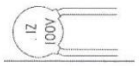
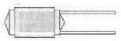
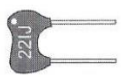
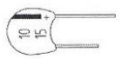
TYPE		1. WVDC 2. CAPACITANCE 3. DIELECTRIC ABSORPTION 4. STANDARD TOLERANCE	IR 1.<1μF 2.>1μF (MΩ-μF)	FREQUENCY RESPONSE 1. (1= POOR, 10 = BEST) 2. MAX. FREQUENCY	TEMPERATURE RANGE	DF @ 1 KHZ, % (MAX.)	STABILITY 1000 HOURS %ΔC	ADVANTAGES/DISADVANTAGES	APPLICATIONS
Multilayer Ceramics	NPO	25–200 V 1pF–0.01 μF 0.6% [±1 (F), ±2% (G), ±5% (J), ±10% (K)]	10^5 NA	9 100 MHz	–55°C, +125°C	0.1%	0.1%	Good stability, low inductance, low DA, good frequency response. Very low temperature drift, very low aging, voltage coefficient, frequency coefficient, leakage, and dissipation factor. More expensive than the other types of ceramics.	Excellent in HF decoupling (into the GHz range) due to low series inductance. High-frequency switch-mode power supplies. Used in many analog applications, such as HF switch-mode power supplies, but avoided in sample-hold and integrators, where DA may be a problem.
	Stable	25–200 V 220 pF–0.47 μF 2.5% [±5% (J), ±10% (K), ±20% (M)]	10^5 2500	8 10 MHz	–55°C, +125°C	2.5%	10%	Low inductance, wide range of values, small, higher density than dipped ceramic. Poor stability, poor DA, high voltage coefficient, and significant aging rate. Sensitive to vibration—some types may be resonant with comparatively high Q.	Best suited for coupling/dc blocking and power supply bypassing. They should be used only in linear applications where performance and stability are of no great concern.
	(High-K) HiK	25–100 V 0.25 pF–22 μF NA [±20% (M), ±80%–20% (Z)]	10^4 10^3	8 10 MHz	+10°C, +85°C and –55°C, +85°C	4.0%	20%	Very poor stability, especially with temperature variations. Poor DA and high voltage coefficient. Not suited for high-temperature environment. Short longevity.	Limited mainly to dc blocking and power supply bypassing. Even then, change in capacitance due to aging, temperature, and voltage coefficients must be taken into consideration. Use lowest-K material you can get.
Ceramic Disc (NPO, Stable, HiK) 		50–10,000 V 1pF–0.1 μF Same as multilayers	Same as multi-layers	8 Same as multilayers	–55°C, +85°C	0.1% – 4.0%	Same as multi-layers	Inexpensive, wide range of values, and popular. Same features as multilayers.	Used in coupling and bypassing, but can be quite inductive if leads are long. Internal structure not coiled, so can be used in high-frequency applications. See applications of multilayers.
Polystyrene 		30–600 V 100 pF–0.027 μF 0.05% ±65%	10^6 NA	6 NA	–55°C, +70°C	0.1%	2%	Inexpensive, low DA available, wide range of values, good stability. High isolation resistance. Damaged by temperatures >+70°C. Large case size, high inductance.	Not used in high-frequency applications—inside acts like an inductor coil. Works well in filter circuits or timing circuits that run at several hundred kHz or less. Good choice for coupling and/or storage applications due to high isolation resistance.

TYPE	1. WVDC 2. CAPACITANCE 3. DIELECTRIC ABSORPTION 4. STANDARD TOLERANCE	IR 1.<1μF 2.>1μF (MΩ-μF)	FREQUENCY RESPONSE 1. (1= POOR, 10 = BEST) 2. MAX. FREQUENCY	TEMPERATURE RANGE	DF @ 1 KHZ, % (MAX.)	STABILITY 1000 HOURS %ΔC	ADVANTAGES/DISADVANTAGES	APPLICATIONS
Polypropylene Film 	100–600 V 0.001 μF to 0.47 μF 0.05% ±5%	10^5 NA	6 NA	–55°C, +85°C	0.35%	3%	Inexpensive, low DA available, wide range of values, high isolation resistance, damaged by temperatures >105°C, large case size.	Good choice for coupling and/or storage applications due to high isolation resistance. Most stable capacitance for frequencies below 100 kHz, but often used at higher frequencies. Used for noise suppression, blocking, bypassing, coupling, filtering, snubbing, and timing. Good general-purpose capacitor.
Metallized Polypropylene 	100–1250 V 47 pF–10 μF 0.05% [±20% (M), ±10%(K), ±5% (J)]	10^5 NA	6 NA	–55°C, +105°C	0.05%	2%	More compact than film/foil types, but higher DF, lower IR, lower maximum current, lower ac-unique self-healing feature, unlike film/foil, voltage-frequency capability.	Used in moderately high-frequency, high-voltage circuits, and for noise suppression, timing, and snubbing. Used in switching power supplies, audio equipment (provide musically clean dynamic), and many other general-purpose applications.
Polyester Film (Mylar) 	50–600 V 0.001 μF–10 μF 0.5% ±10	10^4 10^3	6 NA	–55°C, +125°C	2%	10%	Moderate stability, inexpensive, low DA available, wide range of values, high isolation resistance, large case size.	Good choice for coupling and/or storage applications due to high isolation resistance. Moderately high-frequency circuits, audio sound quality, oscillator circuits.
Metallized Polyester 	63–1250 V 470 pF–22 μF 0.5% [±20% (M), ±10%(K), ±5% (J)]	10^4 10^3	6 NA	–55°C +125°C	0.8%	NA	More compact than film/foil types, but higher DF, lower IR, lower maximum current, lower ac-voltage-frequency capability. Does have a unique self-healing feature, unlike film/foil, which prevents dielectric breakdown from resulting in catastrophic permanent failure.	General-purpose applications, audio equipment, moderately high-frequency, high-voltage applications. Switching power supplies, blocking, bypassing, filtering, timing, coupling, decoupling, and interference suppression.

Mica 	50–500 V 1 pF–0.09 μF 0.3%–0.7% ±1% ±5%	10^2 NA	7 100	–55°C, +125°C	0.1%	0.1%	Low loss at HF, low inductance, very stable, available in 1% values or better Large, low values (<10 nF), expensive.	Excellent capacitor, good at RF. Used in resonance circuits and high-frequency filters, due to good stability with temperature. Also used in high-voltage circuits due to their good insulation.
Multilayer Glass	50–2000 V 0.5 pF–0.01 μF 0.05% ±1%, ±5%	10^5 NA	9	–75°C, +200°C	0.2%	0.5%	Extremely low stable Q factor at high frequencies, low dielectric absorption, large RF current capability, high operating temperature range, high shock/vibration capability. Excellent stability and long-term stability.	Use in military applications and high-performance commercial sectors. Wide applications: high-temperature circuitry, modulators, RF amplifier output filters, variable-frequency oscillators, amplifier coupling, sample-hold, transistor biasing, ramp integrators, voltage snubbers, etc.
Aluminum Electrolytic 	4 V–450 V 0.1 μF–1 F High +100%, –10%	NA 100	2 NA	–40°C, +85°C	8% at 120 Hz	10%	High currents, high voltages, small size. Very poor stability, poor accuracy, inductive. Usually polar, meaning they can be damaged if placed in reverse polarity.	Not suited for storage or HF coupling applications due to poor isolation resistance and internal inductance. Usually used as a ripple filter in power supplies or as a filter to bypass low-frequency signals. Used in audio bypassing and power supply filtering—at higher frequencies there is too much loss.
Tantalum Electrolytic 	6.3–50 V 0.01–1000 μF High ±20%	10^2 10	5 0.002 MHz	–55°C, +125°C	8%– 24%	10%	Small size, large values, medium inductance. Better capacitance stability than aluminum with temperature. Quite high leakage, usually polarized, expensive, poor stability, poor accuracy.	Not suited for storage or HF coupling applications due to poor isolation resistance and internal inductance. Acts more like an inductor than a capacitor above a few MHz. Used in dc blocking, bypassing, decoupling, filtering, and timing. Usually used as a ripple filter in power supplies or as a filter to bypass low-frequency signals.