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(TE) Dielectric Resonators & Materials

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Product Introduction

Microwave dielectric resonator material is the cornerstone of future communications technology.

Features :

- High Q Value.
- Easy to control τ f.
- Various dielectric constant materials.

Applications :

- Police Radar Detectors.
- Dielectric Resonator Antennas.
- LMDS/MMDS Wireless Cable TV.
- Automobile Collision Avoidance Sensors.
- LNB, PCS/PCN Filters, Duplexer & Combiners.
- Cellular Base Station Filter, Duplexer & Combiners.

Microwave dielectric ceramics as the key basic materials to modern communication technology, after Token Electronics years of continuous research and development, using the latest technology to produce microwave ceramics have achieved a variety of dielectric constant, quality factor Q of the new media ceramic materials, and as a dielectric material application microwave frequencies of modern circuits, and modern electronic communications in the filters, resonators, dielectric substrates, such as microwave dielectric waveguide circuit components materials.

Comparing with microwave dielectric components made of Token's ceramic materials and metal cavity resonator, obviously, Token dielectric resonator features with a light weight, small volume, temperature coefficient of stability, cheap, and so on. They have been widely used in satellite broadcast reception systems, PCS / PCN filters, base stations, radar detectors, wireless mobile communications, telecommunications computer systems, military facilities, microwave, modern medicine and many other areas.

Taking advantage of Token's microwave dielectric ceramic materials for dielectric filters and resonators, with a relatively high dielectric constant, can make the device smaller, space-saving design of the circuit; high quality factor Q value and low dielectric loss, in order to ensure a good selection frequency characteristics and low insertion loss of the device; the temperature coefficient is small, in order to ensure the thermal stability of the device. Dielectric constant, quality factor Q, the temperature coefficient, these three parameters to evaluate the important microwave dielectric ceramic material specifications and production.

Custom parts are available on request. Token will also produce devices outside these specifications to meet specific customer requirements, contact us with your specific needs. For more information, please link to Token official website "Dielectric Resonators".

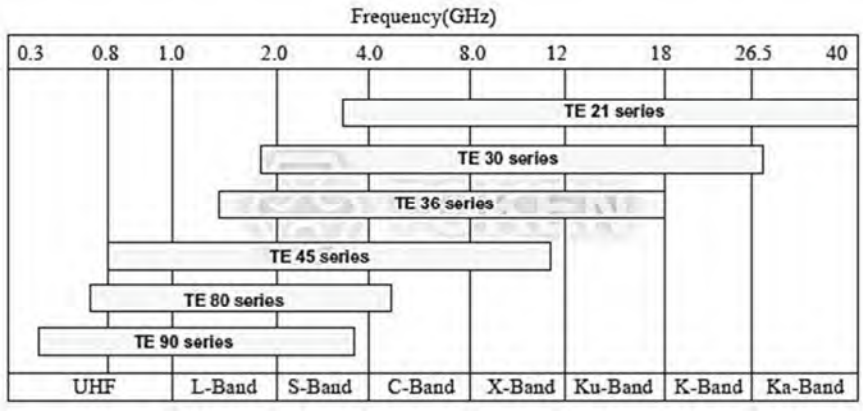
Available Range by Every Material

Available Range by Every Material TE01 δ Mode (TE)

Material Series	Dielectric Constant	Fo Q(1/tanδ)	Temperature Coefficient (PPM/℃)	Insulation Resistance (Ω-cm)	Application Frequency Range	Application Range
TE21	19~22	6,000@10GHz	0 ± 3	$>10^{14}$	Refer Frequency Chat	Refer Frequency Chat
TE30	29~30	15,000@10GHz	0 ± 6	$>10^{14}$		
TE36	35~37	10,000@4GHz	0 ± 3	$>10^{14}$		
TE45	44~46	10,000@4GHz	0 ± 6	$>10^{14}$		
TE80	79~81	7,000@1GHz	0 ± 6	$>10^{14}$		
TE90	89~91	7,000@1GHz	0 ± 6	$>10^{14}$		

Frequency Chart of Every Material

Frequency Chart of Every Material TE01 δ Mode (TE)



TE01δ Mode (TE) Frequency Chart

Application Notice

Application Notice TE01 δ Mode (TE)

1. **Aging**:
   Ceramics aging is small. Microwave Dielectric Ceramics any change in resonant frequency can be attributed to changes in measurement cavity or measurement techniques.

2. **Water Absorbing**:
   Ceramics absorb water is not obvious, but the moisture condensation in the ceramic microwave resonator on the surface will affect the Q_u. But Q_u will be self-healing, when the water dried, For example, Dielectric resonator in the filter operation of the self-heating.

3. **Cleanliness**:
   Q_u degradation of the oil may be due to a finger, pencil lead note, tape, adhesives, or other contaminants. Cleanliness of the dielectric ceramics is important.

4. **Dielectric Constant**:
   In fact, the microwave dielectric ceramics of the dielectric constant is not fixed. It varies with the additives added, and used to determine the temperature coefficient ceramics. The dielectric constant of each batch is slightly different and it changes slightly with temperature changes. Token compensates for these effects and provide resonators size to frequency, and offers custom temperature coefficient on request.

5. **Dielectric loss factor tanδ & Q_u**:
   Dielectric loss factor and quality factor of the relationship, such as Quality Factor ($Q = 1 / \tan\delta$), Dielectric microwave materials are commonly assigned a loss tangent to permit an estimate of signal losses. Ceramic resonator is usually run on a specific frequency, a specific geometric shape, it can directly measure its size, with no-load quality factor Q_u, Q_u is an important basic resonator parameters (more useful than the loss tangent), particularly suitable filter and oscillator applications.

6. **Smooth Surfaces**:
   Ceramic hard surface contact, it is prone to very small fragments. Most of the small fragments will not affect the electrical properties of dielectric ceramics. Ceramic surface roughness is not particularly important factor. Ceramic resonator itself does not current exist only in the form of stored energy from the field. Smooth surfaces are desirable from the standpoint of avoiding trapped contaminants.

7. **Thermal Shock**:
   Microwave dielectric ceramics in the temperature exceeds 1200° in furnace to burn out; they can be more resistant than the temperature of electronic devices, far beyond the welding temperature. However, the thermal conduction velocity of dielectric ceramics is much slower than the metal. Large temperature gradient through the ceramic device, because of uneven expansion, could lead to device failure, which is called thermal shock. Suddenly applied heat in the thick ceramic devices will lead to broken ceramics.

8. **Adhesives**:
   Adhesives to install ceramic resonators must be carefully selected. Adhesives will reduce the dielectric ceramics Q_u, The right adhesives can reduce Q_u to a minimum, while ensuring the adhesion strength.

Order Codes

Order Codes TE01 δ Mode (TE)

TE	36	-	10	A	S
Part Number	Dielectric Constant		Center Frequency (GHz)	Configuration	Construction

A	With hole
B	Without hole

S	Support
W	Without support

General Information

Advantage of Token's Microwave Dielectric Components

New Microwave Dielectric Materials for Wireless Communication from Token Electronics
"Everything from the electromagnetic properties to microstructure of the material is important for the final result"

A small ceramic component made from a dielectric material is fundamental to the operation of filters and oscillators in several microwave systems, such as satellite TV receivers, military radar systems, Global Positioning System (GPS) devices, and mobile communications. Token Electronics had been able to develop specialized piezoelectric materials which lead to more reliable and clearer microwave communication signals.

In microwave communications, dielectric components are used to discriminate between wanted and unwanted signal frequencies in the transmitted and received signal. When the wanted frequency is extracted and detected it is necessary to maintain a strong signal nevertheless. For clarity it is also critical that the wanted signal frequencies are not affected by seasonal temperature changes.

The resonator materials for practical applications have to have certain key properties. A high relative dielectric constant is needed so that the materials can be miniaturized and a high quality factor (Q) is needed for improved selectivity. Low temperature variation of the material's resonant frequency is also required so that the microwave circuits remain stable.

Although large numbers of ceramic dielectric materials have been developed, it has proven difficult to satisfy all these requirements in a single material at a reasonable cost. "Token takes the advantages of these new materials that they are relatively cheap compared with some of the compounds currently used and in the future they can be improved even further by suitable additives and by optimizing the preparation conditions."

Dielectric Material Composition & Study

The new dielectric materials developed by Token, are based on ceramics formed by baking the pressed powdered starting material mixture in a furnace at between 1200 and 1550 degrees Celsius.

Token Engineers used X-ray diffraction studies, Raman spectroscopy and scanning electron microscopy to reveal the structure of the ceramics. The materials have the general formula Ce (M1/2Ti1/2) O3.5. Ce is the element cerium, Ti is titanium and O is oxygen. "M" represents any one of the metals magnesium, zinc, calcium, cobalt, manganese, nickel or tungsten. The numbers refer to the proportions of each element in the ceramic.

"Further work is in progress to find the exact composition, internal structure and secondary phases in the ceramics".

Token's Service & PDF Catalogue Download

Token reliably deliver high-quality microwave dielectric components according to the each customer special needs with respect to performance, costs, and technology modifications.

For marketing discontinuations or sourcing activities concerning dielectric products, you are encouraged to contact our Sales Department so the request can be properly directed within Token.