

## Lower Voltage Ceramic DC Disc Capacitors 1000 V<sub>DC</sub> General Purpose


**RoHS**  
COMPLIANT

### FEATURES

- Low losses
- High stability
- High capacitance in small size
- Complete range of capacitance values
- 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

- Bypassing, coupling, and decoupling
- DC blocking
- Switching power supplies

### DESIGN

The capacitors consist of a ceramic disc of which both sides are silver-plated. Connection leads are made of tinned copper or tinned copper clad steel having diameters of 0.020" (0.51 mm) or 0.025" (0.64 mm).

The capacitors may be supplied with radial kinked or straight leads having lead spacing of 0.250" (6.35 mm) or 0.375" (9.5 mm).

The standard tolerance is  $\pm 20\%$ .

Coating is made of resin coating or flammable resistant epoxy resin in accordance with "UL 94 V-0".

### CAPACITANCE RANGE

10 pF to 0.1  $\mu$ F

### RATED VOLTAGE

1000 V<sub>DC</sub>

### DIELECTRIC STRENGTH BETWEEN LEADS

Component test, 100 % test at production line:

2500 V<sub>DC</sub>, 2 s

### CERAMIC DIELECTRIC

C0G, U2J (Class 1)

X5F, X7R, Y5U, Z5U (Class 2)

QUICK REFERENCE DATA						
DESCRIPTION	VALUE					
Ceramic Class	1			2		
Ceramic Dielectric	C0G	U2J	X5F	X7R	Y5U	Z5U
Voltage (V <sub>DC</sub> )	1000					
Min. Capacitance (pF)	10	33	100	1000	1000	1200
Max. Capacitance (pF)	10	33	500	1000	1000	100 000
Mounting	Radial					

### INSULATION RESISTANCE

Min. 1000  $\Omega$ F or 20 000 M $\Omega$  for 10 pF to 0.020  $\mu$ F

Min. 15 000 M $\Omega$  for 0.050  $\mu$ F

Min. 5000 M $\Omega$  for 0.10  $\mu$ F

### TOLERANCE ON CAPACITANCE

$\pm 20\%$

### DISSIPATION FACTOR

2.5 % max. at 1 kHz; 1 V

### CATEGORY TEMPERATURE RANGE

(-55 to +125) °C C0G, U2J, X7R

(-25 to +85) °C X5F, Y5U, Z5U

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

55/125/21 C0G, U2J, X7R

25/085/21 X5F, Y5U, Z5U

### OPERATING TEMPERATURE RANGE

-55 °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)



**ORDERING INFORMATION, CERAMIC 1000 V<sub>DC</sub> GENERAL PURPOSE**

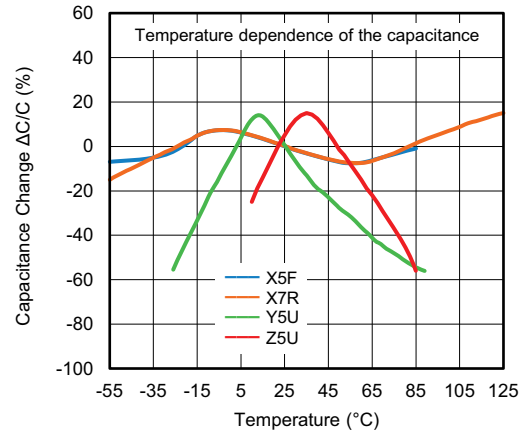
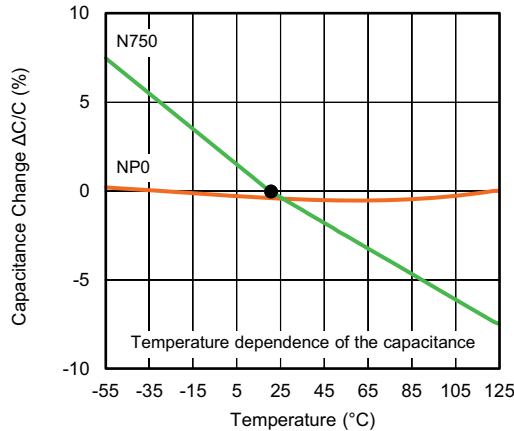
C (pF)	TOL. (%)	D <sub>max.</sub> DIAMETER INCH (mm)	T <sub>max.</sub> THICKNESS INCH (mm)	LS LEAD SPACE INCH (mm) ± 1 mm	LO LEAD OFFSET INCH (mm) ± 0.5 mm	FIG.	WIRE SIZE		ORDERING CODE						
							AWG	INCH (mm)							
<b>COG (NP0)</b>															
10	± 20	0.250 (6.4)	0.156 (4.0)	0.250 (6.4)	0.051 (1.3)	2	24	0.020 (0.51)	561R5GAQ10						
<b>U2J (N750)</b>															
33	± 20	0.290 (7.4)	0.156 (4.0)	0.250 (6.4)	0.039 (1.0)	2	24	0.020 (0.51)	561R5GAQ33						
<b>X5F</b>															
100	± 20	0.250 (6.4)	0.156 (4.0)	0.250 (6.4)	0.055 (1.4)	2	24	0.020 (0.51)	562R5GAT10						
150					0.043 (1.1)				562R5GAT15						
200					0.039 (1.0)				562R5GAT20						
220					0.051 (1.3)				562R5GAT22						
330					0.039 (1.0)				562R5GAT33						
470					0.039 (1.0)				562R5GAT47						
500					0.039 (1.0)				562R5GAT50						
<b>X7R</b>															
1000	± 20	0.290 (7.4)	0.156 (4.0)	0.250 (6.4)	0.047 (1.2)	2	24	0.020 (0.51)	562R5GAD10						
<b>Y5U</b>															
1000	+ 100 / - 0	0.290 (7.4)	0.156 (4.0)	0.250 (6.4)	0.039 (1.0)	2	24	0.020 (0.51)	562R5HKD10						
<b>Z5U</b>															
1200	± 20	0.290 (7.4)	0.156 (4.0)	0.250 (6.4)	0.043 (1.1)	2	24	0.020 (0.51)	562R5GAD12						
1500					0.039 (1.0)				562R5GAD15						
2000					0.047 (1.2)				562R5GAD20						
2200					0.047 (1.2)				562R5GAD22						
2500					0.043 (1.1)				562R5GAD25						
2700					0.043 (1.1)				562R5GAD27						
3000					0.039 (1.0)				562R5GAD30						
3300					0.039 (1.0)				562R5GAD33						
4700					0.370 (9.4)				0.156 (4.0)	0.250 (6.4)	0.047 (1.2)	1	22	0.025 (0.64)	562R5GAD47
5000					0.370 (9.4)				0.156 (4.0)	0.250 (6.4)	0.043 (1.1)				562R5GAD50
6800					0.440 (11.2)				0.156 (4.0)	0.250 (6.4)	0.047 (1.2)				562R5GAD68
8200					0.440 (11.2)				0.156 (4.0)	0.250 (6.4)	0.043 (1.1)				562R5GAD82
0.010 μF					0.490 (12.4)				0.156 (4.0)	0.375 (9.5)	0.047 (1.2)				562R5GAS10
0.010 μF					0.490 (12.4)				0.156 (4.0)	0.250 (6.4)	0.047 (1.2)				562R5HKMS10
0.010 μF	+ 100 / - 0	0.490 (12.4)	0.156 (4.0)	0.375 (9.5)	0.043 (1.1)	562R5HKS10									
0.015 μF	± 20	0.560 (14.2)	0.156 (4.0)	0.375 (9.5)	0.043 (1.1)	562R5GAS15									
0.020 μF		0.680 (17.3)	0.156 (4.0)	0.375 (9.5)	0.047 (1.2)	562R5GAS20									
0.050 μF		0.770 (19.6)	0.200 (5.1)	0.375 (9.5)	0.047 (1.2)	565R10HKS50									
0.10 μF		0.950 (24.1)	0.200 (5.1)	0.375 (9.5)	0.047 (1.2)	565R10GAP10									



TAPE AND REEL OPTIONS

- Tape and reel available on diameter sizes 0.250" to 0.680"
- Part number codes and specifications for tape and reel packaging are found in the general information document [www.vishay.com/doc?23140](http://www.vishay.com/doc?23140)

CAPACITANCE CHANGE VS. TEMPERATURE (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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