

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

Date: 9/22/2011

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.js@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.dscc.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

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

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2
 Qualification Letters: VQE-06-012150, VQE-07-012577, VQE-09-018384, VQE-10-020411, VQE-11-022279
 Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant
 Max. Panel Size: 20" x 26"
 Max. Number of Layers: 24
 Max. Board Thickness: .22"
 Min. Hole Size: .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

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

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2
 Qualification Letters: VQE-08-015934, VQE-11-021830
 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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|-------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: Amphenol Printed Circuits 91 Northeastern Boulevard, Nashua, NH, 03062 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 57034 Phone: 603-879-3268 Fax: 603-879-2818 E-Mail: 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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| MANUFACTURER INFORMATION: Amphenol Printed Circuits 91 Northeastern Boulevard, Nashua, NH, 03062 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 57034 Phone: 603-879-3268 Fax: 603-879-2818 E-Mail: 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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|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: Calumet Electronics Corp. 25830 Depot Street, Calumet, MI, 49913-1985 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 65337 Phone: 906-337-1305 Fax: 906-337-5359 E-Mail: 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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|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: Cirexx International, Inc. 791 Nuttman Street, Santa Clara, CA, 95054 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 4MEG7 Phone: 408-988-3980 Fax: 408-988-4534 E-Mail: 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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| MANUFACTURER INFORMATION: Cirexx International, Inc. 791 Nuttman Street, Santa Clara, CA, 95054 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 4MEG7 Phone: 408-988-3980 Fax: 408-988-4534 E-Mail: 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)

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

Specification: MIL-PRF-31032/4
 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**

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|---------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: Colonial Circuits, Inc. 1026 Warrenton Road, Fredericksburg, VA, 22406-6200 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 6T499 Phone: 540-753-5511, x125 Fax: 540-752-2109 EMail: 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

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| MANUFACTURER INFORMATION: Colonial Circuits, Inc. 1026 Warrenton Road, Fredericksburg, VA, 22406-6200 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 6T499 Phone: 540-753-5511, x125 Fax: 540-752-2109 E-Mail: 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

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|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: Cosmotronic, Inc. 16721 Noyes Avenue, Irvine, CA, 92606 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 63695 Phone: 949-660-0740 Fax: 949-553-8371 E-Mail: 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

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|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: Cosmotronic, Inc. 16721 Noyes Avenue, Irvine, CA, 92606 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 63695 Phone: 949-660-0740 Fax: 949-553-8371 E-Mail: 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

| | | |
|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: Cosmotronic, Inc. 16721 Noyes Avenue, Irvine, CA, 92606 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 63695 Phone: 949-660-0740 Fax: 949-553-8371 E-Mail: 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

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|----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <p>MANUFACTURER INFORMATION: Cosmotronic, Inc. 16721 Noyes Avenue, Irvine, CA, 92606 US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 63695 Phone: 949-660-0740 Fax: 949-553-8371 EMail: Patricia_Alcantar@cosmotronic.com</p> |
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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

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: DDi Cleveland Corp. 7 Ascot Parkway, Cuyahoga Falls, OH, 44223 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 7Z463 Phone: 330-572-3400 Fax: 330-572-3434 EMail: 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

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

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

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LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: DDi Denver Corp. 10570 Bradford Road, Littleton, CO, 80127 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 75815 Phone: 303-972-4105 Fax: 303-933-2934 E-Mail: 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

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LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

| | | |
|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: DDI Global Corp. - Anaheim 1220 N. Simon Circle, Anaheim, CA, 92806 US | PLANT LOCATION: 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

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|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: DDi Global Corp. - Sterling, VA 1200 Severn Way, Dulles, VA, 20166-8904 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 0K703 Phone: 703-652-2200 Fax: 703-652-2272 E-Mail: 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

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|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: DDi North Jackson Corp. 12080 DeBartolo Drive, North Jackson, OH, 44451 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 0GN71 Phone: 330-538-3900, x211 Fax: 330-538-3820 E-Mail: 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

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| MANUFACTURER INFORMATION: DDi North Jackson Corp. 12080 DeBartolo Drive, North Jackson, OH, 44451 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 0GN71 Phone: 330-538-3900, x211 Fax: 330-538-3820 E-Mail: 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**

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| MANUFACTURER INFORMATION: DDi Toronto Corp. 8150 Sheppard Avenue East, Scarborough, Ontario Canada M1B 5K2 | PLANT LOCATIONS: 1. Same Address as Manufacturer 2. Coretec, Inc., CAGE Code: 3AF82, 2020 Ellesmere Road, Scarborough, Ontario, Canada M1H 2Z8 | CAGE Code: 3AF82 Phone: 416-208-2100 Fax: 416-208-2196 EMail: lgarvin@ddiglobal.com |
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2
 Qualification Letters: VQE-04-006240, VQE-08-015407, VQE-09-018857
 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

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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| <p>MANUFACTURER INFORMATION: Dynaco Corp. 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-31032/1, 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)

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

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|-----------------------------------------------------------------------------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------------------------|
| <p>MANUFACTURER INFORMATION: Dynaco Corp. 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**

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

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

CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION

Qualification Letters: , , ,
 Max. Panel Size: " x "
 Max. Number of Layers:
 Max. Board Thickness: "
 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

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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| MANUFACTURER INFORMATION: Electro Plate Circuitry, Inc. 1430 Century Drive, Carrollton, TX, 75006 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 79616 Phone: 972-466-0818 Fax: 972-466-9078 E-Mail: jimmm@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**

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| MANUFACTURER INFORMATION: Electrotek Corp. 7745 S. 10th Street, Oak Creek, WI, 53154 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 66030 Phone: 414-762-1390 Fax: 414-762-1510 EMail: 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

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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| MANUFACTURER INFORMATION: Endicott Interconnect Technologies, Inc. Dept. 0069/014-3, 1093 Clark Street, Endicott, NY, 13760 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 3ECL3 Phone: 607-755-5896 Fax: 607-755-4649 E-Mail: 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

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| MANUFACTURER INFORMATION: Firan Technology Group 250 Finchdene Square, Scarborough, Ontario Canada M1X 1A5 | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: L2665 Phone: 416-299-4000 Fax: 416-292-4308 E-Mail: 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**

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| <p>MANUFACTURER INFORMATION: Firan Technology Group 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**

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|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: Global Innovations Corp. 901 Hensley Drive, Wylie, TX, 75098 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 04RV5 Phone: 214-291-1427 Fax: EMail: 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**

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| <p>MANUFACTURER INFORMATION: Global Innovations Corp. 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: bnoland@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

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| <p>MANUFACTURER INFORMATION: Gorilla Circuits 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**

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|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| <p>MANUFACTURER INFORMATION: Hamby Corporation 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-31032/1, 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: Hamby Corporation 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

| | | |
|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: Hans Brockstedt GmbH Clara-Immerwahr Strasse 7, 24145 Kiel Germany | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: C4831 Phone: 0049-431-71966-0, -30 Fax: 0049-431-71966-29 E-Mail: 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

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

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

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: Hughes Circuits 540 S. Pacific Street, San Marcos, CA, 92078-4056 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 1KXU6 Phone: 760-744-0300 Fax: 760-744-6388 EMail: joe@hughescircuits.com |
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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

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| <p>MANUFACTURER INFORMATION: KCA Electronics, Inc. 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

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| MANUFACTURER INFORMATION: Lockheed Martin Mission Systems & Sensors 1801 State Route 17C, Owego, NY, 13827 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 03640 Phone: 607-751-4665 Fax: 607-751-7714 E-Mail: 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

| | | |
|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: Lockheed Martin Mission Systems & Sensors 1801 State Route 17C, Owego, NY, 13827 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 03640 Phone: 607-751-4665 Fax: 607-751-7714 E-Mail: 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**

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| MANUFACTURER INFORMATION: Micom Corp. 475 Old Highway 8 NW, New Brighton, MN, 55112 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 34076 Phone: 651-604-2639 Fax: 651-636-1352 E-Mail: lleonard@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

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| <p>MANUFACTURER INFORMATION: Pioneer Circuits, Inc. 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)

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

| | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------|
| <p>MANUFACTURER INFORMATION: Pioneer Circuits, Inc. 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)

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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

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

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

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| MANUFACTURER INFORMATION: Printed Circuits, Inc. 1200 West 96th Street, Bloomington, MN, 55431 US | PLANT LOCATION: 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

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

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

CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION

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

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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

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

CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION

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

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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| MANUFACTURER INFORMATION: Sanmina-SCI (San Jose) 2050 Bering Drive, San Jose, CA, 95131 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 3DR67 Phone: 408-964-6515 Fax: 408-964-6453 E-Mail: 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**

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| MANUFACTURER INFORMATION: Sanmina-SCI (San Jose) 2050 Bering Drive, San Jose, CA, 95131 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 3DR67 Phone: 408-964-6515 Fax: 408-964-6453 EMail: 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

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LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: Speedy Circuits, Inc. 5331 McFadden Avenue, Huntington Beach, CA, 92649-1204 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 66982 Phone: 714-898-4901 Fax: 714-891-0607 Email: 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

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| MANUFACTURER INFORMATION: Speedy Circuits, Inc. 5331 McFadden Avenue, Huntington Beach, CA, 92649-1204 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 66982 Phone: 714-898-4901 Fax: 714-891-0607 E-Mail: 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**

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|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: Strataflex Corp. 11 Dohme Avenue, Toronto, Ontario Canada M4B 1Y7 | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 38661 Phone: 416-752-2224 Fax: 416-752-6719 EMail: 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

| | | |
|------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: TTM Technologies (Santa Ana) 2630 South Harbor Boulevard, Santa Ana, CA, 92704 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 1WQ42 Phone: 714-241-0303, x3127 Fax: 714-241-0708 E-Mail: 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

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|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: TTM Technologies (Santa Clara) 407 Mathew Street, Santa Clara, CA, 95050 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 65916 Phone: 408-486-3184 Fax: 408-727-1003 E-Mail: 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

| | | |
|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: TTM Technologies (Santa Clara) 407 Mathew Street, Santa Clara, CA, 95050 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 65916 Phone: 408-486-3184 Fax: 408-727-1003 E-Mail: 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

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|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: TTM Technologies (Stafford) 4 Old Monson Road, Stafford, CT, 77497 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 5L706 Phone: 860-684-5881 Fax: 860-684-7425 E-Mail: 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

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|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: TTM Technologies (Stafford) 4 Old Monson Road, Stafford, CT, 77497 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 5L706 Phone: 860-684-5881 Fax: 860-684-7425 E-Mail: 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

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LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| MANUFACTURER INFORMATION: TTM Technologies (Stafford) 4 Old Monson Road, Stafford, CT, 77497 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 5L706 Phone: 860-684-5881 Fax: 860-684-7425 E-Mail: 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

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| MANUFACTURER INFORMATION: TTM Technologies (Stafford) 4 Old Monson Road, Stafford, CT, 77497 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 5L706 Phone: 860-684-5881 Fax: 860-684-7425 E-Mail: 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**

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| MANUFACTURER INFORMATION: Unicircuit, Inc. 8192 Southpark Lane, Littleton, CO, 80120 US | PLANT LOCATION: 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, VQE-11-23044
 Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant
 Max. Panel Size: 12" x 18"
 Max. Number of Layers: 16
 Max. Board Thickness: .12"
 Min. Hole Size: .006" Laser Abated Plated Hole Size Before Plating, .02" Drilled Plated-Through Hole Before Plating
 Aspect Ratio: 6:1 Through-Hole
 Min. Conductor Width/Space: .005"/.005"
 Hole Preparation: Plasma Etchback
 Hole Wall Conductive Coating: Electroless Copper
 Copper Plating: Direct Current Plate, Pulse Plate
 Hole Fill/Via Plug: Conductive, Non-Conductive
 Solder Resist: Liquid Photoimageable
 Finish System: HASL, Hot Oil Reflow of Plated Sn/Pb
 Additional Fab Capabilities: Blind Vias, Buried Vias, Foil Lamination, Sequential Lamination
 Controlled Impedance: Differential, Single-Ended

CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2
 Qualification Letters: VQE-09-17422
 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

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| MANUFACTURER INFORMATION: Universal Circuits, Inc. 8860 Zachary Lane North, Maple Grove, MN, 55369-4524 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 45032 Phone: 763-424-3788 Fax: 763-425-0999 EMail: sbialka@universalcircuits.com |
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2
 Qualification Letters: VQE-10-019530, VQE-10-020323
 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: Carbon-based
 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: Carbon-based
 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: Carbon-based
 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**

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| <p>MANUFACTURER INFORMATION: Vermont Circuits, Inc. 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**

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| MANUFACTURER INFORMATION: Viasystems Corporation (CA) 355 Turtle Creek Court, San Jose, CA, 95125-1316 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 0MHG5 Phone: 408-938-7219 Fax: 408-280-0641 E-Mail: 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**

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| MANUFACTURER INFORMATION: Viasystems Corporation (OR) 1521 Poplar Lane, Forest Grove, OR, 97116 US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 01KV9 Phone: (503) 992-4068 Fax: EMail: 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

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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

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|-----------------------------------------------------|------------------------------------------|---------------------------------|
| <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 | |