



CAPABILITIES OVERVIEW

DOD CONTRACTS

ITAR REGISTERED

AEROSPACE APPROVED

MIL-PRF-31032

MIL-PRF-55110

AS9100D

ISO 9001

JCP REGISTERED

IPC-6012 CLASS 2/3A

UL CERTIFIED

MATERIALS

FR-4

STANDARD FR4.....	40 LAYERS
ISOLA FR406.....	40 LAYERS

HALOGEN FREE

VENTEC VT-441, VT-447.....	40 LAYERS
ISOLA TERRAGREEN.....	40 LAYERS

ROHS

ITEQ IT-180A.....	30 LAYERS
ISOLA 185HR.....	30 LAYERS
ISOLA 370HR.....	40 LAYERS
FR408HR.....	40 LAYERS
ISOLA I-TERA MT (RF/MW).....	40 LAYERS
NELCO BT-N5000.....	30 LAYERS
NELCO 4000-29.....	40 LAYERS
NELCO 4000-13 & 13SI.....	40 LAYERS
NELCO 4000-13EP & EPSI.....	40 LAYERS
POLYIMIDE.....	40 LAYERS
CYANATE ESTER.....	20 LAYERS

RF MATERIALS

ROGERS 3000 SERIES.....	20 LAYERS
(FR-4 W/ RO3000 CAPS)	
ROGERS 4003C & 4350B.....	20 LAYERS
ROGERS 5870/5880.....	8 LAYERS
TACONIC RF MATERIALS.....	2 LAYERS
ISOLA IS680.....	40 LAYERS
I-TERA RF MT.....	40 LAYERS
ISOLA ASTRA MT77.....	40 LAYERS

ADVANCED RF MATERIALS

NELCO 9000 SERIES (PTFE).....	2 LAYERS
ROGERS 6000 SERIES.....	4 LAYERS
ROGERS 5000 SERIES.....	2 LAYERS
ROGERS DICLAD 880.....	20 LAYERS
ROGERS AD300A.....	20 LAYERS
ROGERS CUCLAD 250 & 233.....	20 LAYERS
ROGERS CTLE.....	20 LAYERS
ISOLA I-SPEED.....	40 LAYERS
ARLON GENCLAD 280.....	10 LAYERS
ARLON LX250.....	10 LAYERS
ARLON GYN 2.17 DK.....	10 LAYERS

ADVANCED HDI & SIGNAL INTEGRITY

PANASONIC MEGTRON 6.....	AVAILABLE
3M ECM.....	AVAILABLE
ROHACELL.....	12 LAYERS
TACONIC FFASTRISE 27 & 28 BONDPLY.....	AVAILABLE
ISOLA TACHYON 100G.....	40 LAYERS
ISOLA I-TERA MT40.....	40 LAYERS
ROGERS 2929 BONDPLY.....	AVAILABLE
ARLON 6700 & 6250 BONDPLY.....	AVAILABLE

SPECIAL FEATURES

HEAVY COPPER.....	UP TO 20 OZ.
HEATSINKS.....	AVAILABLE
BACKPLATES.....	AVAILABLE
2 LYRS UP TO 37" X 96" W/ NPT'S.....	AVAILABLE
ROHACELL FOAM BONDING.....	AVAILABLE
BURIED CHIPS & RESISTORS.....	AVAILABLE
RESISTANCE & CONDUCTANCE TEST.....	AVAILABLE

FEATURE SIZE CAPABILITIES

INTERNAL LAYER CAPABILITIES

<i>MINIMUM CONDUCTOR WIDTH & SPACING:</i>	
INTERNAL STARTING COPPER WEIGHT 1/2 OZ.	▶ 0.00275" LINE / 0.003" SPACE
INTERNAL STARTING COPPER WEIGHT 1 OZ.	▶ 0.00375" LINE / 0.0045" SPACE
INTERNAL STARTING COPPER WEIGHT 2 OZ.	▶ 0.005" LINE / 0.006" SPACE
INTERNAL STARTING COPPER WEIGHT 3 OZ.	▶ 0.009" LINE / 0.011" SPACE
INTERNAL STARTING COPPER WEIGHT 4 OZ.	▶ 0.012" LINE / 0.016" SPACE

EXTERNAL LAYER CAPABILITIES

<i>MINIMUM CONDUCTOR WIDTH & SPACING:</i>	
EXTERNAL COPPER FINISHED THICKNESS 1.0 OZ.	▶ 0.00275" FINISHED
EXTERNAL COPPER FINISHED THICKNESS 1.5 OZ.	▶ 0.004" FINISHED
EXTERNAL COPPER FINISHED THICKNESS 2.0 OZ.	▶ 0.005" FINISHED
EXTERNAL COPPER FINISHED THICKNESS 3.0 OZ.	▶ 0.009" FINISHED
EXTERNAL COPPER FINISHED THICKNESS 4.0 OZ.	▶ 0.010" FINISHED
EXTERNAL COPPER FINISHED THICKNESS 5.0 OZ.	▶ 0.020" FINISHED
EXTERNAL COPPER FINISHED THICKNESS 6.0 OZ.	▶ 0.030" FINISHED
EXTERNAL COPPER FINISHED THICKNESS 7.0 OZ.	▶ 0.045" FINISHED
EXTERNAL COPPER FINISHED THICKNESS 8.0 OZ.	▶ 0.060" FINISHED

PAD DIAMETER TO DRILLED HOLE SIZE: IPC-6012 CLASS 2

COMPONENT HOLES.....	DRILLED SIZE PLUS 0.006"
VIA HOLES.....	DRILLED SIZE PLUS 0.006"

PAD DIAMETER TO DRILLED HOLE SIZE: IPC-6012 CLASS 3/3A

COMPONENT HOLES.....	DRILLED SIZE PLUS 0.012"
VIA HOLES.....	DRILLED SIZE PLUS 0.010"

PAD DIAMETER TO LASER ABLATED HOLE SIZE

MINIMUM.....	DRILLED SIZE PLUS 0.004"
STANDARD.....	DRILLED SIZE PLUS 0.008"

VIA-IN-PAD

EPOXY FILLED / NON-CONDUCTIVE:

EPOXY FILLED THRU HOLE CAPABILITY.....	YES
EPOXY FILLED THRU HOLE MINIMUM.....	0.004" FHS
EPOXY FILLED THRU HOLE MAXIMUM.....	0.040" FHS
MINIMUM BOARD THICKNESS.....	0.015"
MAXIMUM BOARD THICKNESS.....	0.187"
VIA FILL ASPECT RATIO.....	10:1

COPPER PLATED/FILLED:

COPPER FILLED μ VIA PROCESS.....	YES
COPPER FILLED μ VIA HOLE MIN.....	0.003" LASER DRILLED
COPPER FILLED μ VIA HOLE MAX.....	0.010" LASER DRILLED
VIA FILL ASPECT RATIO.....	0.75:1 STANDARD/1:1 ADVANCED

MECHANICAL

MACHINING DRILL CAPABILITIES

PRIMARY DRILLED HOLE LOCATION TOLERANCE TO DATUM ZERO (DTP).....	0.005"
2ND DRILL HOLE LOCATION TOLERANCE TO DATUM ZERO (DTP).....	0.005"
MINIMUM CLEARANCE FROM COPPER CONDUCTOR TO MECHANICAL DRILLED HOLE.....	0.004"
MINIMUM CLEARANCE FROM COPPER CONDUCTOR TO A LASER DRILLED HOLE.....	0.004"

PLATED THROUGH HOLES

SMALLEST PLATED THROUGH HOLE SIZE WITH 0.001" MINIMUM AVERAGE COPPER REQUIREMENT

FINISHED PANEL THICKNESS < 0.020".....	0.003" FINISHED HOLE
FINISHED PANEL THICKNESS 0.031".....	0.003" FINISHED HOLE
FINISHED PANEL THICKNESS 0.062".....	0.004" FINISHED HOLE
FINISHED PANEL THICKNESS 0.093".....	0.008" FINISHED HOLE
FINISHED PANEL THICKNESS 0.125".....	0.010" FINISHED HOLE
FINISHED PANEL THICKNESS 0.187".....	0.012" FINISHED HOLE
FINISHED PANEL THICKNESS 0.250".....	0.018" FINISHED HOLE (EXCLUDING HAL FINISH)
PLATED HOLE SIZE TOLERANCE.....	+/- 0.003" STANDARD ; +/- 0.002" SPECIAL
PLATED HOLE SIZE PRESS FIT APPLICATIONS.....	+/- 0.002" TYPICAL
ASPECT RATIO (WITH 0.010" DRILL).....	18:1 (0.007" FINISH IN 0.130" THICK)
PLATED HOLE SPACING MIN. (DRILLED HOLE TO HOLE).....	0.008"

NON-PLATED THROUGH HOLES

SMALLEST NON-PLATED HOLE SIZE.....	0.006"	LARGEST NON-PLATED HOLE SIZE ROUTED.....	NO LIMIT
NON-PLATED ROUTED HOLE TOLERANCE.....	+/- 0.005" TYPICAL; +/- 0.003" SPECIAL		
MINIMUM NPPTH TO EDGE OF BOARD SPACING.....	0.010"		

BLIND / BURIED VIAS (SEQUENTIAL LAMINATION)

MIN. FINISHED VIA HOLE DIAMETER (EPOXY FILLED).....	0.006"	MAX. FINISHED VIA HOLE DIAMETER (EPOXY FILLED).....	0.04"
MAX. ASPECT RATIO FOR EPOXY FILLED VIA HOLES.....	10:1		
AVAILABLE EPOXY FILL TYPES.....	CONDUCTIVE & NON-CONDUCTIVE		

HDI / LASER MICROVIA (μ VIA) CAPABILITIES

SMALLEST (AS ABLATED) LASER VIA.....	0.003"	LARGEST (AS ABLATED) LASER VIA.....	0.010"
VIA ASPECT RATIO (DEPTH TO DIAMETER).....	0.75:1 STANDARD; 1:1 ADVANCED		
CAPTURE PAD SIZE.....	μ VIA +0.008" STANDARD; μ VIA +0.006" ADVANCED		
LANDING PAD SIZE.....	μ VIA +0.008" STANDARD; μ VIA +0.006" ADVANCED		
STACKED VIA.....	YES	COPPER FILLED MICROVIA.....	YES
TYPE I CAPABILITIES.....	YES		
TYPE II CAPABILITIES.....	YES		
TYPE III CAPABILITIES.....	DESIGN DEPENDENT		

CONTROL DEPTH / BACK DRILLING CAPABILITIES

BACKDRILL - PTH STUB REMOVAL.....	PTH + 0.010" DIAMETER (TYPICAL)		
MINIMUM BACKSIDE DIELECTRIC SEPARATION.....	0.005"		
CONTROL DEPTH DRILL DEPTH TOLERANCE.....	+/- 0.004"		
EDGE MILLING AVAILABLE.....	YES		
MINIMUM BACK DRILL DIAMETER.....	0.014"		
DRILLED HOLE OVER FINISHED HOLE SIZE.....	0.010"		
DRILL DEPTH TOLERANCE.....	0.005" TYPICAL; 0.004" MINIMUM		

SCORING CAPABILITIES

ANGLES.....	STANDARD 30°; AVAILABLE 20°, 45°, & 60°		
OFFSET TOLERANCE.....	+/- 0.005"		
OPTIMUM REMAINING WEB THICKNESS.....	TYPICAL MAX. 1/3 OF THICKNESS		
REMAINING WEB TOLERANCE.....	+/- 0.005"	TRUE POSITION TOLERANCE.....	+/- 0.005"

EDGE CONNECTOR BEVEL CAPABILITIES

FINGER TIP ANGLE.....	15°, 20°, 30°, 45°		
BEVEL DEPTH TOLERANCE.....	+/- 0.005"		

PROFILE CAPABILITIES

STANDARD ROUTER BIT DIAMETER.....	0.093", 0.062", 0.031" (ROUTER BITS); 0.021" SPECIAL		
ROUTED PROFILE TOLERANCE.....	+/- 0.005" STANDARD; +/- 0.004" SPECIAL		
MINIMUM INTERNAL ROUT RADIUS.....	0.0105"		
MINIMUM ROUTED PTH SLOT WIDTH.....	0.022" TYPICAL W/ 0.008" MIN.		
CONTROLLED DEPTH MILLING.....	YES		
LASER ROUTING.....	0.001" MIN. RADIUS		

SOLDER MASK & LEGEND

SOLDER MASK

MIN. LPI SOLDER MASK CLEARANCE (FLOOD)

- ▶ 0.002" / SIDE (PAD SIZE + 0.004")

MIN. LPI SOLDER MASK CLEARANCE (LDI IMAGED)

- ▶ 1:1 (DESIGN DEPENDENT)

PAD SIZE LARGER THAN NPPTH

- ▶ 0.005" / SIDE (PAD SIZE + 0.010")

WEB BETWEEN SURFACE MOUNT PADS

- ▶ 0.004" PREFERRED, 0.002" MINIMUM (GREEN)

LEW PROCESSING

- ▶ 0.005" MIN. LEW / CLEAR UNDERCOAT

SOLDER MASK COLORS

- ▶ GREEN, MATTE GREEN, BLUE, RED, BLACK, MATTE BLACK, YELLOW, LEW WHITE, WHITE, ORANGE, PURPLE, PINK, BROWN, CLEAR

SOLDER MASK TYPE

- ▶ LIQUID PHOTO IMAGEABLE (LPI)
- ▶ LASER DIRECT IMAGING (LDI) SPECIAL

MIN. MASK DEFINED PAD DIAMETER..... 0.005"

SOLDER MASK PLUGGED VIAS..... YES

LEGEND

PRINTED LEGEND MINIMUM STROKE/WIDTH..... 0.005"

LPI LEGEND CAPABILITY..... YES

LPI LEGEND MINIMUM STROKE/WIDTH..... 0.002"

SCREENED / LPI LEGEND COLORS

- ▶ WHITE, BLACK, YELLOW, RED, BLUE

SERIALIZATION / UNIQUE SERIALIZATION..... YES

SURFACE FINISH OPTIONS

SURFACE FINISH SELECTION

HOT AIR SOLDER LEVEL (LEAD-FREE, LEAD BASED).... YES

IMMERSION SILVER..... YES

OSP..... YES (OUTSOURCED)

ELECTROLESS NICKEL IMMERSION GOLD..... YES

ENEPIG..... YES

IMMERSION TIN..... YES (OUTSOURCED)

FULL BODY GOLD..... YES

BONDABLE GOLD..... YES (OUTSOURCED)

PLATED NICKEL..... YES

ELECTROLESS NICKEL..... YES

COPPER..... YES

HOT OIL REFLOW..... YES

MIXED FINISHES

HASL WITH SELECTIVE GOLD..... YES

DUAL GOLD PLATING..... YES

IMMERSION GOLD W/ HARD GOLD ON FINGERS..... YES

RECESSED FINGERS..... YES

USABLE PANEL AREA

FOR 12" X 18" PANEL..... 10" X 16" (UP TO 40 LAYERS)

FOR 18" X 24" PANEL..... 16.6" X 22" (UP TO 40 LAYERS)

FOR 18" X 27" PANEL..... 16" X 25" (UP TO 8 LAYERS)

FOR 18" X 32" PANEL..... 16" X 30" (UP TO 8 LAYERS)

FOR 18" X 36" PANEL..... 16" X 34" (UP TO 8 LAYERS)

FOR 18" X 42" PANEL..... 16" X 40" (UP TO 8 LAYERS)

FOR 18" X 54" PANEL..... 16" X 52" (UP TO 8 LAYERS)

FOR 21" X 24" PANEL..... 19" X 22" (UP TO 30 LAYERS)

FOR 21" X 60" PANEL..... 18" X 58" (UP TO 8 LAYERS)

FOR 24" X 30" PANEL..... 22" X 28" (UP TO 8 LAYERS)

STACK UP

OVERALL BOARD THICKNESS..... 0.010" - 0.250"

OVERALL BOARD TOLERANCES:

<0.020"..... STANDARD +/-0.004" SPECIAL +/-0.003"

0.031"..... STANDARD +/-0.004" SPECIAL +/-0.003"

0.062"..... STANDARD +/-0.006" SPECIAL +/-0.003"

0.093"..... STANDARD +/-0.009" SPECIAL +/-0.006"

0.125"..... STANDARD +/-0.012" SPECIAL +/-0.009"

0.187"..... STANDARD +/-0.018" SPECIAL +/-0.014"

0.250"..... STANDARD +/-0.025" SPECIAL +/-0.018"

THINNEST DIELECTRIC FINISHED:

OVERALL THICKNESS..... 0.010" 2 LAYER / 0.015" 4 LAYER

THINNEST PLATED CORE..... 0.004"

ELECTRICAL PERFORMANCE

TDR TEST TOLERANCE (PRINT & ETCH)

- ▶ STANDARD 10% / ADVANCED 5%

TDR TEST TOLERANCE (PLATED COPPER)

- ▶ STANDARD 10% / ADVANCED 5%

TDR TEST TOLERANCE DIFFERENTIAL MEASUREMENTS

- ▶ STANDARD 10% / ADVANCED 5%

TDR TOLERANCE SINGLE ENDED TOLERANCE

- ▶ STANDARD 10% / ADVANCED 5%

HIPOT TESTING (AC & DC)

DATA & DOCUMENTATION

TOOLING FORMATS

FILM DATA FORMATS

- ▶ DXF; RS-274-X; RS-274-D; ODB++

DRILL DATA FORMATS

- ▶ ASCII, EXCELLON FORMAT; RS-274-X; RS-274-D

ELECTRICAL TEST FORMATS

- ▶ IPC-D356

NETLIST COMPARE FORMATS

- ▶ IPC-D356; IPC-D356A

TOOLING COMMUNICATION

COMPRESSION FORMATS

- ▶ ZIP; TAR; TGZ

SECURED DATA TRANSFER METHODS

- ▶ SECURE DATA TRANSFER; PGP

MILITARY

ETCH BACK

IPC CLASS 3 ETCHBACK SPECIFICATION..... 0.0002"-0.002"

TESTING CAPABILITIES

MIN. TEST CONTINUITY RESISTANCE..... 0.1 OHMS

MAX. TEST VOLTAGE..... 1000 VOLTS

MAX. TEST ISOLATED RESISTANCE..... 25 MOHM-2GOHM

LARGEST TEST - FIXTURED..... 16" X 22"

LARGEST TEST - FLYING PROBE..... 27" X 24"

E-TEST PITCH (FIXTURE TEST)..... 0.020"

E-TEST PITCH (FLYING PROBE TEST)..... 0.004"

DC LINE RESISTANCE TESTING..... YES