

## Dielectric Resonators (TEM Mode)



TEM Coaxial Resonators made with high Q / high  $\epsilon'$  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 microwave frequency applications.

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

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

The ruggedized silver coating exhibits exceptional solderability and produces some of the highest Q's in the industry.

MCV-Microwave offers a wide selection resonator sizes and four 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 ( $\pm 0.7\%$  max).

### APPLICATIONS

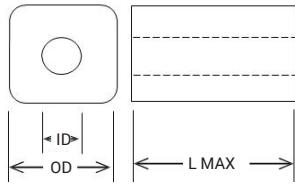
- Dielectric resonating oscillators (DRO)
- Voltage controlled oscillators (VCO)
- Global positioning systems (GPS)
- Cellular and wireless communications
- Bandpass / band reject filters / Duplexers / Multiplexers
- Inductors
- Narrowband/delay

### BENEFITS

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

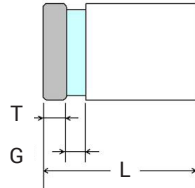
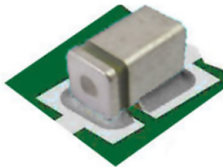
# DIELECTRIC RESONATORS - TEM

## Tabbed & Tableless Types



### TAB TYPE

- Tab insertion available
- Available Sizes: 3 mm ~ 12 mm
- Tabs are manufactured by etching. Wide range of shapes and sizes are available.



### TABLESS TYPE (SMT)

- Large foot print
- Excellent solder reflow
- Low Loss
- Reliable

## Material Availability

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

## Coaxial Resonators Die Sizes

Size	OD $\phi$	ID $\phi$	L MAX	Size	OD $\phi$	ID $\phi$	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	D1700	18.00	5.25	45

## Standard Frequency Range $\lambda/4$ Mhz

Series	2 mm	3 mm	4 mm	6 mm	12 mm
$\epsilon_{21}$	2000 - 4000 MHz	1500 - 4000 MHz	1000 - 4000 MHz	600 - 2500 MHz	600 - 1250 MHz
$\epsilon_{37}$	1500 - 3000 MHz	1500 - 3000 MHz	800 - 3000 MHz	500 - 2000 MHz	450 - 1000 MHz
$\epsilon_{90}$	900 - 2000 MHz	650 - 2000 MHz	450 - 2000 MHz	450 - 1000 MHz	300 - 650 MHz

### FREQUENCY CALCULATION

The length of the coaxial resonator (L) is a function of the frequency (f) and the dielectric constant ( $\epsilon_r$ ):

( $\lambda/4$  Application)

$$L = \frac{\lambda_0}{4\sqrt{\epsilon_r}}$$

( $\lambda/2$  Application)

$$L = \frac{\lambda_0}{2\sqrt{\epsilon_r}}$$

Unites:  $\lambda_0$  (mm), L (mm), f (GHz.)

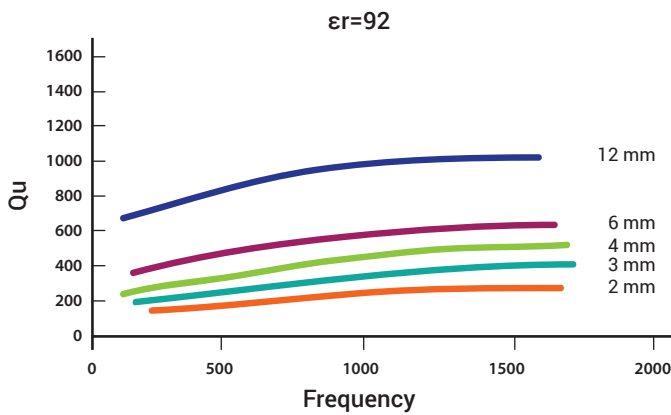
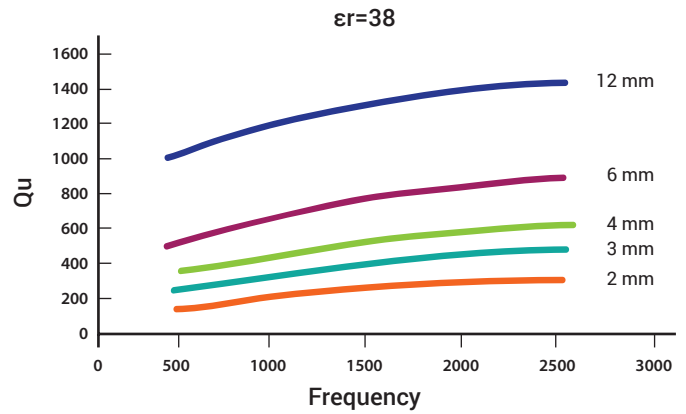
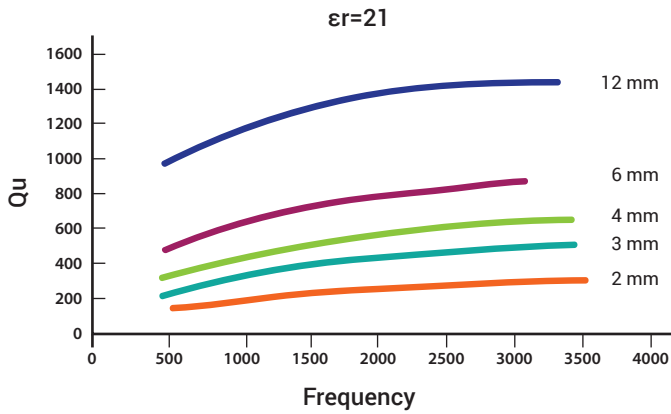
### SOLDERING RECOMMENDATIONS

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.

## Q<sub>u</sub> vs. Dielectric Constant vs. 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 promotional to the  $\sqrt{f_0}$ .

**LEGEND** 12 mm ■ 6 mm ■ 4 mm ■ 3 mm ■ 2 mm ■



## Ordering Information

MDR	90	D120	8	4	1000	N
MCV Resonator	Material Dielectric	Dimension	Impedance Ohms	Resonant Wave Length	Frequency MHz	Tab
	21	D20 = 2 mm		$2 = \lambda/2$		N = Tabless
	37	D30 = 3 mm		$4 = \lambda/4$		T = Tab
	80	D40 = 4 mm				
	90	D60 = 6 mm				
		D80 = 8 mm				
		D100 = 10 mm				
		D120 = 12 mm				



## 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](mailto:Engineering@mcv-microwave.com)**

**[Sales@mcv-microwave.com](mailto: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