Holy Stone

Technical Note 3

Capacitor Dielectric Comparison

Characteristic	MLCC			Ceramic Disc	Aluminum Electrolytics	Tantalum	Mica	Film capacitor			
	NPO	X7R	Y5V/ Y5U					Poly propylene	Polyester	Poly carbonate	Poly styrene
Capacitance	1pF-0.1uF	1nF-10uF	1uF-100uF	1pF-100nF	0.5uF-1F	10nF-1000 uF	1pF-100nF	100pF-100nF	1nF- 10nF	1nF- 10nF	100pF- 33nF
DF	0.1%	2.5%	5%	0.1%-5%	8%	10%-20%	0.1%	0.35%	2.0%	1.0%	0.1%
I.R.	>100GΩ	500 Ω.F	500 Ω.F	Same as MLCC	100 Ω.F	1GΩ	1GΩ	100GΩ	1-10GΩ	10-100GΩ	100GΩ
Voltage (VDC)	10v-5Kv	6.3v-5Kv	6.3-50	100v-1Kv	5-500	5-125	50-500	50v-600v	50v-600v	50v-600v	16-600
Temperature Range	-55ºC to 125ºC	-55ºC to 125ºC	-30ºC to 85ºC	Same as MLCC	-40ºC to 85ºC	-55ºC to 125ºC	-55ºC to 125ºC	-55ºC to 85ºC	-55ºC to 125ºC	-55ºC to 125ºC	-55ºC to 70ºC
T.C (ΔC)	±0.3%	±15%	22 to -82% / 22 to -56%	Same as MLCC	±10%	±8%	<±2%	±1%	±12%	±2%	±8%
Dielectric Absorption	0.5%	2.5%	NA	Same as MLCC	NA	NA	0.5%	0.05%	0.5%	0.35%	0.05%
Max Frequency (MHz)	200	10	10	Same as MLCC	NA	0.003	100	NA	NA	NA	NA
Frequency response	Excellent	Good	Good	Good	Poor	Medium	Good	Good	Good	Good	Good
Features/ Application	For TC stable application-Timing circuits, etc…	Coupling, Bypass, Smoothing, etc	Coupling, Bypass, filtering, etc..	Hi voltage, Safety protection, Surge suppression, etc…	Large Cap to volume ratio, smoothing in power supplies	Smoothing and line filteration	Inert material, good temp. stability	AC application, Filtering, motor startup	AC application, Filtering, DC blocking, motor startup	AC application, Filtering, motor start up	Low power RF and precision analog application
Remarks	Low ESR & ESL	Subject to Microphonics (Piezoelectric)	Smaller size Subject to Microphonics		Polarized, High Dielectric Leakage, High ESR/ESL	Large Cap to volume ratio, smaller size and good stability, Fails quite violently	Corona resistant, moisture resistant	Low moisture absorption, Self healing	Smaller size and lower current capability	Good moisture resistant	Good moisture resistant