

# High Voltage Ceramic DC Disc Capacitors

## 10 kV<sub>DC</sub> and 15 kV<sub>DC</sub>


**RoHS**  
COMPLIANT

**FEATURES**

- 20 kV rated voltage available on request
- Low losses
- High capacitance in small sizes
- High stability
- Radial leads
- Ceramic singlelayer capacitor
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

**APPLICATIONS**

- High voltage power supplies
- DC and pulse high voltage
- X-ray equipment, baggage scanner, air purifier, ionizer

**DESIGN**

The capacitors consist of a ceramic disc of which both sides are silver-plated. Connection leads are made of tinned copper having diameters of 0.032" (0.81 mm).

The capacitors may be supplied with straight leads having lead spacing of 0.375" (9.5 mm), 0.500" (12.7 mm) or 0.750" (19.2 mm).

Coating is made of flame retardant epoxy resin in accordance with "UL 94 V-0".

**CAPACITANCE RANGE**

100 pF to 3300 pF

**DIELECTRIC STRENGTH BETWEEN LEADS**

10 kV <sub>DC</sub>	15 000 V <sub>DC</sub> , 2 s
15 kV <sub>DC</sub>	24 000 V <sub>DC</sub> , 2 s (in dielectric fluid)

**CERAMIC DIELECTRIC**

T3M (Class 1)  
X5F, Y5R, Y5U, Z5U (Class 2)

**LINKS TO ADDITIONAL RESOURCES**


QUICK REFERENCE DATA				
DESCRIPTION	VALUE			
Ceramic Class	1		2	
Ceramic Dielectric	T3M (N4700)		X5F, Y5R, Y5U, Z5U	
Voltage (V <sub>DC</sub> )	10 000	15 000	10 000	15 000
Min. Capacitance (pF)	250	100	100	100
Max. Capacitance (pF)	1000	750	3300	2500
Mounting	Radial			

**INSULATION RESISTANCE**

Min. 1000 ΩF or 200 000 MΩ

**TOLERANCE ON CAPACITANCE**

± 20 % or + 80 % / - 20 %

**DISSIPATION FACTOR**

0.2 % max. at 1 kHz; 1 V (Class 1)  
2.0 % max. at 1 kHz; 1 V (Class 2)

**CATEGORY TEMPERATURE RANGE**

-25 °C to +85 °C

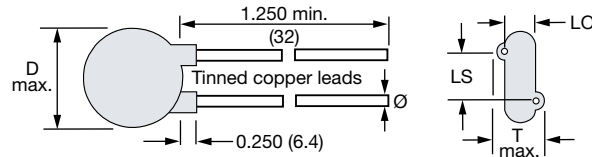
**CLIMATIC CATEGORY ACC. TO EN 60068-1**

25 / 85 / 21

**OPERATING TEMPERATURE RANGE**

 -25 °C to +105 °C <sup>(1)</sup>
**Note**

- <sup>(1)</sup> For explanation about the difference of operating temperature range and temperature characteristic of capacitance, please see [www.vishay.com/doc?48299](http://www.vishay.com/doc?48299)

**DIMENSIONS** in inches (millimeters)

**ORDERING INFORMATION, CERAMIC 10 kV<sub>DC</sub>**

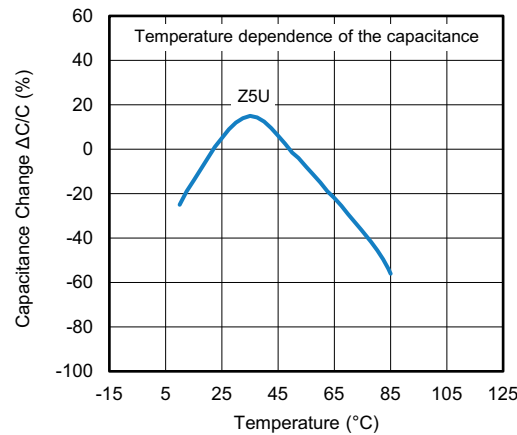
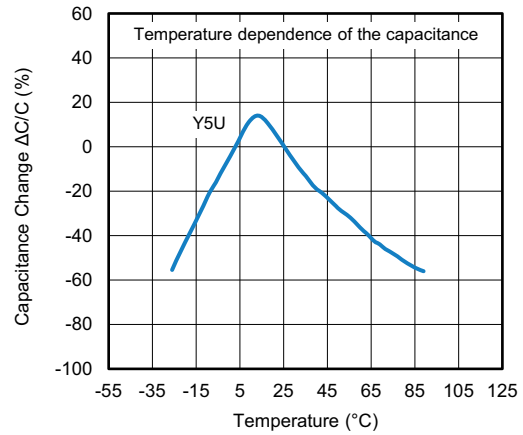
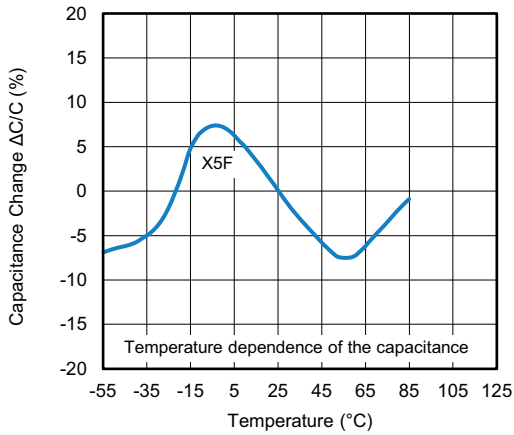
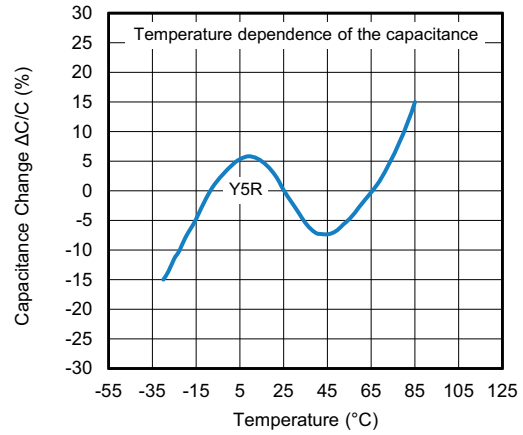
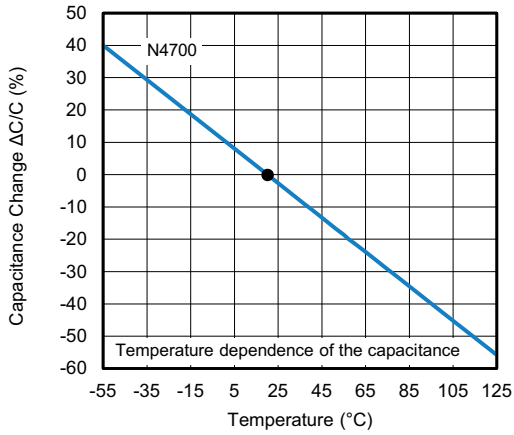
C (pF)	TOL. (%)	D <sub>max.</sub> DIAMETER INCH (mm)	T <sub>max.</sub> THICKNESS INCH (mm)	LS LEAD SPACE INCH (mm) ± 0.040" (± 1 mm)	LO LEAD OFFSET INCH (mm) ± 0.020" (± 0.5 mm)	WIRE SIZE		ORDERING CODE		
						AWG	INCH (mm)			
<b>T3M (N4700)</b>										
250	± 20	0.490 (12.4)	0.290 (7.4)	0.375 (9.5)	0.193 (4.9)	20	0.032 (0.81)	615R100GATT25		
500		0.680 (17.3)	0.272 (6.9)					0.500 (12.7)	0.173 (4.4)	615R100GATT50
680		0.750 (19.1)	0.300 (7.6)						0.181 (4.6)	615R100GATT68
820		0.810 (20.6)							0.181 (4.6)	615R100GATT82
1000		0.980 (24.9)	0.320 (8.1)						0.189 (4.8)	615R100GATD10
<b>X5F</b>										
100	± 20	0.680 (17.3)	0.382 (9.7)	0.500 (12.7)	0.283 (7.2)	20	0.032 (0.81)	615R100GAT10		
250			0.300 (7.6)		0.201 (5.1)			615R100GAT25		
500			0.345 (8.8)		0.248 (6.3)			615R100GAT50		
<b>Y5R</b>										
100	± 20	0.490 (12.4)	0.320 (8.1)	0.375 (9.5)	0.220 (5.6)	20	0.032 (0.81)	615R100GAST10		
250			0.331 (8.4)		0.232 (5.9)			615R100GAST25		
500			0.310 (7.9)		0.213 (5.4)			615R100GAST50		
1000			0.750 (19.1)		0.320 (8.1)			0.220 (5.6)	615R100GAD10	
<b>Y5U</b>										
1000	+ 80 / - 20	0.680 (17.3)	0.330 (8.4)	0.500 (12.7)	0.232 (5.9)	20	0.032 (0.81)	615R100GASD10		
2500	± 20	0.980 (24.9)						615R100GATD25		
<b>Z5U</b>										
2500	+ 80 / - 20	0.750 (19.1)	0.350 (8.9)	0.500 (12.7)	0.256 (6.5)	20	0.032 (0.81)	615R100GAD25		
3300		0.980 (24.9)			0.390 (9.9)			0.303 (7.7)	615R100GAD33	

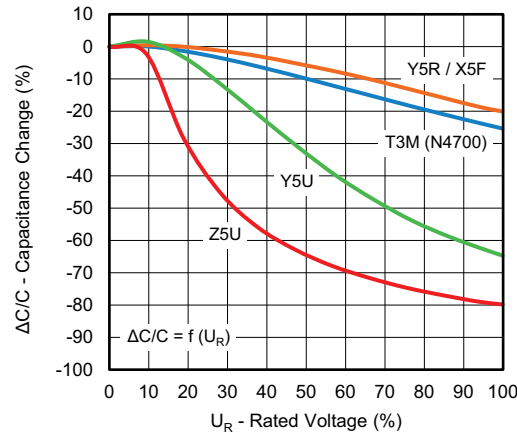
**ORDERING INFORMATION, CERAMIC 15 kV<sub>DC</sub>**

C (pF)	TOL. (%)	D <sub>max.</sub> DIAMETER INCH (mm)	T <sub>max.</sub> THICKNESS INCH (mm)	LS LEAD SPACE INCH (mm) ± 0.040" (± 1 mm)	LO LEAD OFFSET INCH (mm) ± 0.020" (± 0.5 mm)	WIRE SIZE		ORDERING CODE		
						AWG	INCH (mm)			
<b>T3M (N4700)</b>										
100	± 20	0.490 (12.4)	0.470 (11.9)	0.500 (12.7)	0.370 (9.4)	20	0.032 (0.81)	615R150GATT10		
250		0.670 (17.0)	0.460 (11.7)		0.750 (19.1)			0.362 (9.2)	615R150GATT25	
390		0.750 (19.1)	0.425 (10.8)					0.283 (7.2)	615R150GATT39	
500		0.810 (20.6)	0.382 (9.7)					0.283 (7.2)	615R150GATT50	
750		1.063 (27.0)	0.430 (10.9)					0.331 (8.4)	615R150GATT75	
<b>X5F</b>										
100	± 20	0.670 (17.0)	0.430 (10.9)	0.750 (19.1)	0.331 (8.4)	20	0.032 (0.81)	615R150GAT10		
250			0.455 (11.6)		0.358 (9.1)			615R150GAT25		
<b>Y5R</b>										
100	± 20	0.490 (12.4)	0.449 (11.4)	0.500 (12.7)	0.350 (8.9)	20	0.032 (0.81)	615R150GAST10		
250			0.480 (12.2)		0.382 (9.7)			615R150GAST25		
500			0.670 (17.0)		0.450 (11.4)			0.750 (19.1)	0.331 (8.4)	615R150GAT50
1000			0.980 (24.9)		0.460 (11.7)				0.362 (9.2)	615R150GATD10
<b>Y5U</b>										
500	+ 80 / - 20	0.490 (12.4)	0.375 (9.5)	0.500 (12.7)	0.276 (7.0)	20	0.032 (0.81)	615R150GAST50		
1000		0.670 (17.0)	0.420 (10.7)	0.750 (19.1)	0.323 (8.2)			615R150GAD10		
<b>Z5U</b>										
2200	+ 80 / - 20	0.980 (24.9)	0.510 (13.0)	0.750 (19.1)	0.413 (10.5)	20	0.032 (0.81)	615R150GAD22		
2500			0.450 (11.4)		0.350 (8.9)			615R150GAD25		



### CAPACITANCE CHANGE VS. TEMPERATURE (TYPICAL)



**CAPACITANCE CHANGE VS. VOLTAGE (TYPICAL)**

**STORAGE**

The capacitors must not be stored in a corrosive atmosphere, where sulphide or chloride gas, acid, alkali or salt are present. Exposure of the components to moisture, should be avoided. The solderability of the leads is not affected by storage of up to 24 months (temperature +10 °C to +40 °C, relative humidity up to 60 % RH). Class 2 ceramic dielectric capacitors are also subject to aging see general information ([www.vishay.com/doc?23140](http://www.vishay.com/doc?23140)).

**SOLDERING**
**SOLDERING SPECIFICATIONS**

Soldering test for capacitors with wire leads: (according to IEC 60068-2-20, solder bath method)

	SOLDERABILITY	RESISTANCE TO SOLDERING HEAT
Soldering temperature	(235 ± 5) °C	(260 ± 5) °C
Soldering duration	(2 ± 0.5) s	(10 ± 1) s
Distance from component body	≥ 2 mm	≥ 5 mm

**SOLDERING RECOMMENDATIONS**

Ceramic capacitors are very sensitive to rapid changes in temperature (thermal shock) therefore the solder heat resistance specification (see table above) should not be exceeded. Exposing the capacitor to excessive heating may result in thermal shocks that can crack the ceramic body. Similarly, excessive heating can cause the internal solder junction to melt.

When soldering radial leaded ceramic capacitors with a soldering iron, it should be performed under the following conditions and should not exceed:

- Maximum temperature of iron-tip: 400 °C
- Maximum soldering iron wattage: 50 W
- Maximum soldering time: 3.5 s

Failure to follow the above cautions may result, in worst case, in short circuit or cause fuming or thermo-mechanical damage when the product is used.

Leaded ceramic capacitors are not designed for reflow process or dipping the body into a solder melt.

**CLEANING**

The components should be cleaned immediately following the soldering operation with vapor degreasers.

**CLEANING (ULTRASONIC CLEANING)**

To perform ultrasonic cleaning, observe the following conditions:

- Maximum rinse bath capacity output: 20 W/liter
- Maximum rinsing time: 300 s
- Do not vibrate the PCB/PWB directly
- Excessive ultrasonic cleaning may lead to mechanical damage



**SOLVENT RESISTANCE**

The coating and marking of the capacitors are resistant to the following test method:  
IEC 60068-2-45 (method XA)

**MOUNTING**

We do not recommend modifying the lead terminals, e.g. bending or cropping. This action could break the coating or crack the ceramic insert. In order to avoid such failures we are offering different lead wire designs (e.g. straight, inline, inside crimp, outside crimp etc.) If however, the lead must be modified in any way, we recommend support of the lead with a clamping fixture next to the coating. If a defined product stop is required for mounting on a PCB, a mechanically formed product stop or a mounting tool should be used.

**OPERATING VOLTAGE**

In case the voltage is applied to the circuit, starting as well as stopping, may generate irregular voltage for a transit period because of resonance or switching. Be sure to use a capacitor with a rated voltage range that includes these irregular voltages.

**OPERATING TEMPERATURE AND SELF-GENERATED HEAT**

Keep the surface temperature of a capacitor below the upper limit of its rated operating temperature range. Be sure to take into account the heat generated by the capacitor itself. When the capacitor is used in a high frequency, pulse, or similar application, it may have self-generated heat due to dielectric dissipation.

Temperature increase due to self-generated heating should not exceed 20 °C while operating at an atmosphere temperature of 25 °C.

When measuring, the surface temperature, make sure that the capacitor is not affected by radiant, conductive and convective heat by its surroundings. Excessive heat may lead to thermo-mechanical deterioration of the capacitor's characteristics and reliability.

RELATED DOCUMENTS	
General Information	<a href="http://www.vishay.com/doc?23140">www.vishay.com/doc?23140</a>



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