

**Specification Details:**

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

**Contact Information:**

DSCC Office of Primary Involvement: Electronic Devices Branch, DSCC-VQE  
Primary DSCC-VQ Contact: 614-692-0627, e-mail: vqe.ls@dla.mil  
Secondary DSCC-VQ Contact: 614-692-0631, e-mail: vqe.bw@dla.mil

**Notes:**

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

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

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

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

The following abbreviations are used in this listing:

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

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

<b>MANUFACTURER INFORMATION:</b> <b>Accurate Circuit Engineering</b> 3019 S. Kilson Drive Santa Ana, CA 92707, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 0MNN9  <b>Contact:</b> James Hofer <b>Phone:</b> 714-546-162 <b>Fax:</b> 714-433-7418 <b>EMail:</b> James@ace-pcb.com
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>	<b>QUALIFICATION LETTERS:</b>
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<b>Specification:</b> MIL-PRF-31032/1, MIL-PRF-31032/2	
<b>Panel Size:</b> 20" X 26"	
<b>Max./Min. Board Thickness:</b> .22"/Not Specified	
<b>Max./Min. Base CU Thickness:</b> .0056"/Not Specified	
<b>Max./Min. Through Hole Size:</b> .075"/.008" (after plating) .247"/Not Specified (mounting-after plating)	
<b>Aspect Ratio:</b> 11:1 (Through Hole)	
<b>Max. Number of Layers:</b> 24	
<b>Min. Conductor Width:</b> .003"	
<b>Min. Conductor Space:</b> .003" (+/-10%)	
<b>Part Mounting:</b> MIX, SM, THM	
<b>Rigid Base Material:</b> GF: Woven E-Glass, Epoxy Resin, Flame Resistant	
<b>Flex Base Material:</b> N/A	
<b>Finish System:</b> ENIG, Electrolytic Ni-Au, HASL	
<b>Hole Preparation:</b> Permanganate Desmear/Etchback, Plasma Desmear/Etchback	
<b>Alternate Construction:</b> Blind Vias, Buried Vias, Foil Lamination, Sequential Lamination	
<b>Copper Plating:</b> Acid Copper	
<b>Solder Resist:</b> LPI	
<b>Controlled Impedance:</b> Characteristic, Differential 50, 75, 100 ohms +/-10%	
<b>Hole Fill/Via Plug:</b> Non-conductive Hole Fill/Via Plug	
<b>Flex Usage:</b> N/A	
<b>Hole Wall Conductive Coating:</b> Electroless Copper	

	VQE-06-12150 VQE-07-12577 VQE-09-18384
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<b>MANUFACTURER INFORMATION:</b> <b>American Standard Circuits</b> RF Division, 475 Industrial Drive West Chicago, IL 60185, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	CAGE Code: 4AA34  Contact: Lori Ryan Phone: 603-639-5438 Fax: EMail: lori@asc-i.com
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>	<b>QUALIFICATION LETTERS:</b>
Specification: MIL-PRF-31032/1, MIL-PRF-31032/2 Panel Size: 12" X 18" Max./Min. Board Thickness: .062"/Not Specified Max./Min. Base CU Thickness: .006"/Not Specified (1/2 oz.) Max./Min. Through Hole Size: .052"/.009" (after plating) Aspect Ratio: 7:1 (Through Hole) Max. Number of Layers: 10 Min. Conductor Width: .004" Min. Conductor Space: .004" (+/-10%) Part Mounting: MIX, SMT, THM Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant Flex Base Material: N/A Finish System: HASL Hole Preparation: Permanganate 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: Electroless Copper	VQE-08-015934

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

<b>Specification:</b>	MIL-PRF-31032/1, MIL-PRF-31032/2
<b>Panel Size:</b>	24" X 36", 30" X 36"
<b>Max./Min. Board Thickness:</b>	.322"/Not Specified
<b>Max./Min. Base CU Thickness:</b>	N/A
<b>Max./Min. Through Hole Size:</b>	Not Specified/.008"
<b>Aspect Ratio:</b>	0.5:1 (Blind Via) 11:1 (Through Hole)
<b>Max. Number of Layers:</b>	28
<b>Min. Conductor Width:</b>	.004"
<b>Min. Conductor Space:</b>	.004"
<b>Part Mounting:</b>	Compliant Pin, MIX, SMT, THM
<b>Rigid Base Material:</b>	GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Hybrid Built GF/Hydrocarbon Ceramic Hydrocarbon Ceramic
<b>Flex Base Material:</b>	N/A
<b>Finish System:</b>	Electrolytic Hard & Soft Gold, Electrolytic Nickel, Fused SnB, Nickel
<b>Hole Preparation:</b>	Permanganate Desmear/Etchback, Plasma Desmear
<b>Alternate Construction:</b>	Blind Vias Mechanicall Drilled
<b>Copper Plating:</b>	Acid Copper, DC Plate, Pulse Plate
<b>Solder Resist:</b>	LPI, SMOBC, thermal cured Soldermask
<b>Controlled Impedance:</b>	120 ohms ± 10%, 50 ohms ± 10%
<b>Hole Fill/Via Plug:</b>	Conductive Via Fill, Non-conductive Via Fill
<b>Flex Usage:</b>	N/A
<b>Hole Wall Conductive Coating:</b>	N/A

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

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<b>MANUFACTURER INFORMATION:</b> <b>Amphenol Printed Circuits</b> 91 Northeastern Boulevard Nashua, NH 03062, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 57034  <b>Contact:</b> Denise Chevalier <b>Phone:</b> 603-879-3268 <b>Fax:</b> 603-879-2818 <b>E-Mail:</b> denise.chevalier@amphenol-tcs.com
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
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	VQE-09-018717	

<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
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.	VQE-10-019533	

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<p>MANUFACTURER INFORMATION:  <b>Amphenol Printed Circuits</b>            91 Northeastern Boulevard            Nashua, NH 03062, US</p>	<p>PLANT LOCATION:            Same Address as Manufacturer</p>	<p>CAGE Code: 57034             Contact: Denise Chevalier            Phone: 603-879-3268            Fax: 603-879-2818            EMail: denise.chevalier@amphenol-tcs.com</p>
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CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION	QUALIFICATION LETTERS:
<p>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 &amp; 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: N/A            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.</p>	<p>VQE-10-019533</p>

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

Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2	VQE-03-4657 VQE-04-6280
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	

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<b>MANUFACTURER INFORMATION:</b> <b>Cirex International, Inc.</b> 791 Nuttman Street Santa Clara, CA 95054,	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 4MEG7  <b>Contact:</b> Don Angulo <b>Phone:</b> 408-988-3980 <b>Fax:</b> 408-988-4534 <b>EMail:</b> dangulo@cirexxintl.com
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
Specification:	MIL-PRF-31032/1	VQ-08-016602
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:	Pemanganate 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	

<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
Specification:	MIL-PRF-31032/2	VQE-07-014176
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	



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

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

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

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

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

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

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<b>MANUFACTURER INFORMATION:</b> <b>Colonial Circuits, Inc.</b> 1026 Warrenton Road Fredericksburg, VA 22406-6200, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 6T499  <b>Contact:</b> Mike Hill <b>Phone:</b> 540-753-5511, x125 <b>Fax:</b> 540-752-2109 <b>EMail:</b> quality@colonialcircuits.com
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
Specification:	MIL-PRF-31032/4	VQE-04-6002
Panel Size:	12" X 18"	
Max./Min. Board Thickness:	.093"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	.045"/.025"	
Aspect Ratio:	3.7:1 (Through Hole)	
Max. Number of Layers:	10	
Min. Conductor Width:	.005"	
Min. Conductor Space:	.005"	
Part Mounting:	PTH, SMT	
Rigid Base Material:	GI: Glass Base, Woven, Polyimide Resin, Heat Resistant	
Flex Base Material:	IPC-4204/1 Acrylic Adhesive	
Finish System:	Tin/Lead Reflow	
Hole Preparation:	Plasma Desmear/Etchback	
Alternate Construction:	N/A	
Copper Plating:	Electrolytic Acid Copper	
Solder Resist:	LPI	
Controlled Impedance:	N/A	
Hole Fill/Via Plug:	N/A	
Flex Usage:	N/A	
Hole Wall Conductive Coating:	N/A	

<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
Specification:	MIL-PRF-31032/Custom	VQE-04-6002
Panel Size:	12" X 18"	
Max./Min. Board Thickness:	.031"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	.117"/.02"	
Aspect Ratio:	1.55:1 (Through Hole)	
Max. Number of Layers:	2	
Min. Conductor Width:	.025"	
Min. Conductor Space:	.01"	
Part Mounting:	SMT	
Rigid Base Material:	PTFE Resin with Ceramic Filler With or Without Woven E-Glass	
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	

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

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

<b>MANUFACTURER INFORMATION:</b> <b>Coretec Cleveland, Inc.</b> 7 Ascot Parkway Cuyahoga Falls, OH 44223, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 7Z463  <b>Contact:</b> Mark Kasting <b>Phone:</b> 330-572-3400 <b>Fax:</b> 330-572-3434 <b>EMail:</b> 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**

<b>MANUFACTURER INFORMATION:</b> <b>Coretec Cleveland, Inc.</b> 7 Ascot Parkway Cuyahoga Falls, OH 44223, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 7Z463  <b>Contact:</b> Mark Kasting <b>Phone:</b> 330-572-3400 <b>Fax:</b> 330-572-3434 <b>EMail:</b> mark_kasting/coretec@coretec-inc.com
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>	<b>QUALIFICATION LETTERS:</b>
<b>Specification:</b> MIL-PRF-31032/3, MIL-PRF-31032/4  <b>Panel Size:</b> 18" X 24" <b>Max./Min. Board Thickness:</b> .126"/Not Specified <b>Max./Min. Base CU Thickness:</b> N/A <b>Max./Min. Through Hole Size:</b> Not Specified/.017" <b>Aspect Ratio:</b> 10:1 (Through Hole) <b>Max. Number of Layers:</b> 11 <b>Min. Conductor Width:</b> .003" <b>Min. Conductor Space:</b> .003" <b>Part Mounting:</b> SMT, THM <b>Rigid Base Material:</b> GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant <b>Flex Base Material:</b> IPC-4204/1 Acrylic Adhesive IPC-4204/11 Adhesiveless  <b>Finish System:</b> HASL <b>Hole Preparation:</b> Plasma Etchback <b>Alternate Construction:</b> N/A <b>Copper Plating:</b> Acid Copper <b>Solder Resist:</b> N/A <b>Controlled Impedance:</b> N/A <b>Hole Fill/Via Plug:</b> N/A <b>Flex Usage:</b> Class A Flex to Install <b>Hole Wall Conductive Coating:</b> Electroless Copper	VQE-01-0909 VQE-06-010963

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

<b>MANUFACTURER INFORMATION:</b> <b>Cosmotronic, Inc.</b> 16721 Noyes Avenue Irvine, CA 92606, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 63695  <b>Contact:</b> Alan Exley <b>Phone:</b> 949-660-0740 <b>Fax:</b> 949-553-8371 <b>EMail:</b> 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**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Cosmotronic, Inc.</b> 16721 Noyes Avenue Irvine, CA 92606, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 63695  <b>Contact:</b> Alan Exley <b>Phone:</b> 949-660-0740 <b>Fax:</b> 949-553-8371 <b>E-Mail:</b> 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**

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

<b>Specification:</b> MIL-PRF-31032/Custom  <b>Panel Size:</b> 12" X 18" <b>Max./Min. Board Thickness:</b> .225"/Not Specified <b>Max./Min. Base CU Thickness:</b> N/A <b>Max./Min. Through Hole Size:</b> Not Specified/.02" <b>Aspect Ratio:</b> 10:1 (Through Hole) <b>Max. Number of Layers:</b> 16 <b>Min. Conductor Width:</b> .011" <b>Min. Conductor Space:</b> .007" <b>Part Mounting:</b> SMT <b>Rigid Base Material:</b> Rogers 4003 Ceramic-Filled Thermoset Resin Rogers 4003/GI Composite <b>Flex Base Material:</b> N/A <b>Finish System:</b> ENIG, HASL <b>Hole Preparation:</b> Plasma Desmear/Etchback <b>Alternate Construction:</b> Blind Vias, Sequential Lamination <b>Copper Plating:</b> Electro-deposited Acid Copper <b>Solder Resist:</b> LPI, SMOBC <b>Controlled Impedance:</b> N/A <b>Hole Fill/Via Plug:</b> N/A <b>Flex Usage:</b> N/A <b>Hole Wall Conductive Coating:</b> 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**

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

<b>Specification:</b> MIL-PRF-31032/1, MIL-PRF-31032/2  <b>Panel Size:</b> 18" X 24" <b>Max./Min. Board Thickness:</b> .125"/Not Specified <b>Max./Min. Base CU Thickness:</b> .001"/Not Specified <b>Max./Min. Through Hole Size:</b> .109"/.013" <b>Aspect Ratio:</b> 7:1 <b>Max. Number of Layers:</b> 20 <b>Min. Conductor Width:</b> .004" <b>Min. Conductor Space:</b> .004" <b>Part Mounting:</b> MIX, SMT, THM <b>Rigid Base Material:</b> GF: Woven E-Glass, Epoxy Resin, Flame Resistant <b>Flex Base Material:</b> N/A <b>Finish System:</b> ENIG, HASL, IR Reflow Following SnPb Plate <b>Hole Preparation:</b> Plasma Desmear/Etchback <b>Alternate Construction:</b> N/A <b>Copper Plating:</b> Acid Copper <b>Solder Resist:</b> LPI <b>Controlled Impedance:</b> N/A <b>Hole Fill/Via Plug:</b> Non-conductive Epoxy Hole Fill/Via Plug <b>Flex Usage:</b> N/A <b>Hole Wall Conductive Coating:</b> Electroless Copper <b>Max. Base Cu Weight</b> 2 oz.	VQE-02-0317 VQE-05-7627 VQE-05-9014 VQE-09-18719 VQE-10-020224
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**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>DDi Denver Corp.</b> 10570 Bradford Road Littleton, CO 80127, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 75815  <b>Contact:</b> Douglas N. Berry <b>Phone:</b> 303-972-4105 <b>Fax:</b> 303-933-2934 <b>EMail:</b> dberry@ddiglobal.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION** **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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LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

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

<b>Specification:</b> MIL-PRF-31032/1, MIL-PRF-31032/2  <b>Panel Size:</b> 18" X 24" <b>Max./Min. Board Thickness:</b> .125"/Not Specified <b>Max./Min. Base CU Thickness:</b> .001"/" <b>Max./Min. Through Hole Size:</b> .109"/.013" <b>Aspect Ratio:</b> 10:1 <b>Max. Number of Layers:</b> 20 <b>Min. Conductor Width:</b> .004" <b>Min. Conductor Space:</b> .004" <b>Part Mounting:</b> MIX, SMT, THM <b>Rigid Base Material:</b> GI: Glass Base, Woven, Polyimide Resin, Heat Resistant <b>Flex Base Material:</b> N/A <b>Finish System:</b> ENIG, HASL, IR Reflow following SnPb plate <b>Hole Preparation:</b> Plasma Desmear/Etchback <b>Alternate Construction:</b> N/A <b>Copper Plating:</b> Acid Copper <b>Solder Resist:</b> LPI <b>Controlled Impedance:</b> N/A <b>Hole Fill/Via Plug:</b> Non-conductive Epoxy Hole Fill/Via Plug <b>Flex Usage:</b> N/A <b>Hole Wall Conductive Coating:</b> Electroless Copper <b>Max. Base Cu Weight</b> 2 oz.	VQE-02-0217 VQE-05-7626 VQE-05-9014 VQE-09-18719 VQE-10-020224
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**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>DDI Global Corp. - Anaheim</b> 1220 N. Simon Circle Anaheim, CA 92806, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 0BSG1  <b>Contact:</b> Rick Sylvain <b>Phone:</b> 714-688-7371 <b>Fax:</b> <b>E-Mail:</b> rsylvain@ddiglobal.com
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
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	

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

<b>MANUFACTURER INFORMATION:</b> <b>DDi Global Corp. - Sterling, VA</b> 1200 Severn Way Dulles, VA 20166-8904, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 0K703  <b>Contact:</b> Tony Trnka <b>Phone:</b> 703-652-2266 <b>Fax:</b> 703-652-2271 <b>EMail:</b> atnka@va.ddiglobal.com
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>	<b>QUALIFICATION LETTERS:</b>																																										
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">Specification:</td> <td>MIL-PRF-31032/1, MIL-PRF-31032/2</td> </tr> <tr> <td>Panel Size:</td> <td>18" X 24"</td> </tr> <tr> <td>Max./Min. Board Thickness:</td> <td>.1"/Not Specified</td> </tr> <tr> <td>Max./Min. Base CU Thickness:</td> <td>N/A</td> </tr> <tr> <td>Max./Min. Through Hole Size:</td> <td>.05"/.009" (nominal) .15"/Not Specified (non-PTH)</td> </tr> <tr> <td>Aspect Ratio:</td> <td>10:1</td> </tr> <tr> <td>Max. Number of Layers:</td> <td>22</td> </tr> <tr> <td>Min. Conductor Width:</td> <td>.004"</td> </tr> <tr> <td>Min. Conductor Space:</td> <td>.003"</td> </tr> <tr> <td>Part Mounting:</td> <td>BGA, MIX, SMT, THM</td> </tr> <tr> <td>Rigid Base Material:</td> <td>GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant</td> </tr> <tr> <td>Flex Base Material:</td> <td>N/A</td> </tr> <tr> <td>Finish System:</td> <td>ENIG, HASL</td> </tr> <tr> <td>Hole Preparation:</td> <td>Plasma Desmear/Etchback</td> </tr> <tr> <td>Alternate Construction:</td> <td>0.005 Blind Vias laser, 0.006 Blind Micro Vias laser, Buried Resistors 33 ohms ± 15%</td> </tr> <tr> <td>Copper Plating:</td> <td>Electrolytic Acid Copper</td> </tr> <tr> <td>Solder Resist:</td> <td>LPI</td> </tr> <tr> <td>Controlled Impedance:</td> <td>Differential 100 ohms ± 10%, Single Ended 50 ohms ± 10%</td> </tr> <tr> <td>Hole Fill/Via Plug:</td> <td>Buried Vias with Non-conductive Via Fill</td> </tr> <tr> <td>Flex Usage:</td> <td>N/A</td> </tr> <tr> <td>Hole Wall Conductive Coating:</td> <td>Electroless Copper</td> </tr> </table>	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
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																																										

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

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

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

<b>MANUFACTURER INFORMATION:</b> <b>DDi Ontario</b> 8150 Sheppard Avenue East Scarborough, Ontario, Canada M1B 5K2	<b>PLANT LOCATIONS:</b> 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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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
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	

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

<b>MANUFACTURER INFORMATION:</b> <b>Dynaco Corp.</b> 1000 South Priest Drive Tempe, AZ 85281-5238, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 61642  <b>Contact:</b> Ted Edwards <b>Phone:</b> 480-736-3728 <b>Fax:</b> 480-921-9830 <b>EMail:</b> tedwards@dynacocorp.com
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>	<b>QUALIFICATION LETTERS:</b>
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: .001"/Not Specified Max./Min. Through Hole Size: .045"/.032" Aspect Ratio: 3:1 (Through Hole) Max. Number of Layers: 10 Min. Conductor Width: .01" Min. Conductor Space: .01" Part Mounting: THM Rigid Base Material: GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant Flex Base Material: N/A Finish System: HASL Hole Preparation: Permanganate Desmear/Etchback Alternate Construction: N/A Copper Plating: Acid Copper Solder Resist: N/A Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Hole Wall Conductive Coating: N/A	VQE-05-9356

<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>	<b>QUALIFICATION LETTERS:</b>
Specification: MIL-PRF-31032/3, MIL-PRF-31032/4 Panel Size: 12" X 18", 18" X 24" Max./Min. Board Thickness: .1"/Not Specified Max./Min. Base CU Thickness: .001"/Not Specified Max./Min. Through Hole Size: .045"/.032" Aspect Ratio: 3:1 (Through Hole) 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: IPC-241/11 Adhesiveless IPC-4204/11 Adhesiveless Finish System: HASL Hole Preparation: Permanganate Desmear/Etchback Alternate Construction: Foil Lamination Copper Plating: Acid Copper Solder Resist: N/A Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: Class A Flex to Install, Class B Continuous Flex Hole Wall Conductive Coating: N/A	VQE-05-9356

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

<p>MANUFACTURER INFORMATION:  <b>Dynaco Corp.</b>          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>
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
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**

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

<b>Specification:</b> MIL-PRF-31032/1, MIL-PRF-31032/2  <b>Panel Size:</b> 16" X 18" <b>Max./Min. Board Thickness:</b> .125"/Not Specified <b>Max./Min. Base CU Thickness:</b> N/A <b>Max./Min. Through Hole Size:</b> .039"/.018" (0.0135" Drilled) <b>Aspect Ratio:</b> 9.3:1 (Through Hole) <b>Max. Number of Layers:</b> 16 <b>Min. Conductor Width:</b> .005" <b>Min. Conductor Space:</b> .005" <b>Part Mounting:</b> MIX, SMT, THM <b>Rigid Base Material:</b> GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  <b>Flex Base Material:</b> N/A <b>Finish System:</b> HASL <b>Hole Preparation:</b> Plasma Etchback <b>Alternate Construction:</b> N/A <b>Copper Plating:</b> Acid Copper <b>Solder Resist:</b> Dry Film Solder Resist Plugs, LPI <b>Controlled Impedance:</b> N/A <b>Hole Fill/Via Plug:</b> N/A <b>Flex Usage:</b> N/A <b>Hole Wall Conductive Coating:</b> N/A	VQE-00-0007 VQE-01-0311 VQE-03-0818 VQE-98-1143
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**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

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

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

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

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

<b>Specification:</b>	MIL-PRF-31032/1, MIL-PRF-31032/2
<b>Panel Size:</b>	18" X 24"
<b>Max./Min. Board Thickness:</b>	.115"/Not Specified
<b>Max./Min. Base CU Thickness:</b>	N/A
<b>Max./Min. Through Hole Size:</b>	".012"
<b>Aspect Ratio:</b>	9:1 (Through Hole)
<b>Max. Number of Layers:</b>	18
<b>Min. Conductor Width:</b>	.003"
<b>Min. Conductor Space:</b>	.003"
<b>Part Mounting:</b>	MIX, SMT, THM
<b>Rigid Base Material:</b>	GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant
<b>Flex Base Material:</b>	N/A
<b>Finish System:</b>	ENIG, Electrolytic Nickel/Gold, HASL, ImmAg
<b>Hole Preparation:</b>	Permanganate Desmear, Plasma Etchback
<b>Alternate Construction:</b>	Cap Lamination, Foil Lamination
<b>Copper Plating:</b>	Electroplated Acid Copper
<b>Solder Resist:</b>	Dry Film, LPI
<b>Controlled Impedance:</b>	GF: 100 ohms/50 ohms ± 10%, GI: 100 ohms ± 10%
<b>Hole Fill/Via Plug:</b>	Via-fill Technology, 0.016" ±25% Diameter
<b>Flex Usage:</b>	N/A
<b>Hole Wall Conductive Coating:</b>	Electroless Copper

VQ-06-011451  
 VQ-08-014513  
 VQE-09-018692

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

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

Specification: MIL-PRF-31032/1, MIL-PRF-31032/2  Panel Size: 24" X 28" Max./Min. Board Thickness: .116"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: ".01" Aspect Ratio: 12:1 (Through Hole) Max. Number of Layers: 30 Min. Conductor Width: .003" 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 Hole Preparation: Glass Etch, Permanganate 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	VQE-04-005311 VQE-07-012236 VQE-07-013506 VQE-08-015922
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**SECTION I**  
**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

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

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

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

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

<b>Specification:</b>	MIL-PRF-31032/1, MIL-PRF-31032/2
<b>Panel Size:</b>	18" X 24"
<b>Max./Min. Board Thickness:</b>	.22"/Not Specified
<b>Max./Min. Base CU Thickness:</b>	N/A
<b>Max./Min. Through Hole Size:</b>	Not Specified/.005" (Laser Control Depth) Not Specified/.006" (Buried Via Mechanical Drill) .025"/.008" (Mechanical Drill)
<b>Aspect Ratio:</b>	7:1 (Through Hole)
<b>Max. Number of Layers:</b>	20
<b>Min. Conductor Width:</b>	.004"
<b>Min. Conductor Space:</b>	.004"
<b>Part Mounting:</b>	MIX, SMT, THM
<b>Rigid Base Material:</b>	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
<b>Flex Base Material:</b>	N/A
<b>Finish System:</b>	ENIG, HASL, Immersion Tin, Silver, Reflow Solder
<b>Hole Preparation:</b>	Permanganate Desmear, Plasma Etchback
<b>Alternate Construction:</b>	Sequential Lamination for Blind & Buried Vias and Micro Vias
<b>Copper Plating:</b>	Electroless Acid Copper, Electrolytic Acid Copper
<b>Solder Resist:</b>	Hole Fill, LPI
<b>Controlled Impedance:</b>	Characteristic $\pm$ 10%, Differential $\pm$ 10%
<b>Hole Fill/Via Plug:</b>	N/A
<b>Flex Usage:</b>	N/A
<b>Hole Wall Conductive Coating:</b>	N/A

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

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LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

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

<b>Specification:</b> MIL-PRF-31032/1, MIL-PRF-31032/2	VQE-03-4341
<b>Panel Size:</b> 18" X 24"	VQE-04-5599
<b>Max./Min. Board Thickness:</b> .119"/Not Specified	VQE-04-5891
<b>Max./Min. Base CU Thickness:</b> N/A	VQE-05-7288
<b>Max./Min. Through Hole Size:</b> Not Specified/.01"	
<b>Aspect Ratio:</b> 7.5:1 (Through Hole)	
<b>Max. Number of Layers:</b> 18	
<b>Min. Conductor Width:</b> .004"	
<b>Min. Conductor Space:</b> .005"	
<b>Part Mounting:</b> MIX	
<b>Rigid Base Material:</b> GF: Woven E-Glass, Epoxy Resin, Flame Resistant	
<b>Flex Base Material:</b> N/A	
<b>Finish System:</b> HASL	
<b>Hole Preparation:</b> Permanganate Desmear, Plasma Etchback	
<b>Alternate Construction:</b> Foil Lamination	
<b>Copper Plating:</b> Electro-deposited Acid Copper	
<b>Solder Resist:</b> Dry Film, LPI	
<b>Controlled Impedance:</b> N/A	
<b>Hole Fill/Via Plug:</b> N/A	
<b>Flex Usage:</b> N/A	
<b>Hole Wall Conductive Coating:</b> Electroless Copper	

VQE-03-4341  
 VQE-04-5599  
 VQE-04-5891  
 VQE-05-7288

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

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

<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
Specification:	MIL-PRF-31032/6	VQE-07-13270
Panel Size:	9" X 16"	VQE-09-17797
Max./Min. Board Thickness:	.036"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	Not Specified/.031"	
Aspect Ratio:	1.2:1 (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	
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	

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

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

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

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<b>MANUFACTURER INFORMATION:</b> <b>Hans Brockstedt GmbH</b> Clara-Immerwahr Strasse 7 24145 Kiel, Germany	<b>PLANT LOCATION:</b> Same Address as Manufacturer	CAGE Code: C4831  Contact: Hilmar Klammer Phone: 0049-431-71966-0, -30 Fax: 0049-431-71966-29 EMail: 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

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

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

<p><b>MANUFACTURER INFORMATION:</b>  <b>Hughes Circuits</b>                      540 S. Pacific Street                      San Marcos, CA 92078-4056, US</p>	<p><b>PLANT LOCATION:</b>                      Same Address as Manufacturer</p>	<p>CAGE Code: 1KXU6                      Contact: Joe Hughes                      Phone: 760-744-0300                      Fax: 760-744-6388                      EMail: joe@hughescircuits.com</p>
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>	<b>QUALIFICATION LETTERS:</b>
<p>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</p>	<p>VQE-07-014018</p>



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<b>MANUFACTURER INFORMATION:</b> <b>Lockheed Martin Systems Integration-Owego</b> 1801 State Route 17C Owego, NY 13827, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 03640  <b>Contact:</b> Melita Nagerl <b>Phone:</b> 607-751-4665 <b>Fax:</b> 607-751-7714 <b>E-Mail:</b> melita.nagerl@lmco.com
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2	VQE-00-0961
Panel Size:	18" X 24"	VQE-99-0130
Max./Min. Board Thickness:	.2"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	Not Specified/.02"	
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:	AF: Aramid Fabric, Woven, Majority Polyfunctional Epoxy Resin	
Flex Base Material:	N/A	
Finish System:	Fused SnPb, HASL, NiAu	
Hole Preparation:	Permanganate Desmear, Plasma Etchback	
Alternate Construction:	N/A	
Copper Plating:	Electro-deposited Acid Copper	
Solder Resist:	LPI	
Controlled Impedance:	N/A	
Hole Fill/Via Plug:	N/A	
Flex Usage:	N/A	
Hole Wall Conductive Coating:	Electroless Copper	

<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2	VQE-01-0539
Panel Size:	18" X 24"	
Max./Min. Board Thickness:	.095"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	Not Specified/.014"	
Aspect Ratio:	6.8:1 (Through Hole)	
Max. Number of Layers:	14	
Min. Conductor Width:	.004"	
Min. Conductor Space:	.004"	
Part Mounting:	SMT, THM	
Rigid Base Material:	BI: Aramid Fabric, Nonwoven, Polyimide Resin	
Flex Base Material:	N/A	
Finish System:	Fused SnPb, HASL, NiAu	
Hole Preparation:	Permanganate Desmear	
Alternate Construction:	N/A	
Copper Plating:	Electro-deposited Acid Copper	
Solder Resist:	LPI	
Controlled Impedance:	N/A	
Hole Fill/Via Plug:	N/A	
Flex Usage:	N/A	
Hole Wall Conductive Coating:	Electroless Copper	

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<b>MANUFACTURER INFORMATION:</b> <b>Lockheed Martin Systems Integration-Owego</b> 1801 State Route 17C Owego, NY 13827, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 03640  <b>Contact:</b> Melita Nagerl <b>Phone:</b> 607-751-4665 <b>Fax:</b> 607-751-7714 <b>E-Mail:</b> melita.nagerl@lmco.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION** **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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**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

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

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LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<b>MANUFACTURER INFORMATION:</b> <b>Lockheed Martin Systems Integration-Owego</b> 1801 State Route 17C Owego, NY 13827, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 03640  <b>Contact:</b> Melita Nagerl <b>Phone:</b> 607-751-4665 <b>Fax:</b> 607-751-7714 <b>EMail:</b> melita.nagerl@lmco.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION** **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><b>MANUFACTURER INFORMATION:</b>  <b>Merix Corp. (Forest Grove, OR)</b>  1521 Poplar Lane  Forest Grove, OR 97116, US</p>	<p><b>PLANT LOCATION:</b>  Same Address as Manufacturer</p>	<p><b>CAGE Code:</b> 01KV9  <b>Contact:</b> Roger Michalowski  <b>Phone:</b> 781-639-5410  <b>Fax:</b>  <b>EMail:</b> Customerservice@merix.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:	.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

VQ-09-017325

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

<b>MANUFACTURER INFORMATION:</b> <b>Merix Corp. (San Jose, CA)</b> 355 Turtle Creek Court San Jose, CA 95125-1316, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 0MHG5  <b>Contact:</b> Dave Williams <b>Phone:</b> 408-280-0422 <b>Fax:</b> 408-280-0641 <b>E-Mail:</b> david.williams@sj.merix.com
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
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**

<p>MANUFACTURER INFORMATION:  <b>Micom Corp.</b>          475 Old Highway 8 NW          New Brighton, MN 55112, US</p>	<p>PLANT LOCATION:          Same Address as Manufacturer</p>	<p>CAGE Code: 34076           Contact: Larry Leonard          Phone: 651-604-2639          Fax: 651-636-1352          EMail: lleonard@micomcircuits.com</p>
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2	VQE-02-002780
Panel Size:	18" X 24"	VQE-03-2980
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	

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

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

<b>Specification:</b>	MIL-PRF-31032/1
<b>Panel Size:</b>	18" X 21"
<b>Max./Min. Board Thickness:</b>	.09"/Not Specified
<b>Max./Min. Base CU Thickness:</b>	.002"/Not Specified
<b>Max./Min. Through Hole Size:</b>	.044"/.012"
<b>Aspect Ratio:</b>	4:1 (Through Hole)
<b>Max. Number of Layers:</b>	12
<b>Min. Conductor Width:</b>	.005"
<b>Min. Conductor Space:</b>	.005"
<b>Part Mounting:</b>	MIX, SMT, THM
<b>Rigid Base Material:</b>	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
<b>Flex Base Material:</b>	N/A
<b>Finish System:</b>	HASL, IR Reflow following SnPb Plate
<b>Hole Preparation:</b>	Permanganate Desmear/Etchback
<b>Alternate Construction:</b>	N/A
<b>Copper Plating:</b>	Acid Copper
<b>Solder Resist:</b>	LPI
<b>Controlled Impedance:</b>	N/A
<b>Hole Fill/Via Plug:</b>	N/A
<b>Flex Usage:</b>	N/A
<b>Hole Wall Conductive Coating:</b>	N/A

VQE-99-1107



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

<p>MANUFACTURER INFORMATION:</p> <p><b>Pioneer Circuits, Inc.</b>          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:**

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:	.003"
Min. Conductor Space:	.003"
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:  <b>Pioneer Circuits, Inc.</b>          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:	.177"/Not Specified
Max./Min. Base CU Thickness:	N/A
Max./Min. Through Hole Size:	.206"/.013"
Aspect Ratio:	11:1
Max. Number of Layers:	22
Min. Conductor Width:	.003"
Min. Conductor Space:	.003"
Part Mounting:	MIX, SMT, THM
Rigid Base Material:	G1: Glass Base, Woven, Polyimide Resin, Heat 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:  <b>Pioneer Circuits, Inc.</b>          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:	18" X 24"
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:	G1: 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

VQE-09-017323  
VQE-09-017656

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

<p>MANUFACTURER INFORMATION:  <b>Pioneer Circuits, Inc.</b>          3000 S. Shannon Street          Santa Ana, CA 92704-6321, US</p>		<p>CAGE Code: 65723          Contact: Elias Gabriel          Phone: 714-641-3132 x234          Fax: 714-641-3120          EMail:</p>
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
Specification:	MIL-PRF-31032/3, MIL-PRF-31032/4	VQE-09-017323
Panel Size:	24" X 36"	VQE-09-017656
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	

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

<p>MANUFACTURER INFORMATION:</p> <p><b>PNC, Inc.</b>          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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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>	<b>QUALIFICATION LETTERS:</b>
<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**

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

<b>MANUFACTURER INFORMATION:</b> <b>Sanmina-SCI (San Jose)</b> 2050 Bering Drive San Jose, CA 95131, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 3DR67  <b>Contact:</b> Darrell Myers <b>Phone:</b> 408-964-6515 <b>Fax:</b> 408-964-6453 <b>EMail:</b> darrell.myers@sanmina-sci.com
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>	<b>QUALIFICATION LETTERS:</b>
<b>Specification:</b> MIL-PRF-31032/1, MIL-PRF-31032/2  <b>Panel Size:</b> 18" X 24" <b>Max./Min. Board Thickness:</b> .062"/Not Specified <b>Max./Min. Base CU Thickness:</b> N/A <b>Max./Min. Through Hole Size:</b> .25"/.01" <b>Aspect Ratio:</b> 6:1 (Through Hole) <b>Max. Number of Layers:</b> 8 <b>Min. Conductor Width:</b> .003" <b>Min. Conductor Space:</b> .003" <b>Part Mounting:</b> SMT, THM <b>Rigid Base Material:</b> GI: Glass Base, Woven, Polyimide Resin, Heat Resistant <b>Flex Base Material:</b> N/A <b>Finish System:</b> ENIG, HASL, ImmAg, OSP <b>Hole Preparation:</b> Plasma Desmear <b>Alternate Construction:</b> Buried Via Mechanical Drill, Foil Lamination, Sequential Lamination <b>Copper Plating:</b> Acid Copper <b>Solder Resist:</b> Dry Film, LPI <b>Controlled Impedance:</b> 50-110 ohms ± 5% <b>Hole Fill/Via Plug:</b> Epoxy, Silver <b>Flex Usage:</b> N/A <b>Hole Wall Conductive Coating:</b> Electroless Copper	VQE-06-011137 VQE-10-019381



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

<b>MANUFACTURER INFORMATION:</b> <b>Speedy Circuits, Inc.</b> 5331 McFadden Avenue Huntington Beach, CA 92649-1204, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 66982  <b>Contact:</b> Jan Lesky <b>Phone:</b> 714-766-6243 <b>Fax:</b> 714-899-7074 <b>E-Mail:</b>
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
Specification: MIL-PRF-31032/1, MIL-PRF-31032/2 Panel Size: 18" X 24" Max./Min. Board Thickness: .11"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: .048"/.02" Aspect Ratio: 4:1 (Through Hole) 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: 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	VQE-08-016434	

<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
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: .048"/.02" Aspect Ratio: 4:1 (Through Hole) Max. Number of Layers: 10 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: LPI Controlled Impedance: 100/50 ohms +/-10% Characteristic, 100/50 ohms +/-10% Differential Hole Fill/Via Plug: N/A Flex Usage: Class A Flex to Install, Class B Continuous Hole Wall Conductive Coating: Electroless Copper	VQE-08-016434	



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

<p>MANUFACTURER INFORMATION:  <b>Speedy Circuits, Inc.</b>                      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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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>	<b>QUALIFICATION LETTERS:</b>
<p>Specification: MIL-PRF-31032/5, MIL-PRF-31032/6                      Panel Size: 12" X 18"                      Max./Min. Board Thickness: .1"/Not Specified                      Max./Min. Base CU Thickness: N/A                      Max./Min. Through Hole Size: .048"/.02"                      .125"/.01"                      Aspect Ratio: 10:1                      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 and Soft Gold, Electrolytic Nickel, HASL                      Hole Preparation: Plasma Desmear                      Alternate Construction: N/A                      Copper Plating: Acid Copper                      Solder Resist: LPI                      Controlled Impedance: 100/50 ohms +/-10% Characteristic, Differential                      Hole Fill/Via Plug: N/A                      Flex Usage: N/A                      Hole Wall Conductive Coating: Electroless Copper</p>	<p>VQE-09-018657</p>

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

<b>MANUFACTURER INFORMATION:</b> <b>Speedy Circuits, Inc.</b> 5331 McFadden Avenue Huntington Beach, CA 92649-1204, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 66982  <b>Contact:</b> Jan Lesky <b>Phone:</b> 714-766-6243 <b>Fax:</b> 714-899-7074 <b>EMail:</b>
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>	<b>QUALIFICATION LETTERS:</b>
Specification: MIL-PRF-31032/6 Panel Size: 12" X 18" Max./Min. Board Thickness: .036"/Not Specified Max./Min. Base CU Thickness: N/A Max./Min. Through Hole Size: .048"/.02" Aspect Ratio: 2:1 (Through Hole) Max. Number of Layers: 2 Min. Conductor Width: .005" Min. Conductor Space: .005" Part Mounting: SMT Rigid Base Material: GR: Glass Base, Nonwoven, Polytetrafluoroethylene Resin, Flame Resistant GY: Glass Base, Woven, Polytetrafluoroethylene Resin, Flame Resistant, for Microwave Application  Flex Base Material: N/A Finish System: Electro-deposited fused SnPb Hole Preparation: N/A Alternate Construction: N/A Copper Plating: Acid Copper Solder Resist: N/A Controlled Impedance: N/A Hole Fill/Via Plug: N/A Flex Usage: N/A Hole Wall Conductive Coating: Electroless Copper	VQE-08-016434

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

<p>MANUFACTURER INFORMATION:  <b>Strataflex Corp.</b>          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**

<b>MANUFACTURER INFORMATION:</b> <b>Strataflex Corp.</b> 11 Dohme Avenue Toronto, Ontario, Canada M4B 1Y7	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 38661  <b>Contact:</b> Peter Pialis <b>Phone:</b> 416-752-2224 <b>Fax:</b> 416-752-6719 <b>EMail:</b> ppialis@strataflex.ca
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION** **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

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

<b>MANUFACTURER INFORMATION:</b> <b>Strataflex Corp.</b> 11 Dohme Avenue Toronto, Ontario, Canada M4B 1Y7	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 38661  <b>Contact:</b> Peter Pialis <b>Phone:</b> 416-752-2224 <b>Fax:</b> 416-752-6719 <b>EMail:</b> ppialis@strataflex.ca
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION** **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

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<b>MANUFACTURER INFORMATION:</b> <b>Titan PCB East, Inc.</b> 2 Industrial Way Amesbury, MA 01913, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 0BX48  <b>Contact:</b> Lance Arlander <b>Phone:</b> 978-388-5740 <b>Fax:</b> 978-388-5538 <b>EMail:</b> larlander@titaneast.com
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2	VQE-04-6518
Panel Size:	18" X 24"	VQE-05-7439
Max./Min. Board Thickness:	.012"/Not Specified	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	Not Specified/.012"	
Aspect Ratio:	10:1 (Through Hole)	
Max. Number of Layers:	14	
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, Electroplated Gold, HASL	
Hole Preparation:	Plasma 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:	N/A	
Hole Wall Conductive Coating:	N/A	



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

<b>MANUFACTURER INFORMATION:</b> <b>Titan PCB East, Inc.</b> 2 Industrial Way Amesbury, MA 01913, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 0BX48  <b>Contact:</b> Lance Arlander <b>Phone:</b> 978-388-5740 <b>Fax:</b> 978-388-5538 <b>EMail:</b> larlander@titaneast.com
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION** **QUALIFICATION LETTERS:**

<b>Specification:</b> MIL-PRF-31032/3, MIL-PRF-31032/4  <b>Panel Size:</b> 12" X 18", 18" X 24" <b>Max./Min. Board Thickness:</b> .012"/Not Specified <b>Max./Min. Base CU Thickness:</b> N/A <b>Max./Min. Through Hole Size:</b> Not Specified/.012" <b>Aspect Ratio:</b> 10:1 (Through Hole) <b>Max. Number of Layers:</b> 14 <b>Min. Conductor Width:</b> .004" <b>Min. Conductor Space:</b> .004" <b>Part Mounting:</b> MIX, SMT, THM <b>Rigid Base Material:</b> GF: Woven E-Glass, Epoxy Resin, Flame Resistant GI: Glass Base, Woven, Polyimide Resin, Heat Resistant  <b>Flex Base Material:</b> N/A <b>Finish System:</b> ENIG, Electroplated Gold, HASL, Immersion Ni/Au <b>Hole Preparation:</b> Plasma Etchback <b>Alternate Construction:</b> N/A <b>Copper Plating:</b> Electrodeposited Acid Copper <b>Solder Resist:</b> Dry Film, LPI <b>Controlled Impedance:</b> N/A <b>Hole Fill/Via Plug:</b> N/A <b>Flex Usage:</b> N/A <b>Hole Wall Conductive Coating:</b> N/A	VQE-01-0024 VQE-04-6518 VQE-05-7439
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**LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY**

<p>MANUFACTURER INFORMATION:  <b>TTM Technologies (Redmond)</b>          17550 NE 67th Court          Redmond, WA 98052-4939, US</p>	<p>PLANT LOCATION:          Same Address as Manufacturer</p>	<p>CAGE Code: 3EDZ0          Contact: Margaret Schlosser          Phone: 425-883-7575          Fax:          EMail: mschlosser@ttmtech.com</p>
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2	VQE-06-011027
Panel Size:	21.5" X 24.5"	VQE-06-011656
Max./Min. Board Thickness:	.063"/Not Specified (nominal)	
Max./Min. Base CU Thickness:	N/A	
Max./Min. Through Hole Size:	Not Specified/.01"	
Aspect Ratio:	6.3:1 (Through Hole)	
Max. Number of Layers:	12	
Min. Conductor Width:	.005"	
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:	ENIG	
Hole Preparation:	Desmear/Etchback	
Alternate Construction:	N/A	
Copper Plating:	Acid Copper	
Solder Resist:	N/A	
Controlled Impedance:	N/A	
Hole Fill/Via Plug:	N/A	
Flex Usage:	N/A	
Hole Wall Conductive Coating:	N/A	

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

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

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

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

<b>MANUFACTURER INFORMATION:</b> <b>TTM Technologies (Santa Clara)</b> 400 Matthew Street Santa Clara, CA 95050, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 65916  <b>Contact:</b> Nellie Guitierrez <b>Phone:</b> 408-486-3184 <b>Fax:</b> 408-727-1003 <b>EMail:</b> nellie.guitierrez@ttmtech.com
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2	VQE-03-3888
Panel Size:	18" X 24"	VQE-04-5823
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, 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, Immersion Ni/Au	
Hole Preparation:	Plasma Desmear/Etchback	
Alternate Construction:	Blind Vias	
Copper Plating:	Electrolytic Acid Copper	
Solder Resist:	LPI, Screen Printed	
Controlled Impedance:	Characteristic, Differential +/-10%	
Hole Fill/Via Plug:	N/A	
Flex Usage:	N/A	
Hole Wall Conductive Coating:	Electroless Copper	

<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
Specification:	MIL-PRF-31032/3, MIL-PRF-31032/4	VQE-03-3895
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:	10	
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:	IPC-4204/1 Acrylic Adhesive IPC-4204/11 Adhesiveless	
Finish System:	HASL, Immersion Ni/Au	
Hole Preparation:	Plasma Desmear/Etchback	
Alternate Construction:	N/A	
Copper Plating:	Acid Copper	
Solder Resist:	N/A	
Controlled Impedance:	N/A	
Hole Fill/Via Plug:	N/A	
Flex Usage:	Class A Flex to Install, Class B Continuous	
Hole Wall Conductive Coating:	Electroless Copper	

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

<b>MANUFACTURER INFORMATION:</b> <b>TTM Technologies (Santa Clara)</b> 400 Matthew Street Santa Clara, CA 95050, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 65916  <b>Contact:</b> Nellie Guitierrez <b>Phone:</b> 408-486-3184 <b>Fax:</b> 408-727-1003 <b>EMail:</b> nellie.guitierrez@ttmtech.com
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
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/Custom 18" X 24" .62"/.006" N/A .02"/.015" (drilled) .076"/.015" (drilled) 4:1 (Through Hole) 6 .007" .008" MIX, SMT, THM GF: Woven E-Glass, Epoxy Resin, Flame Resistant IPC-4103/10 Construction N/A ENIG Chemical Desmear Blind vias Electroless, Electrolytic Acid Copper LPI, SMOBC 50 ohms +/-10% N/A N/A N/A	VQE-07-13211

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

<b>MANUFACTURER INFORMATION:</b> <b>TTM Technologies (Stafford)</b> 4 Old Monson Road P.O. Box 145, Stafford, CT 77497, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 5L706  <b>Contact:</b> Michelle Herbert <b>Phone:</b> 860-684-5881 <b>Fax:</b> 860-684-7425 <b>EMail:</b> 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

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<b>MANUFACTURER INFORMATION:</b> <b>TTM Technologies (Stafford)</b> 4 Old Monson Road P.O. Box 145, Stafford, CT 77497, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 5L706  <b>Contact:</b> Michelle Herbert <b>Phone:</b> 860-684-5881 <b>Fax:</b> 860-684-7425 <b>EMail:</b> 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

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

<b>Specification:</b>	MIL-PRF-31032/1, MIL-PRF-31032/2
<b>Panel Size:</b>	30" X 54"
<b>Max./Min. Board Thickness:</b>	.4"/Not Specified
<b>Max./Min. Base CU Thickness:</b>	N/A
<b>Max./Min. Through Hole Size:</b>	.195"/.0079" (drilled)
<b>Aspect Ratio:</b>	14:1 (Through Hole)
<b>Max. Number of Layers:</b>	50
<b>Min. Conductor Width:</b>	.004"
<b>Min. Conductor Space:</b>	.003"
<b>Part Mounting:</b>	MIX, Press Fit, SM, THM
<b>Rigid Base Material:</b>	GF: Woven E-Glass, Epoxy Resin, Flame Resistant
<b>Flex Base Material:</b>	N/A
<b>Finish System:</b>	ENIG, Electrolytic Nickel, Electrolytic Soft & Hard Gold, HASL, Hot Oil Reflow following SnPb plate, Reflowed Solder
<b>Hole Preparation:</b>	Plasma Desmear/Etchback
<b>Alternate Construction:</b>	Blind and Buried Vias, Buried Resistors, Copper Invar Copper, Micro Vias, Multiple Laminations
<b>Copper Plating:</b>	Acid Copper
<b>Solder Resist:</b>	Dry Film, LPI, Wet Mask
<b>Controlled Impedance:</b>	Characteristic, Differential, Dual Stripline, Embedded Microstrip, Microstrip, Range 30-150 ohms (+/- 10%)
<b>Hole Fill/Via Plug:</b>	Conductive & Non-conductive Epoxy Hole Fill / Via Plug
<b>Flex Usage:</b>	N/A
<b>Hole Wall Conductive Coating:</b>	Electroless Copper
<b>Max. Base Cu Weight</b>	1 oz.

VQE-03-3348  
 VQE-09-18855



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

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

<b>Specification:</b>	MIL-PRF-31032/1, MIL-PRF-31032/2
<b>Panel Size:</b>	18" X 24"
<b>Max./Min. Board Thickness:</b>	.13"/Not Specified
<b>Max./Min. Base CU Thickness:</b>	N/A
<b>Max./Min. Through Hole Size:</b>	.133"/.0118" (drilled)
<b>Aspect Ratio:</b>	11:1 (Through hole)
<b>Max. Number of Layers:</b>	32
<b>Min. Conductor Width:</b>	.004"
<b>Min. Conductor Space:</b>	.003"
<b>Part Mounting:</b>	MIX, Press Fit, SM, THM
<b>Rigid Base Material:</b>	GI: Glass Base, Woven, Polyimide Resin, Heat Resistant
<b>Flex Base Material:</b>	N/A
<b>Finish System:</b>	ENIG, Electrolytic Nickel, Electrolytic Soft & Hard Gold, HASL, Hot Oil Reflow following SnPb plate
<b>Hole Preparation:</b>	Plasma Desmear/Etchback
<b>Alternate Construction:</b>	Blind and Buried Vias, Buried Resistors, Copper Invar Copper, Micro Vias, Multiple Laminations
<b>Copper Plating:</b>	Acid Copper
<b>Solder Resist:</b>	Dry-Film, LPI, Wet Mask
<b>Controlled Impedance:</b>	Characteristic, Differential, Dual Stripline, Embedded Microstrip, Microstrip, Range 30-150 ohms (+/- 10%)
<b>Hole Fill/Via Plug:</b>	Conductive & Non-conductive Epoxy Hole Fill / Via Plug
<b>Flex Usage:</b>	N/A
<b>Hole Wall Conductive Coating:</b>	Electroless Copper
<b>Max. Base Cu Weight</b>	1 oz.

VQE-03-003348  
 VQE-09-18855

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

<p>MANUFACTURER INFORMATION:  <b>TTM Technologies (Stafford)</b>          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**

<b>MANUFACTURER INFORMATION:</b> <b>TTM Technologies (Stafford)</b> 4 Old Monson Road P.O. Box 145, Stafford, CT 77497, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 5L706  <b>Contact:</b> Michelle Herbert <b>Phone:</b> 860-684-5881 <b>Fax:</b> 860-684-7425 <b>EMail:</b> 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:	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:  <b>TTM Technologies (Stafford)</b>          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**

<b>MANUFACTURER INFORMATION:</b> <b>TTM Technologies (Stafford)</b> 4 Old Monson Road P.O. Box 145, Stafford, CT 77497, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 5L706  <b>Contact:</b> Michelle Herbert <b>Phone:</b> 860-684-5881 <b>Fax:</b> 860-684-7425 <b>E-Mail:</b> 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**

<b>MANUFACTURER INFORMATION:</b> <b>TTM Technologies (Stafford)</b> 4 Old Monson Road P.O. Box 145, Stafford, CT 77497, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 5L706  <b>Contact:</b> Michelle Herbert <b>Phone:</b> 860-684-5881 <b>Fax:</b> 860-684-7425 <b>E-Mail:</b> 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**

<b>MANUFACTURER INFORMATION:</b> <b>Unicircuit, Inc.</b> 8192 Southpark Lane Littleton, CO 80120, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	CAGE Code: 66311  Contact: Bob Lageman Phone: 303-730-0505, x110 Fax: EMail: blageman@unicircuit.com
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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>		<b>QUALIFICATION LETTERS:</b>
Specification:	MIL-PRF-31032/1, MIL-PRF-31032/2	VQE-07-13789
		VQE-09-17422
Panel Size:	12" X 18"	
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	

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

<b>MANUFACTURER INFORMATION:</b> <b>Universal Circuits, Inc.</b> 8860 Zachary Lane North Maple Grove, MN 55369-4524, US	<b>PLANT LOCATION:</b> Same Address as Manufacturer	<b>CAGE Code:</b> 45032  <b>Contact:</b> <b>Phone:</b> <b>Fax:</b> <b>EMail:</b>
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**CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION** **QUALIFICATION LETTERS:**

<b>Specification:</b>	MIL-PRF-31032/1, MIL-PRF-31032/2
<b>Panel Size:</b>	18" X 24"
<b>Max./Min. Board Thickness:</b>	.125"/Not Specified .18"/Not Specified
<b>Max./Min. Base CU Thickness:</b>	N/A
<b>Max./Min. Through Hole Size:</b>	".008" ".021"
<b>Aspect Ratio:</b>	7.75:1 8.57:1
<b>Max. Number of Layers:</b>	16, 18
<b>Min. Conductor Width:</b>	.0032" .005"
<b>Min. Conductor Space:</b>	.0032" .005"
<b>Part Mounting:</b>	MIX, SMT, THM
<b>Rigid Base Material:</b>	GF: Woven E-Glass, Epoxy Resin, Flame Resistant Hybrid GF Hydrocarbon/Ceramic
<b>Flex Base Material:</b>	N/A
<b>Finish System:</b>	ENIG, HASL
<b>Hole Preparation:</b>	Chemical Desmear, Plasma Etchback
<b>Alternate Construction:</b>	Blind Vias, Foil Lamination, Sequential Lamination
<b>Copper Plating:</b>	Acid Copper
<b>Solder Resist:</b>	LPI
<b>Controlled Impedance:</b>	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
<b>Hole Fill/Via Plug:</b>	Acid Copper
<b>Flex Usage:</b>	N/A
<b>Hole Wall Conductive Coating:</b>	Direct Metallization
<b>Through Hole Metallization</b>	Direct Metallization

VQE-10-019530  
 VQE-10-020323



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

<p>MANUFACTURER INFORMATION: <b>Vermont Circuits, Inc.</b> 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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<b>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION</b>	<b>QUALIFICATION LETTERS:</b>
<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

**Coretec Cleveland, Inc.**

7 Ascot Parkway, Cuyahoga Falls, OH 44223, US

**Cosmotronic, Inc.**

16721 Noyes Avenue, Irvine, CA 92606, 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-Owego**

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

**Merix Corp. (Forest Grove, OR)**

1521 Poplar Lane, Forest Grove, OR 97116, US

**Merix Corp. (San Jose, CA)**

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

**Micom Corp.**

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

**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

**Titan PCB East, Inc.**

2 Industrial Way, Amesbury, MA 01913, US

**TTM Technologies (Redmond)**

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

**TTM Technologies (Santa Ana)**

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

**TTM Technologies (Santa Clara)**

400 Matthew Street, Santa Clara, CA 95050, US

**TTM Technologies (Stafford)**

4 Old Monson Road, P.O. Box 145, Stafford, 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

**Coretec Cleveland, Inc.**

7 Ascot Parkway, Cuyahoga Falls, OH 44223, US

**Cosmotronic, Inc.**

16721 Noyes Avenue, Irvine, CA 92606, 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-Owego**

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

**Merix Corp. (Forest Grove, OR)**

1521 Poplar Lane, Forest Grove, OR 97116, US

**Merix Corp. (San Jose, CA)**

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

**Micom Corp.**

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

**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

**Titan PCB East, Inc.**

2 Industrial Way, Amesbury, MA 01913, US

**TTM Technologies (Redmond)**

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

**TTM Technologies (Santa Ana)**

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

**TTM Technologies (Santa Clara)**

400 Matthew Street, Santa Clara, CA 95050, US

**TTM Technologies (Stafford)**

4 Old Monson Road, P.O. Box 145, Stafford, 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

**Coretec Cleveland, Inc.**

7 Ascot Parkway, Cuyahoga Falls, OH 44223, US

**Cosmotronic, Inc.**

16721 Noyes Avenue, Irvine, CA 92606, 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-Owego**

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

**Pioneer Circuits, Inc.**

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

**Printed Circuits, Inc.**

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

**Speedy Circuits, Inc.**

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

**Strataflex Corp.**

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

**Titan PCB East, Inc.**

2 Industrial Way, Amesbury, MA 01913, US

**TTM Technologies (Santa Clara)**

400 Matthew Street, Santa Clara, CA 95050, US

**TTM Technologies (Stafford)**

4 Old Monson Road, P.O. Box 145, Stafford, 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

**Coretec Cleveland, Inc.**

7 Ascot Parkway, Cuyahoga Falls, OH 44223, US

**Cosmotronic, Inc.**

16721 Noyes Avenue, Irvine, CA 92606, 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-Owego**

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

**Pioneer Circuits, Inc.**

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

**Printed Circuits, Inc.**

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

**Speedy Circuits, Inc.**

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

**Strataflex Corp.**

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

**Titan PCB East, Inc.**

2 Industrial Way, Amesbury, MA 01913, US

**TTM Technologies (Santa Clara)**

400 Matthew Street, Santa Clara, CA 95050, US

**TTM Technologies (Stafford)**

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

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

**MIL-PRF-31032/5**

**Speedy Circuits, Inc.**

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



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

**MIL-PRF-31032/6**

**Global Innovations Corp.**

901 Hensley Drive, Wylie, TX 75098, 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: <b>Accurate Circuit Engineering</b> 3019 S. Kilson Drive Santa Ana, CA 92707, US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 0MNN9  Contact: James Hofer Phone: 714-546-162 Fax: 714-433-7418 EMail: James@ace-pcb.com</p>
<p>MANUFACTURER INFORMATION: <b>American Standard Circuits</b> 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: <b>Amphenol Printed Circuits</b> 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: <b>Calumet Electronics Corp.</b> 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: <b>Cirexx International, Inc.</b> 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: <b>Colonial Circuits, Inc.</b> 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: <b>Coretec Cleveland, Inc.</b> 7 Ascot Parkway Cuyahoga Falls, OH 44223, US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 7Z463  Contact: Mark Kasting Phone: 330-572-3400 Fax: 330-572-3434 EMail: mark_kasting/coretec@coretec-inc.com</p>
<p>MANUFACTURER INFORMATION: <b>Cosmotronic, Inc.</b> 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>

**SECTION III  
ALPHABETICAL LIST OF QUALIFIED MANUFACTURERS**

<p>MANUFACTURER INFORMATION: <b>DDi Denver Corp.</b> 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: <b>DDI Global Corp. - Anaheim</b> 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: <b>DDi Global Corp. - Sterling, VA</b> 1200 Severn Way Dulles, VA 20166-8904, US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 0K703  Contact: Tony Trnka Phone: 703-652-2266 Fax: 703-652-2271 EMail: atrnka@va.ddiglobal.com</p>
<p>MANUFACTURER INFORMATION: <b>DDi North Jackson Corp.</b> 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: <b>DDi Ontario</b> 8150 Sheppard Avenue East Scarborough, Ontario, Canada M1B 5K2</p>	<p>PLANT LOCATIONS: 1. Same Address as Manufacturer 2. Coretec, Inc., CAGE Code: 3AF82, 2020 Ellesmere Road, Scarborough, Ontario, Canada M1H 2Z8</p>	<p>CAGE Code: 3AF82  Contact: Noor Al-Shaikh Phone: 416-208-2100 Fax: 416-439-1582 EMail: alshaikh@coretec-inc.com</p>
<p>MANUFACTURER INFORMATION: <b>Dynaco Corp.</b> 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: <b>Dynamic &amp; Proto Circuits, Inc.</b> 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: <b>Electro Plate Circuitry, Inc.</b> 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: <b>Electrotek Corp.</b> 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: <b>Endicott Interconnect Technologies, Inc.</b> 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: <b>Firan Technology Group</b> 250 Finchdene Square Scarborough, Ontario, Canada M1X 1A5</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: L2665  Contact: Bryan Clark Phone: 416-299-4000 Fax: 416-292-4308 EMail: byanclark@firantechnology.com</p>
<p>MANUFACTURER INFORMATION: <b>Global Innovations Corp.</b> 901 Hensley Drive Wylie, TX 75098, US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 04RV5  Contact: Bob Noland Phone: 214-291-1427 Fax: EMail: b noland@globalinnovationcorp.com</p>
<p>MANUFACTURER INFORMATION: <b>Hamby Corporation</b> 27704 Avenue Scott Valencia, CA 91355, US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 07284  Contact: Sue Sharp Phone: 661-257-1924 Fax: 661-257-1213 EMail: suesharp@hambycorp.com</p>
<p>MANUFACTURER INFORMATION: <b>Hans Brockstedt GmbH</b> Clara-Immerwahr Strasse 7 24145 Kiel, Germany</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: C4831  Contact: Hilmar Klammer Phone: 0049-431-71966-0, -30 Fax: 0049-431-71966-29 EMail: klammer@brockstedt.de</p>
<p>MANUFACTURER INFORMATION: <b>Hughes Circuits</b> 540 S. Pacific Street San Marcos, CA 92078-4056, US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 1KXU6  Contact: Joe Hughes Phone: 760-744-0300 Fax: 760-744-6388 EMail: joe@hughescircuits.com</p>
<p>MANUFACTURER INFORMATION: <b>Lockheed Martin Systems Integration-Owego</b> 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: <b>Merix Corp. (Forest Grove, OR)</b> 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>
<p>MANUFACTURER INFORMATION: <b>Merix Corp. (San Jose, CA)</b> 355 Turtle Creek Court San Jose, CA 95125-1316, US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 0MHG5  Contact: Dave Williams Phone: 408-280-0422 Fax: 408-280-0641 EMail: david.williams@sj.merix.com</p>
<p>MANUFACTURER INFORMATION: <b>Micom Corp.</b> 475 Old Highway 8 NW New Brighton, MN 55112, US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 34076  Contact: Larry Leonard Phone: 651-604-2639 Fax: 651-636-1352 EMail: lleonard@micomcircuits.com</p>
<p>MANUFACTURER INFORMATION: <b>Philway Products, Inc.</b> 701 Virginia Avenue Ashland, OH 44806, US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 21971  Contact: Tom School Phone: 419-281-7777 Fax: 419-289-3447 EMail: quality@philway.com</p>
<p>MANUFACTURER INFORMATION: <b>Pioneer Circuits, Inc.</b> 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>
<p>MANUFACTURER INFORMATION: <b>PNC, Inc.</b> 115 East Centre Street Nutley, NJ 07110, US</p>		<p>CAGE Code: 66766  Contact: Carmela Conte Phone: 973-284-1600 Fax: EMail: carmela@pnconline.com</p>
<p>MANUFACTURER INFORMATION: <b>Printed Circuits, Inc.</b> 1200 West 96th Street Bloomington, MN 55431, US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 65114  Contact: Jim Smith Phone: 612-888-7900 Fax: 612-888-2719 EMail: jsmith@printedcircuits.com</p>
<p>MANUFACTURER INFORMATION: <b>Sanmina-SCI (San Jose)</b> 2050 Bering Drive San Jose, CA 95131, US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 3DR67  Contact: Darrell Myers Phone: 408-964-6515 Fax: 408-964-6453 EMail: darrell.myers@sanmina-sci.com</p>

**SECTION III**  
**ALPHABETICAL LIST OF QUALIFIED MANUFACTURERS**

<p>MANUFACTURER INFORMATION: <b>Speedy Circuits, Inc.</b> 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: <b>Strataflex Corp.</b> 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: <b>Titan PCB East, Inc.</b> 2 Industrial Way Amesbury, MA 01913, US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 0BX48  Contact: Lance Arlander Phone: 978-388-5740 Fax: 978-388-5538 EMail: larlander@titaneast.com</p>
<p>MANUFACTURER INFORMATION: <b>TTM Technologies (Redmond)</b> 17550 NE 67th Court Redmond, WA 98052-4939, US</p>	<p>PLANT LOCATION: Same Address as Manufacturer</p>	<p>CAGE Code: 3EDZ0  Contact: Margaret Schlosser Phone: 425-883-7575 Fax: EMail: mschlosser@ttmtech.com</p>
<p>MANUFACTURER INFORMATION: <b>TTM Technologies (Santa Ana)</b> 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: <b>TTM Technologies (Santa Clara)</b> 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: <b>TTM Technologies (Stafford)</b> 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: <b>Unicircuit, Inc.</b> 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>

**SECTION III**  
**ALPHABETICAL LIST OF QUALIFIED MANUFACTURERS**

<p>MANUFACTURER INFORMATION:  <b>Universal Circuits, Inc.</b>              8860 Zachary Lane North              Maple Grove, MN 55369-4524, US</p>	<p>PLANT LOCATION:              Same Address as Manufacturer</p>	<p>CAGE Code: 45032               Contact:              Phone:              Fax:              EMail:</p>
<p>MANUFACTURER INFORMATION:  <b>Vermont Circuits, Inc.</b>              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>