

**MULTILAYER CERAMIC CHIP CAPACITORS**

**SELECTION OF CERAMIC CHIP CAPACITOR**

Pro-Cap Multilayer Ceramic Chip Capacitor are RoHS Compliant and offer the most complete range fo characteristics and configuration available in the industry. We suggest your selection of capacitors be based on consideration of the following items:

**1. DIELECTRIC TYPE**

The choice of dielectric is determined by the required capacitance-temperature stability. We offer COG(1B), X5R, X7R(2R1), X6S, Z5U(2E6) and Y5V(2F4).

**2. CAPACITANCE AND TOLERANCE**

Capacitance and its tolerance are determined by circuit requirement and cost consideration.

**3. RATED VOLTAGE**

Rated voltage is determined by circuit requirement.

**4. SIZE**

Size is determined by the circuit design and cost consideration.

**5. PACKAGING**

Specify the packaging of Capacitors as BULK or TAPE & REEL.

**6. NON-STANDARD REQUIREMENTS**

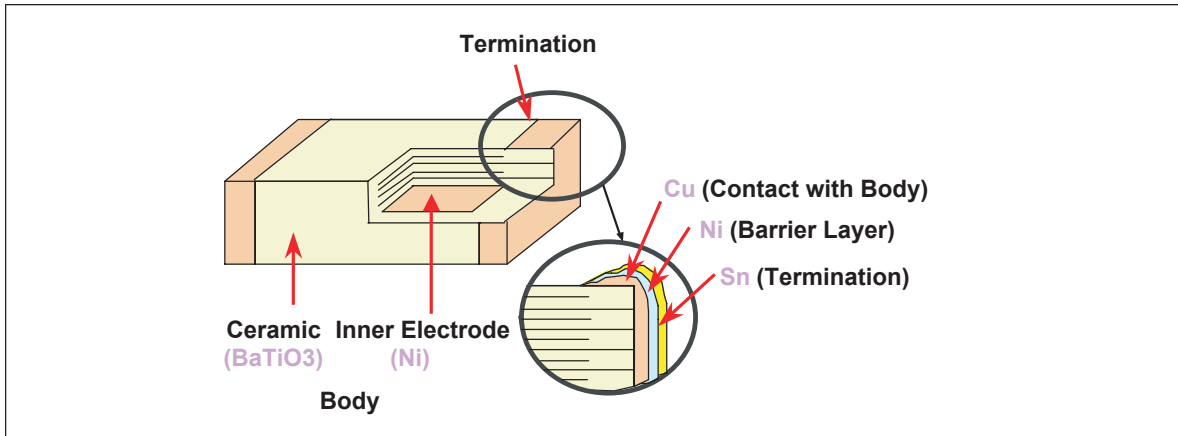
Specify any non-standard requirements which are not stated in the catalogue.

Dielectric	COG(1B)	X5R, X7R(2R1), X6S	Z5U(2E6), Y5V(2F4)
	<ul style="list-style-type: none"> <li>• Ultra-stable</li> <li>• Low dissipation factor</li> <li>• Tight tolerance available</li> <li>• Good frequency performance</li> <li>• No aging of capacitance</li> <li>• Class I Dielectric, temperature compensating</li> <li>• High stability over time, voltage and temperature changes</li> <li>• Nickel barrier termination and excellent mechanical strength</li> </ul>	<ul style="list-style-type: none"> <li>• Semi-stable High K</li> <li>• High volumetric efficiency</li> <li>• Highly relieable in high temperature application</li> <li>• High insulation resistance</li> <li>• Class II Dielectric, temperature stable</li> <li>• Excellent frequency characteristics, non-linear capacitance change</li> <li>• Higher capacitance then COG</li> <li>• Nickel barrier terminations and excellent mechanical strength</li> </ul>	<ul style="list-style-type: none"> <li>• Highest volumetric efficiency</li> <li>• Non-polar construction</li> <li>• General purpose, High K dielectric</li> <li>• High capacitance density</li> <li>• Low ESL, low ESR and excellent frequency response</li> <li>• Nickel barrier terminations and excellent mechanical strength</li> </ul>
Applications	<ul style="list-style-type: none"> <li>• LC and RC tuned circuit</li> <li>• Filtering</li> <li>• Timing</li> </ul>	<ul style="list-style-type: none"> <li>• Blocking</li> <li>• Coupling</li> <li>• Timing</li> <li>• Bypassing</li> <li>• Frequency discriminating</li> <li>• Filtering</li> </ul>	<ul style="list-style-type: none"> <li>• Bypassing</li> <li>• De-coupling</li> <li>• Filtering</li> </ul>

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**DESCRIPTION: CHIP SERIES (MA TYPE)**

Pro-Cap offers RoHS compliant Multilayer Ceramic Chip Capacitors that are ideally suitable for thick-film hybrid circuits and automatic surface mounting on any printed circuit boards. The nickel-barrier terminations consist of a nickel barrier layer over the silver metallization and then finished by electroplated solder layer to ensure the terminations have good solderability. The nickel barrier layer in terminations prevent the dissolution of the termination when extended immersion in molten solder at elevated solder temperature. This product meets the Moisture Sensitivity Level 1 (MSL 1) requirements.

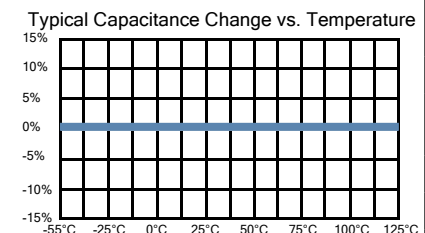


Composition part	Material group	Materials	CAS if applicable
Dielectric body	Ceramic	Barium Titanium Zirconate	66402-68-4
Inner electrode	Ni Paste	Nickel	7440-02-0
		Barium Titanate	12047-27-7
		Ethyl Cellulose	9004-57-3
		n-Paraffin	64771-72-8
		Terpineol	8000-41-7
Terminal electrode	Cu Paste	Copper	7440-50-8
		Glass frit	
		Terpineol	8000-41-7
		Acrylic polymer	
Under plating	Nickel	Ni	7440-02-0
Surface plating	Tin	Sn	7440-31-5

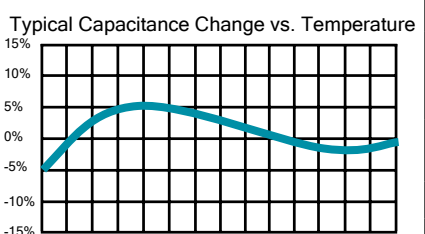
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**DIELECTRIC CHARACTERISTICS**

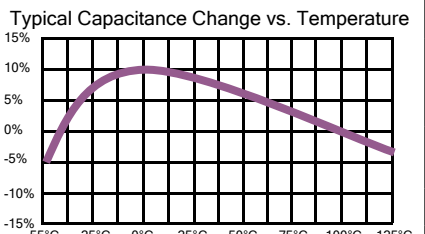
**NPO/COG:**

Operating Temperature Range	-55°C to +125°C	<p>Typical Capacitance Change vs. Temperature</p> 
Temperature Coefficient	0 ± 30ppm / °C	
Temperature Voltage Coefficient	0 ± 30ppm / °C	
Dissipation Factor	0.1% max, (For "U" material, Quality factor is 2500 min.)	
Insulation Resistance	>1000 ohms F for 100 G ohms, whichever is less at 25°C, VDCW (The IR at 125°C is 10% of the value at 25°C)	
Ageing	None	
Withstanding Voltage	>2.5 times VDCW	
Test Parameters	1MHz ± 100KHz at 1.0 ± 2Vrms ≤ 1000pF, 25°C 1KHz ± 100Hz at 1.0 ± 2Vrms > 1000pF, 25°C	
Capacitance Tolerance	P, A, B, C, D, E, F, G, J, K	

**X7R:**

Operating Temperature Range	-55°C to +125°C	<p>Typical Capacitance Change vs. Temperature</p> 
Temperature Coefficient	0 ± 15%Δ°C	
Temperature Voltage Coefficient	Not applicable	
Dissipation Factor	For 50Volts and 100Volts: 2.5% Max.; For 25Volts: 3.0% Max; For 16Volts: 3.5% Max; For 10Volts: 5.0% Max; For 6.3Volts: 10% Max; For values > 10µF and ≤10V, D.F. is 10% Max	
Insulation Resistance	>1000 ohms F for 100 G ohms, whichever is less at 25°C, VDCW (The IR at 125°C is 10% of the value at 25°C)	
Ageing	2.5% per decade hour, typical	
Withstanding Voltage	>2.5 times VDCW	
Test Parameters	1KHz ± 100Hz at 1.0 ± 2Vrms > 100pF, 25°C	
Capacitance Tolerance	F, G, J, K, M	

**X5R:**

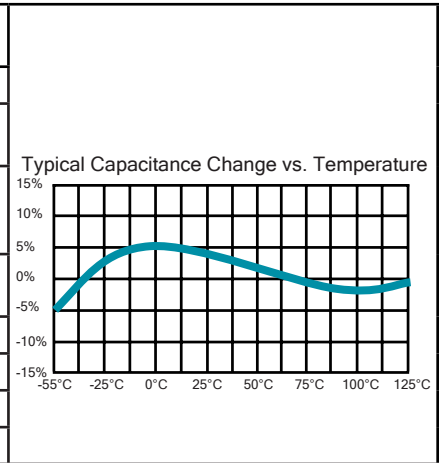
Operating Temperature Range	-55°C to +85°C	<p>Typical Capacitance Change vs. Temperature</p> 
Temperature Coefficient	0 ± 15%Δ°C Max.	
Temperature Voltage Coefficient	Not applicable	
Dissipation Factor	For 50Volts and 100Volts: 2.5% Max.; For 25Volts: 3.0% Max; For 16Volts: 3.5% Max; For 10Volts: 5.0% Max; For 6.3Volts: 10% Max; For values > 10µF and ≤10V, D.F. is 10% Max	
Insulation Resistance	>1000 ohms F for 100 G ohms, whichever is less at 25°C, VDCW (10,000 ohms at 125°C)	
Ageing	2.5% per decade hour, typical	
Withstanding Voltage	>2.5 times VDCW	
Test Parameters	1KHz ± 100Hz at 1.0 ± 2Vrms > 100pF, 25°C	
Capacitance Tolerance	F, G, J, K, M	

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**DIELECTRIC CHARACTERISTICS**

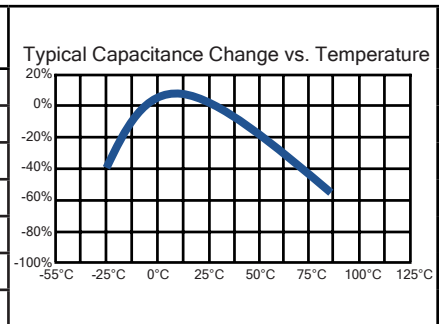
**X6S:**

Operating Temperature Range	-55°C to +105°C
Temperature Coefficient	0 ± 22%Δ°C
Temperature Voltage Coefficient	Not applicable
Dissipation Factor	For 50Volts and 100Volts: 2.5% Max.; For 25Volts: 3.0% Max; For 16Volts: 3.5% Max; For 10Volts: 5.0% Max; For 6.3Volts: 10% Max; For values > 10μF and ≤10V, D.F. is 10% Max
Insulation Resistance	>1000 ohms F for 100 G ohms, whichever is less at 25°C, VDCW (The IR at 125°C is 10% of the value at 25°C)
Ageing	2.5% per decade hour, typical
Withstanding Voltage	>2.5 times VDCW
Test Parameters	1KHz ± 100Hz at 1.0 ± 2Vrms > 100pF, 25°C
Capacitance Tolerance	K, M



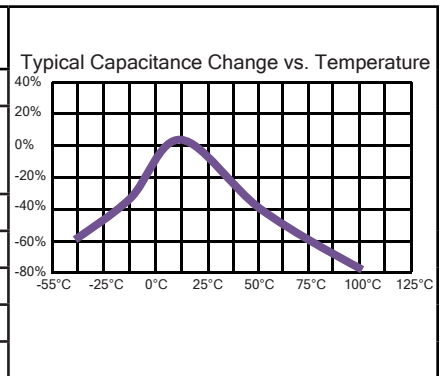
**Z5U:**

Operating Temperature Range	-10°C to +85°C
Temperature Coefficient	+22% -56%Δ°C Max
Dissipation Factor	4.0% Max
Insulation Resistance	>100 ohms F for 10 G ohms, whichever is less at 25°C, VDCW
Ageing	5.0% per decade hour, typical
Withstanding Voltage	>2.5 times VDCW
Test Parameters	1KHz ± 100Hz at 0.5 ± 1Vrms, 25°C
Capacitance Tolerance	K, M, Z



**Y5V:**

Operating Temperature Range	-30°C to +85°C
Temperature Coefficient	+22% -82%Δ°C Max
Dissipation Factor	For 25Volts and 50Volts: 5% Max; For 16Volts: 7.0% Max; For 10Volts: 9.0% Max; For 6.3Volts: 11% Max; For higher Cap values > 10μF and ≤10V, D.F. is 10% Max
Insulation Resistance	>100 ohms F for 10 G ohms, whichever is less at 25°C, VDCW
Ageing	7.0% per decade hour, typical
Withstanding Voltage	>2.5 times VDCW
Test Parameters	1KHz ± 100Hz at 1.0 ± 2Vrms, 25°C
Capacitance Tolerance	K, M, Z



**CAPACITANCE CHANGE VS DC VOLTAGE**

