MCV MICROWAVE

Material Driven Solutions

for RF and Microwave Applications

DIELECTRIC RESONATORS | PATCH ANTENNAS | DIELECTRIC SUBSTRATES

WIRELESS COMMUNICATIONS

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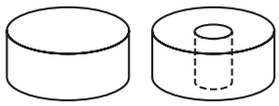
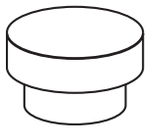
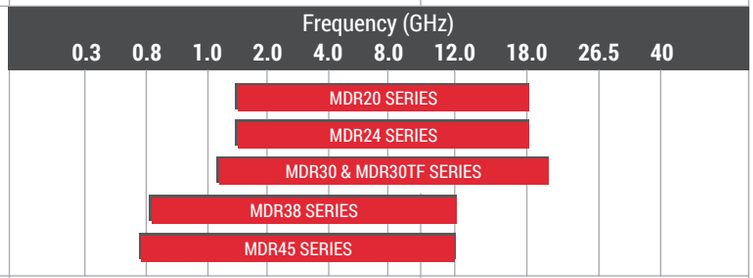
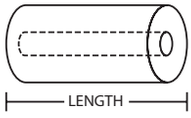
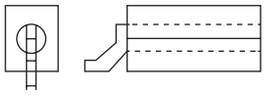
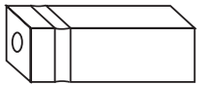
MCV MICROWAVE

Dielectric Material Overview

MCV Dielectric Resonators are offered in both TE, TM, and TEM mode with a wide range of low loss microwave dielectric materials. Some of these materials exhibit ultra-high Q performance with Qf > 300,000 @ 10 GHz and are ideally suited for applications such as voltage controlled oscillators, dielectric resonator oscillators, microwave filters, combiners, cellular base station filters and satellite based communication equipment.

Dielectric Substrates are available in a wide range of dielectric materials ranging from K = 9 to 190 and are used for microwave integrated circuits, strip line and thin film passive network applications for frequencies from 6GHz to 100GHz.
Available Substrate Sizes: 1" x 1", 2" x 2", .005", .010" thickness and greater. Custom sizes available upon request.

TYPE	CONFIGURATION	CHARACTERISTICS	SIZE
DIELECTRIC RESONATORS			
TE Mode		High Q / Low Loss at 260 MHz. To 26 GHz. Wide selection of dielectric constants and temperature compensating materials available.	Available OD Sizes: 2 mm to 140 mm Frequency Range: 260 MHz. to 26 GHz.
TE Mode With Support			
TM Mode		TM Mode Resonators, Silver Metallization, Low Loss / High Q, Compact Size *Variety of sizes and dielectric constant are available.*	Max OD: 50 mm, Max L: 100 mm
TEM Mode With Tab		Offers High Q and size as small as 1.5mm square, Ag metallized. Can be made with tab.	OD 1.5 mm ~ 18 mm Length: 11~ 45 mm *Larger sizes available upon request*
TEM Mode Tabless Type		No tab necessary, very reliable with high performance.	OD 1.5 mm ~ 18 mm Length: 11~ 45 mm *Larger sizes available upon request*
DIELECTRIC ANTENNA			
Block		Dielectric Patch Antennas, Variety of sizes and dielectric constant are available.	(12 x 12)mm to (25 x 25)mm Thickness: 2 ~ 6 mm
DIELECTRIC SUBSTRATES			
Substrate		Wide range of dielectric constant materials, sizes and thicknesses available. *Thick and Thin film metallization available.*	1" x1", 2" x 2"; thicknesses: .005", .010" and greater *Custom sizes available upon request*

DIELECTRIC RESONATORS - TE MODE

Dielectric Resonators (TE Mode)

MCV Microwave is a volume supplier of dielectric resonators with a 45,000 square foot manufacturing facility to provide customers with technically advanced high quality products at competitive prices. Our facilities have been ISO 9001 certified.

MCV's TE Mode dielectric resonators (DR) are available in a wide range of dielectric constants, disk and cylinder type, exhibiting exceptionally high Q and temperature stability with tight dielectric constant.

These components are typically used in oscillators, satellite-based communication equipment, microwave filters and combiner ranging in frequency from 260MHz to 26 GHz.

Dielectric standoffs and tuners are available to improve coupling, temperatures stability and tuning, while minimizing cavity losses. These dielectric standoffs have high thermal conductivity, high Q, providing excellent long-term reliability and performance.

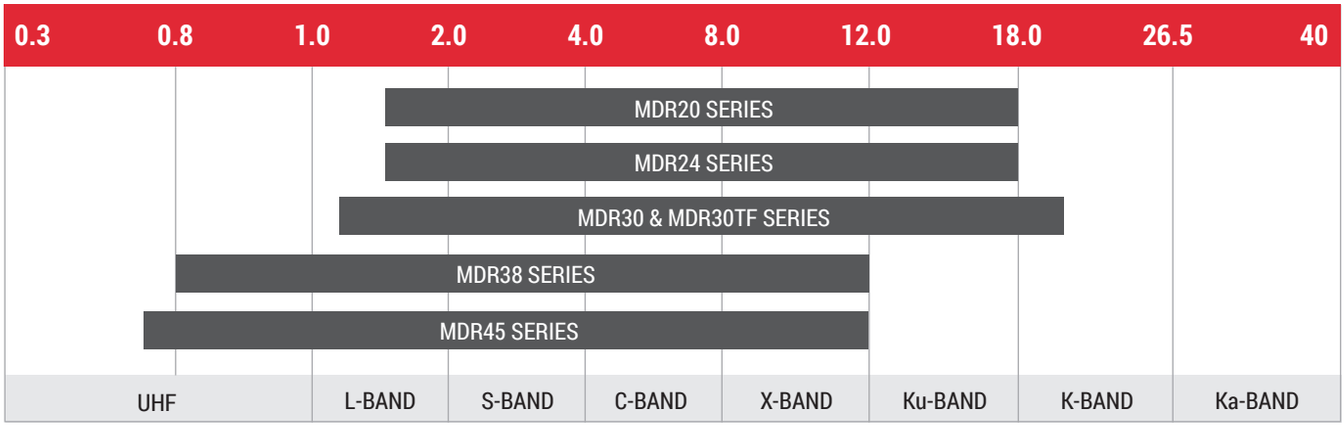
APPLICATIONS

- Dielectric Resonator Oscillator (DRO)
- Global Positioning Systems (GPS)
- Base Station DR Filters and Combiners
- Satellite Communication Equipment
- Direct Broadcast System (DBS)
- Radar Detectors
- AMPS / GSM / PCS / WLL / Wireless LAN / MMDS
- Public Safety
- Fixed and Auto-tuned Combiners

FEATURES

- High Dielectric Constant
- High Quality Factor (Q)
- High Frequency Stability
- Low Temperature Coefficient
- Wide Selection of Materials
- Tight Dielectric Constant Tolerance
- Linear T_f
- Consistent Lot-to-Lot Characteristics

Frequency (GHz)



Material Availability

Series	Dielectric Constant ε_r	τ_f (ppm/°C)	Qf Values
MDR-21	21 ± 1	5 ± 5	> 60,000 @ 6.5 GHz
MDR-24	24 ± 1	1 to 3 ± 1	> 300,000 @ 10 GHz
MDR-30	30 ± 1	0 ± 2	> 150,000 @ 10 GHz
MDR-34	34 ± 1	2 to 3 ± 1	> 150,000 @ 10 GHz
MDR-36	36 ± 2	0 ± 5	> 30,000 @ 5 GHz
MDR-38	38 ± 1	0.7 ± 0.5	> 47,000 @ 5.0 GHz
MDR-40	40 ± 1	3 ± 5	> 70,000 @ 5.0 GHz
MDR-45	46 ± 1	-2 to 6 ± 0.5	> 43,000 @ 6.0 GHz
MDR-47	47 ± 1	0 ± 10	> 46,000 @ 6.0 GHz

Standard OD Sizes

Standard OD sizes are available from .078" (2 mm) to 5.516" (140 mm) and are designed to meet applications requirements ranging from 260 MHz to 26 GHz.

All resonators are available in both disc and cylinder types. Please consult the factory for your specific requirements.

Alumina Support Materials

To improve coupling and temperature stability of the dielectric resonator use a dielectric supports to reduce phase noise and cavity losses. Supports can be supplied in either disk or cylinder form.

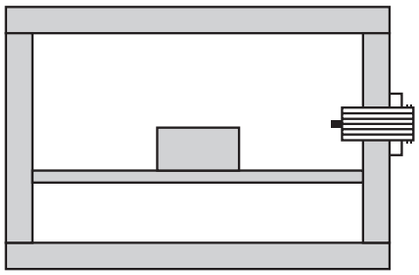
Support materials exhibit low loss, high thermal conductivity and excellent long term reliability.

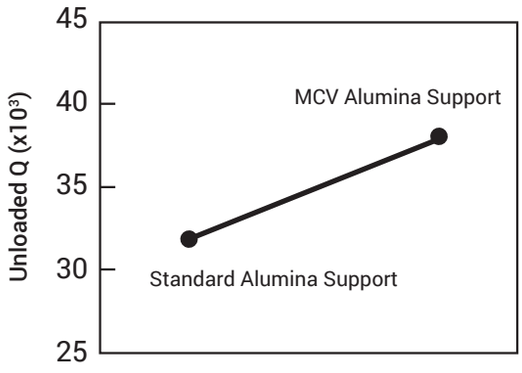
Calculate Resonator Frequency

To Calculate Resonate Frequency in MHz (f_o) of a dielectric resonator, the resonator thickness (T) must be divided by the outside diameter D_r; (T/D_r) aspect ratio should be between 0.35 - 0.45 and ε′ is the dielectric constant of the resonator.

$$f_o = 8766 / ((\varepsilon'^{1/2}) \times (\pi/4)^{1/3} \times (D_r^2 T)^{1/3})$$

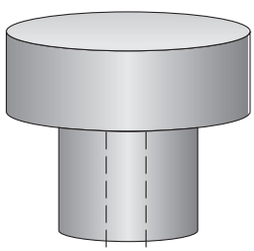
When measuring f_o we recommend a cylindrical metal test fixture that is approximately 3-5 times larger than the D_r shown below. A low loss, low ε′ material is used to support the resonator in the center of the fixture. A bent coaxial probe is used for coupling.





Support Specifications

Characteristcs	Std. Alumina Support	MCV Alumina Support
ε′	9.8	9.8
Tan δ	3.0×10^{-4}	1.0×10^{-4}
Density (g/cm³)	3.75	3.90
Measuring Freq. (GHz.)	10	10

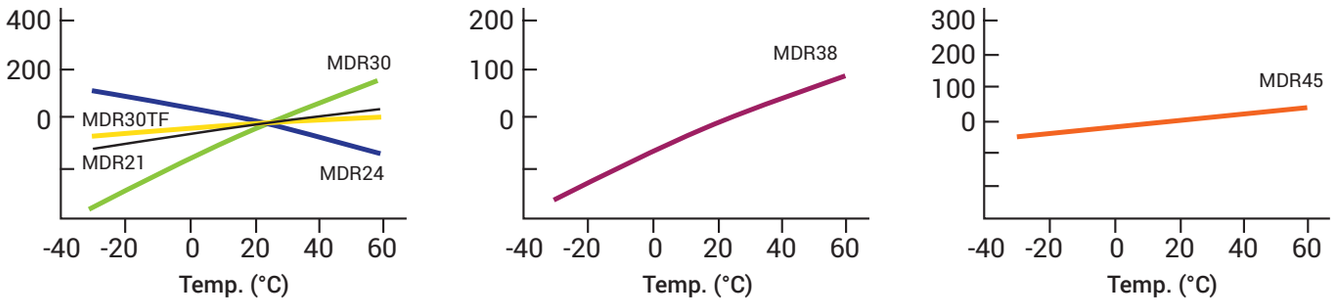


Support material specifications are shown above. Consult factory for alternative support materials and size availability.

DIELECTRIC RESONATORS - TE MODE

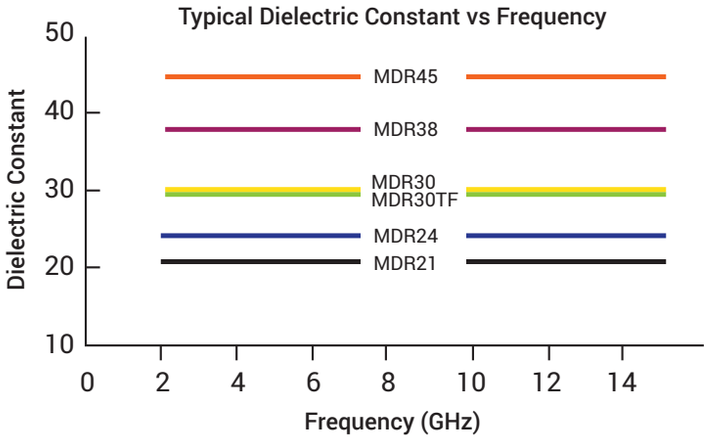
Material Properties

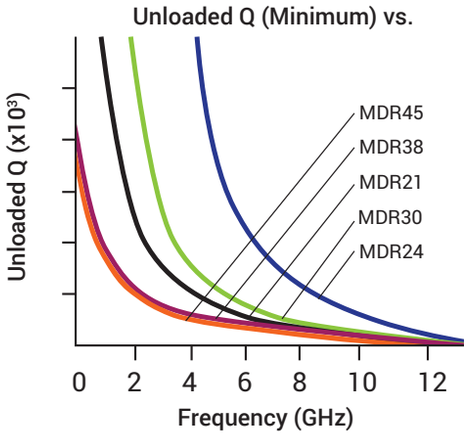
Temperature Characteristics



LEGEND MDR21 MDR24 MDR30 MDR30TF MDR38 MDR45

Performance





Dielectric Resonator - TE Mode

MDR	38	03	S	108	40	50
MCV Dielectric Resonator	Dielectric Constant	Temperature Coefficient	Temperature Coefficient Tolerance	Outer Diameter ($x10^{-1}$ mm)	Inner Diameter ($x10^{-1}$ mm)	Height ($x10^{-1}$ mm)
	20	00=Special	P = ±0.5 ppm/°C	108 = 10.8 mm	40 = 4 mm	50 = 5 mm
	24, 24S	01 = +6 ppm/°C	S = ±1.0 ppm/°C		00 = disc	
	30, 30S	02 = +3 ppm/°C	N = ±2.0 ppm/°C			
	30TF	03 = 0 ppm/°C	R = ±5.0 ppm/°C			
	38	04 = -3 ppm/°C				
	45	05 = -6 ppm/°C				

Dielectric Resonator - TM Mode

MCV High Q Dielectric Resonators - TM mode is the ideal choice for next-generation mobile communication where controlling interferential signal, size and performance are required. Typically 1/10 the size of standard TM-Mode resonators, exhibits excellent temperature coefficient, high Qu for frequencies ranging from 0.1 to 30 GHz.

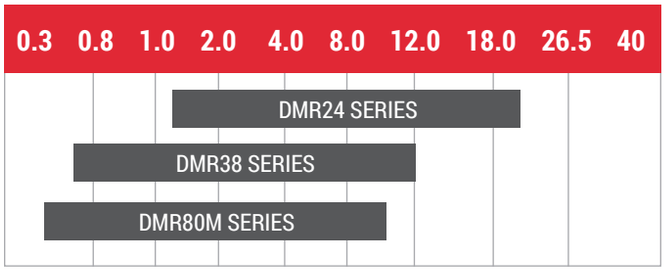
FEATURES

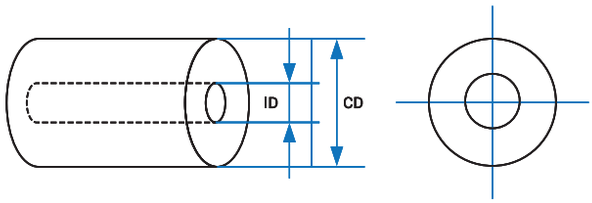
- High Q / Low Loss
- Small / Compact Size
- Stable Temperature Coefficient
- Frequency 0.1 to 30 GHz.
- Material Availability ε' = 21, 24, 38, 80M, 90, 110

Available Sizes

Size Code	OD φ	ID φ	L MAX
D560C	5.6	1.47	20.0
D620C	6.2	2.48	20.0
D1360C	13.6	4.04	30.0
D1600C	16	5.25	55.0
D1700C	17	4.62	55.0
D2450C	24.5	8.56	55.0
D3000C	30	8.84	55.0
D4500C	45	12.80	80.0
D5000C	50	12.80	100.0

Frequency (GHz)



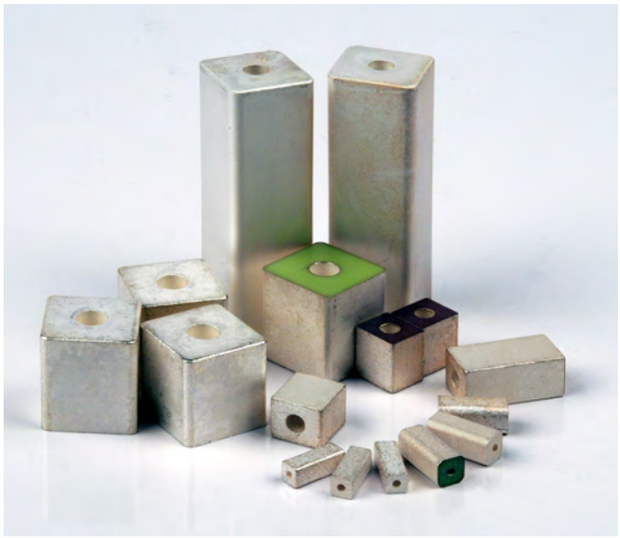


Dielectric Resonator - TM

MDT	38	03	S	108	40	50
MCV Dielectric Resonator (TM Mode)	Dielectric Constant	Temperature Coefficient	Temperature Coefficient Tolerance	Outer Diameter ($x10^{-1}$ mm)	Inner Diameter ($x10^{-1}$ mm)	Height ($x10^{-1}$ mm)
	21	00=Special	P = ±0.5 ppm/°C	108 = 10.8 mm	40 = 4 mm	50 = 5 mm
	24	01 = +6 ppm/°C	S = ±1.0 ppm/°C			
	38	02 = +3 ppm/°C	N = ±2.0 ppm/°C			
	80	03 = 0 ppm/°C	R = ±5.0 ppm/°C			
	90	04 = -3 ppm/°C				
	110	05 = -6 ppm/°C				

DIELECTRIC RESONATORS - TEM MODE

Dielectric Resonators (TEM Mode)



TEM Coaxial Resonators made with high Q / high ε' dielectric materials that allow the designer to miniaturize their filter designs, distributed inductive or capacitive circuit elements.

The combined benefits of cost, size, temperature stability and low loss materials make these elements ideally suited for UHF and RF/Microwave frequency applications.

All SMT coaxial resonators are available in λ/4 and λ/2 types in both standard with tabs and tabless versions and can be soldered directly to the circuit board.

The large solder pad of tabless resonators eliminates misalignment and tab solder reflow problems ensuring optimum performance.

The ruggedized silver coating, a signature in-house materials technology created by MCV Microwave, exhibits exceptional solderability and produces some of the highest Q's in the industry.

MCV-Microwave offers a wide selection resonator sizes and dielectric constant materials ranging from 6 to 98, designed for applications starting at 150 MHz to 10 GHz range.

These resonators are pre-tuned and tested to your specified frequency (± 0.7% max).

APPLICATIONS

- Dielectric resonating oscillators (DRO)
- Voltage controlled oscillators (VCO)
- Global positioning systems (GPS)
- Cellular and wireless communications
- Bandpass / band reject filters / Duplexers / Multiplexers
- Inductors
- Narrowband/delay line

BENEFITS

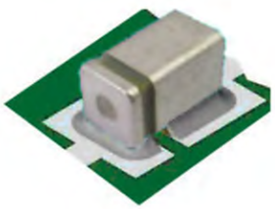
- Lower Harmonics
- Circuit miniaturization
- Repeatability of design
- Negligible aging effects
- Excellent solderability
- Excellent adhesion
- Thermal stabilization

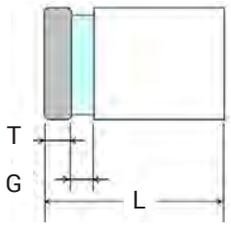
Material Availability

Series	Dielectric Constant ε_r	τ_f (ppm/°C)	Qf Values	Series	Dielectric Constant ε_r	τ_f (ppm/°C)	Qf Values
MDR-9	9 ± 1	6 ± 5	> 58,000 (@ 9.5GHz)	MDR-77M	77 ± 1	-1 to 5 ± 2	> 10,000 (@ 3.5GHz)
MDR-21	21 ± 1	5 ± 5	> 60,000 (@ 6.5GHz)	MDR-88M	80 ± 1	-1 to 5 ± 2	> 8,000 (@ 1.5GHz)
MDR-36	36 ± 2	0 ± 5	> 30,000 (@ 5GHz)	MDR-90	93 ± 1	9 ± 4	> 6,000 (@ 3.0GHz)
MDR-38	38 ± 1	0.7 ± 0.5	> 47,000 (@ 5.0GHz)	MDR-90N	93 ± 1	9 ± 4	> 5,800 (@ 3.0GHz)
MDR-70	72 ± 1	0 ± 2	> 9,000 (@ 3.5GHz)				

TABLESS TYPE (SMT)

- Large foot print for superior SMT
- Excellent solder reflow
- Low Loss
- Reliable





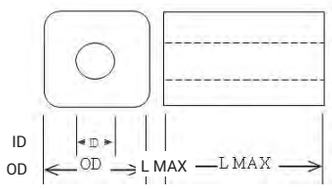
FREQUENCY CALCULATION - TABLESS RESONATORS

L= 81280/Frequency (MHz) x $\sqrt{\text{dielectric constant}}$

OD φ	T (mm)	G (mm)
2	0.50	0.64
3	0.50	0.64
4	1.10	1.27
5	1.00	1.27
6	1.10	1.27
7	1.40	1.85
8	1.40	1.85
10	1.40	1.85
12	1.40	1.85

COAXIAL TYPE

- Tab insertion available
- Available Sizes: 1.5 mm ~ 18 mm
- Tabs are manufactured by etching. Wide range of shapes and sizes are available.



Coaxial Resonators Die Sizes

Size	OD φ	ID φ	L MAX	Size	OD φ	ID φ	L MAX
D150	1.50	0.62	11	D333	3.30	0.83	10
D175	1.75	0.68	11	D340	3.40	1.16	15
D200	2.00	0.83	10	D350	3.50	1.17	15
D210	2.10	0.83	6.5	D400	4.00	1.20	26
D230	2.30	0.83	8	D500	5.00	1.48	26
D250	2.50	0.90	11	D600	6.00	2.22	33
D260	2.60	0.83	10	D600	6.00	2.35	33
D265	2.65	0.90	13	D670	6x7	2.35	33
D280	2.80	0.89	11	D700	7.00	2.35	15
D285	2.85	1.03	11	D800	8.00	2.59	40
D291	2.91	0.89	13	D1000	10.00	2.85	45
D300	3.00	0.98	14	D1200	12.00	3.50	45
D305	3.05	0.78	14	D1800	18.00	5.25	45

Standard Frequency Range λ/4 MHz

Series	2 mm	3 mm	4 mm	6 mm	12 mm
ε21	2000 - 4000 MHz	1500 - 4000 MHz	1000 - 4000 MHz	600 - 2500 MHz	600 - 1250 MHz
ε37	1500 - 3000 MHz	1500 - 3000 MHz	800 - 3000 MHz	500 - 2000 MHz	450 - 1000 MHz
ε90	900 - 2000 MHz	650 - 2000 MHz	450 - 2000 MHz	450 - 1000 MHz	300 - 650 MHz

FREQUENCY CALCULATION - COAXIAL TYPE

The length of the coaxial resonator (L) is a function of the frequency (ƒ) and the dielectric constant (ε_r):

(λ/4 Application)

$$L = \frac{\lambda_o}{4\sqrt{\varepsilon_r}}$$

(λ/2 Application)

$$L = \frac{\lambda_o}{2\sqrt{\varepsilon_r}}$$

Unit: λo (mm), L (mm), ƒ (GHz.)

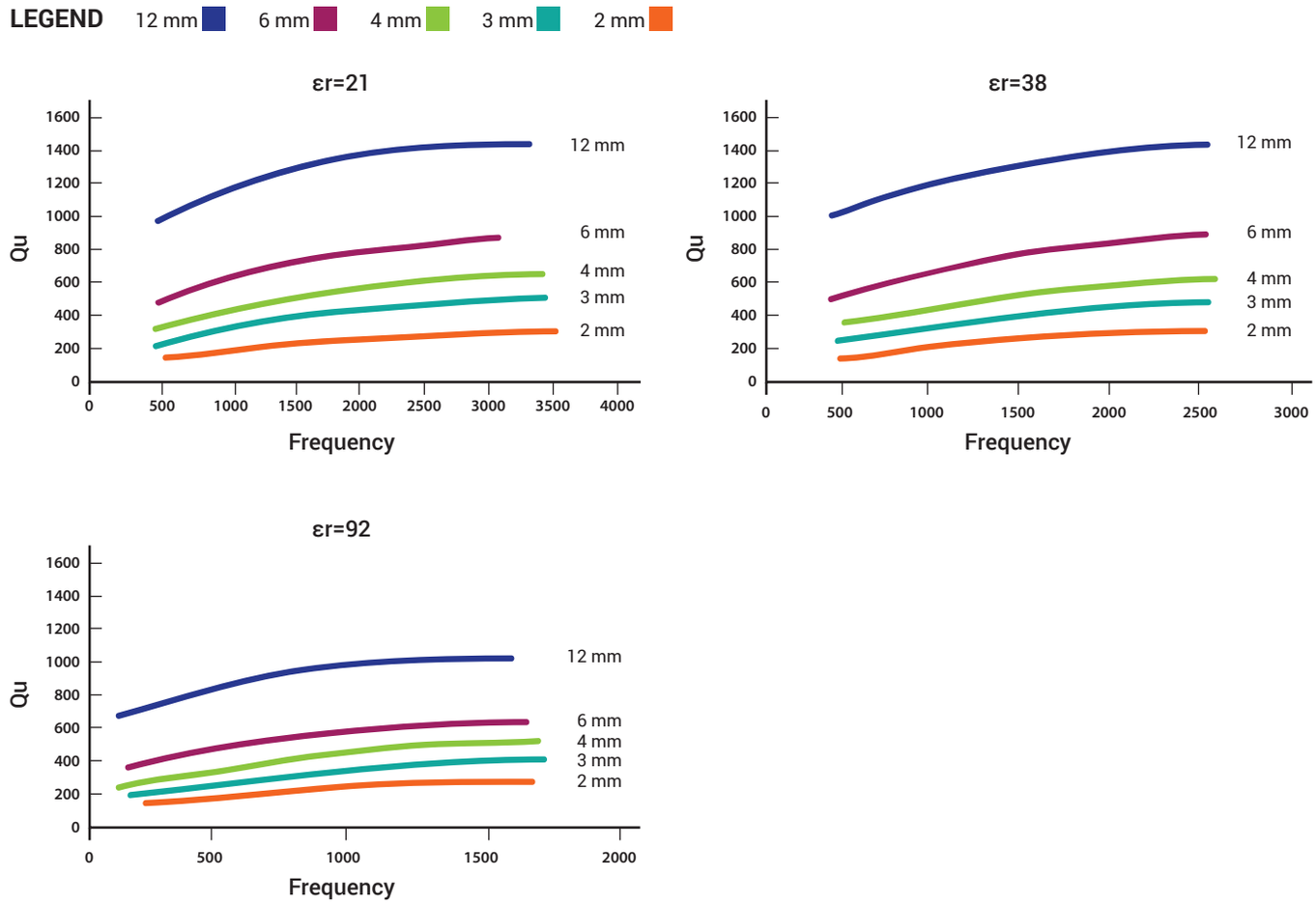
SOLDERING RECOMMENDATIONS

Coaxial resonators must be preheated in order to avoid a thermal shock and mechanical stress that create a failure. MCV recommends a minimum preheating time of 2 minutes at 120°C with a maximum heating rate of 2°C / sec.

DIELECTRIC RESONATORS - TEM

Qu vs. Dielectric Constant and Size (OD mm)

The Q factor of a coaxial resonator is a function of size, metallization and to a lesser extent the dielectric material losses, where Q min. increases as frequency increases proportional to the $\sqrt{f_o}$



Ordering Information

MDC	90	D120	8	4	1000	N
MCV Coaxial Resonator	Dielectric Constant	Resonator Size	Impedance Ohms	Resonant Wave Length	Frequency MHz	Tab
	21 37 80 90	D20 = 2 mm D30 = 3 mm D40 = 4 mm D60 = 6 mm D80 = 8 mm D100 = 10 mm		2 = λ/2 4 = λ/4		N = Tabless T = Tab

DIELECTRIC PATCH ANTENNAS

Dielectric Antennas

MCV Microwave Dielectric Antennas are compact size, high performance, reliable, RoHS compliant and cost competitive. MCV offers patch antennas in various sizes for GPS and Wireless LAN applications.

Rectangular microstrip designed patch antennas have excellent stability and sensitivity through the use of high-performance, proprietary dielectric materials with strict dimensional accuracy, dielectric constant and temperature stability.

Send us your Dielectric Antenna specification requirements today and we will respond quickly to your request.

FEATURES

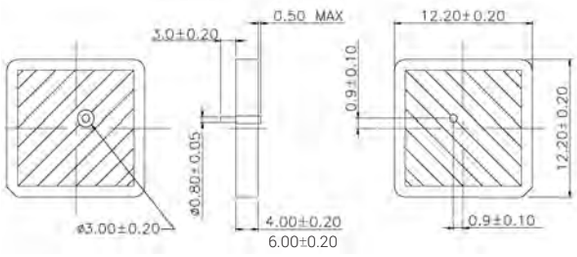
- Small patch dimensions
- High Gain
- Rugged construction
- Low Loss Silver High Qu
- Negligible aging effects
- Excellent solderability
- Excellent Temperature Stability

APPLICATIONS

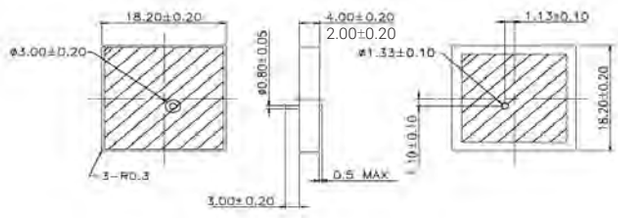
- Global Positioning Systems (GPS) L1, L2, L5
- W-LAN.
- Mobile Satellite Communications
- Direct Broadcast Satellite Services
- Medical Hyperthermia
- Remote Sensing
- Military Aircraft, Missiles, Rockets, Satellites

Product Dimensions

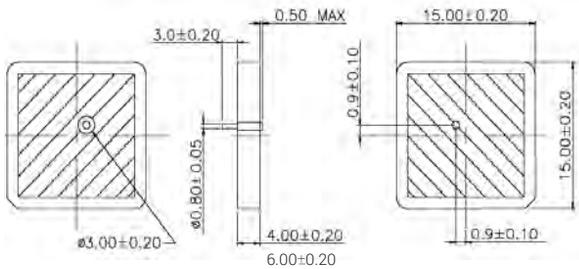
Dielectric Patch Antenna (12 x 12mm)
Available in 4 mm and 6 mm thicknesses



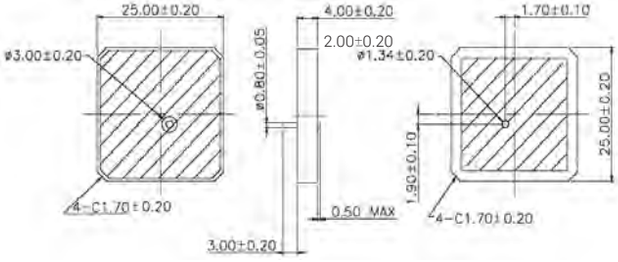
Dielectric Patch Antenna (18 x 18mm)
Available in 2 mm and 4 mm thicknesses



Dielectric Patch Antenna (15 x 15mm)
Available in 4 mm thickness



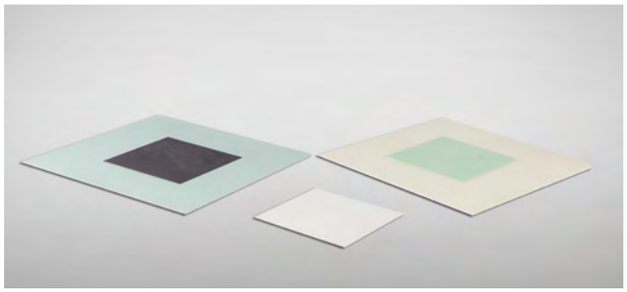
Dielectric Patch Antenna (25 x 25mm)
Available in 2 mm and 4 mm thicknesses



DIELECTRIC PATCH ANTENNAS

Material Availability

Characteristics	Specifications	
MCV Part No.	**MA 1204XXP (12mm x 12mm x 4 mm)**	**MA 1206XXP (12mm x 12mm x 6 mm)**
Frequency Range (MHz.)	1595 - 1614	1595 - 1614
Center Frequency (50x50mm GP)	1605.0 ±3.0 MHz	1605.0 ±3.0 MHz
Bandwidth	5.0 min MHz Return Loss ≤ -10dB	5.0 min MHz Return Loss ≤ -10dB
Gain at Zenith	+0 typical dBi @1605.0 MHz	+1.0 typical dBi @1605.0 MHz
Gain at 10° elevation	-8.0 typical dBi @1605.0 MHz	-7.0 typical dBi @1605.0 MHz
Impedance	50Ω	50Ω
Axial ratio	3 max dB	3 @1605.0 MHz max dB @1605.0 MHz
Dielectric Constant K	90 ± 2.5	90 ± 2.5
Quality Factor, Q (=1/tanδ)	≥5000@9GHz	≥5000@9GHz
Tf (-40 °C ~ + 85 °C)	0 ± 20 ppm/°C	0 ± 20 ppm/°C
MCV Part No.	**MA 1504XXP (15mm x 15mm x 4 mm)**	
Frequency Range (MHz.)	1576 - 1595	
Center Frequency (50x50mm GP)	1585.0 ±3.0 MHz	
Bandwidth	5.0 min MHz Return Loss ≤ -10dB	
Gain at Zenith	+1.0 typical dBi @1585.0 MHz	
Gain at 10° elevation	-7.0 typical dBi @1585.0 MHz	
Impedance	50Ω	
Axial ratio	3 max dB @1585.0 MHz	
Dielectric Constant K	65 ± 2.5	
Quality Factor, Q (=1/tanδ)	≥5000@9GHz	
Tf (-40 °C ~ + 85 °C)	0 ± 20 ppm/°C	
MCV Part No.	**MA 1802XXP (18 mm x 18mm x 2mm)**	**MA 1804XXP (18 mm x 18mm x 2mm)**
Frequency Range (MHz.)	1576 - 1595	1576 - 1595
Center Frequency (50x50mm GP)	1580.0 ±3.0 MHz	1580.0 ±3.0 MHz
Bandwidth	6.0 min MHz Return Loss ≤ -10dB	7.0 min MHz Return Loss ≤ -10dB
Gain at Zenith	+1 typical dBi @1580.0 MHz	+3.5 typical dBi @1580.0 MHz
Gain at 10° elevation	-5.5 typical dBi @1580.0 MHz	-4.0 typical dBi @1580.0 MHz
Impedance	50Ω	50Ω
Axial ratio	3 max dB @1580.0 MHz	3 max dB @1580.0 MHz
Dielectric Constant K	37 ± 2.5	37 ± 2.5
Quality Factor, Q (=1/tanδ)	≥5000@9GHz	≥5000@9GHz
Tf (-40 °C ~ + 85 °C)	0 ± 20 ppm/°C	0 ± 20 ppm/°C
MCV Part No.	**MA 2502XXP (25 mm x 25mm x 2mm)**	**MA 1804XXP (25 mm x 25mm x 4mm)**
Frequency Range (MHz.)	1576 - 1595	1576 - 1595
Center Frequency (70x70mm GP)	1580.0 ± 3.0 MHz	1580.0 ±3.0 MHz
Bandwidth	9.0 min MHz Return Loss ≤ -10dB	9.0 min MHz Return Loss ≤ -10dB
Gain at Zenith	+4.5 typical dBi @1580.0 MHz	+5.0 typical dBi @1580.0 MHz
Gain at 10° elevation	-3.0 typical dBi @1580.0 MHz	-1.0 typical dBi @1580.0 MHz
Impedance	50Ω	50Ω
Axial ratio	3 max dB @1580.0 MHz	3 max dB @1580.0 MHz
Dielectric Constant K	20 ± 2.5	20 ± 2.5
Quality Factor, Q (=1/tanδ)	≥5000@9GHz	≥5000@9GHz
Tf (-40 °C ~ + 85 °C)	0 ± 20 ppm/°C	0 ± 20 ppm/°C



Dielectric Substrates

MCV-Microwave, offers a wide section of High K substrates exhibiting low loss, excellent temperature stability, and high density with tight dielectric constant Ɛr tolerance from Ɛr 9.0 to 325. They are ideally suited for microwave integrated circuits and high Q capacitors. These substrates are available either as bare ceramic or with thick or thin film metallization.

Grain Boundary barrier layer (GBBL) Subsrtates having dielectric constants in 30,000~50,000 and 90,000~100,000 are available with X7R and X7S temperature performance, from -55°C to + 125°C, respectively. Electrical characteristics, as outlined in MIL-C-49464, will meet those specified for class II dielectrics. MCV GBBL Substrates exhibit ultra-high K, extremely low ESR, low insertion loss, and excellent voltage handling capability up to 40 GHz forDC block, RF bypass, source bypass and Impedance matching mirowave applications.

Material Availability

Series	Dielectric Constant ε_r	τ_f (ppm/°C)	Qf Values	Series	Dielectric Constant ε_r	τ_f (ppm/°C)	Qf Values
MDS-9	9 ± 1	6 ± 5	> 58,000 @ 9.5GHz	MDS-70	72 ± 1	0 ± 2	> 9,000 @ 3.5GHz
MDS-21	21 ± 1	5 ± 5	> 60,000 @ 6.5GHz	MDS-77M	77 ± 1	-1~5 ± 2	> 10,000 @3.5GHz
MDS-24	24 ± 1	1~3 ± 1	> 300,000 @ 10GHz	MDS-88M	80 ± 1	-1~5 ± 2	> 8,000 @1.5GHz
MDS-30	30 ± 1	0 ± 2	> 150,000 @ 10GHz	MDS-90	93 ± 1	9 ± 4	> 6,000 @3.0GHz
MDS-34	34 ± 1	2~3 ± 1	> 150,000 @ 10GHz	MDS-90N	93 ± 1	9 ± 4	> 5,800 @3.0GHz
MDS-36	36 ± 2	0 ± 5	> 30,000 @ 5GHz	MDS-96	98 ± 2	10 ± 4	> 4,500 @3.5GHz
MDS-38	38 ± 1	0.7 ± 0.5	> 47,000 @ 5.0GHz	MDS-113	113 ± 3	20 ± 10	> 3,000 @2.0GHz
MDS-40	40 ± 1	3 ± 5	>70,000 @ 5.0GHz	MDS-190	194 ± 3	25 ± 10	> 1,300 @3.0GHz
MDS-45	46 ± 1	-2~6 ± 0.5	> 43,000 @ 6.0GHz	MDS-325	4000 ± 500	± 10%	tanδ1.0%
MDS-47	47 ± 1	0 ± 10	> 46,000 @ 6.0GHz				

GBBL Substrates – *Substrate for Single Layer (Grain Boundary Barrier Layer) Capacitors.*

Type	Dielectric Constant	Size	Thickness	D.F (%)	I.R. (25~50V)	TCC (-55°~+125°C)
MAXI	25,000 = Avx (<25mil part w/ border K=30000~50000)	1.5"x1.5"	.005"-.02"	<1.5	>10G	X7R <+/-15%
MAXI+	Super High K (<25mil part w/ border K=90000~100000)	1.5"x1.5"	.005"-.02"	<1.5	>10G	X7S <+/-18~20%

FEATURES

GBBL Substrate has 10 times and 20 times higher dielectric constant than traditional material but keeps the same property; Low-loss; Low insertion loss; Operates at very much higher frequency than traditional material up to the self-resonant frequency

APPLICATION

DC Block, RF Bypass, Source Bypass, and Impedance Matching.

Available Sizes & Tolerences

Standard Sizes	Minimum Thickness
1 x 1	.005", .010"
1.5 x 1.5	.005", .010"
2 x 2	.005", .010"

Note: (1) Custom Sizes and tolerances available.
(2) Contract thick film metallization is available.

ELECTRICAL TEST METHODS

Dielectric Constant Test Measurements

Dielectric constants also known as relative permittivity, K or ε' is tested primarily using the Courtney "parallel-plate" dielectrometer1. With this method, a cylindrical rod resonator sample is placed between two parallel conducting plates. Resonant frequency of the sample in the TE01 resonant mode is measured as are the sample dimensions, and from these values dielectric constant is calculated.

Quality Factor (Q) Measurement

Quality factor for higher dielectric constant materials is tested using a cylindrical resonant cavity made of high conductivity metal with interior dimensions approximately 3-5 times larger than the dimensions of the test sample. The test sample is placed inside the cavity upon a low loss, low dielectric constant support and inductive coupling to the resonator sample is achieved via a coupling loop or bent probe. The S21 or transmission characteristics of the TE01 resonant mode is measured, and quality factor is calculated using the formula:

$Q = (f_0 / f) / (1 - 10^{(-I.L./20)})$ where f_0 is the resonant frequency, f is the -3dB bandwidth, and I.L. is the insertion loss expressed in dB.

Temperature Coefficient of Resonant Frequency Tf Measurement

Temperature coefficient of resonant frequency is measured by using a cylindrical resonant cavity made of high conductivity metal with dimensions approximately 3-5 times larger than the dimensions of the test sample. The test sample is placed inside the cavity on a low loss, low dielectric constant, low thermal expansion support and inductive coupling to the resonator is achieved via a coupling loop or bent probe. The cavity is then placed inside of a temperature chamber and the temperature is cycled over the desired range (usually 25°-60°C). The resonant frequency of the TE01 mode is measured at each temperature. Temperature coefficient is calculated as follows and is expressed in parts-per-million-per-degree Celsius (ppm/°C.): $f_0 / (f_0 T)$. For more precise applications, polynomials are fitted to the data which can include temperatures below 25°C.

Industry Abbreviations

Symbol	Description	Symbol	Description
DBS	Direct Broadcast Satellite	MM	Millimeter Wave
DR	Dielectric Resonator	PCN	Personal Communication Network
DRO	Dielectric Resonator Oscillator	PCS	Personal Communication System
ECM	Electronic Counter Measures	PVD	Physical Vapor Deposition
GPS	Global Positioning System	RMS	Root Mean Square
GSM	Global Specialized Mobile	SG	Standard Grade
HPH	High Power Handling	TVRO	TV Receive Only

Corporate Profile

MCV-Microwave, a division of MCV Technologies, Inc. (MCV), designs, manufactures and markets custom filters. With expertise in high Q dielectric powder recipes IP, MCV provides dielectric resonators with a QF value greater than 300,000 – critical to high performance filter and DRO applications. Our antennas and filters/ duplexers/multiplexers are widely used in wireless commercial and military communications.

MCV's proprietary high power ceramic filters can handle 60W continuous power, with PIM superior to a cavity filter, in half the size. We supply products for 4G LTE & DVB-T, AMPS, GSM, CDMA, WCDMA, PCS, GPS, ISM915MHz/ 921MHz/2.4GHz/5.8GHz, 802.11, SATCOM, and proprietary point-to-point wireless systems. MCV filters support the latest generation LTE and GPS L1, L2 & L5 band products, achieving low insertion loss and rejection of nearby frequency band for military, industrial, and commercial applications.

We welcome your inquiry. Please contact MCV Microwave Engineering and Sales:

Engineering@mcv-microwave.com

Sales@mcv-microwave.com

MCV Microwave Competitive Advantages

High Q Dielectrics

Materials IP, vertically integrated from powder spray drying to ceramic resonators and monoblock manufacturing, providing Qf values as high as 300,000 @ 10GHz

Patented TEM Resonator

Reduce resonator length 40%~60%, extending ceramic filter frequency range below 300MHz

Thick Film Pastes

In-house thick film silver paste provides smooth silver metallization having excellent adhesion and solderability

Small Filter Form Factor

Discrete and monoblock ceramic filter from 1.5mm to 17mm size; reduce filter size with high Er ceramic dielectric materials

High Power Ceramic Filter

Typical power handling 20W CW (up to 60W possible), allows MCV ceramic filter to replace cavity filter for LTE small cell with superior low PIM

Quick-Turn Sample & Local Support

Samples available in 2-4 weeks; MCV Microwave is just one phone call away

Filter Design Capability

Excellent Filter Design Capability offers complex band reject filter and multiplexer, in addition to Lowpass, Highpass and Bandpass filters

Filter Topology

MCV offers LC, Ceramic, Cavity and Helical Filters as well as combination of technologies

Volume Manufacturing

Experience in large volume production

MCV MICROWAVE

MCV Microwave

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