Chip-on-Flex Filter Technology Eliminates Stress from Thermal Shock and Vibration

Today’s high-reliability military, aerospace, and industrial applications require more rugged, lighter-weight filter connectors. The filter connector provides a stray signal barrier upstream and away from electronic devices to protect critical circuits from electrical interference, without affecting system function and performance. Typical filter connectors use ceramic planar arrays for filtering, which don’t perform well under repeated shock, vibration, and temperature extremes.

The planar array design that is currently the industry standard for filter connectors uses a block capacitor with plated thru holes where feed thru contacts are inserted and soldered into place. The planar array filters are ceramic based and require a reliable electrical joint with the contact through a variety of soldering processes.

A damaged/cracked ceramic capacitor leads to electrical failure that requires costly thermal shock screening and burn-in procedures to assure the connector’s electrical performance integrity.

ITT’s new Cannon Chip-on-flex (CoF) technology was developed to handle high shock and vibration, extreme temperature fluctuations, and provide a lighter weight solution (up to 15%).

CoF technology provides a significant performance improvement in thermal shock and vibration. The Chip-on-Flex designs replace the fragile ceramic planar array block capacitor with a patented state-of-the-art flexible circuit where individual chip capacitors are surface mounted on a pad adjacent to the feed thru contact. Since the feed thru contacts are not soldered directly to the capacitor, thermal stress points that impact performance in thermal shock and vibration have been virtually eliminated.
The resulting design is a very robust filter connector with superior mechanical performance and improved reliability. These CoF filter connectors provide the standard filtering capabilities including individual isolated pin filtering of high-frequency noise, built-in ground plane barriers in the connector inserts, and filtering at the face of system boxes.

Since the flex assembly is significantly lighter in weight and less solder is required for the flex material, a connector weight reduction of up to 15 percent is achievable for MIL-DTL-38999 configurations.

The CoF filter approach offers the system designer complete flexibility in defining or changing individual circuit capacitance, ground, and electro-magnetic pulse (EMP) performance during the design/development phase. This flexibility removes any need to retool a ceramic planar array. The CoF design uses readily available flex circuits and configurations leading to reduced design/development cycle time and more efficient production delivery.

CoF technology not only maintains the same performance benefits as traditional ceramic filter capacitors but it affords ease of customisation for end users. For example, EMP protection may be added by substituting a Zener diode in place of a chip capacitor. Further, the user may easily select and change the cut-in frequency from the performance attenuation curves for each individual circuit requirement.
CoF filter technology offers significant manufacturing process advantages. Ceramic planar arrays require hand soldering or hand placement of solder rings prior to reflow oven soldering. These processing requirements lead to varied solder deposits. CoF manufacturing processes eliminate this significant source of processing variability through the use of newly developed, error proof, robust solder application process.

ITT’s CoF filter designs may be selected for all standard connector families and customer applications, including Mil-DTL-38999, Mil-DTL-24308, Mil-C-26482, ARINC 600, and ARINC 404.

ITT’s CoF filter connectors have passed MIL-DTL-38999 Series III testing for thermal shock, random vibration, humidity, and high altitude DWV. These connectors are ideal for high-reliability military, aerospace, and industrial applications including integrated avionics, radio and navigation systems, fire control devices, electronic counter measures, satellite communications, and data transmitters.