

EMI Filter and Transient Voltage Suppression Packaging

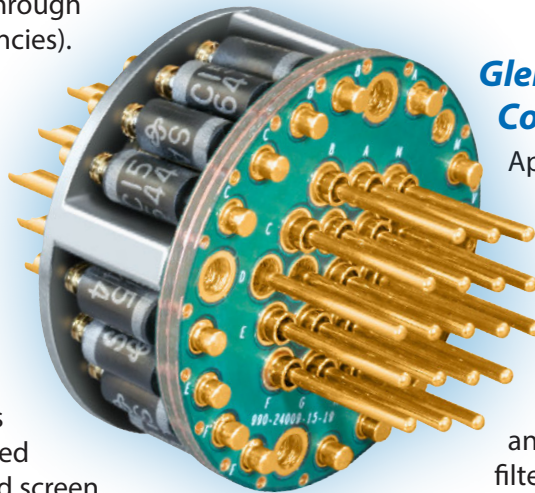
The packaging of EMI and TVS elements in standard connectors is an important element in effective EMC design. EMI/EMP connectors typically come in Mil-Spec packaging for easy intermating with Mil-Spec circular, D-sub, Micro-D and other standard formats. Such connectors are broadly identified as ‘low-pass’ filters (i.e., they let low frequency signals pass through and attenuate higher frequencies). The attenuation curve can be shaped using different filter types (different configurations of capacitors and inductors).

While the exterior of these very special connectors look normal enough, inside is another story—a planar array made of multiple layers of ceramic dielectric, separated by sheets of ceramic tape and screen printed with a pattern of metal electrodes to create a capacitor used to suppress or attenuate unwanted noise. Capacitance at each electrode protects against EMI, while carefully placed transient voltage suppression diodes guard against damage from lightning strike and other voltage surges.

Planar, multi-layer ceramic capacitive filters offer reduced size and improved performance compared to discrete discoidal chips or tubular capacitors. Planar array filter devices have the advantage, especially when compared to capacitive filters integrated at the circuit board level, of being bidirectionally effective at attenuating unwanted noise travelling into and out of equipment enclosures.

As critical EMI problems are often discovered late in

the development process—perhaps only after equipment has been installed for use—it is critical that turnaround times in design and fabrication of both standard and non-standard designs are kept to a minimum. Glenair is committed to meeting the most aggressive delivery requirements for planar array type filter connectors.



Glenair's Growing Filter Connector Availability

Applications requiring filtered connectors generally call for specific plating, mounting style, keying, shell size, contact layout, contact gender, termination, and frequency filtration. Typically, the filtered connector is either replacing an existing non-filtered receptacle, or it must mate with an existing cable plug. In some cases the filtering element is built into a connector go-between or saver. Whatever the packaging requirement, Glenair is committed to a “no gaps” product availability model whereby we can quickly build and ship any possible filter connector configuration for industry standard connector families such as MIL-DTL-38999, MIL-DTL-83513 and our own Series 80 “Mighty Mouse.”

Shell Size and Contact Count	Capacitance Codes
9	A, B, D, F
15	A, D
21	A, C, D
25	B, D, F
31	D
37	B, D, F

Dimensions in inches (millimeters) and are subject to change without notice.



Introduction to Filter Connectors EMI Filters and Transient Voltage Suppression Packaging

We currently stock some finished filtered connector parts in our Same Day inventory, and we will continue to add to this stock. More importantly, we have placed into inventory a wide range of the longest lead time component—ceramic planar filter arrays—in the most popular capacitance values. This filter array stocking program enables Glenair to provide the industry's fastest delivery of finished filtered connectors. In addition, we now have the in-house capability to manufacture our own ceramic planar capacitor arrays. This vertical integration will allow us to continue to add to component stock and reduce lead times even further.

Listed below are the current filtered connector families available for the fastest delivery in the industry. For any capacitor array code listed, we can accommodate both C-Section and Pi-Section capacitance values.

Shell Size Layout	Contact Count and Size	Capacitor Array Codes
11-35	13 #22D	B
13-35	22 #22D	D, E, F
15-35	37 #22D	E, X
17-8	8 #16	A
17-35	55 #22D	D, E, F
21-35	79 #22D	G
23-21	21 #16	X
23-35	100 #22D	G
25-29	29 #16	D
25-35	128 #22	D
25-43	20 #16, 23#20	C

MIL-DTL-38999 series I, II, III, and IV connectors in any plug or receptacle style, along with any material, plating, or filtration in the size and contact layouts with the capacitor codes listed below. These listed filter arrays make more than 142,000 D38999 finished parts. And more D38999 filter array layouts are being added to stock every day!

Mighty Mouse Series 801, 804, 805, and 800 in plug or any receptacle style, material, plating, or filtration are available in the size and contact layouts with the

Shell Size	Contact Count and Size	Capacitance Codes
5	3 #23	A
6	4 #23	A, D
6	7 #23	A, D
7	10 #23	A, D
8	13 #23	D
9	19 #23	A
10	26 #23	A, D
13	37 #23	A
16	55 #23	A
17	85 #23	A

capacitor codes listed above. These listed filter arrays can make more than 29,000 Mighty Mouse finished parts and more Mighty Mouse filter array layouts are being added to stock every day!

Micro-D Connectors in Solder Cup, Pre-Wired Pigtailed, Vertical Printed Circuit Boards, Right Angle Printed Circuit Boards and In-Line Adapters in any material, plating, or filtration are available in the size and contact counts with the capacitor codes listed below. These listed filter arrays can make almost 35,000 Micro-D finished parts (along with an essentially infinite number of pigtail Micro-D part numbers pre-wired to any length). Again, more Micro-D filter array layouts are being added to stock every day!

In addition to standard catalog products, Glenair filter connector designs may be customized for use in a wide range of application environments including avionic systems, down-hole drilling and logging devices, naval and marine platforms, network-centric ground warfare systems, and missile and satellite/space applications. Please call the factory or visit our website for more information.

Left to right: standard connector, filter connector, TVS connector



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EMP and TVS Defined

Electromagnetic Pulse (EMP) refers to the intense radio frequency pulses produced by nuclear explosions at high altitudes. Other names for this include Nuclear EMP (NEMP) and High-Altitude EMP (HEMP). Similarly, System Generated EMP (SGEMP) refers to electrical noise resultant from large amounts of composite skin used in satellites, aircraft and helicopters that discharge over time. Like other forms of electromagnetic interference, EMP can have a destructive effect on sensitive electronic devices, particularly those used in mission-critical military applications. This occurs if and when the EMP couples to an antenna or an unshielded cable and passes unmolested into an electronic device. EMP hardened equipment is designed to protect vital communications at a time when unhardened devices are likely to fail. Thus it is a standard requirement for many military applications to proactively protect certain devices from EMP via the integration of Transient Voltage Suppression technologies into the connectors that service the device.

Transient Voltage Suppression (TVS) technologies are designed to shunt voltage transients directly to ground before such surges can damage sensitive electronic equipment. Individual TVS diodes as well as diode modules may be incorporated directly into the filter connector package to provide optimal protection for either individual contacts or groups of contacts without significant increases in connector size or weight. Individual circuit protection diodes and diode modules are available for all connector types and are routinely stocked by Glenair to reduce lead-times. RTCA DO-160 and other electrical performance standards now define acceptable benchmarks for withstanding electromagnetic pulse, lightning strike, or other induced voltage surges.

Hermetic Packaging

Hermetic connectors are specified for applications as divergent as submarines and orbiting satellites. They are deployed to resist moisture ingress in underground applications and to withstand pressure differentials in vacuum chambers, laboratory equipment and commercial and military aircraft. Hermetic connectors, such as the MIL-DTL-38999 Series I, II, III and IV supplied by Glenair, are principally designed for use in military aerospace—in fact, the requirement for connector hermeticity was originally driven by military electronic applications. But the products are equally at home in commercial applications such as oil-patch logging equipment or medical devices.

Hermetic connectors are constructed from a core component-set that includes the connector shell, a vitreous glass insert and the selected contacts. Shells may be machined from stainless steel or Kovar[®], an iron-nickel-cobalt alloy with a co-efficient of expansion closely balanced to the glass inserts. Contacts used in hermetic connectors must be fabricated from high-grade iron/nickel materials that can withstand high-heat, and bond effectively to the vitreous glass seal.

As with other connector families, hermetic customers may specify the connector coupling style (threaded, bayonet, etc.), pin or socket gender and layout, contact termination type (solder cup or PCB termination), conductive or non-conductive finish, polarization and so on. Glenair's complete in-house hermetic capability affords us the ability to produce a wide-range of special purpose hermetic connectors designed to meet individual and unique customer specifications—such as EMI/EMP filtering.

Hermetic class EMI/EMP filter connectors are available throughout our complete range of filtered connector products in both Pi and C from 35 pF to 56000 pF. Connector platings and materials are offered in class H2 (stainless steel, electrodeposited nickel).

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