



QUALIFICATIONS VALIDATED
ANNUALLY

QML-31032-11
19 March 2002
SUPERSEDING
QML-31032-10
28 March 2001

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.dscccols.com/offices/sourcing_and_qualification/

QML: <http://www.dscccols.com/programs/qmlqpl/QPLdetail.asp?QPL=31032>

DSCC contacts for QML companies can be located in the file "31032 main points-of-contact" at website:

http://www.dscc.dla.mil/offices/sourcing_and_qualification/offices.asp?section=VQE

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

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

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

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

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

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

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

SAS Circuits, Inc.
10570 Bradford Road
Littleton, CO 80127

Sanmina Tech Center East
46 Rogers Road
Ward Hill, MA 01835

Teradyne Circuits Operation
Connection Systems Division
91 Northeastern Boulevard
Nashua, New Hampshire 03062

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

MIL-PRF-31032/2 - Printed Wiring Board, Rigid, Single and Double Layer, Woven E-Glass Reinforced Thermosetting Resin Base Material, With or Without Plated Through Holes, For Soldered Part Mounting.

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

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

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

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

Sanmina Tech Center East
46 Rogers Road
Ward Hill, MA 01835

Teradyne Circuits Operation
Connection Systems Division
91 Northeastern Boulevard
Nashua, New Hampshire 03062

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

SECTION I

LIST OF MANUFACTURERS BY ASSOCIATED SPECIFICATION

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

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

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

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

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

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

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" Max/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 SM/THM Base Material GF (Woven E-glass Epoxy Resin) GI (Polyimide Resin) Finish System Hot Air Solder Leveling Solder Resist Liquid Photoimageable 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 SM, THM, MIX Base Material GF (Woven E-Glass, Epoxy resin) GI (Woven E-Glass, Polyimide resin) Finish System Hot Air Solder Leveling Hole Preparation Plasma Etch Copper Plating Acid Copper Solder Resist Liquid Photoimageable 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 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
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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 Dry Film Photo Imageable, 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																									
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Part Mounting	SMT, THM																									
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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 Panel Size 18" X 24" Max. Board Thickness 0.200" Max/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 Liquid Photoimageable		VQE-99-0130 VQE-00-0961
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:
MIL-PRF-31032/1 Panel Size 18" X 24" Max. Board Thickness 0.095" Max/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 PTH, SM 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 Liquid Photoimageable		VQE-01-0539

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

<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>
<p>CAPABILITIES BY TECHNOLOGY/ASSOCIATED SPECIFICATION:</p>		<p>QUALIFICATION LETTER:</p>
<p>MIL-PRF-31032/1</p> <p>Panel Size 18" X 24" Max. Board Thickness 0.111" Max/Min Hole Size /0.022" Aspect Ratio 5.05: 1 Max. Number of Layers 14 Min. Conductor Width 0.0045" Min. Conductor Spacing 0.004" Part Mounting PTH, SM Base Material GC (Glass Base, Woven E-reinforcement, Majority Cyanate Ester, Flame Resistant</p> <p>Finish System Fused SnPb, HASL, NiAu Hole Preparation Permanganate Desmear Copper Plating Electro-deposited Cu Solder Resist Liquid Photoimageable</p>		<p>VQE-01-0540</p>
<p>CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:</p>		<p>QUALIFICATION LETTER:</p>
<p>MIL-PRF-31032/3, /4</p> <p>Panel Size 18" X 24" Max. Board Thickness 0.110" Max/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) FlexBase 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>		<p>VQE-00-0684</p>

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:
MIL-PRF-31032/1 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 SM, 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 Hot Air Solder Leveling: IR Reflow following SnPb plate Hole Preparation Permanganate Desmear/Etchback Copper Plating Acid Copper Solder Resist Liquid Photoimageable		VQE-99-1107

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

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:																										
MIL-PRF-31032/1, /2, /3, /4 <table border="0"> <tr> <td>Panel Size</td> <td>12" X 18", 18" X 24"</td> </tr> <tr> <td>Max. Board Thickness</td> <td>0.120"</td> </tr> <tr> <td>Max/Min Hole Size</td> <td>/0.010"</td> </tr> <tr> <td>Aspect Ratio</td> <td>10:1</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>0.005"</td> </tr> <tr> <td>Part Mounting</td> <td>SM/THM, MIX</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>IPC-FC-241/1 through /4 IPC-FC-241/11 Fused SnPb HASL Electroplated Nickel/Gold Electroless Nickel/Gold</td> </tr> <tr> <td>Hole Preparation</td> <td>Plasma Desmear/Etchback</td> </tr> <tr> <td>Copper Plating</td> <td>Acid Copper</td> </tr> <tr> <td>Solder Resist</td> <td>Liquid/Dry Film Photo Imageable SMOBC</td> </tr> </table>		Panel Size	12" X 18", 18" X 24"	Max. Board Thickness	0.120"	Max/Min Hole Size	/0.010"	Aspect Ratio	10:1	Max. Number of Layers	16	Min. Conductor Width	0.004"	Min. Conductor Spacing	0.005"	Part Mounting	SM/THM, MIX	Base Material	GF (Woven E-glass Epoxy Resin) GI (Woven, E-glass Polyimide Resin)	Finish System	IPC-FC-241/1 through /4 IPC-FC-241/11 Fused SnPb HASL Electroplated Nickel/Gold Electroless Nickel/Gold	Hole Preparation	Plasma Desmear/Etchback	Copper Plating	Acid Copper	Solder Resist	Liquid/Dry Film Photo Imageable SMOBC	VQE-01-0024
Panel Size	12" X 18", 18" X 24"																											
Max. Board Thickness	0.120"																											
Max/Min Hole Size	/0.010"																											
Aspect Ratio	10:1																											
Max. Number of Layers	16																											
Min. Conductor Width	0.004"																											
Min. Conductor Spacing	0.005"																											
Part Mounting	SM/THM, MIX																											
Base Material	GF (Woven E-glass Epoxy Resin) GI (Woven, E-glass Polyimide Resin)																											
Finish System	IPC-FC-241/1 through /4 IPC-FC-241/11 Fused SnPb HASL Electroplated Nickel/Gold Electroless Nickel/Gold																											
Hole Preparation	Plasma Desmear/Etchback																											
Copper Plating	Acid Copper																											
Solder Resist	Liquid/Dry Film Photo Imageable SMOBC																											

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Proto Circuit, Inc. 7 Ascot Parkway Cuyahoga Falls, OH 44223	PLANT LOCATION Same	CAGE CODE: 7Z463 CONTACT: Peter Menuez PHONE #: 330-572-3400 FAX #: 330-572-3434 EMAIL: menuez@protocircuit.com
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:
MIL-PRF-31032/1 Panel Size 18" X 24" Max. Board Thickness 0.126" Max/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 SM/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% (max/min/tolerance) Sequential Lamination for Blind & Buried Vias Alternate Construction (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" Max/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 SM/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

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS SAS Circuits, Inc. 10570 Bradford Road Littleton, CO 80127	PLANT LOCATION Same	CAGE CODE: 75815 CONTACT: Frank Bauer PHONE #: 303-972-4105 FAX #: 303-933-2934 EMAIL: Frank@sascircuits.com
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:
MIL-PRF-31032/1 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 SM, 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 Liquid Photoimageable, Dry Film		VQE-02-0317

SECTION II

LIST OF MANUFACTURERS' QUALIFIED CAPABILITIES FOR EACH TECHNOLOGY

MANUFACTURER NAME & ADDRESS Sanmina Tech Center East 46 Rogers Road Ward Hill, MA 01835	PLANT LOCATION Same	CAGE CODE: 65316 CONTACT: Steve Aliquo PHONE #: 978-556-6152 FAX #: 978-556-6370 EMAIL: steve.aliquo@sanmina.com
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:
MIL-PRF-31032/1 MIL-PRF-31032/2 Panel Size 18" X 24" Max. Board Thickness 0.095" Max/Min Hole Size /0.013" Aspect Ratio 5.9:1 Max. Number of Layers 16 Min. Conductor Width 0.006" Min. Conductor Spacing 0.005" Part Mounting SM/THM Base Material GF (Woven E-glass Epoxy resin) GI (Woven E-glass Polyimide Resin) Finish System HASL, Solder Reflow, Nickel, Conductive Silver Fill Hole Preparation Plasma Desmear, Etchback Copper Plating Acid Copper Solder Resist Liquid Photo Imageable		VQE-02-0162

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: Mark Buechner PHONE #: 603-791-3832 FAX #: 603-791-3080 EMAIL:Mark.Buechner @tcs.teradyne.com																										
CAPABILITIES BY TECHNOLOGY / ASSOCIATED SPECIFICATION:		QUALIFICATION LETTER:																										
MIL-PRF-31032/1 MIL-PRF-31032/2 <table border="0"> <tr><td>Panel Size</td><td>24" X 36"</td></tr> <tr><td>Max. Board Thickness</td><td>0.322"</td></tr> <tr><td>Max/Min Hole Size</td><td>/0.016"</td></tr> <tr><td>Aspect Ratio</td><td>8:1</td></tr> <tr><td>Max. Number of Layers</td><td>27</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, Compliant Pin, SMT</td></tr> <tr><td>Base Material</td><td>GF (Epoxy resin) GI (Polyimide resin)</td></tr> <tr><td>Finish System</td><td>Fused SnPB Nickel Gold</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>Thermal Cured Soldermask and SMOBC</td></tr> </table>		Panel Size	24" X 36"	Max. Board Thickness	0.322"	Max/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 (Epoxy resin) GI (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
Panel Size	24" X 36"																											
Max. Board Thickness	0.322"																											
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Aspect Ratio	8:1																											
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Hole Preparation	Permanganate Desmear/Etchback																											
Copper Plating	Acid Copper																											
Solder Resist	Thermal Cured Soldermask and SMOBC																											

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-31032/1 MIL-PRF-31032/2 <table border="0"> <tr><td>Panel Size</td><td>18" X 24"</td></tr> <tr><td>Max. Board Thickness</td><td>0.150"</td></tr> <tr><td>Max/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>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>Base Material</td><td>BI (Nonwoven aramid reinforced polyimide resin) GF (Epoxy resin) GI (Polyimide resin)</td></tr> <tr><td>Finish System</td><td>Fused SnPB Hot Air Solder Leveling OSP Nickel Gold</td></tr> <tr><td>Hole Preparation</td><td>Plasma Desmear/Etchback</td></tr> <tr><td>Copper Plating</td><td>Acid Copper</td></tr> <tr><td>Solder Resist</td><td>Liquid Photo Imageable (Spray Coated and Screen Printed), Dry Film Photo Imageable, SMOBC</td></tr> </table>		Panel Size	18" X 24"	Max. Board Thickness	0.150"	Max/Min Hole Size	/0.010"	Aspect Ratio	9:1	Max. Number of Layers	20	Min. Conductor Width	0.004"	Min. Conductor Spacing	0.004"	Part Mounting	THM, SM	Base Material	BI (Nonwoven aramid reinforced polyimide resin) GF (Epoxy resin) GI (Polyimide resin)	Finish System	Fused SnPB Hot Air Solder Leveling OSP Nickel Gold	Hole Preparation	Plasma Desmear/Etchback	Copper Plating	Acid Copper	Solder Resist	Liquid Photo Imageable (Spray Coated and Screen Printed), Dry Film Photo Imageable, SMOBC	VQE-97-0509 VQE-97-0718
Panel Size	18" X 24"																											
Max. Board Thickness	0.150"																											
Max/Min Hole Size	/0.010"																											
Aspect Ratio	9:1																											
Max. Number of Layers	20																											
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Copper Plating	Acid Copper																											
Solder Resist	Liquid Photo Imageable (Spray Coated and Screen Printed), Dry Film Photo Imageable, SMOBC																											
MIL-PRF-31032/3 <table border="0"> <tr><td>Panel Size</td><td>18" X 24"</td></tr> <tr><td>Max/Min Hole Size</td><td>/0.010"</td></tr> <tr><td>Aspect Ratio</td><td>9:1</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</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, HAL, OSP, Nickel, Gold Immersion Silver</td></tr> <tr><td>Copper Plating</td><td>Electro-deposited Acid Copper</td></tr> <tr><td>Usage</td><td>Class A</td></tr> </table>		Panel Size	18" X 24"	Max/Min Hole Size	/0.010"	Aspect Ratio	9:1	Min. Conductor Width	0.004"	Min. Conductor Spacing	0.004"	Part Mounting	THM	Flex Base Material	IPC-FC-241/1 IPC-FC-241/11	Finish System	Fused SnPB, HAL, OSP, Nickel, Gold Immersion Silver	Copper Plating	Electro-deposited Acid Copper	Usage	Class A	VQE-99-0935						
Panel Size	18" X 24"																											
Max/Min Hole Size	/0.010"																											
Aspect Ratio	9:1																											
Min. Conductor Width	0.004"																											
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Usage	Class A																											

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 Panel Size 18" X 26" Max. Board Thickness 0.150" Max/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 (Epoxy resin) GI (Polyimide resin) Flex Base Material IPC-FC-241/1 IPC-FC-241/11 Finish System Fused SnPb, HAL, 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

SECTION III
ALPHABETICAL LIST OF QUALIFIED MANUFACTURERS

MANUFACTURER'S NAME & ADDRESS	PLANT LOCATION	OTHER INFORMATION
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
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
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 Menuez PHONE #: 330-572-3400 FAX #: 330-572-3434 EMAIL: menuez@protocircuit.com
SAS Circuits, Inc. 10570 Bradford Road Littleton, CO 80127	Same	CAGE CODE: 75815 CONTACT: Frank Bauer PHONE #: 303-972-4105 FAX #: 303-933-2934 EMAIL: Frank@sascircuits.com

SECTION III
ALPHABETICAL LIST OF QUALIFIED MANUFACTURERS

MANUFACTURER'S NAME & ADDRESS	PLANT LOCATION	OTHER INFORMATION
Sanmina Tech Center East 40 Rogers Road Ward Hill, MA 01835	Same	CAGE CODE: 65316 CONTACT: Steve Aliquo PHONE #: 978-556-6152 FAX #: 978-556-6370 EMAIL: steve.aliquo@sanmina.com
Teradyne, Inc. Connection Systems Division 91 Northeastern Boulevard Nashua, New Hampshire 03062	Same	CAGE CODE: 3T000 CONTACT: Mark Buechner PHONE #: 603-791-3832 FAX #: 603-791-3080 EMAIL: Mark.Buechner@tcs.teradyne.com
Tyco Printed Circuits Group Austin Division 12501 Research Blvd., Module 1 Austin, TX 78759	Same	CAGE CODE: 1EHD4 CONTACT: Scott Grover PHONE #: (512) 250-6456 FAX #: (512) 250-7010 EMAIL: grover@tycoelectronics.com