

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: No
 Specification contains space level reliability requirements: No
 Specification allows test optimization: Yes

Contact Information:

DSCC Office of Primary Involvement: Electronic Devices Team, DSCC-VQE
 Primary DSCC-VQ Contact: 614-692-0627, e-mail: vqe.ls@dla.mil
 Secondary DSCC-VQ 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.

DSCC contacts for QML companies can be located in the file ζ 31032 main points-of-contact ζ at website:
http://www.dsccl.dla.mil/offices/sourcing_and_qualification/offices.asp?section=VQE

QML is a definition of a manufacturer's verified capabilities. Manufacturers may use the add-on qualification process to qualify capabilities that are not currently listed on the QML. The user is encouraged to contact the manufacturer or DSCC 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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|--|--|---|
| <p>MANUFACTURER INFORMATION: Accurate Circuit Engineering 3019 S. Kilson Drive Santa Ana, CA 92707, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 0MNN9 Contact: James Hofer Phone: 714-546-162 Fax: 714-433-7418 EMail: James@ace-pcb.com</p> |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|--|-------------------------------|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 | VQE-07-12577 |
| Panel Size: | 20" X 26" | VQE-06-12150 |
| Max./Min. Board Thickness: | 0.22"/Not Specified | |
| Max./Min. Base CU Thickness: | 0.006"/Not Specified | |
| Max./Min. Through Hole Size: | 0.025"/0.008" ((after plating)) | |
| Aspect Ratio: | 11:1 (Through Hole) | |
| Max. Number of Layers: | 24 | |
| Min. Conductor Width: | 0.003" | |
| Min. Conductor Space: | 0.003" (+/-10%) | |
| Part Mounting: | SMT, THM, MIX | |
| Rigid Base Material: | GF: Woven E-Glass, Epoxy Resin, Flame Resistant | |
| Flex Base Material: | N/A | |
| Finish System: | ENIG | |
| Hole Preparation: | Permanganate Desmear/Etchback | |
| Alternate Construction: | Buried Vias, Sequential Lamination, Blind Vias | |
| Copper Plating: | Acid Copper | |
| Solder Resist: | LPI | |
| Controlled Impedance: | Characteristic, Differential 50, 75, 100 ohms +/-10% | |
| Hole Fill/Via Plug: | Non-conductive Hole Fill/Via Plug | |
| Flex Usage: | N/A | |
| Through Hole Metallization: | N/A | |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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|--|--|--|
| MANUFACTURER INFORMATION: American Standard Circuits RF Division, 475 Industrial Drive West Chicago, IL 60185, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 4AA34 Contact: Lori Ryan Phone: 603-639-5438 Fax: EMail: lori@asc-i.com |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|---|-------------------------------|
| Specification: Panel Size: Max./Min. Board Thickness: Max./Min. Base CU Thickness: Max./Min. Through Hole Size: Aspect Ratio: Max. Number of Layers: Min. Conductor Width: Min. Conductor Space: Part Mounting: Rigid Base Material: Flex Base Material: Finish System: Hole Preparation: Alternate Construction: Copper Plating: Solder Resist: Controlled Impedance: Hole Fill/Via Plug: Flex Usage: Through Hole Metallization: | MIL-PRF-31032/1, MIL-PRF-31032/2 12" X 18" 0.062"/Not Specified 0.006"/Not Specified ((1/2 oz.)) 0.052"/0.009" ((after plating)) 7:1 (Through Hole) 10 0.004" 0.004" (+/-10%) THM, SMT, MIX GF: Woven E-Glass, Epoxy Resin, Flame Resistant N/A HASL Permanganate Desmear N/A Acid Copper LPI N/A N/A N/A N/A | VQE-08-015934 |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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

| | |
|------------------------------|---|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 |
| Panel Size: | 24" X 36", 30" X 36" |
| Max./Min. Board Thickness: | 0.322"/Not Specified |
| Max./Min. Base CU Thickness: | N/A |
| Max./Min. Through Hole Size: | Not Specified/0.008" |
| Aspect Ratio: | 11:1 (Through Hole) 0.5:1 (Blind Via) |
| Max. Number of Layers: | 28 |
| Min. Conductor Width: | 0.004" |
| Min. Conductor Space: | 0.004" |
| Part Mounting: | THM, Compliant Pin, SMT, MIX |
| Rigid Base Material: | Hybrid Built (GF/Hydrocarbon Ceramic) GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Hydrocarbon Ceramic |
| Flex Base Material: | N/A |
| Finish System: | Fused SnB, Nickel, Electrolytic Hard & Soft Gold, Electrolytic Nickel |
| Hole Preparation: | Permanganate Desmear/Etchback, Plasma Desmear |
| Alternate Construction: | Blind Vias (Mechanical Drilled) |
| Copper Plating: | Acid Copper, DC Plate, Pulse Plate |
| Solder Resist: | thermal cured Soldermask, LPI, SMOBC |
| Controlled Impedance: | 50 ohms ± 10%, 120 ohms ± 10% |
| Hole Fill/Via Plug: | Non-conductive Via Fill, Conductive Via Fill |
| Flex Usage: | N/A |
| Through Hole Metallization: | N/A |

VQE-97-0649
 VQE-06-10054
 VQE-09-17008

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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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 Contact: Robert Hall Phone: 906-337-1305 Fax: 906-337-5359 EMail: rhall@cec-up.com |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|---|-------------------------------|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 | VQE-03-4657 |
| Panel Size: | 18" X 24" | VQE-04-6280 |
| Max./Min. Board Thickness: | 0.125"/Not Specified | |
| Max./Min. Base CU Thickness: | N/A | |
| Max./Min. Through Hole Size: | 0.125"/0.016" | |
| Aspect Ratio: | 8:1 (Through Hole) | |
| Max. Number of Layers: | 10 | |
| Min. Conductor Width: | 0.006" | |
| Min. Conductor Space: | 0.003" | |
| Part Mounting: | THM, SMT | |
| Rigid Base Material: | GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant | |
| Flex Base Material: | N/A | |
| Finish System: | HASL, Au, Ni | |
| Hole Preparation: | FR4: Chemical Etchback, Non FR4: Plasma Etchback | |
| Alternate Construction: | N/A | |
| Copper Plating: | Electro-deposited Acid Copper | |
| Solder Resist: | N/A | |
| Controlled Impedance: | N/A | |
| Hole Fill/Via Plug: | N/A | |
| Flex Usage: | N/A | |
| Through Hole Metallization: | N/A | |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

| | | |
|--|--|--|
| MANUFACTURER INFORMATION: Calumet Electronics Corp. 25830 Depot Street Calumet, MI 49913-1985, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 65337 Contact: Robert Hall Phone: 906-337-1305 Fax: 906-337-5359 EMail: rhall@cec-up.com |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | QUALIFICATION LETTERS: |
|---|-------------------------------|
| Specification: MIL-PRF-31032/3, MIL-PRF-31032/4 Panel Size: 12" X 180" Max./Min. Board Thickness: 0.035"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: 0.011"/Not Specified Aspect Ratio: 3:1 (Through Hole) Max. Number of Layers: 7 Min. Conductor Width: 0.007" Min. Conductor Space: 0.007" Part Mounting: SMT, THM Rigid Base Material: N/A Flex Base Material: FR4-IPC-4101/21 Flexible Polyimide Clad (IPC-4204/1) Flexible Polyimide Film (PIC-4202/1) Flexible Polyimide Film/Acrylic (IPC-4203/1) Finish System: HASL Hole Preparation: Plasma Desmear/Etchback Alternate Construction: N/A Copper Plating: Acid Copper Solder Resist: N/A Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A | VQE-04-5354 |

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

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|--|--|---|
| MANUFACTURER INFORMATION: Cirex International 791 Nuttman Street Santa Clara, CA 95054, | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 4MEG7 Contact: Don Angulo Phone: 408-988-3980 Fax: 408-988-4534 E-Mail: dangulo@cirexintl.com |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|--|-------------------------------|
| Specification: MIL-PRF-31032/2 Panel Size: 12" X 18" Max./Min. Board Thickness: 0.1"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/0.01" Aspect Ratio: 10:1 (Through Hole) Max. Number of Layers: 2 Min. Conductor Width: 0.004" Min. Conductor Space: 0.004" Part Mounting: SMT, THM, MIX Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant Flex Base Material: N/A Finish System: HASL, Ni/AU, ENIG Hole Preparation: Plasma Desmear Alternate Construction: N/A Copper Plating: Acid Copper Solder Resist: LPI Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A | | VQE-07-014176 |

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|---|--|-------------------------------|
| Specification: MIL-PRF-31032/3 Panel Size: 12" X 18" Max./Min. Board Thickness: 0.1"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/0.01" Aspect Ratio: 10:1 (Through Hole) Max. Number of Layers: 2 Min. Conductor Width: 0.004" Min. Conductor Space: 0.004" Part Mounting: SMT, THM, MIX Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant Flex Base Material: Copper-Clad Adhesiveless Polyimide Acrylic Adhesive Polyimide Finish System: HASL, Ni/Au, ENIG Hole Preparation: Plasma Desmear Alternate Construction: N/A Copper Plating: Acid Copper Solder Resist: Kapton Covelay Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: Class A (Flex-to-Install) Class B (Continuous Flex) Through Hole Metallization: N/A | | VQE-07-014176 |

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

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|--|--|--|
| MANUFACTURER INFORMATION: Cirex International 791 Nuttman Street Santa Clara, CA 95054, | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 4MEG7 Contact: Don Angulo Phone: 408-988-3980 Fax: 408-988-4534 E-Mail: dangulo@cirexxintl.com |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | QUALIFICATION LETTERS: |
|--|-------------------------------|
| Specification: MIL-PRF-31032/1 Panel Size: 12" X 18" Max./Min. Board Thickness: 0.125"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/0.01" ((Mechanical)) Aspect Ratio: 12.5:1 Max. Number of Layers: 22 Min. Conductor Width: 0.004" Min. Conductor Space: 0.004" Part Mounting: THM, MIX, SMT Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: N/A Finish System: HASL, ENIG Hole Preparation: Plasma Etchback, Pemanganate Desmear Alternate Construction: N/A Copper Plating: Acid Copper Solder Resist: LPI Controlled Impedance: 50 ohms +/- 10%, 100 ohms +/- 10% Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A | VQ-08-016602 |

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | QUALIFICATION LETTERS: |
|---|-------------------------------|
| Specification: MIL-PRF-31032/4 Panel Size: 12" X 18" Max./Min. Board Thickness: 0.125"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/0.01" ((Mechanical)) Aspect Ratio: 10:1 Max. Number of Layers: 16 Min. Conductor Width: 0.004" Min. Conductor Space: 0.004" Part Mounting: SMT, THM, MIX 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 Acrylic Adhesie Finish System: ENIG, HASL Hole Preparation: Plasma Etchback, Permanganate Desmear Alternate Construction: N/A Copper Plating: Acid Coper Solder Resist: LPI Controlled Impedance: 50 ohms +/- 10%, 100 ohms +/-10% Hole Fill/Via Plug: N/A Flex Usage: Class A (Flex-to-Install) Through Hole Metallization: N/A | VQ-08-016602 |

SECTION I
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 Contact: Mike Hill Phone: 540-753-5511, x125 Fax: 540-752-2109 EMail: quality@colonialcircuits.com |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | QUALIFICATION LETTERS: |
|--|-------------------------------|
| Specification: MIL-PRF-31032/1 Panel Size: 18" X 24" Max./Min. Board Thickness: 0.127"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: 0.228"/0.015" Aspect Ratio: 8.5:1 (Through Hole) Max. Number of Layers: 12 Min. Conductor Width: 0.008" Min. Conductor Space: 0.005" Part Mounting: PTH, SMT Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant Flex Base Material: N/A Finish System: Tin/Lead HASL Hole Preparation: Plasma Desmear Alternate Construction: N/A Copper Plating: Electrolytic Acid Copper Solder Resist: LPI Controlled Impedance: 55 Ohms (± 10%) Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A | VQE-04-6002 |

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | QUALIFICATION LETTERS: |
|---|-------------------------------|
| Specification: MIL-PRF-31032/1 Panel Size: 18" X 24" Max./Min. Board Thickness: 0.088"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: 0.052"/0.021" Aspect Ratio: 4.2:1 (Through Hole) Max. Number of Layers: 14 Min. Conductor Width: 0.006" Min. Conductor Space: 0.005" Part Mounting: PTH, SMT Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: N/A Finish System: Tin/Lead HASL Hole Preparation: Plasma Desmear Alternate Construction: N/A Copper Plating: Electrolytic Acid Copper Solder Resist: LPI Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A | VQE-04-6002 |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

| | | |
|--|--|--|
| MANUFACTURER INFORMATION: Colonial Circuits, Inc. 1026 Warrenton Road Fredericksburg, VA 22406-6200, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 6T499 Contact: Mike Hill Phone: 540-753-5511, x125 Fax: 540-752-2109 EMail: quality@colonialcircuits.com |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|-------------|-------------------------------|
| Specification: MIL-PRF-31032/4 Panel Size: 12" X 18" Max./Min. Board Thickness: 0.093"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: 0.045"/0.025" Aspect Ratio: 3.7:1 (Through Hole) Max. Number of Layers: 10 Min. Conductor Width: 0.005" Min. Conductor Space: 0.005" Part Mounting: PTH, SMT Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: IPC-4204/1 (Acrylic Adhesive) Finish System: Tin/Lead Reflow Hole Preparation: Plasma Desmear/Etchback Alternate Construction: N/A Copper Plating: Electrolytic Acid Copper Solder Resist: LPI Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A | VQE-04-6002 | |

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|---|-------------|-------------------------------|
| Specification: MIL-PRF-31032/Custom Panel Size: 12" X 18" Max./Min. Board Thickness: 0.083"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: 0.045"/0.02" Aspect Ratio: 4.15:1 (Through Hole) Max. Number of Layers: 4 Min. Conductor Width: 0.01" Min. Conductor Space: 0.011" Part Mounting: PTH, SMT Rigid Base Material: Rogers 4003 Flex Base Material: N/A Finish System: Tin/Lead HASL Hole Preparation: Plasma Desmear Alternate Construction: N/A Copper Plating: Electrolytic Acid Copper Solder Resist: LPI Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A | VQE-04-6002 | |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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

| | |
|------------------------------|--|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 |
| Panel Size: | 18" X 24" |
| Max./Min. Board Thickness: | 0.126"/Not Specified |
| Max./Min. Base CU Thickness: | N/A |
| Max./Min. Through Hole Size: | Not Specified/0.014" |
| Aspect Ratio: | 5:1 (Through Hole) |
| Max. Number of Layers: | 16 |
| Min. Conductor Width: | 0.004" |
| Min. Conductor Space: | 0.004" |
| Part Mounting: | SMT, THM |
| Rigid Base Material: | AF: Aramid Fabric, Woven, Majority Polyfunctional Epoxy Resin GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant BI: Aramid Fabric, Nonwoven, Polyimide Resin |
| Flex Base Material: | N/A |
| Finish System: | HASL, Fused Tin Lead late, Selective Solder Strip-Tin Lead Plate |
| Hole Preparation: | Plasma Etchback |
| Alternate Construction: | Sequential Lamination for Blind & Buried Vias (8 layer max) |
| Copper Plating: | Acid Copper |
| Solder Resist: | N/A |
| Controlled Impedance: | 100/50 ohm (±5%) |
| Hole Fill/Via Plug: | N/A |
| Flex Usage: | N/A |
| Through Hole Metallization: | N/A |

VQE-05-008414
 VQE-06-010963
 VQE-00-0289
 VQE-01-0910

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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|---|--|---|
| MANUFACTURER INFORMATION: Coretec Cleveland, Inc. 7 Ascot Parkway Cuyahoga Falls, OH 44223, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 7Z463 Contact: Mark Kasting Phone: 330-572-3400 Fax: 330-572-3434 EMail: mark_kasting/coretec@coretec-inc.com |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | QUALIFICATION LETTERS: |
|---|-------------------------------|
| Specification: MIL-PRF-31032/3, MIL-PRF-31032/4 Panel Size: 18" X 24" Max./Min. Board Thickness: 0.126"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/0.017" Aspect Ratio: 10:1 (Through Hole) Max. Number of Layers: 11 Min. Conductor Width: 0.003" Min. Conductor Space: 0.003" Part Mounting: SMT, THM Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: IPC-4204/1 (Acrylic Adhesive) IPC-4204/11 (Adhesiveless) Finish System: HASL Hole Preparation: Plasma Etchback Alternate Construction: N/A Copper Plating: Acid Copper Solder Resist: N/A Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: Class A (Flex to Install) Through Hole Metallization: N/A | VQE-06-010963 VQE-01-0909 |

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

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| MANUFACTURER INFORMATION: Coretec Denver, Inc. 10570 Bradford Road Littleton, CO 80127, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 75815 Contact: Douglas N. Berry Phone: 303-904-6119 Fax: 303-933-2934 EMail: dberry@coretec-denver.com |
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

| | |
|------------------------------|--|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 |
| Panel Size: | 18" X 24" |
| Max./Min. Board Thickness: | 0.125"/Not Specified |
| Max./Min. Base CU Thickness: | 0.001"/Not Specified |
| Max./Min. Through Hole Size: | 0.109"/0.015" |
| Aspect Ratio: | 7:1 (Through Hole) |
| Max. Number of Layers: | 16 |
| Min. Conductor Width: | 0.006" |
| Min. Conductor Space: | 0.006" |
| Part Mounting: | SMT, MIX, THM |
| Rigid Base Material: | GM: Glass Base, Woven, Triazine and/or Bismaleimide Modified Epoxy Resin, Flame Resistant GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant |
| Flex Base Material: | N/A |
| Finish System: | HASL, IR Reflow Following SnPb Plate, ENIG |
| Hole Preparation: | Permanganate Desmear/Etchback |
| Alternate Construction: | N/A |
| Copper Plating: | Acid Copper |
| Solder Resist: | LPI, Dry Film |
| Controlled Impedance: | N/A |
| Hole Fill/Via Plug: | Conductive Epoxy, Non-conductive Epoxy |
| Flex Usage: | N/A |
| Through Hole Metallization: | N/A |

VQE-02-0317
 VQE-05-9014
 VQE-05-7627

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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|---|--|--|
| MANUFACTURER INFORMATION: Coretec, Inc. 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 Contact: Noor Al-Shaikh Phone: 416-208-2100 Fax: 416-439-1582 EMail: alshaikh@coretec-inc.com |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|---|-------------------------------|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 | VQE-04-006240 |
| Panel Size: | 18" X 24" | VQE-08-015407 |
| Max./Min. Board Thickness: | 0.08"/Not Specified | |
| Max./Min. Base CU Thickness: | N/A | |
| Max./Min. Through Hole Size: | Not Specified/0.01" ((as drilled)) | |
| Aspect Ratio: | 7:1 (Through Hole) | |
| Max. Number of Layers: | 14 | |
| Min. Conductor Width: | 0.005" | |
| Min. Conductor Space: | 0.005" | |
| Part Mounting: | MIX, SMT, THM | |
| Rigid Base Material: | GF: Woven E-Glass, Epoxy Resin, Flame Resistant | |
| Flex Base Material: | N/A | |
| Finish System: | ENIG, HASL | |
| Hole Preparation: | Chemical desmear | |
| Alternate Construction: | N/A | |
| Copper Plating: | Acid Copper | |
| Solder Resist: | LPI | |
| Controlled Impedance: | Characteristics ($\pm 10\%$), Differential ($\pm 10\%$) | |
| Hole Fill/Via Plug: | Non-conductive Via Plug | |
| Flex Usage: | N/A | |
| Through Hole Metallization: | N/A | |

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|--|-------------------------------|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 | VQE-08-015407 |
| Panel Size: | 18" X 24" | VQE-04-006240 |
| Max./Min. Board Thickness: | 0.08"/Not Specified | |
| Max./Min. Base CU Thickness: | N/A | |
| Max./Min. Through Hole Size: | Not Specified/0.01" ((as drilled)) | |
| Aspect Ratio: | 7:1 (Through Hole) | |
| Max. Number of Layers: | 14 | |
| Min. Conductor Width: | 0.005" | |
| Min. Conductor Space: | 0.005" | |
| Part Mounting: | THM, SMT, MIX | |
| Rigid Base Material: | GI: Glass Base, Woven, Polyimide Resin, Heat Resistant | |
| Flex Base Material: | N/A | |
| Finish System: | HASL, ENIG | |
| Hole Preparation: | Plasma Etchback, Desmear | |
| Alternate Construction: | N/A | |
| Copper Plating: | Acid Copper | |
| Solder Resist: | LPI | |
| Controlled Impedance: | Characteristics (+/-10%), Differential (+/-10%) | |
| Hole Fill/Via Plug: | Non-conductive Via Plug | |
| Flex Usage: | N/A | |
| Through Hole Metallization: | N/A | |

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 Contact: Alan Exley Phone: 949-660-0740 Fax: 949-553-8371 E-Mail: alan_exley@cosmotronic.com |
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

| | |
|------------------------------|---|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 |
| Panel Size: | 18" X 24" |
| Max./Min. Board Thickness: | 0.335"/Not Specified |
| Max./Min. Base CU Thickness: | N/A |
| Max./Min. Through Hole Size: | Not Specified/0.014" |
| Aspect Ratio: | 15:1 (Through Hole) |
| Max. Number of Layers: | 36 |
| Min. Conductor Width: | 0.005" |
| Min. Conductor Space: | 0.004" |
| Part Mounting: | SMT, THM, MIX |
| Rigid Base Material: | GM: Glass Base, Woven, Triazine and/or Bismaleimide Modified Epoxy Resin, Flame Resistant GF: Woven E-Glass, Epoxy Resin, Flame Resistant AF: Aramid Fabric, Woven, Majority Polyfunctional Epoxy Resin GI: Glass Base, Woven, Polyimide Resin, Heat Resistant BF: Aramid Fabric, Nonwoven, Epoxy Resin BI: Aramid Fabric, Nonwoven, Polyimide Resin |
| Flex Base Material: | N/A |
| Finish System: | Fused SnPB, HASL, Selective Solder Strip-Tin Lead Plate, ENIG |
| Hole Preparation: | Plasma Desmear/Etchback |
| Alternate Construction: | Blind Vias, Sequential Lamination |
| Copper Plating: | Electro-deposited Acid Copper |
| Solder Resist: | LPI, SMOBC |
| Controlled Impedance: | 50 ohms ± 10% (nominal/tolerance) |
| Hole Fill/Via Plug: | N/A |
| Flex Usage: | N/A |
| Through Hole Metallization: | N/A |

VQE-05-009107
 VQE-04-006966
 VQE-06-010085
 VQE-06-011248

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 Contact: Alan Exley Phone: 949-660-0740 Fax: 949-553-8371 EMail: alan_exley@cosmotronic.com |
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

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|-------------------------------------|--|
| Specification: | MIL-PRF-31032/3, MIL-PRF-31032/4 |
| Panel Size: | 18" X 24" |
| Max./Min. Board Thickness: | 0.165"/Not Specified |
| Max./Min. Base CU Thickness: | N/A |
| Max./Min. Through Hole Size: | Not Specified/0.012" |
| Aspect Ratio: | 8:1 (Through Hole) |
| Max. Number of Layers: | 22 |
| Min. Conductor Width: | 0.006" |
| Min. Conductor Space: | 0.008" |
| Part Mounting: | SMT, THM |
| Rigid Base Material: | GM: Glass Base, Woven, Triazine and/or Bismaleimide Modified Epoxy Resin, Flame Resistant GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant GI/GM Composite Material |
| Flex Base Material: | IPC-4204/1 (Acrylic Adhesive) IPC-4204/11 (Adhesiveless) |
| Finish System: | Fused SnPB, HASL, Selective Solder Strip-Tin Lead Plate, ENIG, |
| Hole Preparation: | N/A |
| Alternate Construction: | N/A |
| Copper Plating: | Electro-deposited Acid Copper |
| Solder Resist: | LPI, SMOBC |
| Controlled Impedance: | N/A |
| Hole Fill/Via Plug: | N/A |
| Flex Usage: | Class A (Flex to Install) Class B (Continuous Flex) |
| Through Hole Metallization: | N/A |

VQE-05-009107
 VQE-04-006966
 VQE-06-010085

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 Contact: Alan Exley Phone: 949-660-0740 Fax: 949-553-8371 EMail: alan_exley@cosmotronic.com |
|--|--|---|

CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

| | |
|------------------------------|--|
| Specification: | MIL-PRF-31032/Custom |
| Panel Size: | 12" X 18" |
| Max./Min. Board Thickness: | 0.225"/Not Specified |
| Max./Min. Base CU Thickness: | N/A |
| Max./Min. Through Hole Size: | Not Specified/0.02" |
| Aspect Ratio: | 10:1 (Through Hole) |
| Max. Number of Layers: | 16 |
| Min. Conductor Width: | 0.011" |
| Min. Conductor Space: | 0.007" |
| Part Mounting: | SMT |
| Rigid Base Material: | Rogers 4003 (Ceramic-Filled Thermoset Resin) Rogers 4003/GI Composite |
| Flex Base Material: | N/A |
| Finish System: | HASL, ENIG |
| Hole Preparation: | Plasma Desmear/Etchback |
| Alternate Construction: | Blind Vias, Sequential Lamination |
| Copper Plating: | Electro-deposited Acid Copper |
| Solder Resist: | LPI, SMOBC |
| Controlled Impedance: | N/A |
| Hole Fill/Via Plug: | N/A |
| Flex Usage: | N/A |
| Through Hole Metallization: | N/A |

VQE-05-009107
 VQE-04-006966
 VQE-06-010085

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

| | | |
|---|--|---|
| <p>MANUFACTURER INFORMATION: Diversified Systems 3939 West 56th Street Indianapolis, IN 46254, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 5S706 Contact: Linda Bell Phone: 317-299-9547, x238 Fax: 317-298-2061 EMail: linda.bell@divsys.com</p> |
|---|--|---|

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|---|-------------------------------|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 | VQE-01-0309 |
| Panel Size: | 18" X 24" | VQE-02-0015 |
| Max./Min. Board Thickness: | 0.11"/Not Specified | |
| Max./Min. Base CU Thickness: | N/A | |
| Max./Min. Through Hole Size: | Not Specified/0.012" | |
| Aspect Ratio: | 5.5:1 (Through Hole) | |
| Max. Number of Layers: | 14 | |
| Min. Conductor Width: | 0.005" | |
| Min. Conductor Space: | 0.005" | |
| Part Mounting: | SMT, THM | |
| Rigid Base Material: | GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant | |
| Flex Base Material: | N/A | |
| Finish System: | HASL | |
| Hole Preparation: | Permanganate Desmear/Etchback | |
| Alternate Construction: | Foil Lamination | |
| Copper Plating: | Electro-deposited Acid Copper | |
| Solder Resist: | Dry Film, LPI | |
| Controlled Impedance: | Embedded Stripline & Microstrip | |
| Hole Fill/Via Plug: | N/A | |
| Flex Usage: | N/A | |
| Through Hole Metallization: | N/A | |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

| | | |
|--|--|---|
| MANUFACTURER INFORMATION: Dynaco Corp. 1000 South Priest Drive Tempe, AZ 85281-5238, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 61642 Contact: Ted Edwards Phone: 480-736-3728 Fax: 480-921-9830 EMail: tedwards@dynacocorp.com |
|--|--|---|

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|---|-------------------------------|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 | VQE-05-9356 |
| Panel Size: | 18" X 24" | |
| Max./Min. Board Thickness: | 0.1"/Not Specified | |
| Max./Min. Base CU Thickness: | 0.001"/Not Specified | |
| Max./Min. Through Hole Size: | 0.045"/0.032" | |
| Aspect Ratio: | 3:1 (Through Hole) | |
| Max. Number of Layers: | 10 | |
| Min. Conductor Width: | 0.01" | |
| Min. Conductor Space: | 0.01" | |
| Part Mounting: | THM | |
| Rigid Base Material: | GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant | |
| Flex Base Material: | N/A | |
| Finish System: | HASL | |
| Hole Preparation: | Permanganate Desmear/Etchback | |
| Alternate Construction: | N/A | |
| Copper Plating: | Acid Copper | |
| Solder Resist: | N/A | |
| Controlled Impedance: | N/A | |
| Hole Fill/Via Plug: | N/A | |
| Flex Usage: | N/A | |
| Through Hole Metallization: | N/A | |

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|--|-------------------------------|
| Specification: | MIL-PRF-31032/3, MIL-PRF-31032/4 | VQE-05-9356 VQE-06-10600 |
| Panel Size: | 18" X 24", 12" X 18" | |
| Max./Min. Board Thickness: | 0.12"/Not Specified | |
| Max./Min. Base CU Thickness: | 0.001"/Not Specified | |
| Max./Min. Through Hole Size: | 0.045"/0.01" | |
| Aspect Ratio: | 12:1 (Through Hole) | |
| Max. Number of Layers: | 20 | |
| Min. Conductor Width: | 0.004" | |
| Min. Conductor Space: | 0.006" | |
| Part Mounting: | THM | |
| Rigid Base Material: | GI: Glass Base, Woven, Polyimide Resin, Heat Resistant | |
| Flex Base Material: | IPC-4204/1 (Acrylic Adhesive) | |
| Finish System: | HASL, Fused Sn/Pb | |
| Hole Preparation: | Permanganate Desmear/Etchback, Plasma Etchback | |
| Alternate Construction: | N/A | |
| Copper Plating: | Electroless Acid Copper, Electroplated Acid Copper | |
| Solder Resist: | N/A | |
| Controlled Impedance: | N/A | |
| Hole Fill/Via Plug: | N/A | |
| Flex Usage: | N/A | |
| Through Hole Metallization: | N/A | |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

| | | |
|--|--|---|
| MANUFACTURER INFORMATION: Dynaco Corp. 1000 South Priest Drive Tempe, AZ 85281-5238, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 61642 Contact: Ted Edwards Phone: 480-736-3728 Fax: 480-921-9830 EMail: tedwards@dynacocorp.com |
|--|--|---|

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | QUALIFICATION LETTERS: |
|---|-------------------------------|
| Specification: MIL-PRF-31032/3, MIL-PRF-31032/4 Panel Size: 12" X 18", 18" X 24" Max./Min. Board Thickness: 0.1"/Not Specified Max./Min. Base CU Thickness: 0.001"/Not Specified Max./Min. Through Hole Size: 0.045"/0.032" Aspect Ratio: 3:1 (Through Hole) Max. Number of Layers: 10 Min. Conductor Width: 0.01" Min. Conductor Space: 0.01" Part Mounting: THM Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: IPC-241/11 (Adhesiveless) IPC-4204/11 (Adhesiveless) Finish System: HASL Hole Preparation: Permanganate Desmear/Etchback Alternate Construction: Foil Lamination Copper Plating: Acid Copper Solder Resist: N/A Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: Class A (Flex to Install) Class B (Continuous Flex) Through Hole Metallization: N/A | VQE-05-9356 |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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

| | |
|--|--|
| Specification: MIL-PRF-31032/1, MIL-PRF-31032/2 Panel Size: 16" X 18" Max./Min. Board Thickness: 0.125"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: 0.039"/0.018" (0.0135" Drilled) Aspect Ratio: 9.3:1 (Through Hole) Max. Number of Layers: 16 Min. Conductor Width: 0.005" Min. Conductor Space: 0.005" Part Mounting: SMT, THM, MIX Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: N/A Finish System: HASL Hole Preparation: Plasma Etchback Alternate Construction: N/A Copper Plating: Acid Copper Solder Resist: LPI, Dry Film Solder Resist Plugs Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A | VQE-98-1143 VQE-00-0007 VQE-01-0311 VQE-03-0818 |
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SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

| | | |
|--|--|---|
| MANUFACTURER INFORMATION: Dynamic Details, Inc. 1200 Severn Way Dulles, VA 20166-8904, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 0K703 Contact: Tony Trnka Phone: 703-652-2266 Fax: 703-652-2271 EMail: atnka@va.ddiglobal.com |
|--|--|---|

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|---|-------------------------------|
| Specification: Panel Size: Max./Min. Board Thickness: Max./Min. Base CU Thickness: Max./Min. Through Hole Size: Aspect Ratio: Max. Number of Layers: Min. Conductor Width: Min. Conductor Space: Part Mounting: Rigid Base Material: Flex Base Material: Finish System: Hole Preparation: Alternate Construction: Copper Plating: Solder Resist: Controlled Impedance: Hole Fill/Via Plug: Flex Usage: Through Hole Metallization: | MIL-PRF-31032/1, MIL-PRF-31032/2 18" X 24" 0.1"/Not Specified N/A 0.038"/0.024" ((0.150" max. non-PTH)) 6.8:1 (Through Hole) 20 0.004" 0.003" SMT, THM, MIX GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant N/A HASL Plasma Desmear/Etchback Blind Vias Electrolytic Acid Copper N/A N/A N/A N/A | VQE-03-3545 |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

| | | |
|--|--|---|
| MANUFACTURER INFORMATION: Electro Plate Circuitry 1430 Century Drive Carrollton, TX 75006, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 79616 Contact: James McNeal Phone: 972-466-0818 Fax: 972-466-9078 EMail: jjimm@eplate.com |
|--|--|---|

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | QUALIFICATION LETTERS: |
|---|--------------------------------|
| Specification: MIL-PRF-31032/1, MIL-PRF-31032/2 Panel Size: 18" X 16", 18" X 24" Max./Min. Board Thickness: 0.12"/0.03" Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/0.008" Aspect Ratio: 9.3:1 (Through Hole) Max. Number of Layers: 14 Min. Conductor Width: 0.004" Min. Conductor Space: 0.004" Part Mounting: SMT, THM, MIX Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: N/A Finish System: HASL, Reflowed SnPb, ENIG, Hard Gold Hole Preparation: Plasma Desmear/Etchback Alternate Construction: Sequential Lamination, Blind/Buried Vias, Filled Vias, Foil Lamination Copper Plating: Acid Copper Solder Resist: LPI, Dry Film Controlled Impedance: ± 3% Tolerance Hole Fill/Via Plug: CB100 (conductive), UVP100 (non-conductive) Flex Usage: N/A Through Hole Metallization: N/A | VQE-06-011433 VQE-06-010333 |

**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 Contact: Tom Tikusis Phone: 414-762-1390 Fax: 414-762-1510 EMail: sales@boards4u.com |
|---|--|--|

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|---|-------------------------------|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 | VQ-06-011451 |
| Panel Size: | 18" X 24" | VQ-08-014513 |
| Max./Min. Board Thickness: | 0.115"/Not Specified | |
| Max./Min. Base CU Thickness: | N/A | |
| Max./Min. Through Hole Size: | Not Specified/0.012" | |
| Aspect Ratio: | 9:1 (Through Hole) | |
| Max. Number of Layers: | 18 | |
| Min. Conductor Width: | 0.003" | |
| Min. Conductor Space: | 0.003" | |
| Part Mounting: | SMT, THM, MIX | |
| Rigid Base Material: | GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant | |
| Flex Base Material: | N/A | |
| Finish System: | HASL, ENIG, ImmAg | |
| Hole Preparation: | Permanganate Desmear, Plasma Etchback | |
| Alternate Construction: | Via-fill Technology, 0.016" (±25%) Diameter | |
| Copper Plating: | Electroplated Acid Copper | |
| Solder Resist: | LPI, Dry Film | |
| Controlled Impedance: | GF: 100 ohms/50 ohms ± 10%, GI: 100 ohms ± 10% | |
| Hole Fill/Via Plug: | N/A | |
| Flex Usage: | N/A | |
| Through Hole Metallization: | N/A | |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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|--|--|--|
| MANUFACTURER INFORMATION: Endicott Interconnect Technologies, Inc. 1701 North Street P.O. Box 658, Endicott, NY 13760, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 3ECL3 Contact: Jose Rios Phone: 607-755-5896 Fax: 607-755-4649 EMail: JoseA.Rios@eitny.com |
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

| | |
|---|--|
| Specification: MIL-PRF-31032/1, MIL-PRF-31032/2 Panel Size: 24" X 28" Max./Min. Board Thickness: 0.116"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/0.01" Aspect Ratio: 12:1 (Through Hole) Max. Number of Layers: 30 Min. Conductor Width: 0.003" Min. Conductor Space: 0.004" Part Mounting: MIX, THM, SMT Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant Flex Base Material: N/A Finish System: HASL, ENIG Hole Preparation: Permanganate Desmear, Plasma Etchback, Glass Etch Alternate Construction: Foil-Lamination, Cap-Lamination Copper Plating: Electroplated Acid Copper Solder Resist: LPI Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A | VQE-04-005311 VQE-07-013506 VQE-07-012236 VQE-08-015922 |
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SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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|--|--|--|
| MANUFACTURER INFORMATION: Endicott Interconnect Technologies, Inc. 1701 North Street P.O. Box 658, Endicott, NY 13760, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 3ECL3 Contact: Jose Rios Phone: 607-755-5896 Fax: 607-755-4649 EMail: JoseA.Rios@eitny.com |
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

| | |
|---|---|
| Specification: MIL-PRF-31032/1, MIL-PRF-31032/2 Panel Size: 18" X 24" Max./Min. Board Thickness: 0.084"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/0.012" Aspect Ratio: 7:1 (Through Hole) Max. Number of Layers: 12 Min. Conductor Width: 0.004" Min. Conductor Space: 0.004" Part Mounting: MIX, THM, SMT Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: N/A Finish System: HASL, ENIG Hole Preparation: Pemanganate Desmear, Plasma Etchback Alternate Construction: Foil-Lamination, Cap-Lamination Copper Plating: Electroplated Acid Copper Solder Resist: LPI Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A | VQE-04-005311 VQE-07-013506 VQE-07-012236 |
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

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|---|---|
| Specification: MIL-PRF-31032/Custom Panel Size: 19.5" X 24" Max./Min. Board Thickness: 0.153"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/0.02" Aspect Ratio: 7.6:1 (Through Hole) Max. Number of Layers: 19 Min. Conductor Width: 0.005" Min. Conductor Space: 0.005" Part Mounting: MIX Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: N/A Finish System: ENIG Hole Preparation: Pemanganate Desmear, Plasma Etchback Alternate Construction: Foil-Lamination, Copper Core Copper Plating: Electroplated Acid Copper Solder Resist: LPI Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A | VQE-04-005311 VQE-07-013506 VQE-07-012236 |
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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 Contact: Bryan Clark Phone: 416-299-4000 Fax: 416-292-4308 E-Mail: byanclark@firantechnology.com |
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

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|-------------------------------------|---|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 |
| Panel Size: | 18" X 24" |
| Max./Min. Board Thickness: | 0.22"/Not Specified |
| Max./Min. Base CU Thickness: | N/A |
| Max./Min. Through Hole Size: | 0.025"/0.008" (Mechanical Drill) Not Specified/0.005" (Laser Control Depth) Not Specified/0.006" (Buried Via Mechanical Drill) |
| Aspect Ratio: | 7:1 (Through Hole) |
| Max. Number of Layers: | 20 |
| Min. Conductor Width: | 0.004" |
| Min. Conductor Space: | 0.004" |
| Part Mounting: | MIX, SMT, THM |
| Rigid Base Material: | GM: Glass Base, Woven, Triazine and/or Bismaleimide Modified Epoxy Resin, Flame Resistant GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant BI: Aramid Fabric, Nonwoven, Polyimide Resin GX: Glass Base, Woven, Polytetrafluoroethylene Resin, Flame Resistant |
| Flex Base Material: | N/A |
| Finish System: | HASL, Reflow Solder, Immersion Tin, Silver, ENIG |
| Hole Preparation: | Permanganate Desmear, Plasma Etchback |
| Alternate Construction: | Sequential Lamination for Blind & Buried Vias and Micro Vias |
| Copper Plating: | Electroless Acid Copper, Electrolytic Acid Copper |
| Solder Resist: | LPI, Hole Fill |
| Controlled Impedance: | Characteristic ($\pm 10\%$), Differential ($\pm 10\%$) |
| Hole Fill/Via Plug: | N/A |
| Flex Usage: | N/A |
| Through Hole Metallization: | N/A |

VQE-05-009339
 VQE-06-010764
 VQE-06-010889

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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|--|--|---|
| MANUFACTURER INFORMATION: Global Innovation Corp. 901 Hensley Drive Wylie, TX 75098, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 04RV5 Contact: Bob Noland Phone: 214-291-1427 Fax: E-Mail: bnoland@globalinnovationcorp.com |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|--------------|-------------------------------|
| Specification: MIL-PRF-31032/2 Panel Size: 9" X 16" Max./Min. Board Thickness: 0.036"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/0.031" Aspect Ratio: 1.2:1 (Through Hole) Max. Number of Layers: 2 Min. Conductor Width: 0.005" Min. Conductor Space: 0.005" Part Mounting: N/A Rigid Base Material: GR: Glass Base, Nonwoven, Polytetrafluoroethylene Resin, Flame Resistant Flex Base Material: N/A Finish System: HASL Hole Preparation: N/A Alternate Construction: N/A Copper Plating: N/A Solder Resist: N/A Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A | VQE-07-13270 | |

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|---|--|-------------------------------|
| Specification: MIL-PRF-31032/1, MIL-PRF-31032/2 Panel Size: 18" X 24" Max./Min. Board Thickness: 0.119"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/0.01" Aspect Ratio: 7.5:1 (Through Hole) Max. Number of Layers: 18 Min. Conductor Width: 0.004" Min. Conductor Space: 0.005" Part Mounting: MIX Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant Flex Base Material: N/A Finish System: HASL Hole Preparation: Permanganate Desmear, Plasma Etchback Alternate Construction: Foil Lamination Copper Plating: Electro-deposited Acid Copper Solder Resist: LPI, Dry Film Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A | VQE-03-4341 VQE-04-5599 VQE-04-5891 VQE-05-7288 | |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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|--|--|--|
| MANUFACTURER INFORMATION: Global Innovation Corp. 901 Hensley Drive Wylie, TX 75098, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 04RV5 Contact: Bob Noland Phone: 214-291-1427 Fax: EMail: bnoland@globalinnovationcorp.com |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|--|-------------------------------|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 | VQE-04-4957 |
| Panel Size: | 18" X 24" | VQE-05-7288 |
| Max./Min. Board Thickness: | 0.074"/Not Specified | |
| Max./Min. Base CU Thickness: | N/A | |
| Max./Min. Through Hole Size: | Not Specified/0.012" | |
| Aspect Ratio: | 6.2:1 (Through Hole) | |
| Max. Number of Layers: | 12 | |
| Min. Conductor Width: | 0.005" | |
| Min. Conductor Space: | 0.005" | |
| Part Mounting: | MIX | |
| Rigid Base Material: | GI: Glass Base, Woven, Polyimide Resin, Heat Resistant | |
| Flex Base Material: | N/A | |
| Finish System: | HASL | |
| Hole Preparation: | Plasma Etchback | |
| Alternate Construction: | N/A | |
| Copper Plating: | Electro-deposited Acid Copper | |
| Solder Resist: | LPI | |
| Controlled Impedance: | 62/37.5 ohms (±10%) | |
| Hole Fill/Via Plug: | N/A | |
| Flex Usage: | N/A | |
| Through Hole Metallization: | N/A | |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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|--|--|---|
| MANUFACTURER INFORMATION: Hamby Corporation 27704 Avenue Scott Valencia, CA 91355, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 07248 Contact: Sue Sharp Phone: 661-257-1924 Fax: 661-257-1213 E-Mail: suesharp@hambycorp.com |
|--|--|---|

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|---------------|-------------------------------|
| Specification: MIL-PRF-31032/1, MIL-PRF-31032/2 Panel Size: 12" X 18" Max./Min. Board Thickness: 0.035"/" Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: 0.05"/0.02" (drilled) Aspect Ratio: 2:1 ((through hole)) Max. Number of Layers: 6 Min. Conductor Width: 0.009" Min. Conductor Space: 0.009" Part Mounting: THM, SMT, MIX Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: N/A Finish System: HASL, Ni/Au Hole Preparation: Plasma Etchback/Desmear Alternate Construction: N/A Copper Plating: Electrodeposited Acid Copper Solder Resist: N/A Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A | VQE-09-017349 | |

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|---------------|-------------------------------|
| Specification: MIL-PRF-31032/3, MIL-PRF-31032/4 Panel Size: 18" X 24" Max./Min. Board Thickness: 0.085"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: 0.035"/0.018" Not Specified/" Aspect Ratio: 5:1 (Through Hole) Max. Number of Layers: 11 Min. Conductor Width: 0.004" Min. Conductor Space: 0.004" Part Mounting: SMT, THM, MIX Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: IPC-4204/1 (Acrylic Adhesive) IPC-4204/11 (Adhesiveless) Finish System: HASL, Ni/Au Hole Preparation: Plasma Etchback/Desmear Alternate Construction: N/A Copper Plating: Electrodeposited Acid Copper Solder Resist: N/A Controlled Impedance: Characteristic: 35-50 ohms +/-10%, Differential: 100 ohms +/-10% Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A | VQE-08-014596 | |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

| | | |
|---|--|---|
| MANUFACTURER INFORMATION: Hans Brockstedt GmbH Leiterplattenschnelldienst, Clara-Immerwahr-Str. 7 24145, Kiel, Germany | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: C4831 Contact: Hilmar Klammer 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 **QUALIFICATION LETTERS:**

| | |
|------------------------------|--|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 |
| Panel Size: | 9" X 13", 13" X 20", 15" X 21", 18" X 24" |
| Max./Min. Board Thickness: | 0.2"/Not Specified |
| Max./Min. Base CU Thickness: | N/A |
| Max./Min. Through Hole Size: | Not Specified/0.01" (Mech. Drilled) Not Specified/0.004" (Laser Drilled) |
| Aspect Ratio: | 1:1 (Blind Vias) 7:1 (Through Hole) |
| Max. Number of Layers: | 12 |
| Min. Conductor Width: | 0.004" |
| Min. Conductor Space: | 0.004" |
| Part Mounting: | SMT, THM, MIX |
| Rigid Base Material: | GF: Woven E-Glass, Epoxy Resin, Flame Resistant G: Glass Base, Woven, Polyimide Resin, Heat Resistant |
| Flex Base Material: | N/A |
| Finish System: | Fused SnPb, HASL, Electroless Sn, Electroplated Nickel/Gold, Electroless Nickel/Gold, Electroplated SnPb |
| Hole Preparation: | Plasma Desmear/Etchback |
| Alternate Construction: | Blind Vias, Buried Vias, Laser Drilled Vias |
| Copper Plating: | Acid Copper |
| Solder Resist: | LPI |
| Controlled Impedance: | N/A |
| Hole Fill/Via Plug: | N/A |
| Flex Usage: | N/A |
| Through Hole Metallization: | N/A |

VQE-03-2619
VQE-05-7480

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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|---|--|---|
| MANUFACTURER INFORMATION: Hans Brockstedt GmbH Leiterplattenschnelldienst, Clara-Immerwahr-Str. 7 24145, Kiel, Germany | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: C4831 Contact: Hilmar Klammer 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 **QUALIFICATION LETTERS:**

| | |
|------------------------------|---|
| Specification: | MIL-PRF-31032/3, MIL-PRF-31032/4 |
| Panel Size: | 9" X 13", 13" X 20" |
| Max./Min. Board Thickness: | 0.2"/Not Specified |
| Max./Min. Base CU Thickness: | N/A |
| Max./Min. Through Hole Size: | Not Specified/0.01" (Mech. Drilled) Not Specified/0.004" (Laser Drilled) |
| Aspect Ratio: | 1:1 (Blind Vias) 7:1 (Through Hole) |
| Max. Number of Layers: | 12 |
| Min. Conductor Width: | 0.004" |
| Min. Conductor Space: | 0.004" |
| Part Mounting: | SMT, THM, MIX |
| Rigid Base Material: | GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant |
| Flex Base Material: | IPC-4204/1 (Acrylic Adhesive) IPC-4204/11 (Adhesiveless) |
| Finish System: | Fused SnPb, HASL, Electroless Sn, Electroplated Nickel/Gold, Electroless Nickel/Gold, Electroplated SnPb |
| Hole Preparation: | Plasma Desmear/Etchback |
| Alternate Construction: | Blind Vias, Buried Vias, Laser Drilled Vias |
| Copper Plating: | Acid Copper |
| Solder Resist: | LPI |
| Controlled Impedance: | N/A |
| Hole Fill/Via Plug: | N/A |
| Flex Usage: | Class A (Flex to Install) |
| Through Hole Metallization: | N/A |

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| VQE-03-2619 |
| VQE-05-7480 |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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|--|--|---|
| <p>MANUFACTURER INFORMATION: Hughes Circuits 540 S. Pacific Street San Marcos, CA 92078-4056, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 1KXU6 Contact: Joe Hughes Phone: 760-744-0300 Fax: 760-744-6388 EMail: joe@hughescircuits.com</p> |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|--|-------------------------------|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 | VQE-07-014018 |
| Panel Size: | 18" X 24" | |
| Max./Min. Board Thickness: | 0.08"/Not Specified | |
| Max./Min. Base CU Thickness: | N/A | |
| Max./Min. Through Hole Size: | 0.012"/Not Specified Not Specified/0.01" | |
| Aspect Ratio: | 7:1 (Through Hole) | |
| Max. Number of Layers: | 10 | |
| Min. Conductor Width: | 0.005" | |
| Min. Conductor Space: | 0.005" | |
| Part Mounting: | MIX | |
| Rigid Base Material: | GI: Glass Base, Woven, Polyimide Resin, Heat Resistant | |
| Flex Base Material: | N/A | |
| Finish System: | HASL | |
| Hole Preparation: | Plasma Desmea | |
| Alternate Construction: | N/A | |
| Copper Plating: | Electrodeposited Acid Copper | |
| Solder Resist: | LPI | |
| Controlled Impedance: | N/A | |
| Hole Fill/Via Plug: | N/A | |
| Flex Usage: | N/A | |
| Through Hole Metallization: | N/A | |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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|---|--|---|
| MANUFACTURER INFORMATION: Lockheed Martin Systems Integration-Owego 1801 State Route 17C Owego, NY 13827, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 03640 Contact: Melita Nagerl Phone: 607-751-4665 Fax: 607-751-7714 E-Mail: melita.nagerl@lmco.com |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|---|-------------------------------|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 | VQE-99-0130 |
| Panel Size: | 18" X 24" | VQE-00-0961 |
| Max./Min. Board Thickness: | 0.2"/Not Specified | |
| Max./Min. Base CU Thickness: | N/A | |
| Max./Min. Through Hole Size: | Not Specified/0.02" | |
| Aspect Ratio: | 8:1 (Through Hole) | |
| Max. Number of Layers: | 16 | |
| Min. Conductor Width: | 0.004" | |
| Min. Conductor Space: | 0.004" | |
| Part Mounting: | SMT, THM | |
| Rigid Base Material: | AF: Aramid Fabric, Woven, Majority Polyfunctional Epoxy Resin | |
| Flex Base Material: | N/A | |
| Finish System: | Fused SnPb, HASL, NiAu | |
| Hole Preparation: | Permanganate Desmear, Plasma Etchback | |
| Alternate Construction: | N/A | |
| Copper Plating: | Electro-deposited Acid Copper | |
| Solder Resist: | LPI | |
| Controlled Impedance: | N/A | |
| Hole Fill/Via Plug: | N/A | |
| Flex Usage: | N/A | |
| Through Hole Metallization: | N/A | |

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|--|-------------------------------|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 | VQE-01-0539 |
| Panel Size: | 18" X 24" | |
| Max./Min. Board Thickness: | 0.095"/Not Specified | |
| Max./Min. Base CU Thickness: | N/A | |
| Max./Min. Through Hole Size: | Not Specified/0.014" | |
| Aspect Ratio: | 6.8:1 (Through Hole) | |
| Max. Number of Layers: | 14 | |
| Min. Conductor Width: | 0.004" | |
| Min. Conductor Space: | 0.004" | |
| Part Mounting: | SMT, THM | |
| Rigid Base Material: | BI: Aramid Fabric, Nonwoven, Polyimide Resin | |
| Flex Base Material: | N/A | |
| Finish System: | Fused SnPb, HASL, NiAu | |
| Hole Preparation: | Permanganate Desmear | |
| Alternate Construction: | N/A | |
| Copper Plating: | Electro-deposited Acid Copper | |
| Solder Resist: | LPI | |
| Controlled Impedance: | N/A | |
| Hole Fill/Via Plug: | N/A | |
| Flex Usage: | N/A | |
| Through Hole Metallization: | N/A | |

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

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|--|---|---|
| <p>MANUFACTURER INFORMATION: Lockheed Martin Systems Integration-Owego 1801 State Route 17C Owego, NY 13827, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 03640 Contact: Melita Nagerl Phone: 607-751-4665 Fax: 607-751-7714 EMail: melita.nagerl@lmco.com</p> |
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

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|--|--|
| <p>Specification: MIL-PRF-31032/1, MIL-PRF-31032/2</p> <p>Panel Size:</p> <p>Max./Min. Board Thickness: 0.2"/Not Specified</p> <p>Max./Min. Base CU Thickness: N/A</p> <p>Max./Min. Through Hole Size: Not Specified/0.018"</p> <p>Aspect Ratio: 8:1 (Through Hole)</p> <p>Max. Number of Layers: 24</p> <p>Min. Conductor Width: 0.004"</p> <p>Min. Conductor Space: 0.004"</p> <p>Part Mounting: SMT, THM</p> <p>Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant</p> <p>Flex Base Material: N/A</p> <p>Finish System: Fused SnPb, HASL, NiAu</p> <p>Hole Preparation: Permanganate Desmear, Plasma Etchback</p> <p>Alternate Construction: N/A</p> <p>Copper Plating: Electro-deposited Acid Copper</p> <p>Solder Resist: LPI</p> <p>Controlled Impedance: N/A</p> <p>Hole Fill/Via Plug: N/A</p> <p>Flex Usage: N/A</p> <p>Through Hole Metallization: N/A</p> | <p>VQE-99-0130 VQE-00-0961 VQE-07-013268 VQE-07-013459</p> |
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**SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

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|---|--|---|
| MANUFACTURER INFORMATION: Lockheed Martin Systems Integration-Owego 1801 State Route 17C Owego, NY 13827, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 03640 Contact: Melita Nagerl Phone: 607-751-4665 Fax: 607-751-7714 EMail: melita.nagerl@lmco.com |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|--|---|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 | VQE-99-0130 VQE-00-0961 VQE-07-013459 |
| Panel Size: | 24" X 30" | |
| Max./Min. Board Thickness: | 0.2"/Not Specified | |
| Max./Min. Base CU Thickness: | N/A | |
| Max./Min. Through Hole Size: | Not Specified/0.018" | |
| Aspect Ratio: | 8:1 (Through Hole) | |
| Max. Number of Layers: | 16 | |
| Min. Conductor Width: | 0.004" | |
| Min. Conductor Space: | 0.004" | |
| Part Mounting: | SMT, THM | |
| Rigid Base Material: | GI: Glass Base, Woven, Polyimide Resin, Heat Resistant | |
| Flex Base Material: | N/A | |
| Finish System: | Fused SnPb, HASL, NiAu | |
| Hole Preparation: | Permanganate Desmear, Plasma Etchback | |
| Alternate Construction: | N/A | |
| Copper Plating: | Electro-deposited Acid Copper | |
| Solder Resist: | LPI | |
| Controlled Impedance: | N/A | |
| Hole Fill/Via Plug: | N/A | |
| Flex Usage: | N/A | |
| Through Hole Metallization: | N/A | |

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

| | | |
|---|--|--|
| MANUFACTURER INFORMATION: Lockheed Martin Systems Integration-Owego 1801 State Route 17C Owego, NY 13827, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 03640 Contact: Melita Nagerl Phone: 607-751-4665 Fax: 607-751-7714 EMail: melita.nagerl@lmco.com |
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

| | |
|-------------------------------------|---|
| Specification: | MIL-PRF-31032/3, MIL-PRF-31032/4 |
| Panel Size: | 18" X 24" |
| Max./Min. Board Thickness: | 0.11"/Not Specified |
| Max./Min. Base CU Thickness: | N/A |
| Max./Min. Through Hole Size: | Not Specified/0.016" |
| Aspect Ratio: | 6:1 (Through Hole) |
| Max. Number of Layers: | 18 |
| Min. Conductor Width: | 0.003" |
| Min. Conductor Space: | 0.004" |
| Part Mounting: | SMT, THM |
| Rigid Base Material: | GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant |
| Flex Base Material: | IPC-4204/4 IC-4204/11 (Adhesiveless) IPC-4204/2 IPC-4204/1 (Acrylic Adhesiveless) IPC-4204/3 |
| Finish System: | Fused SnPb, HASL |
| Hole Preparation: | Permanganate Desmear, Plasma Etchback |
| Alternate Construction: | N/A |
| Copper Plating: | Electro-deposited Acid Copper |
| Solder Resist: | LPI |
| Controlled Impedance: | N/A |
| Hole Fill/Via Plug: | N/A |
| Flex Usage: | N/A |
| Through Hole Metallization: | N/A |

VQE-00-0684
VQE-07-013459

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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|---|--|--|
| MANUFACTURER INFORMATION: Merix Corp. (Forest Grove, OR) 1521 Poplar Lane Forest Grove, OR 97116, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 01KV9 Contact: Roger Michalowski Phone: 781-639-5410 Fax: EMail: Customerservice@merix.com |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|--|-------------------------------|
| Specification: Panel Size: Max./Min. Board Thickness: Max./Min. Base CU Thickness: Max./Min. Through Hole Size: Aspect Ratio: Max. Number of Layers: Min. Conductor Width: Min. Conductor Space: Part Mounting: Rigid Base Material: Flex Base Material: Finish System: Hole Preparation: Alternate Construction: Copper Plating: Solder Resist: Controlled Impedance: Hole Fill/Via Plug: Flex Usage: Through Hole Metallization: | MIL-PRF-31032/1, MIL-PRF-31032/2 18" X 24" 0.13"/" N/A Not Specified/0.008" ((Mechanical)) 0.003"/" ((Laser Via)) 10:1 ((Through Hold0)) 0.8:1 ((Blind Vias)) 26 0.004" 0.004" THM, SMT, MIX GF: Woven E-Glass, Epoxy Resin, Flame Resistant N/A HASL, ENIG, Ni/Hard-Au, Immersion Ag Plasma Desmear, Etchback, Chemical Desmear (Permanganate) Blind Vias, Laser Drilled Vias Electrodeposited Acid Copper LPI Microstrip, Single Line, Single Ended, Differential Methods ±5% at 50 ohms N/A N/A N/A | VQ-09-017325 |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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| MANUFACTURER INFORMATION: Merix Corp. (San Jose, CA) 355 Turtle Creek Court San Jose, CA 95125-1316, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 0MHG5 Contact: Dave Williams Phone: 408-280-0422 Fax: 408-280-0641 E-Mail: david.williams@sj.merix.com |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|--|-------------------------------|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 | VQE-08-016481 |
| Panel Size: | 18" X 24" | VQE-08-016632 |
| Max./Min. Board Thickness: | 0.13"/Not Specified | |
| Max./Min. Base CU Thickness: | N/A | |
| Max./Min. Through Hole Size: | 0.25"/0.008" ((mechanical)) 0.004"/0.008" ((laser drilled)) | |
| Aspect Ratio: | 10:1 (Through Hole) 0.8:1 ((blind vias)) | |
| Max. Number of Layers: | 20 | |
| Min. Conductor Width: | 0.004" | |
| Min. Conductor Space: | 0.004" | |
| Part Mounting: | THM, SMT, MIX | |
| Rigid Base Material: | GF: Woven E-Glass, Epoxy Resin, Flame Resistant G: Glass Base, Woven, Polyimide Resin, Heat Resistant | |
| Flex Base Material: | N/A | |
| Finish System: | HASL, Nickel, Hard Gold, ENIG | |
| Hole Preparation: | Plasma Etchback, Desmear, Chemical Desmear | |
| Alternate Construction: | Sequential Lamination, Blind Vias, Buried Vias | |
| Copper Plating: | Electrodeposited Acid Copper | |
| Solder Resist: | LPI | |
| Controlled Impedance: | 25-125 ohms +/-10% | |
| Hole Fill/Via Plug: | Non-conductive Filled Vias | |
| Flex Usage: | N/A | |
| Through Hole Metallization: | N/A | |

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 Contact: Larry Leonard Phone: 651-604-2639 Fax: 651-636-1352 EMail: lleonard@micomcircuits.com |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|---|-------------------------------|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 | VQE-03-2980 |
| Panel Size: | 18" X 24" | VQE-02-002780 |
| Max./Min. Board Thickness: | 0.239"/Not Specified | |
| Max./Min. Base CU Thickness: | N/A | |
| Max./Min. Through Hole Size: | Not Specified/0.007" | |
| Aspect Ratio: | 11:1 (Through Hole) | |
| Max. Number of Layers: | 28 | |
| Min. Conductor Width: | 0.004" | |
| Min. Conductor Space: | 0.004" | |
| Part Mounting: | SMT, THM | |
| Rigid Base Material: | GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant | |
| Flex Base Material: | N/A | |
| Finish System: | Fuse Following SnPb Plate, HASL | |
| Hole Preparation: | Permanganate Desmear/Etchback, Plasma Desmear/Etchback | |
| Alternate Construction: | Blind & Buried Vias | |
| Copper Plating: | Acid Copper | |
| Solder Resist: | LPI, Dry Film | |
| Controlled Impedance: | Characteristic ($\pm 10\%$), Differential ($\pm 10\%$) | |
| Hole Fill/Via Plug: | N/A | |
| Flex Usage: | N/A | |
| Through Hole Metallization: | N/A | |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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| MANUFACTURER INFORMATION: Philway Products, Inc. 701 Virginia Avenue Ashland, OH 44806, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 21971 Contact: Tom School Phone: 419-281-7777 Fax: 419-289-3447 EMail: quality@philway.com |
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

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|---|-------------|
| Specification: MIL-PRF-31032/1 Panel Size: 18" X 21" Max./Min. Board Thickness: 0.09"/Not Specified Max./Min. Base CU Thickness: 0.002"/Not Specified Max./Min. Through Hole Size: 0.044"/0.012" Aspect Ratio: 4:1 (Through Hole) Max. Number of Layers: 12 Min. Conductor Width: 0.005" Min. Conductor Space: 0.005" Part Mounting: SMT, THM, MIX Rigid Base Material: GM: Glass Base, Woven, Triazine and/or Bismaleimide Modified Epoxy Resin, Flame Resistant GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: N/A Finish System: HASL, IR Reflow following SnPb Plate Hole Preparation: Permanganate Desmear/Etchback Alternate Construction: N/A Copper Plating: Acid Copper Solder Resist: LPI Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A | VQE-99-1107 |
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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 Contact: Elias Gabriel Phone: 714-641-3132 x234 Fax: 714-641-3120 EMail:</p> |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | QUALIFICATION LETTERS: |
|---|-------------------------------|
| <p>Specification: MIL-PRF-31032/1, MIL-PRF-31032/2 Panel Size: 18" X 24" Max./Min. Board Thickness: 0.177"/" Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: 0.206"/0.02" Aspect Ratio: 8.85:1 Max. Number of Layers: 22 Min. Conductor Width: 0.004" Min. Conductor Space: 0.006" Part Mounting: THM Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: N/A Finish System: HASL Hole Preparation: Plasma Desmear, Etchback Alternate Construction: N/A Copper Plating: Acid Copper Solder Resist: N/A Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A</p> | <p>VQE-09-017323</p> |

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | QUALIFICATION LETTERS: |
|---|-------------------------------|
| <p>Specification: MIL-PRF-31032/3, MIL-PRF-31032/4 Panel Size: 24" X 36" Max./Min. Board Thickness: 0.185"/" Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: 0.167"/0.039" Aspect Ratio: 4.75:1 Max. Number of Layers: 26 Min. Conductor Width: 0.008" Min. Conductor Space: 0.005" Part Mounting: THM Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: Adhesiveless Polyimide Finish System: HASL Hole Preparation: Plasma Desmear, Etchback Alternate Construction: N/A Copper Plating: Electrodeposited Copper Solder Resist: N/A Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: Class A (Flex During Installation) Class B (Dynamic) Through Hole Metallization: N/A</p> | <p>VQE-09-017323</p> |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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|---|--|--|
| <p>MANUFACTURER INFORMATION:</p> <p>Pioneer Circuits, Inc. 3000 S. Shannon Street Santa Ana, CA 92704-6321, US</p> | | <p>CAGE Code: 65723</p> <p>Contact: Elias Gabriel Phone: 714-641-3132 x234 Fax: 714-641-3120 EMail:</p> |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | QUALIFICATION LETTERS: |
|---|-------------------------------|
| <p>Specification: MIL-PRF-31032/1, MIL-PRF-31032/2</p> <p>Panel Size: 18" X 24"</p> <p>Max./Min. Board Thickness: 0.1"/"</p> <p>Max./Min. Base CU Thickness: N/A</p> <p>Max./Min. Through Hole Size: 0.045"/0.025"</p> <p>Aspect Ratio: 4:1</p> <p>Max. Number of Layers: 10</p> <p>Min. Conductor Width: 0.005"</p> <p>Min. Conductor Space: 0.005"</p> <p>Part Mounting: THM</p> <p>Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant</p> <p>Flex Base Material: N/A</p> <p>Finish System: HASL</p> <p>Hole Preparation: Plasma Desmear, Etchback</p> <p>Alternate Construction: N/A</p> <p>Copper Plating: Electrodeposited Acid Copper</p> <p>Solder Resist: LPI</p> <p>Controlled Impedance: N/A</p> <p>Hole Fill/Via Plug: N/A</p> <p>Flex Usage: N/A</p> <p>Through Hole Metallization: N/A</p> | <p>VQE-09-017323</p> |

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | QUALIFICATION LETTERS: |
|---|-------------------------------|
| <p>Specification: MIL-PRF-31032/3, MIL-PRF-31032/4</p> <p>Panel Size: 18" X 24"</p> <p>Max./Min. Board Thickness: 0.1"/"</p> <p>Max./Min. Base CU Thickness: N/A</p> <p>Max./Min. Through Hole Size: 0.045"/0.024"</p> <p>Aspect Ratio: 4:1</p> <p>Max. Number of Layers: 10</p> <p>Min. Conductor Width: 0.005"</p> <p>Min. Conductor Space: 0.005"</p> <p>Part Mounting: THM</p> <p>Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant</p> <p>Flex Base Material: Acrylic Adhesive</p> <p>Finish System: HASL</p> <p>Hole Preparation: Plasma Desmear, Etchback</p> <p>Alternate Construction: N/A</p> <p>Copper Plating: Electrodeposited Acid Copper</p> <p>Solder Resist: LPI</p> <p>Controlled Impedance: N/A</p> <p>Hole Fill/Via Plug: N/A</p> <p>Flex Usage: Class A (Flex During Installation) Class B (Dynamic)</p> <p>Through Hole Metallization: N/A</p> | <p>VQE-09-017323</p> |

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 Contact: Jim Smith Phone: 612-888-7900 Fax: 612-888-2719 E-Mail: jsmith@printedcircuits.com |
|---|--|---|

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | QUALIFICATION LETTERS: |
|--|-------------------------------|
| Specification: MIL-PRF-31032/3, MIL-PRF-31032/4 Panel Size: 12" X 18", 18" X 24" Max./Min. Board Thickness: 0.12"/Not Specified Max./Min. Base CU Thickness: (1/2 oz.) Max./Min. Through Hole Size: Not Specified/0.01" Aspect Ratio: 10:1 (Through Hole) Max. Number of Layers: 16 Min. Conductor Width: 0.004" Min. Conductor Space: 0.005" (+/- 10%) Part Mounting: SMT, MIX, THM Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: IPC-4204/1 (Acrylic Adhesive) IPC-4204/11 (Adhesiveless) Finish System: HASL, Fused SnPb, Electrolytic Ni/Au, Electroless Ni/Au Hole Preparation: Plasma Desmear/Etchback Alternate Construction: N/A Copper Plating: Electrolytic Acid Copper Solder Resist: LPI, Dry Film, SMOBC Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: Class A (Flex to Install) Class B (Continuous Flex) Through Hole Metallization: N/A | VQE-01-0024 |

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 Contact: Darrell Myers Phone: 408-964-6515 Fax: 408-964-6453 E-Mail: darrell.myers@sanmina-sci.com |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|---------------|-------------------------------|
| Specification: MIL-PRF-31032/1, MIL-PRF-31032/2 Panel Size: 18" X 24" Max./Min. Board Thickness: 0.062"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: 0.25"/0.01" Aspect Ratio: 6:1 (Through Hole) Max. Number of Layers: 8 Min. Conductor Width: 0.003" Min. Conductor Space: 0.003" Part Mounting: SMT, THM Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: N/A Finish System: HASL, ImmAg, ENIG, OSP Hole Preparation: Plasma Desmear Alternate Construction: Foil Lamination Copper Plating: Acid Copper Solder Resist: LPI, Dry Film Controlled Impedance: 50-110 ohms (± 5%) Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A | VQE-06-011137 | |

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|---|---------------|-------------------------------|
| Specification: MIL-PRF-31032/1, MIL-PRF-31032/2 Panel Size: 18" X 24" Max./Min. Board Thickness: 0.04"/Not Specified (for Plasma Etchback) 0.25"/Not Specified (for Plasma Desmear) Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: 0.25"/0.008" Aspect Ratio: 15:1 (Through Hole) 1:2 (Microvias, Laser) Max. Number of Layers: 30 Min. Conductor Width: 0.003" Min. Conductor Space: 0.003" Part Mounting: SMT, THM, MIX Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant Flex Base Material: N/A Finish System: HASL, ENIG, Electrolytic Nickel Gold, Reflowed Solder Hole Preparation: Plasma Desmear//Etchback Alternate Construction: Min. Blind Via: 0.005" Laser, Min. Buried Via: 0.010" Mechanical Drill, Foil Lamination, Sequential Lamination Copper Plating: Electrolytic Acid Copper Solder Resist: LPI, Dry Film Controlled Impedance: 50-110 ohms (± 5%) Hole Fill/Via Plug: Epoxy, Silver Flex Usage: N/A Through Hole Metallization: N/A | VQE-06-011137 | |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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| MANUFACTURER INFORMATION: Sovereign Circuits, Inc. 12080 DeBartolo Drive North Jackson, OH 44451, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 0GN71 Contact: Cynthia Savakis Phone: 330-538-3900, x211 Fax: 330-538-3820 EMail: quality@sovereign-circuits.com |
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

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|------------------------------|---|
| Specification: | MIL-PRF-31032/3, MIL-PRF-31032/4 |
| Panel Size: | 18" X 24" |
| Max./Min. Board Thickness: | 0.25"/Not Specified |
| Max./Min. Base CU Thickness: | 0.005"/Not Specified |
| Max./Min. Through Hole Size: | 0.008"/" |
| Aspect Ratio: | 15:1 (Through Hole) |
| Max. Number of Layers: | 24 |
| Min. Conductor Width: | 0.003" |
| Min. Conductor Space: | 0.003" |
| Part Mounting: | THM, SMT, MIX, Press Fit |
| Rigid Base Material: | GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant |
| Flex Base Material: | IPC-4204/1 (Acrylic Adhesive) IPC-4204/11 (Adhesiveless) |
| Finish System: | HASL, Fused SnPb, Immersion White tin, Immersion Ag, Ni/Au, OSP, Reflowed Pure Tin |
| Hole Preparation: | Permanganate Desmear/Etchback, Plasma Desmear/Etchback |
| Alternate Construction: | Blind Via, Buried Via, Foil Lamination, Cap Lamination |
| Copper Plating: | Electroless Acid Copper, Electroplated Acid Copper |
| Solder Resist: | LPI, Dry Film |
| Controlled Impedance: | Characteristic & Differential, 50, 75, 100 ohms ± 10% |
| Hole Fill/Via Plug: | Non-Conductive |
| Flex Usage: | N/A |
| Through Hole Metallization: | N/A |

VQE-03-003214
 VQE-03-003121
 VQE-07-012925

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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|---|--|--|
| MANUFACTURER INFORMATION: Sovereign Circuits, Inc. 12080 DeBartolo Drive North Jackson, OH 44451, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 0GN71 Contact: Cynthia Savakis Phone: 330-538-3900, x211 Fax: 330-538-3820 EMail: quality@sovereign-circuits.com |
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

| | |
|------------------------------|---|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 |
| Panel Size: | 18" X 24" |
| Max./Min. Board Thickness: | 0.25"/Not Specified |
| Max./Min. Base CU Thickness: | N/A |
| Max./Min. Through Hole Size: | 0.008"/Not Specified |
| Aspect Ratio: | 15:1 (Through Hole) |
| Max. Number of Layers: | 24 |
| Min. Conductor Width: | 0.003" |
| Min. Conductor Space: | 0.003" |
| Part Mounting: | SMT, THM, MIX, Press Fit |
| Rigid Base Material: | GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant BI: Aramid Fabric, Nonwoven, Polyimide Resin |
| Flex Base Material: | N/A |
| Finish System: | HASL, Fused SnPb, Immersion White Tin, Ni/Au, Ni/Pd/Au, OSP, Reflowed Pure Tin, Immersion Ag |
| Hole Preparation: | Plasma Desmear/Etchback, Permanganate Desmear/Etchback |
| Alternate Construction: | Blind Vias, Buried Vias, Foil Lamination, Cap Lamination |
| Copper Plating: | Electroless Acid Copper, Electroplated Acid Copper |
| Solder Resist: | LPI, Dry Film |
| Controlled Impedance: | Range 30-150 ohms ($\pm 10\%$), Microstrip, Embedded Microstrip, Dual Stripline, Characteristic, Differential |
| Hole Fill/Via Plug: | Conductive, Non-conductive |
| Flex Usage: | N/A |
| Through Hole Metallization: | N/A |

VQE-07-012925
 VQE-03-003214
 VQE-03-003121

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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|---|--|---|
| MANUFACTURER INFORMATION: Speedy Circuits 5331 McFadden Avenue Huntington Beach, CA 92649-1204, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 66982 Contact: Jan Lesky Phone: 714-766-6243 Fax: 714-899-7074 EMail: |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|---|---------------|-------------------------------|
| Specification: MIL-PRF-31032/1, MIL-PRF-31032/2 Panel Size: 18" X 24" Max./Min. Board Thickness: 0.11"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: 0.048"/0.02" Aspect Ratio: 4:1 (Through Hole) Max. Number of Layers: 10 Min. Conductor Width: 0.005" Min. Conductor Space: 0.005" Part Mounting: SMT, THM Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: N/A Finish System: HASL, Electro-deposited Fused SnPb, Electrolytic Hard Gold, Electrolytic Soft Gold, Electrolytic Nickel Hole Preparation: Plasma Desmear, Etchback Alternate Construction: Foil Lamination Copper Plating: Acid Copper Solder Resist: LPI Controlled Impedance: 100/50 ohms +/-10% Characteristic, 100/50 ohms +/-10% Differential Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A | VQE-08-016434 | |

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|---|---------------|-------------------------------|
| Specification: MIL-PRF-31032/3, MIL-PRF-31032/4 Panel Size: 18" X 24" Max./Min. Board Thickness: 0.11"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: 0.048"/0.02" Aspect Ratio: 4:1 (Through Hole) Max. Number of Layers: 10 Min. Conductor Width: 0.005" Min. Conductor Space: 0.005" Part Mounting: SMT, THM Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: Adhesiveless Polyimide Finish System: HASL, Electro-deposited Fused SnPb, Electrolytic Hard Gold, Electrolytic Soft Gold, Electrolytic Nickel Hole Preparation: Plasma Desmear, Etchback Alternate Construction: Foil Lamination Copper Plating: Electro-deposited Acid Copper Solder Resist: LPI Controlled Impedance: 100/50 ohms +/-10% Characteristic, 100/50 ohms +/-10% Differential Hole Fill/Via Plug: N/A Flex Usage: Class A (Flex to Install) Class B (Continuous) Through Hole Metallization: N/A | VQE-08-016434 | |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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| <p>MANUFACTURER INFORMATION: Speedy Circuits 5331 McFadden Avenue Huntington Beach, CA 92649-1204, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 66982 Contact: Jan Lesky Phone: 714-766-6243 Fax: 714-899-7074 EMail:</p> |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | QUALIFICATION LETTERS: |
|---|-------------------------------|
| <p>Specification: MIL-PRF-31032/6 Panel Size: 12" X 18" Max./Min. Board Thickness: 0.036"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: 0.048"/0.02" Aspect Ratio: 2:1 (Through Hole) Max. Number of Layers: 2 Min. Conductor Width: 0.005" Min. Conductor Space: 0.005" Part Mounting: SMT Rigid Base Material: GR: Glass Base, Nonwoven, Polytetrafluoroethylene Resin, Flame Resistant GY: Glass Base, Woven, Polytetrafluoroethylene Resin, Flame Resistant, for Microwave Application Flex Base Material: N/A Finish System: Electro-deposited fused SnPb Hole Preparation: N/A Alternate Construction: N/A Copper Plating: Acid Copper Solder Resist: N/A Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A</p> | <p>VQE-08-016434</p> |

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 Contact: Peter Pialis Phone: 416-752-2224 Fax: 416-752-6719 EMail: ppialis@strataflex.ca |
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

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|---|--------------------------------|
| Specification: MIL-PRF-31032/3, MIL-PRF-31032/4 Panel Size: 12" X 18" Max./Min. Board Thickness: 0.035"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: 0.011"/Not Specified Aspect Ratio: 3:1 (Through Hole) Max. Number of Layers: 7 Min. Conductor Width: 0.007" Min. Conductor Space: 0.007" Part Mounting: SM, THM Rigid Base Material: N/A Flex Base Material: Flexible Polyimide Film (IPC-4202/1) FR4 (IPC-4101/21) Flexible Polyimide Clad (IPC-4204/1) Woven E-Glass, Polyimide Resin (IPC-4101/41) Flexible Polyimide Film/Acrylic (IPC-4203/1) Finish System: HASL Hole Preparation: Plasma Etchback Alternate Construction: N/A Copper Plating: Electrodeposited Acid Copper Solder Resist: N/A Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A | VQE-04-005354 VQE-08-015729 |
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**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 Contact: Peter Pialis Phone: 416-752-2224 Fax: 416-752-6719 E-Mail: ppialis@strataflex.ca |
|--|--|---|

CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

| | |
|-------------------------------------|--|
| Specification: | MIL-PRF-31032/3, MIL-PRF-31032/4 |
| Panel Size: | 12" X 18" |
| Max./Min. Board Thickness: | 0.035"/Not Specified |
| Max./Min. Base CU Thickness: | N/A |
| Max./Min. Through Hole Size: | 0.011"/Not Specified |
| Aspect Ratio: | 3:1 (Through Hole) |
| Max. Number of Layers: | 7 |
| Min. Conductor Width: | 0.007" |
| Min. Conductor Space: | 0.007" |
| Part Mounting: | SMT, THM |
| Rigid Base Material: | Flexible Polyimide Film (IPC-4202/1) FR4-IPC-4101/21 Flexible Polyimide Clad (IPC-4204/1) Flexible Polyimide Film/Acylic (IPC-4203/1) |
| Flex Base Material: | N/A |
| Finish System: | HASL |
| Hole Preparation: | Plasma Desmear/Etchback |
| Alternate Construction: | N/A |
| Copper Plating: | Acid Copper |
| Solder Resist: | N/A |
| Controlled Impedance: | N/A |
| Hole Fill/Via Plug: | N/A |
| Flex Usage: | N/A |
| Through Hole Metallization: | N/A |

VQE-04-5354

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

| | | |
|--|--|---|
| MANUFACTURER INFORMATION: Strataflex Corp. 11 Dohme Avenue Toronto, Ontario, Canada M4B 1Y7 | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 38661 Contact: Peter Pialis Phone: 416-752-2224 Fax: 416-752-6719 E-Mail: ppialis@strataflex.ca |
|--|--|---|

CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

| | |
|------------------------------|---|
| Specification: | MIL-PRF-31032/3, MIL-PRF-31032/4 |
| Panel Size: | 12" X 18" |
| Max./Min. Board Thickness: | 0.094"/Not Specified |
| Max./Min. Base CU Thickness: | N/A |
| Max./Min. Through Hole Size: | Not Specified/0.008" |
| Aspect Ratio: | 12:1 (Through Hole) |
| Max. Number of Layers: | 12 |
| Min. Conductor Width: | 0.006" |
| Min. Conductor Space: | 0.004" |
| Part Mounting: | N/A |
| Rigid Base Material: | N/A |
| Flex Base Material: | Woven E-Glass, Polyimide Resin (IPC-4101/40) Woven E-Glass, Polyimide Resin (IPC-4101/41) Woven E-Glass, Polyimide Resin (IPC-4101/42) Flexible Polyimide (IPC-4204/11) Flexible Polyimide Film/Acrylic (IC-4203/1) |
| Finish System: | HASL |
| Hole Preparation: | Plasma Etchback |
| Alternate Construction: | N/A |
| Copper Plating: | Electrodeposited Acid Copper |
| Solder Resist: | TA140 PSR-4000 HG |
| Controlled Impedance: | N/A |
| Hole Fill/Via Plug: | N/A |
| Flex Usage: | N/A |
| Through Hole Metallization: | N/A |

VQE-04-005354
 VQE-08-015729

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

| | | |
|---|--|---|
| MANUFACTURER INFORMATION: Titan PCB East, Inc. 2 Industrial Way Amesbury, MA 01913, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 0BX48 Contact: Lance Arlander Phone: 978-388-5740 Fax: 978-388-5538 E-Mail: larlander@titaneast.com |
|---|--|---|

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|---|-------------------------------|
| Specification: Panel Size: Max./Min. Board Thickness: Max./Min. Base CU Thickness: Max./Min. Through Hole Size: Aspect Ratio: Max. Number of Layers: Min. Conductor Width: Min. Conductor Space: Part Mounting: Rigid Base Material: Flex Base Material: Finish System: Hole Preparation: Alternate Construction: Copper Plating: Solder Resist: Controlled Impedance: Hole Fill/Via Plug: Flex Usage: Through Hole Metallization: | MIL-PRF-31032/1, MIL-PRF-31032/2 18" X 24" 0.012"/Not Specified N/A Not Specified/0.012" 10:1 (Through Hole) 14 0.004" 0.004" SMT, THM, MIX GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant N/A HASL, ENIG, Electroplated Gold Plasma Etchback N/A Electrolytic Acid Copper LPI, Dry Film N/A N/A N/A N/A | VQE-05-7439 VQE-04-6518 |

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|--|-------------------------------|
| Specification: Panel Size: Max./Min. Board Thickness: Max./Min. Base CU Thickness: Max./Min. Through Hole Size: Aspect Ratio: Max. Number of Layers: Min. Conductor Width: Min. Conductor Space: Part Mounting: Rigid Base Material: Flex Base Material: Finish System: Hole Preparation: Alternate Construction: Copper Plating: Solder Resist: Controlled Impedance: Hole Fill/Via Plug: Flex Usage: Through Hole Metallization: | MIL-PRF-31032/3, MIL-PRF-31032/4 18" X 24" 0.012"/Not Specified N/A Not Specified/0.012" 10:1 (Through Hole) 14 0.004" 0.004" SMT, THM, MIX GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant N/A HASL, Immersion Ni/Au, ENIG, Electroplated Gold Plasma Etchback N/A Electrodeposited Acid Copper LPI, Dry Film N/A N/A N/A N/A | VQE-05-7439 VQE-04-6518 |

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

| | | |
|---|--|--|
| MANUFACTURER INFORMATION: Titan PCB East, Inc. 2 Industrial Way Amesbury, MA 01913, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 0BX48 Contact: Lance Arlander Phone: 978-388-5740 Fax: 978-388-5538 EMail: larlander@titaneast.com |
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| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|----------------------------------|-------------------------------|
| Specification: | MIL-PRF-31032/3, MIL-PRF-31032/3 | VQE-01-0024 |
| Panel Size: | 12" X 18", 18" X 24" | |
| Max./Min. Board Thickness: | 0.12"/Not Specified | |
| Max./Min. Base CU Thickness: | N/A | |
| Max./Min. Through Hole Size: | N/A | |
| Aspect Ratio: | N/A | |
| Max. Number of Layers: | N/A | |
| Min. Conductor Width: | N/A | |
| Min. Conductor Space: | N/A | |
| Part Mounting: | N/A | |
| Rigid Base Material: | N/A | |
| Flex Base Material: | N/A | |
| Finish System: | N/A | |
| Hole Preparation: | N/A | |
| Alternate Construction: | N/A | |
| Copper Plating: | N/A | |
| Solder Resist: | N/A | |
| Controlled Impedance: | N/A | |
| Hole Fill/Via Plug: | N/A | |
| Flex Usage: | N/A | |
| Through Hole Metallization: | N/A | |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

| | | |
|--|--|---|
| <p>MANUFACTURER INFORMATION: TTM Technologies (Redmond) 17550 NE 67th Court Redmond, WA 98052-4939, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 3EDZ0 Contact: Margaret Schlosser Phone: 425-883-7575 Fax: EMail: mschlosser@ttmtech.com</p> |
|--|--|---|

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|---|-------------------------------|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 | VQE-06-011027 |
| Panel Size: | 21.5" X 24.5" | VQE-06-011656 |
| Max./Min. Board Thickness: | 0.063"/Not Specified (nominal) | |
| Max./Min. Base CU Thickness: | N/A | |
| Max./Min. Through Hole Size: | Not Specified/0.01" | |
| Aspect Ratio: | 6.3:1 (Through Hole) | |
| Max. Number of Layers: | 12 | |
| Min. Conductor Width: | 0.005" | |
| Min. Conductor Space: | 0.003" | |
| Part Mounting: | SMT, THM | |
| Rigid Base Material: | GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant | |
| Flex Base Material: | N/A | |
| Finish System: | ENIG | |
| Hole Preparation: | Desmear/Etchback | |
| Alternate Construction: | N/A | |
| Copper Plating: | Acid Copper | |
| Solder Resist: | N/A | |
| Controlled Impedance: | N/A | |
| Hole Fill/Via Plug: | N/A | |
| Flex Usage: | N/A | |
| Through Hole Metallization: | N/A | |

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 Contact: Terry Lichte Phone: 714-241-0303, x3127 Fax: 714-241-0708 EMail: tlichte@ttmtech.comca |
|---|--|---|

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|---|-------------------------------|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 | VQE-05-8644 |
| | | VQE-06-011211 |
| Panel Size: | 21" X 28" | |
| Max./Min. Board Thickness: | 0.2"/Not Specified | |
| Max./Min. Base CU Thickness: | N/A | |
| Max./Min. Through Hole Size: | 0.044"/0.013" | |
| Aspect Ratio: | 14:1 (Through Hole) | |
| Max. Number of Layers: | 24 | |
| Min. Conductor Width: | 0.003" | |
| Min. Conductor Space: | 0.003" | |
| Part Mounting: | SMT, THM | |
| Rigid Base Material: | GF: Woven E-Glass, Epoxy Resin, Flame Resistant | |
| Flex Base Material: | N/A | |
| Finish System: | HASL, ENIG, OSP, ImmAg, Fused SnPb | |
| Hole Preparation: | Desmear Etchback | |
| Alternate Construction: | Min. Blind Via: 0.005" Laser, Min. Buried Via: 0.0135" Mechanical Drill, Sequential Lamination, Aspect Ratio Microvias: 1:1 | |
| Copper Plating: | Acid Copper | |
| Solder Resist: | LPI, Dry Film | |
| Controlled Impedance: | N/A | |
| Hole Fill/Via Plug: | N/A | |
| Flex Usage: | N/A | |
| Through Hole Metallization: | N/A | |

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|---|-------------------------------|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 | VQE-05-8644 |
| | | VQE-06-011211 |
| Panel Size: | 18" X 24" | |
| Max./Min. Board Thickness: | 0.2"/Not Specified | |
| Max./Min. Base CU Thickness: | N/A | |
| Max./Min. Through Hole Size: | 0.044"/0.013" | |
| Aspect Ratio: | 14:1 (Through Hole) | |
| Max. Number of Layers: | 24 | |
| Min. Conductor Width: | 0.003" | |
| Min. Conductor Space: | 0.003" | |
| Part Mounting: | SMT, THM | |
| Rigid Base Material: | GI: Glass Base, Woven, Polyimide Resin, Heat Resistant | |
| Flex Base Material: | N/A | |
| Finish System: | HASL, ENIG, OSP, ImmAg, Fused SnPb | |
| Hole Preparation: | Desmear Etchback | |
| Alternate Construction: | Min. Blind Via: 0.005" Laser, Min. Buried Via: 0.0135" Mechanical Drill, Sequential Lamination, Aspect Ratio Microvias: 1:1 | |
| Copper Plating: | Acid Copper | |
| Solder Resist: | LPI, Dry Film | |
| Controlled Impedance: | N/A | |
| Hole Fill/Via Plug: | N/A | |
| Flex Usage: | N/A | |
| Through Hole Metallization: | N/A | |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

| | | |
|--|--|---|
| MANUFACTURER INFORMATION: TTM Technologies (Santa Clara) 400 Matthew Street Santa Clara, CA 95050, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 65916 Contact: Nellie Guitierrez Phone: 408-486-3184 Fax: 408-727-1003 EMail: nellie.guitierrez@ttmtech.com |
|--|--|---|

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|---|-------------------------------|
| Specification: | MIL-PRF-31032/1, MIL-PRF-31032/2 | VQE-03-3888 |
| Panel Size: | 18" X 24" | VQE-04-5823 |
| Max./Min. Board Thickness: | 0.12"/Not Specified | |
| Max./Min. Base CU Thickness: | N/A | |
| Max./Min. Through Hole Size: | 0.191"/0.012" | |
| Aspect Ratio: | 9:1 (Through Hole) | |
| Max. Number of Layers: | 20 | |
| Min. Conductor Width: | 0.004" | |
| Min. Conductor Space: | 0.004" | |
| Part Mounting: | SMT, THM, MIX | |
| Rigid Base Material: | GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant | |
| Flex Base Material: | N/A | |
| Finish System: | HASL, Immersion Ni/Au | |
| Hole Preparation: | Plasma Desmear/Etchback | |
| Alternate Construction: | Blind Vias | |
| Copper Plating: | Electrolytic Acid Copper | |
| Solder Resist: | LPI, Screen Printed | |
| Controlled Impedance: | Characteristic, Differential +/-10% | |
| Hole Fill/Via Plug: | N/A | |
| Flex Usage: | N/A | |
| Through Hole Metallization: | N/A | |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

| | | |
|--|--|---|
| MANUFACTURER INFORMATION: TTM Technologies (Santa Clara) 400 Matthew Street Santa Clara, CA 95050, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 65916 Contact: Nellie Guitierrez Phone: 408-486-3184 Fax: 408-727-1003 EMail: nellie.guitierrez@ttmtech.com |
|--|--|---|

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | QUALIFICATION LETTERS: |
|---|-------------------------------|
| Specification: MIL-PRF-31032/3, MIL-PRF-31032/4 Panel Size: 18" X 24" Max./Min. Board Thickness: 0.12"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: 0.191"/0.012" Aspect Ratio: 9:1 (Through Hole) Max. Number of Layers: 10 Min. Conductor Width: 0.004" Min. Conductor Space: 0.004" Part Mounting: SMT, THM, MIX Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: IPC-4204/1 (Acrylic Adhesive) IPC-4204/11 (Adhesiveless) Finish System: HASL, Immersion Ni/Au Hole Preparation: Plasma Desmear/Etchback Alternate Construction: N/A Copper Plating: Acid Copper Solder Resist: N/A Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: Class A (Flex to Install) Class B (Continuous) Through Hole Metallization: N/A | VQE-03-3895 |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

| | | |
|--|--|---|
| MANUFACTURER INFORMATION: TTM Technologies (Santa Clara) 400 Matthew Street Santa Clara, CA 95050, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 65916 Contact: Nellie Guitierrez Phone: 408-486-3184 Fax: 408-727-1003 EMail: nellie.guitierrez@ttmtech.com |
|--|--|---|

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | | QUALIFICATION LETTERS: |
|--|---|-------------------------------|
| Specification: Panel Size: Max./Min. Board Thickness: Max./Min. Base CU Thickness: Max./Min. Through Hole Size: Aspect Ratio: Max. Number of Layers: Min. Conductor Width: Min. Conductor Space: Part Mounting: Rigid Base Material: Flex Base Material: Finish System: Hole Preparation: Alternate Construction: Copper Plating: Solder Resist: Controlled Impedance: Hole Fill/Via Plug: Flex Usage: Through Hole Metallization: | MIL-PRF-31032/Custom 18" X 24" 0.62"/0.006" N/A 0.076"/0.015" ((drilled)) 0.02"/0.015" ((drilled)) 4:1 (Through Hole) 6 0.007" 0.008" MIX, SMT, THM IPC-4103/10 Construction GF: Woven E-Glass, Epoxy Resin, Flame Resistant N/A ENIG Chemical Desmear Blind vias Electroless, Electrolytic Acid Copper LPI, SMOBC 50 ohms +/-10% N/A N/A N/A | VQE-07-13211 |

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

| | | |
|---|--|---|
| MANUFACTURER INFORMATION: TTM Technologies (Stafford) 4 Old Monson Road P.O. Box 145, Stafford, TX 77497, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 5L706 Contact: Michelle Herbert Phone: 860-684-5881 Fax: 860-684-7425 EMail: michele.hebert@tycoelectronics.com |
|---|--|---|

CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

| | |
|--|-------------|
| Specification: MIL-PRF-31032/3, MIL-PRF-31032/4 Panel Size: 30" X 54" Max./Min. Board Thickness: 0.3"/0.003" Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: 0.221"/0.009" (drilled) Aspect Ratio: 9:1 (Through Hole) Max. Number of Layers: 28 Min. Conductor Width: 0.004" Min. Conductor Space: 0.004" Part Mounting: SMT, THM, MIX Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: IPC-4204/1 (Acrylic Adhesive) IPC-4204/11 (Adhesiveless) Finish System: HASL, SMOBC, Reflowed Solder, Electroless Nickel/Immersion Gold, Electrolytic Hard & Soft Gold, Electrolytic Nickel, Bright Tin, Immersion Tin Hole Preparation: Plasma Etchback Alternate Construction: Buried Via Aspect Ratio: 5:1, Copper Invar Copper, Blind and Buried Vias, Micro Vias, Buried Resistors, Multiple Laminations Copper Plating: Acid Copper Solder Resist: LPI, Dy Film, Wet Mask, Hole Fill, Hole Plug Controlled Impedance: Range 30-150 ($\pm 10\%$), Microstrip, Embedded Microstrip, Dual Stripline, Characteristic, Differential Hole Fill/Via Plug: N/A Flex Usage: Class A (Flex to Install) Class B (Continuous) Through Hole Metallization: N/A | VQE-03-3349 |
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SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

| | | |
|---|--|---|
| MANUFACTURER INFORMATION: TTM Technologies (Stafford) 4 Old Monson Road P.O. Box 145, Stafford, TX 77497, US | PLANT LOCATION: Same Address as Manufacturer | CAGE Code: 5L706 Contact: Michelle Herbert Phone: 860-684-5881 Fax: 860-684-7425 EMail: michele.hebert@tycoelectroni cs.com |
|---|--|---|

CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

| | |
|---|-------------|
| Specification: MIL-PRF-31032/1, MIL-PRF-31032/2 Panel Size: 30" X 54" Max./Min. Board Thickness: 1.088"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: 0.095"/0.221" (drilled) Aspect Ratio: 10:1 (Through Hole) Max. Number of Layers: 68 Min. Conductor Width: 0.004" Min. Conductor Space: 0.004" Part Mounting: SMT, THM, MIX, Press Fit Rigid Base Material: GM: Glass Base, Woven, Triazine and/or Bismaleimide Modified Epoxy Resin, Flame Resistant AF: Aramid Fabric, Woven, Majority Polyfunctional Epoxy Resin GF: Woven E-Glass, Epoxy Resin, Flame Resistant SC: Glass Base, Woven S-2, Fiber, Majority Cyanate Ester, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant BF: Aramid Fabric, Nonwoven, Epoxy Resin BI: Aramid Fabric, Nonwoven, Polyimide Resin Flex Base Material: N/A Finish System: HASL, SMOBC, Reflowed Solder, Electroless Nickel/Immersion Gold, Electrolytic Hard & Soft Gold, Electrolytic Nickel, Bright Tin, Immersion Tin Hole Preparation: Plasma Etchback Alternate Construction: Buried Via Aspect Ratio: 1:1, Copper Invar Copper, Blind and Buried Vias, Micro Vias, Buried Resistors, Multiple Laminations Copper Plating: Acid Copper Solder Resist: LPI, Dry Film, Wet Mask, Hole Fill, Hole Plug Controlled Impedance: Range 30-150 ($\pm 10\%$), Microstrip, Embedded Microstrip, Dual Stripline, Characteristic, Differential Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A | VQE-03-3348 |
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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 Contact: Bob Lageman Phone: 303-730-0505, x110 Fax: EMail: blageman@unicircuit.com |
|---|--|--|

| CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION | QUALIFICATION LETTERS: |
|--|-------------------------------|
| Specification: MIL-PRF-31032/1, MIL-PRF-31032/2 Panel Size: 12" X 18" Max./Min. Board Thickness: 0.12"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: 0.02"/0.129" (Drilled Through Hole) Aspect Ratio: 6:1 (Through Hole) Max. Number of Layers: 16 Min. Conductor Width: 0.005" Min. Conductor Space: 0.005" Part Mounting: SMT, THM Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: N/A Finish System: HASL, Reflowed Tin Lead Hole Preparation: Plasma Etchback Alternate Construction: Sequential Lamination, Blind Via, Bured Via, Laser-drilled Microvias, Foil Lamination Copper Plating: Electrodeposited Acid Copper Solder Resist: LPI Controlled Impedance: 55 ohms characteristic, 100 ohms differential +/-10% Hole Fill/Via Plug: N/A Flex Usage: N/A Through Hole Metallization: N/A Laser Via Hole Size .006 +/- .001 | VQE-07-13789 |

SECTION II
LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION

MIL-PRF-31032/1

Accurate Circuit Engineering

3019 S. Kilson Drive, Santa Ana, CA 92707, US

American Standard Circuits

RF Division, 475 Industrial Drive, West Chicago, IL 60185, US

Amphenol Printed Circuits

91 Northeastern Boulevard, Nashua, NH 03062, US

Calumet Electronics Corp.

25830 Depot Street, Calumet, MI 49913-1985, US

Cirexx International

791 Nuttman Street, Santa Clara, CA 95054,

Colonial Circuits, Inc.

1026 Warrenton Road, Fredericksburg, VA 22406-6200, US

Coretec Cleveland, Inc.

7 Ascot Parkway, Cuyahoga Falls, OH 44223, US

Coretec Denver, Inc.

10570 Bradford Road, Littleton, CO 80127, US

Coretec, Inc.

8150 Sheppard Avenue East, Scarborough, Ontario, Canada M1B 5K2

Cosmotronic, Inc.

16721 Noyes Avenue, Irvine, CA 92606, US

Diversified Systems

3939 West 56th Street, Indianapolis, IN 46254, US

Dynaco Corp.

1000 South Priest Drive, Tempe, AZ 85281-5238, US

Dynamic & Proto Circuits, Inc.

869 Barton Street, Stoney Creek, Ontario, Canada L8E 5G6

Dynamic Details, Inc.

1200 Severn Way, Dulles, VA 20166-8904, US

Electro Plate Circuitry

1430 Century Drive, Carrollton, TX 75006, US

Electrotek Corp.

7745 S. 10th Street, Oak Creek, WI 53154, US

Endicott Interconnect Technologies, Inc.

1701 North Street, P.O. Box 658, Endicott, NY 13760, US

Firan Technology Group

250 Finchdene Square, Scarborough, Ontario, Canada M1X 1A5

Global Innovation Corp.

901 Hensley Drive, Wylie, TX 75098, US

Hamby Corporation

27704 Avenue Scott, Valencia, CA 91355, US

Hans Brockstedt GmbH

Leiterplattenschnelldienst, Clara-Immerwahr-Str. 7, 24145, Kiel, Germany

Hughes Circuits

540 S. Pacific Street, San Marcos, CA 92078-4056, US

Lockheed Martin Systems Integration-Owego

1801 State Route 17C, Owego, NY 13827, US

Merix Corp. (Forest Grove, OR)

1521 Poplar Lane, Forest Grove, OR 97116, US

Merix Corp. (San Jose, CA)

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

Micom Corp.

475 Old Highway 8 NW, New Brighton, MN 55112, US

Philway Products, Inc.

701 Virginia Avenue, Ashland, OH 44806, US

SECTION II
LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION

MIL-PRF-31032/1

Pioneer Circuits, Inc.

3000 S. Shannon Street, Santa Ana, CA 92704-6321, US

Sanmina-SCI (San Jose)

2050 Bering Drive, San Jose, CA 95131, US

Sovereign Circuits, Inc.

12080 DeBartolo Drive, North Jackson, OH 44451, US

Speedy Circuits

5331 McFadden Avenue, Huntington Beach, CA 92649-1204, US

Titan PCB East, Inc.

2 Industrial Way, Amesbury, MA 01913, US

TTM Technologies (Redmond)

17550 NE 67th Court, Redmond, WA 98052-4939, US

TTM Technologies (Santa Ana)

2630 South Harbor Boulevard, Santa Ana, CA 92704, US

TTM Technologies (Santa Clara)

400 Matthew Street, Santa Clara, CA 95050, US

TTM Technologies (Stafford)

4 Old Monson Road, P.O. Box 145, Stafford, TX 77497, US

Unicircuit, Inc.

8192 Southpark Lane, Littleton, CO 80120, US

SECTION II
LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION

MIL-PRF-31032/2

Accurate Circuit Engineering

3019 S. Kilson Drive, Santa Ana, CA 92707, US

American Standard Circuits

RF Division, 475 Industrial Drive, West Chicago, IL 60185, US

Amphenol Printed Circuits

91 Northeastern Boulevard, Nashua, NH 03062, US

Calumet Electronics Corp.

25830 Depot Street, Calumet, MI 49913-1985, US

Cirexx International

791 Nuttman Street, Santa Clara, CA 95054,

Colonial Circuits, Inc.

1026 Warrenton Road, Fredericksburg, VA 22406-6200, US

Coretec Cleveland, Inc.

7 Ascot Parkway, Cuyahoga Falls, OH 44223, US

Coretec Denver, Inc.

10570 Bradford Road, Littleton, CO 80127, US

Coretec, Inc.

8150 Sheppard Avenue East, Scarborough, Ontario, Canada M1B 5K2

Cosmotronic, Inc.

16721 Noyes Avenue, Irvine, CA 92606, US

Diversified Systems

3939 West 56th Street, Indianapolis, IN 46254, US

Dynaco Corp.

1000 South Priest Drive, Tempe, AZ 85281-5238, US

Dynamic & Proto Circuits, Inc.

869 Barton Street, Stoney Creek, Ontario, Canada L8E 5G6

Dynamic Details, Inc.

1200 Severn Way, Dulles, VA 20166-8904, US

Electro Plate Circuitry

1430 Century Drive, Carrollton, TX 75006, US

Electrotek Corp.

7745 S. 10th Street, Oak Creek, WI 53154, US

Endicott Interconnect Technologies, Inc.

1701 North Street, P.O. Box 658, Endicott, NY 13760, US

Firan Technology Group

250 Finchdene Square, Scarborough, Ontario, Canada M1X 1A5

Global Innovation Corp.

901 Hensley Drive, Wylie, TX 75098, US

Hamby Corporation

27704 Avenue Scott, Valencia, CA 91355, US

Hans Brockstedt GmbH

Leiterplattenschnelldienst, Clara-Immerwahr-Str. 7, 24145, Kiel, Germany

Hughes Circuits

540 S. Pacific Street, San Marcos, CA 92078-4056, US

Lockheed Martin Systems Integration-Owego

1801 State Route 17C, Owego, NY 13827, US

Merix Corp. (Forest Grove, OR)

1521 Poplar Lane, Forest Grove, OR 97116, US

Merix Corp. (San Jose, CA)

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

Micom Corp.

475 Old Highway 8 NW, New Brighton, MN 55112, US

Pioneer Circuits, Inc.

3000 S. Shannon Street, Santa Ana, CA 92704-6321, US

SECTION II
LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION

MIL-PRF-31032/2

Sanmina-SCI (San Jose)

2050 Bering Drive, San Jose, CA 95131, US

Sovereign Circuits, Inc.

12080 DeBartolo Drive, North Jackson, OH 44451, US

Speedy Circuits

5331 McFadden Avenue, Huntington Beach, CA 92649-1204, US

Titan PCB East, Inc.

2 Industrial Way, Amesbury, MA 01913, US

TTM Technologies (Redmond)

17550 NE 67th Court, Redmond, WA 98052-4939, US

TTM Technologies (Santa Ana)

2630 South Harbor Boulevard, Santa Ana, CA 92704, US

TTM Technologies (Santa Clara)

400 Matthew Street, Santa Clara, CA 95050, US

TTM Technologies (Stafford)

4 Old Monson Road, P.O. Box 145, Stafford, TX 77497, US

Unicircuit, Inc.

8192 Southpark Lane, Littleton, CO 80120, US

SECTION II
LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION

MIL-PRF-31032/3

Calumet Electronics Corp.

25830 Depot Street, Calumet, MI 49913-1985, US

Cirexx International

791 Nuttman Street, Santa Clara, CA 95054,

Coretec Cleveland, Inc.

7 Ascot Parkway, Cuyahoga Falls, OH 44223, US

Cosmotronic, Inc.

16721 Noyes Avenue, Irvine, CA 92606, US

Dynaco Corp.

1000 South Priest Drive, Tempe, AZ 85281-5238, US

Hamby Corporation

27704 Avenue Scott, Valencia, CA 91355, US

Hans Brockstedt GmbH

Leiterplattenschnelldienst, Clara-Immerwahr-Str. 7, 24145, Kiel, Germany

Lockheed Martin Systems Integration-Owego

1801 State Route 17C, Owego, NY 13827, US

Pioneer Circuits, Inc.

3000 S. Shannon Street, Santa Ana, CA 92704-6321, US

Printed Circuits, Inc.

1200 West 96th Street, Bloomington, MN 55431, US

Sovereign Circuits, Inc.

12080 DeBartolo Drive, North Jackson, OH 44451, US

Speedy Circuits

5331 McFadden Avenue, Huntington Beach, CA 92649-1204, US

Strataflex Corp.

11 Dohme Avenue, Toronto, Ontario, Canada M4B 1Y7

Titan PCB East, Inc.

2 Industrial Way, Amesbury, MA 01913, US

TTM Technologies (Santa Clara)

400 Matthew Street, Santa Clara, CA 95050, US

TTM Technologies (Stafford)

4 Old Monson Road, P.O. Box 145, Stafford, TX 77497, US

SECTION II
LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION

MIL-PRF-31032/4

Calumet Electronics Corp.

25830 Depot Street, Calumet, MI 49913-1985, US

Cirexx International

791 Nuttman Street, Santa Clara, CA 95054,

Colonial Circuits, Inc.

1026 Warrenton Road, Fredericksburg, VA 22406-6200, US

Coretec Cleveland, Inc.

7 Ascot Parkway, Cuyahoga Falls, OH 44223, US

Cosmotronic, Inc.

16721 Noyes Avenue, Irvine, CA 92606, US

Dynaco Corp.

1000 South Priest Drive, Tempe, AZ 85281-5238, US

Hamby Corporation

27704 Avenue Scott, Valencia, CA 91355, US

Hans Brockstedt GmbH

Leiterplattenschnelldienst, Clara-Immerwahr-Str. 7, 24145, Kiel, Germany

Lockheed Martin Systems Integration-Owego

1801 State Route 17C, Owego, NY 13827, US

Pioneer Circuits, Inc.

3000 S. Shannon Street, Santa Ana, CA 92704-6321, US

Printed Circuits, Inc.

1200 West 96th Street, Bloomington, MN 55431, US

Sovereign Circuits, Inc.

12080 DeBartolo Drive, North Jackson, OH 44451, US

Speedy Circuits

5331 McFadden Avenue, Huntington Beach, CA 92649-1204, US

Strataflex Corp.

11 Dohme Avenue, Toronto, Ontario, Canada M4B 1Y7

Titan PCB East, Inc.

2 Industrial Way, Amesbury, MA 01913, US

TTM Technologies (Santa Clara)

400 Matthew Street, Santa Clara, CA 95050, US

TTM Technologies (Stafford)

4 Old Monson Road, P.O. Box 145, Stafford, TX 77497, US

SECTION II
LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION

MIL-PRF-31032/6

Speedy Circuits

5331 McFadden Avenue, Huntington Beach, CA 92649-1204, US

SECTION II
LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION

MIL-PRF-31032/Custom

Colonial Circuits, Inc.

1026 Warrenton Road, Fredericksburg, VA 22406-6200, US

Cosmotronic, Inc.

16721 Noyes Avenue, Irvine, CA 92606, US

Endicott Interconnect Technologies, Inc.

1701 North Street, P.O. Box 658, Endicott, NY 13760, US

TTM Technologies (Santa Clara)

400 Matthew Street, Santa Clara, CA 95050, US

SECTION III
ALPHABETICAL LIST OF QUALIFIED MANUFACTURERS

| | | |
|---|---|---|
| <p>MANUFACTURER INFORMATION: Accurate Circuit Engineering 3019 S. Kilson Drive Santa Ana, CA 92707, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 0MNN9 Contact: James Hofer Phone: 714-546-162 Fax: 714-433-7418 EMail: James@ace-pcb.com</p> |
| <p>MANUFACTURER INFORMATION: American Standard Circuits RF Division, 475 Industrial Drive West Chicago, IL 60185, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 4AA34 Contact: Lori Ryan Phone: 603-639-5438 Fax: EMail: lori@asc-i.com</p> |
| <p>MANUFACTURER INFORMATION: Amphenol Printed Circuits 91 Northeastern Boulevard Nashua, NH 03062, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 57034 Contact: Denise Chevalier Phone: 603-879-3268 Fax: 603-879-2818 EMail: denise.chevalier@amphenol-tcs.com</p> |
| <p>MANUFACTURER INFORMATION: Calumet Electronics Corp. 25830 Depot Street Calumet, MI 49913-1985, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 65337 Contact: Robert Hall Phone: 906-337-1305 Fax: 906-337-5359 EMail: rhall@cec-up.com</p> |
| <p>MANUFACTURER INFORMATION: Cirexx International 791 Nuttman Street Santa Clara, CA 95054,</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 4MEG7 Contact: Don Angulo Phone: 408-988-3980 Fax: 408-988-4534 EMail: dangulo@cirexxintl.com</p> |
| <p>MANUFACTURER INFORMATION: Colonial Circuits, Inc. 1026 Warrenton Road Fredericksburg, VA 22406-6200, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 6T499 Contact: Mike Hill Phone: 540-753-5511, x125 Fax: 540-752-2109 EMail: quality@colonialcircuits.com</p> |
| <p>MANUFACTURER INFORMATION: Coretec Cleveland, Inc. 7 Ascot Parkway Cuyahoga Falls, OH 44223, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 7Z463 Contact: Mark Kasting Phone: 330-572-3400 Fax: 330-572-3434 EMail: mark_kasting/coretec@coretec-inc.com</p> |
| <p>MANUFACTURER INFORMATION: Coretec Denver, Inc. 10570 Bradford Road Littleton, CO 80127, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 75815 Contact: Douglas N. Berry Phone: 303-904-6119 Fax: 303-933-2934 EMail: dberry@coretec-denver.com</p> |

SECTION III
ALPHABETICAL LIST OF QUALIFIED MANUFACTURERS

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| <p>MANUFACTURER INFORMATION: Coretec, Inc. 8150 Sheppard Avenue East Scarborough, Ontario, Canada M1B 5K2</p> | <p>PLANT LOCATIONS: 1. Same Address as Manufacturer 2. Coretec, Inc., CAGE Code: 3AF82, 2020 Ellesmere Road, Scarborough, Ontario, Canada M1H 2Z8</p> | <p>CAGE Code: 3AF82 Contact: Noor Al-Shaikh Phone: 416-208-2100 Fax: 416-439-1582 EMail: alshaikh@coretec-inc.com</p> |
| <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 Contact: Alan Exley Phone: 949-660-0740 Fax: 949-553-8371 EMail: alan_exley@cosmotronic.com</p> |
| <p>MANUFACTURER INFORMATION: Diversified Systems 3939 West 56th Street Indianapolis, IN 46254, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 5S706 Contact: Linda Bell Phone: 317-299-9547, x238 Fax: 317-298-2061 EMail: linda.bell@divsys.com</p> |
| <p>MANUFACTURER INFORMATION: Dynaco Corp. 1000 South Priest Drive Tempe, AZ 85281-5238, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 61642 Contact: Ted Edwards Phone: 480-736-3728 Fax: 480-921-9830 EMail: tedwards@dynacocorp.com</p> |
| <p>MANUFACTURER INFORMATION: Dynamic & Proto Circuits, Inc. 869 Barton Street Stoney Creek, Ontario, Canada L8E 5G6</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 38898 Contact: Stephen Hazell Phone: 905-643-9900 Fax: 905-643-9911 EMail: stephenhazell@dapc.com</p> |
| <p>MANUFACTURER INFORMATION: Dynamic Details, Inc. 1200 Severn Way Dulles, VA 20166-8904, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 0K703 Contact: Tony Trnka Phone: 703-652-2266 Fax: 703-652-2271 EMail: atnka@va.ddiglobal.com</p> |
| <p>MANUFACTURER INFORMATION: Electro Plate Circuitry 1430 Century Drive Carrollton, TX 75006, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 79616 Contact: James McNeal Phone: 972-466-0818 Fax: 972-466-9078 EMail: jimm@eplate.com</p> |
| <p>MANUFACTURER INFORMATION: Electrotek Corp. 7745 S. 10th Street Oak Creek, WI 53154, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 66030 Contact: Tom Tikusis Phone: 414-762-1390 Fax: 414-762-1510 EMail: sales@boards4u.com</p> |

**SECTION III
ALPHABETICAL LIST OF QUALIFIED MANUFACTURERS**

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|--|---|---|
| <p>MANUFACTURER INFORMATION: Endicott Interconnect Technologies, Inc. 1701 North Street P.O. Box 658, Endicott, NY 13760, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 3ECL3 Contact: Jose Rios Phone: 607-755-5896 Fax: 607-755-4649 EMail: JoseA.Rios@eitny.com</p> |
| <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 Contact: Bryan Clark Phone: 416-299-4000 Fax: 416-292-4308 EMail: byanclark@firantechnology.com</p> |
| <p>MANUFACTURER INFORMATION: Global Innovation Corp. 901 Hensley Drive Wylie, TX 75098, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 04RV5 Contact: Bob Noland Phone: 214-291-1427 Fax: EMail: bnoland@globalinnovationcorp.com</p> |
| <p>MANUFACTURER INFORMATION: Hamby Corporation 27704 Avenue Scott Valencia, CA 91355, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 07248 Contact: Sue Sharp Phone: 661-257-1924 Fax: 661-257-1213 EMail: susharp@hambycorp.com</p> |
| <p>MANUFACTURER INFORMATION: Hans Brockstedt GmbH Leiterplattenschnelldienst, Clara-Immerwahr-Str. 7 24145, Kiel, Germany</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: C4831 Contact: Hilmar Klammer Phone: 0049-431-71966-0, -30 Fax: 0049-431-71966-29 EMail: klammer@brockstedt.de</p> |
| <p>MANUFACTURER INFORMATION: Hughes Circuits 540 S. Pacific Street San Marcos, CA 92078-4056, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 1KXU6 Contact: Joe Hughes Phone: 760-744-0300 Fax: 760-744-6388 EMail: joe@hughescircuits.com</p> |
| <p>MANUFACTURER INFORMATION: Lockheed Martin Systems Integration-Owego 1801 State Route 17C Owego, NY 13827, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 03640 Contact: Melita Nagerl Phone: 607-751-4665 Fax: 607-751-7714 EMail: melita.nagerl@lmco.com</p> |
| <p>MANUFACTURER INFORMATION: Merix Corp. (Forest Grove, OR) 1521 Poplar Lane Forest Grove, OR 97116, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 01KV9 Contact: Roger Michalowski Phone: 781-639-5410 Fax: EMail: Customerservice@merix.com</p> |

**SECTION III
ALPHABETICAL LIST OF QUALIFIED MANUFACTURERS**

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|---|---|---|
| <p>MANUFACTURER INFORMATION: Merix Corp. (San Jose, CA) 355 Turtle Creek Court San Jose, CA 95125-1316, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 0MHG5 Contact: Dave Williams Phone: 408-280-0422 Fax: 408-280-0641 EMail: david.williams@sj.merix.com</p> |
| <p>MANUFACTURER INFORMATION: Micom Corp. 475 Old Highway 8 NW New Brighton, MN 55112, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 34076 Contact: Larry Leonard Phone: 651-604-2639 Fax: 651-636-1352 EMail: lleonard@micomcircuits.com</p> |
| <p>MANUFACTURER INFORMATION: Philway Products, Inc. 701 Virginia Avenue Ashland, OH 44806, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 21971 Contact: Tom School Phone: 419-281-7777 Fax: 419-289-3447 EMail: quality@philway.com</p> |
| <p>MANUFACTURER INFORMATION: Pioneer Circuits, Inc. 3000 S. Shannon Street Santa Ana, CA 92704-6321, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 65723 Contact: Elias Gabriel Phone: 714-641-3132 x234 Fax: 714-641-3120 EMail:</p> |
| <p>MANUFACTURER INFORMATION: Printed Circuits, Inc. 1200 West 96th Street Bloomington, MN 55431, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 65114 Contact: Jim Smith Phone: 612-888-7900 Fax: 612-888-2719 EMail: jsmith@printedcircuits.com</p> |
| <p>MANUFACTURER INFORMATION: Sanmina-SCI (San Jose) 2050 Bering Drive San Jose, CA 95131, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 3DR67 Contact: Darrell Myers Phone: 408-964-6515 Fax: 408-964-6453 EMail: darrell.myers@sanmina-sci.com</p> |
| <p>MANUFACTURER INFORMATION: Sovereign Circuits, Inc. 12080 DeBartolo Drive North Jackson, OH 44451, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 0GN71 Contact: Cynthia Savakis Phone: 330-538-3900, x211 Fax: 330-538-3820 EMail: quality@sovereign-circuits.com</p> |
| <p>MANUFACTURER INFORMATION: Speedy Circuits 5331 McFadden Avenue Huntington Beach, CA 92649-1204, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 66982 Contact: Jan Lesky Phone: 714-766-6243 Fax: 714-899-7074 EMail:</p> |

SECTION III
ALPHABETICAL LIST OF QUALIFIED MANUFACTURERS

| | | |
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| <p>MANUFACTURER INFORMATION: Strataflex Corp. 11 Dohme Avenue Toronto, Ontario, Canada M4B 1Y7</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 38661 Contact: Peter Pialis Phone: 416-752-2224 Fax: 416-752-6719 EMail: ppialis@strataflex.ca</p> |
| <p>MANUFACTURER INFORMATION: Titan PCB East, Inc. 2 Industrial Way Amesbury, MA 01913, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 0BX48 Contact: Lance Arlander Phone: 978-388-5740 Fax: 978-388-5538 EMail: larlander@titaneast.com</p> |
| <p>MANUFACTURER INFORMATION: TTM Technologies (Redmond) 17550 NE 67th Court Redmond, WA 98052-4939, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 3EDZ0 Contact: Margaret Schlosser Phone: 425-883-7575 Fax: EMail: mschlosser@ttmtech.com</p> |
| <p>MANUFACTURER INFORMATION: TTM Technologies (Santa Ana) 2630 South Harbor Boulevard Santa Ana, CA 92704, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 1WQ42 Contact: Terry Lichte Phone: 714-241-0303, x3127 Fax: 714-241-0708 EMail: tlichte@ttmtech.comca</p> |
| <p>MANUFACTURER INFORMATION: TTM Technologies (Santa Clara) 400 Matthew Street Santa Clara, CA 95050, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 65916 Contact: Nellie Guitierrez Phone: 408-486-3184 Fax: 408-727-1003 EMail: nellie.guitierrez@ttmtech.com</p> |
| <p>MANUFACTURER INFORMATION: TTM Technologies (Stafford) 4 Old Monson Road P.O. Box 145, Stafford, TX 77497, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 5L706 Contact: Michelle Herbert Phone: 860-684-5881 Fax: 860-684-7425 EMail: michele.hebert@tycoelectronics.com</p> |
| <p>MANUFACTURER INFORMATION: Unicircuit, Inc. 8192 Southpark Lane Littleton, CO 80120, US</p> | <p>PLANT LOCATION: Same Address as Manufacturer</p> | <p>CAGE Code: 66311 Contact: Bob Lageman Phone: 303-730-0505, x110 Fax: EMail: blageman@unicircuit.com</p> |