



QUALIFICATIONS VALIDATED
ANNUALLY

QML-31032-15
14 November 2003
SUPERSEDING
QML-31032-14
8 May 2003

QUALIFIED MANUFACTURERS LIST
OF
PRODUCTS QUALIFIED UNDER PERFORMANCE SPECIFICATION
MIL-PRF-31032
PRINTED CIRCUIT BOARD / PRINTED WIRING BOARD,
GENERAL SPECIFICATION FOR

This list has been prepared for use by or for the Government in the acquisition of printed circuit boards / printed wiring boards (hereafter referred to as printed boards) covered by Department of Defense Performance Specification MIL-PRF-31032. Listing of a manufacturer is not intended to and does not connote endorsement of the manufacturer by the Department of Defense. All listings herein have been qualified under the requirements as specified in the latest effective issue of MIL-PRF-31032. This list is subject to change without notice; revision or amendment of this list will be issued as necessary. The listing of a manufacturer does not in any way release the manufacturer from compliance with the individual item specification requirements.

THE ACTIVITY RESPONSIBLE FOR THIS QML IS THE DEFENSE SUPPLY CENTER COLUMBUS (DSCC-VQE),
3990 EAST BROAD STREET, COLUMBUS, OH 43216-5000.

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.

QML-31032 is available from the DSCC-VQ World Wide Web pages at the following addresses:

Web pages: http://www.dsccl.dla.mil/offices/sourcing_and_qualification/

QML: <http://www.dsccl.dla.mil/programs/qmlqpl/OPLdetail.asp?QPL=31032>

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.

SECTION I

LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION

MIL-PRF-31032/1 - Printed Wiring Board, Rigid, Multilayered, Woven E-Glass Reinforced Thermosetting Resin Base Material, With Plated Through Holes, For Soldered Part Mounting.

Ambitech, Inc.
8944 Fullbright Avenue
Chatsworth, CA 91311-6123

Calumet Electronics Corp.
25830 Depot Street
Calumet, MI 49913-1985

Coretec Denver, Inc.
10570 Bradford Road
Littleton, CO 80127

Crown Circuits, Inc.
6070 Avenida Encinas
Carlsbad, CA 92009-1001

Diversified Systems
3939 W. 56th Street
Indianapolis, IN 46254

Dynamic & Proto Circuits, Inc.
869 Barton Street
Stoney Creek, Ontario L8E 5G6 Canada

Dynamic Details, Inc.
1200 Severn Way
Dulles, VA 20166-8904

Geometric Circuits, Inc.
11 Michael Avenue
Farmingdale, NY 11735

Hans Brockstedt GmbH
Leiterplattenschnelldienst
Clara-Immerwahr-Strape 7
24145 Kiel, Germany

Lockheed Martin Corp.
Missiles and Fire Control Orlando
5600 West Sandlake Road
Orlando, FL 32819-8907

Lockheed Martin Systems Integration-Owego
1801 State Route 17C
Owego, NY 13827

Lone Star Circuits
901 Hensley Drive
Wylie, TX 75098

Micom Corp.
475 Old Highway 8 NW
New Brighton, MN 55112

Philway Products, Inc.
701 Virginia Avenue
Ashland, OH 44806

Printed Circuits, Inc.
1200 W. 96th Street
Bloomington, MN 55431-2699

Sanmina – SCI (Costa Mesa)
2945 Airway Avenue
Costa Mesa, CA 92626

Sanmina SCI (Phoenix)
5020 South 36th Street
Phoenix, AZ 85040

Sanmina – SCI (Wilmington)
One Jewell Drive
Wilmington, MA

Sovereign Circuits, Inc.
12080 DeBartolo Drive
North Jackson, OH 44451

Teradyne, Inc.
Connection Systems Division
91 Northeastern Boulevard
Nashua, New Hampshire 03062

Tyco Printed Circuits Group
Santa Clara Division
400 Matthew Street
Santa Clara, CA 95050

Tyco Printed Circuits Group
Stafford Division
4 Old Monson Road
P.O. Box 145
Stafford, CT 06075

Tyco Printed Circuits Group
Austin Division
12501 Research Boulevard, Module 1
Austin, TX 78759

SECTION I

LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION

MIL-PRF-31032/2 - Printed Wiring Board, Rigid, Single and Double Layer, Woven E-Glass Reinforced Thermosetting Resin Base Material, With Plated Through Holes, For Soldered Part Mounting.

Calumet Electronics Corp.
25830 Depot Street
Calumet, MI 49913-1985

Sanmina – SCI (Costa Mesa)
2945 Airway Avenue
Costa Mesa, CA 92626

Crown Circuits, Inc.
6070 Avenida Encinas
Carlsbad, CA 92009-1001

Sanmina – SCI (Wilmington)
One Jewell Drive
Wilmington, MA

Diversified Systems
3939 W. 56th Street
Indianapolis, IN 46254

Sovereign Circuits, Inc.
12080 DeBartolo Drive
North Jackson, OH 44451

Dynamic & Proto Circuits, Inc.
869 Barton Street
Stoney Creek, Ontario L8E 5G6 Canada

Teradyne, Inc.
Connection Systems Division
91 Northeastern Boulevard
Nashua, NH 03062

Dynamic Details, Inc.
1200 Severn Way
Dulles, VA 20166-8904

Tyco Printed Circuits Group
Santa Clara Division
400 Matthew Street
Santa Clara, CA 95050

Geometric Circuits, Inc.
11 Michael Avenue
Farmingdale, NY 11735

Tyco Printed Circuits Group
Stafford Division
4 Old Monson Road
P.O. Box 145
Stafford, CT 06075

Hans Brockstedt GmbH
Leiterplattenschnelldienst
Clara-Immerwahr-Strape7
24145 Kiel, Germany

Tyco Printed Circuits Group
Austin Division
12501 Research Boulevard, Module 1
Austin, TX 78759

Lockheed Martin Corp.
Missiles and Fire Control Orlando
5600 West Sandlake Road
Orlando, FL 32819-8907

Lockheed Martin Systems Integration-Owego
1801 State Route 17C
Owego, NY 13827

Lone Star Circuits
901 Hensley Drive
Wylie, TX 75098

Micom Corp.
475 Old Highway 8 NW
New Brighton, MN 55112

Printed Circuits, Inc.
1200 W. 96th Street
Bloomington, MN 55431-2699

SECTION I

LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION

MIL-PRF-31032/3 – Printed Wiring Board, Flexible, Single and Double Layer, With or Without Plated Holes, With or Without Stiffeners, for Soldered Part Mounting

Hans Brockstedt GmbH
Leiterplattenschnelldienst
Clara-Immerwahr-Strape 7
24145 Kiel, Germany

Lockheed Martin Systems Integration-Owego
1801 State Route 17C
Owego, NY 13827

Printed Circuits, Inc.
1200 W. 96th Street
Bloomington, MN 55431-2699

Proto Circuit, Inc.
7 Ascot Parkway
Cuyahoga Falls, OH 44223

Sovereign Circuits, Inc.
12080 DeBartolo Drive
North Jackson, OH 44451

Tyco Printed Circuits Group
Santa Clara Division
400 Matthew Street
Santa Clara, CA 95050

Tyco Printed Circuits Group
Stafford Division
4 Old Monson Road
P.O. Box 145
Stafford, CT 06075

Tyco Printed Circuits Group
Austin Division
12501 Research Boulevard, Module 1
Austin, TX 78759

SECTION I

LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION

MIL-PRF-31032/4 – Printed Wiring Board, Rigid-Flex or Flexible, Multilayer with Plated Holes, With or Without Stiffeners, for Soldered Part Mounting

Hans Brockstedt GmbH
Leiterplattenschnelldienst
Clara-Immerwahr-Strape 7
24145 Kiel, Germany

Lockheed Martin Systems Integration-Owego
1801 State Route 17C
Owego, NY 13827

Printed Circuits, Inc.
1200 W. 96th Street
Bloomington, MN 55431-2699

Proto Circuit, Inc.
7 Ascot Parkway
Cuyahoga Falls, OH 44223

Sovereign Circuits, Inc.
12080 DeBartolo Drive
North Jackson, OH 44451

Tyco Printed Circuits Group
Santa Clara Division
400 Matthew Street
Santa Clara, CA 95050

Tyco Printed Circuits Group
Stafford Division
4 Old Monson Road
P.O. Box 145
Stafford, CT 06075

Tyco Printed Circuits Group
Austin Division
12501 Research Boulevard, Module 1
Austin, TX 78759

SECTION II

COMMON ABBREVIATIONS

The following abbreviations are used in this section:

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

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Ambitech, Inc. 8944 Fullbright Avenue Chatsworth, CA 91311-6123	PLANT LOCATION Same	CAGE CODE: 51484 CONTACT: Jim Spaulding PHONE #: 818-882-5550 FAX #: 818-882-9408 EMAIL: jim.spaulding@ambi.com
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:
MIL-PRF-31032/1 Panel Size 24" X 30" Max/Min. Board Thickness 0.264"/0.025" Max/Min. Base Cu Thickness 0.00056/0.00035" Max/Min Hole Size 0.281"/0.008" (0.006 sub assy) Aspect Ratio 12:1 Max. Number of Layers 36 Min. Dielectric Thickness 0.002" Min. Conductor Width 0.0035" Min. Conductor Spacing 0.0035" Part Mounting SMT/THM/MIX Base Material GF (Woven E-glass Epoxy Resin) GI (Woven E-glass, Polyimide Resin) Finish System HASL, Immersion Ag, Fuse Following SnPb Plate, OSP, Electrolytic Ni/Au or Ni/Pd/Au Solder Resist LPI, Dry Film Hole Preparation Plasma Desmear/Etchback Copper Plating Acid Copper Controlled Impedance 100/56 ohm ±10% Alternate Construction Sequential Lamination for Blind & Buried Vias		VQE-02-2464

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Calumet Electronics Corp. 25830 Depot Street Calumet, MI 49913-1985	PLANT LOCATION Same	CAGE CODE: 65337 CONTACT: Robert Hall PHONE #: 906-337-1305 FAX #: 906-337-5359 EMAIL: rhall@cec-up.com																								
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:																								
MIL-PRF-31032/1 & 2 <table border="0"> <tr><td>Panel Size</td><td>18" X 24"</td></tr> <tr><td>Max/Min. Board Thickness</td><td>0.125"</td></tr> <tr><td>Max/Min Hole Size</td><td>0.125"/0.016"</td></tr> <tr><td>Aspect Ratio</td><td>8:1</td></tr> <tr><td>Max. Number of Layers</td><td>10</td></tr> <tr><td>Min. Conductor Width</td><td>0.006"</td></tr> <tr><td>Min. Conductor Spacing</td><td>0.003"</td></tr> <tr><td>Part Mounting</td><td>THM/SM</td></tr> <tr><td>Base Material</td><td>GF (Woven E-glass Epoxy Resin)</td></tr> <tr><td>Finish System</td><td>HASL, Au , Ni</td></tr> <tr><td>Hole Preparation</td><td>Chemical Etchback</td></tr> <tr><td>Copper Plating</td><td>Electrodeposited Acid Copper</td></tr> </table>		Panel Size	18" X 24"	Max/Min. Board Thickness	0.125"	Max/Min Hole Size	0.125"/0.016"	Aspect Ratio	8:1	Max. Number of Layers	10	Min. Conductor Width	0.006"	Min. Conductor Spacing	0.003"	Part Mounting	THM/SM	Base Material	GF (Woven E-glass Epoxy Resin)	Finish System	HASL, Au , Ni	Hole Preparation	Chemical Etchback	Copper Plating	Electrodeposited Acid Copper	VQE-03-4657
Panel Size	18" X 24"																									
Max/Min. Board Thickness	0.125"																									
Max/Min Hole Size	0.125"/0.016"																									
Aspect Ratio	8:1																									
Max. Number of Layers	10																									
Min. Conductor Width	0.006"																									
Min. Conductor Spacing	0.003"																									
Part Mounting	THM/SM																									
Base Material	GF (Woven E-glass Epoxy Resin)																									
Finish System	HASL, Au , Ni																									
Hole Preparation	Chemical Etchback																									
Copper Plating	Electrodeposited Acid Copper																									

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Coretec Denver, Inc. 10570 Bradford Road Littleton, CO 80127	PLANT LOCATION Same	CAGE CODE: 75815 CONTACT: Douglas N. Berry PHONE #: 303-904-6119 FAX #: 303-933-2934 EMAIL: dberry@coretec-denver.com																												
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:																												
MIL-PRF-31032/1 <table border="0"> <tr><td>Panel Size</td><td>18" X 24"</td></tr> <tr><td>Max. Board Thickness</td><td>0.100"</td></tr> <tr><td>Max. Base Cu Thickness</td><td>0.001"</td></tr> <tr><td>Max/Min Hole Size</td><td>0.044"/0.024"</td></tr> <tr><td>Aspect Ratio</td><td>4:1</td></tr> <tr><td>Max. Number of Layers</td><td>10</td></tr> <tr><td>Min. Conductor Width</td><td>0.010"</td></tr> <tr><td>Min. Conductor Spacing</td><td>0.010"</td></tr> <tr><td>Part Mounting</td><td>SMT, THM, MIX</td></tr> <tr><td>Base Material</td><td>GF (Woven E-glass, Epoxy resin) GI (Woven E-glass, Polyimide Resin) GM (Woven E-glass, Triazine and/or Bismaleimide Modified Epoxy Resin)</td></tr> <tr><td>Finish System</td><td>HASL, IR Reflow following SnPb Plate</td></tr> <tr><td>Hole Preparation</td><td>Permanganate Desmear/Etchback</td></tr> <tr><td>Copper Plating</td><td>Acid Copper</td></tr> <tr><td>Solder Resist</td><td>LPI, Dry Film</td></tr> </table>		Panel Size	18" X 24"	Max. Board Thickness	0.100"	Max. Base Cu Thickness	0.001"	Max/Min Hole Size	0.044"/0.024"	Aspect Ratio	4:1	Max. Number of Layers	10	Min. Conductor Width	0.010"	Min. Conductor Spacing	0.010"	Part Mounting	SMT, THM, MIX	Base Material	GF (Woven E-glass, Epoxy resin) GI (Woven E-glass, Polyimide Resin) GM (Woven E-glass, Triazine and/or Bismaleimide Modified Epoxy Resin)	Finish System	HASL, IR Reflow following SnPb Plate	Hole Preparation	Permanganate Desmear/Etchback	Copper Plating	Acid Copper	Solder Resist	LPI, Dry Film	VQE-02-0317
Panel Size	18" X 24"																													
Max. Board Thickness	0.100"																													
Max. Base Cu Thickness	0.001"																													
Max/Min Hole Size	0.044"/0.024"																													
Aspect Ratio	4:1																													
Max. Number of Layers	10																													
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Min. Conductor Spacing	0.010"																													
Part Mounting	SMT, THM, MIX																													
Base Material	GF (Woven E-glass, Epoxy resin) GI (Woven E-glass, Polyimide Resin) GM (Woven E-glass, Triazine and/or Bismaleimide Modified Epoxy Resin)																													
Finish System	HASL, IR Reflow following SnPb Plate																													
Hole Preparation	Permanganate Desmear/Etchback																													
Copper Plating	Acid Copper																													
Solder Resist	LPI, Dry Film																													

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Crown Circuits, Inc. 6070 Avenida Encinas Carlsbad, CA 92009-1001	PLANT LOCATION Same	CAGE CODE: 65882 CONTACT: Ellen Araneta PHONE #: 760-431-1124 FAX #: 760-431-1462 EMAIL: sales@crowncircuits.com
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:
MIL-PRF-31032/1 MIL-PRF-31032/2 Panel Size 18" X 24" Max. Board Thickness 0.110" Max/Min Hole Size 0.250"/0.013" Aspect Ratio 8:1 Max. Number of Layers 14 Min. Conductor Width 0.0035" Min. Conductor Spacing 0.0035" Part Mounting SMT, THM Base Material GF (Woven E-glass, Epoxy resin) GI (Woven E-glass, Polyimide Resin) Finish System (HASL), Soft and Hard Gold Over Nickel, Immersion Gold Over Electroless Gold, Enteck-organic Coating Hole Preparation Plasma Etchback Copper Plating Electrodeposited Acid Copper		VQE-02-2305

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Diversified Systems 3939 W. 56 th Street Indianapolis, IN 46254	PLANT LOCATION Same	CAGE CODE: 5S706 CONTACT: Doreen Palmert PHONE #: 317-299-9547, x161 FAX #: 317-298-2055 EMAIL: dpalmert@divsys.com
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:
MIL-PRF-31032/1 MIL-PRF-31032/2 Panel Size 18" X 24" Max. Board Thickness 0.110" Min. Hole Size 0.012" Aspect Ratio 5.5:1 Max. Number of Layers 14 Min. Conductor Width 0.005" Min. Conductor Spacing 0.005" Part Mounting SMT/THM Base Material GF (Woven E-glass, Epoxy Resin) GI (Woven E-glass, Polyimide Resin) Finish System HASL Solder Resist LPI, Dry Film Hole Preparation Permanganate Desmear/Etchback Copper Plating Electro-deposited Acid Copper Controlled Impedance Embedded Stripline & Microstrip		VQE-01-0309 VQE-02-0015

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Dynamic & Proto Circuits, Inc. 869 Barton Street Stoney Creek, Ontario L8E 5G6 Canada	PLANT LOCATION Same	CAGE CODE: 38898 CONTACT: Mr. David Foster PHONE #: 905-643-9900 FAX #: 905-643-9911 EMAIL: dfoster@dapc.com
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:
MIL-PRF-31032/1 MIL-PRF-31032/2 Panel Size 16"X18" Max. Board Thickness 0.125" Max/Min Hole Size 0.039"/0.018" (0.0135" drilled) Aspect Ratio 9:3:1 Max. Number of Layers 16 Min. Conductor Width 0.005" Min. Conductor Spacing 0.005" Part Mounting SMT, THM, MIX Base Material GF (Woven E-Glass, Epoxy resin) GI (Woven E-Glass, Polyimide resin) Finish System HASL Hole Preparation Plasma Etch Copper Plating Acid Copper Solder Resist LPI, Dry film solder resist plugs		VQE-98-1143, VQE-00-0007 VQE-01-0311, VQE-02-0818

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Dynamic Details, Inc. 1200 Severn Way Dulles, VA 20166-8904	PLANT LOCATION Same	CAGE CODE: 0K703 CONTACT: Mr. Mike Hill PHONE #: 703-652-2202 FAX #: 703-652-2271 EMAIL: ddiglobal.com
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:
MIL-PRF-31032/1 MIL-PRF-31032/2 Panel Size 18"X24" Max. Board Thickness 0.1003" Max./Min. Hole Size 0.038"/0.024" (0.150" max. non-PTH) Aspect Ratio 6:8:1 Max. Number of Layers 20 Min. Conductor Width 0.004" Min. Conductor Spacing 0.003" Part Mounting SMT, THM, MIX Base Material GF (Woven E-Glass, Epoxy resin) GI (Woven E-Glass, Polyimide resin) Finish System HASL Hole Preparation Plasma Desmear/Etchback Copper Plating Electrolytic Acid Copper Alternate Construction Blind Vias		VQE-03-3545

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Geometric Circuits, Inc. 11 Michael Avenue Farmingdale, NY 11735	PLANT LOCATION Same	CAGE CODE: 65423 CONTACT: Phil Cate PHONE #: 631-249-0230 FAX #: 631-249-0286 EMAIL: phil@geometriccircuits.com
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:
MIL-PRF-31032/1 & /2 Panel Size 18"X24" Max. Board Thickness 0.100" Max./Min. PTH Hole Size 0.100"/0.025" (drill) Aspect Ratio 4:1 Max. Number of Layers 10 Min. Conductor Width 0.007" Min. Conductor Spacing 0.007" Part Mounting SM, THM, MIX Base Material GF (Woven E-Glass, Epoxy resin) Finish System HASL Hole Preparation Permanganate Desmear/Etchback Copper Plating Electrolytic Acid Copper Solder Resist LPI		VQE-03-4303

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Lockheed Martin Corp. Missiles & Fire Control Orlando 5600 West Sandlake Road Orlando, FL 32819-8907	PLANT LOCATION Same	CAGE CODE: 04939 CONTACT: Vijay Kumar PHONE #: 407-356-0282 FAX #: 407-356-8291 EMAIL: vijay.kumar@lmco.com CONTACT: Paul Rose PHONE #: 407-356-5537 EMAIL: paul.b.rose@lmco.com
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:
MIL-PRF-31032/1 MIL-PRF-31032/2 Panel Size 12" X 18" Max. Board Thickness 0.100" (nominal) Max/Min Hole Size 0.250"/0.018" Aspect Ratio 5.5:1 Max. Nuber of Layers 12 Min. Conductor Width 0.005" Min. Conductor Spacing 0.005" Part Mounting SMT, THM Base Material GI (Woven E-glass Polyimide Resin) Finish System Reflow Solder, HASL Hole Preparation Plasma Desmear Copper Plating Electro-deposited Acid Copper		VQE-00-0734 VQE-02-0254

CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:
MIL-PRF-31032/1 MIL-PRF-31032/2 Panel Size 12" X 18" Max. Board Thickness 0.076" Max/Min Hole Size 0.052"/0.012" Aspect Ratio 6:1 Max. Nuber of Layers 14 Min. Conductor Width 0.004" Min. Conductor Spacing 0.005" Part Mounting SMT Base Material GF (Woven E-glass Epoxy Resin) Finish System HASL Hole Preparation Plasma Desmear Copper Plating Electro-deposited Acid Copper Solder Resist LPI, Dry Film, SMOBC		VQE-00-0193

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

<p>MANUFACTURER NAME & ADDRESS</p> <p>Lockheed Martin Corp. Missiles & Fire Control Orlando 5600 West Sandlake Road Orlando, FL 32819-8907</p>	<p>PLANT LOCATION</p> <p>Same</p>	<p>CAGE CODE: 04939</p> <p>CONTACT: Vijay Kumar PHONE #: 407-356-0282 FAX #: 407-356-8291 EMAIL: vijay.kumar@lmco.com</p> <p>CONTACT: Paul Rose PHONE #: 407-356-5537 EMAIL: paul.b.rose@lmco.com</p>																								
<p>CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:</p>		<p>QUALIFICATION LETTER:</p>																								
<p>MIL-PRF-31032/1 MIL-PRF-31032/2</p> <table border="0"> <tr> <td>Panel Size</td> <td>12" X 18"</td> </tr> <tr> <td>Max. Board Thickness</td> <td>0.051" (nominal)</td> </tr> <tr> <td>Max/Min Hole Size</td> <td>0.038"/0.016"</td> </tr> <tr> <td>Aspect Ratio</td> <td>3:1</td> </tr> <tr> <td>Max. Nuber of Layers</td> <td>7</td> </tr> <tr> <td>Min. Conductor Width</td> <td>0.005"</td> </tr> <tr> <td>Min. Conductor Spacing</td> <td>0.005"</td> </tr> <tr> <td>Part Mounting</td> <td>SMT, THM</td> </tr> <tr> <td>Base Material</td> <td>SC (Woven S-glass Cyanate Ester)</td> </tr> <tr> <td>Finish System</td> <td>Reflow Solder</td> </tr> <tr> <td>Hole Preparation</td> <td>Plasma Desmear</td> </tr> <tr> <td>Copper Plating</td> <td>Electro-deposited Acid Copper</td> </tr> </table>		Panel Size	12" X 18"	Max. Board Thickness	0.051" (nominal)	Max/Min Hole Size	0.038"/0.016"	Aspect Ratio	3:1	Max. Nuber of Layers	7	Min. Conductor Width	0.005"	Min. Conductor Spacing	0.005"	Part Mounting	SMT, THM	Base Material	SC (Woven S-glass Cyanate Ester)	Finish System	Reflow Solder	Hole Preparation	Plasma Desmear	Copper Plating	Electro-deposited Acid Copper	<p>VQE-02-0960</p>
Panel Size	12" X 18"																									
Max. Board Thickness	0.051" (nominal)																									
Max/Min Hole Size	0.038"/0.016"																									
Aspect Ratio	3:1																									
Max. Nuber of Layers	7																									
Min. Conductor Width	0.005"																									
Min. Conductor Spacing	0.005"																									
Part Mounting	SMT, THM																									
Base Material	SC (Woven S-glass Cyanate Ester)																									
Finish System	Reflow Solder																									
Hole Preparation	Plasma Desmear																									
Copper Plating	Electro-deposited Acid Copper																									

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Lockheed Martin Systems Integration-Owego 1801 State Route 17C Owego, NY 13827	PLANT LOCATION Same	CAGE CODE: 03640 CONTACT: Chris Conklin PHONE #: 607-751-4251 FAX #: 607-751-7714 EMAIL: c.j.conklin@lmco.com																										
CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:																										
MIL-PRF-31032/1, /2 <table border="0"> <tr><td>Panel Size</td><td>18" X 24"</td></tr> <tr><td>Max. Board Thickness</td><td>0.200"</td></tr> <tr><td>Min Hole Size</td><td>0.020"</td></tr> <tr><td>Aspect Ratio</td><td>8:1</td></tr> <tr><td>Max. Number of Layers</td><td>16</td></tr> <tr><td>Min. Conductor Width</td><td>0.004"</td></tr> <tr><td>Min. Conductor Spacing</td><td>0.004"</td></tr> <tr><td>Part Mounting</td><td>SMT, THM</td></tr> <tr><td>Base Material</td><td>GF (Woven E-glass Epoxy Resin) GI (Woven E-glass, Polyimide Resin) AF (Woven Aramid, Epoxy Resin)</td></tr> <tr><td>Finish System</td><td>Fused SnPb, HASL</td></tr> <tr><td>Hole Preparation</td><td>Permanganate Desmear, Plasma Etchback</td></tr> <tr><td>Copper Plating</td><td>Electro-deposited Copper</td></tr> <tr><td>Solder Resist</td><td>LPI</td></tr> </table>		Panel Size	18" X 24"	Max. Board Thickness	0.200"	Min Hole Size	0.020"	Aspect Ratio	8:1	Max. Number of Layers	16	Min. Conductor Width	0.004"	Min. Conductor Spacing	0.004"	Part Mounting	SMT, THM	Base Material	GF (Woven E-glass Epoxy Resin) GI (Woven E-glass, Polyimide Resin) AF (Woven Aramid, Epoxy Resin)	Finish System	Fused SnPb, HASL	Hole Preparation	Permanganate Desmear, Plasma Etchback	Copper Plating	Electro-deposited Copper	Solder Resist	LPI	VQE-99-0130 VQE-00-0961
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MIL-PRF-31032/1 <table border="0"> <tr><td>Panel Size</td><td>18" X 24"</td></tr> <tr><td>Max. Board Thickness</td><td>0.095"</td></tr> <tr><td>Min Hole Size</td><td>0.014"</td></tr> <tr><td>Aspect Ratio</td><td>6.8:1</td></tr> <tr><td>Max. Number of Layers</td><td>14</td></tr> <tr><td>Min. Conductor Width</td><td>0.004"</td></tr> <tr><td>Min. Conductor Spacing</td><td>0.004"</td></tr> <tr><td>Part Mounting</td><td>SMT, THM</td></tr> <tr><td>Base Material</td><td>BI (Aramid fabric, Nonwoven, Polyimide Resin)</td></tr> <tr><td>Finish System</td><td>Fused SnPb, HASL, NiAu</td></tr> <tr><td>Hole Preparation</td><td>Permanganate Desmear</td></tr> <tr><td>Copper Plating</td><td>Electro-deposited Cu</td></tr> <tr><td>Solder Resist</td><td>LPI</td></tr> </table>		Panel Size	18" X 24"	Max. Board Thickness	0.095"	Min Hole Size	0.014"	Aspect Ratio	6.8:1	Max. Number of Layers	14	Min. Conductor Width	0.004"	Min. Conductor Spacing	0.004"	Part Mounting	SMT, THM	Base Material	BI (Aramid fabric, Nonwoven, Polyimide Resin)	Finish System	Fused SnPb, HASL, NiAu	Hole Preparation	Permanganate Desmear	Copper Plating	Electro-deposited Cu	Solder Resist	LPI	VQE-01-0539
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<p>MANUFACTURER NAME & ADDRESS</p> <p>Lockheed Martin Systems Integration-Owego 1801 State Route 17C Owego, NY 13827</p>	<p>PLANT LOCATION</p> <p>Same</p>	<p>CAGE CODE: 03640</p> <p>CONTACT: Chris Conklin PHONE #: 607-751-4251 FAX #: 607-751-7714 EMAIL: c.j.conklin@lmco.com</p>																												
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<p>MIL-PRF-31032/3, /4</p> <table border="0"> <tr><td>Panel Size</td><td>18" X 24"</td></tr> <tr><td>Max. Board Thickness</td><td>0.110"</td></tr> <tr><td>Min Hole Size</td><td>0.040"</td></tr> <tr><td>Aspect Ratio</td><td>2.75:1</td></tr> <tr><td>Max. Number of Layers</td><td>10</td></tr> <tr><td>Min. Conductor Width</td><td>0.004"</td></tr> <tr><td>Min. Conductor Spacing</td><td>0.004"</td></tr> <tr><td>Part Mounting</td><td>SMT, THM</td></tr> <tr><td>Rigid Base Material</td><td>GF (Woven E-glass, Epoxy Resin) GI (Woven E-glass, Polyimide Resin)</td></tr> <tr><td>Flex Base Material</td><td>IPC-FC-241/1 through /4 IPC-FC-241/11</td></tr> <tr><td>Finish System</td><td>Fused SnPb, HASL</td></tr> <tr><td>Hole Preparation</td><td>Permanganate Desmear/Plasma Etchback</td></tr> <tr><td>Copper Plating</td><td>Electro-deposited Acid Copper</td></tr> <tr><td>Solder Resist</td><td>UV-Cured Wet Screen</td></tr> </table>		Panel Size	18" X 24"	Max. Board Thickness	0.110"	Min Hole Size	0.040"	Aspect Ratio	2.75:1	Max. Number of Layers	10	Min. Conductor Width	0.004"	Min. Conductor Spacing	0.004"	Part Mounting	SMT, THM	Rigid Base Material	GF (Woven E-glass, Epoxy Resin) GI (Woven E-glass, Polyimide Resin)	Flex Base Material	IPC-FC-241/1 through /4 IPC-FC-241/11	Finish System	Fused SnPb, HASL	Hole Preparation	Permanganate Desmear/Plasma Etchback	Copper Plating	Electro-deposited Acid Copper	Solder Resist	UV-Cured Wet Screen	<p>VQE-00-0684</p>
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LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

<p>MANUFACTURER NAME & ADDRESS</p> <p>Lone Star Circuits 901 Hensley Drive Wylie, TX 75098</p>	<p>PLANT LOCATION</p> <p>Same</p>	<p>CAGE CODE: 04RV5</p> <p>PHONE #: 972-771-1930 FAX #: 972-771-0360 EMAIL: sales@lonestar-circuits.com</p>
<p>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION:</p>		<p>QUALIFICATION LETTER:</p>
<p>MIL-PRF-31032/1 & 2</p> <p>Panel Size 18" X 24"</p> <p>Max. Board Thickness 0.100"</p> <p>Min Hole Size 0.0145"</p> <p>Aspect Ratio 6.9: 1</p> <p>Max. Number of Layers 10</p> <p>Min. Conductor Width 0.005"</p> <p>Min. Conductor Spacing 0.005"</p> <p>Part Mounting MIX</p> <p>Base Material GF (Woven E-Glass, Epoxy Resin)</p> <p>Finish System HASL</p> <p>Hole Preparation Permanganate Desmear</p> <p>Copper Plating Electrodeposited Acid Copper</p> <p>Solder Resist LPI</p>		<p>VQE-03-4341</p>
<p>CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:</p>		<p>QUALIFICATION LETTER:</p>
<p>MIL-PRF-31032/1 & 2</p> <p>Panel Size 18" X 24"</p> <p>Max. Board Thickness 0.070"</p> <p>Min Hole Size 0.018"</p> <p>Aspect Ratio 3.89:1</p> <p>Max. Number of Layers 6</p> <p>Min. Conductor Width 0.016"</p> <p>Min. Conductor Spacing 0.008"</p> <p>Part Mounting MIX</p> <p>Rigid Base Material GI (Woven E-glass, Polyimide Resin)</p> <p>Finish System HASL</p> <p>Hole Preparation Plasma Etchback</p> <p>Copper Plating Electrodeposited Acid Copper</p> <p>Solder Resist LPI</p>		<p>VQE-04-4957</p>

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LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Micom Corp. 475 Old Highway 8 NW New Brighton, MN 55112	PLANT LOCATION Same	CAGE CODE: 34076 CONTACT: Larry Leonard PHONE #: 651-604-2639 FAX #: 651-636-1352 EMAIL:lleonard@micomcircuits.com																														
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:																														
MIL-PRF-31032/1, /2 <table border="0"> <tr><td>Panel Size</td><td>18" X 24"</td></tr> <tr><td>Max. Board Thickness</td><td>0.239"</td></tr> <tr><td>Max./Min. Plated Hole Size</td><td>0.0079"</td></tr> <tr><td>Aspect Ratio</td><td>11:1</td></tr> <tr><td>Max. Number of Layers</td><td>28</td></tr> <tr><td>Min. Conductor Width</td><td>0.004"</td></tr> <tr><td>Min. Conductor Spacing</td><td>0.004"</td></tr> <tr><td>Part Mounting</td><td>SMT, THM</td></tr> <tr><td>Base Material</td><td>GF (Woven E-Glass, Epoxy resin) GI (Woven E-Glass, Polyimide resin)</td></tr> <tr><td>Finish System</td><td>HASL, Fuse Following SnPb Plate</td></tr> <tr><td>Hole Preparation</td><td>Plasma Desmear/Etchback, Permanganate Desmear/Etchback</td></tr> <tr><td>Copper Plating</td><td>Acid Copper</td></tr> <tr><td>Solder Resist</td><td>LPI, Dry Film</td></tr> <tr><td>Controlled Impedance</td><td>Characteristic (±10%) Differential (±10%)</td></tr> <tr><td>Alternate Construction</td><td>Blind & Buried Vias</td></tr> </table>		Panel Size	18" X 24"	Max. Board Thickness	0.239"	Max./Min. Plated Hole Size	0.0079"	Aspect Ratio	11:1	Max. Number of Layers	28	Min. Conductor Width	0.004"	Min. Conductor Spacing	0.004"	Part Mounting	SMT, THM	Base Material	GF (Woven E-Glass, Epoxy resin) GI (Woven E-Glass, Polyimide resin)	Finish System	HASL, Fuse Following SnPb Plate	Hole Preparation	Plasma Desmear/Etchback, Permanganate Desmear/Etchback	Copper Plating	Acid Copper	Solder Resist	LPI, Dry Film	Controlled Impedance	Characteristic (±10%) Differential (±10%)	Alternate Construction	Blind & Buried Vias	VQE-03-2980
Panel Size	18" X 24"																															
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MANUFACTURER NAME & ADDRESS Philway Products, Inc. 701 Virginia Avenue Ashland, OH 44806	PLANT LOCATION Same	CAGE CODE: 21971 CONTACT: Ted Norris PHONE #: 419-281-7777 FAX #: 419-289-3447 EMAIL:chris@philway.com																												
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MIL-PRF-31032/1 <table border="0"> <tr> <td>Panel Size</td> <td>18" X 21"</td> </tr> <tr> <td>Max. Board Thickness</td> <td>0.090"</td> </tr> <tr> <td>Max. Base Cu Thickness</td> <td>0.002"</td> </tr> <tr> <td>Max/Min Plated Hole Size</td> <td>0.044"/0.012</td> </tr> <tr> <td>Aspect Ratio</td> <td>4:1</td> </tr> <tr> <td>Max. Number of Layers</td> <td>12</td> </tr> <tr> <td>Min. Conductor Width</td> <td>0.005"</td> </tr> <tr> <td>Min. Conductor Spacing</td> <td>0.005"</td> </tr> <tr> <td>Part Mounting</td> <td>SMT, THM, MIX</td> </tr> <tr> <td>Base Material</td> <td>GF (Woven E-Glass, Epoxy resin) GI (Woven E-Glass, Polyimide resin) GM (Woven E-Glass, Triazine and/or Bismaleimide Modified Epoxy resin)</td> </tr> <tr> <td>Finish System</td> <td>HASL, IR Reflow following SnPb plate</td> </tr> <tr> <td>Hole Preparation</td> <td>Permanganate Desmear/Etchback</td> </tr> <tr> <td>Copper Plating</td> <td>Acid Copper</td> </tr> <tr> <td>Solder Resist</td> <td>LPI</td> </tr> </table>		Panel Size	18" X 21"	Max. Board Thickness	0.090"	Max. Base Cu Thickness	0.002"	Max/Min Plated Hole Size	0.044"/0.012	Aspect Ratio	4:1	Max. Number of Layers	12	Min. Conductor Width	0.005"	Min. Conductor Spacing	0.005"	Part Mounting	SMT, THM, MIX	Base Material	GF (Woven E-Glass, Epoxy resin) GI (Woven E-Glass, Polyimide resin) GM (Woven E-Glass, Triazine and/or Bismaleimide Modified Epoxy resin)	Finish System	HASL, IR Reflow following SnPb plate	Hole Preparation	Permanganate Desmear/Etchback	Copper Plating	Acid Copper	Solder Resist	LPI	VQE-99-1107
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MANUFACTURER NAME & ADDRESS Printed Circuits, Inc. 1200 W. 96 th Street Bloomington, MN 55431-2699	PLANT LOCATION Same	CAGE CODE: 65114 CONTACT: Dennis Cantwell PHONE #: 612-888-7900 FAX #: 612-888-2719 EMAIL: dcant@printedcircuits.com																										
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:																										
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MANUFACTURER NAME & ADDRESS Proto Circuit, Inc. 7 Ascot Parkway Cuyahoga Falls, OH 44223	PLANT LOCATION Same	CAGE CODE: 7Z463 CONTACT: Peter Menez PHONE #: 330-572-3400 FAX #: 330-572-3434 EMAIL: menez@protocircuit.com
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:
MIL-PRF-31032/1 Panel Size 18" X 24" Max. Board Thickness 0.126" Min Hole Size 0.014" Aspect Ratio 5:1 Max. Number of Layers 16 Min. Conductor Width 0.004" Min. Conductor Spacing 0.004" Part Mounting SMT/THM Base Material GF (Woven E-glass Epoxy resin) GI (Woven E-glass Polyimide Resin) AF (Woven Aramid Epoxy Resin) BI (Non-woven Aramid Polyimide Resin) Finish System HASL, Fused Tin Lead Plate, Selective Solder Strip-Tin Lead Plate Hole Preparation Plasma Etchback Copper Plating Acid Copper Controlled Impedance 100/50 ohm ±5% Alternate Construction Sequential Lamination for Blind & Buried Vias (8 layer max)		VQE-00-0289 VQE-01-0910
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:
MIL-PRF-31032/3 MIL-PRF-31032/4 Panel Size 18" X 24" Max. Board Thickness 0.126" Min Hole Size 0.017" Aspect Ratio 10:1 Max. Number of Layers 11 Min. Conductor Width 0.003" Min. Conductor Spacing 0.003" Part Mounting SMT/THM Base Material Rigid GF (Woven E-glass Epoxy resin) GI (Woven E-glass Polyimide Resin) Flex Adhesiveless Construction Finish System HASL Hole Preparation Plasma Etchback Copper Plating Acid Copper Flexibility Class Class A		VQE-01-0909

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LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Sanmina –SCI (Phoenix) 5020 South 36 th Street Phoenix, AZ 85040	PLANT LOCATION Same	CAGE CODE: 1V6J6 CONTACT: Alfred Macha PHONE #: 602-824-8456 FAX #: 602-824-8674 EMAIL: Macha@sanmina-sci.com
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:
MIL-PRF-31032/1 Panel Size 18" X 24" Max. Board Thickness 0.0925" Min Hole Size 0.013" (TH) Aspect Ratio 5.7:1 Max. Number of Layers 16 Min. Conductor Width 0.006" Min. Conductor Spacing 0.005" Part Mounting SMT, THM, MIX Base Material GF (Woven E-glass, Epoxy resin) GI (Woven E-glass, Polyimide Resin) Finish System HASL, Electrolytic Nickel Gold, Electroless Nickel/ Immersion Gold, Immersion Silver Hole Preparation Desmear Copper Plating Acid Copper Solder Resist LPI Controlled Impedance 200/28 ohms ± 10% Hypot Test Max Voltage: 1000V		VQE-03-4646

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Sanmina –SCI (Wilmington) One Jewel Drive Wilmington, MA 01887-3390	PLANT LOCATION Same	CAGE CODE: 65359 CONTACT: John Adams PHONE #: 978-933-1920 FAX #: 978-933-1818 email: john.Adams@sanmina-sci.com																																				
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:																																				
MIL-PRF-31032/1, /2 <table border="0"> <tr><td>Panel Size</td><td>18" X 24"</td></tr> <tr><td>Max. Board Thickness</td><td>0.230"</td></tr> <tr><td>Min . Hole Size</td><td>0.098" (TH)</td></tr> <tr><td></td><td>0.008" (Buried Via)</td></tr> <tr><td>Aspect Ratio</td><td>10:1</td></tr> <tr><td>Max. Number of Layers</td><td>28</td></tr> <tr><td>Min. Conductor Width</td><td>0.0035"</td></tr> <tr><td>Min. Conductor Spacing</td><td>0.0035"</td></tr> <tr><td>Part Mounting</td><td>SMT, THM, MIX</td></tr> <tr><td>Base Material</td><td>GF (Woven E-glass, Epoxy resin)</td></tr> <tr><td></td><td>GI (Woven E-glass, Polyimide Resin)</td></tr> <tr><td>Finish System</td><td>HASL, Reflowed Solder, Electroless Nickel</td></tr> <tr><td></td><td>Immersion Gold (ENIG), Immersion Tin,</td></tr> <tr><td></td><td>Immersion Silver, OSP</td></tr> <tr><td>Hole Preparation</td><td>Desmear</td></tr> <tr><td>Copper Plating</td><td>Acid Copper</td></tr> <tr><td>Solder Resist</td><td>LPI</td></tr> <tr><td>Special</td><td>Buried Vias</td></tr> </table>		Panel Size	18" X 24"	Max. Board Thickness	0.230"	Min . Hole Size	0.098" (TH)		0.008" (Buried Via)	Aspect Ratio	10:1	Max. Number of Layers	28	Min. Conductor Width	0.0035"	Min. Conductor Spacing	0.0035"	Part Mounting	SMT, THM, MIX	Base Material	GF (Woven E-glass, Epoxy resin)		GI (Woven E-glass, Polyimide Resin)	Finish System	HASL, Reflowed Solder, Electroless Nickel		Immersion Gold (ENIG), Immersion Tin,		Immersion Silver, OSP	Hole Preparation	Desmear	Copper Plating	Acid Copper	Solder Resist	LPI	Special	Buried Vias	VQE-03-3935 VQE-03-4769
Panel Size	18" X 24"																																					
Max. Board Thickness	0.230"																																					
Min . Hole Size	0.098" (TH)																																					
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Aspect Ratio	10:1																																					
Max. Number of Layers	28																																					
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Part Mounting	SMT, THM, MIX																																					
Base Material	GF (Woven E-glass, Epoxy resin)																																					
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Finish System	HASL, Reflowed Solder, Electroless Nickel																																					
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Hole Preparation	Desmear																																					
Copper Plating	Acid Copper																																					
Solder Resist	LPI																																					
Special	Buried Vias																																					

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Sovereign Circuits, Inc. 12080 DeBartolo Drive North Jackson, OH 44551	PLANT LOCATION Same	CAGE CODE: 0GN71 CONTACT: Scott Bowles PHONE #: 330-538-3900 FAX #: 330-538-3820 EMAIL:bowles@sovereign-circuits.com																														
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:																														
MIL-PRF-31032/1, /2 <table border="0"> <tr><td>Panel Size</td><td>18" X 24"</td></tr> <tr><td>Max. Board Thickness</td><td>0.160"</td></tr> <tr><td>Max./Min. Hole Size</td><td>0.008"</td></tr> <tr><td>Aspect Ratio</td><td>10:1</td></tr> <tr><td>Max. Number of Layers</td><td>20</td></tr> <tr><td>Min. Conductor Width</td><td>0.004"</td></tr> <tr><td>Min. Conductor Spacing</td><td>0.004"</td></tr> <tr><td>Part Mounting</td><td>SMT, THM, MIX, Press Fit</td></tr> <tr><td>Base Material</td><td>GF (Woven E-glass, Epoxy resin) GI (Woven E-glass, Polyimide Resin) BI (Non-woven Aramid, Reinforced Polyimide) QIL (Woven Quartz Reinforced Polyimide)</td></tr> <tr><td>Finish System</td><td>HASL, Fused, SnPb, Immersion White Tin, Ni/Au, Ni/Pd/Au, OSP, Reflowed Pure Tin</td></tr> <tr><td>Hole Preparation</td><td>Plasma Desmear/Etchback, Permanganate Desmear/Etchback</td></tr> <tr><td>Copper Plating</td><td>Electroless & Electroplated Acid Copper</td></tr> <tr><td>Solder Resist</td><td>LPI, Dry Film</td></tr> <tr><td>Controlled Impedance</td><td>Range 30-150 ohms ($\pm 10\%$), Microstrip, Embedded Microstrip, Dual Stripline, Characteristic, Differential</td></tr> <tr><td>Alternate Construction</td><td>Blind & Buried Vias</td></tr> </table>		Panel Size	18" X 24"	Max. Board Thickness	0.160"	Max./Min. Hole Size	0.008"	Aspect Ratio	10:1	Max. Number of Layers	20	Min. Conductor Width	0.004"	Min. Conductor Spacing	0.004"	Part Mounting	SMT, THM, MIX, Press Fit	Base Material	GF (Woven E-glass, Epoxy resin) GI (Woven E-glass, Polyimide Resin) BI (Non-woven Aramid, Reinforced Polyimide) QIL (Woven Quartz Reinforced Polyimide)	Finish System	HASL, Fused, SnPb, Immersion White Tin, Ni/Au, Ni/Pd/Au, OSP, Reflowed Pure Tin	Hole Preparation	Plasma Desmear/Etchback, Permanganate Desmear/Etchback	Copper Plating	Electroless & Electroplated Acid Copper	Solder Resist	LPI, Dry Film	Controlled Impedance	Range 30-150 ohms ($\pm 10\%$), Microstrip, Embedded Microstrip, Dual Stripline, Characteristic, Differential	Alternate Construction	Blind & Buried Vias	VQE-03-3120 VQE-03-3213
Panel Size	18" X 24"																															
Max. Board Thickness	0.160"																															
Max./Min. Hole Size	0.008"																															
Aspect Ratio	10:1																															
Max. Number of Layers	20																															
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Part Mounting	SMT, THM, MIX, Press Fit																															
Base Material	GF (Woven E-glass, Epoxy resin) GI (Woven E-glass, Polyimide Resin) BI (Non-woven Aramid, Reinforced Polyimide) QIL (Woven Quartz Reinforced Polyimide)																															
Finish System	HASL, Fused, SnPb, Immersion White Tin, Ni/Au, Ni/Pd/Au, OSP, Reflowed Pure Tin																															
Hole Preparation	Plasma Desmear/Etchback, Permanganate Desmear/Etchback																															
Copper Plating	Electroless & Electroplated Acid Copper																															
Solder Resist	LPI, Dry Film																															
Controlled Impedance	Range 30-150 ohms ($\pm 10\%$), Microstrip, Embedded Microstrip, Dual Stripline, Characteristic, Differential																															
Alternate Construction	Blind & Buried Vias																															

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Sovereign Circuits, Inc. 12080 DeBartolo Drive North Jackson, OH 44551	PLANT LOCATION Same	CAGE CODE: 0GN71 CONTACT: Scott Bowles PHONE #: 330-538-3900 FAX #: 330-538-3820 EMAIL:bowles@sovereign-circuits.com
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:
MIL-PRF-31032/3, /4		VQE-03-3121 VQE-03-3214
Panel Size Max. Board Thickness Max./Min. Hole Size Aspect Ratio Max. Number of Layers Min. Conductor Width Min. Conductor Spacing Part Mounting Rigid Base Material Flex Base Material Finish System Hole Preparation Solder Resist Copper Plating Controlled Impedance Flexibility Class Alternate Construction	18" X 24" 0.160" 0.008" 10:1 20 0.003" 0.003" SMT, THM, MIX, Press Fit GF (Woven E-glass, Epoxy resin) GI (Woven E-glass, Polyimide Resin) IPC-FC-241/1 (Acrylic Adhesive) IPC-FC-241/11 (Adhesiveless) HASL, Fused, SnPb, Immersion White Tin, Ni/Au, OSP, Reflowed Pure Tin Plasma Desmear/Etchback Permanganate Dsmear/Etchback LPI, Dry Film Electroless & Electroplated Acid Copper Range 30-150 ohms ($\pm 10\%$), Microstrip, Embedded Microstrip, Dual Stripline, Characteristic, Differential Class A (Flex During Installation) Class B (Continuous Flexing) Blind & Buried Vias	

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Teradyne, Inc. Connection Systems Division 91 Northeastern Boulevard Nashua, New Hampshire 03062	PLANT LOCATION Same	CAGE CODE: 3T000 CONTACT: Melissa Baker PHONE #: 603-879-3818 FAX #: 603-879-2818 email: melissa.k.baker@teradyne.com
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:
MIL-PRF-31032/1 MIL-PRF-31032/2 Panel Size 24" X 36" Max. Board Thickness 0.322" Min. Hole Size 0.016" Aspect Ratio 8:1 Max. Number of Layers 27 Min. Conductor Width 0.004" Min. Conductor Spacing 0.004" Part Mounting THM, Compliant Pin, SMT Base Material GF (Woven E-glass, Epoxy resin) GI (Woven E-glass, Polyimide resin) Finish System Fused SnPB, Nickel, Gold Hole Preparation Permanganate Desmear/Etchback Copper Plating Acid Copper Solder Resist Thermal Cured Soldermask and SMOBC		VQE-97-0649 VQE-97-0721

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Tyco Printed Circuits Group Santa Clara Division 400 Matthew Street Santa Clara, CA 95050	PLANT LOCATION Same	CAGE CODE: 65916 CONTACT: Lorenzo Cano PHONE #: (408) 486-3197 FAX #: (408) 727-1003 EMAIL: lorenzo.cano@tycoelectronics.com
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:
MIL-PRF-31032/1, /2 Panel Size 18" X 24" Max. Board Thickness 0.120" Min Hole Size 0.191"/0.012" Aspect Ratio 9:1 Max. Number of Layers 20 Min. Conductor Width 0.004" Min. Conductor Spacing 0.004" Part Mounting SMT, THM, MIX GF (Woven E-glass, Epoxy resin) GI (Woven E-glass, Polyimide resin) Finish System HASL, Immersion Ni/Au Hole Preparation Plasma Desmear/Etchback Copper Plating Electrolytic Acid Copper Solder Resist LPI, Screen Printed Controlled Impedance Range 30-150 ohms (\pm 10%), Microstrip, Embedded Microstrip, Dual Stripline, Characteristic, Differential Alternate Construction Blind Vias		VQE-03-3888
MIL-PRF-31032/3, /4 Panel Size 18" X 24" Max./Min. Board Thickness 0.0120" Max./Min. PTH Hole Size 0.191"/0.012" Aspect Ratio 9:1 Max. Number of Layers 10 Min. Conductor Width 0.004" Min. Conductor Spacing 0.004" Part Mounting SMT, THM, MIX Rigid Base Material GF (Woven E-glass, Epoxy resin) Flex Base Material GI (Woven E-glass, Polyimide resin) Finish System HASL, Immersion Ni/Au Hole Preparation Plasma Desmear/Etchback Copper Plating Electro-deposited Acid Copper		VQE-03-3895

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Tyco Printed Circuits Group Stafford Division 4 Old Monson Road, P.O. Box 145 Stafford, CT 06075	PLANT LOCATION Same	CAGE CODE: 5L706 CONTACT: Mr. Robert Lucey PHONE #: (860) 684-5881 FAX #: (860) 684-7425 EMAIL: robert.lucey@tycoelectronics.com EMAIL: michele.hebert@tycoelectronics.com
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:
MIL-PRF-31032/3, /4 Panel Size 30" X 54" Max. Board Thickness 0.300"/0.003" Max./Min.,Hole Size 0.221"/0.0095" drilled Aspect Ratio 9:1 Buried Via Aspect Ratio 5:1 Max. Number of Layers 28 Min. Conductor Width 0.004" Min. Conductor Spacing 0.004" Part Mounting SMT, THM, MIX GF (Woven E-glass, Epoxy resin) GI (Woven E-glass, Polyimide resin) Flex Base Material IPC-4204/1 Acrylic Adhesive IPC-4204/11 Adhesiveless SC (Woven S-glass Cyanate Ester) Finish System HASL, SMOBC, Reflowed Solder, Electroless Nickel/Immersion Gold, Electrolytic Hard and Soft Gold, Electrolytic Nickel, Bright Tin, Immersion Tin Hole Preparation Plasma Etchback Copper Plating Electroless and Electrolytic Copper Solder Resist LPI, Dry Film, Wet Mask, Hole Fill, Hole Plug Controlled Impedance Range 30-150 ohms (± 10%), Microstrip, Embedded Microstrip, Dual Stripline, Characteristic, Differential Alternate Construction Copper Invar Copper, Blind and Buried Vias, Micro Vias, Buried Resistors, Multiple Laminations Flexibility Class Class A (Flex During Installation) Class B (Continuous Flexing)		VQE-03-3349

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

<p>MANUFACTURER NAME & ADDRESS</p> <p>Tyco Printed Circuits Group Austin Division 12501 Research Blvd., Module 1 Austin, TX 78759</p>	<p>PLANT LOCATION</p> <p>Same</p>	<p>CAGE CODE: 1EHD4</p> <p>CONTACT: Scott Grover PHONE #: 512-250-6456 FAX #: 512-250-7010 EMAIL: grover@tycoelectronics.com</p>
<p>CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:</p>		<p>QUALIFICATION LETTER:</p>
<p>MIL-PRF-31032/1, /2</p> <p>Panel Size 18" X 24"</p> <p>Max. Board Thickness 0.150"</p> <p>Min. Hole Size 0.010"</p> <p>Aspect Ratio 9:1</p> <p>Max. Number of Layers 20</p> <p>Min. Conductor Width 0.004"</p> <p>Min. Conductor Spacing 0.004"</p> <p>Part Mounting THM, SM</p> <p>Base Material BI (Nonwoven aramid reinforced polyimide resin) GF (Woven E-glass, Epoxy resin) GI (Woven E-glass, Polyimide resin)</p> <p>Finish System Fused SnPb, HASL, OSP, Nickel, Gold</p> <p>Hole Preparation Plasma Desmear/Etchback</p> <p>Copper Plating Acid Copper</p> <p>Solder Resist LPI (Spray Coated and Screen Printed), Dry Film Photo Imageable, SMOBC</p>		<p>VQE-97-0509 VQE-97-0718</p>
<p>MIL-PRF-31032/3</p> <p>Panel Size 18" X 24"</p> <p>Max. Board Thickness 0.010"</p> <p>Min. Hole Size 0.010"</p> <p>Aspect Ratio 9:1</p> <p>Min. Conductor Width 0.004"</p> <p>Min. Conductor Spacing 0.004"</p> <p>Part Mounting THM</p> <p>Base Material IPC-FC-241/1 IPC-FC-241/11</p> <p>Finish System Fused SnPb, HASL, OSP, Nickel, Gold, Immersion Silver</p> <p>Copper Plating Electrodeposited Acid Copper</p> <p>Usage Class A</p>		<p>VQE-99-0935</p>

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Tyco Printed Circuits Group Austin Division 12501 Research Blvd., Module 1 Austin, TX 78759	PLANT LOCATION Same	CAGE CODE: 1EHD4 CONTACT: Scott Grover PHONE #: 512-250-6456 FAX #: 512-250-7010 EMAIL: grover@tycoelectronics.com																														
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:																														
MIL-PRF-31032/4 <table border="0"> <tr><td>Panel Size</td><td>18" X 26"</td></tr> <tr><td>Max. Board Thickness</td><td>0.150"</td></tr> <tr><td>Min. Hole Size</td><td>0.010"</td></tr> <tr><td>Aspect Ratio</td><td>9:1</td></tr> <tr><td>Max. Number of Layers</td><td>20</td></tr> <tr><td>Internal Connections</td><td>Blind Vias</td></tr> <tr><td>Min. Conductor Width</td><td>0.004"</td></tr> <tr><td>Min. Conductor Spacing</td><td>0.004"</td></tr> <tr><td>Part Mounting</td><td>THM, SM</td></tr> <tr><td>Rigid Base Material</td><td>GF (Woven E-glass, Epoxy resin) GI (Woven E-glass, Polyimide resin)</td></tr> <tr><td>Flex Base Material</td><td>IPC-FC-241/1 IPC-FC-241/11</td></tr> <tr><td>Finish System</td><td>Fused SnPb, HASL, OSP, Nickel Gold, Immersion Silver</td></tr> <tr><td>Copper Plating</td><td>Electro-deposited Acid Copper</td></tr> <tr><td>Solder Resist</td><td>UV-Cured Wet Screen</td></tr> <tr><td>Usage</td><td>Class A (Flex During Installation)</td></tr> </table>		Panel Size	18" X 26"	Max. Board Thickness	0.150"	Min. Hole Size	0.010"	Aspect Ratio	9:1	Max. Number of Layers	20	Internal Connections	Blind Vias	Min. Conductor Width	0.004"	Min. Conductor Spacing	0.004"	Part Mounting	THM, SM	Rigid Base Material	GF (Woven E-glass, Epoxy resin) GI (Woven E-glass, Polyimide resin)	Flex Base Material	IPC-FC-241/1 IPC-FC-241/11	Finish System	Fused SnPb, HASL, OSP, Nickel Gold, Immersion Silver	Copper Plating	Electro-deposited Acid Copper	Solder Resist	UV-Cured Wet Screen	Usage	Class A (Flex During Installation)	VQE-99-0933
Panel Size	18" X 26"																															
Max. Board Thickness	0.150"																															
Min. Hole Size	0.010"																															
Aspect Ratio	9:1																															
Max. Number of Layers	20																															
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Part Mounting	THM, SM																															
Rigid Base Material	GF (Woven E-glass, Epoxy resin) GI (Woven E-glass, Polyimide resin)																															
Flex Base Material	IPC-FC-241/1 IPC-FC-241/11																															
Finish System	Fused SnPb, HASL, OSP, Nickel Gold, Immersion Silver																															
Copper Plating	Electro-deposited Acid Copper																															
Solder Resist	UV-Cured Wet Screen																															
Usage	Class A (Flex During Installation)																															

SECTION III
ALPHABETICAL LIST OF QUALIFIED MANUFACTURERS

MANUFACTURER'S NAME & ADDRESS	PLANT LOCATION	OTHER INFORMATION
Ambitech, Inc. 8944 Fullbright Avenue Chatsworth, CA 91311-6123	Same	CAGE CODE: 51484 CONTACT: Jim Spaulding PHONE #: 818-882-5550 FAX #: 818-882-9408 EMAIL: jim.spaulding@ambi.com
Calumet Electronics Corp. 25830 Depot Street Calumet, MI 49913-1985	Same	CAGE CODE: 65337 CONTACT: Robert Hall PHONE #: 906-337-1305 FAX #: 906-337-5359 EMAIL: rhall@cec-up.com
Coretec Denver, Inc. 10570 Bradford Road Littleton, CO 80127	Same	CAGE CODE: 75815 CONTACT: Douglas N. Berry PHONE #: 303-904-6119 FAX #: 303-933-2934 EMAIL: dberry@coretec-denver.com
Crown Circuits, Inc. 6070 Avenida Encinas Carlsbad, CA 92009-1001	Same	CAGE CODE: 65882 CONTACT: Ellen Araneta PHONE #: 760-431-1124, x161 FAX #: 760-431-1462 EMAIL: sales@crowncircuits.com
Diversified Systems 3939 W. 56 th Street Indianapolis, IN 46254	Same	CAGE CODE: 5S706 CONTACT: Doreen Palmert PHONE #: 317-299-9547, x161 FAX #: 317-298-2055 EMAIL: dpalmert@divsys.com
Dynamic & Proto Circuits, Inc. 869 Barton Street Stoney Creek, Ontario L8E 5G6 Canada	Same	CAGE CODE: 38898 CONTACT: Mr. David Foster PHONE #: 905-643-9900 FAX #: 905-643-9911 EMAIL: dfoster@dapc.com
Dynamic Details, Inc. 1200 Severn Way Dulles, VA 20166-8904	Same	CAGE CODE: 0K703 CONTACT: Mike Hill PHONE #: 703-652-2202 FAX #: 703-652-2271 EMAIL: ddiglobal.com
Geometric Circuits, Inc. 11 Michael Avenue Farmingdale, NY 11735	Same	CAGE CODE: 65423 CONTACT: Phil Cate PHONE #: 631-249-0230 FAX #: 631-249-0286 EMAIL: phil@geometriccircuits.com
Hans Brockstedt GmbH Leiterplattenschnelldienst Clara-Immerwahr-Strape 7 24145 Kiel, Germany	Same	CAGE CODE: C4831 CONTACT: Hilmar Klammer PHONE #: 0049-431-71966-0, -30 FAX #: 0049-431-71966-29 EMAIL: klammer@brockstedt.de

SECTION III
ALPHABETICAL LIST OF QUALIFIED MANUFACTURERS

MANUFACTURER'S NAME & ADDRESS	PLANT LOCATION	OTHER INFORMATION
Lockheed Martin Corp. Missiles & Fire Control Orlando 5600 Sandlake Road Orlando, FL 32819-8907	Same	CAGE CODE: 09205 CONTACT: Vijay Kumar PHONE #: 407-356-0282 FAX #: 407-356-8291 EMAIL: vijay.kumar@lmco.com CONTACT: Paul Rose PHONE #: 407-356-5537 EMAIL: paul.b.rose@lmco.com
Lockheed Martin Systems Integration-Owego 1801 State Route 17C Owego, NY 13827	Same	CAGE CODE: 03640 CONTACT: Chris Conklin PHONE #: 607-751-4251 FAX #: 607-751-7714 EMAIL: c.j.conklin@lmco.com
Lone Star Circuits 901 Hensley Drive Wylie, TX 75098	Same	CAGE CODE: 04RV5 PHONE #: 972-771-1930 FAX #: 972-771-0360 EMAIL: sales@lonestar-circuits.com
Micom Corp. 475 Old Highway 8 NW New Brighton, MN 55112	Same	CAGE CODE: 34076 CONTACT: Larry Leonard PHONE #: 651-604-2639 FAX #: 651-636-1352 EMAIL: lleonard@micomcircuits.com
Philway Products, Inc. 701 Virginia Avenue Ashland, OH 44806	Same	CAGE CODE: 21971 CONTACT: Ted Norris PHONE #: 419-281-7777 FAX #: 419-289-3447 EMAIL: chris@philway.com
Printed Circuits, Inc. 1200 W. 96 th Street Bloomington, MN 55431-2699	Same	CAGE CODE: 65114 CONTACT: Dennis Cantwell PHONE #: 612-888-7900 FAX #: 612-888-2719 EMAIL: dcant@printedcircuits.com
Proto Circuit, Inc. 7 Ascot Parkway Cuyahoga Falls, OH 44223	Same	CAGE CODE: 7Z463 CONTACT: Peter Menez PHONE #: 330-572-3400 FAX #: 330-572-3434 EMAIL: menez@protocircuit.com
Sanmina – SCI (Costa Mesa) 2945 Airway Avenue Costa Mesa, CA 92626	Same	CAGE CODE: 3BKL5 CONTACT: Terry Lichte PHONE #: 714-371-2847 FAX #: 714-371-2833 EMAIL: terry.lichte@sanmina-sci.com
Sanmina – SCI (Phoenix) 5020 South 36 th Street Phoenix, AZ 85040	Same	CAGE CODE: 1V6J6 CONTACT: Alfred Macha PHONE #: 602-824-8456 FAX #: 602-824-8674 EMAIL: Macha@sanmina-sci.com

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ALPHABETICAL LIST OF QUALIFIED MANUFACTURERS

MANUFACTURER'S NAME & ADDRESS	PLANT LOCATION	OTHER INFORMATION
Sanmina – SCI (Wilmington) One Jewel Drive Wilmington, MA 01887-3390	Same	CAGE CODE: 65359 CONTACT: John Adams PHONE #: 978-933-1920 FAX #: 978-933-1818 EMAIL: john.adams@sanmina-sci.com
Teradyne, Inc. Connection Systems Division 91 Northeastern Boulevard Nashua, NH 03062	Same	CAGE CODE: 3T000 CONTACT: Melissa Baker PHONE #: 603-879-3818 FAX #: 603-879-2818 EMAIL: melissa.k.baker@teradyne.com
Sovereign Circuits, Inc 12080 DeBartolo Drive North Jackson, OH 44451	Same	CAGE CODE: 0GN71 CONTACT: Scott Bowles PHONE #: 330-538-3900 FAX #: 330-538-3820 EMAIL: bowles@sovereign-circuits.com
Tyco Printed Circuits Group Santa Clara Division 400 Matthew Street Santa Clara, CA 95050	Same	CAGE CODE: 65916 CONTACT: Lorenzo Cano PHONE #: 408-486-3197 FAX #: 408-727-1003 EMAIL: lorenzo.cano@tycoelectronics.com
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