



FERRITE DOMEN Co.  
Since 1959

## Microwave Ceramics



Ferrite Domen Company presents the wide choice of high-Q ceramics with dielectric constant 4 up to 140 for microwave products operational in wide frequency and temperature ranges.

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### SYMBOLS

$\epsilon'$	Dielectric constant	—
$tg\delta_\epsilon$	Dielectric loss tangent	—
$TK\epsilon$	Temperature coefficient of dielectric constant	ppm/°C
$\tau_f$	Temperature coefficient of resonant frequency	ppm/°C
$\rho$	Bulk density	g/cm <sup>3</sup>
$W$	Water absorption	%

FERRITE DOMEN Co.  
25, Tsvetochnaya st., Bld. 3  
196006 St. Petersburg, Russia  
E-mail: [info@domen.ru](mailto:info@domen.ru)  
[www.ferrite-domen.com](http://www.ferrite-domen.com)

## 1. High-Q microwave ceramics

These ceramic materials give wide choice of applications addressing everything from substrates to microwave ferrite devices such as circulators, isolators, phase shifters. Dielectric substrates are used in hybrid IC, filters, delay lines, etc.

Material grade	$\epsilon'$	$tg\delta_{\epsilon}$ [x10 <sup>-4</sup> ]	$\rho$	$TK\epsilon$	$W$	Composition
		max.	g/cm <sup>3</sup>	ppm/°C	% max.	
5 K	4.7±0.3 @9.8 GHz	3	2.4	+55	0.1	Mg-Al-Si-O
6.3 F	6.3±0.3 @9.8 GHz	3	2.8	+107	0.2	Mg-Si-O
7.4 MTK	7.4±0.2 @9.8 GHz	3	3.0	+100	0.1	Mg-Si-Ti-O
8 ML	8.2±0.3 @9.8 GHz	3	3.3	+100	0.2	Mg-Al-O
9.5 MTK	9.5±0.3 @9.8 GHz	2	3.2	+100	0.1	Mg-Si-Ti-O
10.3 MTK	10.3±0.3 @9.8 GHz	2	3.3	+100	0.1	Mg-Si-Ti-O
12 MTK	12±0.4 @9.8 GHz	2	3.3	+100	0.1	Mg-Si-Ti-O
13 MT	13±0.3 @9.8 GHz	2	3.4	+100	0.1	Mg-Ti-O
15 MT	15±0.3 @9.8 GHz	2	3.5	+100	0.1	Mg-Ti-O
16 MT	16±0.3 @9.8 GHz	2	3.6	+100	0.1	Mg-Ti-O
18 MCT	18±0.5 @9.8 GHz	2	3.5	-70	0.1	Mg-Ca-Ti-O
20 MCT	20±1.0 @9.8 GHz	2	3.5	-130	0.1	Mg-Ca-Ti-O
30 MCT	30±1.5 @4.5 GHz	3	3.6	-370	0.1	Mg-Ca-Ti-O
40 MCT	40±2.0 @4.5 GHz	4	3.65	-580	0.1	Mg-Ca-Ti-O
50 MCT	50±2.5 @4.5 GHz	4	3.68	-730	0.1	Mg-Ca-Ti-O
70 MCT	70±3.5 @4.5 GHz	8	3.70	-960	0.1	Mg-Ca-Ti-O
80 MCT	80±4.0 @4.5 GHz	8	3.70	-1050	0.1	Mg-Ca-Ti-O
100 MCT	100±5.0 @4.5 GHz	8	3.75	-1120	0.1	Mg-Ca-Ti-O
120 MCT	120±6.0 @4.5 GHz	8	3.80	-1170	0.1	Mg-Ca-Ti-O
140 MCT	140±7.0 @4.5 GHz	8	3.85	-1200	0.1	Ca-Ti-O

## 2. Thermostable microwave ceramics

This sort of ceramics was developed for realization of dielectric resonators featuring high quality factor (Q) and excellent stability of temperature coefficient of frequency. These devices are widely used in low-noise frequency converters, dielectric high-stable oscillators of communication equipment, detectors of radar radiation, microwave filters, generators of microwave signals, etc.

Material grade	$\varepsilon'$ @ 4.5 GHz	$tg\delta_\varepsilon$ [x10 <sup>-4</sup> ]	$\tau_f$ @ (20-60) °C	$\rho$	$W$
	nominal	max.	ppm/°C	g/cm <sup>3</sup>	% max.
KT-10	9...11	3	0 ± 6	3.2 ± 0.2	0.05
KT-24	22...26	3	0 ± 6	7.3 ± 0.3	0.05
KT-28	26...30	2	0 ± 9	7.6 ± 0.3	0.05
KT-37	34...40	3	0 ± 6	4.8 ± 0.3	0.05
KT-40	38...42	4	0 ± 6	4.8 ± 0.3	0.05
KT-75	70...80	8	0 ± 9	5.5 ± 0.3	0.05
KT-90	80...90	10	0 ± 15	5.0 ± 0.3	0.05

Note. – Maximum deviation of  $\varepsilon' \pm 2\%$

## 3. Powders for LTCC Tape Casting

Powders designed for RF and microwave multilayer substrates using the Low Temperature Co-fired Ceramic (LTCC) technology.

### Typical Powder Properties

Average Particle Size (d50): 0.5-5  $\mu\text{m}$   
Specific Surface Area: 1.0 – 2.0 m<sup>2</sup>/g

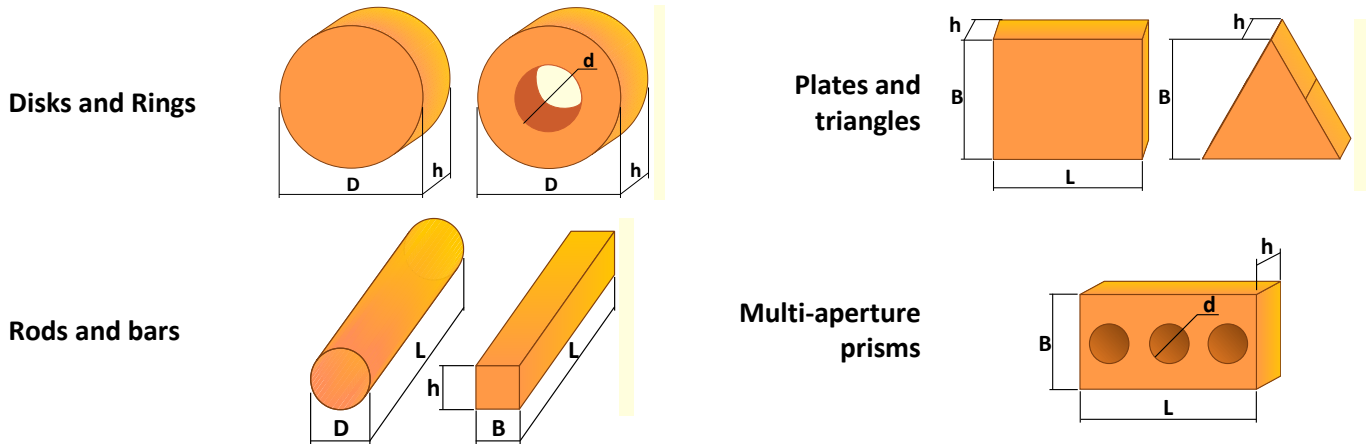
### Co-fired

Heating Rate: 1.2-3.0 °C/minute  
Firing temperature: 870-880 °C  
Cooling Rate: 2 - 3 °C/min  
Setters: 96% Al<sub>2</sub>O<sub>3</sub>

Material grade	$\varepsilon'$	$tg\delta_\varepsilon$ [x10 <sup>-3</sup> ]	$\rho$	Composition
		max.	g/cm <sup>3</sup>	
NP7MT	7 ± 0.3 @ 10 GHz	1.5	3.1	Mg-Ti-Ca-Zn-Zr-Fe-Ni
NP7MT1	7 ± 0.3 @ 10 GHz	2.0	2.9	Mg-Ti-Zn-B-Si
NP13MT	13 ± 0.5 @ 10 GHz	1.5	3.5	Mg-Ti-Ca-Zn-Zr-Fe-Ni
NP13MT1	13 ± 0.5 @ 10 GHz	2.0	3.3	Mg-Ti-Ca-Zn-B-Si
NP20MT	20 ± 1.0 @ 10 GHz	1.5	3.6	Mg-Ti-Ca-Zn-Zr-Fe-Ni
NP20MT1	20 ± 1.0 @ 10 GHz	2.0	3.4	Mg-Ti-Ca-Zn-B-Si

Note. \* - measured at 10 GHz on pressed rods, dimension: 1.12x1.12x18 mm

## Standard form factors of microwave ceramic parts



## The maximum dimensions of ceramic parts, mm

	D	L	B	h	H	d
Disks	100	—	—	10	—	—
Rings	70	—	—	10	—	50
Plates	—	100	60	10	—	—
Triangles	—	—	—	10	90	—
Rods	40	100	—	—	—	—
Bars	—	100	30	—	10	—
Multiple-aperture prisms	—	14	6.5	14	—	1...1.5

Standard tolerances of parts:  $\pm 0.05$  mm

Standard surface roughness:  $R_a \geq 0.8$   $\mu\text{m}$

Custom sizes and tolerances available on request