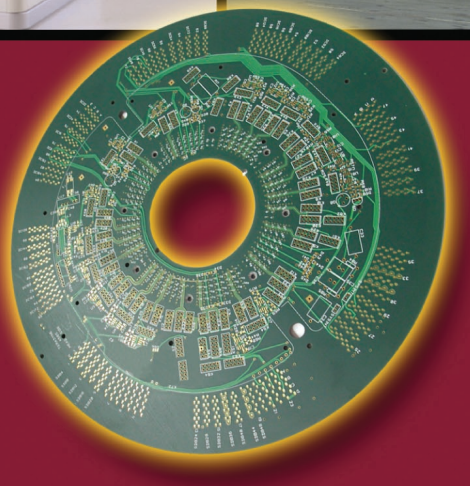
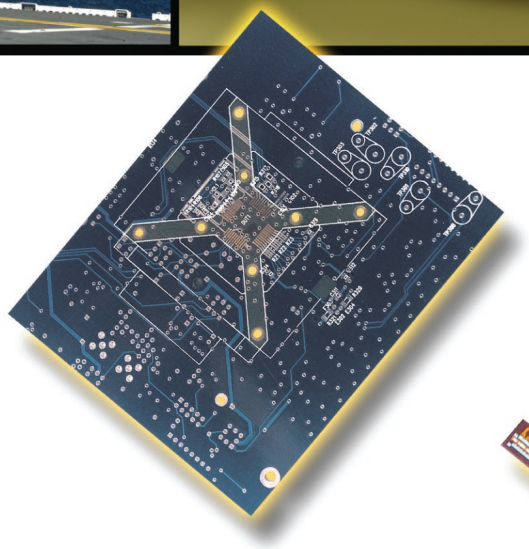
Printed Circuit Boards

Product Guide





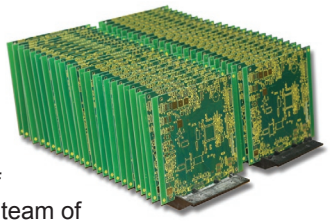
A complete product line of printed circuit board solutions for the most demanding applications.

- Military Aircraft
- Military Ground Vehicles
- Missile Guidance
- Medical Products
- RF Microwave / Antennas
- Wind Turbine
- Cell Towers
- Satellites

MOOG
COMPONENTS GROUP

Printed Circuit Boards

Overview



Moog Components Group is your prototype printed circuit board facility. Our focus is to provide customers with answers to complex printed circuit board applications. We pride ourselves in developing strong customer relationships and encourage you to contact us for a thorough review of your requirements.

Moog Components Group has an excellent industry reputation for being the facility for standard products of 2 - 24 layers or the exotic products requiring extensive or complex engineering design and development. A team of dedicated engineers and manufacturing personnel successfully produce standard and specialty products including heavy copper plating up to 10 oz. with blind and buried vias requiring sequential lamination.

With a wide customer base consisting of world leaders in electronics, communications, military industries and universities, Moog Components Group is dedicated to quality products and the shortest lead times in the industry, where customer satisfaction is paramount. Our niche in the marketplace is primarily prototype, fast turn production and low volume printed circuit board production. In addition, we possess offshore capabilities that allow us to also address mid to large volume production quantities.

Pre-Engineering and Customer Service

Moog Components Group strives to provide excellent customer service and pre-engineering support. Our sales and engineering staff work as a team to ensure a great working relationship with each of our customers. Customer satisfaction is of utmost importance to the future success of our business.

Our experienced sales staff prides itself in providing the customer with a fast and accurate quote. In most cases, you will receive your quote within a few hours, but not more than 24 hours after sending your request for quote. Sales also works with each customer to meet their needs in terms of delivery and quantities required. We constantly work to improve our service and to exceed customer expectations.

A team of dedicated engineers review customer data using Frontline Genesis 2000® software. This software assists in identifying any potential manufacturing obstacles and data issues. The engineering department then communicates with the customer to resolve any issues up front. This open communication is key to ensuring that our customer's needs are met prior to release to our production staff. This is one of the many aspects that sets us apart from our competitors. Our engineering group will work with your engineering team to develop custom processes as required for your rigid, flex and rigid flex designs.

Technical Capabilities

Moog Components Group has complete in-house process capabilities which allow us to customize our processes to your design. Our staff carefully builds each board to meet customer specifications. Process engineers work to resolve any problems throughout each process step to make sure the board is manufactured properly. As a part of our quality assurance, our inspection staff also reviews the boards at various stages to ensure that we are meeting or exceeding customer quality requirements. We operate three shifts to make sure that our customer's product never stops moving through the facility.

Manufacturing turn times are available beginning as quick as one day. Technology levels typically range from 1 - 24 layers with lines and spaces of .004 inch. We process a wide array of materials for flex, rigid flex, and rigid printed circuit board product. Our management and staff have in-depth experience in building printed circuit boards for the telecommunications, military and commercial industries.

Additional In-House Capabilities

We constantly invest in new equipment to maintain our competitive edge in an ever changing industry.

- Micro-section lab with fully trained lab technicians
- OEM enclosed vacuum press with recipe generation
- Laser ablation, skiving and routing technology through the use of Excellon Cobra V1000 UV / CO^2 Laser
- Polar instruments, impedance calculators and equipment and circuit resistance / insulation resistance testing

Certifications and Awards

- ISO 9001:2000 Certified
- IPC Member Since 1997
- UL 94 V-O Certified Since 1996
- Analog Supplier Excellence Award 2005 and 2007
- Outstanding Performance Award, On-Time Shipments FY07 Moog Components Group
- Galax / Grayson / Carroll Chamber of Commerce Industry of the Year Award 2006

Specifications and information are subject to change without prior notice. *Photo credit to U.S. Department of Defense (Osprey aircraft and Abrams tank)*

Printed Circuit Boards

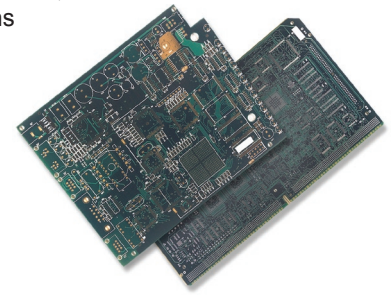
Manufacturing Capabilities

Description	Standard	Review
Layer Count	16	24
Board Thickness	.004 - .125 inch	Up to .450 inch
Copper Foil Thickness (Min.)	.5 oz. / ft^2	.25 oz. / ft^2
Copper Foil Thickness (Max.) External / Internal Layer	2 oz. / ft^2	10 oz. / ft^2 (Special projects)
Through Hole Size (Min. Drilled)	.008 inch	.006 inch
Hole Size, Plated (Dia. Tolerance)	+/- .002 inch	+/- .001 inch
Trace / Space Width	.004 inch / .004 inch	.003 inch / .003 inch
SMT Pitch	.015 inch	Below .015 inch
Aspect Ratio	10:1	Above 10:1
Materials	• Dupont® LF and AP series material for Flex and Rigid Flex • *FR4 - ED130 / P / UV - FR402 / 04 / 05 - FR406 / BC / N • High temperature materials - FR408 - *Polyimide (P95) • High speed application materials - Rogers® 4003, *4350, etc. - Ceramic (TMM series, etc.) - BT - Teflon® (Rogers Duroid™, etc.) • RoHS compliant materials - *IS410 (180 Tg material) - *IS400 / 402 / 410BC / 610 • *Nelco® (N105, N205, N3105, N4105)	Other materials as requested by the customer
Final Finish	• HASL (Hot-Air-Solder-Level) • Immersion Silver • ENIG • Selective Gold • Hard Gold (130 - 180 Knopp) • Specialty Hard Gold (200 - 250 Knopp) • Wirebondable Gold	Other finishes as requested by the customer
Manufacturing minimum turn times by layer for prototypes	• 2 - 4 Layer - 1 - 2 days • 6 - 12 Layer - 2 - 3 days • 14 - 24 Layer - 3 - 5 days	Special process and flex applications
Manufacturing turn times by volume	• Mid Volume - 3 to 4 weeks • Low Production - 1 week	High production

* Denotes UL certification for specified material

Additional Manufacturing Information and Capabilities

- IPC specifications referenced IPV - A - 600, IPC - 4202 / 4203 / 4204, IPC - 6012 / 6013, IPC - 2221 / 2223, IPC - 6202
- We are currently pursuing military certification, but we are able to manufacture to military specifications Mil-PRF-31032 / 1 & / 2, Mil-PRF-55110, Mil-I-45208, Mil-Q-9858, Mil-P-50884
- Controlled impedance
- Blind and buried vias with sequential lamination
- Edge plating
- Net list electrical testing
- AOI
- BGA SMT and micro via design
- Conductive epoxy hole fill



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