

Specification Details:

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

Contact Information:

Office of Primary Involvement: Electronic Devices Branch, DLA Land and Maritime - VQE
Primary Qualifying Activity Contact: 614-692-0627, e-mail: vqe.ls@dla.mil
Secondary Qualifying Activity Contact: 614-692-0631, e-mail: vqe.bw@dla.mil

Notes:

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

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

The DLA Land and Maritime - VQE contacts for QML companies can be located in the file "31032 main points-of-contact" at website: http://www.dsc.dla.mil/offices/sourcing_and_qualification/offices.asp?section=VQE

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

The following abbreviations are used in this listing:

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

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

MANUFACTURER INFORMATION: Accurate Circuit Engineering 3019 S. Kilson Drive Santa Ana, CA 92707, US	PLANT LOCATION: Same Address as Manufacturer	CAGE Code: 0MNN9 Contact: James Hofer Phone: 714-546-162 Fax: 714-433-7418 EMail: James@ace-pcb.com
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2
Panel Size:	20" X 26"
Max./Min. Board Thickness:	.22"/Not Specified
Max./Min. Base CU Thickness:	.0056"/Not Specified
Max./Min. Through Hole Size:	.075"/.008" (after plating)
	.247"/Not Specified (mounting-after plating)
Aspect Ratio:	11:1 (Through Hole)
Max. Number of Layers:	24
Min. Conductor Width:	.003"
Min. Conductor Space:	.003" (+/-10%)
Part Mounting:	MIX, SM, THM
Rigid Base Material:	GF: Woven E-Glass, Epoxy Resin, Flame Resistant
Flex Base Material:	N/A
Finish System:	ENIG, Electrolytic Ni-Au, HASL
Hole Preparation:	Permanganate Desmear/Etchback, Plasma Desmear/Etchback
Alternate Construction:	Blind Vias, Buried Vias, Foil Lamination, Sequential Lamination
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
Hole Wall Conductive Coating:	Electroless Copper

VQE-06-12150
 VQE-07-12577
 VQE-09-18384

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

<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>
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION		QUALIFICATION LETTERS:
<p>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: Hole Wall Conductive Coating:</p>	<p>MIL-PRF-31032/1, MIL-PRF-31032/2 12" X 18" .062"/Not Specified .006"/Not Specified (1/2 oz.) .052"/.009" (after plating) 7:1 (Through Hole) 10 .004" .004" (+/-10%) MIX, SMT, THM GF: Woven E-Glass, Epoxy Resin, Flame Resistant N/A HASL Permanganate Desmear N/A Acid Copper LPI N/A N/A N/A Electroless Copper</p>	<p>VQE-08-015934</p>

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

MANUFACTURER INFORMATION: Amphenol Printed Circuits 91 Northeastern Boulevard Nashua, NH 03062, US	PLANT LOCATION: Same Address as Manufacturer	CAGE Code: 57034 Contact: Denise Chevalier Phone: 603-879-3268 Fax: 603-879-2818 E-Mail: denise.chevalier@amphenol-tcs.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 36", 30" X 36"
Max./Min. Board Thickness:	.322"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	Not Specified/.008"
Aspect Ratio:	0.5:1 (Blind Via) 11:1 (Through Hole)
Max. Number of Layers:	28
Min. Conductor Width:	.004"
Min. Conductor Space:	.004"
Part Mounting:	Compliant Pin, MIX, SMT, THM
Rigid Base Material:	GF: Woven E-Glass, Epoxy Resin, Flame Resistant Gl: Glass Base, Woven, Polyimide Resin, Heat Resistant Hybrid Built GF/Hydrocarbon Ceramic Hydrocarbon Ceramic
Flex Base Material:	N/A
Finish System:	Electrolytic Hard & Soft Gold, Electrolytic Nickel, Fused SnB, Nickel
Hole Preparation:	Permanganate Desmear/Etchback, Plasma Desmear
Alternate Construction:	Blind Vias Mechanicall Drilled
Copper Plating:	Acid Copper, DC Plate, Pulse Plate
Solder Resist:	Dry Film Soldermask, LPI, SMOBC, Thermal Cured Soldermask
Controlled Impedance:	120 ohms ± 10%, 50 ohms ± 10%
Hole Fill/Via Plug:	Conductive Via Fill, Non-conductive Via Fill
Flex Usage:	N/A
Hole Wall Conductive Coating:	N/A

VQE-06-010054
 VQE-09-017008
 VQE-10-020582
 VQE-97-000649

SECTION I
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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 E-Mail: denise.chevalier@amphenol-tcs.com</p>
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION		QUALIFICATION LETTERS:
<p>Specification: MIL-PRF-31032/1, MIL-PRF-31032/2 Panel Size: 21" X 24" Max./Min. Board Thickness: .078"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: ".026" Aspect Ratio: 3:1 Max. Number of Layers: 10 Min. Conductor Width: .004" Min. Conductor Space: .004" Part Mounting: Compliant Pin, MIX, SMT, THM Rigid Base Material: GM (Woven E-Glass, Triazine/Bismaleimide Modified Epoxy Resin) Flex Base Material: N/A Finish System: ENIG, Electrolytic Hard and Soft Gold, Electrolytic Nickel, Fused SnPb, HASL Hole Preparation: Plasma Desmear Alternate Construction: N/A Copper Plating: Acid Copper: DC Plate, Pulse Plate Solder Resist: N/A Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Hole Wall Conductive Coating: Electroless Copper</p>	<p>VQE-09-018717</p>	

CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION		QUALIFICATION LETTERS:
<p>Specification: MIL-PRF-31032/3 Panel Size: 18" X 24" Max./Min. Board Thickness: .125"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: ".012" ((drilled)) Aspect Ratio: 7.75:1 ((Through Hole)) Max. Number of Layers: 15 Min. Conductor Width: .006" Min. Conductor Space: .005" Part Mounting: MIX, SM, THM Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: 4203/1 Acrylic Adhesive Polyimide Coverlayer 4204/11 Adhesiveless Polyimide Finish System: HASL, Hot Oil Reflow following SnPb plate Hole Preparation: Plasma Desmear/Etchback Alternate Construction: N/A Copper Plating: Acid Copper (DC and Pulse Plate) Solder Resist: N/A Controlled Impedance: Characteristic, Differential, Range 50-100 ohms (+/- 10%) Hole Fill/Via Plug: N/A Flex Usage: Use A (Flex to Install) Hole Wall Conductive Coating: Direct Metal Max. Base Cu Weight 1 oz.</p>	<p>VQE-10-019533</p>	

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: Amphenol Printed Circuits 91 Northeastern Boulevard Nashua, NH 03062, US	PLANT LOCATION: Same Address as Manufacturer	CAGE Code: 57034 Contact: Denise Chevalier Phone: 603-879-3268 Fax: 603-879-2818 EMail: denise.chevalier@amphenol-tcs.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)) Max./Min. Board Thickness: .031"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: ".055" ((drilled)) Aspect Ratio: 0.7:1 ((Through Hole)) Max. Number of Layers: 4 Min. Conductor Width: .005" Min. Conductor Space: .005" Part Mounting: N/A Rigid Base Material: N/A (types 1, 2 & 3 only) Flex Base Material: 4203/1 Acrylic Adhesive Polyimide Coverlayer 4204/1 Acrylic Adhesive Finish System: HASL, Hot Oil Reflow following SnPb plate Hole Preparation: Plasma Desmear/Etchback Alternate Construction: N/A Copper Plating: Acid Copper Solder Resist: Dru Film Soldermask Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: Use A (Flex to Install), Use B (Dynamic Flex) Hole Wall Conductive Coating: Direct Metal Max. Base Cu Weight 1 oz.	VQE-10-019533 VQE-10-020582

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-31032/1, MIL-PRF-31032/2 Panel Size: 18" X 24" Max./Min. Board Thickness: .125"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: .125"/.016" Aspect Ratio: 8:1 (Through Hole) Max. Number of Layers: 10 Min. Conductor Width: .006" Min. Conductor Space: .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: Au, HASL, 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 Hole Wall Conductive Coating: N/A	VQE-03-4657 VQE-04-6280
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SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: Cirexx International, Inc. 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 EMail: 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: .125"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/.01" (Mechanical) Aspect Ratio: 12.5:1 Max. Number of Layers: 22 Min. Conductor Width: .004" Min. Conductor Space: .004" Part Mounting: MIX, 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, HASL Hole Preparation: Permanganate Desmear, Plasma Etchback Alternate Construction: N/A Copper Plating: Acid Copper Solder Resist: LPI Controlled Impedance: 100 ohms +/- 10%, 50 ohms +/- 10% Hole Fill/Via Plug: N/A Flex Usage: N/A Hole Wall Conductive Coating: N/A	VQ-08-016602
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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: .1"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/.01" Aspect Ratio: 10:1 (Through Hole) Max. Number of Layers: 2 Min. Conductor Width: .004" Min. Conductor Space: .004" 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, Ni/AU 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 Hole Wall Conductive Coating: N/A	VQE-07-014176
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SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: Cirex International, Inc. 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 EMail: dangulo@cirexxintl.com
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION	QUALIFICATION LETTERS:
Specification: MIL-PRF-31032/3 Panel Size: 12" X 18" Max./Min. Board Thickness: .1"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/.01" Aspect Ratio: 10:1 (Through Hole) Max. Number of Layers: 2 Min. Conductor Width: .004" Min. Conductor Space: .004" Part Mounting: MIX, SMT, THM Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant Flex Base Material: Acrylic Adhesive Polyimide Copper-Clad Adhesiveless Polyimide Finish System: ENIG, HASL, Ni/Au 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 Hole Wall Conductive Coating: N/A	VQE-07-014176

CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION	QUALIFICATION LETTERS:
Specification: MIL-PRF-31032/4 Panel Size: 12" X 18" Max./Min. Board Thickness: .125"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/.01" (Mechanical) Aspect Ratio: 10:1 Max. Number of Layers: 16 Min. Conductor Width: .004" Min. Conductor Space: .004" Part Mounting: MIX, SMT, THM Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: Acrylic Adhesie Copper Clad Adhesiveless Polyimide Finish System: ENIG, HASL Hole Preparation: Permanganate Desmear, Plasma Etchback Alternate Construction: N/A Copper Plating: Acid Coper Solder Resist: LPI Controlled Impedance: 100 ohms +/-10%, 50 ohms +/- 10% Hole Fill/Via Plug: N/A Flex Usage: Class A Flex-to-Install Hole Wall Conductive Coating: N/A	VQ-08-016602

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 E-Mail: 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: .088"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: .052"/.021" Aspect Ratio: 4.2:1 (Through Hole) Max. Number of Layers: 14 Min. Conductor Width: .006" Min. Conductor Space: .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 Hole Wall Conductive Coating: 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: .127"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: .228"/.015" Aspect Ratio: 8.5:1 (Through Hole) Max. Number of Layers: 12 Min. Conductor Width: .008" Min. Conductor Space: .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 Hole Wall Conductive Coating: 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 E-Mail: quality@colonialcircuits.com
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION		QUALIFICATION LETTERS:
Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2	VQE-04-6002
Panel Size:	12" X 18"	VQE-06-010192
Max./Min. Board Thickness:	.09"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	.139"/.021"	
Aspect Ratio:	4.29:1 (Through Hole)	
Max. Number of Layers:	8	
Min. Conductor Width:	.005"	
Min. Conductor Space:	.005"	
Part Mounting:	PTH, SMT	
Rigid Base Material:	Hydrocarbon Resin with Ceramic Filler Woven E-Glass	
Flex Base Material:	N/A	
Finish System:	Tin/Lead HASL, Tin/Lead Reflow	
Hole Preparation:	Plasma Desmear, Plasma Etchback	
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	
Hole Wall Conductive Coating:	N/A	

CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION		QUALIFICATION LETTERS:
Specification:	MIL-PRF-31032/3, MIL-PRF-31032/4	VQ-10-019425
Panel Size:	18" X 24"	
Max./Min. Board Thickness:	.093"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	.15"/.01"	
Aspect Ratio:	8.6:1	
Max. Number of Layers:	10	
Min. Conductor Width:	.005"	
Min. Conductor Space:	.005"	
Part Mounting:	PTH, SMT	
Rigid Base Material:	Rigid Flex/Kapton Adhesive	
Flex Base Material:	IPC-FC-241/11 (Adhesiveless)	
Finish System:	N/A	
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:	0.010	
Flex Usage:	Class A (Flex During Installation), Class B (Dynamic)	
Hole Wall Conductive Coating:	Immersion Tin, Tin/Lead Reflow	

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/Custom Panel Size: 12" X 18" Max./Min. Board Thickness: .083"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: .045"/.02" Aspect Ratio: 4.15:1 (Through Hole) Max. Number of Layers: 4 Min. Conductor Width: .01" Min. Conductor Space: .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 Hole Wall Conductive Coating: N/A	VQE-04-6002

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
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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:	.335"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	Not Specified/.014"
Aspect Ratio:	15:1 (Through Hole)
Max. Number of Layers:	36
Min. Conductor Width:	.005"
Min. Conductor Space:	.004"
Part Mounting:	MIX, SMT, THM
Rigid Base Material:	AF: Aramid Fabric, Woven, Majority Polyfunctional Epoxy Resin BF: Aramid Fabric, Nonwoven, Epoxy Resin BI: Aramid Fabric, Nonwoven, Polyimide Resin GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant GM: Glass Base, Woven, Triazine and/or Bismaleimide Modified Epoxy Resin, Flame Resistant
Flex Base Material:	N/A
Finish System:	ENIG, Fused SnPB, HASL, Selective Solder Strip-Tin Lead Plate
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
Hole Wall Conductive Coating:	N/A

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

SECTION I
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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:**

Specification:	MIL-PRF-31032/3, MIL-PRF-31032/4
Panel Size:	18" X 24"
Max./Min. Board Thickness:	.165"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	Not Specified/.012"
Aspect Ratio:	8:1 (Through Hole)
Max. Number of Layers:	22
Min. Conductor Width:	.006"
Min. Conductor Space:	.008"
Part Mounting:	SMT, THM
Rigid Base Material:	GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant GI/GM Composite Material GM: Glass Base, Woven, Triazine and/or Bismaleimide Modified Epoxy Resin, Flame Resistant
Flex Base Material:	IPC-4204/1 Acrylic Adhesive IPC-4204/11 Adhesiveless
Finish System:	ENIG, Fused SnPB, HASL, Selective Solder Strip-Tin Lead Plate
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
Hole Wall Conductive Coating:	N/A

VQE-04-006966
 VQE-05-009107
 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
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

Specification: MIL-PRF-31032/Custom Panel Size: 12" X 18" Max./Min. Board Thickness: .225"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/.02" Aspect Ratio: 10:1 (Through Hole) Max. Number of Layers: 16 Min. Conductor Width: .011" Min. Conductor Space: .007" Part Mounting: SMT Rigid Base Material: Rogers 4003 Ceramic-Filled Thermoset Resin Rogers 4003/GI Composite Flex Base Material: N/A Finish System: ENIG, HASL 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 Hole Wall Conductive Coating: N/A	VQE-04-006966 VQE-05-009107 VQE-06-010085
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SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: DDi Cleveland Corp. 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:	.126"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	Not Specified/.014"
Aspect Ratio:	5:1 (Through Hole)
Max. Number of Layers:	16
Min. Conductor Width:	.004"
Min. Conductor Space:	.004"
Part Mounting:	SMT, THM
Rigid Base Material:	AF: Aramid Fabric, Woven, Majority Polyfunctional Epoxy Resin BI: Aramid Fabric, Nonwoven, Polyimide Resin GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant
Flex Base Material:	N/A
Finish System:	Fused Tin Lead late, HASL, 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
Hole Wall Conductive Coating:	Electroless Copper

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

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: DDi Cleveland Corp. 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: .126"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/.017" Aspect Ratio: 10:1 (Through Hole) Max. Number of Layers: 11 Min. Conductor Width: .003" Min. Conductor Space: .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 Hole Wall Conductive Coating: Electroless Copper	VQE-01-0909 VQE-06-010963

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: DDi Denver Corp. 10570 Bradford Road Littleton, CO 80127, US	PLANT LOCATION: Same Address as Manufacturer	CAGE Code: 75815 Contact: Douglas N. Berry Phone: 303-972-4105 Fax: 303-933-2934 E-Mail: dberry@ddiglobal.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: .125"/Not Specified Max./Min. Base CU Thickness: .001"/Not Specified Max./Min. Through Hole Size: .109"/.013" Aspect Ratio: 7:1 Max. Number of Layers: 20 Min. Conductor Width: .004" Min. Conductor Space: .004" 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, IR Reflow Following SnPb Plate Hole Preparation: Plasma Desmear/Etchback Alternate Construction: N/A Copper Plating: Acid Copper Solder Resist: LPI Controlled Impedance: N/A Hole Fill/Via Plug: Non-conductive Epoxy Hole Fill/Via Plug Flex Usage: N/A Hole Wall Conductive Coating: Electroless Copper Max. Base Cu Weight 2 oz.	VQE-02-0317 VQE-05-7627 VQE-05-9014 VQE-09-18719 VQE-10-020224
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**SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

MANUFACTURER INFORMATION: DDi Denver Corp. 10570 Bradford Road Littleton, CO 80127, US	PLANT LOCATION: Same Address as Manufacturer	CAGE Code: 75815 Contact: Douglas N. Berry Phone: 303-972-4105 Fax: 303-933-2934 EMail: dberry@ddiglobal.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: .092"/Not Specified Max./Min. Base CU Thickness: .001"/" Max./Min. Through Hole Size: .053"/.039" Aspect Ratio: 3:1 Max. Number of Layers: 12 Min. Conductor Width: .004" Min. Conductor Space: .004" Part Mounting: MIX, SMT, THM Rigid Base Material: GM: Glass Base, Woven, Triazine and/or Bismaleimide Modified Epoxy Resin, Flame Resistant Flex Base Material: N/A Finish System: ENIG, HASL, IR Reflow following SnPb plate Hole Preparation: Plasma Desmear/Etchback Alternate Construction: N/A Copper Plating: Acid Copper Solder Resist: LPI Controlled Impedance: N/A Hole Fill/Via Plug: Non-conductive Epoxy Hole Fill/Via Plug Flex Usage: N/A Hole Wall Conductive Coating: Electroless Copper Max. Base Cu Weight 2 oz.	VQE-02-0317 VQE-05-7627 VQE-05-9014 VQE-09-18719 vqe-10-020224
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SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: DDi Denver Corp. 10570 Bradford Road Littleton, CO 80127, US	PLANT LOCATION: Same Address as Manufacturer	CAGE Code: 75815 Contact: Douglas N. Berry Phone: 303-972-4105 Fax: 303-933-2934 E-Mail: dberry@ddiglobal.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: .125"/Not Specified Max./Min. Base CU Thickness: .001"/" Max./Min. Through Hole Size: .109"/.013" Aspect Ratio: 10:1 Max. Number of Layers: 20 Min. Conductor Width: .004" Min. Conductor Space: .004" Part Mounting: MIX, SMT, THM Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: N/A Finish System: ENIG, HASL, IR Reflow following SnPb plate Hole Preparation: Plasma Desmear/Etchback Alternate Construction: N/A Copper Plating: Acid Copper Solder Resist: LPI Controlled Impedance: N/A Hole Fill/Via Plug: Non-conductive Epoxy Hole Fill/Via Plug Flex Usage: N/A Hole Wall Conductive Coating: Electroless Copper Max. Base Cu Weight 2 oz.	VQE-02-0217 VQE-05-7626 VQE-05-9014 VQE-09-18719 VQE-10-020224
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SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: DDI Global Corp. - Anaheim 1220 N. Simon Circle Anaheim, CA 92806, US	PLANT LOCATION: Same Address as Manufacturer	CAGE Code: 0BSG1 Contact: Rick Sylvain Phone: 714-688-7371 Fax: E-Mail: rsylvain@ddiglobal.com
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION		QUALIFICATION LETTERS:
Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2	VQ-09-018147
Panel Size:	N/A	
Max./Min. Board Thickness:	.1"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	.045"/.032" (drilled)	
Aspect Ratio:	3:1	
Max. Number of Layers:	10	
Min. Conductor Width:	.01"	
Min. Conductor Space:	.01"	
Part Mounting:	THM	
Rigid Base Material:	GI: Glass Base, Woven, Polyimide Resin, Heat Resistant	
Flex Base Material:	N/A	
Finish System:	HASL ENIG	
Hole Preparation:	Plasma Desmear, Plasma Etchback	
Alternate Construction:	Foil Lamination	
Copper Plating:	Electrodeposited Acid Copper, Electroless Acid Copper	
Solder Resist:	LPI	
Controlled Impedance:	N/A	
Hole Fill/Via Plug:	N/A	
Flex Usage:	N/A	
Hole Wall Conductive Coating:	N/A	

CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION		QUALIFICATION LETTERS:
Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2	VQ-09-018147
Panel Size:	18" X 24"	
Max./Min. Board Thickness:	.115"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	.009"/Not Specified (Vias) ".05" (Plated Hole Size)	
Aspect Ratio:	10:1	
Max. Number of Layers:	22	
Min. Conductor Width:	.004"	
Min. Conductor Space:	.006"	
Part Mounting:	BGA, 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:	Plasma Desmear, Plasma Etchback	
Alternate Construction:	Foil Lamination	
Copper Plating:	Electrodeposited Acid Copper, Electroless Acid Copper	
Solder Resist:	LPI	
Controlled Impedance:	Differential: 100 ohms +/-10%, Single Ended: 50 ohms +/-10%	
Hole Fill/Via Plug:	Blind Vias, Buried Vias with Non-conductive Fill	
Flex Usage:	N/A	
Hole Wall Conductive Coating:	N/A	

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: DDi Global Corp. - Sterling, VA 1200 Severn Way Dulles, VA 20166-8904, US	PLANT LOCATION: Same Address as Manufacturer	CAGE Code: 0K703 Contact: Juan Vasquez Phone: 703-652-2200 Fax: 703-652-2272 EMail: jvasquez@ddiglobal.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: .1"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: .05"/.009" (nominal) .15"/Not Specified (non-PTH) Aspect Ratio: 10:1 Max. Number of Layers: 22 Min. Conductor Width: .004" Min. Conductor Space: .003" Part Mounting: BGA, MIX, 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, HASL Hole Preparation: Plasma Desmear/Etchback Alternate Construction: 0.005 Blind Vias laser, 0.006 Blind Micro Vias laser, Buried Resistors 33 ohms ± 15% Copper Plating: Electrolytic Acid Copper Solder Resist: LPI Controlled Impedance: Differential 100 ohms ± 10%, Single Ended 50 ohms ± 10% Hole Fill/Via Plug: Buried Vias with Non-conductive Via Fill Flex Usage: N/A Hole Wall Conductive Coating: Electroless Copper	VQE-03-3545

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: DDi North Jackson Corp. 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:	.25"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	.008"/Not Specified
Aspect Ratio:	15:1 (Through Hole)
Max. Number of Layers:	24
Min. Conductor Width:	.003"
Min. Conductor Space:	.003"
Part Mounting:	MIX, Press Fit, SMT, THM
Rigid Base Material:	BI: Aramid Fabric, Nonwoven, Polyimide Resin GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant
Flex Base Material:	N/A
Finish System:	ENIG, Fused SnPb, HASL, Immersion Ag, Immersion White Tin, Ni/Au, Ni/Pd/Au, OSP, Reflowed Pure Tin
Hole Preparation:	Permanganate Desmear/Etchback, Plasma Desmear/Etchback
Alternate Construction:	Blind Vias, Buried Vias, Cap Lamination, Foil Lamination
Copper Plating:	Electroless Acid Copper, Electroplated Acid Copper
Solder Resist:	Dry Film, LPI
Controlled Impedance:	Characteristic, Differential, Dual Stripline, Embedded Microstrip, Microstrip, Range 30-150 ohms ±10%
Hole Fill/Via Plug:	Conductive, Non-conductive
Flex Usage:	N/A
Hole Wall Conductive Coating:	Electroless

VQE-03-003121
 VQE-03-003214
 VQE-07-012925
 VQE-10-020405

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: DDi North Jackson Corp. 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 E-Mail: quality@sovereign-circuits.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:	.25"/Not Specified
Max./Min. Base CU Thickness:	.005"/Not Specified
Max./Min. Through Hole Size:	.008"/Not Specified
Aspect Ratio:	15:1 (Through Hole)
Max. Number of Layers:	24
Min. Conductor Width:	.003"
Min. Conductor Space:	.003"
Part Mounting:	MIX, Press Fit, 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:	ENIG, Fused SnPb, HASL, Immersion Ag, Immersion White tin, Ni/Au, OSP, Reflowed Pure Tin
Hole Preparation:	Permanganate Desmear/Etchback, Plasma Desmear/Etchback
Alternate Construction:	Blind Via, Buried Via, Cap Lamination, Foil Lamination
Copper Plating:	Electroless Acid Copper, Electroplated Acid Copper
Solder Resist:	Dry Film, LPI
Controlled Impedance:	30 - 150 ohms ± 10%
Hole Fill/Via Plug:	Non-Conductive
Flex Usage:	N/A
Hole Wall Conductive Coating:	Electroless

VQE-03-003121
 VQE-03-003214
 VQE-07-012925
 VQE-10-020405

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: DDi Ontario 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:	.08"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	Not Specified/.01" (as drilled)	
Aspect Ratio:	7:1 (Through Hole)	
Max. Number of Layers:	14	
Min. Conductor Width:	.005"	
Min. Conductor Space:	.005"	
Part Mounting:	MIX, SMT, THM	
Rigid Base Material:	GI: Glass Base, Woven, Polyimide Resin, Heat Resistant	
Flex Base Material:	N/A	
Finish System:	ENIG, HASL	
Hole Preparation:	Desmear, Plasma Etchback	
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	
Hole Wall Conductive Coating:	Electroless Copper	

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:	.08"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	Not Specified/.01" (as drilled)	
Aspect Ratio:	7:1 (Through Hole)	
Max. Number of Layers:	14	
Min. Conductor Width:	.005"	
Min. Conductor Space:	.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 ± 10%, Differential ± 10%	
Hole Fill/Via Plug:	Non-conductive Via Plug	
Flex Usage:	N/A	
Hole Wall Conductive Coating:	Electroless Copper	

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
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION		QUALIFICATION LETTERS:
Specification:	MIL-PRF-31032/3, MIL-PRF-31032/4	VQE-05-9356
Panel Size:	12" X 18", 18" X 24"	VQE-06-10600
Max./Min. Board Thickness:	.12"/Not Specified	
Max./Min. Base CU Thickness:	.001"/Not Specified	
Max./Min. Through Hole Size:	.045"/.01"	
Aspect Ratio:	12:1 (Through Hole)	
Max. Number of Layers:	20	
Min. Conductor Width:	.004"	
Min. Conductor Space:	.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:	Fused Sn/Pb, HASL	
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	
Hole Wall Conductive Coating:	N/A	

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

<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>
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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: 16" X 18"</p> <p>Max./Min. Board Thickness: .125"/Not Specified</p> <p>Max./Min. Base CU Thickness: N/A</p> <p>Max./Min. Through Hole Size: .039"/.018" (0.0135" Drilled)</p> <p>Aspect Ratio: 9.3:1 (Through Hole)</p> <p>Max. Number of Layers: 16</p> <p>Min. Conductor Width: .005"</p> <p>Min. Conductor Space: .005"</p> <p>Part Mounting: MIX, SMT, THM</p> <p>Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant</p> <p>Flex Base Material: N/A</p> <p>Finish System: HASL</p> <p>Hole Preparation: Plasma Etchback</p> <p>Alternate Construction: N/A</p> <p>Copper Plating: Acid Copper</p> <p>Solder Resist: Dry Film Solder Resist Plugs, LPI</p> <p>Controlled Impedance: N/A</p> <p>Hole Fill/Via Plug: N/A</p> <p>Flex Usage: N/A</p> <p>Hole Wall Conductive Coating: N/A</p>	<p>VQE-00-0007 VQE-01-0311 VQE-03-0818 VQE-98-1143</p>
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SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: Electro Plate Circuitry, Inc. 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
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION		QUALIFICATION LETTERS:
Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2	VQE-06-010333 VQE-06-011433 VQE-10-020352
Panel Size:	18" X 24", 18" X 16"	
Max./Min. Board Thickness:	.12"/.03"	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	".008"	
Aspect Ratio:	9.3:1 (Through Hole)	
Max. Number of Layers:	14	
Min. Conductor Width:	.004"	
Min. Conductor Space:	.004"	
Part Mounting:	MIX, SMT, THM	
Rigid Base Material:	GI: Glass Base, Woven, Polyimide Resin, Heat Resistant	
Flex Base Material:	N/A	
Finish System:	ENIG, HASL, Hard Au, Reflowed SnPb	
Hole Preparation:	Plasma Desmear/Etchback	
Alternate Construction:	Blind/Buried Vias, Filled Vias, Foil Lamination, Sequential Lamination	
Copper Plating:	Acid Copper	
Solder Resist:	Dry Film, LPI	
Controlled Impedance:	± 3% Tolerance	
Hole Fill/Via Plug:	CB100 conductive, UVP100 non-conductive	
Flex Usage:	N/A	
Hole Wall Conductive Coating:	Electroless	

CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION		QUALIFICATION LETTERS:
Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2	VQE-06-010333 VQE-06-011433 VQE-10-020352
Panel Size:	18" X 16", 18" X 24"	
Max./Min. Board Thickness:	.17"/.03"	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	".008"	
Aspect Ratio:	9.3:1 ((Through Hole))	
Max. Number of Layers:	18	
Min. Conductor Width:	.004"	
Min. Conductor Space:	.004"	
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, Hard Au, Reflowed SnPb	
Hole Preparation:	Plasma Desmear/Etchback	
Alternate Construction:	Blind/Buried Vias, Filled Vias, Foil Lamination, Sequential Lamination	
Copper Plating:	Acid Copper	
Solder Resist:	Dry Film, LPI	
Controlled Impedance:	± 3% Tolerance	
Hole Fill/Via Plug:	CB100 conductive, UVP100 non-conductive	
Flex Usage:	N/A	
Hole Wall Conductive Coating:	Electroless	

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: Electro Plate Circuitry, Inc. 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 E-Mail: jimm@eplate.com
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

Specification: MIL-PRF-31032/5, MIL-PRF-31032/6 Panel Size: 12" X 18", 18" X 24" Max./Min. Board Thickness: .18"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: ".008" Aspect Ratio: 6:1 Max. Number of Layers: 6 Min. Conductor Width: .004" Min. Conductor Space: .004" Part Mounting: MIX, SMT, THM Rigid Base Material: GT: Woven E-Glass, PTFE Resin GX: Glass Base, Non-Woven, PTFE Resin, Flame Resistant GY: Glass Base, Woven, PTFE Resin, Flame Resistant, for Microwave Application With or Without Woven or Non-Woven E-Glass, Polytetrafluoroethylene (PTFE) Resin, Ceramic Filler Flex Base Material: N/A Finish System: ENIG, Electrolytic Nickel with Electrolytic Hard/Soft Gold, HASL, Hot Oil Reflow of Plated SnPb, Tin Lead Plate Hole Preparation: Plasma Desmear Alternate Construction: Blind Vias, Cavity, Exposed Inner Layer, Foil Lamination, Sequential Lamination Copper Plating: Acid Copper Solder Resist: Dry Film, LPI Controlled Impedance: ± 3% Characteristic, ± 3% Differential Hole Fill/Via Plug: Conductive, Non-Conductive Flex Usage: N/A Hole Wall Conductive Coating: Electroless	VQE-10-021161
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**SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

MANUFACTURER INFORMATION: Electro Plate Circuitry, Inc. 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
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION	QUALIFICATION LETTERS:
Specification: N/A Panel Size: N/A Max./Min. Board Thickness: N/A 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 Hole Wall Conductive Coating: N/A	N/A

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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
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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: .115"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: ".012" Aspect Ratio: 9:1 (Through Hole) Max. Number of Layers: 18 Min. Conductor Width: .003" Min. Conductor Space: .003" Part Mounting: MIX, 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, Electrolytic Nickel/Gold, HASL, ImmAg Hole Preparation: Permanganate Desmear, Plasma Etchback Alternate Construction: Cap Lamination, Foil Lamination Copper Plating: Electroplated Acid Copper Solder Resist: Dry Film, LPI Controlled Impedance: GF: 100 ohms/50 ohms ± 10%, GI: 100 ohms ± 10% Hole Fill/Via Plug: Via-fill Technology, 0.016" ±25% Diameter Flex Usage: N/A Hole Wall Conductive Coating: Electroless Copper	VQ-06-011451 VQ-08-014513 VQE-09-018692
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SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

<p>MANUFACTURER INFORMATION: Endicott Interconnect Technologies, Inc. Dept. 0069/014-3, 1093 Clark Street 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>
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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: 24" X 28"</p> <p>Max./Min. Board Thickness: .116"/Not Specified</p> <p>Max./Min. Base CU Thickness: N/A</p> <p>Max./Min. Through Hole Size: ".01"</p> <p>Aspect Ratio: 12:1 (Through Hole)</p> <p>Max. Number of Layers: 30</p> <p>Min. Conductor Width: .003"</p> <p>Min. Conductor Space: .004"</p> <p>Part Mounting: MIX, 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: ENIG, HASL</p> <p>Hole Preparation: Glass Etch, Permanganate Desmear, Plasma Etchback</p> <p>Alternate Construction: Cap-Lamination, Foil-Lamination</p> <p>Copper Plating: Electroplated 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>Hole Wall Conductive Coating: N/A</p>	<p>VQE-04-005311 VQE-07-012236 VQE-07-013506 VQE-08-015922</p>
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SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: Endicott Interconnect Technologies, Inc. Dept. 0069/014-3, 1093 Clark Street Endicott, NY 13760, US	PLANT LOCATION: Same Address as Manufacturer	CAGE Code: 3ECL3 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	VQE-04-005311 VQE-07-012236 VQE-07-013506
Panel Size:	18" X 24"	
Max./Min. Board Thickness:	.084"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	Not Specified/.012"	
Aspect Ratio:	7:1 (Through Hole)	
Max. Number of Layers:	12	
Min. Conductor Width:	.004"	
Min. Conductor Space:	.004"	
Part Mounting:	MIX, SMT, THM	
Rigid Base Material:	GI: Glass Base, Woven, Polyimide Resin, Heat Resistant	
Flex Base Material:	N/A	
Finish System:	ENIG, HASL	
Hole Preparation:	Pemanganate Desmear, Plasma Etchback	
Alternate Construction:	Cap-Lamination, Foil-Lamination	
Copper Plating:	Electroplated Acid Copper	
Solder Resist:	LPI	
Controlled Impedance:	N/A	
Hole Fill/Via Plug:	N/A	
Flex Usage:	N/A	
Hole Wall Conductive Coating:	N/A	

CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION		QUALIFICATION LETTERS:
Specification:	MIL-PRF-31032/Custom	VQE-04-005311 VQE-07-012236 VQE-07-013506
Panel Size:	19.5" X 24"	
Max./Min. Board Thickness:	.153"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	Not Specified/.02"	
Aspect Ratio:	7.6:1 (Through Hole)	
Max. Number of Layers:	19	
Min. Conductor Width:	.005"	
Min. Conductor Space:	.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	
Hole Wall Conductive Coating:	N/A	

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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:**

Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2
Panel Size:	18" X 24"
Max./Min. Board Thickness:	.22"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	Not Specified/.005" (Laser Control Depth) Not Specified/.006" (Buried Via Mechanical Drill) .025"/.008" (Mechanical Drill)
Aspect Ratio:	7:1 (Through Hole)
Max. Number of Layers:	20
Min. Conductor Width:	.004"
Min. Conductor Space:	.004"
Part Mounting:	MIX, SMT, THM
Rigid Base Material:	BI: Aramid Fabric, Nonwoven, Polyimide Resin GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant GM: Glass Base, Woven, Triazine and/or Bismaleimide Modified Epoxy Resin, Flame Resistant
Flex Base Material:	N/A
Finish System:	ENIG, HASL, Immersion Tin, Silver, Reflow Solder
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:	Hole Fill, LPI
Controlled Impedance:	Characteristic \pm 10%, Differential \pm 10%
Hole Fill/Via Plug:	N/A
Flex Usage:	N/A
Hole Wall Conductive Coating:	N/A

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

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: Global Innovations 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 Panel Size: 18" X 24" Max./Min. Board Thickness: .119"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/.01" Aspect Ratio: 7.5:1 (Through Hole) Max. Number of Layers: 18 Min. Conductor Width: .004" Min. Conductor Space: .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: Dry Film, LPI Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Hole Wall Conductive Coating: Electroless Copper	VQE-03-4341 VQE-04-5599 VQE-04-5891 VQE-05-7288
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SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: Global Innovations 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:	.074"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	Not Specified/.012"	
Aspect Ratio:	6.2:1 (Through Hole)	
Max. Number of Layers:	12	
Min. Conductor Width:	.005"	
Min. Conductor Space:	.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	
Hole Wall Conductive Coating:	Electroless Copper	

CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION		QUALIFICATION LETTERS:
Specification:	MIL-PRF-31032/6	VQE-07-013270
Panel Size:	9" X 16"	VQE-09-017797
Max./Min. Board Thickness:	.098"/Not Specified	VQE-10-020600
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	Not Specified/.031"	
Aspect Ratio:	3.2:1 (Through Hole)	
Max. Number of Layers:	2	
Min. Conductor Width:	.005"	
Min. Conductor Space:	.005"	
Part Mounting:	MIX	
Rigid Base Material:	GR: Glass Base, Nonwoven, Polytetrafluoroethylene Resin, Flame Resistant	
Flex Base Material:	N/A	
Finish System:	HASL, Ni/Au	
Hole Preparation:	Fluoroetch	
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	
Hole Wall Conductive Coating:	Electroless Copper	

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: Hamby Corporation 27704 Avenue Scott Valencia, CA 91355, US	PLANT LOCATION: Same Address as Manufacturer	CAGE Code: 07284 Contact: Sue Sharp Phone: 661-257-1924 Fax: 661-257-1213 E-Mail: suesharp@hambycorp.com
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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: .035"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: .05"/.02" (drilled) Aspect Ratio: 2:1 (Through Hole) Max. Number of Layers: 6 Min. Conductor Width: .009" Min. Conductor Space: .009" Part Mounting: MIX, 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, 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 Hole Wall Conductive Coating: Electroless Copper	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: .085"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: .035"/.018" Aspect Ratio: 5:1 (Through Hole) Max. Number of Layers: 11 Min. Conductor Width: .004" Min. Conductor Space: .004" Part Mounting: MIX, SMT, THM 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 Hole Wall Conductive Coating: Electroless Copper	VQE-08-014596

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: Hans Brockstedt GmbH Clara-Immerwahr Strasse 7 24145 Kiel, Germany	PLANT LOCATION: Same Address as Manufacturer	CAGE Code: C4831 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:	.2"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	Not Specified/.004" (Laser Drilled)
	Not Specified/.01" (Mech. Drilled)
Aspect Ratio:	1:1 (Blind Vias)
	7:1 (Through Hole)
Max. Number of Layers:	12
Min. Conductor Width:	.004"
Min. Conductor Space:	.004"
Part Mounting:	MIX, 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:	Electroless Nickel/Gold, Electroplated Nickel/Gold, Electroplated SnPb, Fused SnPb, HASL
Hole Preparation:	Plasma Desmear/Etchback
Alternate Construction:	Blind Vias, Buried Vias, Foil Lamination, Laser Drilled Vias
Copper Plating:	Acid Copper
Solder Resist:	LPI
Controlled Impedance:	N/A
Hole Fill/Via Plug:	N/A
Flex Usage:	N/A
Hole Wall Conductive Coating:	Electroless Copper

VQE-03-2619
 VQE-05-7480

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: Hans Brockstedt GmbH Clara-Immerwahr Strasse 7 24145 Kiel, Germany	PLANT LOCATION: Same Address as Manufacturer	CAGE Code: C4831 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:	.2"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	Not Specified/.004" (Laser Drilled)
	Not Specified/.01" (Mech. Drilled)
Aspect Ratio:	1:1 (Blind Vias)
	7:1 (Through Hole)
Max. Number of Layers:	12
Min. Conductor Width:	.004"
Min. Conductor Space:	.004"
Part Mounting:	MIX, SMT, THM
Rigid Base Material:	GF: Woven E-Glass, Epoxy Resin, Flame Resistant
	Gl: Glass Base, Woven, Polyimide Resin, Heat Resistant
Flex Base Material:	IPC-4204/1 Acrylic Adhesive
	IPC-4204/11 Adhesiveless
Finish System:	Electroless Nickel/Gold, Electroplated Nickel/Gold, Electroplated SnPb, Fused
	SnPb, HASL
Hole Preparation:	Plasma Desmear/Etchback
Alternate Construction:	Blind Vias, Buried Vias, Foil Lamination, Laser Drilled Vias
Copper Plating:	Acid Copper
Solder Resist:	LPI
Controlled Impedance:	N/A
Hole Fill/Via Plug:	N/A
Flex Usage:	Use A (Flex to Install), Use B (Continuous Flex)
Hole Wall Conductive Coating:	Electroless Copper

VQE-03-2619
 VQE-05-7480

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

MANUFACTURER INFORMATION: Hughes Circuits 540 S. Pacific Street San Marcos, CA 92078-4056, US	PLANT LOCATION: Same Address as Manufacturer	CAGE Code: 1KXU6 Contact: Joe Hughes Phone: 760-744-0300 Fax: 760-744-6388 EMail: joe@hughescircuits.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: .08"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/.01" .012"/Not Specified Aspect Ratio: 7:1 (Through Hole) Max. Number of Layers: 10 Min. Conductor Width: .005" Min. Conductor Space: .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 Hole Wall Conductive Coating: N/A	VQE-07-014018

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: Lockheed Martin Systems Integration 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: 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: Hole Wall Conductive Coating:	MIL-PRF-31032/1, MIL-PRF-31032/2 18" X 24" .2"/Not Specified N/A Not Specified/.02" 8:1 (Through Hole) 16 .004" .004" SMT, THM AF: Aramid Fabric, Woven, Majority Polyfunctional Epoxy Resin N/A Fused SnPb, HASL, NiAu Permanganate Desmear, Plasma Etchback N/A Electro-deposited Acid Copper LPI N/A N/A N/A Electroless Copper	VQE-00-0961 VQE-99-0130

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: Hole Wall Conductive Coating:	MIL-PRF-31032/1, MIL-PRF-31032/2 18" X 24" .095"/Not Specified N/A Not Specified/.014" 6.8:1 (Through Hole) 14 .004" .004" SMT, THM BI: Aramid Fabric, Nonwoven, Polyimide Resin N/A Fused SnPb, HASL, NiAu Permanganate Desmear N/A Electro-deposited Acid Copper LPI N/A N/A N/A Electroless Copper	VQE-01-0539

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

MANUFACTURER INFORMATION: Lockheed Martin Systems Integration 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 Panel Size: 24" X 30" Max./Min. Board Thickness: .2"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/.018" Aspect Ratio: 8:1 (Through Hole) Max. Number of Layers: 24 Min. Conductor Width: .004" Min. Conductor Space: .004" Part Mounting: SMT, THM Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame 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 Hole Wall Conductive Coating: Electroless Copper	VQE-00-0961 VQE-07-013268 VQE-07-013459 VQE-99-0130
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SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

<p>MANUFACTURER INFORMATION: Lockheed Martin Systems Integration 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:
Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2	VQE-00-0961 VQE-07-013459 VQE-99-0130
Panel Size:	24" X 30"	
Max./Min. Board Thickness:	.2"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	Not Specified/.018"	
Aspect Ratio:	8:1 (Through Hole)	
Max. Number of Layers:	16	
Min. Conductor Width:	.004"	
Min. Conductor Space:	.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	
Hole Wall Conductive Coating:	Electroless Copper	

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: Lockheed Martin Systems Integration 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:	.11"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	Not Specified/.016"
Aspect Ratio:	6:1 (Through Hole)
Max. Number of Layers:	18
Min. Conductor Width:	.003"
Min. Conductor Space:	.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:	IC-4204/11 Adhesiveless IPC-4204/1 Acrylic Adhesive IPC-4204/2 IPC-4204/3 IPC-4204/4
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
Hole Wall Conductive Coating:	Electroless Copper

VQE-00-0684
 VQE-07-013459

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

<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>
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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: .13"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: .003"/Not Specified (Laser Via) ".008" (Mechanical) Aspect Ratio: 0.8:1 (Blind Vias) 10:1 (Through Hole) Max. Number of Layers: 26 Min. Conductor Width: .004" Min. Conductor Space: .004" Part Mounting: MIX, 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, HASL, Immersion Ag, Ni/Hard-Au Hole Preparation: Chemical Desmear Permanganate, Plasma Desmear, Etchback Alternate Construction: Blind Vias, Laser Drilled Vias Copper Plating: Electrodeposited Acid Copper Solder Resist: LPI Controlled Impedance: Differential Methods $\pm 5\%$ at 50 ohms, Microstrip, Single Ended, Single Line Hole Fill/Via Plug: N/A Flex Usage: N/A Hole Wall Conductive Coating: N/A</p>	<p>VQ-09-017325</p>

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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:	.13"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	.004"/.008" (laser drilled) .25"/.008" (mechanical)	
Aspect Ratio:	0.8:1 (Blind Vias) 10:1 (Through Hole)	
Max. Number of Layers:	20	
Min. Conductor Width:	.004"	
Min. Conductor Space:	.004"	
Part Mounting:	MIX, SMT, THM	
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:	ENIG, HASL, Hard Gold, Nickel	
Hole Preparation:	Chemical Desmear, Desmear, Plasma Etchback	
Alternate Construction:	Blind Vias, Buried Vias, Sequential Lamination	
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	
Hole Wall Conductive Coating:	N/A	

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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 Panel Size: 18" X 24" Max./Min. Board Thickness: .239"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/.007" Aspect Ratio: 11:1 (Through Hole) Max. Number of Layers: 28 Min. Conductor Width: .004" Min. Conductor Space: .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: Dry Film, LPI Controlled Impedance: Characteristic $\pm 10\%$, Differential $\pm 10\%$ Hole Fill/Via Plug: N/A Flex Usage: N/A Hole Wall Conductive Coating: N/A	VQE-02-002780 VQE-03-2980

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

<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:
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<p>Specification: MIL-PRF-31032/1, MIL-PRF-31032/2</p> <p>Panel Size: 18" X 24"</p> <p>Max./Min. Board Thickness: .177"/Not Specified</p> <p>Max./Min. Base CU Thickness: N/A</p> <p>Max./Min. Through Hole Size: .206"/.0135"</p> <p>Aspect Ratio: 11:1</p> <p>Max. Number of Layers: 22</p> <p>Min. Conductor Width: .0035"</p> <p>Min. Conductor Space: .0035"</p> <p>Part Mounting: MIX, SMT, THM</p> <p>Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant</p> <p>Flex Base Material: N/A</p> <p>Finish System: ENIG, Electrolytic Ni/Au Bondable, HASL, Reflowed Tin/Lead Fused, SMOBC, Selective Tin/Lead Strip</p> <p>Hole Preparation: Permanganate Desmear, Plasma Etchback</p> <p>Alternate Construction: Blind/Buried Vias, Filled Via Holes, Plated Sub-Assemblies, Sequential Lamination</p> <p>Copper Plating: Acid Copper</p> <p>Solder Resist: Dry Film, LPI</p> <p>Controlled Impedance: Characteristic & Differential \pm 10%</p> <p>Hole Fill/Via Plug: N/A</p> <p>Flex Usage: N/A</p> <p>Hole Wall Conductive Coating: Electroless Copper</p>	<p>VQE-09-017323</p> <p>VQE-09-017656</p>
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SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

<p>MANUFACTURER INFORMATION: Pioneer Circuits, Inc. 3000 S. Shannon Street Santa Ana, CA 92704-6321, US</p>		<p>CAGE Code: 65723 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:**

Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2
Panel Size:	18" X 24"
Max./Min. Board Thickness:	.275"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	.252"/.012"
Aspect Ratio:	11:1
Max. Number of Layers:	20
Min. Conductor Width:	.0035"
Min. Conductor Space:	.0035"
Part Mounting:	MIX, SMT, THM
Rigid Base Material:	GF: Woven E-Glass, Epoxy Resin, Flame Resistant
Flex Base Material:	N/A
Finish System:	ENIG, Electrolytic Ni/Au Bondable, HASL, Reflowed Tin/Lead Fused, SMOBC, Selective Tin/Lead Strip
Hole Preparation:	Permanganate Desmear, Plasma Etchback
Alternate Construction:	Blind/Buried Vias, Filled Via Holes, Plated Sub-Assemblies, Sequential Lamination
Copper Plating:	Acid Copper
Solder Resist:	Dry Film, LPI
Controlled Impedance:	Characteristic & Differential \pm 10%
Hole Fill/Via Plug:	N/A
Flex Usage:	N/A
Hole Wall Conductive Coating:	Electroless Copper

VQE-09-017323
VQE-09-017656

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

<p>MANUFACTURER INFORMATION: Pioneer Circuits, Inc. 3000 S. Shannon Street Santa Ana, CA 92704-6321, US</p>		<p>CAGE Code: 65723 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-31032/3, MIL-PRF-31032/4</p> <p>Panel Size: 18" X 26"</p> <p>Max./Min. Board Thickness: .231"/Not Specified</p> <p>Max./Min. Base CU Thickness: N/A</p> <p>Max./Min. Through Hole Size: .169"/.02"</p> <p>Aspect Ratio: 8.5:1</p> <p>Max. Number of Layers: 22</p> <p>Min. Conductor Width: .003"</p> <p>Min. Conductor Space: .003"</p> <p>Part Mounting: MIX, SMT, THM</p> <p>Rigid Base Material: GF (Epoxy Glass)</p> <p>Flex Base Material: Adhesiveless Epoxy</p> <p>Finish System: ENIG, Electrolytic Ni/Au (Bondable), HASL, Reflowed Tin/Lead (Fused), SMOBC, Selective Tin/Lead Strip</p> <p>Hole Preparation: Permanganate Desmear, Plasma Etchback</p> <p>Alternate Construction: Blind/Buried Vias, Filled Via Holes, Plated Sub-Assemblies, Sequential Lamination</p> <p>Copper Plating: Acid Copper</p> <p>Solder Resist: LPI</p> <p>Controlled Impedance: Characteristic & Differential +/- 10%</p> <p>Hole Fill/Via Plug: N/A</p> <p>Flex Usage: Class A (Flex During Installation)</p> <p>Hole Wall Conductive Coating: Electroless Copper</p>	<p>VQE-09-017323 VQE-09-017656 VQE-10-020651</p>

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

<p>MANUFACTURER INFORMATION: Pioneer Circuits, Inc. 3000 S. Shannon Street Santa Ana, CA 92704-6321, US</p>		<p>CAGE Code: 65723 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:
Specification:	MIL-PRF-31032/3, MIL-PRF-31032/4	VQE-09-017323
Panel Size:	18" X 24"	VQE-09-017656
Max./Min. Board Thickness:	.1"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	.193"/.016"	
Aspect Ratio:	6:1	
Max. Number of Layers:	10	
Min. Conductor Width:	.003"	
Min. Conductor Space:	.003"	
Part Mounting:	MIX, SMT, THM	
Rigid Base Material:	GI: Glass Base, Woven, Polyimide Resin, Heat Resistant	
Flex Base Material:	Adhesive Polyimide	
Finish System:	ENIG, Electrolytic Ni/Au Bondable, HASL, Reflowed Tin/Lead Fused, SMOBC, Selective Tin/Lead Strip	
Hole Preparation:	Permanganate Copper, Plasma Etchback	
Alternate Construction:	Blind/Buried Vias, Filled Via Holes, Plated Sub-Assemblies, Sequential Lamination	
Copper Plating:	Acid Copper	
Solder Resist:	LPI	
Controlled Impedance:	Characteristic & Differential \pm 10%	
Hole Fill/Via Plug:	N/A	
Flex Usage:	Class A Flex During Installation, Class B Dynamic	
Hole Wall Conductive Coating:	Electroless Copper	

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

<p>MANUFACTURER INFORMATION: Pioneer Circuits, Inc. 3000 S. Shannon Street Santa Ana, CA 92704-6321, US</p>		<p>CAGE Code: 65723 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:**

Specification:	MIL-PRF-31032/3, MIL-PRF-31032/4
Panel Size:	24" X 36"
Max./Min. Board Thickness:	.185"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	.167"/.013"
Aspect Ratio:	11:1
Max. Number of Layers:	26
Min. Conductor Width:	.003"
Min. Conductor Space:	.003"
Part Mounting:	MIX, SMT, THM
Rigid Base Material:	GI: Glass Base, Woven, Polyimide Resin, Heat Resistant
Flex Base Material:	Adhesiveless Polyimide
Finish System:	ENIG, Electrolytic Ni/Au Bondable, HASL, Reflowed Tin/Lead Fused, SMOBC, Selective Tin/Lead Strip
Hole Preparation:	Permanganate Desmear, Plasma Etchback
Alternate Construction:	Blind/Buried Vias, Bood Binder, Filled Via Holes, Plated Sub-Assemblies, Sequential Lamination
Copper Plating:	Acid Copper
Solder Resist:	LPI
Controlled Impedance:	Characteristic & Differential \pm 10%
Hole Fill/Via Plug:	N/A
Flex Usage:	Class A Flex During Installation, Class B Dynamic
Hole Wall Conductive Coating:	Electroless Copper

VQE-09-017323
VQE-09-017656

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

<p>MANUFACTURER INFORMATION:</p> <p>PNC, Inc. 115 East Centre Street Nutley, NJ 07110, US</p>		<p>CAGE Code: 66766</p> <p>Contact: Carmela Conte Phone: 973-284-1600 Fax: EMail: carmela@pnconline.com</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 22"</p> <p>Max./Min. Board Thickness: .093"/Not Specified</p> <p>Max./Min. Base CU Thickness: N/A</p> <p>Max./Min. Through Hole Size: .12"/.014"</p> <p>Aspect Ratio: 6.6:1</p> <p>Max. Number of Layers: 10</p> <p>Min. Conductor Width: .008"</p> <p>Min. Conductor Space: .008"</p> <p>Part Mounting: MIX, 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: HASL</p> <p>Hole Preparation: Permanganate Desmear</p> <p>Alternate Construction: Foil Lamination</p> <p>Copper Plating: Electroplated 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>Hole Wall Conductive Coating: Electroless Copper</p>	<p>VQE-10-19440</p>

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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 EMail: jsmith@printedcircuits.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 18", 18" X 24" Max./Min. Board Thickness: .12"/Not Specified Max./Min. Base CU Thickness: (1/2 oz.) Max./Min. Through Hole Size: Not Specified/.01" Aspect Ratio: 10:1 (Through Hole) Max. Number of Layers: 16 Min. Conductor Width: .004" Min. Conductor Space: .005" (+/- 10%) Part Mounting: MIX, 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: Electroless Ni/Au, Electrolytic Ni/Au, Fused SnPb, HASL, SMOBC Hole Preparation: Plasma Desmear/Etchback Alternate Construction: N/A Copper Plating: Electrolytic Acid Copper Solder Resist: Dry Film, LPI, Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: Class A Flex to Install, Class B Continuous Flex Hole Wall Conductive Coating: Electroless Copper	VQE-01-0024

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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 EMail: 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: .062"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: .25"/.01" Aspect Ratio: 6:1 (Through Hole) Max. Number of Layers: 8 Min. Conductor Width: .003" Min. Conductor Space: .003" Part Mounting: SMT, THM Rigid Base Material: GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: N/A Finish System: ENIG, HASL, ImmAg, OSP Hole Preparation: Plasma Desmear Alternate Construction: Buried Via Mechanical Drill, Foil Lamination, Sequential Lamination Copper Plating: Acid Copper Solder Resist: Dry Film, LPI Controlled Impedance: 50-110 ohms ± 5% Hole Fill/Via Plug: Epoxy, Silver Flex Usage: N/A Hole Wall Conductive Coating: Electroless Copper	VQE-06-011137 VQE-10-019381

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

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 EMail: darrell.myers@sanmina-sci.com
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION		QUALIFICATION LETTERS:
Specification:	MIL-PRF-31032/2, MIL-PRF-31032/6	VQE-10-020921
Panel Size:	21" X 24"	VQE-10-021014
Max./Min. Board Thickness:	.062"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	.145"/.0197"	
Aspect Ratio:	3.1:1	
Max. Number of Layers:	2	
Min. Conductor Width:	.008"	
Min. Conductor Space:	.014"	
Part Mounting:	MIX, SMT, THM	
Rigid Base Material:	Rogers 4000 Series Ceramic-Filled Thermoset Resin	
Flex Base Material:	N/A	
Finish System:	ENIG	
Hole Preparation:	N/A	
Alternate Construction:	N/A	
Copper Plating:	Electroplated Acid Copper	
Solder Resist:	LPI	
Controlled Impedance:	N/A	
Hole Fill/Via Plug:	Epoxy, Silver	
Flex Usage:	N/A	
Hole Wall Conductive Coating:	Electroless Copper	

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

<p>MANUFACTURER INFORMATION: Speedy Circuits, Inc. 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:
Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2	VQE-08-016434
Panel Size:	18" X 24"	VQE-10-021007
Max./Min. Board Thickness:	.11"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	.194"/.015"	
Aspect Ratio:	7:1	
Max. Number of Layers:	14	
Min. Conductor Width:	.005"	
Min. Conductor Space:	.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:	Electroless Nickel Immersion Gold, HASL	
Hole Preparation:	Etchback, Plasma Desmear	
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	
Hole Wall Conductive Coating:	Electroless Copper	

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: Speedy Circuits, Inc. 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-31032/3, MIL-PRF-31032/4
Panel Size:	18" X 24"
Max./Min. Board Thickness:	.13"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	.048"/.02"
Aspect Ratio:	7:1
Max. Number of Layers:	18
Min. Conductor Width:	.005"
Min. Conductor Space:	.005"
Part Mounting:	SMT, THM
Rigid Base Material:	GI: Glass Base, Woven, Polyimide Resin, Heat Resistant
Flex Base Material:	Adhesiveless Polyimide
Finish System:	Electro-deposited Fused SnPb, Electrolytic Hard Gold, Electrolytic Nickel, Electrolytic Soft Gold, HASL
Hole Preparation:	Etchback, Plasma Desmear
Alternate Construction:	Foil Lamination
Copper Plating:	Electro-deposited Acid Copper
Solder Resist:	Dry Film, LPI
Controlled Impedance:	100/50 ohms +/-10% Characteristic, 100/50 ohms +/-10% Differential
Hole Fill/Via Plug:	N/A
Flex Usage:	Class A (Flex During Installation), Class B (Dynamic)
Hole Wall Conductive Coating:	Electroless Copper

VQE-08-016434
 VQE-10-019157
 VQE-10-021007

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: Speedy Circuits, Inc. 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 E-Mail:
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

Specification:	MIL-PRF-31032/5
Panel Size:	12" X 18"
Max./Min. Board Thickness:	.068"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	.125"/.01"
Aspect Ratio:	6:1
Max. Number of Layers:	10
Min. Conductor Width:	.005"
Min. Conductor Space:	.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:	Electro-deposited Fused SnPb, Electrolytic Hard Gold, Electrolytic Nickel, Electrolytic Soft Gold, HASL
Hole Preparation:	Plasma Desmear
Alternate Construction:	Electro-deposited Fused SnPb, Electrolytic Hard and Soft Gold, Electrolytic Nickel, HASL
Copper Plating:	Acid Copper
Solder Resist:	LPI,
Controlled Impedance:	50 ohms +/- 10% (Characteristic, Differential)
Hole Fill/Via Plug:	N/A
Flex Usage:	N/A
Hole Wall Conductive Coating:	Ceramic Filler, Epoxy Resin - Mixed, PTFE Resin, With or Without Woven or Non-woven E-Glass, Woven E-Glass

VQE-09-018657
 VQE-10-021007

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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

<p>Specification: MIL-PRF-31032/3, MIL-PRF-31032/4</p> <p>Panel Size: 12" X 18"</p> <p>Max./Min. Board Thickness: .035"/Not Specified</p> <p>Max./Min. Base CU Thickness: N/A</p> <p>Max./Min. Through Hole Size: .011"/Not Specified</p> <p>Aspect Ratio: 3:1 (Through Hole)</p> <p>Max. Number of Layers: 7</p> <p>Min. Conductor Width: .007"</p> <p>Min. Conductor Space: .007"</p> <p>Part Mounting: SM, THM</p> <p>Rigid Base Material: N/A</p> <p>Flex Base Material: FR4 IPC-4101/21 Flexible Polyimide Clad IPC-4204/1 Flexible Polyimide Film IPC-4202/1 Flexible Polyimide Film/Acrylic IPC-4203/1 Woven E-Glass, Polyimide Resin IPC-4101/41</p> <p>Finish System: HASL</p> <p>Hole Preparation: Plasma Etchback</p> <p>Alternate Construction: N/A</p> <p>Copper Plating: Electrodeposited Acid Copper</p> <p>Solder Resist: N/A</p> <p>Controlled Impedance: N/A</p> <p>Hole Fill/Via Plug: N/A</p> <p>Flex Usage: N/A</p> <p>Hole Wall Conductive Coating: N/A</p>	<p>VQE-04-005354 VQE-08-015729</p>
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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 EMail: ppialis@strataflex.ca
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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: .094"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: Not Specified/.008" Aspect Ratio: 12:1 (Through Hole) Max. Number of Layers: 12 Min. Conductor Width: .006" Min. Conductor Space: .004" Part Mounting: N/A Rigid Base Material: N/A Flex Base Material: Flexible Polyimide Film/Acrylic IC-4203/1 Flexible Polyimide IPC-4204/11 Woven E-Glass, Polyimide Resin IPC-4101/40 Woven E-Glass, Polyimide Resin IPC-4101/41 Woven E-Glass, Polyimide Resin IPC-4101/42 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 Hole Wall Conductive Coating: Direct Metallization	VQE-04-005354 VQE-08-015729
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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 EMail: ppialis@strataflex.ca
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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: .035"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: .011"/Not Specified Aspect Ratio: 3:1 (Through Hole) Max. Number of Layers: 7 Min. Conductor Width: .007" Min. Conductor Space: .007" Part Mounting: SMT, THM Rigid Base Material: FR4-IPC-4101/21 Flexible Polyimide Clad IPC-4204/1 Flexible Polyimide Film IPC-4202/1 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 Hole Wall Conductive Coating: N/A	VQE-04-5354

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
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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:	.2"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	.044"/.013"	
Aspect Ratio:	14:1 (Through Hole)	
Max. Number of Layers:	24	
Min. Conductor Width:	.003"	
Min. Conductor Space:	.003"	
Part Mounting:	SMT, THM	
Rigid Base Material:	GI: Glass Base, Woven, Polyimide Resin, Heat Resistant	
Flex Base Material:	N/A	
Finish System:	ENIG, Fused SnPb, HASL, ImmAg, OSP	
Hole Preparation:	Desmear Etchback	
Alternate Construction:	Aspect Ratio Microvias: 1:1, Min. Blind Via: 0.005" Laser, Min. Buried Via: 0.0135" Mechanical Drill, Sequential Lamination	
Copper Plating:	Acid Copper	
Solder Resist:	Dry Film, LPI	
Controlled Impedance:	N/A	
Hole Fill/Via Plug:	N/A	
Flex Usage:	N/A	
Hole Wall Conductive Coating:	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:	21" X 28"	
Max./Min. Board Thickness:	.2"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	.044"/.013"	
Aspect Ratio:	14:1 (Through Hole)	
Max. Number of Layers:	24	
Min. Conductor Width:	.003"	
Min. Conductor Space:	.003"	
Part Mounting:	SMT, THM	
Rigid Base Material:	GF: Woven E-Glass, Epoxy Resin, Flame Resistant	
Flex Base Material:	N/A	
Finish System:	ENIG, Fused SnPb, HASL, ImmAg, OSP	
Hole Preparation:	Desmear Etchback	
Alternate Construction:	Aspect Ratio Microvias: 1:1, Min. Blind Via: 0.005" Laser, Min. Buried Via: 0.0135" Mechanical Drill, Sequential Lamination	
Copper Plating:	Acid Copper	
Solder Resist:	Dry Film, LPI	
Controlled Impedance:	N/A	
Hole Fill/Via Plug:	N/A	
Flex Usage:	N/A	
Hole Wall Conductive Coating:	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
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION		QUALIFICATION LETTERS:
Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2	VQE-03-003888 VQE-10-020500 VQE-10-020581
Panel Size:	18" X 24"	
Max./Min. Board Thickness:	.12"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	.191"/.012"	
Aspect Ratio:	9:1 (Through Hole)	
Max. Number of Layers:	20	
Min. Conductor Width:	.004"	
Min. Conductor Space:	.004"	
Part Mounting:	MIX, SM, THM	
Rigid Base Material:	GF (Woven E-Glass, Epoxy Resin)	
Flex Base Material:	N/A	
Finish System:	ENIG, Electrolytic Ni, HASL	
Hole Preparation:	Plasma Desmear/Etchback	
Alternate Construction:	Blind Vias	
Copper Plating:	Electrolytic Acid Copper	
Solder Resist:	LPI, Screen Printed	
Controlled Impedance:	+/-10% tolerance	
Hole Fill/Via Plug:	N/A	
Flex Usage:	N/A	
Hole Wall Conductive Coating:	Electroless Copper	

CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION		QUALIFICATION LETTERS:
Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2	VQE-03-003888 VQE-10-020500 VQE-10-020581
Panel Size:	18" X 24"	
Max./Min. Board Thickness:	.12"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	.191"/.012"	
Aspect Ratio:	9:1	
Max. Number of Layers:	12	
Min. Conductor Width:	.004"	
Min. Conductor Space:	.004"	
Part Mounting:	MIX, SM, THM	
Rigid Base Material:	gi (Woven E-Glass, Polyimide Resin)	
Flex Base Material:	N/A	
Finish System:	ENIG, Electrolytic Ni, HASL	
Hole Preparation:	Plasma Desmear/Etchback	
Alternate Construction:	Blind Vias	
Copper Plating:	Electrolytic Acid Copper	
Solder Resist:	LPI, Screen Printed	
Controlled Impedance:	+/- 10% tolerance	
Hole Fill/Via Plug:	N/A	
Flex Usage:	N/A	
Hole Wall Conductive Coating:	Electroless Copper	

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
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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: .1"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: .045"/.031" Aspect Ratio: 9:1 (Through Hole) Max. Number of Layers: 10 Min. Conductor Width: .004" Min. Conductor Space: .004" Part Mounting: MIX, SM, THM Rigid Base Material: GF (Woven E-Glass, Epoxy Resin) GI (Woven E-Glass, Polyimide Resin) Flex Base Material: IPC-4203/1 (Acrylic Adhesive Coverlay) IPC-4204/1 (Adhesive Polyimide) Finish System: ENIG, Electrolytic Ni, HASL Hole Preparation: Plasma Desmear/Etchback Alternate Construction: N/A Copper Plating: Electrolytic Acid Copper Solder Resist: N/A Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Hole Wall Conductive Coating: Electroless Copper	VQE-03-003895 VQE-10-020500 VQE-10-020581
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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
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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: .12"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: .191"/.012" Aspect Ratio: 9:1 Max. Number of Layers: 16 Min. Conductor Width: .004" Min. Conductor Space: .004" Part Mounting: MIX, SM, THM Rigid Base Material: GF (Woven E-Glass, Epoxy Resin) GI (Woven E-Glass, Polyimide Resin) Flex Base Material: IPC-4203/1 (Acrylic Adhesive Coverlay) IPC-4204/11 (Adhesiveless Polyimide) Finish System: ENIG, Electrolytic Ni, HASL Hole Preparation: Plasma Desmear/Etchback Alternate Construction: N/A Copper Plating: Electrolytic Acid Copper Solder Resist: N/A Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Hole Wall Conductive Coating: Electroless Copper	VQE-03-003895 VQE-10-020500 VQE-10-020581
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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, CT 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
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2
Panel Size:	30" X 32"
Max./Min. Board Thickness:	.1"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	.067"/.032" (drilled)
Aspect Ratio:	3:1 (Through hole)
Max. Number of Layers:	10
Min. Conductor Width:	.004"
Min. Conductor Space:	.003"
Part Mounting:	MIX, Press Fit, SM, THM
Rigid Base Material:	GC: Glass Base, Woven E, Reinforcement, Majority Cyanate Ester, Flame Resistant SC: Glass Base, Woven S-2, Fiber, Majority Cyanate Ester, Flame Resistant
Flex Base Material:	N/A
Finish System:	ENIG, Electrolytic Nickel, Electrolytic Soft & Hard Gold, HASL, Hot Oil Reflow following SnPb plate
Hole Preparation:	Plasma Desmear/Etchback
Alternate Construction:	Blind and Buried Vias, Buried Resistors, Micro Vias, Multiple Laminations
Copper Plating:	Acid Copper
Solder Resist:	Dry-Film, LPI, Wet Mask
Controlled Impedance:	Characteristic, Differential, Dual Stripline, Embedded Microstrip, Microstrip, Range 30-150 ohms (+/- 10%)
Hole Fill/Via Plug:	Conductive & Non-conductive Epoxy Hole Fill / Via Plug
Flex Usage:	N/A
Hole Wall Conductive Coating:	Electroless Copper
Max. Base Cu Weight	1 oz.

VQE-03-003348
 VQE-09-18855

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: TTM Technologies (Stafford) 4 Old Monson Road P.O. Box 145, Stafford, CT 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
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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:	.1"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	.045"/.032" (drilled)
Aspect Ratio:	3:1 (Through hole)
Max. Number of Layers:	10
Min. Conductor Width:	.004"
Min. Conductor Space:	.003"
Part Mounting:	MIX, Press Fit, SM, THM
Rigid Base Material:	GM: Glass Base, Woven, Triazine and/or Bismaleimide Modified Epoxy Resin, Flame Resistant
Flex Base Material:	N/A
Finish System:	ENIG, Electrolytic Nickel, Electrolytic Soft & Hard Gold, HASL, Hot Oil Reflow following SnPb plate
Hole Preparation:	Plasma Desmear/Etchback
Alternate Construction:	Blind and Buried Vias, Buried Resistors, Micro Vias, Multiple Laminations
Copper Plating:	Acid Copper
Solder Resist:	Dry-Film, LPI, Wet Mask
Controlled Impedance:	Characteristic, Differential, Dual Stripline, Embedded Microstrip, Microstrip, Range 30-150 ohms (+/- 10%)
Hole Fill/Via Plug:	Conductive & Non-conductive Epoxy Hole Fill / Via Plug
Flex Usage:	N/A
Hole Wall Conductive Coating:	Electroless Copper
Max. Base Cu Weight	1 oz.

VQE-03-003348
 VQE-09-18855

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: TTM Technologies (Stafford) 4 Old Monson Road P.O. Box 145, Stafford, CT 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
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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:	.4"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	.195"/.0079" (drilled)
Aspect Ratio:	14:1 (Through Hole)
Max. Number of Layers:	50
Min. Conductor Width:	.004"
Min. Conductor Space:	.003"
Part Mounting:	MIX, Press Fit, SM, THM
Rigid Base Material:	GF: Woven E-Glass, Epoxy Resin, Flame Resistant
Flex Base Material:	N/A
Finish System:	ENIG, Electrolytic Nickel, Electrolytic Soft & Hard Gold, HASL, Hot Oil Reflow following SnPb plate, Reflowed Solder
Hole Preparation:	Plasma Desmear/Etchback
Alternate Construction:	Blind and Buried Vias, Buried Resistors, Copper Invar Copper, Micro Vias, Multiple Laminations
Copper Plating:	Acid Copper
Solder Resist:	Dry Film, LPI, Wet Mask
Controlled Impedance:	Characteristic, Differential, Dual Stripline, Embedded Microstrip, Microstrip, Range 30-150 ohms (+/- 10%)
Hole Fill/Via Plug:	Conductive & Non-conductive Epoxy Hole Fill / Via Plug
Flex Usage:	N/A
Hole Wall Conductive Coating:	Electroless Copper
Max. Base Cu Weight	1 oz.

VQE-03-3348
 VQE-09-18855

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: TTM Technologies (Stafford) 4 Old Monson Road P.O. Box 145, Stafford, CT 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
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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:	.13"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	.133"/.0118" (drilled)
Aspect Ratio:	11:1 (Through hole)
	2.5:1 (Buried Vias)
Max. Number of Layers:	32
Min. Conductor Width:	.004"
Min. Conductor Space:	.003"
Part Mounting:	MIX, Press Fit, SM, THM
Rigid Base Material:	GI: Glass Base, Woven, Polyimide Resin, Heat Resistant
Flex Base Material:	N/A
Finish System:	ENIG, Electrolytic Nickel, Electrolytic Soft & Hard Gold, HASL, Hot Oil Reflow following SnPb plate
Hole Preparation:	Plasma Desmear/Etchback
Alternate Construction:	Blind and Buried Vias, Buried Resistors, Copper Invar Copper, Micro Vias, Multiple Laminations
Copper Plating:	Acid Copper
Solder Resist:	Dry-Film, LPI, Wet Mask
Controlled Impedance:	Characteristic, Differential, Dual Stripline, Embedded Microstrip, Microstrip, Range 30-150 ohms (+/- 10%)
Hole Fill/Via Plug:	Conductive & Non-conductive Epoxy Hole Fill / Via Plug
Flex Usage:	N/A
Hole Wall Conductive Coating:	Electroless Copper
Max. Base Cu Weight	1 oz.

VQE-03-003348
 VQE-09-18855

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

<p>MANUFACTURER INFORMATION: TTM Technologies (Stafford) 4 Old Monson Road P.O. Box 145, Stafford, CT 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>
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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:	.1"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	.045"/.0118" (drilled)
Aspect Ratio:	6:1 (Through hole)
Max. Number of Layers:	10
Min. Conductor Width:	.004"
Min. Conductor Space:	.003"
Part Mounting:	MIX, Press Fit, SM, THM
Rigid Base Material:	BI: Aramid Fabric, Nonwoven, Polyimide Resin
Flex Base Material:	N/A
Finish System:	ENIG, Electrolytic Nickel, Electrolytic Soft & Hard Gold, HASL, Hot Oil Reflow following SnPb plate
Hole Preparation:	Plasma Desmear/Etchback
Alternate Construction:	Blind and Buried Vias, Buried Resistors, Micro Vias, Multiple Laminations
Copper Plating:	Acid Copper
Solder Resist:	Dry-Film, LPI, Wet Mask
Controlled Impedance:	Characteristic, Differential, Dual Stripline, Embedded Microstrip, Microstrip, Range 30-150 ohms (+/- 10%)
Hole Fill/Via Plug:	Conductive & Non-conductive Epoxy Hole Fill / Via Plug
Flex Usage:	N/A
Hole Wall Conductive Coating:	Electroless Copper
Max. Base Cu Weight	1 oz.

VQE-03-003348
VQE-09-18855

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

<p>MANUFACTURER INFORMATION: TTM Technologies (Stafford) 4 Old Monson Road P.O. Box 145, Stafford, CT 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@tycoelectroni cs.com</p>
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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:	.1"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	.045"/.032" (drilled)
Aspect Ratio:	3:1 (Through hole)
Max. Number of Layers:	10
Min. Conductor Width:	.004"
Min. Conductor Space:	.003"
Part Mounting:	MIX, Press Fit, SM, THM
Rigid Base Material:	AF: Aramid Fabric, Woven, Majority Polyfunctional Epoxy Resin
Flex Base Material:	N/A
Finish System:	ENIG, Electrolytic Nickel, Electrolytic Soft & Hard Gold, HASL, Hot Oil Reflow following SnPb plate
Hole Preparation:	Plasma Desmear/Etchback
Alternate Construction:	Blind and Buried Vias, Buried Resistors, Micro Vias, Multiple Laminations
Copper Plating:	Acid Copper
Solder Resist:	Dry-Film, LPI, Wet Mask
Controlled Impedance:	Characteristic, Differential, Dual Stripline, Embedded Microstrip, Microstrip, Range 30-150 ohms (+/- 10%)
Hole Fill/Via Plug:	Conductive & Non-conductive Epoxy Hole Fill / Via Plug
Flex Usage:	N/A
Hole Wall Conductive Coating:	Electroless Copper
Max. Base Cu Weight	1 oz.

VQE-03-003348
VQE-09-18855

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

<p>MANUFACTURER INFORMATION: TTM Technologies (Stafford) 4 Old Monson Road P.O. Box 145, Stafford, CT 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@tycoelectroni cs.com</p>
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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:	N/A
Max./Min. Base CU Thickness:	.002"/"
Max./Min. Through Hole Size:	.045"/.0118" (drilled)
Aspect Ratio:	7:1 (Through hole)
Max. Number of Layers:	10
Min. Conductor Width:	.004"
Min. Conductor Space:	.003"
Part Mounting:	MIX, Press Fit, SM, THM
Rigid Base Material:	BF: Aramid Fabric, Nonwoven, Epoxy Resin
Flex Base Material:	N/A
Finish System:	ENIG, Electrolytic Nickel, Electrolytic Soft & Hard Gold, HASL, Hot Oil Reflow following SnPb plate
Hole Preparation:	Plasma Desmear/Etchback
Alternate Construction:	Blind and Buried Vias, Buried Resistors, Micro Vias, Multiple Laminations
Copper Plating:	Acid Copper
Solder Resist:	Dry-Film, LPI, Wey Mask
Controlled Impedance:	Characteristic, Differential, Dual Stripline, Embedded Microstrip, Microstrip, Range 30-150 ohms (+/- 10%)
Hole Fill/Via Plug:	Conductive & Non-conductive Epoxy Hole Fill / Via Plug
Flex Usage:	N/A
Hole Wall Conductive Coating:	Electroless Copper
Max. Base Cu Weight	1 oz.

VQE-03-003348
VQE-09-18855

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: TTM Technologies (Stafford) 4 Old Monson Road P.O. Box 145, Stafford, CT 77497, US	PLANT LOCATION: Same Address as Manufacturer	CAGE Code: 5L706 Contact: Michelle Herbert Phone: 860-684-5881 Fax: 860-684-7425 E-Mail: michele.hebert@tycoelectroni cs.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:	.125"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	.063"/.013" (drilled)
Aspect Ratio:	9:1 (Through Hole)
Max. Number of Layers:	24
Min. Conductor Width:	.004"
Min. Conductor Space:	.003"
Part Mounting:	MIX, Press Fit, SM, THM
Rigid Base Material:	GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant
Flex Base Material:	4201/11 Acrylic Adhesive Coverlayer 4204/11 Adhesive Polyimide
Finish System:	ENIG, Electrolytic Nickel, Electrolytic Soft & Hard Gold, HASL, Hot Oil Reflow following SnPb plate
Hole Preparation:	Plasma Desmear/Etchback
Alternate Construction:	Blind and Buried Vias, Buried Resistors, Micro Vias, Multiple Laminations
Copper Plating:	Acid Copper
Solder Resist:	Dy Film, LPI, Wet Mask
Controlled Impedance:	Characteristic, Differential, Dual Stripline, Embedded Microstrip, Microstrip, Range 30-150 ohms (+/- 10%)
Hole Fill/Via Plug:	Conductive & Non-conductive Epoxy Hole Fill / Via Plug
Flex Usage:	Class A Flex to Install, Class B Continuous
Hole Wall Conductive Coating:	Electroless Copper
Max. Base Cu Weight	1 oz.

VQE-03-003349
 VQE-09-18855
 VQE-10-19456

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: TTM Technologies (Stafford) 4 Old Monson Road P.O. Box 145, Stafford, CT 77497, US	PLANT LOCATION: Same Address as Manufacturer	CAGE Code: 5L706 Contact: Michelle Herbert Phone: 860-684-5881 Fax: 860-684-7425 E-Mail: michele.hebert@tycoelectroni cs.com
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION **QUALIFICATION LETTERS:**

Specification:	MIL-PRF-31032/3, MIL-PRF-31032/4, MIL-PRF-31032/Custom
Panel Size:	18" X 24"
Max./Min. Board Thickness:	.07"/Not Specified .11"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	Not Specified/.035" (drilled) .0413"/.0197" (drilled)
Aspect Ratio:	2:1 3.3:1 ((through hole))
Max. Number of Layers:	11, 12
Min. Conductor Width:	.004" .006"
Min. Conductor Space:	.003" .004"
Part Mounting:	MIX, Press Fit, SM, THM
Rigid Base Material:	GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Hydrocarbon with Ceramic Filler PTFE Resin with Ceramic Filler,
Flex Base Material:	4204/1 Acrylic Adhesive
Finish System:	ENIG, Electrolytic Nickel, Electrolytic Soft & Hard Gold, HASL, Hot Oil Reflow following SnPb plate
Hole Preparation:	Plasma Desmear/Etchback
Alternate Construction:	Blind and Buried Vias, Buried Resistors, Micro Vias, Multiple Laminations
Copper Plating:	Acid Copper
Solder Resist:	Dry-Film, LPI, LPI, Dry-Film, Wet Mask, Wet Mask
Controlled Impedance:	Characteristic, Differential, Dual Stripline, Embedded Microstrip, Microstrip, Range 30-150 ohms (+/- 10%)
Hole Fill/Via Plug:	Conductive & Non-conductive Epoxy Hole Fill/Via Plug
Flex Usage:	N/A
Hole Wall Conductive Coating:	Electroless Copper
Max. Base Cu Weight	1 oz.

VQE-03-003348
 VQE-03-003349
 VQE-10-19456
 VQE-10-19855

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION		QUALIFICATION LETTERS:
Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2	VQE-07-13789
Panel Size:	12" X 18"	VQE-09-17422
Max./Min. Board Thickness:	.12"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	.129"/.02"	
Aspect Ratio:	6:1 (Through Hole)	
Max. Number of Layers:	16	
Min. Conductor Width:	.005"	
Min. Conductor Space:	.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:	Blind Via, Bured Via, Foil Lamination, Laser-drilled Microvias, Sequential Lamination	
Copper Plating:	Electrodeposited Acid Copper,	
Solder Resist:	LPI	
Controlled Impedance:	100 ohms differential +/-10%, 53 ohms characteristic +/-7%	
Hole Fill/Via Plug:	Conductive fill, Non-conductive fill	
Flex Usage:	N/A	
Hole Wall Conductive Coating:	Electroless Copper	
Laser Via Hole Size	.006 +/- .001	

CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION		QUALIFICATION LETTERS:
Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2	VQE-09-17422
Panel Size:	20" X 26"	
Max./Min. Board Thickness:	.19"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	.252"/.029"	
Aspect Ratio:	6.5:1 ((thru hole))	
Max. Number of Layers:	24	
Min. Conductor Width:	.005"	
Min. Conductor Space:	.005"	
Part Mounting:	SMT, THM	
Rigid Base Material:	GF: Woven E-Glass, Epoxy Resin, Flame Resistant	
Flex Base Material:	N/A	
Finish System:	HASL, Reflowed Tin Lead	
Hole Preparation:	Plasma Etchback	
Alternate Construction:	N/A	
Copper Plating:	Electrodeposited Acid Copper	
Solder Resist:	LPI	
Controlled Impedance:	100 ohms differential +/-10%, 53 ohms characteristic +/-7%	
Hole Fill/Via Plug:	Conductive fill, Non-conductive fill	
Flex Usage:	N/A	
Hole Wall Conductive Coating:	Electroless Copper	

SECTION I
LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER INFORMATION: Universal Circuits, Inc. 8860 Zachary Lane North Maple Grove, MN 55369-4524, US	PLANT LOCATION: Same Address as Manufacturer	CAGE Code: 45032 Contact: Phone: Fax: 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:	.125"/Not Specified .18"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	".008" ".021"
Aspect Ratio:	7.75:1 8.57:1
Max. Number of Layers:	16, 18
Min. Conductor Width:	.0032" .005"
Min. Conductor Space:	.0032" .005"
Part Mounting:	MIX, SMT, THM
Rigid Base Material:	GF: Woven E-Glass, Epoxy Resin, Flame Resistant Hybrid GF Hydrocarbon/Ceramic
Flex Base Material:	N/A
Finish System:	ENIG, HASL
Hole Preparation:	Chemical Desmear, Plasma Etchback
Alternate Construction:	Blind Vias, Foil Lamination, Sequential Lamination
Copper Plating:	Acid Copper
Solder Resist:	LPI
Controlled Impedance:	Differential 77.5 +/- 7.5, 90 +/- 13.5, 98 +/- 13, 100 +/- 10, 120 +/- 12, 150 +/- 7 ohms, Single-ended 50 +/- 2.5, 55 +/- 5 ohms
Hole Fill/Via Plug:	Acid Copper
Flex Usage:	N/A
Hole Wall Conductive Coating:	Direct Metallization
Through Hole Metallization	Direct Metallization

VQE-10-019530
 VQE-10-020323

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

<p>MANUFACTURER INFORMATION: Vermont Circuits, Inc. 76 Technology Drive P.O. Box 1890, Brattleboro, VT 05302-1890, US</p>		<p>CAGE Code: 65200 Contact: Bob Downing Phone: 802-257-4571 Fax: 802-257-0011 EMail: Bob.Downing@vtcircuits.com</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: .1"/Not Specified Max./Min. Base CU Thickness: 1"/.5" Max./Min. Through Hole Size: .04"/.008" ((.0453/.012 Drilled)) Aspect Ratio: 7.5:1 Max. Number of Layers: 10 Min. Conductor Width: .005" Min. Conductor Space: .005" Part Mounting: THM Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant Flex Base Material: N/A Finish System: ENIG, HASL Hole Preparation: Permanganate Desmear, Plasma Etchback/Desmear Alternate Construction: Foil Lamination Copper Plating: Acid Copper: DC Plate Solder Resist: LPI Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Hole Wall Conductive Coating: Electroless Copper</p>	<p>VQE-10-019275</p>

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, Inc.

791 Nuttman Street, Santa Clara, CA 95054,

Colonial Circuits, Inc.

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

Cosmotronic, Inc.

16721 Noyes Avenue, Irvine, CA 92606, US

DDi Cleveland Corp.

7 Ascot Parkway, Cuyahoga Falls, OH 44223, US

DDi Denver Corp.

10570 Bradford Road, Littleton, CO 80127, US

DDi Global Corp. - Anaheim

1220 N. Simon Circle, Anaheim, CA 92806, US

DDi Global Corp. - Sterling, VA

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

DDi North Jackson Corp.

12080 DeBartolo Drive, North Jackson, OH 44451, US

DDi Ontario

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

Dynaco Corp.

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

Dynamic & Proto Circuits, Inc.

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

Electro Plate Circuitry, Inc.

1430 Century Drive, Carrollton, TX 75006, US

Electrotek Corp.

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

Endicott Interconnect Technologies, Inc.

Dept. 0069/014-3, 1093 Clark Street, Endicott, NY 13760, US

Firan Technology Group

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

Global Innovations Corp.

901 Hensley Drive, Wylie, TX 75098, US

Hamby Corporation

27704 Avenue Scott, Valencia, CA 91355, US

Hans Brockstedt GmbH

Clara-Immerwahr Strasse 7, 24145 Kiel, Germany

Hughes Circuits

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

Lockheed Martin Systems Integration

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

SECTION II
LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION

MIL-PRF-31032/1

Philway Products, Inc.

701 Virginia Avenue, Ashland, OH 44806, US

Pioneer Circuits, Inc.

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

PNC, Inc.

115 East Centre Street, Nutley, NJ 07110, US

Sanmina-SCI (San Jose)

2050 Bering Drive, San Jose, CA 95131, US

Speedy Circuits, Inc.

5331 McFadden Avenue, Huntington Beach, CA 92649-1204, 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, CT 77497, US

Unicircuit, Inc.

8192 Southpark Lane, Littleton, CO 80120, US

Universal Circuits, Inc.

8860 Zachary Lane North, Maple Grove, MN 55369-4524, US

Vermont Circuits, Inc.

76 Technology Drive, P.O. Box 1890, Brattleboro, VT 05302-1890, 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, Inc.

791 Nuttman Street, Santa Clara, CA 95054,

Colonial Circuits, Inc.

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

Cosmotronic, Inc.

16721 Noyes Avenue, Irvine, CA 92606, US

DDi Cleveland Corp.

7 Ascot Parkway, Cuyahoga Falls, OH 44223, US

DDi Denver Corp.

10570 Bradford Road, Littleton, CO 80127, US

DDi Global Corp. - Anaheim

1220 N. Simon Circle, Anaheim, CA 92806, US

DDi Global Corp. - Sterling, VA

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

DDi North Jackson Corp.

12080 DeBartolo Drive, North Jackson, OH 44451, US

DDi Ontario

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

Dynaco Corp.

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

Dynamic & Proto Circuits, Inc.

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

Electro Plate Circuitry, Inc.

1430 Century Drive, Carrollton, TX 75006, US

Electrotek Corp.

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

Endicott Interconnect Technologies, Inc.

Dept. 0069/014-3, 1093 Clark Street, Endicott, NY 13760, US

Firan Technology Group

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

Global Innovations Corp.

901 Hensley Drive, Wylie, TX 75098, US

Hamby Corporation

27704 Avenue Scott, Valencia, CA 91355, US

Hans Brockstedt GmbH

Clara-Immerwahr Strasse 7, 24145 Kiel, Germany

Hughes Circuits

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

Lockheed Martin Systems Integration

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

SECTION II
LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION

MIL-PRF-31032/2

Pioneer Circuits, Inc.

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

PNC, Inc.

115 East Centre Street, Nutley, NJ 07110, US

Sanmina-SCI (San Jose)

2050 Bering Drive, San Jose, CA 95131, US

Speedy Circuits, Inc.

5331 McFadden Avenue, Huntington Beach, CA 92649-1204, 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, CT 77497, US

Unicircuit, Inc.

8192 Southpark Lane, Littleton, CO 80120, US

Universal Circuits, Inc.

8860 Zachary Lane North, Maple Grove, MN 55369-4524, US

Vermont Circuits, Inc.

76 Technology Drive, P.O. Box 1890, Brattleboro, VT 05302-1890, US

SECTION II
LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION

MIL-PRF-31032/3

Amphenol Printed Circuits

91 Northeastern Boulevard, Nashua, NH 03062, US

Cirexx International, Inc.

791 Nuttman Street, Santa Clara, CA 95054,

Colonial Circuits, Inc.

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

Cosmotronic, Inc.

16721 Noyes Avenue, Irvine, CA 92606, US

DDi Cleveland Corp.

7 Ascot Parkway, Cuyahoga Falls, OH 44223, US

DDi North Jackson Corp.

12080 DeBartolo Drive, North Jackson, OH 44451, US

Dynaco Corp.

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

Hamby Corporation

27704 Avenue Scott, Valencia, CA 91355, US

Hans Brockstedt GmbH

Clara-Immerwahr Strasse 7, 24145 Kiel, Germany

Lockheed Martin Systems Integration

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

Speedy Circuits, Inc.

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

Strataflex Corp.

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

TTM Technologies (Santa Clara)

400 Matthew Street, Santa Clara, CA 95050, US

TTM Technologies (Stafford)

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

SECTION II
LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION

MIL-PRF-31032/4

Amphenol Printed Circuits

91 Northeastern Boulevard, Nashua, NH 03062, US

Cirexx International, Inc.

791 Nuttman Street, Santa Clara, CA 95054,

Colonial Circuits, Inc.

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

Cosmotronic, Inc.

16721 Noyes Avenue, Irvine, CA 92606, US

DDi Cleveland Corp.

7 Ascot Parkway, Cuyahoga Falls, OH 44223, US

DDi North Jackson Corp.

12080 DeBartolo Drive, North Jackson, OH 44451, US

Dynaco Corp.

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

Hamby Corporation

27704 Avenue Scott, Valencia, CA 91355, US

Hans Brockstedt GmbH

Clara-Immerwahr Strasse 7, 24145 Kiel, Germany

Lockheed Martin Systems Integration

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

Speedy Circuits, Inc.

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

Strataflex Corp.

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

TTM Technologies (Santa Clara)

400 Matthew Street, Santa Clara, CA 95050, US

TTM Technologies (Stafford)

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

SECTION II
LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION

MIL-PRF-31032/5

Electro Plate Circuitry, Inc.

1430 Century Drive, Carrollton, TX 75006, US

Speedy Circuits, Inc.

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

SECTION II
LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION

MIL-PRF-31032/6

Electro Plate Circuitry, Inc.

1430 Century Drive, Carrollton, TX 75006, US

Global Innovations Corp.

901 Hensley Drive, Wylie, TX 75098, US

Sanmina-SCI (San Jose)

2050 Bering Drive, San Jose, CA 95131, US

Speedy Circuits, Inc.

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.

Dept. 0069/014-3, 1093 Clark Street, Endicott, NY 13760, 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, CT 77497, 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, Inc. 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: 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: DDi Cleveland Corp. 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>

SECTION III
ALPHABETICAL LIST OF QUALIFIED MANUFACTURERS

<p>MANUFACTURER INFORMATION: DDi Denver Corp. 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: 303-972-4105 Fax: 303-933-2934 EMail: dberry@ddiglobal.com</p>
<p>MANUFACTURER INFORMATION: DDI Global Corp. - Anaheim 1220 N. Simon Circle Anaheim, CA 92806, US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 0BSG1 Contact: Rick Sylvain Phone: 714-688-7371 Fax: EMail: rsylvain@ddiglobal.com</p>
<p>MANUFACTURER INFORMATION: DDi Global Corp. - Sterling, VA 1200 Severn Way Dulles, VA 20166-8904, US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 0K703 Contact: Juan Vasquez Phone: 703-652-2200 Fax: 703-652-2272 EMail: jvasquez@ddiglobal.com</p>
<p>MANUFACTURER INFORMATION: DDi North Jackson Corp. 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: DDi Ontario 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: 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: Electro Plate Circuitry, Inc. 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: jimmm@eplate.com</p>

SECTION III
ALPHABETICAL LIST OF QUALIFIED MANUFACTURERS

<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>
<p>MANUFACTURER INFORMATION: Endicott Interconnect Technologies, Inc. Dept. 0069/014-3, 1093 Clark Street 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 Innovations 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: b noland@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: 07284 Contact: Sue Sharp Phone: 661-257-1924 Fax: 661-257-1213 EMail: suesharp@hambycorp.com</p>
<p>MANUFACTURER INFORMATION: Hans Brockstedt GmbH Clara-Immerwahr Strasse 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 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>

**SECTION III
ALPHABETICAL LIST OF QUALIFIED MANUFACTURERS**

<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: E-Mail: Customerservice@merix.com</p>
<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 E-Mail: 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 E-Mail: 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 E-Mail: quality@philway.com</p>
<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 E-Mail:</p>
<p>MANUFACTURER INFORMATION: PNC, Inc. 115 East Centre Street Nutley, NJ 07110, US</p>		<p>CAGE Code: 66766 Contact: Carmela Conte Phone: 973-284-1600 Fax: E-Mail: carmela@pnconline.com</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 E-Mail: 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 E-Mail: darrell.myers@sanmina-sci.com</p>

**SECTION III
ALPHABETICAL LIST OF QUALIFIED MANUFACTURERS**

<p>MANUFACTURER INFORMATION: Speedy Circuits, Inc. 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>
<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: 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, CT 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>
<p>MANUFACTURER INFORMATION: Universal Circuits, Inc. 8860 Zachary Lane North Maple Grove, MN 55369-4524, US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 45032 Contact: Phone: Fax: EMail:</p>
<p>MANUFACTURER INFORMATION: Vermont Circuits, Inc. 76 Technology Drive P.O. Box 1890, Brattleboro, VT 05302-1890, US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 65200 Contact: Bob Downing Phone: 802-257-4571 Fax: 802-257-0011 EMail: Bob.Downing@vtcircuits.com</p>