

Tubular FT Ceramic Capacitors

Low cost solution for general purpose filtering.

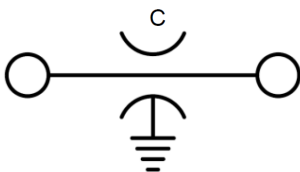
Applications

- Medical implantable devices
- EMI/RF suppression filters
- Commercial and defense applications
- Power supplies
- Converters

Feedthrough (FT) tubular capacitors are ideally suited for by-pass and filtering applications. Due to the cylindrical design, the capacitors will have uniform insertion loss over a broad frequency range. This structure yields a low inductance when compared to conventional wound capacitors.

Solid FT capacitors have no internal electrodes and find their primary usage in low cost applications. Multilayered FT capacitors have a higher capacitance to volume ratio and are ideally suited for greater filtering at lower frequencies. Multilayered FT capacitors are also designed for applications where source impedances are high and sharp attenuation rise is critical.

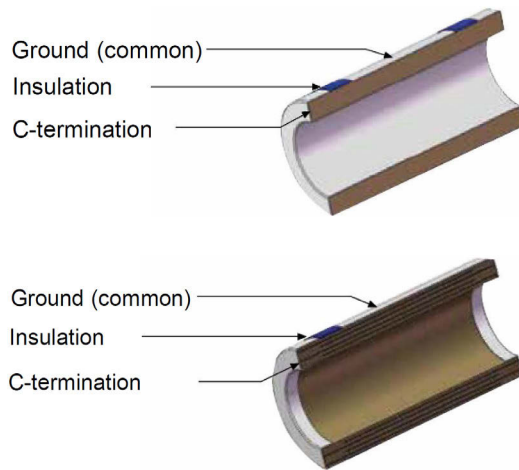
Feedthrough Circuit



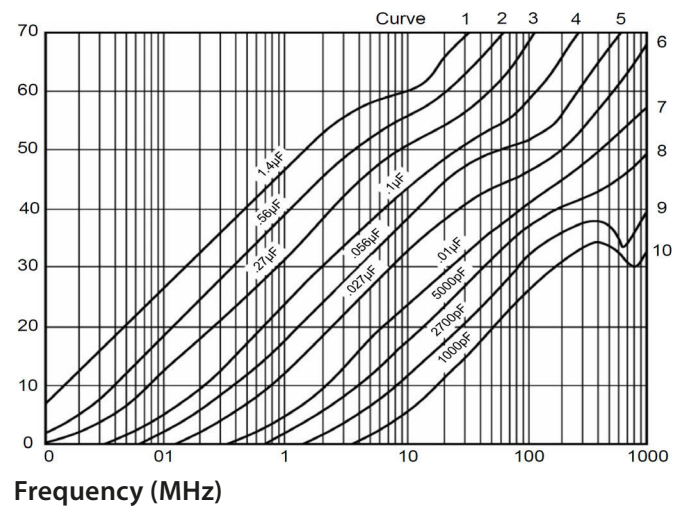
Features

- High ratio of capacitance to volume
- Low inductance, non-polar
- Small, lightweight, reliable, high dielectric strength
- Impervious to moisture and contamination
- Uniform IL over a board frequency range
- -55°C to +125°C operation are achieved with no voltage de-rating.
- Outer terminations feature a nickel barrier and final metal layer, typically silver

Feedthrough Construction



Insertion Loss (dB) Per MIL-STD-220



General Ceramic Capacitors Information

Exhibit low parasitic capacitance and superior EMI filtering capabilities.

Specialty Tubular Products

We offer many variations of tubular capacitors to fit your custom application:

- Various OD, ID, thickness, and length configurations
- Lapped feedthrough capabilities
- Square tube for surface mount application
- Custom style capability



Tubular Electrical Testing

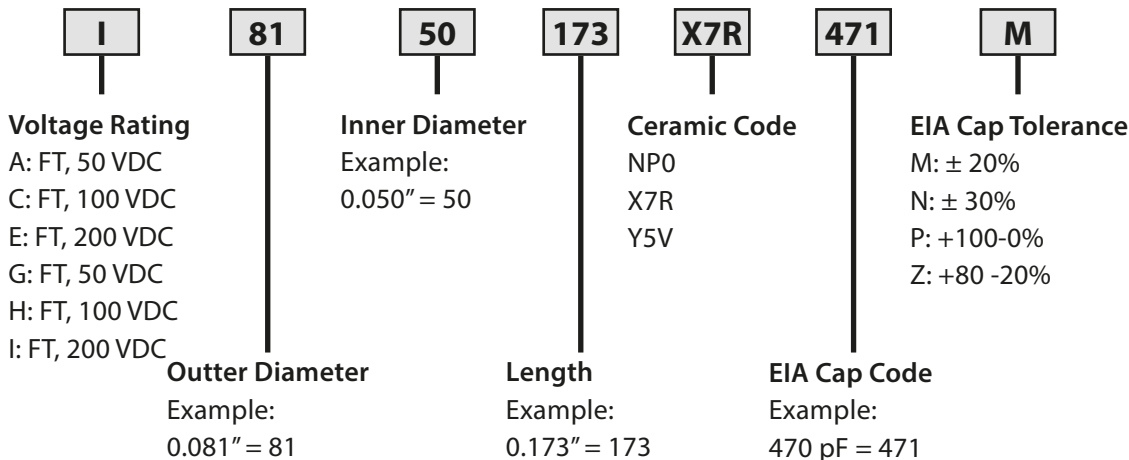
Electrical Parameter	Test Method	Temperature Coefficient		
		NPO	X7R	Y5V
Temperature Coefficient	EIA 198	±30 ppm/°C, -55 to 125°C	±15%, -55 to 125°C	+22, -82%, -30 to +85°C
Capacitance Tolerance	EIA Tolerance Code	M, P	N, P, Z	N, P, Z
Capacitance Test @25°C	MIL-STD-202, Method 305	Cap ≤ 100pF; 1 MHz 1 Vrms Cap ≥ 100pF: 1 KHZ, 1 Vrms	1 KHZ, 1 Vrms	1 KHZ, 1.0 Vms
Dissipation Factor @25°C	MIL-STD-202, Method 305	0.15% max.	3.5% max.	3.5% max.
Aging Rate (per decade)		No Aging	< 2.0%	< 2.5%
Insulation Resistance @25°C	MIL-STD-202, Method 302	50 K Megohm or 500 Ohm-Farad, whichever is lower	50 K Megohm or 500 Ohm-Farad, whichever is lower	50 K Megohm or 500 Ohm-Farad, whichever is lower
Insulation Resistance @25°C	MIL-STD-202, Method 302	5 K Megohm or 50 Ohm-Farad, whichever is less	5 K Megohm or 50 Ohm-Farad, whichever is less	5 K Megohm or 50 Ohm-Farad, whichever is less
Dielectric Withstanding Voltage	MIL-STD-202, Method 301	250% of rated voltage 5 second hold, 30-50 mA	250% of rated voltage 5 second hold, 30-50 mA	250% of rated voltage 5 second hold, 30-50 mA

Tubular Part Numbering System

After determining the capacitor properties required for a given application, use the part numbering system below to place order. If there are any questions, do not hesitate to contact APITech's customer service team.

The part number shown represents a Pi tubular capacitor with an outer diameter of 0.081" and inner diameter of 0.050". The voltage rating for this part is 200 VDC. The ceramic type will be X7R. The capacitance value is 470 pF with a tolerance of ±20%. The termination will be silver and the parts will receive bulk packaging.

Example: I8150173X7R471M



Processing & Soldering Notes

General Soldering Recommendations for Leadless Ceramic Capacitors

Soldering Ceramic Capacitors with High Temperature Process

SN10 Solder

Ramp Rate, Heating and Cooling: Approx. 30°C/min.

Peak Temperature: Approx. 320°C

Dwell at Peak: <30 Seconds

Soldering Ceramic Capacitors with Medium Temperature Process

SN96 Solder

Ramp Rate, Heating and Cooling: Approx. 30°C/min.

Peak Temperature: Approx. 250°C

Dwell at Peak: <30 Seconds

Soldering Ceramic Capacitors with Low Temperature wProcess

SN62 Solder

Ramp Rate, Heating and Cooling: Approx. 30°C/min.

Peak Temperature: Approx. 220°C

Dwell at Peak: <30 Seconds

Notes

Care must be taken to minimize the time silver terminations are exposed to molten solder to avoid leaching (amalgamation of the silver into molten solder). APITech recommends the use of a silver (Ag) bearing solder when terminating directly to ceramic ceramic capacitors to reduce the potential for leaching. Gradual heating and cooling of the components are essential to prevent thermal stresses to the ceramic.

Application Note: Soldering Recommendations for Switch Mode Power Supply Capacitors

- SMPS capacitors are highly durable structures designed to provide long service per lifetime, however they require attention to basic considerations during assembly. Like all ceramic components, SMPS capacitors are subject to thermal stresses. For this reason, preheating of the capacitor assemblies is recommended. Preheat components using hot plate to 120 to 150°C, or within 50 to 60°C of the soldering temperature being applied. Avoid over-exposure to high temperatures during assembly and allow for gradual, post-assembly cooling.
- For hand iron soldering, recommended soldering iron tip temperature is 330 to 350°C. Contact the pad adjacent to the pre-tinned lead should be made from below the PCB (opposite of the component side), and the dwell time on the solder joint should be less than five seconds. An aluminum heat sink plate may be placed adjacent to the SMPS lead frame to protect the ceramic body during assembly. Avoid direct contact between soldering iron and ceramic during assembly process. Soldering time is dependant upon heat sinking provided by the chassis and boardmaterial, so a longer preheat cycle may be required.
- Standard solders (Sn60, Sn63, Sn60/38/2) may be used. Please consult the factory for use with RoHS compliant solders.
- Use a controlled temperature profile ramp not exceeding 4°C per second as measured by an attached low mass thermocouple.
- Soldering time and temperatures can vary with component size, board material and layout. Please consult the factory for assistance.