



Amphenol Integrated Systems



The Leading Choice

Amphenol Integrated Systems - The Leading Choice

Amphenol is the leading manufacturer of integrated system solutions for the military and aerospace markets. Amphenol Integrated Systems is the synergistic combination of three key divisions:

- Amphenol Backplane Systems
- Amphenol Printed Circuits
- Amphenol Aerospace Operations Board Level Products

We have over 60 years of experience in the military and aerospace market and our commitment to the industry is exemplified in everything we do. With our dedicated facilities in Nashua, New Hampshire; Sidney, New York; and Nogales, Mexico, Amphenol Integrated Systems is the military and aerospace industries premier choice for system-level packaging solutions. We understand the relationship between the interconnect, the printed circuit board, the backplane and the chassis, and we use that knowledge to provide complete solutions for our customers.

Amphenol Products - Performance in the Most Demanding Environments

We lead the industry by offering the elements necessary for success in the military and aerospace OEM supply chain:

- Design and Modeling
- Applications Engineering
- Fabrication
- Value-added Assembly
- Test

Coupled with the largest interconnect offering in the market, Amphenol supports all of your system-level needs.



Amphenol's Solutions - The Pinnacle of Technology

Some of the world's most demanding programs rely on Amphenol's packaging solutions, including:

- F-35
- F-22
- F-18
- MIDS/JTRS Radio
- Theater High Altitude Air Defense Radar (THAAD)
- AH-64 Apache
- 787 Dreamliner
- Future Combat Systems
- DDG-51
- DDG-1000

Integrated Systems solutions are found aboard commercial airliners, helicopters, Navy and Air Force fighters, C4I electronics, missiles, ground vehicles, Homeland Security Systems, and Navy warships.

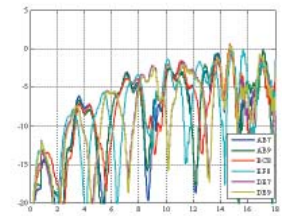
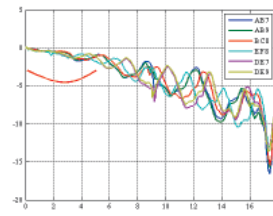
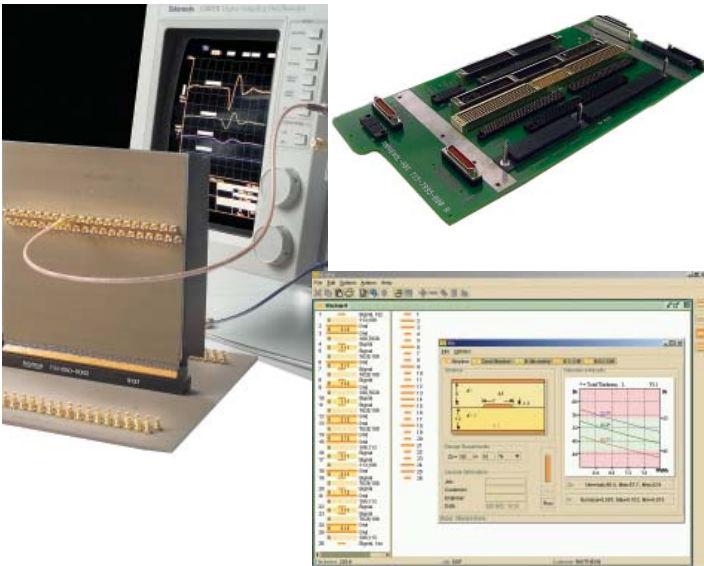


The Amphenol Engineering Edge

Amphenol Integrated Systems tackles problems such as PWB routing, signal integrity, mechanical robustness, and thermal reliability concurrently rather than independently by value-added applications engineering support.

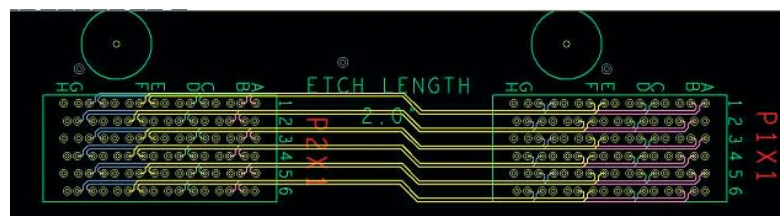
Solving complex packaging challenges depends on making sure that environmental, mechanical, and electrical factors are all addressed at the system-level. By taking this system-level perspective and focusing on these factors, Amphenol Integrated Systems is able to meet your program's most challenging packaging requirements. We are an extension of your design team, providing expert design and applications engineering assistance every step of the way to ensure program success.

Our engineers evaluate your design to optimize your design prior to production.



Engineering Capabilities

- Integrated Design Services
- Thermal Analysis
- Concurrent Application Engineering Support
- Connector Selection
- Impedance and Signal Integrity Modeling
- Mechanical Design
- Solid Modeling and CAD Software Tools
- Polar Impedance Modeling & Design
- Risk Analysis
 - Design for Manufacturability and Assembly (DFMA)
 - Design to Cost (DTC)
- PWB Design Rule Check (DRC) software
- PWB Design Services
 - Multiple Software Systems Available
 - PWB Fabrication and Assembly drawings
 - Analysis Reports and Test Specifications
- PWB Design Support
 - Board Materials
 - Impedance/Stack-up modeling
 - Line Widths/Spacing: DFM Optimization
- Innovative Power Solutions
- Metal Plate/Wire-wrap Assembly Conversion to PWB
- Integration of Hybrid Optical Electric backplanes





Backplane Systems and Enclosures

For over 40 years, Amphenol Backplane Systems (ABS) has been a leading manufacturer of backplane assemblies and enclosures for military and aerospace applications. ABS combines a wide range of innovative product and process technologies, advanced component manufacturing, and process control with highly focused, customer specific program management and testing at the assembly level. In addition, we provide expert design and unsurpassed applications engineering assistance at every step of the way.

Amphenol Backplane Systems production capabilities are the result of Amphenol's significant investment in new state-of-the-art equipment and software such as:

- Pressfit Installation
- Through-Hole Soldering
- Automated Hi-Temp Soldering
- Large-Format Surface Mount Soldering
- Aqueous cleaning
- Conformal Coat (Type UR and XY)
- Electrical Test.



For electrical testing, ABS offers Level I (bareboard), Level II (post assembly), and Level III (in-circuit) capabilities. Our industry leading large-format surface mount line with a capability of up to 29" x 60" circuits, is well positioned for the largest backplanes in the industry as well as volume production of standard backplane products.

Our advanced manufacturing support software allows us to maintain our world class configuration control as well as create a state-of-the-art visual workplace to ensure we are exceeding customer expectations. Our in-house capability for environmental testing such as Environmental Stress Screening (ESS) supports the increasing customer need for product assurance. We have also expanded our manufacturing capability to include:

- Enclosure and Value-Added Assembly
- High-End Cable and Flex Assemblies,
- Integrated Bus Systems,
- Machined Enclosures, and Metal Faceplates.

In support of the continued need for leading-edge technology coupled with the best cost manufacturing, we have established a qualified DoD Manufacturing Licensing Agreement (MLA) approved work center at our Amphenol Nogales, Mexico campus. This site is a duplication of our Nashua, New Hampshire manufacturing capability and will meet the needs of programs looking for a low cost option while remaining in North America. ABS MIL-Spec. qualifications include MIL-C-28859 (for components) and MIL-A-28870 (for assembled backplanes).

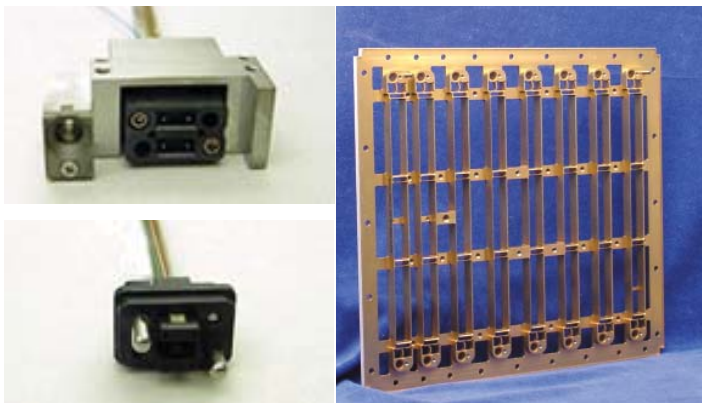
Interconnect Products

Amphenol has the world's broadest selection of cylindrical and rectangular connectors that exceed the high reliability and harsh environment requirements for today's mission critical applications. Many of our rectangular connectors offer two-level system maintenance with ESD protection:

- Line Replaceable Module (LRM) Brush Connectors
- Ultra-High Density (UHD) Fork and Blade Connectors
- VITA 60 and 64 Compliant VME Connectors
- Ruggedized VME64x Connectors
- MIL-C-55302/166 thru 172 Low Mating Force Rectangular Connectors
- High Density Brush (HDB3) Connectors
- Ruggedized Rack and Panel Connectors
- MIL-DTL-38999 Series I, II, and III Circular Connectors (Fiber Optic MT Ferrules options)
- MIL-29504 and 28876 Circular Connectors (Fiber Optic Contact)

Fiber Optic Products

Amphenol offers fiber optic high performance termini and connector systems within a wide range of cylindrical and rectangular interconnect packaging. Fiber optic connectors provide reliable transfer of data signals for communication systems. Combined with the proven MIL-DTL-38999 Series III connector, Amphenol offers a multi-channel fiber optic connector system that is unsurpassed. The same fiber termini are incorporated into LRM surface mount rectangular connectors.



Metal Machining Capabilities

Amphenol has extensive experience in manufacturing a wide variety of complex machined components. Our experienced engineering group can design custom heat sinks and enclosures to fit your board or work from your CAD models, assemblies, or step files. Our state-of-the-art twin spindle milling machines with multi-axis control, unique fixturing, and indexing, guarantee true position tolerancing on multiple faces of a machined piece. Other key benefits and features of Amphenol's design and manufacturing operations include:

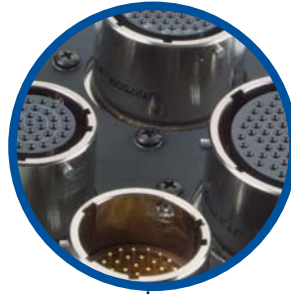
- Manufacturing studies of geometric dimensioning and tolerancing techniques that can assist in optimizing your design to enhance manufacturability from the initial design phase (DFM)
- Flexibility to handle high or low run quantities.
- Capability to hold very precise positional, size, and profile tolerances.
- Parts can be selectively plated and selectively machined to suit customer requirements.

Integrated Solutions - Everything You Need Inside And Outside The Box

Our Enclosure Systems are designed to respond to our customer's performance requirements. We are dedicated to working with our customers in an engineer-to-engineer effort, focusing on system development. We provide the full range of design services required to support our customer's applications, applying the breadth of Amphneol product offerings and technical know-how to meet the future performance demands. Our broad offering of products enables our system-level engineering team to take on custom turn-key solutions, including enclosure integration.

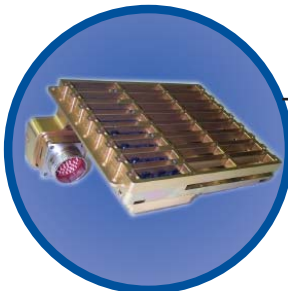
I/O Front Panel Connectors

Rugged, environmentally sealed I/O connectors, filtered and non-filtered. Available in a variety of styles and classes, including thread and bayonet coupling as well as fiber optic, RF and high-speed contacts.



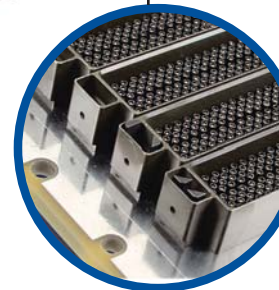
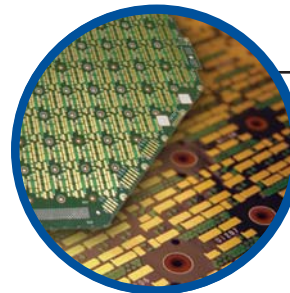
Metal Machining

Faceplates, enclosures, bus bars, heat sinks and stiffener machining capabilities. Multiple plating options available.



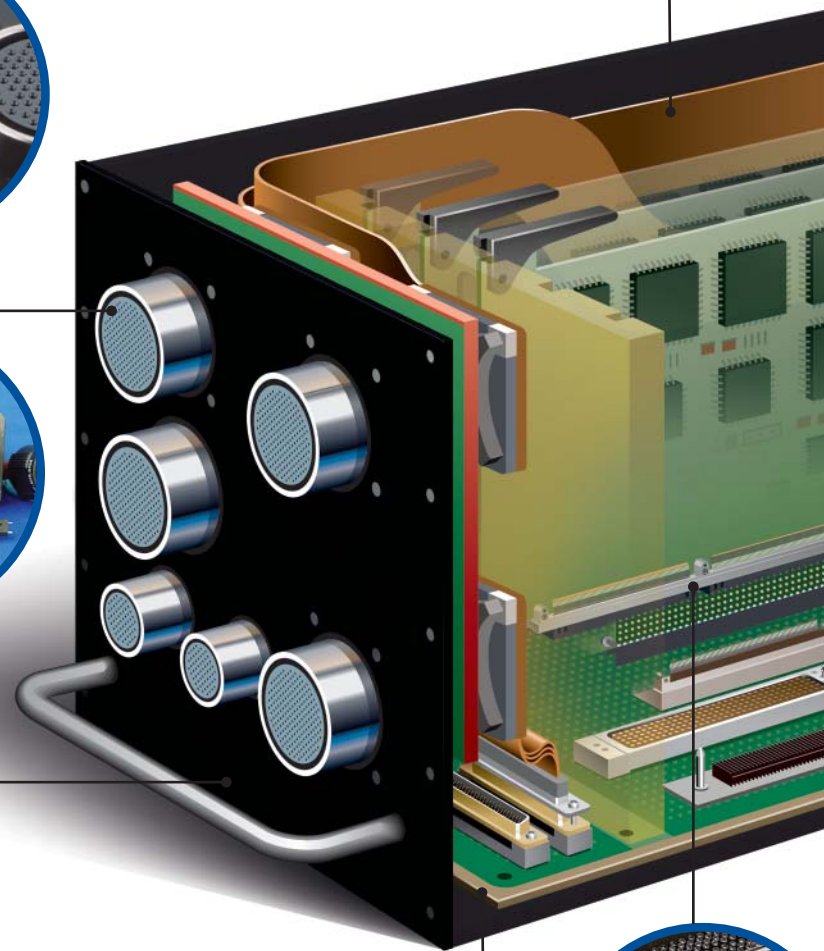
Printed Circuit Boards for Backplanes and Daughtercards

Fabrication capabilities include a wide variety of materials to enable increasing signal speeds, deep microvias, buried, blind and backdrilled vias, sequential lamination, panel sizes from 18" x 24" up to 24" x 54", and layer counts up to 60 with a board thickness of 0.400"



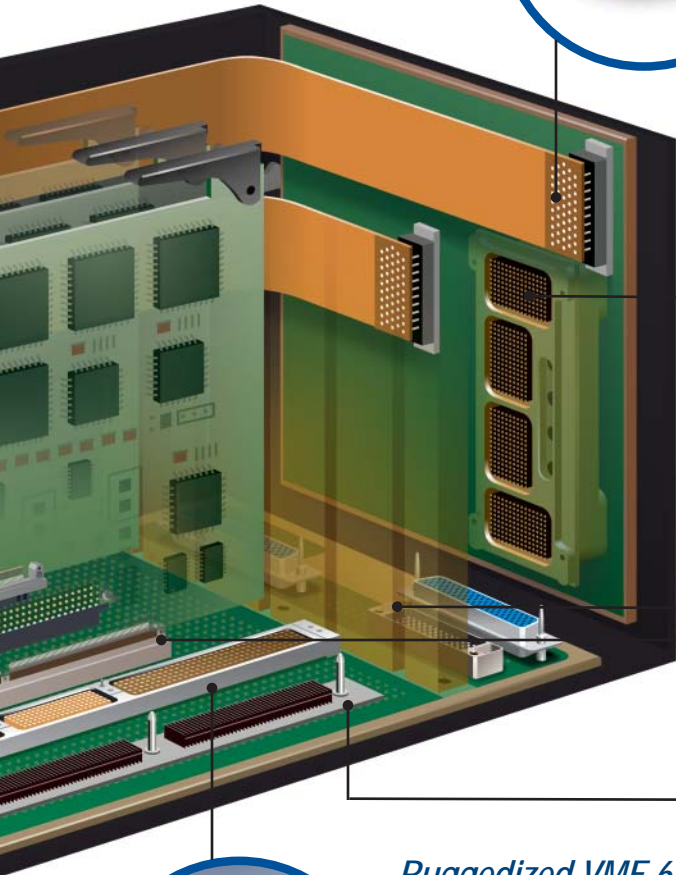
LRM

Designed to meet the high-density, straddle-mount connector solution that meets MIL-C-5015 requirements for long life and stable electrical performance demanded by Line Replaceable



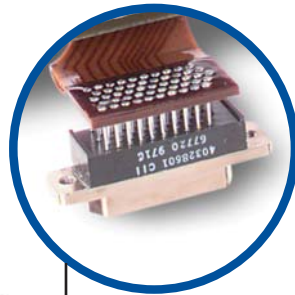
Rigid, Flexible and Rigid-Flex

Rigid-Flex circuit interconnects featuring blind and buried vias, microvias, bookbinder and other cutting-edge technologies including large format panels.



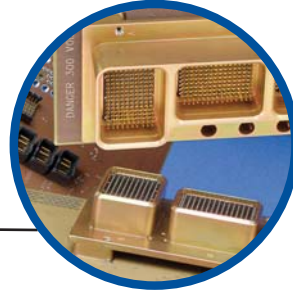
MIL-83513 Micro D

Assembled to flex I/O transition to outside or take signals off the backplane.



Blindmate Rack and Panel Connectors: ARINC 600, 404 and 83527

Designed per ARINC 600 or ARINC 400 specifications, single, double, triple, or quad bay insert styles available. Customize insert arrangements to include signal, power, coax, quadrx, and fiber optic contacts



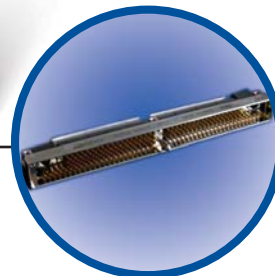
HiLinX

A customized modular connector consisting of interlocking Signal, Power, Fiber Optic and Coax blocks per the M55302 Standard.



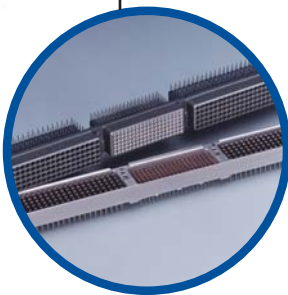
NAFI/UHD

Medium to high-density connector with fork and blade contacts. Module card with straddle-mount and through hole termination and solderless pressfit backplane contacts. EMI shielding, coax, fiber optic, and power contacts available.



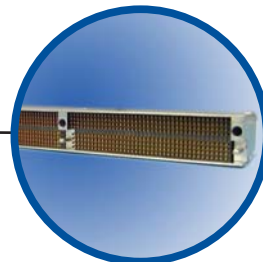
Ruggedized VME 64X

Ruggedized replacement for standard VME connectors. Improved reliability and performance to meet avionic environmental packaging requirements.

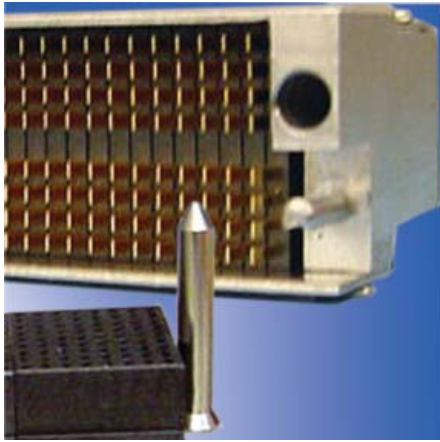


VITA 60/64 (VPX Compliant)

High-density, modular, 6+ Gbps, high vibration performing, ESD shielded, connector meeting the specifications for VITA 46 and 48 in both 3U and 6U configurations. Developed using proven mechanical and signal integrity with unmatched performance in the industry.



density needs of today's integrated electronic modules, this uses the Bristle Brush Contact, a proven military avionics M55302 requirements. The low mating force, extended service life and performance of the Brush contact enables the performance in the Low Resistance Module (LRM) applications.



VIPER® Interconnect Platform

Key Features

- Designed for 10+ Gbps data rate performance
- 100 ohm impedance for differential pair configuration
- Separable interface offering 70 single-ended signals/ 25.4mm and 63 differential signals/ 25.4mm
- Reliable, redundant opposing cantilever contact beam design
- Greater than $\pm 0.52\text{mm}$ X and Y translation in fully mated condition
- ESD protection supports 2-level maintenance designs
- Ruggedized vibration performance greater than $0.6\text{ G}^2/\text{Hz}$ (29.28 G' rms)
- Eye-of-the-needle compliant pins designed to pierce most conformal coatings
- Flexible modular design ideal for standard 3U and 6U applications as well as unique custom configurations incorporating RF microwave and optical MT solutions
- Fully footprint-compatible with VITA 46 and VITA 48 standards



Amphenol's VIPER® connector is a shielded, high-density, high-speed press-fit, modular interconnect system. Optimized for differential pair architectures on a 1.8mm x 1.35mm grid, the waferized daughtercard assembly also provides single-ended and power wafer options integrated onto a stainless steel stiffener with stainless steel guidance and keying blocks. The backplane modules are available in 8 and 16 row increments on a 1.8mm x 1.8mm grid, with or without keying location blocks and integrated stainless steel guidepin/keys. The new backplane signal contacts incorporate a highly reliable 4-points-of-contact beam design and the ground contacts leverage Amphenol's 40 year experience with robust compliant pin and contact fork designs.

ABS developed the VIPER interconnect platform after extensive voice of the customer (VOC) interviews. These interviews drove us to meet or exceed future avionic high-level vibration, mechanical shock and condensing moisture test requirements. Customers emphasized the need for ruggedization in the next generation of military packaging solutions that can scale to higher bandwidths without costly and time-consuming chassis redesigns. The VIPER connector platform offers the ability to scale from 80 Mbps to over 10 Gbps while retaining the same 20.3mm to 25.4mm backplane slot pitch.

ELECTRICAL ATTRIBUTES

- **Data Rate:** 6.5 Gbps scalable 10 Gbps
- **Differential Impedance:** 100 ohms
- **Differential Insertion Loss:** -5 dB up to 5 GHz (10 Gbps)
- **Differential Return Loss:** -5 dB up to 5 GHz (10Gbps)
- **Far End Crosstalk:** -35 dB up to 8 GHz
- **Near End Crosstalk:** -33 dB up to 8 GHz
- **Signal Contacts:** 1 amp
- **Power Wafer:** 8 amps per wafer at 10° C T-Rise
- **Compliant Pin to Plated Thru Hole Resistance:** 1 milliohm max
- **Dielectric Withstanding Voltage:** 500 volts RMS
- **Insulation Resistance:** 1000 megohms

VIPER MATERIALS AND FINISHES

Backplane Signal and Ground Contacts:

C7025 copper alloy, 0.23mm. Finish is 0.00127mm nickel minimum all over per SAE-AMS-QQ-N-290, Class I. Selective 0.00127mm gold minimum per ASTM-B488, Type II, Grade C, Class 1.27 in the mating area. 0.0076mm 60/40 reflowed tin/lead minimum selectively plated in the compliant pin area.

Differential, Power and Single-Ended

Daughtercard Wafer Leadframes:

C7025 copper alloy, 0.38mm. Finish is 0.00127mm nickel minimum all over per SAE-AMS-QQ-N-290, Class I. Selective 0.00127 gold minimum per ASTM-B488, Type II, Grade C, Class 1.27 in the mating area. 0.0076mm 60/40 reflowed tin/lead minimum selectively plated in the compliant pin area.

Backplane Insulators and Daughtercard

Wafer Insert Mold Material:

Glass reinforced polyester (Liquid Crystal Polymer), UL 94VO, Color Black.

Front and Rear Stiffeners: Stainless Steel, 0.6mm, Type 301, 1/2 Hard. Finish per Mill 2B.

Backplane Guide Pin: Stainless Steel, Type 303, Passivated.

Daughtercard Connector Guidance and Keying

Blocks: Stainless Steel, Type 440, Passivated.

MECHANICAL ATTRIBUTES

Signal and Ground Contact Normal Force:

85 grams per beam

Signal and Ground Contact Engagement Force:

45 grams max, 35 grams typical

Signal and Ground Contact Separation Force: 30

grams max, 25 grams typical

Signal and Ground Contact Durability: 500 cycles minimum

Contact Wipe Length: 2.5mm minimum for ground contacts; 2.0mm minimum for power and signal contacts

Backplane Signal and Ground Compliant Pin

Insertion Force: 4.9 kilograms maximum; 2.27 kilograms to 4.9 kilograms depending on the surface finish of PCB.

Backplane Signal and Ground Compliant Pin

Retention Force: 2.27 kilograms minimum

Daughtercard Wafer Compliant Pin Insertion Force:

1.8 kilograms to 3.6 kilograms depending on the surface finish of PCB.

Daughtercard Wafer Compliant Pin Retention

Force: 1.6 kilograms minimum

Translation: ± 0.52 mm in both X and Y direction fully mated

Slot Pitch: 20.30mm

ENVIRONMENTAL ATTRIBUTES

Temperature: -55° C to 125° C

Random Vibration: 90 minutes per X, Y and Z axis at 0.6 G²/ Hz.

Mechanical Shock: 50 G'rms in Y axis, 80 G' rms in X and Z axis, 11 milliseconds, half sine.

Temperature Life: 1000 hours at 125° C

PRINTED CIRCUIT BOARD

Minimum Backplane and Daughtercard Thickness:

2.28mm

Daughtercard Pattern Primary Drilled Hole Size:

0.55mm

Daughtercard Pattern Finished Hole Size:

0.46 \pm 0.05mm

Backplane Pattern Primary Drilled Hole Size:

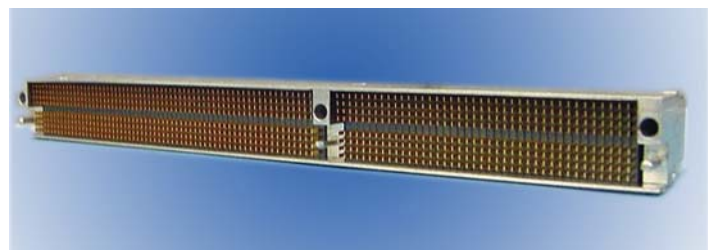
0.65mm

Backplane Pattern Finished Hole Size:

0.56 \pm 0.05mm

Radial Hole Wall Deformation: 0.04mm per side as measured from drilled hole.

Axial Hole Wall Deformation: 0.03mm as measured in the vertical plane.



VIPER 6U VITA 64 Custom Power Configuration



Rigid Printed Circuit Board Capabilities

Amphenol Printed Circuits' (APC) capabilities are among the world's broadest and most advanced, delivering consistent quality and reliability for demanding high-bandwidth systems and mission critical applications for more than 25 years. Proven engineering and manufacturing expertise eliminates printed circuit board design obstacles.

APC's North America printed circuit board operation provides tightly controlled processes for prototype through production printed circuit board volumes. The 214,000 square foot New Hampshire facility features state-of-the-art PCB manufacturing equipment and optimized material handling to ensure the highest quality and consistency.



DESIGN FORMATS	Mentor PADS	Cadence Zuken	
MANUFACTURING FORMATS	ODB++ (Preferred) DXF Gerber 274X	Autoplot Excellon HPGL	DPF Gerber 274D IPC-D-356
MAXIMUM PANEL SIZE	24" x 54" (609.1mm x 1370.6mm) 30" x 44" (761.4mm x 1116.7mm) 36" x 42" (913.7mm x 1065.9mm)		
MAXIMUM PANEL THICKNESS	0.400" (10.15mm)		
LAYER COUNT	Up to 64		
INTERCONNECT FORMATION TYPES	Back Drilled Dual Diameter Thru Hole*	Buried Electrically Isolated Blind (Laser & Mechanical)*	SMT
	*Includes conductive and non-conductive fill		
ASPECT RATIO - DRILLED SIZE	Backplane Daughtercard	17:1 15:1	
FINISHED HOLE SIZE	Compliant Pin Via (A/R dependent) Buried Vias Microvias (Up to 3 electrical layers)		0.018" (0.457mm) 0.008" (0.203mm) 0.006" (0.152mm) 0.004" (0.101mm)
BLIND VIA ASPECT RATIO	1.25:1		
INTERNAL FEATURES	Lines Spacing Buried Resistors Buried Capacitance Core Thickness	0.003" (0.076mm) 0.5 oz copper 0.003" (0.076mm) 0.5 oz copper No No 0.001" (0.0254mm) minimum	
EXTERNAL FEATURES	Lines Spacing	0.004" (0.101mm) 0.5 oz copper 0.004" (0.101mm) 0.5 oz copper	
MATERIALS	High Tg FR4 (Including phenolic cure) Megtron 6 Isola FR408 Nelco 4000-13 & Nelco 4000-SI Rogers 4350/FR4 BT (Bismaleimide triazine resin)		Taconic Gore Cyanate Ester Polyimide Rogers 4350
COPPER PROCESSING	1/4 oz to 15 oz copper (U/L 7 oz)		
IMPEDANCE SINGLE & DIFFERENTIAL	± 10% ± 7.5% ± 5.0%*		*Consult Factory
SURFACE FINISHES	Electrolytic Ni/Au (Hard & Soft) HASL Immersion Tin Reflowed Tin/Lead		ENIG Immersion Silver OSP-Entek 106
CERTIFICATIONS	AS9100 Certification IPC-6012 Class I, II and III ITAR Registration MIL-PRF-31032/2a		ISO 9001:2000 ISO 14001:1996 MIL-PRF-31032/1b MIL-P-55110

Flexible and Rigid-Flex Printed Circuit Board Capabilities

APC is one of the industry's leading manufacturers of flexible and rigid-flex circuit interconnects. For more than 30 years, APC has been providing quick turn prototypes from initial concept through full production with cutting-edge technologies including interconnects with blind and buried vias, microvias, and bookbinder.

Our assembly centers of excellence, located in Nashua, New Hampshire and Nogales, Mexico, providing competitive value-added services including SMT, wave and manual through-hole assembly.

APC works closely with our customers to understand their true system requirements. This allows us to deliver the most cost-effective interconnect solutions with up-front engineering and consistent manufacturing techniques. From functional testing and turn-key assembly, APC's commitment to our customers success is what sets us apart in the industry.

DESIGN FORMATS	DXF Gerber	IGES PADS
PANEL SIZE	12" x 18" (304.5mm x 456.8mm) 18" x 24" (456.8mm x 609.1mm) 24" x 24" (609.1mm x 609.1mm) 24" x 36" (609.1mm x 913.7mm) 24" x 54" (913.7mm x 1370.6mm) Consult Factory	
PANEL THICKNESS	0.003" to 0.225" (0.0762mm to 5.71mm)	
LAYER COUNT	1-30+	
INTERCONNECT FORMATION TYPES	Thru-Hole Buried Blind	SMT Filled Vias Dual Diameter
FINISHED HOLE SIZE	Compliant Pin (Rigid zone only) Via (A/R dependent) Buried Vias Microvias (Up to 3 electrical layers)	0.018" (0.457mm) 0.008" (0.203mm) 0.006" (0.152mm) 0.004" (0.101mm)
BLIND VIA ASPECT RATIO	1.25:1	
INTERNAL FEATURES (COPPER WEIGHT DEPENDENT)	Line Spacing	0.003" (0.076mm) 0.003" (0.076mm)
MATERIALS	Polyimide - FR Polyimide - AP Polyimide - GI Soldermask	Polyimide - Standard Acrylic Silver Epoxy Shielding Copper Epoxy Shielding FR4/ 24/ 26/ 28
COPPER PROCESSING	1/4 oz up to 15 oz	
IMPEDANCE SINGLE & DIFFERENTIAL	± 10% ± 7%*	*Consult Factory.
SURFACE FINISHES	HASL Reflowed Tin/ Lead OSP-Entek 106 ENIG	Immersion Tin Immersion Silver Bright Tin Electrolytic Ni/ Au (Hard & Soft)
ASSEMBLY CAPABILITIES	Full Turn-Key Thru-Hole (Wave & Manual) SMT (Pick & Place)	Wire-Bond Crimp RoHS Compliance
ASSEMBLY FINISHING	Conformal Coat - UR, Acrylic, Parylene, Fluoropolymer Glop Top	
TEST CAPABILITIES	Overmolding Impedance Testing Hi-Pot up to 5,000 VDC 2,000 Points per Circuit Insulation Resistance up to 1,000 VDC Four-Wire Kelvin 0.001Ω to 1 Ω	Bed of Nails Flying Probe Flex Cycling Environmental Functional Test
CERTIFICATIONS	MIL-P-50884, Types 1-5 IPC-6013 Class I, II and III, Types 1-5 ITAR Registration	ISO 9001:2000 IPC-610 AS9100 Certification



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Amphenol

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