD117M□052	11.68	5.18	4.56 to 4.96	Table-7 ②
DRD127M□056	12.70	5.63	4.20 to 4.56	
DRD138M□061	13.81	6.13	3.86 to 4.20	
DRD150M□067	15.02	6.66	3.55 to 3.86	
DRD163M□072	16.33	7.24	3.27 to 3.55	
DRD178M□079	17.76	7.88	3.00 to 3.27	
DRD193M□086	19.31	8.56	2.76 to 3.00	
DRD210M□093	21.00	9.31	2.54 to 2.76	
DRD228M□101	22.83	10.13	2.34 to 2.54	
DRD248M□110	24.82	11.01	2.15 to 2.34	
DRD270M□120	26.99	11.97	1.98 to 2.15	
DRD293M□130	29.35	13.02	1.82 to 1.98	
DRD319M□142	31.91	14.15	1.67 to 1.82	
DRD347M□154	34.70	15.39	1.54 to 1.67	

■RATING (DRT Type)



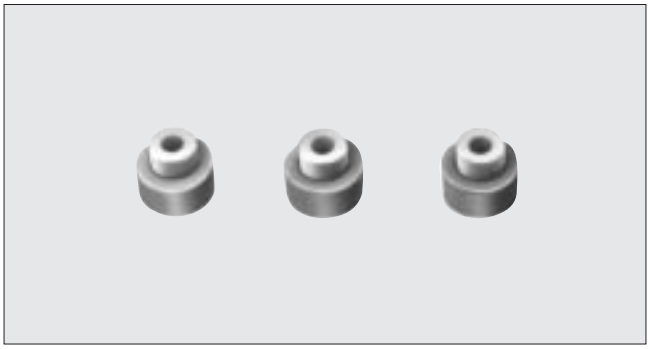
Part Number	Dr±0.05 (mm)	dr±0.1 (mm)	Lr±0.05 (mm)	Resonant Frequency Range (GHz)	Dielectric Constant
DRT051M020□022	5.06	2.0	2.24	10.54 to 11.46	Table-7 ①
DRT055M020□024	5.50	2.0	2.44	9.69 to 10.45	
DRT060M020□027	5.98	2.0	2.65	8.91 to 9.69	
DRT065M020□029	6.50	2.0	2.88	8.20 to 8.91	
DRT071M020□031	7.07	2.0	3.14	7.54 to 8.20	
DRT077M020□034	7.69	2.0	3.41	6.93 to 7.54	
DRT084M030□037	8.36	3.0	3.71	6.38 to 6.93	
DRT091M030□040	9.09	3.0	4.03	5.87 to 6.38	
DRT099M030□044	9.88	3.0	4.38	5.40 to 5.87	
DRT107M040□048	10.75	4.0	4.77	4.96 to 5.40	Table-7 ②
DRT117M040□052	11.68	4.0	5.18	4.56 to 4.96	
DRT127M040□056	12.70	4.0	5.63	4.20 to 4.56	
DRT138M040□061	13.81	4.0	6.13	3.86 to 4.20	
DRT150M040□067	15.02	4.0	6.66	3.55 to 3.86	
DRT163M040□072	16.33	4.0	7.24	3.27 to 3.55	
DRT178M040□079	17.76	4.0	7.88	3.00 to 3.27	
DRT193M040□086	19.31	4.0	8.56	2.76 to 3.00	
DRT210M040□093	21.00	4.0	9.31	2.54 to 2.76	

RESOMICS®

Dielectric Resonator with Support **M** Series (DRBD Type)

■FEATURES

1. High Q of 7,000min. At 7GHz
2. High dielectric constant : εr≒38
3. The resonant frequency temperature coefficient can be chosen from 0 to 6ppm/℃. Tolerance of the frequency temperature can be chosen from ±0.5, ±1 and ±2 ppm/℃.
4. Accurate and repeatable dielectric constant simplifies circuit designing.
5. The shape is a dielectric resonator with a support. And the resonator's Q is not influenced by metal case.
6. These resonator are suitable for Ku band oscillator.



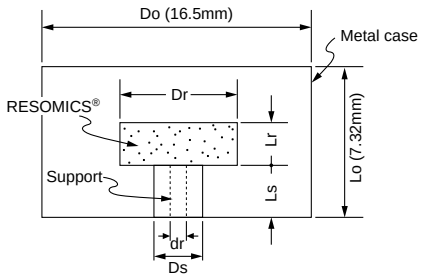
■PART NUMBERING

(Please specify the part number when ordering.)

(Ex.)	DRBD	055	M	D	024	B
	❶	❷	❸	❹	❺	❻

❶Configuration : DRBD denotes disc type resonator with support.
❷Outer Diameter : Outer diameter is designated in units of 1/10mm using 3 digits.
❸Material : M designates the kind of material.
❹Characteristic Code : The temperature coefficient of the resonant frequency is designated by the codes shown in Table 9.
❺Thickness : Thickness is designated in unit of 1/10mm using 3 digits.
❻Special Code : The temperature coefficient tolerance of the resonant frequency is denoted by the codes shown in Table 10.

■TEST SET-UP OF RESOMICS® AND EXTERNAL DIMENSIONS



■RATING

Part Number	Dielectric Resonator		Support			✻ Resonant Frequency Range (GHz)
	Dr±0.05 (mm)	Lr±0.05 (mm)	Ds±0.1 (mm)	dr±0.1 (mm)	Ls±0.05 (mm)	
DRBD046M□021	4.65	2.06	3.6	2.0	1.5	11.46 to 12.45
DRBD051M□022	5.06	2.24	3.6	2.0	1.5	10.54 to 11.46
DRBD055M□024	5.50	2.44	3.6	2.0	1.5	9.69 to 10.54
DRBD060M□027	5.98	2.65	3.6	2.0	1.5	8.91 to 9.69

✻ Frequency Range : Get the resonant frequency of the rating when measuring with above TEST SET-UP OF RESOMICS®.

Table 9. Characteristic codes and electrical specifications

Characteristic Code	Frequency Temperature Coefficient (τf) (ppm/℃)	Dielectric Constant (εr)	Q (at 7GHz)
C	0	38.5±1	7,400 min.
D	2	38.7±1	7,200 min.
E	4	38.9±1	7,100 min.
F	6	39.2±1	7,000 min.

Frequency characteristic of Q value

$$Q \geqq \frac{100{,}000}{2.0 \times f_0 + 0.117 \times \tau f - 0.15}$$

f_0 : [GHz]
τf : [ppm/℃]

Table 10. Special codes

Special Code	Tolerance of the frequency Temperature Coefficient (ppm/℃)
No code	±2
A	±1
B	±0.5

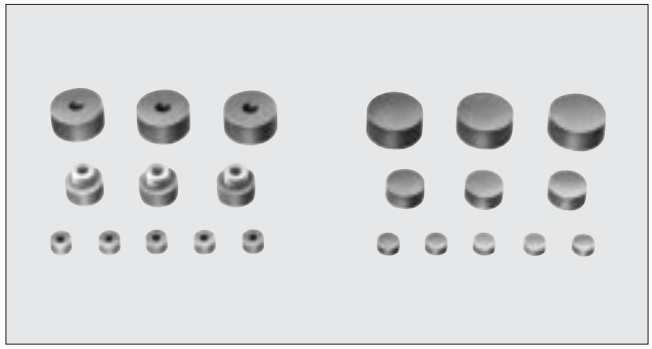
● Please contact us when you need the shape except for above resonator or suport size.

RESOMICS®

Dielectric Resonator **V** Series

■FEATURES

1. High Q-value of 12,000 at 10GHz.
2. High dielectric constant : εr≒34
3. The resonant frequency temperature coefficient can be chosen from 0 to 8ppm/℃. Tolerance of the frequency temperature coefficient can be chosen from ±0.5, ±1 and ±2 ppm/℃.
4. Dielectric resonator are chosen from the frequency range of 3 to 13GHz in disc type (DRD), and from the frequency range of 3 to 12.5GHz in cylindrical type (DRT).



■PART NUMBERING

(Please specify the part number when ordering.)

(Ex.) DRD ❶ | 055 ❷ | V ❸ | D ❹ | 024 ❺ | A ❻

❶Configuration : DRD denotes disc type, DRT denotes cylindrical type.

❷Outer Diameter : Outer diameter is designated in units of 1/10mm using 3 digits.

❸Material : V designates the kind of material.

❹Characteristic Code : The temperature coefficient of the resonant frequency. Designated by the codes shown in Table 11.

❺Thickness : Designated in units of 1/10mm using 3 digits.

❻Special Code : The temperature coefficient tolerance of the resonant frequency is denoted by the codes shown in Table 12.

■RATING (DRD Type)

Part Number	Dr±0.05 (mm)	Lr±0.05 (mm)	Resonant Frequency Range (GHz)
DRD046V□021	4.65	2.06	12.07 to 13.24
DRD051V□022	5.06	2.24	11.10 to 12.07
DRD055V□024	5.50	2.44	10.20 to 11.10
DRD060V□027	5.98	2.65	9.39 to 10.20
DRD065V□029	6.50	2.88	8.64 to 9.39
DRD071V□031	7.07	3.14	7.93 to 8.64
DRD077V□034	7.69	3.41	7.30 to 7.93
DRD084V□037	8.36	3.71	6.71 to 7.30
DRD091V□040	9.09	4.03	6.17 to 6.71
DRD099V□044	9.88	4.38	5.68 to 6.17
DRD107V□048	10.75	4.77	5.22 to 5.68
DRD117V□052	11.68	5.18	4.80 to 5.22
DRD127V□056	12.70	5.63	4.42 to 4.80
DRD138V□061	13.81	6.13	4.06 to 4.42
DRD150V□067	15.02	6.66	3.74 to 4.06
DRD163V□072	16.33	7.24	3.44 to 3.74
DRD178V□079	17.76	7.88	3.16 to 3.44
DRD193V□086	19.31	8.56	2.91 to 3.16

Table 11. Characteristic codes and electrical specifications of dielectric resonator

Characteristic Code	Frequency Temperature Coefficient (τf) (ppm/℃)	Dielectric Constant (εr)	Q (at 10GHz)
C	0	33.5±0.5	10,000min.
D	2	33.9±0.5	
E	4	34.3±0.5	
F	6	34.7±0.5	
G	8	35.1±0.5	

Frequency characteristic of Q value

$$Q \geqq \frac{100,000}{f_0} \qquad f_0 : [GHz]$$

Table 12. Special codes

Special Code	Tolerance of the frequency Temperature Coefficient (ppm/℃)
No code	±2
A	±1
B	±0.5

■RATING (DRT Type)

Part Number	Dr±0.05 (mm)	dr±0.1 (mm)	Lr±0.05 (mm)	Resonant Frequency Range (GHz)
DRT051V020□022	5.06	2.0	2.24	11.41 to 12.52
DRT055V020□024	5.50		2.44	10.42 to 11.42
DRT060V020□027	5.98		2.65	9.54 to 10.42
DRT065V020□029	6.50		2.88	8.74 to 9.54
DRT071V020□031	7.07		3.14	8.00 to 8.74
DRT077V020□034	7.69		3.41	7.34 to 8.00
DRT084V030□037	8.36	3.0	3.71	6.85 to 7.34
DRT091V030□040	9.09		4.03	6.27 to 6.85
DRT099V030□044	9.88		4.38	5.74 to 6.27
DRT107V040□048	10.75	4.0	4.77	5.34 to 5.74
DRT117V040□052	11.68		5.18	4.89 to 5.34
DRT127V040□056	12.70		5.63	4.48 to 4.89
DRT138V040□061	13.81		6.13	4.10 to 4.48
DRT150V040□067	15.02		6.66	3.76 to 4.10
DRT163V040□072	16.33		7.24	3.45 to 3.76
DRT178V040□079	17.76		7.88	3.17 to 3.45
DRT193V040□086	19.31		8.56	2.91 to 3.17

RESOMICS®

Dielectric Resonator **R** Series

■FEATURES

1. High Q-value of 15,000 at 10GHz.
2. High dielectric constant : εr≒30
3. The resonant frequency temperature coefficient can be chosen from 0 to 6ppm/℃. Tolerance of the frequency temperature coefficient can be chosen from ±0.5, ±1 and ±2 ppm/℃.
4. Dielectric resonator are chosen from the frequency range of 4.6 to 24.2GHz in disc type (DRD), and from the frequency range of 5.7 to 13.1GHz in cylindrical type (DRT).

■PART NUMBERING

(Please specify the part number when ordering.)

(Ex.) DRD ❶ | 055 ❷ | R ❸ | D ❹ | 024 ❺ | A ❻

❶Configuration : DRD denotes disc type, DRT denotes cylindrical type.

❷Outer Diameter : Outer diameter is designated in units of 1/10mm using 3 digits.

❸Material : R designates the kind of material.

❹Characteristic Code : The temperature coefficient of the resonant frequency. Designated by the codes shown in Table 13.

❺Thickness : Designated in units of 1/10mm using 3 digits.

❻Special Code : The temperature coefficient tolerance of the resonant frequency is denoted by the codes shown in Table 14.

■RATING (DRD Type)

Part Number	Dr±0.05 (mm)	Lr±0.05 (mm)	Resonant Frequency Range (GHz)
DRD026R□012	2.59	1.15	22.1 to 24.2
DRD028R□013	2.82	1.25	20.4 to 22.1
DRD031R□014	3.06	1.36	18.9 to 20.4
DRD033R□015	3.33	1.48	17.5 to 18.9
DRD036R□016	3.62	1.61	16.2 to 17.5
DRD039R□018	3.94	1.76	15.0 to 16.2
DRD043R□019	4.28	1.91	13.5 to 15.0
DRD046R□021	4.65	2.06	12.6 to 13.5
DRD051R□022	5.06	2.24	11.6 to 12.6
DRD055R□024	5.50	2.44	10.8 to 11.6
DRD060R□027	5.98	2.65	9.7 to 10.8
DRD065R□029	6.50	2.88	9.0 to 9.7
DRD071R□031	7.07	3.14	8.3 to 9.0
DRD077R□034	7.69	3.41	7.7 to 8.3
DRD084R□037	8.36	3.71	6.9 to 7.7
DRD091R□040	9.09	4.03	6.4 to 6.9
DRD099R□044	9.88	4.38	5.9 to 6.4
DRD107R□048	10.75	4.77	5.5 to 5.9
DRD117R□052	11.68	5.18	5.0 to 5.5
DRD127R□056	12.70	5.63	4.6 to 5.0

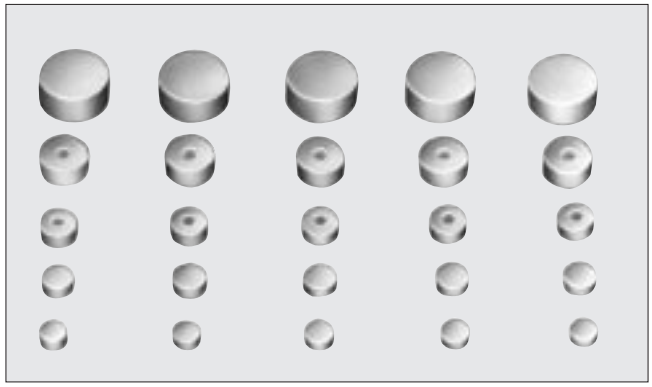


Table 13. Characteristic codes and electrical specifications of dielectric resonator

Characteristic Code	Frequency Temperature Coefficient (τf) (ppm/℃)	Dielectric Constant (εr)	Q (at 10GHz)
C	0	29.7±0.8	12,000min.
D	2	30.3±0.8	
E	4	30.9±0.8	
F	6	31.5±0.8	

Frequency characteristic of Q value

$$Q \geqq \frac{120{,}000}{f_0} \qquad f_0 : [\mathrm{GHz}]$$

Table 14. Special codes

Special Code	Tolerance of the frequency Temperature Coefficient (ppm/℃)
No code	±2
A	±1
B	±0.5

■RATING (DRT Type)

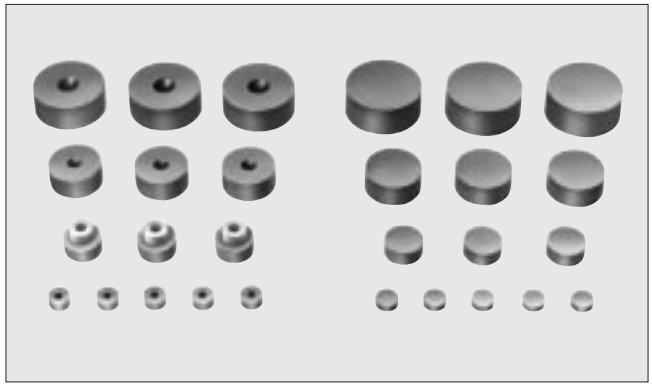
Part Number	Dr±0.05 (mm)	dr±0.1 (mm)	Lr±0.05 (mm)	Resonant Frequency Range (GHz)
DRT051R020□022	5.06	2.0	2.24	11.9 to 13.1
DRT055R020□024	5.50		2.44	11.0 to 11.9
DRT060R020□027	5.98		2.65	10.0 to 11.0
DRT065R020□029	6.50		2.88	9.1 to 10.0
DRT071R020□031	7.07		3.14	8.4 to 9.1
DRT077R020□034	7.69		3.41	7.7 to 8.4
DRT084R030□037	8.36	3.0	3.71	7.1 to 7.7
DRT091R030□040	9.09		4.03	6.5 to 7.1
DRT099R030□044	9.88		4.38	6.0 to 6.5
DRT105R030□046	10.50		4.60	5.7 to 6.0

RESOMICS®

Dielectric Resonator **B** Series

■FEATURES

1. High Q-value of 18,000 at 10GHz.
2. High dielectric constant : εr≒27.9
3. The resonant frequency temperature coefficient can be chosen from 0 to 6ppm/℃. Tolerance of the frequency temperature coefficient can be chosen from ±0.5, ±1 and ±2 ppm/℃.
4. Dielectric resonator are chosen from the frequency range of 5 to 26GHz in disc type (DRD), and from the frequency range of 6 to 13.5GHz in cylindrical type (DRT).



■PART NUMBERING

(Please specify the part number when ordering.)

(Ex.) DRD ❶ | 055 ❷ | B ❸ | D ❹ | 024 ❺ | A ❻

❶Configuration : DRD denotes disc type, DRT denotes cylindrical type.

❷Outer Diameter : Outer diameter is designated in units of 1/10mm using 3 digits.

❸Material : B designates the kind of material.

❹Characteristic Code : The temperature coefficient of the resonant frequency. Designated by the codes shown in Table 15.

❺Thickness : Designated in units of 1/10mm using 3 digits.

❻Special Code : The temperature coefficient tolerance of the resonant frequency is denoted by the codes shown in Table 16.

■RATING (DRD Type)

Part Number	Dr±0.05 (mm)	Lr±0.05 (mm)	Resonant Frequency Range (GHz)
DRD026B□012	2.59	1.15	23.67 to 25.94
DRD028B□013	2.82	1.25	21.75 to 23.67
DRD031B□014	3.06	1.36	20.03 to 21.75
DRD033B□015	3.33	1.48	18.40 to 20.03
DRD036B□016	3.62	1.61	16.92 to 18.40
DRD039B□018	3.94	1.76	15.53 to 16.92
DRD043B□019	4.28	1.91	14.30 to 15.53
DRD046B□021	4.65	2.06	13.19 to 14.30
DRD051B□022	5.06	2.24	12.13 to 13.19
DRD055B□024	5.50	2.44	11.15 to 12.13
DRD060B□027	5.98	2.65	10.26 to 11.15
DRD065B□029	6.50	2.88	9.44 to 10.26
DRD071B□031	7.07	3.14	8.67 to 9.44
DRD077B□034	7.69	3.41	7.97 to 8.67
DRD084B□037	8.36	3.71	7.33 to 7.97
DRD091B□040	9.09	4.03	6.75 to 7.33
DRD099B□044	9.88	4.38	6.21 to 6.75
DRD107B□048	10.75	4.77	5.70 to 6.21
DRD117B□052	11.68	5.18	5.25 to 5.70
DRD127B□056	12.70	5.63	4.83 to 5.25

Table 15. Characteristic codes and electrical specifications of dielectric resonator

Characteristic Code	Frequency Temperature Coefficient (τf) (ppm/℃)	Dielectric Constant (εr)	Q (at 10GHz)
C	0	27.9±0.5	15,000min.
D	2		
E	4		
F	6		

Frequency characteristic of Q value

$$Q \geqq \frac{150,000}{f_0} \qquad f_0 : [GHz]$$

Table 16. Special codes

Special Code	Tolerance of the frequency Temperature Coefficient (ppm/℃)
No code	±2
A	±1
B	±0.5

■RATING (DRT Type)

Part Number	Dr±0.05 (mm)	dr±0.1 (mm)	Lr±0.05 (mm)	Resonant Frequency Range (GHz)
DRT051B020□022	5.06	2.0	2.24	12.47 to 13.66
DRT055B020□024	5.50		2.44	11.39 to 12.47
DRT060B020□027	5.98		2.65	10.42 to 11.39
DRT065B020□029	6.50		2.88	9.55 to 10.42
DRT071B020□031	7.07		3.14	8.74 to 9.55
DRT077B020□034	7.69		3.41	8.02 to 8.74
DRT084B030□037	8.36	3.0	3.71	7.48 to 8.02
DRT091B030□040	9.09		4.03	6.85 to 7.48
DRT099B030□044	9.88		4.38	6.28 to 6.85
DRT105B030□046	10.50		4.60	5.92 to 6.28

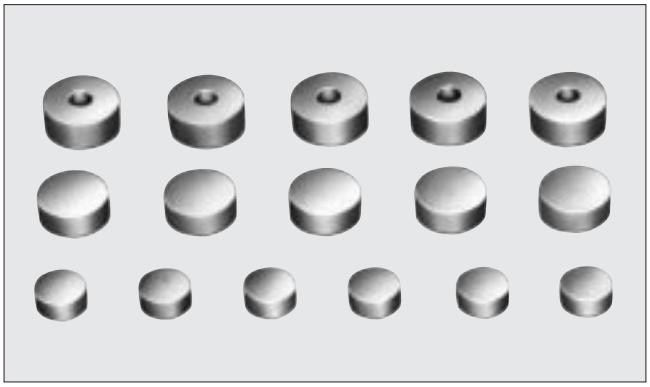
RESOMICS®

Dielectric Resonator **E** Series

The First Resonator (εr≒24.5) with Q of 10,000 at 25GHz

■FEATURES

1. High Q-value of 24,000 at 10GHz.
2. High dielectric constant : εr≒24.5
3. The resonant frequency temperature coefficient can be chosen from 0 to 6ppm/℃. Tolerance of the frequency temperature coefficient can be chosen from ±1 and ±2 ppm/℃.
4. Dielectric resonator are chosen from the frequency range of 8.4 to 25GHz in disc type (DRD), and from the frequency range of 8.4 to 19.5GHz in cylindrical type (DRT).
5. E-series is also fit for application above 25GHz. Please consult us.



■PART NUMBERING

(Please specify the part number when ordering.)

(Ex.) DRD | 055 | E | D | 024 | A

❶ ❷ ❸ ❹ ❺ ❻

❶Configuration : DRD denotes disc type, DRT denotes cylindrical type.

❷Outer Diameter : Outer diameter is designated in units of 1/10mm using 3 digits.

❸Material : E designates the kind of material.

❹Characteristic Code : The temperature coefficient of the resonant frequency is designated by the codes shown in Table 17.

❺Thickness : Designated in units of 1/10mm using 3 digits.

❻Special Code : The temperature coefficient tolerance of the resonant frequency is denoted by the codes shown in Table 18.

Table 17. Characteristic codes and electrical specifications of dielectric resonator

Characteristic Code	Frequency Temperature Coefficient (τf) (ppm/℃)	Dielectric Constant (εr)	Q (at 10GHz)
C	0	24.2±0.4	20,000min.
D	2	24.4±0.4	
E	4	24.7±0.4	
F	6	24.9±0.4	

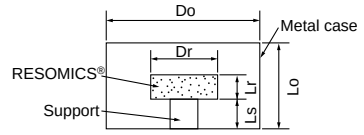
Frequency characteristic of Q value

$$Q \geqq \frac{200{,}000}{f_0} \qquad f_0 : [\mathrm{GHz}]$$

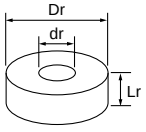
Table 18. Special codes

Special Code	Tolerance of the frequency Temperature Coefficient (ppm/℃)
No code	±2
A	±1

■RATING (DRD Type)

Part Number			
	Dr±0.05 (mm)	Lr±0.05 (mm)	Resonant Frequency Range (GHz)
DRD028E□013	2.82	1.25	23.17 to 25.15
DRD031E□014	3.06	1.36	21.27 to 23.17
DRD033E□015	3.33	1.48	19.48 to 21.27
DRD036E□016	3.62	1.61	17.93 to 19.48
DRD039E□018	3.94	1.76	16.47 to 17.93
DRD043E□019	4.28	1.91	15.16 to 16.47
DRD046E□021	4.65	2.06	13.95 to 15.16
DRD051E□022	5.06	2.24	12.82 to 13.95
DRD055E□024	5.50	2.44	11.80 to 12.82
DRD060E□027	5.98	2.65	10.85 to 11.80
DRD065E□029	6.50	2.88	9.98 to 10.85
DRD071E□031	7.07	3.14	9.18 to 9.98
DRD077E□034	7.69	3.41	8.44 to 9.18

■RATING (DRT Type)

Part Number				
	Dr±0.05 (mm)	dr±0.1 (mm)	Lr±0.05 (mm)	Resonant Frequency Range (GHz)
DRT036E013□016	3.62	1.3	1.61	17.93 to 19.48
DRT039E013□018	3.94		1.76	16.47 to 17.93
DRT043E013□019	4.28		1.91	15.16 to 16.47
DRT046E020□021	4.65	2.0	2.06	13.95 to 15.16
DRT051E020□022	5.06		2.24	12.82 to 13.95
DRT055E020□024	5.50		2.44	11.80 to 12.82
DRT060E020□027	5.98		2.65	10.85 to 11.80
DRT065E020□029	6.50		2.88	9.98 to 10.85
DRT071E020□031	7.07		3.14	9.18 to 9.98
DRT077E020□034	7.69		3.41	8.44 to 9.18

RESOMICS®

Dielectric Resonator **F** Series (DRD Type)

The First Resonator (εr≒24) with Q of 10,000 at 35GHz

■FEATURES

1. High Q-value of 35,000 at 10GHz.
2. High dielectric constant : εr≒24
3. Resonant frequency temperature coefficient can be chosen from 0 to 4ppm/℃. Tolerance of the frequency temperature coefficient can be chosen from ±1 and ±2 ppm/℃.
4. Dielectric resonator are chosen from the frequency range of 10 to 25GHz.
5. F-series is also fit for application above 25GHz. Please consult us.

■PART NUMBERING

(Please specify the part number when ordering.)

(Ex.) DRD ❶ | 055 ❷ | F ❸ | D ❹ | 024 ❺ | A ❻

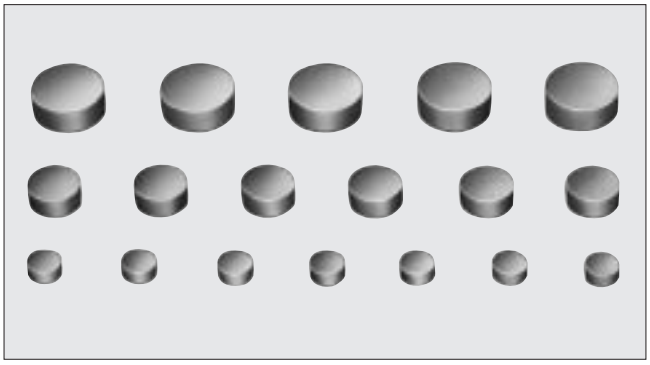
❶Configuration : DRD denotes disc type.
❷Outer Diameter : Outer diameter is designated in units of 1/10mm using 3 digits.
❸Material : F designates the kind of material.
❹Characteristic Code : The temperature coefficient of the resonant frequency is designated by the codes shown in Table 19.
❺Thickness : Designated in units of 1/10mm using 3 digits.
❻Special Code : The temperature coefficient tolerance of the resonant frequency is denoted by the codes shown in Table 20.

Table 19. Characteristic codes and electrical specifications of dielectric resonator

Characteristic Code	Frequency Temperature Coefficient (τf) (ppm/℃)	Dielectric Constant (εr)
C	0	23.8±0.5
M	1	23.9±0.5
D	2	24.0±0.5
N	3	24.1±0.5
E	4	24.2±0.5

Table 20. Special codes

Special Code	Tolerance of the frequency Temperature Coefficient (ppm/℃)
No code	±2
A	±1



■RATING (DRD Type)

Part Number	Do, Dr, Metal case, RESOMICS®, Support, Ls, Lr, Lo		
	Dr±0.05 (mm)	Lr±0.05 (mm)	Resonant Frequency Range (GHz)
DRD028F□013	2.82	1.25	23.17 to 25.15
DRD031F□014	3.06	1.36	21.27 to 23.17
DRD033F□015	3.33	1.48	19.48 to 21.27
DRD036F□016	3.62	1.61	17.93 to 19.48
DRD039F□018	3.94	1.76	16.47 to 17.93
DRD043F□019	4.28	1.91	15.16 to 16.47
DRD046F□021	4.65	2.06	13.95 to 15.16
DRD051F□022	5.06	2.24	12.82 to 13.95
DRD055F□024	5.50	2.44	11.80 to 12.82
DRD060F□027	5.98	2.65	10.85 to 11.80
DRD065F□029	6.50	2.88	9.98 to 10.85

■Unloaded Q specification (DRD Type)

Part Number	Unloaded Q (min.)				
	τf=0	τf=1	τf=2	τf=3	τf=4
DRD028F□013	11000	11200	11500	11700	12000
DRD031F□014	12500	12800	13200	13600	14000
DRD033F□015	14000	14200	14500	14700	15000
DRD036F□016	15500	15800	16200	16600	17000
DRD039F□018	17000	17200	17500	17700	18000
DRD043F□019	18000	18200	18500	18700	19000
DRD046F□021	19000	19300	19700	20100	20500
DRD051F□022	20000	20300	20700	21100	21500
DRD055F□024	22000	22600	23200	23800	24500
DRD060F□027	23500	24100	24700	25300	26000
DRD065F□029	25000	25200	25500	25700	26000

RESOMICS®

Dielectric Resonator **F** Series (DRT Type)

■FEATURES

1. High Q-value of 35,000 at 10GHz.
2. High dielectric constant : εr≒24
3. Resonant frequency temperature coefficient can be chosen from 0 to 4ppm/℃. Tolerance of the frequency temperature coefficient can be chosen from ±1 and ±2 ppm/℃.
4. Dielectric resonator are chosen from the frequency range of 10 to19.5GHz.
5. F-series is also fit for application above 25GHz. Please consult us.

■PART NUMBERING

(Please specify the part number when ordering.)

(Ex.) DRT ❶ | 060 ❷ | F ❸ | 020 ❹ | C ❺ | 027 ❻ | A ❼

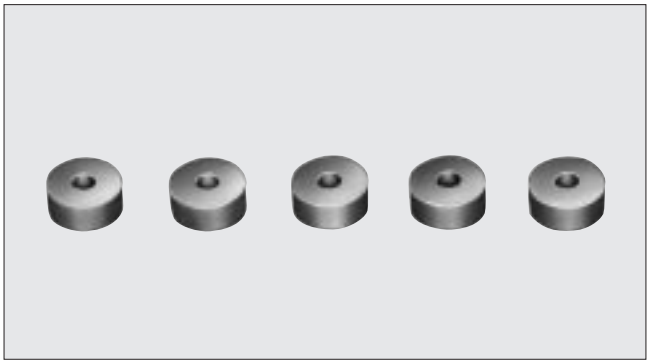
❶Configuration : DRT denotes coaxial cylindrical RESOMICS®
❷Outer Diameter : Outer diameter is designated in units of 1/10mm using 3 digits.
❸Material : F designates the kind of material.
❹Inner Diameter : Inner diameter is designated in units of 1/10mm using 3 digits.
❺Characteristic Code : The temperature coefficient of the resonant frequency is designated by the codes shown in Table 21.
❻Thickness : Thickness is designated in units of 1/10mm using 3 digits.
❼Special Code : The temperature coefficient tolerance of the resonant frequency is denoted by the codes shown in Table 22.

Table 21. Characteristic codes and electrical specifications of dielectric resonator

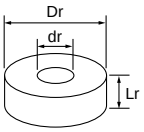
Characteristic Code	Frequency Temperature Coefficient (τf) (ppm/℃)	Dielectric Constant (εr)
C	0	23.8±0.5
M	1	23.9±0.5
D	2	24.0±0.5
N	3	24.1±0.5
E	4	24.2±0.5

Table 22. Special codes

Special Code	Tolerance of the frequency Temperature Coefficient (ppm/℃)
No code	±2
A	±1



■RATING (DRT Type)

Part Number				
	Dr±0.05 (mm)	dr±0.1 (mm)	Lr±0.05 (mm)	Resonant Frequency Range (GHz)
DRT036F013□016	3.62	1.3	1.61	17.93 to 19.48
DRT039F013□018	3.94		1.76	16.47 to 17.93
DRT043F013□019	4.28		1.91	15.16 to 16.47
DRT046F020□021	4.65	2.0	2.06	13.95 to 15.16
DRT051F020□022	5.06		2.24	12.82 to 13.95
DRT055F020□024	5.50		2.44	11.80 to 12.82
DRT060F020□027	5.98		2.65	10.85 to 11.80
DRT065F020□029	6.50		2.88	9.98 to 10.85

■Unloaded Q specification (DRD Type)

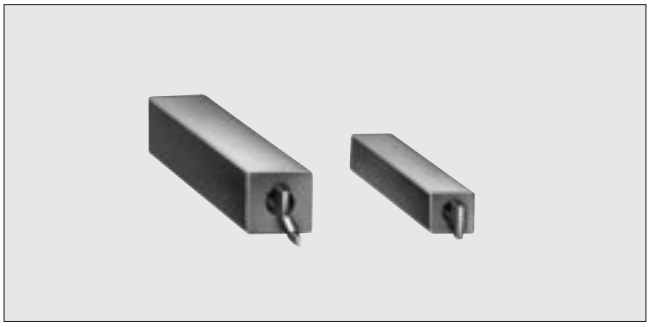
Part Number	Unloaded Q (min.)				
	τf=0	τf=1	τf=2	τf=3	τf=4
DRT036F013□016	14500	14700	15000	15200	15500
DRT039F013□018	17000	17100	17200	17300	17500
DRT043F013□019	17500	17700	18000	18200	18500
DRT046F020□021	18000	18200	18500	18700	19000
DRT051F020□022	18500	18800	19200	19600	20000
DRT055F020□024	20500	21200	22000	22700	23500
DRT060F020□027	21000	21800	22700	23600	24500
DRT065F020□029	22000	22800	23700	24600	25500

RESOMICS®

Dielectric Resonator (Silver Plated **DRR** Type)

■FEATURES

1. Resonator with high dielectric constant of εr=38, 92 can reduce the size of the circuit.
2. Resonator with low loss dielectric ceramics can realize high unloaded Q.
3. The resonator covers the resonant frequency range from 440 to 4800MHz by 10MHz.
4. Resonant wave length can be chosen from λ/4 or λ/2 on DRR040, DRR060, type each.



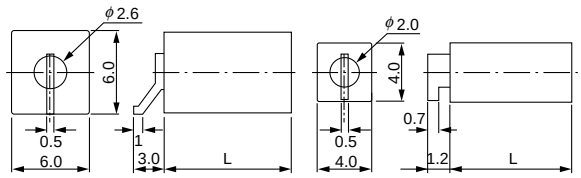
■PART NUMBERING

(Please specify the part number when ordering.)

(Ex.) DRR ❶ | 060 ❷ | KE ❸ | 1R100 ❹ | T ❺

❶Configuration : DRR denotes TEM mode resonator of rod.
❷Size : "060" denotes that the size of square is 6.0mm.
"040" denotes that the size of square is 4.0mm.
❸Material : "UE" denotes U-Series.
"KE" denotes K-Series.
❹Resonant Frequency : "R" denotes the position of a decimal point.
Frequency is specified with GHz in 10MHz step.
❺Type of TEM : "T" denotes the λ/4 TEM mode in 060 type.
"P" denotes the λ/2 TEM mode in 060 type.
"TS" denotes the λ/4 TEM mode in 040 type.
"PS" denotes the λ/2 TEM mode in 040 type.

■DIMENSIONS AND CONFIGURATION



DRR060 DRR040

(in mm)

Dimension L can be calculated by the following, using dielectric constant and resonant frquency.
$L=3\times10^{11}/(n\sqrt{\varepsilon_r}\,f_0)$ (f_0 : Hz)
λ/4 TEM mode : n=4
λ/2 TEM mode : n=2

■ELECTRICAL CHARACTERISTICS AND FREQUENCY RANGE

Material	εr	τf*1 (ppm/℃)	Type	Characteristic Impedance	Resonant Wave Length	Resonant Frequency Range*2 (MHz)	Qu min.*3
U	38±1	3±2	DRR060	8Ω	λ/4	680 to 1,540	450
						1,550 to 1,800	550
					λ/2	1,600 to 2,390	700
						2,400 to 3,500	800
			DRR040	7Ω	λ/4	1,000 to 1,990	360
						2,000 to 2,700	400
					λ/2	2,000 to 2,990	480
						3,000 to 4,800	520
K	92±1	3±2	DRR060	6Ω	λ/4	440 to 790	350
						800 to 1,300	400
					λ/2	1,000 to 1,690	500
						1,700 to 2,200	560
			DRR040	5Ω	λ/4	660 to 1,190	250
						1,200 to 1,650	280
					λ/2	1,300 to 1,990	320
						2,000 to 3,000	350

∗1 : Frequency temperature coefficient ∗2 : Tolerance of resonant frequency (U : ±0.5% max, K : ±0.7% max.)
∗3 : Unloaded Q (Qu) value depends on lower limit of frequency range.

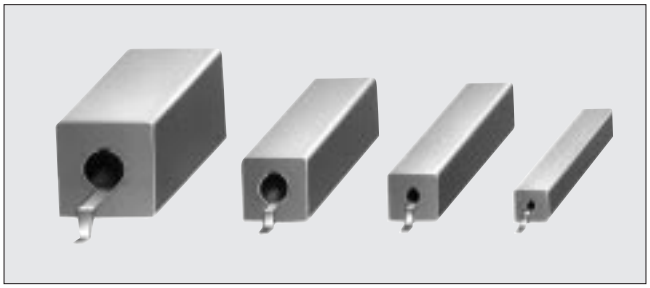
RESOMICS®

Dielectric Resonator (Copper Plated **DRR K** Type)

Copper plating has reduced the price!

■FEATURES

1. TEM mode resonator plated with copper has the lower price than that with silver.
2. Excellent solderability.
3. High dielectric constant : εr=92
4. These resonators cover wide range of resonant frequency. Standard frequency step is 10MHz.



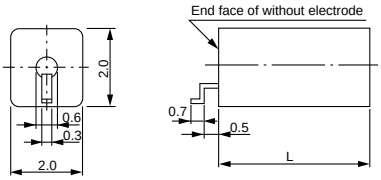
■PART NUMBERING

(Please specify the part number when ordering.)

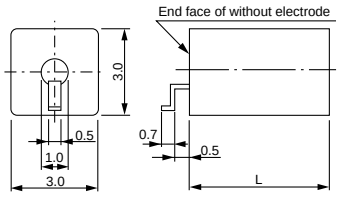
(Ex.)	DRR	040	KE	1R100	T	C
	❶	❷	❸	❹	❺	❻

❶Configuration : DRR denotes TEM mode resonator of rod.
❷Size : "020" denotes that the size of square is 2.0mm.
"030" denotes that the size of square is 3.0mm.
"040" denotes that the size of square is 4.0mm.
"060" denotes that the size of square is 6.0mm.
❸Material : "KE" denotes K-Series.
❹Resonant Frequency : "R" denotes the position of a decimal point. Frequency is specified with GHz in 10MHz step.
❺Type of TEM : "T" denotes the λ/4 TEM mode.
"P" denotes the λ/2 TEM mode.
❻Special Code : "C" denotes copper plating.

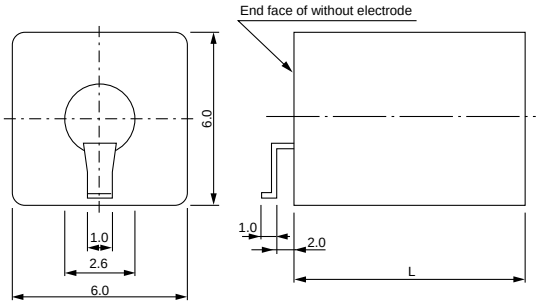
■DIMENSIONS AND CONFIGURATION



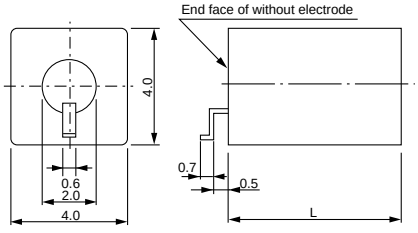
DRR020



DRR030



DRR060



DRR040

(in mm)

Dimension L can be calculated by the following, using dielectric constant and resonant frquency.
$L=3\times10^{11}/(n\sqrt{\varepsilon_r}\,f_0)$ (f_0 : Hz)
λ/4 TEM mode : n=4
λ/2 TEM mode : n=2

■ELECTRICAL CHARACTERISTICS AND FREQUENCY RANGE

Material	εr	τf*1 (ppm/℃)	Type	Characteristic Impedance	Resonant Wave Length	Resonant Frequency Range*2 (MHz)	Qu min.*3
K	92±1	3±2	DRR060	6Ω	λ/4	440 to 490	330
						550 to 790	350
						800 to 1,300	400
					λ/2	1,000 to 1,690	470
						1,700 to 2,200	510
			DRR040	5Ω	λ/4	500 to 540	200
						550 to 640	220
						650 to 790	240
						800 to 890	260
						900 to 1,490	270
						1,500 to 1,800	290
					λ/2	1,000 to 1,390	300
						1,400 to 1,890	340
						1,900 to 3,000	370
			DRR030	7Ω	λ/4	900 to 1,490	230
						1,500 to 1,600	250
			DRR020	8Ω	λ/4	900 to 1,590	150
						1,600 to 2,600	190

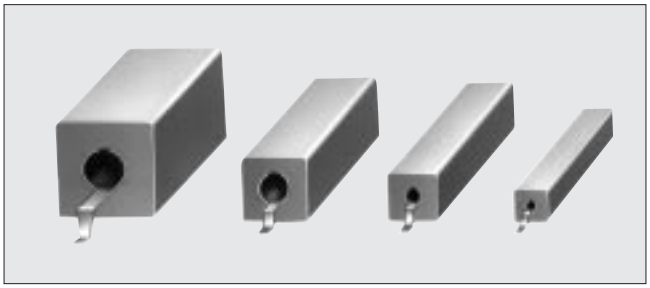
∗1 : Frequency temperature coefficient ∗2 : Tolerance of resonant frequency ±0.7% max.
∗3 : Unloaded Q (Qu) value depends on lower limit of frequency range.

RESOMICS®

Dielectric Resonator (Copper Plated **DRR P** Type)

■FEATURES

1. TEM mode resonator plated with copper has the lower price than that with silver.
2. Excellent solderability.
3. High dielectric constant : εr=21
4. These resonators cover wide range of resonant frequency. Standard frequency step is 10MHz.



■PART NUMBERING

(Please specify the part number when ordering.)

(Ex.)	DRR	040	PE	1R100	T	C
	❶	❷	❸	❹	❺	❻

❶Configuration : DRR denotes TEM mode resonator of rod.

❷Size : "020" denotes that the size of square is 2.0mm.
"030" denotes that the size of square is 3.0mm.
"040" denotes that the size of square is 4.0mm.
"060" denotes that the size of square is 6.0mm.

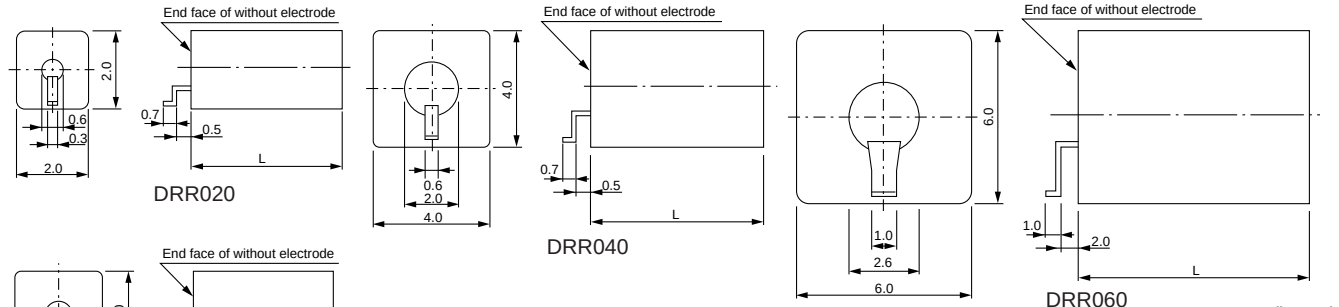
❸Material : "PE" denotes P-Series.

❹Resonant Frequency : "R" denotes the position of a decimal point. Frequency is specified with GHz in 10MHz step.

❺Type of TEM : "T" denotes the λ/4 TEM mode.
"P" denotes the λ/2 TEM mode.

❻Special Code : "C" denotes copper plating.

■DIMENSIONS AND CONFIGURATION



(in mm)

Dimension L can be calculated by the following, using dielectric constant and resonant frquency.

$L=3\times10^{11}/(n\sqrt{\varepsilon r}\, f_0)$ (f_0 : Hz)

λ/4 TEM mode : n=4

λ/2 TEM mode : n=2

■ELECTRICAL CHARACTERISTICS AND FREQUENCY RANGE

Material	εr	τf*1 (ppm/℃)	Type	Characteristic Impedance	Resonant Wave Length	Resonant Frequency Range*2 (MHz)	Qu min.*3
P	21.4±0.2	4±2	DRR060	6Ω	λ/4	1,000 to 1,190	550
						1,200 to 1,790	600
						1,800 to 2,700	650
					λ/2	2,000 to 2,490	800
						2,500 to 3,000	850
			DRR040	10Ω	λ/4	1,300 to 1,490	350
						1,500 to 1,990	400
						2,000 to 3,000	450
					λ/2	2,500 to 3,000	550
			DRR030	15Ω	λ/4	1,900 to 2,490	380
						2,500 to 3,000	400
			DRR020	15Ω	λ/4	2,800 to 3,500	250
						3,510 to 5,000	300

*1 : Frequency temperature coefficient *2 : Tolerance of resonant frequency ±0.7% max. *3 : Unloaded Q (Qu) value depends on lower limit of frequency range.

RESOMICS®

Dielectric Resonator (Copper Plated **DRR** Type)

■STANDARD SOLDERING CONDITION

Ⅰ Temperature profile

① Pre-heating : Heat the resonator for about 120 sec. from room temperature to 150℃.

② Soldering : It is possible to solder at the peak temperature range from 210℃ to 250℃ for 2mm square, 3mm square and 4mm square, from 210℃ to 230℃ for 6mm square (standard temperature is 230℃ for the former, 220℃ for the latter.). But you have to keep the resonator at the temperature range which is higher than the peak temperature minus 30℃ for about 30 sec. (For example, if the peak temperature 230℃, you have to keep the resonator at the temperature range higher than 200℃ for about 30 sec.)

② Cooling : Spontaneous cooling

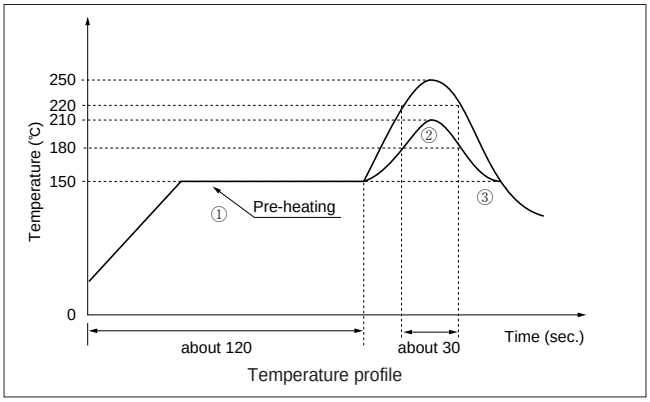
Ⅱ Board land pattern

① Pattern width is same as resonator width (T).

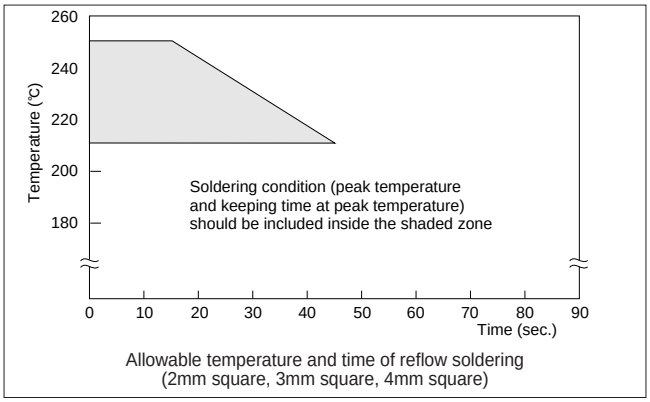
② Pattern length is 3L/4 against resonator length (L). Recommended soldering position is 3/4 part on the middle of the resonator surface.

Ⅲ Solder

Please use creamed type eutectic solder (flux-RM type). (ex : RMA390DH3 90-2C-90 made by Japan Alphametals)



Temperature profile



Allowable temperature and time of reflow soldering (2mm square, 3mm square, 4mm square)

■NOTICE

Please keep the following articles (Ⅰ, Ⅱ) to preserve the solderability and the unloaded Q.

Ⅰ Storage condition before breaking the vacuum packing

① Store the products under the condition of environmental temperature less than 50℃ and relative humidity less than 80%.

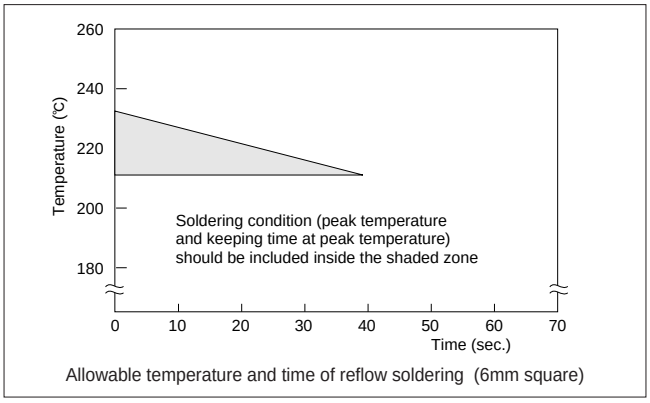
② Do not store the products in the environment of corrosive gas (H2S, NaCl etc.).

Ⅱ Handling or processing

① Do not apply excessive force onto terminals of the products.

② If you presume the products may be affected by corrosive gas or ionic material, you have to keep those products in the completely closed package or container.

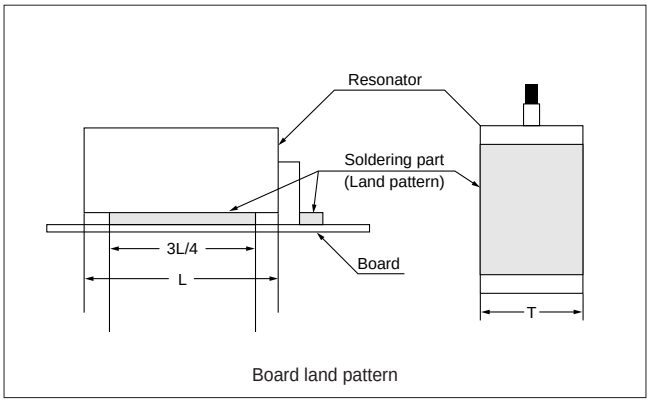
③ The products consists are made of ceramics and copper electrode. Rapid heating and cooling may give a damage to the products on soldering. Please refer to our standard soldering condition when you solder the products.



Allowable temperature and time of reflow soldering (6mm square)

■MINIMUM QUANTITY

DRR020 type	2,500pcs/reel
DRR030 type	2,000pcs/reel
DRR040 type	1,500pcs/reel



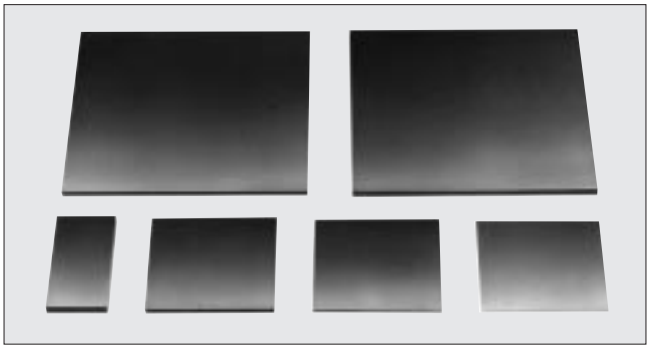
Board land pattern

RESOMICS®

Microwave Dielectric Substrate (**DBR** Type)

■FEATURES

1. High dielectric constant miniaturizes MIC.
2. Provides very high Q-value throughout the microwave bands.
3. Extremely dense ceramic composition provides smooth surfaces.



■PART NUMBERING

(Please specify the part number when ordering.)

(Ex.)	DBR	254	H	127	HG	C	124
	❶	❷	❸	❹	❺	❻	❼

❶Configuration : Denotes rectangle-shaped dielectric substrate.
❷Length : Length is designated in units of 1/10m using 3 digits.
❸Kinds of Material : Materials are designated by codes shown in Table 23.
❹Thickness : Thickness is designated in units of 1/100mm using 3 digits.
❺Temperature Coefficient: The temperature coefficient of the dielectric constant is denoted by the codes shown in Table 23.
❻Surface treatment : Degree of surface treatment is designated by alphabetical characters shown in Table 24. C denotes the standard degree of surface treatment.
❼Width : Width is designated in units of 1/10mm using 3 digits. This item is deleted in case of square substrates.

■EXTERNAL DIMENSIONS

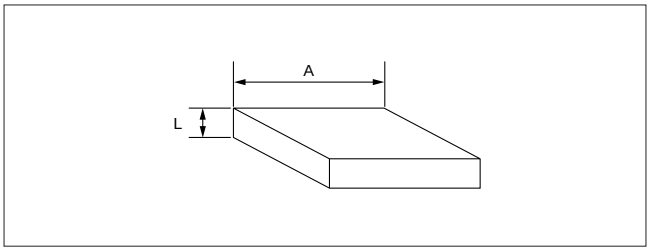


Table 23. Ceramics for Substrate

Material Code	Temp. Coefficient Code	Dielectric Constant (εr)	Temp. Coefficient of Dielectric Constant (ppm/℃)	Linear Expansion Coefficient (ppm/℃)
H	HG	38 ±1	−30±30	6 to 7
P	HG	21.4±1	−30±30	8 to 9
K	HG	92 ±1	−30±30	8 to 9

Table 24. Surface Finish Codes

Surface Finish Code	C	D	F
Average Surface Roughness (μm) [Ra]	0.1 to 0.8	0.05 to 0.4	0.004 to 0.04
Reflective Luster (60°GS)	1 to 6	6 to 50	150 min.

Table 25. Examples of dielectric substrate part numbers and specifications

Part Number	Configuration	A±0.1 (mm)	L±0.05 (mm)	Dielectric Constant (εr)	Linear Expansion Coefficient (ppm/˚C)	Surface Finish (μm) [Ra]
DBR508H127HGC	Square	50.8	1.27	38 ±1	6 to 7	0.1 to 0.8
DBR254H063HGC		25.4	0.63			
DBR508P080HGC		50.8	0.80	21.4±1	8 to 9	
DBR254P040HGC		25.4	0.40			
DBR508K140HGC		50.8	1.40	92 ±1	8 to 9	
DBR254K070HGC		25.4	0.70			

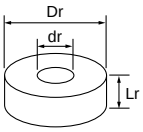
RESOMICS®

Support for Resonator (**DRZ** Type)

■APPLICATION

Supports for RESOMICS® DRD and DRT Type

■RATING

Part Number			
	Outer Diameter ±0.05 (mm)	Inner Diameter ±0.1 (mm)	Thickness ±0.05 (mm)
DRZ001	3.50	2.0	0.60
DRZ002			1.50
DRZ003	6.00	3.0	1.20
DRZ004			2.50
DRZ005	8.00	4.0	2.00
DRZ006			4.00
DRZ007	10.00		3.50
DRZ008			6.00
DRZ009	12.00		4.00
DRZ010			7.00

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   ⑨ Data-processing equipment
   ⑩ Application of similar complexity and/or reliability requirements to the applications listed in the above
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