

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

**Date: 8/4/2011**

**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  
Secondary Qualifying Activity Contact: 614-692-0631, e-mail: vqe.bw@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.dssc.dla.mil/offices/sourcing\\_and\\_qualification/offices.asp?section=VQE](http://www.dssc.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**

<p>MANUFACTURER INFORMATION: <b>Accurate Circuit Engineering</b> 3019 S. Kilson Drive, Santa Ana, CA, 92707 US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 0MNN9 Phone: 714-546-2162 Fax: 714-433-7418 EMail: quality@ace-pcb.com</p>
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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: .0118" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 11:1 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: 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

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

<p>MANUFACTURER INFORMATION: <b>American Standard Circuits</b> 475 Industrial Drive, West Chicago, IL, 60185 US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 4AA34 Phone: 603-639-5444 Fax: 603-293-1240 EMail: sales@asc-i.com</p>
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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  
 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: .072"  
 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: Electrolytic Ni / Hard Au, HASL

**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: 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>E-Mail:</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-97-000649  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 24" x 36", 30" x 36"  
 Max. Number of Layers: 28  
 Max. Board Thickness: .322"  
 Min. Hole Size: .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: .5:1 Microvia, 11:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, 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-97-000649  
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 24" x 36", 30" x 36"  
 Max. Number of Layers: 28  
 Max. Board Thickness: .322"  
 Min. Hole Size: .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: .5:1 Microvia, 11:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Permanganate Etchback, Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Pulse Plate  
 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  
 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  
 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: 24" x 36", 30" x 36"  
 Max. Number of Layers: 28  
 Max. Board Thickness: .322"  
 Min. Hole Size: .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: .5:1 Microvia, 11:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Permanganate Desmear, Permanganate Etchback, 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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**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>E-Mail:</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-09-018717  
 Rigid Base Material: GM: Glass Base, Woven, Triazine and/or Bismaleimide Modified Epoxy Resin, Flame Resistant  
 Max. Panel Size: 21" x 24"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .078"  
 Min. Hole Size: .026" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 3:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.004"  
 Hole Preparation: Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate, Pulse Plate  
 Finish System: ENIG, Electrolytic Ni / Hard Au, Electrolytic Ni / Soft 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-10-019533  
 Flex Base Material: Copper Clad Polyimide with Acrylic Adhesive  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 4 (types 1, 2, and 3 only)  
 Max. Board Thickness: .031"  
 Min. Hole Size: .055"  
 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  
 Finish System: 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-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-10-019533  
 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: 15  
 Max. Board Thickness: .125"  
 Min. Hole Size: .12" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 7.75:1 Through-Hole  
 Min. Conductor Width/Space: .006"/.005"  
 Hole Preparation: Permanganate Etchback, Plasma Desmear  
 Hole Wall Conductive Coating: Graphite-based  
 Copper Plating: Direct Current Plate, Pulse Plate  
 Finish System: HASL, Hot Oil Reflow of Plated Sn/Pb  
 Controlled Impedance: Differential, Single-Ended  
 Flex Usage: Use A (Flex During Installation)

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LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<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	<b>CAGE Code:</b> 65337 <b>Phone:</b> 906-337-1305 <b>Fax:</b> 906-337-5359 <b>Email:</b> tmaier@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: 18" 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: .006"/.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: 18" 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: .006"/.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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**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	<b>CAGE Code:</b> 4MEG7 <b>Phone:</b> 408-988-3980 <b>Fax:</b> 408-988-4534 <b>E-Mail:</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

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**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	<b>CAGE Code:</b> 4MEG7 <b>Phone:</b> 408-988-3980 <b>Fax:</b> 408-988-4534 <b>E-Mail:</b> 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"  
 Max. Number of Layers: 16  
 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**

<p>MANUFACTURER INFORMATION:  <b>Cirexx International, Inc.</b>            791 Nuttman Street, Santa Clara, CA, 95054 US</p>	<p>PLANT LOCATION:            Same Address as Manufacturer</p>	<p>CAGE Code: 4MEG7            Phone: 408-988-3980            Fax: 408-988-4534            EMail: dangulo@cirexxintl.com</p>
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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"  
 Max. Number of Layers: 16  
 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)

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**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>E-Mail:</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>EMail:</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: AF: Aramid Fabric, Woven, Majority Polyfunctional Epoxy Resin  
 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: BF: Aramid Fabric, Nonwoven, Epoxy Resin  
 Max. Panel Size: 18" x 24", 36" x ", 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: BI: Aramid Fabric, Nonwoven, Polyimide Resin  
 Max. Panel Size: 18" x 24", 36" x ", 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

**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-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-04-006966, VQE-05-009107, VQE-06-010085, VQE-06-011248  
 Rigid Base Material: GM: Glass Base, Woven, Triazine and/or Bismaleimide Modified 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

**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 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)

**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

**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>EMail:</b> Patricia_Alcantar@cosmotronic.com
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**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

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**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> mark_kasting/coretec@coretec-inc.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**

<p>MANUFACTURER INFORMATION:  <b>DDi Cleveland Corp.</b>                  7 Ascot Parkway, Cuyahoga Falls, OH, 44223 US</p>	<p>PLANT LOCATION:                  Same Address as Manufacturer</p>	<p>CAGE Code: 7Z463                  Phone: 330-572-3400                  Fax: 330-572-3434                  EMail: mark_kasting/coretec@coretec-inc.com</p>
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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> dberry@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  
 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: 7:1 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: Non-Conductive  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL, IR Reflow of Plated Sn/Pb  
 Additional Fab Capabilities: Foil Lamination

**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  
 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

**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	CAGE Code: 0BSG1 Phone: 714-688-7371 Fax: EMail: rsylvain@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

**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: 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	CAGE Code: 0K703 Phone: 703-652-2200 Fax: 703-652-2272 EMail: jvasquez@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**

<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, x211 <b>Fax:</b> 330-538-3820 <b>E-Mail:</b> quality@sovereign-circuits.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: BI: 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, x211 <b>Fax:</b> 330-538-3820 <b>Email:</b> quality@sovereign-circuits.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**

<p>MANUFACTURER INFORMATION:  <b>DDi Toronto Corp.</b>              8150 Sheppard Avenue East, Scarborough, Ontario              Canada M1B 5K2</p>	<p>PLANT LOCATIONS:              1.              Same Address as Manufacturer              2. Coretec, Inc., CAGE Code: 3AF82,              2020 Ellesmere Road, Scarborough,              Ontario, Canada M1H 2Z8</p>	<p>CAGE Code: 3AF82              Phone: 416-208-2100              Fax: 416-208-2196              EMail: lgarvin@ddiglobal.com</p>
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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  
 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: .07"  
 Min. Hole Size: .0118" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 5.9:1 Through-Hole  
 Min. Conductor Width/Space: .0065"/.0042"  
 Hole Preparation: Permanganate Desmear  
 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  
 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  
 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: .07"  
 Min. Hole Size: .0118" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 3.5:1 Through-Hole  
 Min. Conductor Width/Space: .0108"/.067"  
 Hole Preparation: Permanganate Desmear  
 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  
 Controlled Impedance: Differential, Single-Ended

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

<b>MANUFACTURER INFORMATION:</b> <b>Dynaco Corp.</b> 3020 S. Park Drive, Tempe, AZ, 85282-3158 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 61642 <b>Phone:</b> 602-437-8003 <b>Fax:</b> <b>E-Mail:</b> t.edwards@dynacocorp.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-05-9356  
 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: .032" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 3:1 Through-Hole  
 Min. Conductor Width/Space: .01"/.01"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Dry Film, Liquid Photoimageable, Silk Screen  
 Finish System: HASL  
 Controlled Impedance: Differential

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-05-9356  
 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: .032" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 3:1 Through-Hole  
 Min. Conductor Width/Space: .01"/.01"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Dry Film, Liquid Photoimageable, Silk Screen  
 Finish System: HASL  
 Controlled Impedance: Differential

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-05-9356  
 Rigid Base Material: 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: 10  
 Max. Board Thickness: .1"  
 Min. Hole Size: .032" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 3:1 Through-Hole  
 Min. Conductor Width/Space: .01"/.01"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Dry Film, Liquid Photoimageable, Silk Screen  
 Finish System: HASL  
 Additional Fab Capabilities: Foil Lamination  
 Controlled Impedance: Differential  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)



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LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<p>MANUFACTURER INFORMATION: <b>Dynaco Corp.</b> 3020 S. Park Drive, Tempe, AZ, 85282-3158 US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 61642 Phone: 602-437-8003 Fax: EMail: t.edwards@dynacocorp.com</p>
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, MIL-PRF-31032/4  
 Qualification Letters: VQE-05-9356, VQE-06-10600  
 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", 18" x 24"  
 Max. Number of Layers: 20  
 Max. Board Thickness: .12"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 12:1 Through-Hole  
 Min. Conductor Width/Space: .004"/.006"  
 Hole Preparation: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Dry Film, Liquid Photoimageable, Silk Screen  
 Finish System: HASL  
 Controlled Impedance: Differential  
 Flex Usage: Use A (Flex During Installation), Use B (Dynamic Flex)

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

<p><b>MANUFACTURER INFORMATION:</b>  <b>Dynamic &amp; Proto Circuits, Inc.</b>              869 Barton Street, Stoney Creek, Ontario Canada L8E 5G6</p>	<p><b>PLANT LOCATION:</b>              Same Address as Manufacturer</p>	<p>CAGE Code: 38898              Phone: 905-643-9900              Fax: 905-643-9911              EMail: dynamicinfo@dapc.com</p>
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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  
 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-00-0007, VQE-01-0311, VQE-03-0818, VQE-98-1143  
 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: .005"/.005"  
 Hole Preparation: Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: HASL

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**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> jim@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)  
 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: Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: 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)  
 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: Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni/Au, HASL, ImmAg  
 Additional Fab Capabilities: Foil Lamination  
 Controlled Impedance: Differential, Single-Ended

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**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)  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 24" x 28"  
 Max. Number of Layers: 30  
 Max. Board Thickness: .116"  
 Min. Hole Size: .01" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 12:1 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: ENIG, HASL  
 Additional Fab Capabilities: Foil 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**

<p>MANUFACTURER INFORMATION:  <b>Firan Technology Group</b>                  250 Finchdene Square, Scarborough, Ontario Canada                  M1X 1A5</p>	<p>PLANT LOCATION:                  Same Address as Manufacturer</p>	<p>CAGE Code: L2665                  Phone: 416-299-4000                  Fax: 416-292-4308                  EMail: info@ftgcorp.com</p>
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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  
 Min. Conductor Width/Space: .004"/.005"  
 Hole Preparation: Permanganate Desmear, Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Periodic Reverse Plate  
 Solder Resist: Liquid Photoimageable  
 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"  
 Aspect Ratio: 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: Periodic Reverse 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**

<b>MANUFACTURER INFORMATION:</b> <b>Hamby Corporation</b> 27704 Avenue Scott, Valencia, CA, 91355 US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	CAGE Code: 07284 Phone: 661-257-1924 Fax: 661-257-1213 EMail: suesharp@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: suesharp@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: .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)

**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, 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 Polyimide with Acrylic Adhesive  
 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)

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

<p>MANUFACTURER INFORMATION: <b>Hans Brockstedt GmbH</b> Clara-Immerwahr Strasse 7, 24145 Kiel Germany</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: C4831 Phone: 0049-431-71966-0, -30 Fax: 0049-431-71966-29 EMail: klammer@brockstedt.de</p>
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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</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-07-014018)  
 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: Permanganate Desmear  
 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>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

**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  
 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)

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

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

Qualification Letters: VQE-11-022398, VQE-11-022964  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant; GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24", 18" x 24"  
 Max. Number of Layers: 10 , 20  
 Max. Board Thickness: .0548" , .092"  
 Min. Hole Size: .0079" Drilled Plated-Through Hole Before Plating, .04" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 1.37:1 Through-Hole, 7:1 Through-Hole  
 Min. Conductor Width/Space: .0048"/.004", .01"/.01"  
 Hole Preparation: Permanganate Etchback, Plasma Desmear, Plasma Desmear  
 Hole Wall Conductive Coating: Electroless Copper, Electroless Copper  
 Copper Plating: Direct Current Plate, Direct Current Plate  
 Hole Fill/Via Plug: Non-Conductive  
 Solder Resist: Dry Film, Liquid Photoimageable, Liquid Photoimageable  
 Finish System: HASL, HASL  
 Additional Fab Capabilities: Buried Vias, Embedded Resistors, Foil Lamination, Foil Lamination, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended



**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> 607-751-4665 <b>Fax:</b> 607-751-7714 <b>E-Mail:</b> melita.nagerl@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> 607-751-4665 <b>Fax:</b> 607-751-7714 <b>Email:</b> melita.nagerl@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)

**SECTION I**  
**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	CAGE Code: 34076 Phone: 651-604-2639 Fax: 651-636-1352 EMail: leonard@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  
 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  
 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

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  
 Qualification Letters: VQE-02-002780, VQE-03-002980  
 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  
 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

**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 x234          Fax: 714-641-3120          EMail:</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: Permanganate Desmear, Plasma Etchback  
 Hole Wall Conductive Coating: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Dry Film, Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni/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: 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: 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, Electrolytic Ni/Au, HASL  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/3, 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: 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, Electrolytic Ni/Au, HASL  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended  
 Flex Usage: Use A (Flex During Installation)

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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 x234          Fax: 714-641-3120          EMail:</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: .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: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni/Au, HASL  
 Additional Fab Capabilities: Blind Vias, Buried Vias, 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-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: .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: Liquid Photoimageable  
 Finish System: ENIG, Electrolytic Ni/Au, HASL  
 Additional Fab Capabilities: Blind Vias, Buried Vias, 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**

<p>MANUFACTURER INFORMATION: <b>PNC, Inc.</b> 115 East Centre Street, Nutley, NJ, 07110 US</p>		<p>CAGE Code: 66766 Phone: 973-284-1600 Fax: EMail: <a href="mailto:carmela@pnconline.com">carmela@pnconline.com</a></p>
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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

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

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

**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 Polyimide with Acrylic Adhesive  
 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)

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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



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<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

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**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>Email:</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>Email:</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: 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: 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: ENIG, HASL  
 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>Email:</b> sales@speedycircuits.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: MIL-PRF-31032/6  
 Qualification Letters: VQE-08-016434  
 Composition: S - Homogenous thermosetting 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: S - Homogenous thermosetting base 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>Strataflex Corp.</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> 416-752-2224 <b>Fax:</b> 416-752-6719 <b>Email:</b> ppialis@strataflex.ca
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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)

**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	<b>CAGE Code:</b> 1WQ42 <b>Phone:</b> 714-241-0303, x3127 <b>Fax:</b> 714-241-0708 <b>Email:</b> 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: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  
 Max. Panel Size: 18" x 24"  
 Max. Number of Layers: 24  
 Max. Board Thickness: .2" INCHES  
 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, Permanganate Etchback  
 Copper Plating: Direct Current Plate  
 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  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 Max. Panel Size: 21" x 28"  
 Max. Number of Layers: 24  
 Max. Board Thickness: .2" INCHES  
 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, Permanganate Etchback  
 Copper Plating: Direct Current Plate  
 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>E-Mail:</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  
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant  
 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, 2.5:1 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  
 Additional Fab Capabilities: Blind Vias, Buried Vias, 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  
 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, 2.5:1 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  
 Additional Fab Capabilities: Blind Vias, Buried Vias, 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  
 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: 2.5:1 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  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Embedded Resistors, 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  
 Rigid Base Material: BF: Aramid Fabric, Nonwoven, Epoxy 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: 2.5:1 Microvia, 7:1 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  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Embedded Resistors, 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  
 Rigid Base Material: BI: Aramid Fabric, Nonwoven, Polyimide Resin  
 Max. Panel Size: 16" x 18"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .1"  
 Min. Hole Size: .0118" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 2.5:1 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  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Embedded Resistors, 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  
 Rigid Base Material: GC: Glass Base, Woven E, Reinforcement, Majority Cyanate Ester, Flame Resistant; SC: Glass Base, Woven S-2, Fiber, Majority Cyanate Ester, Flame Resistant  
 Max. Panel Size: 30" x 32"  
 Max. Number of Layers: 10  
 Max. Board Thickness: .1"  
 Min. Hole Size: .032" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 2.5:1 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  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Embedded Resistors, 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  
 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: 2.5:1 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  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Embedded Resistors, Sequential Lamination  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: Custom  
 Qualification Letters: VQE-03-003348, VQE-10-019855  
 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  
 Controlled Impedance: Differential, Single-Ended

**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION**

Specification: Custom  
 Qualification Letters: VQE-03-003348, VQE-10-019855  
 Rigid Base Material: Woven Glass Reinforced, Hydrocarbon Resin with Ceramic Fill  
 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  
 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	CAGE Code: 5L706 Phone: 860-684-5881 Fax: 860-684-7425 EMail: 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-09-018855, VQE-10-019456  
 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: .125"  
 Min. Hole Size: .013" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 2.5:1 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  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Embedded Resistors, Sequential Lamination  
 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-03-003349, VQE-10-019456  
 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: 11  
 Max. Board Thickness: .07"  
 Min. Hole Size: .35" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 2.5:1 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  
 Additional Fab Capabilities: Blind Vias, Buried Vias, Embedded Resistors, 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	CAGE Code: 66311 Phone: 303-730-0505, x110 Fax: EMail: 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  
 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  
 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: .19"  
 Min. Hole Size: .029" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 6.5:1 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>Universal Circuits, Inc.</b> 8860 Zachary Lane North, Maple Grove, MN, 55369-4524 US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 45032 Phone: 763-424-3788 Fax: 763-425-0999 EMail: sbialka@universalcircuits.com</p>
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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  
 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: .125"  
 Min. Hole Size: .008" Drilled Plated-Through Hole Before Plating  
 Aspect Ratio: 7.75:1 Through-Hole  
 Min. Conductor Width/Space: .0032"/.0032"  
 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, MIL-PRF-31032/2  
 Qualification Letters: VQE-10-019530, VQE-10-020323  
 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: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL  
 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  
 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: Electroless Copper  
 Copper Plating: Direct Current Plate  
 Solder Resist: Liquid Photoimageable  
 Finish System: ENIG, HASL  
 Additional Fab Capabilities: Foil Lamination

**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: 802-257-4571          Fax: 802-257-0011          EMail: Bob.Downing@vtcircuits.com</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	<b>CAGE Code:</b> 0MHG5 <b>Phone:</b> 408-938-7219 <b>Fax:</b> 408-280-0641 <b>Email:</b> 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  
 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  
 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>E-Mail:</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-09-017325)  
 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  
 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)  
 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  
 Controlled Impedance: Differential, Single-Ended

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

**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

**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

**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

**Dynaco Corp.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 3020 S. Park Drive, Tempe, AZ, 85282-3158 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 61642  MIL-PRF-31032/3  MIL-PRF-31032/6

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

**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

**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**  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

**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

**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

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

**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 (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

**Strataflex Corp.**  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

**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

**TTM Technologies (Stafford)**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 4 Old Monson Road, Stafford, CT, 77497 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 5L706  MIL-PRF-31032/3  MIL-PRF-31032/6

**Unicircuit, Inc.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 8192 Southpark Lane, Littleton, CO, 80120 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 66311  MIL-PRF-31032/3  MIL-PRF-31032/6

**Universal Circuits, Inc.**  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

**Vermont Circuits, Inc.**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 76 Technology Drive, Brattleboro, VT, 05302-1890 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 65200  MIL-PRF-31032/3  MIL-PRF-31032/6

**Viasystems Corporation (CA)**  MIL-PRF-31032/1  MIL-PRF-31032/4  Custom  
 355 Turtle Creek Court, San Jose, CA, 95125-1316 US  MIL-PRF-31032/2  MIL-PRF-31032/5  
 CAGE Code: 0MHG5  MIL-PRF-31032/3  MIL-PRF-31032/6

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

**Viasystems Corporation (OR)**

1521 Poplar Lane, Forest Grove, OR, 97116 US

CAGE Code: 01KV9

- |   |  |                                 |
|---|--|---------------------------------|
| <input checked="" type="checkbox"/> MIL-PRF-31032/1 | <input type="checkbox"/> MIL-PRF-31032/4 | <input type="checkbox"/> Custom |
| <input checked="" type="checkbox"/> MIL-PRF-31032/2 | <input type="checkbox"/> MIL-PRF-31032/5 |                                 |
| <input type="checkbox"/> MIL-PRF-31032/3            | <input type="checkbox"/> MIL-PRF-31032/6 |                                 |