

DLA Land and Maritime - VQ  
Supplemental Information Sheet for Electronic QML-31032

Date: 2/7/2013

**Specification Details:**

Specification: MIL-PRF-31032  
Title: Printed Circuit Board/Printed Wiring Board  
Federal Supply Class (FSC): 5998  
Conventional: No  
Specification contains quality assurance program: Yes  
MIL-STD-790 Established Reliability & High Reliability: No  
MIL-STD-690 Failure Rate Sampling Plans & Procedures: No  
Weibull Graded: Yes  
Specification contains space level reliability requirements: No  
Specification allows test optimization: Yes

**Contact Information:**

Office of Primary Involvement: Electronic Devices Branch, DLA Land and Maritime - VQE  
Primary Qualifying Activity Contact: 614-692-0627, e-mail: vqe.ls@dla.mil

**Notes:**

If a manufacturer desires to have test data considered for qualification, it must be certified and meet all qualification test requirements of MIL-PRF-31032 and the applicable associated specification.

The listing of printed board manufacturing lines in the QML applies only to printed boards produced in the plant(s) specified herein. Therefore, only those printed boards that have been manufactured and tested on the certified/qualified lines listed herein can be supplied as QML printed boards.

The DLA Land and Maritime - VQE contacts for QML companies can be located in the file "31032 main points-of-contact" at website: [http://www.dsccl.dla.mil/offices/sourcing\\_and\\_qualification/offices.asp?section=VQE](http://www.dsccl.dla.mil/offices/sourcing_and_qualification/offices.asp?section=VQE)

QML is a definition of a manufacturer's verified capabilities. Manufacturers may use the add-on qualification process to qualify capabilities that are not currently listed on the QML. The user is encouraged to contact the manufacturer or Qualifying Activity to make arrangements for QML availability.

The following abbreviations are used in this listing:

Ag: Silver  
Au: Gold  
CAGE: Commercial and Government Entity (Code)  
Cu: Copper  
ENIG: Electroless Nickel Immersion Gold  
HASL: Hot Air Solder Level  
ImmAg: Immersion Silver  
IR: Infrared  
LPI: Liquid Photoimageable  
MIX: Mix of SMT and THM  
Ni: Nickel  
OSP: Organic Surface Protection  
Pb: Lead  
Pd: Palladium  
PTH: Plated Thru Hole  
SMOBC: Solder Mask Over Bare Copper  
SMT: Surface-Mount Technology  
Sn: Tin  
THM: Through-Hole Mounting

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>AC Universal Circuits LLC</b> 8860 Zachary Lane North, Maple Grove, MN, 55369-4524 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	CAGE Code: 45032 Phone: 763-315-1702 Fax: 763-425-0999 EMail: sbialka@universalcircuits.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-10-019530, VQE-10-020323, VQE-12-024534  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 18  
 Max. Board Thickness: .125"  
 Min. Hole Size: .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 8.88:1 Through-Hole  
 Min. Conductor Width/Space: .0032"/.0032"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Carbon-based  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL, ImmAg  
 Additional Fab Capabilities: Foil Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-10-019530, VQE-10-020323, VQE-12-024534  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; Woven Glass Reinforced, Hydrocarbon Resin with Ceramic Fill  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 18  
 Max. Board Thickness: .18"  
 Min. Hole Size: .021" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 8.57:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Carbon-based  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL, ImmAg  
 Additional Fab Capabilities: Blind Vias, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-11-021326, VQE-12-024534  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 8  
 Max. Board Thickness: .062"  
 Min. Hole Size: .0138" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 4.5:1 Through-Hole  
 Min. Conductor Width/Space: .007"/.006"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Carbon-based  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL, ImmAg  
 Additional Fab Capabilities: Foil Lamination

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**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Accurate Circuit Engineering</b> 3019 S. Kilson Drive, Santa Ana, CA, 92707 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 0MNN9 <b>Phone:</b> 714-546-2162 <b>Fax:</b> 714-433-7418 <b>E-Mail:</b> quality@ace-pcb.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-06-012150, VQE-07-012577, VQE-09-018384, VQE-10-020411, VQE-11-022279  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 20" x 26"  
 Max. Number of Layers: 24  
 Max. Board Thickness: .22"  
 Min. Hole Size: .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 11:1 Through-Hole  
 Min. Conductor Width/Space: .003"/.003"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL, ImmAg  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

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**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<p>MANUFACTURER INFORMATION:  <b>Advanced Circuits - Tempe Division</b>                  229 S. Clark Drive, Tempe, AZ, 85281-3073</p>		<p>CAGE Code: 6RJS1                  Phone: 480-966-5894                  Fax: 480-966-5896                  EMail: tempesales@4pcb.com</p>
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-12-024291, VQE-12-024631, VQE-12-025042, VQE-13-025402  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 24  
 Max. Board Thickness: .125"  
 Min. Hole Size: .004" Laser Abated Plated Hole Size Before Plating, .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 12.5:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.0047"  
 Hole Preparation: Permanganate Desmear, Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL, ImmAg  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-12-024291, VQE-12-024631, VQE-12-025042, VQE-13-025402  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 24  
 Max. Board Thickness: .125"  
 Min. Hole Size: .004" Laser Abated Plated Hole Size Before Plating, .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 12.5:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.0047"  
 Hole Preparation: Permanganate Desmear, Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL, ImmAg  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

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<b>MANUFACTURER INFORMATION:</b> <b>Airborn Flexible Circuits, Inc.</b> 11 Dohme Avenue, Toronto, Ontario Canada M4B 1Y7	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 38661 <b>Phone:</b> 416-285-3825 <b>Fax:</b> 416-752-6719 <b>E-Mail:</b> pialisp@airbornflex.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-04-005354, VQE-08-015729  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Polyimide with Acrylic Adhesive  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 7  
 Max. Board Thickness: " Not Specified  
 Aspect Ratio: 3:1 Through-Hole  
 Min. Conductor Width/Space: .007"/.007"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Direct Metalization  
 Copper Plating: Direct Current Plate  
 Solder Resist: Dry Film, Liquid Photoimageable, Silk Screen  
 Finish System: HASL  
 Additional Fab Capabilities: Copper Core, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-04-005354, VQE-08-015729  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Flex Base Material: Copper Clad Adhesiveless Polyimide  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 12  
 Max. Board Thickness: .094"  
 Min. Hole Size: .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 12:1 Through-Hole  
 Min. Conductor Width/Space: .006"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Direct Metalization  
 Copper Plating: Direct Current Plate  
 Solder Resist: Dry Film, Liquid Photoimageable, Silk Screen  
 Finish System: HASL  
 Additional Fab Capabilities: Copper Core, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)

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**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>American Standard Circuits</b> 475 Industrial Drive, West Chicago, IL, 60185 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	CAGE Code: 4AA34 Phone: 603-639-5444 Fax: 603-293-1240 EMail: sales@asc-i.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-08-015934, VQE-11-021830, VQE-11-023138, VQE-13-025323, VQE-13-025791  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 14  
 Max. Board Thickness: .09" (for /1, Type 3 - Multilayer), .125" (for /2, Type /2 - Double-sided only)  
 Min. Hole Size: .009" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 7:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL, ImmAg

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-11-022358  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .125"  
 Min. Hole Size: .02" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 5:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL, ImmAg

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LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Amphenol Printed Circuits</b> 91 Northeastern Boulevard, Nashua, NH, 03062 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 57034 <b>Phone:</b> 603-879-3268 <b>Fax:</b> 603-879-2818 <b>EMail:</b> denise.chevalier@amphenol-tcs.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE 10-020582, VQE-06-010054, VQE-09-017008, VQE-12-023765, VQE-97-000649  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 24" x 42"  
 Max. Number of Layers: 33  
 Max. Board Thickness: .25"  
 Min. Hole Size: .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: .6:1 Microvia, 11:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Permanganate Etchback, Permanganate Etchback, Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Pulse Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable, Silk Screen  
 Finish System: ENIG, Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Blind Vias, Foil Lamination, Press Fit Mounting, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE 10-020582, VQE-06-010054, VQE-09-017008, VQE-12-023765, VQE-97-000649  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 30" x 36"  
 Max. Number of Layers: 28  
 Max. Board Thickness: .18"  
 Min. Hole Size: .0158" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 11:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Pulse Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable, Silk Screen  
 Finish System: ENIG, Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Foil Lamination, Press Fit Mounting  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE 10-020582, VQE-06-010054, VQE-09-017008, VQE-12-023765  
 Composition: H - Homogenous thermoplastic base material printed boards, M - Mixed based material printed boards  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; Woven Glass Reinforced, Hydrocarbon Resin with Ceramic Fill  
 Max. Panel Size: 21" x 24"  
 Max. Number of Layers: 12  
 Max. Board Thickness: .101"  
 Min. Hole Size: .033" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: .5:1 Microvia, 3:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.003"  
 Hole Preparation: Permanganate Desmear, Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Pulse Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable, Silk Screen  
 Finish System: ENIG, Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Blind Vias, Foil Lamination, Press Fit Mounting, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

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<b>MANUFACTURER INFORMATION:</b> <b>Amphenol Printed Circuits</b> 91 Northeastern Boulevard, Nashua, NH, 03062 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 57034 <b>Phone:</b> 603-879-3268 <b>Fax:</b> 603-879-2818 <b>E-Mail:</b> denise.chevalier@amphenol-tcs.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-10-019533, VQE-12-023765  
 Flex Base Material: Copper Clad Polyimide with Acrylic Adhesive  
 Max. Panel Size: 24" x 36"  
 Max. Number of Layers: 4 (types 1, 2, and 3 only)  
 Max. Board Thickness: .031"  
 Min. Hole Size: .0145"  
 Aspect Ratio: .7:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Palladium-based  
 Copper Plating: Direct Current Plate, Pulse Plate  
 Finish System: HASL, Hot Oil Reflow of Plated Sn/Pb  
 Flex Usage: Use A (Flex During Installation)

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-10-019533, VQE-12-023765  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Adhesiveless Polyimide  
 Max. Panel Size: 24" x 49"  
 Max. Number of Layers: 22  
 Max. Board Thickness: .14"  
 Min. Hole Size: .12" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 7.75:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper, Palladium-based  
 Copper Plating: Direct Current Plate, Pulse Plate  
 Finish System: Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Foil Lamination, Press Fit Mounting, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended  
 Flex Usage: Use A (Flex During Installation)



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<b>MANUFACTURER INFORMATION:</b> <b>Calumet Electronics Corp.</b> 25830 Depot Street, Calumet, MI, 49913-1985 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	CAGE Code: 65337 Phone: 906-337-1305 Fax: 906-337-5359 EMail: quality@calumetelectronics.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-03-4657, VQE-04-6280  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 21" x 24"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .125"  
 Min. Hole Size: .016" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 8:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.003"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL  
 Additional Fab Capabilities: Press Fit Mounting

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-03-4657, VQE-04-6280  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 21" x 24"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .125"  
 Min. Hole Size: .016" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 8:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.003"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL

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<b>MANUFACTURER INFORMATION:</b> <b>Cirexx International, Inc.</b> 791 Nuttman Street, Santa Clara, CA, 95054 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 4MEG7 <b>Phone:</b> 408-988-3980 <b>Fax:</b> 408-988-4534 <b>EMail:</b> dangulo@cirexxintl.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1  
 Qualification Letters: VQ(VQE-08-016602)  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 22  
 Max. Board Thickness: .125"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 12.5:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL  
 Additional Fab Capabilities: Foil Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1  
 Qualification Letters: VQ(VQE-08-016602)  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 22  
 Max. Board Thickness: .125"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 12.5:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL  
 Additional Fab Capabilities: Foil Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-07-014176)  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 2  
 Max. Board Thickness: .1"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 10:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni/Au, HASL

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Cirexx International, Inc.</b> 791 Nuttman Street, Santa Clara, CA, 95054 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	CAGE Code: 4MEG7 Phone: 408-988-3980 Fax: 408-988-4534 EMail: dangulo@cirexxintl.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3  
 Qualification Letters: VQ(VQE-07-014176)  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Flex Base Material: Copper Clad Adhesiveless Polyimide  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 2  
 Max. Board Thickness: .1"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 10:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni/Au, HASL  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3  
 Qualification Letters: VQ(VQE-07-014176)  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Flex Base Material: Copper Clad Polyimide with Acrylic Adhesive  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 2  
 Max. Board Thickness: .1"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 10:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni/Au, HASL  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/4  
 Qualification Letters: VQ(VQE-08-016602)  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Adhesiveless Polyimide  
 Max. Panel Size: 12" x 18", 18" x 24"  
 Max. Number of Layers: 20  
 Max. Board Thickness: .125"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 10:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL  
 Additional Fab Capabilities: Foil Lamination  
 Controlled Impedance: Differential, Single-Ended  
 Flex Usage: Use A (Flex During Installation)

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Cirex International, Inc.</b> 791 Nuttman Street, Santa Clara, CA, 95054 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 4MEG7 <b>Phone:</b> 408-988-3980 <b>Fax:</b> 408-988-4534 <b>E-Mail:</b> dangulo@cirexintl.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/4  
 Qualification Letters: VQ(VQE-08-016602)  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Polyimide with Acrylic Adhesive  
 Max. Panel Size: 12" x 18", 18" x 24"  
 Max. Number of Layers: 20  
 Max. Board Thickness: .125"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 10:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL  
 Additional Fab Capabilities: Foil Lamination  
 Controlled Impedance: Differential, Single-Ended  
 Flex Usage: Use A (Flex During Installation)

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Colonial Circuits, Inc.</b> 1026 Warrenton Road, Fredericksburg, VA, 22406-6200 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 6T499 <b>Phone:</b> 540-753-5511, x125 <b>Fax:</b> 540-752-2109 <b>E-Mail:</b> quality@colonialcircuits.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-04-6002  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 14  
 Max. Board Thickness: .088"  
 Min. Hole Size: .021" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 4.2:1 Through-Hole  
 Min. Conductor Width/Space: .006"/.005"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: HASL

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-04-6002  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 12  
 Max. Board Thickness: .127"  
 Min. Hole Size: .015"  
 Aspect Ratio: 8.5:1 Through-Hole  
 Min. Conductor Width/Space: .008"/.005"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: HASL

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-04-6002, VQE-06-010192  
 Rigid Base Material: Woven Glass Reinforced, Hydrocarbon Resin with Ceramic Fill  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 8  
 Max. Board Thickness: .09"  
 Min. Hole Size: .021" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 4.29:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: HASL

**SECTION I  
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Colonial Circuits, Inc.</b> 1026 Warrenton Road, Fredericksburg, VA, 22406-6200 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 6T499 <b>Phone:</b> 540-753-5511, x125 <b>Fax:</b> 540-752-2109 <b>EMail:</b> quality@colonialcircuits.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQ (VQE-10-019425)  
 Flex Base Material: Copper Clad Adhesiveless Polyimide  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .093"  
 Min. Hole Size: .01"  
 Aspect Ratio: 8.6:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: HASL  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/4  
 Qualification Letters: VQE-04-6002  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Polyimide with Acrylic Adhesive  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .093"  
 Min. Hole Size: .025" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 3.7:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: HASL  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: Custom  
 Qualification Letters: VQE-04-6002  
 Rigid Base Material: With or without woven or non-woven E-glass, Polytetrafluoroethylene (PTFE) resin, ceramic filler  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 2  
 Max. Board Thickness: .031"  
 Min. Hole Size: .02" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1.55:1 Through-Hole  
 Min. Conductor Width/Space: .025"/.01"  
 Hole Preparation: Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: HASL

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

**SECTION I  
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Cosmotronic, Inc.</b> 16721 Noyes Avenue, Irvine, CA, 92606 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 63695 <b>Phone:</b> 949-660-0740 <b>Fax:</b> 949-553-8371 <b>E-Mail:</b> Patricia_Alcantar@cosmotronic.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-04-006966, VQE-05-009107, VQE-06-010085, VQE-06-011248  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24", 36" x "  
 Max. Board Thickness: .335"  
 Min. Hole Size: .014" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 15:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Blind Vias, Sequential Lamination  
 Controlled Impedance: Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-04-006966, VQE-05-009107, VQE-06-010085, VQE-06-011248  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24", 36" x "  
 Max. Board Thickness: .335"  
 Min. Hole Size: .014" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 15:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Blind Vias, Sequential Lamination  
 Controlled Impedance: Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-04-006966, VQE-05-009107, VQE-06-010085  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; GI: Glass Base, Woven, Polyimide Resin, Heat Resistant; GM: Glass Base, Woven, Triazine and/or Bismaleimide Modified Epoxy Resin, Flame Resistant  
 Flex Base Material: Copper Clad Adhesiveless Polyimide  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 22  
 Max. Board Thickness: .165"  
 Min. Hole Size: .012" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 8:1 Through-Hole  
 Min. Conductor Width/Space: .006"/.008"  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)

**SECTION I  
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Cosmotronic, Inc.</b> 16721 Noyes Avenue, Irvine, CA, 92606 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 63695 <b>Phone:</b> 949-660-0740 <b>Fax:</b> 949-553-8371 <b>E-Mail:</b> Patricia_Alcantar@cosmotronic.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-04-006966, VQE-05-009107, VQE-06-010085  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; GI: Glass Base, Woven, Polyimide Resin, Heat Resistant; GM: Glass Base, Woven, Triazine and/or Bismaleimide Modified Epoxy Resin, Flame Resistant  
 Flex Base Material: Copper Clad Polyimide with Acrylic Adhesive  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 22  
 Max. Board Thickness: .165"  
 Min. Hole Size: .012" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 8:1 Through-Hole  
 Min. Conductor Width/Space: .006"/.008"  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/5, MIL-PRF-31032/6  
 Qualification Letters: VQE-04-006966, VQE-05-009107, VQE-06-010085  
 Composition: S - Homogenous thermosetting base material printed boards  
 Rigid Base Material: Woven Glass Reinforced, Hydrocarbon Resin with Ceramic Fill  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 16  
 Max. Board Thickness: .225"  
 Min. Hole Size: .02" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 10:1 Through-Hole  
 Min. Conductor Width/Space: .011"/.007"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL  
 Additional Fab Capabilities: Blind Vias, Sequential Lamination

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/5, MIL-PRF-31032/6  
 Qualification Letters: VQE-04-006966, VQE-05-009107, VQE-06-010085  
 Composition: S - Homogenous thermosetting base material printed boards  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant; Woven Glass Reinforced, Hydrocarbon Resin with Ceramic Fill  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 16  
 Max. Board Thickness: .225"  
 Min. Hole Size: .02" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 10:1 Through-Hole  
 Min. Conductor Width/Space: .011"/.007"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL  
 Additional Fab Capabilities: Blind Vias, Sequential Lamination



**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>DDi Cleveland Corp.</b> 7 Ascot Parkway, Cuyahoga Falls, OH, 44223 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 7Z463 <b>Phone:</b> 330-572-3400 <b>Fax:</b> 330-572-3434 <b>E-Mail:</b> salesinfo@ddiglobal.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-00-000289, VQE-01-000910, VQE-05-008414, VQE-06-010963  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .126"  
 Min. Hole Size: .015" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 5:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-00-000289, VQE-01-000910, VQE-05-008414, VQE-06-010963  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 16  
 Max. Board Thickness: .126"  
 Min. Hole Size: .013" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 5:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-01-000909, VQE-06-010963  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Polyimide with Acrylic Adhesive  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 7  
 Max. Board Thickness: .07"  
 Min. Hole Size: .026" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 2.6:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Finish System: HASL  
 Flex Usage: Use A (Flex During Installation)

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>DDi Cleveland Corp.</b> 7 Ascot Parkway, Cuyahoga Falls, OH, 44223 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	CAGE Code: 7Z463 Phone: 330-572-3400 Fax: 330-572-3434 EMail: salesinfo@ddiglobal.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-01-000909, VQE-06-010963  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Adhesiveless Polyimide  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 11  
 Max. Board Thickness: .126"  
 Min. Hole Size: .013" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 10:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Finish System: HASL  
 Flex Usage: Use A (Flex During Installation)

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>DDi Denver Corp.</b> 10570 Bradford Road, Littleton, CO, 80127 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 75815 <b>Phone:</b> 303-972-4105 <b>Fax:</b> 303-933-2934 <b>EMail:</b> salesinfo@ddiglobal.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-02-000317, VQE-05-007627, VQE-05-009014, VQE-09-018719, VQE-10-020224, VQE-12-024984  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 20  
 Max. Board Thickness: .125"  
 Min. Hole Size: .013" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 10:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL, IR Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Foil Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-02-000317, VQE-05-007627, VQE-05-009014, VQE-09-018719, VQE-10-020224, VQE-12-024984  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 20  
 Max. Board Thickness: .125"  
 Min. Hole Size: .013" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 10:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL, IR Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Foil Lamination  
 Controlled Impedance: Differential, Single-Ended

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>DDI Global Corp. - Anaheim</b> 1220 N. Simon Circle, Anaheim, CA, 92806 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 0BSG1 <b>Phone:</b> 714-688-7296 <b>Fax:</b> <b>E-Mail:</b> jdebrita@ddiglobal.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-09-018147)  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .1"  
 Min. Hole Size: .32" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 3:1 Through-Hole  
 Min. Conductor Width/Space: .01"/.01"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL  
 Additional Fab Capabilities: Foil Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-09-018147)  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 22  
 Max. Board Thickness: .115"  
 Min. Hole Size: .009" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 10:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.006"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination  
 Controlled Impedance: Differential, Single-Ended

**SECTION I  
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>DDi Global Corp. - Sterling, VA</b> 1200 Severn Way, Dulles, VA, 20166-8904 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 0K703 <b>Phone:</b> 703-652-2200 <b>Fax:</b> 703-652-2272 <b>EMail:</b> salesinfo@ddiglobal.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-03-003545)  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 22  
 Max. Board Thickness: .1"  
 Min. Hole Size: .005" Laser Abated Plated Hole Size Before Plating, .009" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 10:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.003"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Resistors  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-03-003545)  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 22  
 Max. Board Thickness: .1"  
 Min. Hole Size: .005" Laser Abated Plated Hole Size Before Plating, .009" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 10:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.003"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Resistors  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-11-021244)  
 Rigid Base Material: Woven glass, reinforced, hydrocarbon resin, with ceramic fill  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 2  
 Max. Board Thickness: .034"  
 Min. Hole Size: .02" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1.6:1 Through-Hole  
 Min. Conductor Width/Space: .015"/.005"  
 Hole Preparation: Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<p>MANUFACTURER INFORMATION:  <b>DDi Milpitas Corporation</b>          1992 Tarob Court, Milpitas, CA, 95035</p>		<p>CAGE Code: 0SFV5          Phone: 408-263-0940          Fax: 408-263-9115          EMail: salesinfo@ddiglobal.com</p>
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-12-024360  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18.5" x 24.5"  
 Max. Number of Layers: 22  
 Max. Board Thickness: .115"  
 Min. Hole Size: .009" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 10:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-12-024360  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18.5" x 24.5"  
 Max. Number of Layers: 22  
 Max. Board Thickness: .115"  
 Min. Hole Size: .009" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 10:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL  
 Controlled Impedance: Differential, Single-Ended

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>DDi North Jackson Corp.</b> 12080 DeBartolo Drive, North Jackson, OH, 44451 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 0GN71 <b>Phone:</b> 330-538-3900 <b>Fax:</b> 330-538-3820 <b>EMail:</b> salesinfo@ddiglobal.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-03-003121), VQ(VQE-03-003214), VQ(VQE-07-012925), VQ(VQE-10-020405)  
 Rigid Base Material: Bl: Aramid Fabric, Nonwoven, Polyimide Resin  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 24  
 Max. Board Thickness: .25"  
 Min. Hole Size: .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 15:1 Through-Hole  
 Min. Conductor Width/Space: .003"/.003"  
 Hole Preparation: Permanganate Desmear, Permanganate Etchback, Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni/Au, HASL, ImmAg, Ni/Pd/Au, OSP  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-03-003121), VQ(VQE-03-003214), VQ(VQE-07-012925), VQ(VQE-10-020405)  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 24  
 Max. Board Thickness: .25"  
 Min. Hole Size: .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 15:1 Through-Hole  
 Min. Conductor Width/Space: .003"/.003"  
 Hole Preparation: Permanganate Desmear, Permanganate Etchback, Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni/Au, HASL, ImmAg, Ni/Pd/Au, OSP  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-03-003121), VQ(VQE-03-003214), VQ(VQE-07-012925), VQ(VQE-10-020405)  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 24  
 Max. Board Thickness: .25"  
 Min. Hole Size: .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 15:1 Through-Hole  
 Min. Conductor Width/Space: .003"/.003"  
 Hole Preparation: Permanganate Desmear, Permanganate Etchback, Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, HASL, ImmAg, Ni/Pd/Au, OSP  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination  
 Controlled Impedance: Differential, Single-Ended

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>DDi North Jackson Corp.</b> 12080 DeBartolo Drive, North Jackson, OH, 44451 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 0GN71 <b>Phone:</b> 330-538-3900 <b>Fax:</b> 330-538-3820 <b>EMail:</b> salesinfo@ddiglobal.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQ(VQE-03-003121), VQ(VQE-03-003214), VQ(VQE-07-012925), VQ(VQE-10-020405)  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Adhesiveless Polyimide  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 24  
 Max. Board Thickness: .25"  
 Min. Hole Size: .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 15:1 Through-Hole  
 Min. Conductor Width/Space: .003"/.003"  
 Hole Preparation: Permanganate Desmear, Permanganate Etchback, Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni/Au, HASL, ImmAg, OSP  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQ(VQE-03-003121), VQ(VQE-03-003214), VQ(VQE-07-012925), VQ(VQE-10-020405)  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Polyimide with Acrylic Adhesive  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 24  
 Max. Board Thickness: .25"  
 Min. Hole Size: .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 15:1 Through-Hole  
 Min. Conductor Width/Space: .003"/.003"  
 Hole Preparation: Permanganate Desmear, Permanganate Etchback, Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni/Au, HASL, ImmAg, OSP  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination  
 Controlled Impedance: Differential, Single-Ended



**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>DDi Toronto Corp.</b> 8150 Sheppard Avenue East, Scarborough, Ontario Canada M1B 5K2	<b>PLANT LOCATION:</b> Same Address as Manufacturer	CAGE Code: 3AF82 Phone: 416-208-2100 Fax: 416-208-2196 EMail: salesinfo@ddiglobal.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-04-006240, VQE-08-015407, VQE-09-018857, VQE-11-022676, VQE-12-023550  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 18  
 Max. Board Thickness: .088"  
 Min. Hole Size: .0098" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1:1 Microvia, 8.4:1 Through-Hole  
 Min. Conductor Width/Space: .0037"/.0028"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper,  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL, ImmAg, Ni/Pd/Au  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-04-006240, VQE-08-015407, VQE-09-018857, VQE-11-022676, VQE-12-023550  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 20  
 Max. Board Thickness: .093"  
 Min. Hole Size: .0091" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1:1 Microvia, 9.6:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.003"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL, ImmAg, Ni/Pd/Au  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Dynamic &amp; Proto Circuits, Inc.</b> 869 Barton Street, Stoney Creek, Ontario Canada L8E 5G6	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 38898 <b>Phone:</b> 905-643-9900 <b>Fax:</b> 905-643-9911 <b>E-Mail:</b> dynamicinfo@dapc.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-00-0007, VQE-01-0311, VQE-03-0818, VQE-98-1143  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 16" x 18"  
 Max. Number of Layers: 16  
 Max. Board Thickness: .125"  
 Min. Hole Size: .0135" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 9.3:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Pulse Plate  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: HASL

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-12-024252  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 16" x 18"  
 Max. Number of Layers: 16  
 Max. Board Thickness: .125"  
 Min. Hole Size: .0135" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 9.3:1 Through-Hole  
 Min. Conductor Width/Space: .025"/.025"  
 Hole Preparation: Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Pulse Plate  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: HASL

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Electro Plate Circuitry, Inc.</b> 1430 Century Drive, Carrollton, TX, 75006 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 79616 <b>Phone:</b> 972-466-0818 <b>Fax:</b> 972-466-9078 <b>E-Mail:</b> jimm@eplate.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-06-010333), VQ(VQE-06-011433), VQ(VQE-10-020352)  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 16", 18" x 24"  
 Max. Number of Layers: 14  
 Max. Board Thickness: .12"  
 Min. Hole Size: .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 9.3:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-06-010333), VQ(VQE-06-011433), VQ(VQE-10-020352)  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 16", 18" x 24"  
 Max. Number of Layers: 18  
 Max. Board Thickness: .17"  
 Min. Hole Size: .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 9.3:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/5, MIL-PRF-31032/6  
 Qualification Letters: VQ(VQE-10-021161)  
 Rigid Base Material: GT: Woven E-Glass, PTFE Resin; GX: Glass Base, Woven, Polytetrafluoroethylene Resin, Flame Resistant; GY: Glass Base, Woven, Polytetrafluoroethylene Resin, Flame Resistant, for Microwave Application; With or without woven or non-woven E-glass, Polytetrafluoroethylene (PTFE) resin, ceramic filler  
 Max. Panel Size: 12" x 18", 18" x 24"  
 Max. Number of Layers: 6  
 Max. Board Thickness: .18"  
 Min. Hole Size: .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 6:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Blind Vias, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Electrotek Corp.</b> 7745 S. 10th Street, Oak Creek, WI, 53154 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 66030 <b>Phone:</b> 414-762-1390 <b>Fax:</b> 414-762-1510 <b>E-Mail:</b> sales@boards4u.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-06-011451), VQ(VQE-08-014513), VQ(VQE-09-018692), VQ(VQE-12-024024), VQ(VQE-12-024411)  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 18  
 Max. Board Thickness: .115"  
 Min. Hole Size: .012" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 9:1 Through-Hole  
 Min. Conductor Width/Space: .003"/.003"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: Carbon Ink, ENIG, Electrolytic Ni/Au, HASL, ImmAg  
 Additional Fab Capabilities: Foil Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-06-011451), VQ(VQE-08-014513), VQ(VQE-09-018692), VQ(VQE-12-024024), VQ(VQE-12-024411)  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 18  
 Max. Board Thickness: .115"  
 Min. Hole Size: .012" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 9:1 Through-Hole  
 Min. Conductor Width/Space: .003"/.003"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: Carbon Ink, ENIG, Electrolytic Ni/Au, HASL, ImmAg  
 Additional Fab Capabilities: Foil Lamination  
 Controlled Impedance: Differential, Single-Ended

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Endicott Interconnect Technologies, Inc.</b> Dept. 0069/014-3, 1093 Clark Street, Endicott, NY, 13760 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 3ECL3 <b>Phone:</b> 607-755-5896 <b>Fax:</b> 607-755-4649 <b>E-Mail:</b> JoseA.Rios@eitny.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-04-005311), VQ(VQE-07-012236), VQ(VQE-07-013506), VQ(VQE-08-015922), VQ(VQE-11-022684)  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 16  
 Max. Board Thickness: .062"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 5:1 Through-Hole  
 Min. Conductor Width/Space: .0035"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Periodic Reverse Plate, Pulse Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Embedded Resistors, Foil Lamination, Sequential Lamination

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-04-005311), VQ(VQE-07-012236), VQ(VQE-07-013506)  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 12  
 Max. Board Thickness: .084"  
 Min. Hole Size: .012" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 7:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Permanganate Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL  
 Additional Fab Capabilities: Foil Lamination

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: Custom  
 Qualification Letters: VQ(VQE-04-005311), VQ(VQE-07-012236), VQ(VQE-07-013506)  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 19.5" x 24"  
 Max. Number of Layers: 19  
 Max. Board Thickness: .153"  
 Min. Hole Size: .02" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 7.6:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG  
 Additional Fab Capabilities: Copper Core, Foil Lamination

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Firan Technology Group</b> 250 Finchdene Square, Scarborough, Ontario Canada M1X 1A5	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> L2665 <b>Phone:</b> 416-299-4000 <b>Fax:</b> 416-292-4308 <b>E-Mail:</b> info@ftgcorp.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-05-009339, VQE-06-010764, VQE-06-010889  
 Rigid Base Material: BI: Aramid Fabric, Nonwoven, Polyimide Resin  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 20  
 Max. Board Thickness: .22"  
 Min. Hole Size: .005" Laser Abated Plated Hole Size Before Plating, .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1:1 Microvia, 7:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL, Hot Oil Reflow of Plated Sn/Pb, ImmAg  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-05-009339, VQE-06-010764, VQE-06-010889  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 20  
 Max. Board Thickness: .22"  
 Min. Hole Size: .005" Laser Abated Plated Hole Size Before Plating, .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1:1 Microvia, 7:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL, Hot Oil Reflow of Plated Sn/Pb, ImmAg

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-05-009339, VQE-06-010764, VQE-06-010889  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 20  
 Max. Board Thickness: .22"  
 Min. Hole Size: .005" Laser Abated Plated Hole Size Before Plating, .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1:1 Microvia, 7:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL, Hot Oil Reflow of Plated Sn/Pb, ImmAg

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Firan Technology Group</b> 250 Finchdene Square, Scarborough, Ontario Canada M1X 1A5	<b>PLANT LOCATION:</b> Same Address as Manufacturer	CAGE Code: L2665 Phone: 416-299-4000 Fax: 416-292-4308 EMail: info@ftgcorp.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-05-009339, VQE-06-010764, VQE-06-010889  
 Rigid Base Material: GM: Glass Base, Woven, Triazine and/or Bismaleimide Modified Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 20  
 Max. Board Thickness: .22"  
 Min. Hole Size: .005" Laser Abated Plated Hole Size Before Plating, .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1:1 Microvia, 7:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL, Hot Oil Reflow of Plated Sn/Pb, ImmAg

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Global Innovations Corp.</b> 901 Hensley Drive, Wylie, TX, 75098 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 04RV5 <b>Phone:</b> 214-291-1427 <b>Fax:</b> <b>EMail:</b> bnoiland@globalinnovationcorp.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-03-4341, VQE-04-5599, VQE-04-5891, VQE-05-7288  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 18  
 Max. Board Thickness: .119"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 7.5:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.005"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: HASL  
 Additional Fab Capabilities: Foil Lamination

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-04-4957, VQE-05-7288  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 12  
 Max. Board Thickness: .074"  
 Min. Hole Size: .012" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 6.2:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: HASL  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/6  
 Qualification Letters: VQE-07-013270, VQE-09-017797, VQE-10-020600  
 Rigid Base Material: GR: Glass Base, Nonwoven, Polytetrafluoroethylene Resin, Flame Resistant  
 Max. Panel Size: 9" x 16"  
 Max. Number of Layers: 2  
 Max. Board Thickness: .098"  
 Min. Hole Size: .031" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 3.2:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Sodium Treatment  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: Electrolytic Ni / Hard Au, HASL



**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<p>MANUFACTURER INFORMATION:  <b>Global Innovations Corp.</b>            901 Hensley Drive, Wylie, TX, 75098 US</p>	<p>PLANT LOCATION:            Same Address as Manufacturer</p>	<p>CAGE Code: 04RV5            Phone: 214-291-1427            Fax:            EMail: bnoiland@globalinnovationcorp.com</p>
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/6  
 Qualification Letters: VQE-11-021947  
 Rigid Base Material: GY: Glass Base, Woven, Polytetrafluoroethylene Resin, Flame Resistant, for Microwave Application  
 Max. Panel Size: 12" x 17"  
 Max. Number of Layers: 2  
 Max. Board Thickness: .031"  
 Min. Hole Size: .039" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Sodium Treatment  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Finish System: Hot Oil Reflow of Plated Sn/Pb

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<p>MANUFACTURER INFORMATION:  <b>Gorilla Circuits</b>          1445 Old Oakland Rd, San Jose, CA, 95112 US</p>		<p>CAGE Code: 3C7D2          Phone: 408-294-9897          Fax: 408-297-1540          EMail: info@gorillacircuits.com</p>
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: 11-022314  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 18  
 Max. Board Thickness: .18"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 18:1 Through-Hole, 1:1 Microvia  
 Min. Conductor Width/Space: .004"/.005"  
 Hole Preparation: Permanganate Desmear, Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Pulse Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: 11-022314  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 18  
 Max. Board Thickness: .093"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1:1 Microvia, 9.3:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.005"  
 Hole Preparation: Permanganate Desmear, Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Pulse Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<p>MANUFACTURER INFORMATION:  <b>Graphic Plc</b>  , Down End, Lords Meadow Industrial Estate, Crediton,  Devon, EX17 1HN United Kingdom</p>	<p>PLANT LOCATION:  Same Address as Manufacturer</p>	<p>CAGE Code: U4538  Phone: 44-1363-774874  Fax: 44-1363-772265  EMail:</p>
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
Qualification Letters: VQE-11-023205, VQE-12-025118  
Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
Max. Panel Size: 12" x 18"  
Max. Number of Layers: 10  
Max. Board Thickness: .11" (2.79mm)  
Min. Hole Size: .012" Drilled Plated-Through Hole Before Plating  
Aspect Ratio: 8.4:1 Through-Hole  
Min. Conductor Width/Space: .004"/.004"  
Hole Preparation: Plasma Desmear  
Hole Wall Conductive Coating: Electroless Copper  
Copper Plating: Pulse Plate  
Solder Resist: Liquid Photoimageable  
Finish System: ENIG, HASL  
Additional Fab Capabilities: Foil Lamination

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
Qualification Letters: VQE-12-025119  
Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
Max. Panel Size: 12" x 18"  
Max. Number of Layers: 10  
Max. Board Thickness: .11" (2.79mm)  
Min. Hole Size: .012" Drilled Plated-Through Hole Before Plating  
Aspect Ratio: 8.4:1 Through-Hole  
Min. Conductor Width/Space: .004"/.004"  
Hole Preparation: Plasma Desmear, Plasma Etchback  
Hole Wall Conductive Coating: Electroless Copper  
Copper Plating: Pulse Plate  
Solder Resist: Liquid Photoimageable  
Finish System: ENIG, HASL  
Additional Fab Capabilities: Foil Lamination

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Hamby Corporation</b> 27704 Avenue Scott, Valencia, CA, 91355 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 07284 <b>Phone:</b> 661-257-1924 <b>Fax:</b> 661-257-1213 <b>E-Mail:</b> susharp@hambycorp.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-09-017349  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 6  
 Max. Board Thickness: .035"  
 Min. Hole Size: .02" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 2:1 Through-Hole  
 Min. Conductor Width/Space: .009"/.009"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Finish System: Electrolytic Ni / Hard Au, HASL

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-08-14596  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Adhesiveless Polyimide  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 11  
 Max. Board Thickness: .085"  
 Min. Hole Size: .018" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 5:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Finish System: Electrolytic Ni / Hard Au, HASL  
 Controlled Impedance: Differential, Single-Ended  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-09-017349  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 6  
 Max. Board Thickness: .035"  
 Min. Hole Size: .02" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 2:1 Through-Hole  
 Min. Conductor Width/Space: .009"/.009"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Finish System: Electrolytic Ni / Hard Au, HASL

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<p>MANUFACTURER INFORMATION:  <b>Hamby Corporation</b>                  27704 Avenue Scott, Valencia, CA, 91355 US</p>	<p>PLANT LOCATION:                  Same Address as Manufacturer</p>	<p>CAGE Code: 07284                  Phone: 661-257-1924                  Fax: 661-257-1213                  EMail: susharp@hambycorp.com</p>
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-08-14596  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Polyimide with Acrylic Adhesive  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 11  
 Max. Board Thickness: .095"  
 Min. Hole Size: .018" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 5:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Finish System: Electrolytic Ni / Hard Au, HASL  
 Controlled Impedance: Differential, Single-Ended  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Hans Brockstedt GmbH</b> Clara-Immerwahr Strasse 7, 24145 Kiel Germany	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> C4831 <b>Phone:</b> 0049-431-71966-0, -30 <b>Fax:</b> 0049-431-71966-29 <b>E-Mail:</b> klammer@brockstedt.de
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-03-2619, VQE-05-7480  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 9" x 13", 13" x 20", 15" x 21", 18" x 24"  
 Max. Number of Layers: 12  
 Max. Board Thickness: .2"  
 Min. Hole Size: .004" Laser Abated Plated Hole Size Before Plating, .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1:1 Microvia, 7:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-03-2619, VQE-05-7480  
 Composition: S - Homogenous thermosetting base material printed boards  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Adhesiveless Polyimide  
 Max. Panel Size: 9" x 13", 13" x 20"  
 Max. Number of Layers: 12  
 Max. Board Thickness: .2"  
 Min. Hole Size: .004" Laser Abated Plated Hole Size Before Plating, .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1:1 Microvia, 7:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3  
 Qualification Letters: VQE-03-2619, VQE-05-7480, VQE-13-25594  
 Composition: S - Homogenous thermosetting base material printed boards  
 Flex Base Material: Copper Clad Polyimide with Acrylic Adhesive  
 Max. Panel Size: 9" x 13", 13" x 20"  
 Max. Number of Layers: 2  
 Max. Board Thickness: .01"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Hans Brockstedt GmbH</b> Clara-Immerwahr Strasse 7, 24145 Kiel Germany	<b>PLANT LOCATION:</b> Same Address as Manufacturer	CAGE Code: C4831 Phone: 0049-431-71966-0, -30 Fax: 0049-431-71966-29 EMail: klammer@brockstedt.de
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-03-2619, VQE-05-7480  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 9" x 13", 13" x 20", 15" x 21", 18" x 24"  
 Max. Number of Layers: 12  
 Max. Board Thickness: .2"  
 Min. Hole Size: .004" Laser Abated Plated Hole Size Before Plating, .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1:1 Microvia, 7:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<p>MANUFACTURER INFORMATION:  <b>Hughes Circuits, Inc.</b>                      540 S. Pacific Street, San Marcos, CA, 92078-4056 US</p>	<p>PLANT LOCATION:                      Same Address as Manufacturer</p>	<p>CAGE Code: 1KXU6                      Phone: 760-744-0300                      Fax: 760-744-6388                      EMail: joe@hughescircuits.com</p>
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-08-015865), VQE-12-24783  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .08"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 7:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Graphite-based  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: HASL

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-07-014018), VQE-12-24783  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .08"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 7:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Graphite-based  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: HASL



**SECTION I  
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<p>MANUFACTURER INFORMATION: <b>KCA Electronics, Inc.</b> 223 N. Crescent Way, Anaheim, CA, 92801 US</p>		<p>CAGE Code: 1VUH8 Phone: 714-239-2433 Fax: 714-239-2455 EMail:</p>
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-11-022964  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .0548"  
 Min. Hole Size: .04" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1.37:1 Through-Hole  
 Min. Conductor Width/Space: .01"/.01"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: HASL  
 Additional Fab Capabilities: Foil Lamination

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-11-021796  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Adhesiveless Polyimide  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 16  
 Max. Board Thickness: .074"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 7:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: HASL  
 Additional Fab Capabilities: Blind Vias, Foil Lamination, Sequential Lamination  
 Flex Usage: Use A (Flex During Installation)

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3  
 Qualification Letters: VQE-11-021796  
 Flex Base Material: Copper Clad Polyimide with Acrylic Adhesive  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 1  
 Max. Board Thickness: .008"  
 Min. Conductor Width/Space: .004"/.006"  
 Finish System: HASL  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)

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**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

**MANUFACTURER INFORMATION:**

**KCA Electronics, Inc.**

223 N. Crescent Way, Anaheim, CA, 92801 US

CAGE Code: 1VUH8

Phone: 714-239-2433

Fax: 714-239-2455

E-Mail:

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2

Qualification Letters: VQE-11-022398

Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant

Max. Panel Size: 18" x 24"

Max. Number of Layers: 20

Max. Board Thickness: .092"

Min. Hole Size: .0079" Drilled Plated-Through Hole Before Plating

Aspect Ratio: 7:1 Through-Hole

Min. Conductor Width/Space: .0048"/.004"

Hole Preparation: Plasma Desmear

Hole Wall Conductive Coating: Electroless Copper

Copper Plating: Direct Current Plate

Hole Fill/Via Plug: Non-Conductive

Solder Resist: Dry Film, Liquid Photoimageable

Finish System: HASL

Additional Fab Capabilities: Buried Vias, Embedded Resistors, Foil Lamination, Sequential Lamination

Controlled Impedance: Differential, Single-Ended

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LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Lockheed Martin Mission Systems &amp; Sensors</b> 1801 State Route 17C, Owego, NY, 13827 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 03640 <b>Phone:</b> 607-751-5395 <b>Fax:</b> 607-751-7714 <b>E-Mail:</b> renee.akers@lmco.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-00-0961, VQE-99-0130  
 Rigid Base Material: AF: Aramid Fabric, Woven, Majority Polyfunctional Epoxy Resin  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 16  
 Max. Board Thickness: .2"  
 Min. Hole Size: .02" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 8:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: Electrolytic Ni / Hard Au, HASL, Hot Oil Reflow of Plated Sn/Pb

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-01-0539  
 Rigid Base Material: BI: Aramid Fabric, Nonwoven, Polyimide Resin  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 14  
 Max. Board Thickness: .095"  
 Min. Hole Size: .014" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 6.8:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: Electrolytic Ni / Hard Au, HASL, Hot Oil Reflow of Plated Sn/Pb

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-00-0961, VQE-07-013268, VQE-07-013459, VQE-99-0130  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 24" x 30"  
 Max. Number of Layers: 24  
 Max. Board Thickness: .2"  
 Min. Hole Size: .018" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 8:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: Electrolytic Ni / Hard Au, HASL, Hot Oil Reflow of Plated Sn/Pb

**SECTION I  
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Lockheed Martin Mission Systems &amp; Sensors</b> 1801 State Route 17C, Owego, NY, 13827 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 03640 <b>Phone:</b> 607-751-5395 <b>Fax:</b> 607-751-7714 <b>E-Mail:</b> renee.akers@lmco.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-00-0961, VQE-07-13459, VQE-99-0130  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 24" x 30"  
 Max. Number of Layers: 16  
 Max. Board Thickness: .2"  
 Min. Hole Size: .018" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 8:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: Electrolytic Ni / Hard Au, HASL, Hot Oil Reflow of Plated Sn/Pb

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-00-0684, VQE-07-13459  
 Composition: S - Homogenous thermosetting base material printed boards  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Adhesiveless Polyimide  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 18  
 Max. Board Thickness: .11"  
 Min. Hole Size: .016" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 6:1 Through-Hole  
 Min. Conductor Width/Space: .003"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: HASL, Hot Oil Reflow of Plated Sn/Pb  
 Flex Usage: Use A (Flex During Installation)

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-00-0684, VQE-07-13459  
 Composition: S - Homogenous thermosetting base material printed boards  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Polyimide with Acrylic Adhesive  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 18  
 Max. Board Thickness: .11"  
 Min. Hole Size: .016" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 6:1 Through-Hole  
 Min. Conductor Width/Space: .003"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: HASL, Hot Oil Reflow of Plated Sn/Pb  
 Flex Usage: Use A (Flex During Installation)

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**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Micom Corp.</b> 475 Old Highway 8 NW, New Brighton, MN, 55112 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 34076 <b>Phone:</b> 651-604-2625 <b>Fax:</b> 651-636-1352 <b>E-Mail:</b> kmoe@micomcircuits.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-02-002780, VQE-03-002980, VQE-12-023661  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 28  
 Max. Board Thickness: .239"  
 Min. Hole Size: .007" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 11:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Permanganate Etchback, Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Embedded Resistors, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-02-002780, VQE-03-002980, VQE-12-023661  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 28  
 Max. Board Thickness: .239"  
 Min. Hole Size: .007" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 11:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Permanganate Etchback, Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

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**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

MANUFACTURER INFORMATION: <b>Midwest Printed Circuit Services</b> 1741 Circuit Drive, Round Lake Beach, IL, 60073 US		CAGE Code: 0YYS4 Phone: 847-740-4120 Fax: 847-740-4187 EMail:
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-13-025705  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .1"  
 Min. Hole Size: .023" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 4:1 Through-Hole  
 Min. Conductor Width/Space: .01"/.01"  
 Hole Preparation: Permanganate Desmear, Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-12-024841, VQE-12-025070, VQE-13-025727  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 12  
 Max. Board Thickness: .1"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 9.3:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL  
 Additional Fab Capabilities: Controlled Depth Mechanically Drilled Low Aspect Ratio Blind Vias, Foil Lamination  
 Controlled Impedance: Differential

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LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<p>MANUFACTURER INFORMATION: <b>Pioneer Circuits, Inc.</b> 3000 S. Shannon Street, Santa Ana, CA, 92704-6321 US</p>		<p>CAGE Code: 65723 Phone: 714-641-3132 Fax: 714-641-3120 EMail: Quality@pioneercircuits.com</p>
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-09-017323, VQE-09-017656  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 22  
 Max. Board Thickness: .177"  
 Min. Hole Size: .0135" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 11:1 Through-Hole  
 Min. Conductor Width/Space: .0035"/.0035"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Periodic Reverse Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni/Au, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-09-017323, VQE-09-017656  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 20  
 Max. Board Thickness: .275"  
 Min. Hole Size: .012" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 11:1 Through-Hole  
 Min. Conductor Width/Space: .0035"/.0035"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Periodic Reverse Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni/Au, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-09-017323, VQE-09-017656, VQE-10-029651  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Flex Base Material: Copper Clad Adhesiveless Polyimide  
 Max. Panel Size: 18" x 26"  
 Max. Number of Layers: 22  
 Max. Board Thickness: .231"  
 Min. Hole Size: .02" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 8.5:1 Through-Hole  
 Min. Conductor Width/Space: .003"/.003"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Periodic Reverse Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni/Au, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended  
 Flex Usage: Use A (Flex During Installation)

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<p>MANUFACTURER INFORMATION:  <b>Pioneer Circuits, Inc.</b>          3000 S. Shannon Street, Santa Ana, CA, 92704-6321          US</p>		<p>CAGE Code: 65723          Phone: 714-641-3132          Fax: 714-641-3120          EMail: Quality@pioneercircuits.com</p>
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-09-017323, VQE-09-017656  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Polyimide with Acrylic Adhesive  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .1"  
 Min. Hole Size: .016" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 6:1 Through-Hole  
 Min. Conductor Width/Space: .0035"/.0035"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Periodic Reverse Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni/Au, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Blind Vias, Book Binder, Buried Vias, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-09-017323, VQE-09-017656  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Adhesiveless Polyimide  
 Max. Panel Size: 24" x 36"  
 Max. Number of Layers: 26  
 Max. Board Thickness: .185"  
 Min. Hole Size: .013" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 11:1 Through-Hole  
 Min. Conductor Width/Space: .0035"/.0035"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Periodic Reverse Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni/Au, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Blind Vias, Book Binder, Buried Vias, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)



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**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

MANUFACTURER INFORMATION: <b>PNC, Inc.</b> 115 East Centre Street, Nutley, NJ, 07110 US		CAGE Code: 66766 Phone: 973-284-1600 Fax: EMail: carmela@pnconline.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
Qualification Letters: VQE-10-19440  
Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
Max. Panel Size: 18" x 22"  
Max. Number of Layers: 10  
Max. Board Thickness: .093"  
Min. Hole Size: .014" Drilled Plated-Through Hole Before Plating  
Aspect Ratio: 6.6:1 Through-Hole  
Min. Conductor Width/Space: .008"/.008"  
Hole Preparation: Permanganate Desmear  
Hole Wall Conductive Coating: Electroless Copper  
Copper Plating: Direct Current Plate  
Solder Resist: Liquid Photoimageable  
Finish System: HASL  
Additional Fab Capabilities: Foil Lamination

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<p>MANUFACTURER INFORMATION:  <b>Printed Circuits, Inc.</b>                  1200 West 96th Street, Bloomington, MN, 55431 US</p>	<p>PLANT LOCATION:                  Same Address as Manufacturer</p>	<p>CAGE Code: 65114                  Phone: 612-888-7900                  Fax: 612-888-2719                  EMail: jsmith@printedcircuits.com</p>
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-01-000024  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Adhesiveless Polyimide  
 Max. Panel Size: 12" x 18", 18" x 24"  
 Max. Number of Layers: 16  
 Max. Board Thickness: .12"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 10:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.005"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Pulse Plate  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Sequential Lamination  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<p>MANUFACTURER INFORMATION:  <b>Pro-Tech Interconnect Solutions LLC</b>          4300 Peavey Road, Chaska, MN, 55318 US</p>		<p>CAGE Code: 3CP65          Phone: 952-442-2189          Fax: 952-442-2472          EMail: hkooda@protechmn.com</p>
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-11-021704  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 12" x 24"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .1"  
 Min. Hole Size: .024" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 4:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: HASL

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-11-021704  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .1"  
 Min. Hole Size: .024" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 4:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: HASL

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<p>MANUFACTURER INFORMATION:  <b>Sanmina-SCI (Costa Mesa)</b>                  2945 Airway Avenue, Costa Mesa, CA, 92626 US</p>		<p>CAGE Code: 3BKL5                  Phone: 714-371-2800                  Fax: 714-371-2833                  EMail: joann.medina@sanmina-sci.com</p>
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-12-024031  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 8  
 Max. Board Thickness: .063"  
 Min. Hole Size: .005" Laser Abated Plated Hole Size Before Plating, .013" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1:1 Microvia, 5:1 Through-Hole  
 Min. Conductor Width/Space: .003"/.003"  
 Hole Preparation: Permanganate Desmear, Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: Electrolytic Ni / Soft Au, HASL  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination, Press Fit Mounting, Sequential Lamination  
 Controlled Impedance: Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-12-24471  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 18  
 Max. Board Thickness: .093"  
 Min. Hole Size: .013" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 7 : 1 Through-Hole  
 Min. Conductor Width/Space: .003"/.0035"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: Electrolytic Ni / Soft Au, HASL  
 Additional Fab Capabilities: Foil Lamination  
 Controlled Impedance: Single-Ended

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<p>MANUFACTURER INFORMATION:  <b>Sanmina-SCI (Owego)</b>          1200 Taylor Rd., Owego, NY, 13827 US</p>		<p>CAGE Code: 4GZ84          Phone: 607-689-5543          Fax:          EMail: rick.sylvain@sanmina-sci.com</p>
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-11-21597  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 12  
 Max. Board Thickness: .11"  
 Min. Hole Size: .012" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 9.3:1 Through-Hole  
 Min. Conductor Width/Space: .008"/.0045"  
 Hole Preparation: Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Pulse Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: HASL  
 Additional Fab Capabilities: Foil Lamination

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-11-22386  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 20  
 Max. Board Thickness: .095"  
 Min. Hole Size: .007" Laser Abated Plated Hole Size Before Plating, .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: .59:1 Microvia, 9.7:1 Through-Hole  
 Min. Conductor Width/Space: .0035"/.0032"  
 Hole Preparation: Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Pulse Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: HASL  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Sanmina-SCI (San Jose)</b> 2050 Bering Drive, San Jose, CA, 95131 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 3DR67 <b>Phone:</b> 408-964-6515 <b>Fax:</b> 408-964-6453 <b>E-Mail:</b> darrell.myers@sanmina-sci.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-06-11137, VQE-10-19381, VQE-11-22038  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 21" x 27"  
 Max. Number of Layers: 30  
 Max. Board Thickness: .25"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 14:1 Through-Hole  
 Min. Conductor Width/Space: .003"/.003"  
 Hole Preparation: Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Pulse Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, HASL, Hot Oil Reflow of Plated Sn/Pb, ImmAg, OSP  
 Additional Fab Capabilities: Buried Vias, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-06-11137  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 30  
 Max. Board Thickness: .04"  
 Min. Hole Size: .005" Laser Abated Plated Hole Size Before Plating, .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 15:1 Through-Hole, 1:2 Microvia  
 Min. Conductor Width/Space: .003"/.003"  
 Hole Preparation: Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Pulse Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-06-11137  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 30  
 Max. Board Thickness: .25"  
 Min. Hole Size: .005" Laser Abated Plated Hole Size Before Plating, .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 15:1 Through-Hole, 1:2 Microvia  
 Min. Conductor Width/Space: .003"/.003"  
 Hole Preparation: Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Pulse Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Sanmina-SCI (San Jose)</b> 2050 Bering Drive, San Jose, CA, 95131 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 3DR67 <b>Phone:</b> 408-964-6515 <b>Fax:</b> 408-964-6453 <b>E-Mail:</b> darrell.myers@sanmina-sci.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/2, MIL-PRF-31032/6  
 Qualification Letters: VQE-10-20921, VQE-10-21014  
 Rigid Base Material: Woven Glass Reinforced, Hydrocarbon Resin with Ceramic Fill  
 Max. Panel Size: 21" x 24"  
 Max. Number of Layers: 2  
 Max. Board Thickness: .062"  
 Min. Hole Size: .0197" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 3.1:1 Through-Hole  
 Min. Conductor Width/Space: .008"/.014"  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Pulse Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/5  
 Qualification Letters: VQE-11-021514  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; Woven Glass Reinforced, Hydrocarbon Resin with Ceramic Fill  
 Max. Panel Size: 21" x 24"  
 Max. Number of Layers: 7  
 Max. Board Thickness: .066"  
 Min. Hole Size: .01"  
 Aspect Ratio: 7:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.004"  
 Hole Preparation: Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Pulse Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG  
 Additional Fab Capabilities: Blind Vias, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Speedy Circuits, Inc.</b> 5331 McFadden Avenue, Huntington Beach, CA, 92649-1204 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 66982 <b>Phone:</b> 714-898-4901 <b>Fax:</b> 714-891-0607 <b>E-Mail:</b> sales@speedycircuits.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-08-016434, VQE-10-021007  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 14  
 Max. Board Thickness: .11"  
 Min. Hole Size: .015" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 7:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: Electrolytic Ni (no Au), HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Foil Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-08-016434, VQE-10-021007  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 14  
 Max. Board Thickness: .11"  
 Min. Hole Size: .015" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 7:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Foil Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-08-016434, VQE-10-019157, VQE-10-021007  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Adhesiveless Polyimide  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 18  
 Max. Board Thickness: .13"  
 Min. Hole Size: .002" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 7:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Foil Lamination  
 Controlled Impedance: Differential, Single-Ended  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)



**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Speedy Circuits, Inc.</b> 5331 McFadden Avenue, Huntington Beach, CA, 92649-1204 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 66982 <b>Phone:</b> 714-898-4901 <b>Fax:</b> 714-891-0607 <b>E-Mail:</b> sales@speedycircuits.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/6  
 Qualification Letters: VQE-08-016434  
 Composition: H - Homogenous thermoplastic base material printed boards  
 Rigid Base Material: GR: Glass Base, Nonwoven, Polytetrafluoroethylene Resin, Flame Resistant; GY: Glass Base, Woven, Polytetrafluoroethylene Resin, Flame Resistant, for Microwave Application  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 2  
 Max. Board Thickness: .036"  
 Min. Hole Size: .02" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 2:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Finish System: Hot Oil Reflow of Plated Sn/Pb

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/5, MIL-PRF-31032/6  
 Qualification Letters: VQE-09-018657  
 Composition: M - Mixed based material printed boards  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; With or without woven or non-woven E-glass, Polytetrafluoroethylene (PTFE) resin, ceramic filler  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 10 Woven E-Glass, Hydrocarbon Resin, Ceramic Filler - Homogenous  
 Max. Board Thickness: .1"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 10:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/5, MIL-PRF-31032/6  
 Qualification Letters: VQE-09-018657  
 Composition: S - Homogenous thermosetting base material printed boards  
 Rigid Base Material: Woven Glass Reinforced, Hydrocarbon Resin with Ceramic Fill  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 10 With or Without Woven or Non-woven E-Glass, PTFE Resin, Ceramic Filler and Woven E-Glass, Epoxy Resin - Mixed  
 Max. Board Thickness: .068"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 6:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL, Hot Oil Reflow of Plated Sn/Pb  
 Controlled Impedance: Differential, Single-Ended

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>TTM Technologies (Santa Ana)</b> 2630 South Harbor Boulevard, Santa Ana, CA, 92704 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	CAGE Code: 1WQ42 Phone: 714-241-0303, x3127 Fax: 714-241-0708 EMail: tlichte@ttmtech.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-05-8644, VQE-06-011211  
 Rigid Base Material: G1: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 24  
 Max. Board Thickness: .2"  
 Min. Hole Size: .013" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 14:1 Through-Hole, 1:1 Microvia  
 Min. Conductor Width/Space: .003"/.003"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, HASL, Hot Oil Reflow of Plated Sn/Pb, ImmAg, OSP  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Sequential Lamination

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-05-8644, VQE-06-011211, VQE-12-023569  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 24  
 Max. Board Thickness: .2"  
 Min. Hole Size: .013" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 14:1 Through-Hole, 1:1 Microvia  
 Min. Conductor Width/Space: .003"/.003"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, HASL, Hot Oil Reflow of Plated Sn/Pb, ImmAg, OSP  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Sequential Lamination

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>TTM Technologies (Santa Clara)</b> 407 Mathew Street, Santa Clara, CA, 95050 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 65916 <b>Phone:</b> 408-486-3184 <b>Fax:</b> 408-727-1003 <b>EMail:</b> nellie.gutierrez@ttmtech.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-03-003888, VQE-10-020500, VQE-10-020581, VQE-11-022973  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 20  
 Max. Board Thickness: .12"  
 Min. Hole Size: .012" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 9:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Etchback, Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive  
 Solder Resist: Liquid Photoimageable, Silk Screen  
 Finish System: ENIG, Electrolytic Ni (no Au), Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL  
 Additional Fab Capabilities: Blind Vias, Foil Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-03-003888, VQE-10-020500, VQE-10-020581, VQE-11-022973  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 12  
 Max. Board Thickness: .12"  
 Min. Hole Size: .012" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 9:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive  
 Solder Resist: Liquid Photoimageable, Silk Screen  
 Finish System: ENIG, Electrolytic Ni (no Au), Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL  
 Additional Fab Capabilities: Blind Vias, Foil Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-03-003895, VQE-10-020500, VQE-10-020581, VQE-11-022973  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Adhesiveless Polyimide  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 16  
 Max. Board Thickness: .12"  
 Min. Hole Size: .012" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 9:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive  
 Finish System: ENIG, Electrolytic Ni (no Au), Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL  
 Additional Fab Capabilities: Sequential Lamination  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>TTM Technologies (Santa Clara)</b> 407 Mathew Street, Santa Clara, CA, 95050 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 65916 <b>Phone:</b> 408-486-3184 <b>Fax:</b> 408-727-1003 <b>EMail:</b> nellie.gutierrez@ttmtech.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-03-003895, VQE-10-020500, VQE-10-020581, VQE-11-022973  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Flex Base Material: Copper Clad Polyimide with Acrylic Adhesive  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .1"  
 Min. Hole Size: .031" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 3:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive  
 Finish System: ENIG, Electrolytic Ni (no Au), Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-07-013211, VQE-11-022973  
 Composition: H - Homogenous thermoplastic base material printed boards, M - Mixed based material printed boards  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; Woven Glass Reinforced, Hydrocarbon Resin with Ceramic Fill  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 6  
 Max. Board Thickness: .062"  
 Min. Hole Size: .015" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 4:1 Through-Hole  
 Min. Conductor Width/Space: .007"/.008"  
 Hole Preparation: Permanganate Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni (no Au), Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL  
 Additional Fab Capabilities: Blind Vias  
 Controlled Impedance: Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-03-003888, VQE-10-020500, VQE-10-020581, VQE-11-022973  
 Rigid Base Material: BI: Aramid Fabric, Nonwoven, Polyimide Resin  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 11  
 Max. Board Thickness: .12"  
 Min. Hole Size: .012" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 6.45:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive  
 Solder Resist: Liquid Photoimageable, Silk Screen  
 Finish System: ENIG, Electrolytic Ni (no Au), Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL  
 Additional Fab Capabilities: Blind Vias  
 Controlled Impedance: Differential, Single-Ended

**SECTION I  
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>TTM Technologies (Stafford)</b> 4 Old Monson Road, Stafford, CT, 77497 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 5L706 <b>Phone:</b> 860-684-5881 <b>Fax:</b> 860-684-7425 <b>E-Mail:</b> michele.hebert@ttmtech.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-03-003348, VQE-09-018855, VQE-11-023287, VQE-12-023366  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; Woven E-Glass, Epoxy Resin, Flame Resistant, with Inorganic Filler  
 Max. Panel Size: 30" x 54"  
 Max. Number of Layers: 50  
 Max. Board Thickness: .4"  
 Min. Hole Size: .0079" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 14:1 Through-Hole, 1:1 Microvia  
 Min. Conductor Width/Space: .004"/.003"  
 Hole Preparation: Permanganate Etchback, Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable, Silk Screen  
 Finish System: ENIG, Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL, Hot Oil Reflow of Plated Sn/Pb, Ni/Pd/Au  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Copper Core, Copper Invar Copper, Embedded Resistors, Press Fit Mounting, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-03-003348, VQE-09-018855, VQE-11-023287, VQE-12-023366  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 32  
 Max. Board Thickness: .13"  
 Min. Hole Size: 11.8" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 11:1 Through-Hole, 1:1 Microvia  
 Min. Conductor Width/Space: .004"/.003"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable, Silk Screen  
 Finish System: ENIG, Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL, Hot Oil Reflow of Plated Sn/Pb, Ni/Pd/Au  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Copper Core, Copper Invar Copper, Embedded Resistors, Press Fit Mounting, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-03-003348, VQE-09-018855, VQE-11-023287  
 Rigid Base Material: AF: Aramid Fabric, Woven, Majority Polyfunctional Epoxy Resin  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .1"  
 Min. Hole Size: .032" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1:1 Microvia, 3:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.003"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable, Silk Screen  
 Finish System: ENIG, Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL, Hot Oil Reflow of Plated Sn/Pb, Ni/Pd/Au  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Sequential Lamination,  
 Controlled Impedance: Differential, Single-Ended

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>TTM Technologies (Stafford)</b> 4 Old Monson Road, Stafford, CT, 77497 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 5L706 <b>Phone:</b> 860-684-5881 <b>Fax:</b> 860-684-7425 <b>E-Mail:</b> michele.hebert@ttmtech.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-03-003348, VQE-09-018855, VQE-11-023287, VQE-12-023366  
 Rigid Base Material: BI: Aramid Fabric, Nonwoven, Polyimide Resin  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .1"  
 Min. Hole Size: .0118" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1:1 Microvia, 6:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.003"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable, Silk Screen  
 Finish System: ENIG, Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL, Hot Oil Reflow of Plated Sn/Pb, Ni/Pd/Au  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Sequential Lamination,  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-03-003348, VQE-09-018855, VQE-11-023287  
 Rigid Base Material: GM: Glass Base, Woven, Triazine and/or Bismaleimide Modified Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .1"  
 Min. Hole Size: .032" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1:1 Microvia, 3:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.003"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable, Silk Screen  
 Finish System: ENIG, Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL, Hot Oil Reflow of Plated Sn/Pb, Ni/Pd/Au  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Sequential Lamination,  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: Custom  
 Qualification Letters: VQE-03-003348, VQE-10-019855, VQE-11-023287  
 Rigid Base Material: With or without woven or non-woven E-glass, Polytetrafluoroethylene (PTFE) resin, ceramic filler  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 12  
 Max. Board Thickness: .11"  
 Min. Hole Size: .0197" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 3.3:1 Through-Hole  
 Min. Conductor Width/Space: .006"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable, Silk Screen  
 Finish System: ENIG, Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL, Hot Oil Reflow of Plated Sn/Pb, Ni/Pd/Au  
 Additional Fab Capabilities: Embedded Resistors  
 Controlled Impedance: Differential, Single-Ended

**SECTION I  
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>TTM Technologies (Stafford)</b> 4 Old Monson Road, Stafford, CT, 77497 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 5L706 <b>Phone:</b> 860-684-5881 <b>Fax:</b> 860-684-7425 <b>EMail:</b> michele.hebert@ttmtech.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: Custom  
 Qualification Letters: VQE-03-003348, VQE-10-019855, VQE-11-023287  
 Composition: M - Mixed based material printed boards  
 Rigid Base Material: Woven Glass Reinforced, Hydrocarbon Resin with Ceramic Fill  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 24  
 Max. Board Thickness: .175"  
 Min. Hole Size: .0177" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 9:1 Through-Hole  
 Min. Conductor Width/Space: .006"/.004"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable, Silk Screen  
 Finish System: ENIG, Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL, Hot Oil Reflow of Plated Sn/Pb, Ni/Pd/Au  
 Additional Fab Capabilities: Buried Vias, Embedded Resistors  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-03-003349, VQE-09-018855, VQE-10-019456, VQE-11-023287, VQE-12-023366  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; GI: Glass Base, Woven, Polyimide Resin, Heat Resistant; Woven E-Glass, Epoxy Resin, Flame Resistant, with Inorganic Filler  
 Flex Base Material: Copper Clad Adhesiveless Polyimide  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 24  
 Max. Board Thickness: .125"  
 Min. Hole Size: .013" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1:1 Microvia, 9:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.003"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable, Silk Screen  
 Finish System: ENIG, Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL, Hot Oil Reflow of Plated Sn/Pb, Ni/Pd/Au  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Copper Core, Sequential Lamination  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>TTM Technologies (Stafford)</b> 4 Old Monson Road, Stafford, CT, 77497 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 5L706 <b>Phone:</b> 860-684-5881 <b>Fax:</b> 860-684-7425 <b>E-Mail:</b> michele.hebert@ttmtech.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-03-003349, VQE-10-019456, VQE-11-023287  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; GI: Glass Base, Woven, Polyimide Resin, Heat Resistant; Woven E-Glass, Epoxy Resin, Flame Resistant, with Inorganic Filler  
 Flex Base Material: Copper Clad Polyimide with Acrylic Adhesive  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 11  
 Max. Board Thickness: .07"  
 Min. Hole Size: .35" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1:1 Microvia, 2:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.003"  
 Hole Preparation: Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable, Silk Screen  
 Finish System: ENIG, Electrolytic Ni / Hard Au, Electrolytic Ni / Soft Au, HASL, Hot Oil Reflow of Plated Sn/Pb, Ni/Pd/Au  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Sequential Lamination,  
 Controlled Impedance: Differential, Single-Ended  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)



**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Unicircuit, Inc.</b> 8192 Southpark Lane, Littleton, CO, 80120 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 66311 <b>Phone:</b> 303-730-0505, x110 <b>Fax:</b> <b>EMail:</b> blageman@unicircuit.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-07-13789, VQE-09-17422, VQE-11-23044  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 12" x 18"  
 Max. Number of Layers: 16  
 Max. Board Thickness: .12"  
 Min. Hole Size: .006" Laser Abated Plated Hole Size Before Plating, .02" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 6:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Pulse Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: HASL, Hot Oil Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-09-17422, VQE-12-24296  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 20" x 26"  
 Max. Number of Layers: 16  
 Max. Board Thickness: .12"  
 Min. Hole Size: .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 15:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Pulse Plate  
 Hole Fill/Via Plug: Conductive, Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: HASL, Hot Oil Reflow of Plated Sn/Pb  
 Controlled Impedance: Differential, Single-Ended

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<p>MANUFACTURER INFORMATION:  <b>Vermont Circuits, Inc.</b>          76 Technology Drive, Brattleboro, VT, 05302-1890 US</p>		<p>CAGE Code: 65200          Phone:          Fax:          EMail:</p>
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-10-019275, VQE-11-022979  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24", 18" x 24"  
 Max. Number of Layers: 12  
 Max. Board Thickness: .1"  
 Min. Hole Size: .012" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 7.5:1 Through-Hole  
 Min. Conductor Width/Space: .005"/.005"  
 Hole Preparation: Permanganate Desmear, Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL  
 Additional Fab Capabilities: Foil Lamination  
 Controlled Impedance: Differential

**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Viasystems Corporation (CA)</b> 355 Turtle Creek Court, San Jose, CA, 95125-1316 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	CAGE Code: 0MHG5 Phone: 408-938-7219 Fax: 408-280-0641 EMail: arnold.amaral@viasystems.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-08-016481), VQ(VQE-08-016632)  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 20  
 Max. Board Thickness: .13"  
 Min. Hole Size: .004" Laser Abated Plated Hole Size Before Plating, .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 0.8:1 Microvia, 10:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Pulse Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni, Electrolytic Ni / Hard Au, HASL  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-08-016481), VQ(VQE-08-016632)  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 20  
 Max. Board Thickness: .13"  
 Min. Hole Size: .008" Drilled Plated-Through Hole Before Plating, .008" Laser Abated Plated Hole Size Before Plating  
 Aspect Ratio: 0.8:1 Microvia, 10:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Pulse Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**SECTION I  
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Viasystems Corporation (OR)</b> 1521 Poplar Lane, Forest Grove, OR, 97116 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 01KV9 <b>Phone:</b> (503) 992-4068 <b>Fax:</b> <b>EMail:</b> dennis.hammer@viasystems.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-10-019896)  
 Composition: M - Mixed based material printed boards  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; Woven Glass Reinforced, Hydrocarbon Resin with Ceramic Fill  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 6  
 Max. Board Thickness: .062"  
 Min. Hole Size: .016" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 4:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL, ImmAg  
 Additional Fab Capabilities: Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-09-017325), VQ(VQE-09-018901), VQ(VQE-10-019896)  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 26  
 Max. Board Thickness: .13"  
 Min. Hole Size: .003" Laser Abated Plated Hole Size Before Plating, .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 0.8:1 Microvia, 10:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL, ImmAg  
 Additional Fab Capabilities: Blind Vias, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQ(VQE-09-017325), VQ(VQE-09-018901), VQ(VQE-10-019896)  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 26  
 Max. Board Thickness: .13"  
 Min. Hole Size: .003" Laser Abated Plated Hole Size Before Plating, .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 0.8:1 Microvia, 10:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Plasma Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni / Hard Au, HASL, ImmAg  
 Additional Fab Capabilities: Blind Vias, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**SECTION II**  
**LIST OF MANUFACTURERS AND ASSOCIATED SPECIFICATION**

**AC Universal Circuits LLC**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 8860 Zachary Lane North, Maple Grove, MN, 55369-4524 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 45032  MIL-PRF-31032/3  MIL-PRF-31032/6

**Accurate Circuit Engineering**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 3019 S. Kilson Drive, Santa Ana, CA, 92707 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 0MNN9  MIL-PRF-31032/3  MIL-PRF-31032/6

**Advanced Circuits - Tempe Division**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 229 S. Clark Drive, Tempe, AZ, 85281-3073  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 6RJS1  MIL-PRF-31032/3  MIL-PRF-31032/6

**Airborn Flexible Circuits, Inc.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 11 Dohme Avenue, Toronto, Ontario Canada M4B 1Y7  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 38661  MIL-PRF-31032/3  MIL-PRF-31032/6

**American Standard Circuits**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 475 Industrial Drive, West Chicago, IL, 60185 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 4AA34  MIL-PRF-31032/3  MIL-PRF-31032/6

**Amphenol Printed Circuits**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 91 Northeastern Boulevard, Nashua, NH, 03062 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 57034  MIL-PRF-31032/3  MIL-PRF-31032/6

**Calumet Electronics Corp.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 25830 Depot Street, Calumet, MI, 49913-1985 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 65337  MIL-PRF-31032/3  MIL-PRF-31032/6

**Cirexx International, Inc.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 791 Nuttman Street, Santa Clara, CA, 95054 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 4MEG7  MIL-PRF-31032/3  MIL-PRF-31032/6

**Colonial Circuits, Inc.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 1026 Warrenton Road, Fredericksburg, VA, 22406-6200 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 6T499  MIL-PRF-31032/3  MIL-PRF-31032/6

**Cosmotronic, Inc.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 16721 Noyes Avenue, Irvine, CA, 92606 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 63695  MIL-PRF-31032/3  MIL-PRF-31032/6

**DDi Cleveland Corp.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 7 Ascot Parkway, Cuyahoga Falls, OH, 44223 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 7Z463  MIL-PRF-31032/3  MIL-PRF-31032/6

**DDi Denver Corp.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 10570 Bradford Road, Littleton, CO, 80127 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 75815  MIL-PRF-31032/3  MIL-PRF-31032/6

**DDI Global Corp. - Anaheim**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 1220 N. Simon Circle, Anaheim, CA, 92806 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 0BSG1  MIL-PRF-31032/3  MIL-PRF-31032/6

**DDI Global Corp. - Sterling, VA**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 1200 Severn Way, Dulles, VA, 20166-8904 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 0K703  MIL-PRF-31032/3  MIL-PRF-31032/6

**SECTION II**  
**LIST OF MANUFACTURERS AND ASSOCIATED SPECIFICATION**

**DDi Milpitas Corporation**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 1992 Tarob Court, Milpitas, CA, 95035  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 0SFV5  MIL-PRF-31032/3  MIL-PRF-31032/6

**DDi North Jackson Corp.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 12080 DeBartolo Drive, North Jackson, OH, 44451 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 0GN71  MIL-PRF-31032/3  MIL-PRF-31032/6

**DDi Toronto Corp.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 8150 Sheppard Avenue East, Scarborough, Ontario Canada M1B 5K2  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 3AF82  MIL-PRF-31032/3  MIL-PRF-31032/6

**Dynamic & Proto Circuits, Inc.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 869 Barton Street, Stoney Creek, Ontario Canada L8E 5G6  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 38898  MIL-PRF-31032/3  MIL-PRF-31032/6

**Electro Plate Circuitry, Inc.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 1430 Century Drive, Carrollton, TX, 75006 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 79616  MIL-PRF-31032/3  MIL-PRF-31032/6

**Electrotek Corp.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 7745 S. 10th Street, Oak Creek, WI, 53154 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 66030  MIL-PRF-31032/3  MIL-PRF-31032/6

**Endicott Interconnect Technologies, Inc.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 Dept. 0069/014-3, 1093 Clark Street, Endicott, NY, 13760 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 3ECL3  MIL-PRF-31032/3  MIL-PRF-31032/6

**Firan Technology Group**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 250 Finchdene Square, Scarborough, Ontario Canada M1X 1A5  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: L2665  MIL-PRF-31032/3  MIL-PRF-31032/6

**Global Innovations Corp.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 901 Hensley Drive, Wylie, TX, 75098 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 04RV5  MIL-PRF-31032/3  MIL-PRF-31032/6

**Gorilla Circuits**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 1445 Old Oakland Rd, San Jose, CA, 95112 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 3C7D2  MIL-PRF-31032/3  MIL-PRF-31032/6

**Graphic Plc**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 , Down End, Lords Meadow Industrial Estate, Crediton, Devon, EX17 IHN  MIL-PRF-31032/2  MIL-PRF-31032/5  
 United Kingdom  MIL-PRF-31032/3  MIL-PRF-31032/6  
 CAGE Code: U4538

**Hamby Corporation**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 27704 Avenue Scott, Valencia, CA, 91355 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 07284  MIL-PRF-31032/3  MIL-PRF-31032/6

**Hans Brockstedt GmbH**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 Clara-Immerwahr Strasse 7, 24145 Kiel Germany  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: C4831  MIL-PRF-31032/3  MIL-PRF-31032/6

**Hughes Circuits, Inc.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 540 S. Pacific Street, San Marcos, CA, 92078-4056 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 1KXU6  MIL-PRF-31032/3  MIL-PRF-31032/6

**SECTION II**  
**LIST OF MANUFACTURERS AND ASSOCIATED SPECIFICATION**

**KCA Electronics, Inc.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 223 N. Crescent Way, Anaheim, CA, 92801 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 1VUH8  MIL-PRF-31032/3  MIL-PRF-31032/6

**Lockheed Martin Mission Systems & Sensors**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 1801 State Route 17C, Owego, NY, 13827 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 03640  MIL-PRF-31032/3  MIL-PRF-31032/6

**Micom Corp.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 475 Old Highway 8 NW, New Brighton, MN, 55112 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 34076  MIL-PRF-31032/3  MIL-PRF-31032/6

**Midwest Printed Circuit Services**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 1741 Circuit Drive, Round Lake Beach, IL, 60073 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 0YYS4  MIL-PRF-31032/3  MIL-PRF-31032/6

**Pioneer Circuits, Inc.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 3000 S. Shannon Street, Santa Ana, CA, 92704-6321 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 65723  MIL-PRF-31032/3  MIL-PRF-31032/6

**PNC, Inc.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 115 East Centre Street, Nutley, NJ, 07110 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 66766  MIL-PRF-31032/3  MIL-PRF-31032/6

**Printed Circuits, Inc.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 1200 West 96th Street, Bloomington, MN, 55431 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 65114  MIL-PRF-31032/3  MIL-PRF-31032/6

**Pro-Tech Interconnect Solutions LLC**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 4300 Peavey Road, Chaska, MN, 55318 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 3CP65  MIL-PRF-31032/3  MIL-PRF-31032/6

**Sanmina-SCI (Costa Mesa)**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 2945 Airway Avenue, Costa Mesa, CA, 92626 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 3BKL5  MIL-PRF-31032/3  MIL-PRF-31032/6

**Sanmina-SCI (Owego)**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 1200 Taylor Rd., Owego, NY, 13827 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 4GZ84  MIL-PRF-31032/3  MIL-PRF-31032/6

**Sanmina-SCI (San Jose)**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 2050 Bering Drive, San Jose, CA, 95131 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 3DR67  MIL-PRF-31032/3  MIL-PRF-31032/6

**Speedy Circuits, Inc.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 5331 McFadden Avenue, Huntington Beach, CA, 92649-1204 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 66982  MIL-PRF-31032/3  MIL-PRF-31032/6

**TTM Technologies (Santa Ana)**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 2630 South Harbor Boulevard, Santa Ana, CA, 92704 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 1WQ42  MIL-PRF-31032/3  MIL-PRF-31032/6

**TTM Technologies (Santa Clara)**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 407 Mathew Street, Santa Clara, CA, 95050 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 65916  MIL-PRF-31032/3  MIL-PRF-31032/6

**SECTION II**  
**LIST OF MANUFACTURERS AND ASSOCIATED SPECIFICATION**

**TTM Technologies (Stafford)**

4 Old Monson Road, Stafford, CT, 77497 US

CAGE Code: 5L706

- MIL-PRF-31032/1    MIL-PRF-31032/4    Custom  
 MIL-PRF-31032/2    MIL-PRF-31032/5  
 MIL-PRF-31032/3    MIL-PRF-31032/6

**Unicircuit, Inc.**

8192 Southpark Lane, Littleton, CO, 80120 US

CAGE Code: 66311

- MIL-PRF-31032/1    MIL-PRF-31032/4    Custom  
 MIL-PRF-31032/2    MIL-PRF-31032/5  
 MIL-PRF-31032/3    MIL-PRF-31032/6

**Vermont Circuits, Inc.**

76 Technology Drive, Brattleboro, VT, 05302-1890 US

CAGE Code: 65200

- MIL-PRF-31032/1    MIL-PRF-31032/4    Custom  
 MIL-PRF-31032/2    MIL-PRF-31032/5  
 MIL-PRF-31032/3    MIL-PRF-31032/6

**Viasystems Corporation (CA)**

355 Turtle Creek Court, San Jose, CA, 95125-1316 US

CAGE Code: 0MHG5

- MIL-PRF-31032/1    MIL-PRF-31032/4    Custom  
 MIL-PRF-31032/2    MIL-PRF-31032/5  
 MIL-PRF-31032/3    MIL-PRF-31032/6

**Viasystems Corporation (OR)**

1521 Poplar Lane, Forest Grove, OR, 97116 US

CAGE Code: 01KV9

- MIL-PRF-31032/1    MIL-PRF-31032/4    Custom  
 MIL-PRF-31032/2    MIL-PRF-31032/5  
 MIL-PRF-31032/3    MIL-PRF-31032/6