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DIRECT

Electronics Tech.

(DR) Dielectric Coaxial Resonators

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▶ Product Introduction

Direct coaxial resonators (DR) are the cornerstone of RF microwave communications.

Features :

- High quality factor.
- High dielectric constant.
- Low temperature coefficient.
- Wide range of resonant frequency.

Applications :

- CDMA/PCS/WLL/IMT2000.
- Filters, Duplexer, Oscillators (DRO/VCO).
- Wireless headphone, wireless security system.
- 900MHz, 1.8GHz, 2.4GHz, 5.8GHz wireless phone.

(DR) is a kind of microwave components, also known as ceramic resonator, Direct electronics manufacturing dielectric resonator (cylindrical, ring), coaxial resonator (rectangular cavity, cylindrical cavity, coaxial cavity resonator), microwave resonator, etc. It is made high-Q dielectric ceramics; temperature coefficient is good, mainly used in microwave oscillators and filters.



Dielectric resonator size and dielectric material is inversely proportional to the square root of the dielectric constant, dielectric materials, dielectric constant the greater the required dielectric ceramic block the smaller, thus the smaller the resonator size. Another important parameter is the insertion loss, low dielectric loss microwave dielectric materials, dielectric filters that affect the insertion loss of a major factor. Microwave dielectric Q value and dielectric loss is inversely proportional to the relationship. Q value is greater the lower the filter insertion loss.

Therefore, the microwave dielectric ceramic materials of high dielectric constant is conducive to the miniaturization of microwave dielectric filters, can filter with the microwave tube, a micro strip line realization of microwave hybrid integrated circuit, so that the device dimensions to mm order of magnitude, the price is also much lower than the metallic cavity.

The (DR) impedance used in TEM mode is direct function of its dimensions and of the dielectric material permittivity. Direct coaxial ceramic resonators provide the customers with high Q higher parallel resonant impedance and better temperature characteristics than inductor coils and associated lumped constant elements used in RF amplifiers and oscillators circuits. According to dielectric resonator frequency stabilization mechanism, using dielectric resonator stabilized FET oscillator frequency (also referred to DRO) can be classified into 4 types, namely, reflective, band-reject type, transmission type and feedback type.

(DR) series with two ports, depending on port different boundary conditions, in accordance with the basic structure of the resonator is divided into three types: half-wavelength type, quarter-wavelength type, and capacitive load type, each structure each with distinct characteristics. Direct (DR) series features with small size, high temperature stability characteristics. Indirectly, (DR) series is suitable for a variety of microwave communications equipment, particularly suitable for PCS / PCN filters, base stations, radar detectors, satellite broadcast reception systems, military microwave facilities. Comply with RoHS standards.

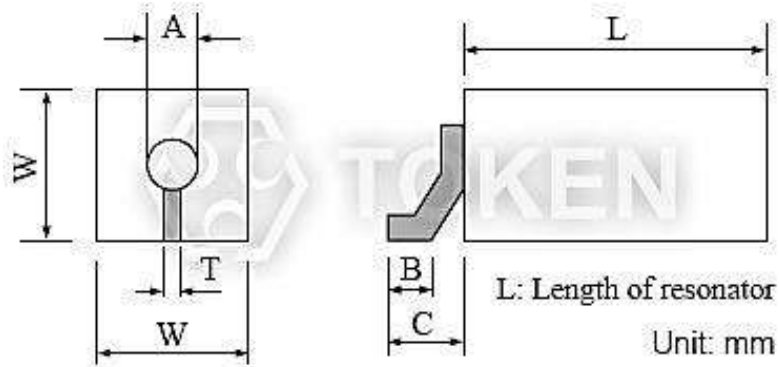
Custom parts are available on request. Direct will also produce devices outside these specifications to meet specific customer requirements, contact us with your specific needs. For more information, please link to Direct official website "[Dielectric resonators](http://www.direct-token.com)".



► Dimensions

Dimensions (Unit: mm) (DR)

Part Number	W(O/D)	A(I/D)	B	C	T
DR120	12.0±0.2	① Φ4.0±0.2	without tab	3.2	1.0
		② Φ3.55±0.2	1.5		
DR100	10.0±0.2	① Φ3.3±0.2	1.3	3.0	1.0
DR80	8.0±0.2	① Φ2.7±0.2	1.3	2.6	0.7
DR60	6.0±0.2	① Φ2.5±0.2	without tab	2.4	0.7
		② Φ2.2±0.2	without tab		
		③ Φ2.0±0.2	1.2		
DR50	5.0±0.2	① Φ1.8±0.2	1.0	2.2	0.6
		② Φ1.5±0.2	1.0		
DR40	4.0±0.1	① Φ1.8±0.1	0.8	1.8	0.6
		② Φ1.5±0.1	without tab		
		③ Φ1.2±0.1	without tab		
DR30	3.0±0.1	① Φ1.0±0.1	0.7	1.5	0.5
DR20	2.1±0.1	① Φ0.6±0.1	0.5	1.2	0.5



(DR) Dimensions



Available Range of TEM Mode

Available Range of TEM Mode (DR)

Material	Dielectric Constant	Tf ^[1]	Type	Characteristic Impedance (Ω)	Wave Length	Frequency Range (MHz)	Q ^[2] (min)
A Series	21±1	0±10	DR120	①15 ②17	λ/4	800~1300	800
					λ/2	1600~2700	1000
			DR100	16	λ/4	800~1300	700
					λ/2	1600~3200	800
			DR80	15	λ/4	1000~3200	650
					λ/2	2000~3000	700
			DR60	①12 ②14 ③15	λ/4	1000~2700	550
					λ/2	2000~3000	600
			DR50	①14 ②17	λ/4	1300~3000	450
					λ/2	2500~4000	500
			DR40	①11 ②14 ③17	λ/4	1300~4000	380
					λ/2	2500~4000	400
DR30 DR20	15 17	λ/4	1900~4000	320			
		λ/4	2800~5000	250			
B Series	36±1	0±10	DR120	①12 ②13	λ/4	600~1000	700
					λ/2	1200~2400	900
			DR100	12	λ/4	600~1200	600
					λ/2	1200~2400	800
			DR80	12	λ/4	800~1500	500
					λ/2	1600~3000	700
			DR60	①10 ②11 ③12	λ/4	800~1800	450
					λ/2	1600~3500	550
			DR50	①11 ②13	λ/4	800~1800	380
					λ/2	1600~3500	450
			DR40	①9 ②11 ③13	λ/4	1000~2700	320
					λ/2	2000~4800	400
DR30 DR20	12 13	λ/4	1300~3000	220			
		λ/4	1300~3000	220			
C Series	90±2	0±10	DR120	①7 ②8	λ/4	400~800	650
					λ/2	800~1500	700
			DR100	7	λ/4	600~800	550
					λ/2	1200~2400	650
			DR80	7	λ/4	440~1000	450
					λ/2	1000~1500	550
			DR60	①6 ②7 ③7	λ/4	440~1300	400
					λ/2	1000~2200	470
			DR50	①7 ②8	λ/4	500~1800	380
					λ/2	1000~3000	450
			DR40	①6 ②7 ③8	λ/4	900~1600	200
					λ/2	2000~4800	300
DR30 DR20	7 8	λ/4	900~1600	250			
		λ/4	900~1600	150			

● [1] Frequency stability of temperature.[2] Q value depends on lower limit of frequency range.



▶ **Order Codes**

Order Codes (DR)

DR	30	A	1		W4		2533	T	
Dielectric Resonators Part Number	Dimension	Material	Impedance		Wave Length		Center Frequency (MHz)	Configuration	
			1	①	W2	$\lambda/2$		T	tab
			2	②	W4	$\lambda/4$		N	without tab
			3	③					

► General Information

Advantage of Direct's Microwave Dielectric Components

New Microwave Dielectric Materials for Wireless Communication from Direct 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. Direct 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. "Direct 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 Direct, are based on ceramics formed by baking the pressed powdered starting material mixture in a furnace at between 1200 and 1550 degrees Celsius.

Direct 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".

Direct's Service & PDF Catalogue Download

Direct 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 Direct.

