

 Time-To-Market Interconnect Solutions™	All values in Inches			Rev 4 (5-24-15)
	Chippewa Falls			
	Standard	Advanced	Development	
<b>Physical Characteristics</b>				
Min. Board Thickness	0.030	0.025	0.020	
Max Board Thickness - All Finishes	.150	.200	.320	
Thickness Tolerance	+/- 10%	+/- 8%	+/- 8%	
Through Hole Aspect Ratio	15:1 (9.8 Drill)	18:1 (9.8 Drill)	> 19:1	
Bow and Twist (Balanced)	0.007"/inch	0.005"/inch	.005"/inch	
Panel Sizes	16.5 x 18.5 18.5 x 24.5 21.5 x 24.5 24.5 x 27.5 21.5 x 27.5			
<b>Technology</b>				
Microvias	Yes	Yes	Yes	
Blind Vias	Sub-assy Drill/Sequential Lam	Sub-assy Drill/Sequential Lam	Sub-assy Drill/Sequential Lam	
Buried Vias	≥.005" DS core, ≤15:1 a/r Mutlit-layer			
Thin Core Pwr/Gnd	.002	.001	.0005	
Buried Resistor	N/A	N/A	N/A	
<b>Inner Layers</b>				
Minimum Line/Space				
H oz	.003"/.003"	.0025"/.0025"	.002"/.002"	
1 oz	.0035"/.0035"	.003"/.003"		
2 oz	.0055"/.0055"	.005"/.005"		
3 oz	.006"/.012"	.005"/.010"		
4 oz	.007"/.013"			
5 oz	.008"/.014"			
Feature Tolerance 1/2 - 1 oz	+/- .0005" for Impedance Lines	+/- .00025" for Impedance Lines		
Feature Tolerance 2 - 5 oz	+/- .001" (2 oz) +/- .003" (5 oz)			
Innerlayer Cu to Edge				
PTH (DHS) to Copper (Drill to Copper)	≥.008"	≥.007"	≥.006"	
NPT Hole/Slot to Copper, Second Drill	≥.008"			
Antipad Size	DHS + .018"	DHS + .016"	DHS + .014"	
Annular Ring Requirements for Drilled Holes <.026"				
Tangency	DHS + .010"	DHS + .008"		
1 mil Annular Ring	DHS + .010"	DHS + .009"	DHS + .008"	
<b>Outer Layers</b>				
Minimum Line/Space				
3/8 oz Base	.003"/.003"	.0025"/.003"		
1/2 oz Base	.0035"/.004"	.003"/.0035"		
1 oz Base	.005"/.005"			
2 oz Base	.006"/.008"			
3 oz Base	.008"/.012"			
4 oz Base	.010"/.014"			
5 oz Base	.012"/.016"			
Feature Attributes				
PTH to Copper	≥.007"	≥.006"		
NPT Hole/Slot to Copper	≥.010"	≥.007" (Second Drill)		
Rout to O/L Copper	≥.010"	≥.006"		
Score to O/L Copper	.020"	≥.015"		


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 Time-To-Market Interconnect Solutions™	All values in Inches			Rev 4 (5-24-15)
	Chippewa Falls			
	Standard	Advanced	Development	
<b>Drill</b>				
Min. Drill Size	.0098" (≤.130" thick .0079")	.0079"	.0059"	
Min. Blind Drill Hole Size (Controlled Depth Drilling)	.0098" (Conical)	.0083" (Conical)	.0059" (Conical)	
Min. Slot Width - Std.	.024"	.0138"		
Min. Positional Tolerance	.004" DTP	.003" DTP		
Min. PTH Tolerance (Primary Drill)	+/- .002" press fit	+/- .0015 press fit	+/- .001" press fit	
Min. Tolerance of Plated Cut Out	+/- .005"	+/- .003"		
Counter Bore/Sink Tolerance	≥ +/- .010" depth	+/- .008" depth		
Max. NPT (hole/slot) in Primary Drill	.220" (radius, width or length)	>220", ≤.250" (radius, width, or length)		
Backdrill Size Over Primary Drill	.008"	.006"	.005"	
Backdrill Stub Length	.009 +/- .007	.008" +/- .006	.007" +/- .005	
<b>Microvia</b>				
Laser via diameter	.005"	.005"	.004"	
Capture/Target pads	DHS + .007"	DHS + .006"	DHS + .005"	
Aspect Ratio	.75:1	.85:1	.9:1	
1 Layer Build Up	Yes			
2 Layer Build Up	Yes			
3+ Layer Build Up	Yes			
4+ Layer Build Up	No			
AnyLayer	No			
Laser Via Stacked on Buried Via	Yes			
Skip Via (ex 1-3)	Yes			
<b>Via in Pad (through hole)</b>				
Non-Conductive Via Fill	Yes			
Line width and Spacing (wrap)	> .005"	> .004" < .004" no wrap process		
Microvia Non-Conductive Via Fill	Yes			
Conductive Via Fill	Outsourced			
Laser Direct Imaging	Yes - sublams and all external			
<b>Plating/Surface Finish</b>				
HASL	Outsourced			
Immersion Gold (ENIG)	Yes			
Immersion Ni/Pd/Au	Outsourced			
Electrolytic Ni/Au Tab Plating	Yes			
Electrolytic Ni/Au (Hard Gold)	Yes			
Organic Solderability Preservative	Yes			
Immersion Silver	Yes			
Immersion Tin	Outsourced			
Selective ENIG or ENEPIG	Yes			
Wirebondable Soft Au	Outsourced			
OSP + Electroplate Ni-Au	Yes			
Fused Tin/Lead	No			


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 Time-To-Market Interconnect Solutions™	All values in Inches		Rev 4 (5-24-15)
	Chippewa Falls		
	Standard	Advanced	Development
<b>Soldermask</b>			
Type	LPI	LDI	Dryfilm
Colors	Green/Red/Blue/Black	Purple/White/Clear/Amber	
Thickness	.00035" - .0007" on top of circuit		
3/8 - 1 oz Base Copper			
Min. Web	.0025"	LDI S/M .002"	
Min. Clearance	.002"	LDI S/M .0015"	
<b>Legend</b>			
Text Width	.004" min.	.003" min.	
Color	White	Yellow, other	
LPI	Yes		
Inkjet	Yes		
<b>Fabrication</b>			
<b>Rout</b>			
Diameter Router Bits Available	.031" - .125"		
Edge to Edge Tolerance	+/- .005"	+/- .003"	
<b>Score</b>			
Score Angles	45°	20°, 30° and 60°	
Positional Tolerance to Datum	+/- .005"		
Front to Back Tolerance	+/- .005"	+/- .003"	
Remaining Web Tolerance	+/- .005"	+/- .003"	
<b>Bevel</b>			
Bevel Angles	20°, 30°, 45°, 60°		
Depth Tolerance	+ .010"/- .015"	+/- .005" smart bevel	
<b>Electrical Test &amp; Performance</b>			
Min. Component Pitch	.016"	<.016"	
Max. Test Voltage	300 Volts	1000 Volts (prober)	
Max. Isolation Resistance	20 M Ohms	100 M Ohms	
Min. Continuity Resistance	20 Ohms	5 Ohms	5 Ohms
Hi Pot Test (Machine Capability)			
	500 VDC for 10 sec.	1200 VDC for 30 sec.	5000 VDC for 30 sec.
		Design dependant	Design dependant
Impedance Tolerance 51-100 ohms	+/- 10%	+/- 8%	+/- 7%
Impedance Tolerance 28-50 Ohms	+/- 10%	+/- 8%	+/- 7%
DC Resistance Testing	Yes	Yes	Yes
Kelvin Test		>2 milli ohms for resistance measurements of through holes. Detecting low plating caused by debris.	
Signal Loss measurement		SPP	SET2DIL
Latent Test			Latent defect detection for traces with resistance under 5 ohms. Still in development stages.


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 Time-To-Market Interconnect Solutions™	Logan		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness	0.020		<0.020
Max Board Thickness - All Finishes	.350	.350-.450	>.450
Thickness Tolerance	+/-10%	+/-8%	< +/- 8%
Through Hole Aspect Ratio	14:1 (9.8 Drill)	18:1	
Bow and Twist (Balanced)	>/=0.007"/inch	>/=0.005"/inch	<.005"/inch
Panel Sizes	18 x 24 18.5 x 24.5 18.5 x 27.5 21.5 x 24.5 21.5 x 27.5	24 x 27 24 x 31 (backplane only) 24 x 36 (backplane only)	
<b>Technology</b>			
Microvias	Yes	Yes	Yes
Blind Vias	Control Depth / Sequential lam	Control Depth / Sequential lam	
Buried Vias	≥.005" DS core, ≤.10:1 a/r ML		
Thin Core Pwr/Gnd	.002	.001	
Buried Resistor	No		
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	.0035" / .0035"	.003" / .0035"	.003" / .003"
1 oz	.004" / .004"	.0035" / .004"	
2 oz	.005" / .007"	.005"/.005"	
3 oz	.006" / .009"		
4 oz	.007" / .010"		
5 oz	.008" / .011"	6 oz = .010"/.012"	
Feature Tolerance 1/2 - 1 oz	+/- 10%, +/- .0005 for Impedance Lines	+/- .0003 for Impedance Lines	
Feature Tolerance 2 - 5 oz	+/- 20%	+/-10%	
Innerlayer Cu to Edge			
PTH (DHS) to Copper (Drill to Copper)	>=.008"	<.008	
NPT Hole/Slot to Copper, Second Drill	>=.010"	<.010	
Antipad Size	>=.020" Larger than Drill Tool	>=.016" Larger than Drill Tool	
Annular Ring Requirements for Drilled Holes <			
Tangency	DHS + .0009"	DHS + .008"	
1 mil Annular Ring	DHS + .011"	DHS + .010"	
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base	.0035"/.0035"	.003"/.003"	
1/2 oz Base	.0035" / .004"	.0035" / .0035"	
1 oz Base	.005" / .005"	.004" / .004"	
2 oz Base	.006" / .008"		
3 oz Base	.008" / .010"		
4 oz Base	.010" / .013"		
5 oz Base	.012"/.015"		
Feature Attributes			
PTH to Copper	>/=.008"	.007" - .0079"	>=.0065"
NPT Hole/Slot to Copper	>/=.008"	>/=.004" (Second Drill)	
Rout to O/L Copper	>=.010"	>=.006"	
Score to O/L Copper	.020"		


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 Time-To-Market Interconnect Solutions™		Logan		
		Standard	Advanced	Development
<b>Drill</b>				
Min. Drill Size		.0091"	.0079"	
Min. Blind Drill Hole Size (Controlled Depth Drilling)		>=.012"	.0098"	<.010"
Min. Slot Width - Std.		0.024" (Step Drill)	.020 (Step Drill)	
Min. Positional Tolerance		.003" DTP		
Min. PTH Tolerance (Primary Drill)		Range of .006" Range of .004" for press fit holes	Range of .004" whisper connector +/- .0015"	
Min. Tolerance of Plated Cut Out		+/- .005"	+/- .003"	
Counter Bore/Sink Tolerance		>= +/-0.007" depth	< +/-0.007" depth	
Max. NPT (hole/slot) in Primary Drill		0.220" (radius, width or length)		
Backdrill Size Over Primary Drill		.008"	.006"	
Backdrill Stub Length		.009 +/- .007	.008" +/- .006	.007" +/- .005
<b>Microvia</b>				
Laser via diameter		.006"	.006"	
Capture/Target pads		DHS + .007"	DHS + .006"	
Aspect Ratio		.75:1		
1 Layer Build Up		Yes		
2 Layer Build Up		No		
3+ Layer Build Up		No		
4+ Layer Build Up		No		
AnyLayer		No		
Laser Via Stacked on Buried Via		No		
Skip Via (ex 1-3)		Yes		
<b>Via in Pad (through hole)</b>				
Non-Conductive Via Fill		Yes		
Line width and Spacing (wrap)		.004"/.004"		
Microvia Non-Conductive Via Fill		Yes		
Conductive Via Fill		Outsourced		
Laser Direct Imaging		I/L, O/L, Soldermask		
<b>Plating/Surface Finish</b>				
HASL		Yes		
Immersion Gold (ENIG)		Yes		
Immersion Ni/Pd/Au		Outsourced		
Electrolytic Ni/Au Tab Plating		Yes		
Electrolytic Ni/Au (Hard Gold)		Yes		
Organic Solderability Preservative		Yes		
Immersion Silver		Yes		
Immersion Tin		Outsourced		
Selective ENIG or ENEPIG		Yes		
Wirebondable Soft Au		Outsourced		
OSP + Electroplate Ni-Au		Yes		
Fused Tin/Lead		No		


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		Logan	
		Standard	Advanced
			Development
Soldermask			
Type	STD - Taiyo PSR4000 HFX & BN	Dry Film	
Colors	Green/Red/Blue/Clear	White/Black/Orange	
Thickness	.0003 " - .002"		
3/8 - 1 oz Base Copper			
Min. Web	.003"	.002"	
Min. Clearance	.003"	.002"	
Legend			
Text Width	.004"	.002 (ink jet)	
Color	White	Yellow, other	
LPI	White	Other Colors	
Inkjet	Yes		
Fabrication			
Rout			
Diameter Router Bits Available	.031" - .125"		
Edge to Edge Tolerance	+/-0.005"	+/- .003	
Score			
Score Angles	30°		
Positional Tolerance to Datum	+/-0.005"		
Front to Back Tolerance	+/-0.005"		
Remaining Web Tolerance	+/- .004"	+/- .003"	
Bevel			
Bevel Angles	15°, 20°, 25°, 30°, 45°		
Depth Tolerance	+/- .005		
Electrical Test & Performance			
Min. Component Pitch	0.016"	<.016"	
Max. Test Voltage	250 Volts	1000 Volts	
Max. Isolation Resistance	10 M Ohms	100 M Ohms	
Min. Continuity Resistance	10 Ohms	5 Ohms	
Hi Pot Test (Machine Capability)	500 VDC for 10 sec. (layers)		
	1000 VDC for 30 Seconds	5000 VDC for 30 Seconds	
Impedance Tolerance 51-100 ohms	+/- 10%	+/-8%	
Impedance Tolerance 28-50 Ohms	+/- 10%	+/-8%	
DC Resistance Testing	Yes		
Kelvin Test			
Signal Loss measurement	Outsourced		
Latent Test			

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 Time-To-Market Interconnect Solutions™	Santa Ana		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness	0.030"	0.025"	0.020"
Max Board Thickness - All Finishes	0.150"	0.250"	0.275"
Thickness Tolerance	+/-10%	+/-8%	
Through Hole Aspect Ratio	12:1	13:1 - 18:1	>18:1
Bow and Twist (Balanced)	0.0075"/inch	0.005"/inch	
Panel Sizes	16x21, 18x24, 21x24	21x28, 24x28	
<b>Technology</b>			
Microvias	Yes	Yes	Yes
Blind Vias	Yes	Yes	Yes
Buried Vias	Yes	Yes	Yes
Thin Core Pwr/Gnd	0.002"	0.001"	
Buried Resistor	Ohmega, Ticer 10, 25, 50, 100 ohm/sq	Ohmega, Ticer 10, 25, 50, 100 ohm/sq	
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	.00265"/.00290"	.00215"/.00240"	<.002"/.002"
1 oz	.00300"/.00350"	.00250"/.00300"	
2 oz	.00350"/.00475"	.00300"/.00425"	
3 oz	.00400"/.00600"	.00350"/.00550"	
4 oz			
5 oz			
Feature Tolerance 1/2 - 1 oz	±.0005" impedance lines (or IPC)	±.0003" impedance lines (or IPC)	
Feature Tolerance 2 - 5 oz	±.001" - .0025" (or IPC)		
Innerlayer Cu to Edge			
PTH (DHS) to Copper (Drill to Copper)	.008"	.007"	.005"
NPT Hole/Slot to Copper, Second Drill	.010"	.009"	
Antipad Size	Drill + .018"	Drill + .016"	Drill + .014"
Annular Ring Requirements for Drilled Holes <			
Tangency	Drill + .010"	Drill + .008"	
1 mil Annular Ring			
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base	.00330" / .00355"	.00280" / .00305"	
1/2 oz Base	.00340" / .00390"	.00290" / .00340"	
1 oz Base	.00350" / .00500"	.00300" / .00450"	
2 oz Base	.00450" / .00800"	.00400" / .00750"	
3 oz Base	.00550" / .01100"	.00500" / .01050"	
4 oz Base			
5 oz Base			
Feature Attributes			
PTH to Copper	.008"	.007"	
NPT Hole/Slot to Copper	.010"	.009"	
Rout to O/L Copper	.010"	.005"	
Score to O/L Copper	.010"	.005"	

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 Time-To-Market Interconnect Solutions™	Santa Ana		
	Standard	Advanced	Development
<b>Drill</b>			
Min. Drill Size	.0079"	.0059"	.0050"
Min. Blind Drill Hole Size (Controlled Depth Drilling)	.0118"	.0098"	
Min. Slot Width - Std.	0.0236"	.0138"	
Min. Positional Tolerance	.004"	.003"	
Min. PTH Tolerance (Primary Drill)	+/- .002" press fit	+/- .0015 press fit	+/- .001" press fit
Min. Tolerance of Plated Cut Out	+/- .005"	+/- .003"	
Counter Bore/Sink Tolerance	+/- .005" depth	+/- .003"	
Max. NPT (hole/slot) in Primary Drill	0.221" (radius, width or length)	0.2559"	
Backdrill Size Over Primary Drill	.008"	.006"	.005
Backdrill Stub Length	.009 +/- .007	.008" +/- .006	.007" +/- .005
<b>Microvia</b>			
Laser via diameter	.006"	.005"	.004"
Capture/Target pads	D+ .006"	D+ .005"	D+ .004"
Aspect Ratio	≤ 0.75:1	0.85:1	1:1
1 Layer Build Up	Yes		
2 Layer Build Up	Yes		
3+ Layer Build Up	Yes		
4+ Layer Build Up		Yes	
AnyLayer			Yes
Laser Via Stacked on Buried Via		Yes	
Skip Via (ex 1-3)		Yes	
<b>Via in Pad (through hole)</b>			
Non-Conductive Via Fill	Yes		
Line width and Spacing (wrap)	.00310"/.00435" (1/2 oz)	.00300"/.00415" (1/2 oz)	
Microvia Non-Conductive Via Fill			
Conductive Via Fill	Yes (Outsourced)		
Laser Direct Imaging	Yes		
<b>Plating/Surface Finish</b>			
HASL	Yes		
Immersion Gold (ENIG)	Yes		
Immersion Ni/Pd/Au	Yes (Outsourced)		
Electrolytic Ni/Au Tab Plating	Yes		
Electrolytic Ni/Au (Hard Gold)	Yes		
Organic Solderability Preservative	Yes		
Immersion Silver	Yes		
Immersion Tin	Yes (Outsourced)		
Selective ENIG or ENEPIG	Yes (ENEPIG Outsourced)		
Wirebondable Soft Au	Yes (Outsourced)		
OSP + Electroplate Ni-Au	Yes		
Fused Tin/Lead	Yes (Outsourced)		


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 Time-To-Market Interconnect Solutions™	Santa Ana		
	Standard	Advanced	Development
<b>Soldermask</b>			
Type	Taiyo LPI PSR4000	Taiyo LDI JA	
Colors	Green/Red/Blue	All Other Colors	
Thickness	.0005"on top of circuit		
3/8 - 1 oz Base Copper			
Min. Web	.003"	.002"	
Min. Clearance	.002"	LDI S/M .0010"	No clearance (LDI)
<b>Legend</b>			
Text Width	0.005"	.003"	
Color	White	Other Colors	
LPI	Yes		
Inkjet	Yes		
<b>Fabrication</b>			
<b>Rout</b>			
Diameter Router Bits Available	.024" - .125"		
Edge to Edge Tolerance	+/-0.005"	+/- .003	
<b>Score</b>			
Score Angles	20°, 30° & 45°		
Positional Tolerance to Datum	+/-0.005"	± 0.004"	
Front to Back Tolerance	+/-0.005"	± 0.003"	
Remaining Web Tolerance	+/- .004"	± 0.003"	
<b>Bevel</b>			
Bevel Angles	20°, 30°, 45°		
Depth Tolerance	± .005		
<b>Electrical Test &amp; Performance</b>			
Min. Component Pitch	0.016"	<0.016"	
Max. Test Voltage	250 Volts	1000 Volts	
Max. Isolation Resistance	10 M Ohms	100 M Ohms	
Min. Continuity Resistance	10 Ohms	5 Ohms	
Hi Pot Test (Machine Capability)	500 VDC	5000 VDC	
Impedance Tolerance 51-100 ohms	+/-10%	+/-8%	+/-5%
Impedance Tolerance 28-50 Ohms			
DC Resistance Testing	Yes		
Kelvin Test		Yes	
Signal Loss measurement	No		
Latent Test	No		

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 Time-To-Market Interconnect Solutions™	Santa Clara		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness	0.005"	0.003"	
Max Board Thickness - All Finishes	.200"	.230"	
Thickness Tolerance	±10%	± 8%	
Through Hole Aspect Ratio	8:1	10:1	12:1
Bow and Twist (Balanced)	IPC standard	< 0.5%	Design dependent
Panel Sizes	18.x24, 12x18, 18.5x24.5 .75" rigid & 1.5" flex and rigid flex border	21x24 & 21.5x24.5 panel .75" rigid & 1.5" flex and rigid flex border	21x26 .75" rigid
<b>Technology</b>			
Microvias	Yes	Yes	Yes
Blind Vias	single & multiple lam-cycles	Sequential lam stacked microvias	
Buried Vias	Yes, laser & mechanical		
Thin Core Pwr/Gnd			
Buried Resistor	Yes outsourced (25-100 ohms)		
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	.004" / .004"	.0035" / .003"	
1 oz	.0045" / .004"	.004" / .004"	
2 oz	.0065" / .0055"	.006" / .0035"	
3 oz	.010" / .010"	.0085" / .0085"	
4 oz			
5 oz			
Feature Tolerance 1/2 - 1 oz	+/- 20% (±.0007")	±10% (±.0005" for CI)	± 5% design dependent
Feature Tolerance 2 - 5 oz	± 20% (±.002")	Design dependent	
Innerlayer Cu to Edge			
PTH (DHS) to Copper (Drill to Copper)	≥ 0.010"	≥ 0.008"	≥ 0.007
NPT Hole/Slot to Copper, Second Drill	≥ 0.015"	≥ 0.010"	
Antipad Size	DHS + .020"	DHS + .016"	design dependent
Annular Ring Requirements for Drilled Holes <			
Tangency	DHS + .010"	DHS + .008"	D+ .006"
1 mil Annular Ring	DHS + .012"	DHS + .010"	D+ .008"
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base	.004" / .004"	.003" / .003"	
1/2 oz Base	.0045" / .0045"	.0035" / .0035"	
1 oz Base	.0055" / .0055"	.0045" / .0045"	
2 oz Base	.0075" / .0065"	.0065" / .0065"	
3 oz Base	.010" / .010"	.0085" / .0085"	
4 oz Base			
5 oz Base			
Feature Attributes			
PTH to Copper	0.010"	0.008"	
NPT Hole/Slot to Copper	0.008"	≥ .004" (second drill)	
Rout to O/L Copper	≥ 0.008"	≥ 0.006"	
Score to O/L Copper	.020"		

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 Time-To-Market Interconnect Solutions™	Santa Clara		
	Standard	Advanced	Development
<b>Drill</b>			
Min. Drill Size	.0098"	.0079"	< .008" with laser
Min. Blind Drill Hole Size (Controlled Depth Drilling)	.010"	.008"	<.008" with laser
Min. Slot Width - Std.	0.024" (Step Drill)	.020 (Step Drill)	
Min. Positional Tolerance	0.006" DTP MMC per GD&T	0.005" DTP MMC per GD&T	
Min. PTH Tolerance (Primary Drill)	± 0.003"	± 0.002"	
Min. Tolerance of Plated Cut Out	+/- .005"	+/- .003"	
Counter Bore/Sink Tolerance	≥ ± 0.010"	+/- .005"	
Max. NPT (hole/slot) in Primary Drill	0.186"	Design dependent	
Backdrill Size Over Primary Drill	.010"		
Backdrill Stub Length	+/- .005"		
<b>Microvia</b>			
Laser via diameter	.006"	.005"	
Capture/Target pads	D + 0.006"	D + 0.005"	
Aspect Ratio	< 0.65:1	0.75:1	
1 Layer Build Up	Yes (plated-shut & epoxy-filled)		
2 Layer Build Up	Yes (plated-shut no wrap)		
3+ Layer Build Up	Yes (plated-shut no wrap)		
4+ Layer Build Up			
AnyLayer			
Laser Via Stacked on Buried Via	Yes		
Skip Via (ex 1-3)		YES	
<b>Via in Pad (through hole)</b>			
Non-Conductive Via Fill	YES	YES	
Line width and Spacing (wrap)	.005 / .005	.004 / .004	
Microvia Non-Conductive Via Fill		YES	
Conductive Via Fill	YES		
Laser Direct Imaging	YES Internal, External & Soldermask		
<b>Plating/Surface Finish</b>			
HASL	YES		
Immersion Gold (ENIG)	YES		
Immersion Ni/Pd/Au	Yes outside source		
Electrolytic Ni/Au Tab Plating	Yes outside source		
Electrolytic Ni/Au (Hard Gold)	Yes outside source		
Organic Solderability Preservative	Yes outside source		
Immersion Silver	Yes outside source		
Immersion Tin	Yes outside source		
Selective ENIG or ENEPIG		Yes outside source	
Wirebondable Soft Au		Yes outside source	
OSP + Electroplate Ni-Au		Yes outside source	
Fused Tin/Lead	YES		

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	Santa Clara		
	Standard	Advanced	Development
<b>Soldermask</b>			
Type	Taiyo LPI, PSR4000 BN, PSR4000 LDI, MP	dry film, flexible LPI	
Colors	Red, blue, black, white, green and clear		
Thickness	0.0002" min.	Double coat	
3/8 - 1 oz Base Copper			
Min. Web	.00035"	.00035"	
Min. Clearance	.0003"	.0002"	
<b>Legend</b>			
Text Width	.007"	.003"	
Color	white, yellow, black, red, orange	NASA outgassing compliant	
LPI		YES	
Inkjet	YES		
<b>Fabrication</b>			
<b>Rout</b>			
Diameter Router Bits Available	.026" - .125"		
Edge to Edge Tolerance	± 0.005"	± 0.003	
<b>Score</b>			
Score Angles	30°, 45°, 60°		
Positional Tolerance to Datum	± 0.006"	± 0.005"	
Front to Back Tolerance	± 0.005"		
Remaining Web Tolerance	± 0.005"	± 0.003"	
<b>Bevel</b>			
Bevel Angles	20°, 30°, 45°		
Depth Tolerance	± 0.010"		
<b>Electrical Test &amp; Performance</b>			
Min. Component Pitch	.015"	<.015" - .010	
Max. Test Voltage	250 Volts	500 volts	1000Volts
Max. Isolation Resistance	100 Mohms	200 M Ohms	
Min. Continuity Resistance	10 Ohms	5 Ohms	
Hi Pot Test (Machine Capability)			
	1000 VDC for 30 Seconds	6000 VDC, unlimited	
Impedance Tolerance 51-100 ohms	<+/- 10%	<+/- 7.5%	
Impedance Tolerance 28-50 Ohms	<+/- 15%	<+/- 10%	
DC Resistance Testing			
Kelvin Test			
Signal Loss measurement			
Latent Test			

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 Time-To-Market Interconnect Solutions™	San Diego		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness			
Max Board Thickness - All Finishes	0.020" - .300"	<.020, >.300	>.400
Thickness Tolerance	+/- 10%	+/- 5%	
Through Hole Aspect Ratio			
Bow and Twist (Balanced)	Per IPC		
Panel Sizes	12x18, 12x9, 16x18, 18x24, 21x24, 24x24	24x54	
<b>Technology</b>			
Microvias	Yes	Yes	Yes
Blind Vias	control depth	drill/sequential lam stacked microvias	
Buried Vias	yes	sequential lamination	
Thin Core Pwr/Gnd			
Buried Resistor	screened carbon and ohmega and chip	Solder chip resistors	
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	.004" / .004" / .004"	.0035" / .004" / .004"	
1 oz	.005" / .005" / .005"	.004" / .004" / .004"	.003" / .003" / .003"
2 oz	.005" / .007" / .008"		
3 oz			
4 oz			
5 oz			
Feature Tolerance 1/2 - 1 oz	+/- .001	+/- .0005	
Feature Tolerance 2 - 5 oz	+/- .002		
<b>Innerlayer Cu to Edge</b>			
PTH (DHS) to Copper (Drill to Copper)	>/.010"	>/.008"	
NPT Hole/Slot to Copper, Second Drill	>/.015"	>/.010"	
Antipad Size	>/.015 Larger than Drill Tool	<.015-.009	
<b>Annular Ring Requirements for Drilled Holes &lt;</b>			
Tangency	DHS + .009"	DHS + .008"	
1 mil Annular Ring	DHS + .011"	DHS + .010"	
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base			
1/2 oz Base	.004" / .004"		
1 oz Base	.005" / .005"		
2 oz Base	.006" / .008"		
3 oz Base			
4 oz Base			
5 oz Base			
<b>Feature Attributes</b>			
PTH to Copper	>/.010"	>/.008"	>=.0065"
NPT Hole/Slot to Copper	>/.008"	>/.004" (Second Drill)	
Rout to O/L Copper	>=.010"	>=.006"	
Score to O/L Copper	.020"		

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 Time-To-Market Interconnect Solutions™	San Diego		
	Standard	Advanced	Development
<b>Drill</b>			
Min. Drill Size	.0091"	.0079"	.0059"
Min. Blind Drill Hole Size (Controlled Depth Drilling)	>=.012"	.010"	<.010"
Min. Slot Width - Std.	0.024" (Step Drill)	.020 (Step Drill)	
Min. Positional Tolerance	.010" DTP	.006" DTP	.003" DTP
Min. PTH Tolerance (Primary Drill)	+/- .003"	+/- .002"	
Min. Tolerance of Plated Cut Out	+/- .005"	+/- .003"	
Counter Bore/Sink Tolerance	+/- .004	+/- .003	
Max. NPT (hole/slot) in Primary Drill	No Limit		
Backdrill Size Over Primary Drill			
Backdrill Stub Length			
<b>Microvia</b>			
Laser via diameter	.006	.005	.004
Capture/Target pads	D+.008	D+.006	D+.005
Aspect Ratio	.75:1	.85:1	1:1
1 Layer Build Up	Yes		
2 Layer Build Up		Yes	
3+ Layer Build Up			Yes
4+ Layer Build Up			
AnyLayer			
Laser Via Stacked on Buried Via			
Skip Via (ex 1-3)			
<b>Via in Pad (through hole)</b>			
Non-Conductive Via Fill	YES		
Line width and Spacing (wrap)			
Microvia Non-Conductive Via Fill			
Conductive Via Fill			
Laser Direct Imaging	YES		
<b>Plating/Surface Finish</b>			
HASL	YES		
Immersion Gold (ENIG)	YES	YES	YES
Immersion Ni/Pd/Au	YES	YES	YES
Electrolytic Ni/Au Tab Plating	YES		
Electrolytic Ni/Au (Hard Gold)			
Organic Solderability Preservative			
Immersion Silver	YES		
Immersion Tin	YES	YES	
Selective ENIG or ENEPIG		YES	
Wirebondable Soft Au	YES		
OSP + Electroplate Ni-Au			
Fused Tin/Lead	YES		

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	San Diego		
	Standard	Advanced	Development
<b>Soldermask</b>			
Type	STD - Taiyo PSR4000 BN	dry film, flexible LPI	
Colors			
Thickness	.0003 " - .002"	3 - 4 mil, std LPI thickness	
3/8 - 1 oz Base Copper			
Min. Web	.004"	.003"	
Min. Clearance	.003"	.002"	
<b>Legend</b>			
Text Width	0.007" min.	.005" min	
Color	Black, White, Yellow, Orange / White		
LPI			
Inkjet			
<b>Fabrication</b>			
Rout			
Diameter Router Bits Available	.031" - .125"	.0156" & .020"	
Edge to Edge Tolerance	+/-0.005"	+/- .003	
Score			
Score Angles	30°, 60°		
Positional Tolerance to Datum	+/-0.005	+/- .002	
Front to Back Tolerance	+/-0.005	+/- .002	
Remaining Web Tolerance	+/- .005	+/- .003	
Bevel			
Bevel Angles	15°, 30°, 45°	Any based on Tool	
Depth Tolerance	+/- .005		
<b>Electrical Test &amp; Performance</b>			
Min. Component Pitch	0.016"	<.016"	
Max. Test Voltage	200 volts	500 volts	>500 volts
Max. Isolation Resistance	100 M Ohms	500 M Ohms	> 500 M ohms
Min. Continuity Resistance	10 Ohms	5 Ohms	
Hi Pot Test (Machine Capability)			
Impedance Tolerance 51-100 ohms			
Impedance Tolerance 28-50 Ohms			
DC Resistance Testing			
Kelvin Test			
Signal Loss measurement			
Latent Test			


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 Time-To-Market Interconnect Solutions™	Stafford		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness	.020	.010	.002
Max Board Thickness - All Finishes	.350	.400	.450
Thickness Tolerance	+/-10%	+/-8%	+/-5%
Through Hole Aspect Ratio	12.5:1	14:1	16:1
Bow and Twist (Balanced)	>/=0.0075"/inch	>/=0.005"/inch	<.005"/inch
Panel Sizes	16x18, 18x21, 20x25, 18x24, 21x24, 21x27, 24x24, 24x36, 24x42	30x42, 24x54, 30x54	
<b>Technology</b>			
Microvias	Yes	Yes	Yes
Blind Vias	Sub-assy Drill/Sequential Lam	Control Depth Drill, Laser Drill	
Buried Vias	≥.005" DS core, ≤.10:1 a/r ML	.004" DS core, ≤.13:1 a/r ML	
Thin Core Pwr/Gnd	.002		.001
Buried Resistor	Yes (Tiger & Ohmega)	Screened Carbon	
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	.004/.004	.003/.003	
1 oz	.004/.005	.004/.004	
2 oz	.005/.007	.005/.006	
3 oz	.008/.011	.008/.010	
4 oz	.008/.012	.008/.011	
5 oz	.008/.013	.008/.012	
Feature Tolerance 1/2 - 1 oz	+/- .001	+/- .0005	
Feature Tolerance 2 - 5 oz	+/- .002	+/- .0015	
Innerlayer Cu to Edge			
PTH (DHS) to Copper (Drill to Copper)	>/= .010"	>/= .008"	>/= .007
NPT Hole/Slot to Copper, Second Drill	>/= .015"	>/= .010"	>/= .008"
Antipad Size	>/= .020 Larger than Drill Tool	>/= .016 Larger than Drill Tool	>/= .014 Larger than Drill Tool
Annular Ring Requirements for Drilled Holes <			
Tangency	DHS + .010	DHS + .009	DHS + .008
1 mil Annular Ring	DHS + .012	DHS + .011	DHS + .010
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base	.0045" / .005"	.004" / .004"	
1/2 oz Base	.005/.0055	.005/.005	
1 oz Base	.005/.008	.005/.007	
2 oz Base	.005/.009	.005/.008	
3 oz Base	.008/.014	.008/.012	
4 oz Base	.008/.016	.008/.014	
5 oz Base	.008/.018	.008/.016	
Feature Attributes			
PTH to Copper	.010"	.008"	.0065"
NPT Hole/Slot to Copper	.015	.012	.010
Rout to O/L Copper	.020	.012	.010
Score to O/L Copper	.020	.012	.010

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 Time-To-Market Interconnect Solutions™	Stafford		
	Standard	Advanced	Development
<b>Drill</b>			
Min. Drill Size	.25mm (.010")	.20mm (.008")	
Min. Blind Drill Hole Size (Controlled Depth Drilling)	.25mm (.010")	.20mm (.008")	
Min. Slot Width - Std.	0.024" (Step Drill)	.020 (Step Drill)	
Min. Positional Tolerance	.006 DTP	.005 DTP	.004 DTP
Min. PTH Tolerance (Primary Drill)	± 0.003"	± 0.002"	
Min. Tolerance of Plated Cut Out	+/- .005	+/- .003	
Counter Bore/Sink Tolerance	+/- .004	+/- .003	
Max. NPT (hole/slot) in Primary Drill	No Limit	No Limit	
Backdrill Size Over Primary Drill	.012"	.008"	.006"
Backdrill Stub Length	.007 +/- .005	.006" +/- .004	.005" +/- .003
<b>Microvia</b>			
Laser via diameter	.006	.005	.004
Capture/Target pads	D+.008	D+.006	D+.005
Aspect Ratio	.75:1	.85:1	1:1
1 Layer Build Up	Yes		
2 Layer Build Up		Yes	
3+ Layer Build Up			Yes
4+ Layer Build Up			Yes
AnyLayer			Yes
Laser Via Stacked on Buried Via		Yes	
Skip Via (ex 1-3)		Yes	
<b>Via in Pad (through hole)</b>			
Non-Conductive Via Fill	Yes		
Line width and Spacing (wrap)	.005/ .005 with Class II Wrap	.004/ .004 with Class II Wrap	
Microvia Non-Conductive Via Fill		Yes	
Conductive Via Fill		Yes	
Laser Direct Imaging	Yes Internal, External, & Soldermask		
<b>Plating/Surface Finish</b>			
HASL	YES		
Immersion Gold (ENIG)	YES		
Immersion Ni/Pd/Au	YES		
Electrolytic Ni/Au Tab Plating	YES		
Electrolytic Ni/Au (Hard Gold)	YES		
Organic Solderability Preservative	Outsourced		
Immersion Silver	Outsourced		
Immersion Tin	Outsourced		
Selective ENIG or ENEPIG	YES		
Wirebondable Soft Au	YES		
OSP + Electroplate Ni-Au	YES		
Fused Tin/Lead	YES		

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 Time-To-Market Interconnect Solutions™	Stafford		
	Standard	Advanced	Development
<b>Soldermask</b>			
Type	Taiyo LDI/LPI, Dry	Taiyo Flexible	
Colors	Green/Red/Blue	White/Clear/Black	
Thickness	.0003-.0015	.0007 min	
3/8 - 1 oz Base Copper			
Min. Web	.005 LPI / .010 Dry	.004 LPI / .008 Dry	
Min. Clearance	.0025 LPI / .003 Dry	.002 LPI	
<b>Legend</b>			
Text Width	.006	.004 (white only)	
Color	Black, White, Yellow, Orange		
LPI		YES	
Inkjet	YES		
<b>Fabrication</b>			
Rout			
Diameter Router Bits Available	.031, .047, .063, .093, .125	Other (special order)	
Edge to Edge Tolerance	+/- .005"	+/- .003"	
Score			
Score Angles	30° (20°, 45° & 60°)		
Positional Tolerance to Datum	+/- .005	+/- .003	
Front to Back Tolerance	+/- .005	+/- .003	
Remaining Web Tolerance	+/- .005	+/- .003	
Bevel			
Bevel Angles	15°, 30°, 45°	Any (Special order Tool)	
Depth Tolerance	+/- .010	+/- .005	
<b>Electrical Test &amp; Performance</b>			
Min. Component Pitch	.012	<.012	
Max. Test Voltage	250 Volts	500 Volts	1000Volts
Max. Isolation Resistance	100 M Ohms	200 M Ohms	1 G Ohms
Min. Continuity Resistance	10 Ohms	2 Ohms	1 Ohm
Hi Pot Test (Machine Capability)	500 VDC for 30 Seconds	5000 VDC for infinite	
Impedance Tolerance 51-100 ohms	+/- 10%	+/-8%	+/-5%
Impedance Tolerance 28-50 Ohms	+/- 10%	+/-8%	+/-7%
DC Resistance Testing	Yes	Yes	Yes
Kelvin Test	No	No	No
Signal Loss measurement		Yes (to 40 GHz))	
Latent Test	No	No	In development

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 Time-To-Market Interconnect Solutions™	Guangzhou		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness	0.020	0.020	
Max Board Thickness - All Finishes	< 0.360"	0.400"	
Thickness Tolerance	+/- 10%	+/-7.5%	
Through Hole Aspect Ratio	10:1/14:1 BP (Backplane)	14:1/16:1 BP	16:1/22:1 BP
Bow and Twist (Balanced)	0.0075 in/inch	0.005 in/inch	
Panel Sizes	12x18, 14 x 16, 14 x 24, 16 x 18, 16 x 21, 18 x 21, 18 x 24, 20 x 24, 21.5x24.5, 21X27, 24.5 x 30.5, 24.5x36.5, 24.5x40.5	24 x 42, 24.2 x 48	
<b>Technology</b>			
Microvias	Yes		
Blind Vias	Yes		
Buried Vias	Yes		
Thin Core Pwr/Gnd	0.002	0.001	
Buried Resistor	No		
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	.0035/.004	.003/.0035	.003/.003
1 oz	.004/.004	.003/.0035	
2 oz	.007/.007	.006/.006	
3 oz	.009/.009	.008/.008	.006/.006
4 oz	.010/.011	.009/.010	
5 oz	.012/.013	.011/.012	
Feature Tolerance 1/2 - 1 oz	+/-15%	+/-10%	+/-8%
Feature Tolerance 2 - 5 oz	+/-20%	+/-15%	
Innerlayer Cu to Edge			
PTH (DHS) to Copper (Drill to Copper)	0.0085	0.008	0.0075
NPT Hole/Slot to Copper, Second Drill	0.0055	0.005	
Antipad Size	DHS+.012	DHS+.010	DHS+.009
Annular Ring Requirements for Drilled Holes <			
Tangency	DHS +0.010	DHS +0.009	
1 mil Annular Ring	DHS +0.011	DHS +0.010	
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base	.003/.0035	.003/.0035	.003/.003
1/2 oz Base	.003/.004	.003/.0035	.003/.0035
1 oz Base	.003/.004	.003/.004	.003/.004
2 oz Base	.005/.0065	.005/.0065	.005/.0060
3 oz Base	.007/.008	.007/.008	.007/.0075
4 oz Base	.008/.011	.008/.011	.008/.0105
5 oz Base	.01/.013	.01/.013	.01/.0125
Feature Attributes			
PTH to Copper	+/-0.005"	+/-0.0034"	
NPT Hole/Slot to Copper	+/-0.005"	+/-0.0034"	
Rout to O/L Copper	+/-0.006"	+/-0.0044"	
Score to O/L Copper	+/-0.006"	+/-0.0044"	

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 Time-To-Market Interconnect Solutions™	Guangzhou		
	Standard	Advanced	Development
<b>Drill</b>			
Min. Drill Size	0.01	0.008	
Min. Blind Drill Hole Size (Controlled Depth Drilling)	0.010	0.008	
Min. Slot Width - Std.	>0.032		
Min. Positional Tolerance	0.006DTP	0.005DTP	0.004DTP
Min. PTH Tolerance (Primary Drill)	+/-0.003	+/- .002	
Min. Tolerance of Plated Cut Out	+/-0.004		
Counter Bore/Sink Tolerance	+/-0.008"	+/-0.006"	
Max. NPT (hole/slot) in Primary Drill	0.25"		
Backdrill Size Over Primary Drill	0.008	0.006	
Backdrill Stub Length	0.009+/-0.007	0.008+/-0.006	0.007+/-0.005
<b>Microvia</b>			
Laser via diameter	0.005	0.004	
Capture/Target pads	mvia + .010	mvia + 0.006	mvia + 0.004
Aspect Ratio	0.80:1	0.85:1	1:1
1 Layer Build Up	YES		
2 Layer Build Up	NO	NO	YES
3+ Layer Build Up	NO		
4+ Layer Build Up	NO		
AnyLayer	NO		
Laser Via Stacked on Buried Via	YES		
Skip Via (ex 1-3)	YES		
<b>Via in Pad (through hole)</b>			
Non-Conductive Via Fill	YES		
Line width and Spacing (wrap)	.005/ .005	.004/ .004 with Class II Wrap	.0035" / .0035" waive Wrap Spec
Microvia Non-Conductive Via Fill	YES		
Conductive Via Fill	No		
Laser Direct Imaging	Yes (Outer layer)		
<b>Plating/Surface Finish</b>			
HASL	Yes		
Immersion Gold (ENIG)	Yes		
Immersion Ni/Pd/Au	Outsource		
Electrolytic Ni/Au Tab Plating	No		
Electrolytic Ni/Au (Hard Gold)	Yes		
Organic Solderability Preservative	Yes		
Immersion Silver	Yes		
Immersion Tin	Yes		
Selective ENIG or ENEPIG	ENIG+OSP, ENIG+Hard Ni-AU		
Wirebondable Soft Au	No		
OSP + Electroplate Ni-Au	Yes		
Fused Tin/Lead	No		

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	Guangzhou		
	Standard	Advanced	Development
<b>Soldermask</b>			
Type	TAIYO – PSR4000 G23K, SP08(spray);Probimer 77MA, 77MA-1, 77EMA (spray)		
Colors	GREEN,RED, BLUE	BLACK	
Thickness	IPC SPEC COVERAGE		
3/8 - 1 oz Base Copper	(SPC RANGES .0002 - .003 TYPICAL = .0007 over conductor)		
Min. Web	0.003	0.002	
Min. Clearance	0.004	0.003	
<b>Legend</b>			
Text Width	0.006	0.005	0.0045
Color	WHITE	BLACK, YELLOW	
LPI	NO	NO	
Inkjet	NO	NO	
<b>Fabrication</b>			
<b>Rout</b>			
Diameter Router Bits Available	0.8~2.4 mm (0.1 mm interval)	0.5mm	
Edge to Edge Tolerance	+/- 0.004		
<b>Score</b>			
Score Angles	30° / 45°/60° / 90°/120°/140°		
Positional Tolerance to Datum	0.004		
Front to Back Tolerance	+/- .004		
Remaining Web Tolerance	+/- .002		
<b>Bevel</b>			
Bevel Angles	15° - 60°		
Depth Tolerance	+/- .005		
<b>Electrical Test &amp; Performance</b>			
Min. Component Pitch	0.016 fixture/0.008 FP (flying probe)	0.011 fixture	0.008 fixture
Max. Test Voltage	250V		
Max. Isolation Resistance	10M OHMS	15M OHMS	
Min. Continuity Resistance	50 OHMS	20 OHMS	
Hi Pot Test (Machine Capability)	Yes		
	+/- 10%	+/- 10%	+/- 8%
	+/- 10%	+/- 10%	+/- 8%
Impedance Tolerance 51-100 ohms	No		
Impedance Tolerance 28-50 Ohms	No	Yes	
DC Resistance Testing	Yes		
Kelvin Test	No		
Signal Loss measurement	No		
Latent Test			

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 Time-To-Market Interconnect Solutions™	Huiyang		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness	0.024	0.016	
Max Board Thickness - All Finishes	0.220"	0.235"	
Thickness Tolerance	+/-10%	+/-8%	
Through Hole Aspect Ratio	10:1	12:1	
Bow and Twist (Balanced)	0.0075 in/inch	0.005 in/inch	
Panel Sizes	Pin lam: 14 x 24, 16 x 18, 18 X 24, 16 x 21, 21 X 24, Mass Lam: 20 X 24, 14 X16	21 x 27 (Double side)	
<b>Technology</b>			
Microvias	Yes	Yes	Yes
Blind Vias	Yes	Yes	Yes
Buried Vias	Yes	Yes	Yes
Thin Core Pwr/Gnd	0.001		
Buried Resistor	No	No	
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	.003/.0035	.003/.00325	.003/.003
1 oz	.003/.004	.003/.00375	.003/.0035
2 oz	.005/.006	.005/.0055	.005/.005
3 oz	.008/.008	.0075/.0075	
4 oz			
5 oz			
Feature Tolerance 1/2 - 1 oz	+/-20% or +/-0.001	+/-15% or +/-0.001	
Feature Tolerance 2 - 5 oz	+/-20% or +/-0.001		
Innerlayer Cu to Edge			
PTH (DHS) to Copper (Drill to Copper)	0.008	0.0075	0.007
NPT Hole/Slot to Copper, Second Drill	0.01	0.008	
Antipad Size	DHS+0.020	DHS+0.019	
Annular Ring Requirements for Drilled Holes <			
Tangency	DHS +0.010	DHS +0.009	
1 mil Annular Ring	DHS +0.012	DHS +0.011	
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base	0.0035/0.0035	0.003/0.0035	0.003/0.003
1/2 oz Base	0.004/0.004	0.0035/0.004	0.0035/0.0035
1 oz Base	0.005/0.0055	0.005/0.005	0.0045/0.005
2 oz Base	0.007/0.0075	0.007/0.007	
3 oz Base	0.01/0.011	0.01/0.01	
4 oz Base	0.012/0.013	0.012/0.012	
5 oz Base			
Feature Attributes			
PTH to Copper	0.0075	0.007	
NPT Hole/Slot to Copper	0.0065	0.006	
Rout to O/L Copper	0.01	0.009	0.008 w/single spindle
Score to O/L Copper	0.01	0.009	0.009

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 Time-To-Market Interconnect Solutions™	Huiyang		
	Standard	Advanced	Development
<b>Drill</b>			
Min. Drill Size	0.01	0.008	0.006
Min. Blind Drill Hole Size (Controlled Depth Drilling)	0.020	0.016	0.01
Min. Slot Width - Std.	0.062	0.062 - 0.031	
Min. Positional Tolerance	0.006DTP	0.006DTP	
Min. PTH Tolerance (Primary Drill)	+/-0.003	+/-0.002	
Min. Tolerance of Plated Cut Out	+/-0.005	+/-0.004	
Counter Bore/Sink Tolerance	+/-0.008	+/-0.005	+/-0.004
Max. NPT (hole/slot) in Primary Drill	0.200	0.250	
Backdrill Size Over Primary Drill	0.010	0.008	0.006
Backdrill Stub Length	0.009+/-0.007	0.008+/-0.006	0.007+/-0.005
<b>Microvia</b>			
Laser via diameter	0.005	0.004	
Capture/Target pads	mvia + .011	mvia + .010	
Aspect Ratio	0.8:1	0.85:1	
1 Layer Build Up	Yes		
2 Layer Build Up	No	Yes	
3+ Layer Build Up	No	No	Yes
4+ Layer Build Up	No	No	Yes
AnyLayer	No	No	No
Laser Via Stacked on Buried Via	No	No	Yes
Skip Via (ex 1-3)	Yes		
<b>Via in Pad (through hole)</b>			
Non-Conductive Via Fill	Yes	Yes	
Line width and Spacing (wrap)	0.004/ 0.004	0.004/ 0.004	
Microvia Non-Conductive Via Fill	Yes	Yes	
Conductive Via Fill	No		
Laser Direct Imaging			Yes - Q3 2015
<b>Plating/Surface Finish</b>			
HASL	Yes		
Immersion Gold (ENIG)	Yes		
Immersion Ni/Pd/Au	No		
Electrolytic Ni/Au Tab Plating			
Electrolytic Ni/Au (Hard Gold)	Yes		
Organic Solderability Preservative	Yes		
Immersion Silver	Yes		
Immersion Tin	Yes		
Selective ENIG or ENEPIG	ENIG+selective Hard Ni-Au		
Wirebondable Soft Au	No		
OSP + Electroplate Ni-Au	Yes – tie bar		
Fused Tin/Lead	No		


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 Time-To-Market Interconnect Solutions™	Huiyang		
	Standard	Advanced	Development
<b>Soldermask</b>			
Type	TAIYO PSR4000-G23K. TAIYO HFX, TAIYO PSR 4000-BL01, PSR4000-MP Probimer 77-MA 72101		
Colors	GREEN	BLUE, RED,BLACK	
Thickness	IPC SPEC COVERAGE		
3/8 - 1 oz Base Copper	(SPC RANGES .0002 - .003 TYPICAL = .0007 over conductor)		
Min. Web	0.003	0.0025	
Min. Clearance	0.006	0.005	
<b>Legend</b>			
Text Width	0.006	0.005	
Color	WHITE	BLACK, YELLOW	
LPI	No	No	
Inkjet	No	No	
<b>Fabrication</b>			
Rout			
Diameter Router Bits Available	.062, .093,	.031, .047, .039, .125	
Edge to Edge Tolerance	+/- 0.005	+/- 0.004	
Score			
Score Angles	30° / 45°/60°		
Positional Tolerance to Datum	+/- 0.005	+/- 0.003	
Front to Back Tolerance	+/-0.003	+/-0.002	
Remaining Web Tolerance	+/- 0.005	+/- 0.003	
Bevel			
Bevel Angles	20°, 30°, 45°, 60°	20°, 30°, 45°, 60°	
Depth Tolerance	+/- .010	+/- .008	
<b>Electrical Test &amp; Performance</b>			
Min. Component Pitch	0.020 fixture/0.008 FP (Flying probe)	0.016 fixture/0.005 FP (Flying probe)	
Max. Test Voltage	250V	250V	
Max. Isolation Resistance	10M OHMS	20M OHMS	
Min. Continuity Resistance	50 OHMS	20 OHMS	10 OHMS
Hi Pot Test (Machine Capability)	No	Yes	
Impedance Tolerance 51-100 ohms	+/- 10%	+/- 7%	+/-5%
Impedance Tolerance 28-50 Ohms	+/- 15% or +/-5ohm	+/- 10% or +/-4ohm	
DC Resistance Testing	No	Yes	
Kelvin Test	Yes		
Signal Loss measurement			
Latent Test			


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 Time-To-Market Interconnect Solutions™	Zhongshan		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness	.024	.021	.021
Max Board Thickness - All Finishes	0.160"	0.160"	0.240"
Thickness Tolerance	+/-10%	+/-7%	+/-7%
Through Hole Aspect Ratio	6:1	8:1	10:1
Bow and Twist (Balanced)	0.0075 in/inch	0.0075 in/inch	0.005 in/inch
Panel Sizes	20X24	21.5X24.5	26x28
<b>Technology</b>			
Microvias	No	No	developing
Blind Vias	No	No	developing
Buried Vias	No	No	developing
Thin Core Pwr/Gnd	No	No	developing
Buried Resistor	No	No	No
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	.004/.004	.003/.003	.003/.003
1 oz	.004/.004	.0035/.0035	.0035/.0035
2 oz	.007/.007	.006/.006	.006/.006
3 oz	.008/.008	.007/.008	.007/.008
4 oz	.009/.009	.008/.008	.008/.008
5 oz	.011/.011	.010/.010	.010/.010
Feature Tolerance 1/2 - 1 oz	±0.0006 for 1/2OZ ±0.0008 for 1OZ	±0.0006 for 1/2OZ ±0.0008 for 1OZ	±0.0006 for 1/2OZ ±0.0008 for 1OZ
Feature Tolerance 2 - 5 oz	±0.0012 for 2OZ ±0.0016 for 3OZ ±0.0020 for 4OZ ±0.0024 for 5OZ	±0.0012 for 2OZ ±0.0016 for 3OZ ±0.0020 for 4OZ ±0.0024 for 5OZ	±0.0012 for 2OZ ±0.0016 for 3OZ ±0.0020 for 4OZ ±0.0024 for 5OZ
Innerlayer Cu to Edge			
PTH (DHS) to Copper (Drill to Copper)	0.0085	0.008	0.007
NPT Hole/Slot to Copper, Second Drill	0.01	0.01	0.007
Antipad Size	DHS+0.017	DHS+0.016	DHS+0.014
Annular Ring Requirements for Drilled Holes <			
Tangency	DHS+0.016	DHS+0.012	DHS+0.010
1 mil Annular Ring	DHS+0.018	DHS+0.014	DHS+0.012
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base	.004/.004	.004/.004	.004/.004
1/2 oz Base	.005/.004	.005/.004	.005/.004
1 oz Base	.006/.006	.006/.006	.006/.006
2 oz Base	.007/.007	.007/.007	.007/.007
3 oz Base	.008/.008	.008/.008	.008/.008
4 oz Base	.009/.009	.009/.009	.009/.009
5 oz Base	.010/.010	.010/.010	.010/.010
Feature Attributes			
PTH to Copper	0.0085	0.008	0.007
NPT Hole/Slot to Copper	0.01	0.01	0.007
Rout to O/L Copper	0.01	0.01	0.01
Score to O/L Copper	0.01	0.01	0.01


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 Time-To-Market Interconnect Solutions™	Zhongshan		
	Standard	Advanced	Development
<b>Drill</b>			
Min. Drill Size	0.010	0.010	0.008
Min. Blind Drill Hole Size (Controlled Depth Drilling)	No	No	No
Min. Slot Width - Std.	>0.032	>0.032	>0.030
Min. Positional Tolerance	+/- .003	+/- .002	+/- .002
Min. PTH Tolerance (Primary Drill)	+/- .003	+/- .002	+/- .002
Min. Tolerance of Plated Cut Out	+/-0.005	+/-0.004	+/-0.003
Counter Bore/Sink Tolerance	Yes	Yes	Yes
Max. NPT (hole/slot) in Primary Drill	0.200	0.250	0.297
Backdrill Size Over Primary Drill	No	No	Yes
Backdrill Stub Length	No	No	Yes
<b>Microvia</b>			
Laser via diameter	No	No	developing
Capture/Target pads	No	No	developing
Aspect Ratio	No	No	developing
1 Layer Build Up	No	No	developing
2 Layer Build Up	No	No	No
3+ Layer Build Up	No	No	No
4+ Layer Build Up	No	No	No
AnyLayer	No	No	No
Laser Via Stacked on Buried Via	No	No	No
Skip Via (ex 1-3)	No	No	No
<b>Via in Pad (through hole)</b>			
Non-Conductive Via Fill	No	No	No
Line width and Spacing (wrap)	No	No	No
Microvia Non-Conductive Via Fill	No	No	No
Conductive Via Fill	No	No	No
Laser Direct Imaging	No	No	No
<b>Plating/Surface Finish</b>			
HASL	Yes	Yes	Yes
Immersion Gold (ENIG)	Yes	Yes	Yes
Immersion Ni/Pd/Au	No	No	No
Electrolytic Ni/Au Tab Plating	No	No	No
Electrolytic Ni/Au (Hard Gold)	No	No	No
Organic Solderability Preservative	Yes	Yes	Yes
Immersion Silver	Yes	Yes	Yes
Immersion Tin	Yes	Yes	Yes
Selective ENIG or ENEPIG	No	No	No
Wirebondable Soft Au	No	No	No
OSP + Electroplate Ni-Au	No	No	No
Fused Tin/Lead	No	No	No


	Zhongshan		
	Standard	Advanced	Development
<b>Soldermask</b>			
Type	Probimer 77MA: 1070/1050; 7179/7180;PSR4000:Z26;MH;G23K;AM03 Taiyo PSR4000; Z26, MH, SP08		
Colors	GREEN	GREEN/Blue/Red	GREEN/Blue/Red/White
Thickness	Single coating: A≥0.2mil, B=0.4-1.0mil		
3/8 - 1 oz Base Copper	Double coating: A≥0.4mil, B=0.8-2.0mil		
Min. Web	0.0035	0.003	0.002
Min. Clearance	0.0035	0.0025	0.002
<b>Legend</b>			
Text Width	0.005	0.005	0.004
Color	WHITE	WHITE/ BLACK YELLOW	N/A
LPI	No	No	No
Inkjet	No	No	developing
<b>Fabrication</b>			
<b>Rout</b>			
Diameter Router Bits Available	0.8-2.4 mm	0.8-2.4 mm	0.8-2.4 mm
Edge to Edge Tolerance	+/- 0.004	+/- 0.004	+/- 0.003
<b>Score</b>			
Score Angles	30° / 45° / 60°/90°/120°		
Positional Tolerance to Datum	+/- .005	+/- .004	+/- .003
Front to Back Tolerance	0.005	0.004	0.003
Remaining Web Tolerance	+/- .005	+/- .004	+/- .002
<b>Bevel</b>			
Bevel Angles	20°, 30°, 45°, 60°	20°, 30°, 45°, 60°	20°, 30°, 45°, 60°
Depth Tolerance	+/- .010	+/- .005	+/- .005
<b>Electrical Test &amp; Performance</b>			
Min. Component Pitch	0.020 fixture/0.004 FP (flying probe)	0.020 fixture/0.004 FP	0.020 fixture/0.004 FP
Max. Test Voltage	150V	250V	250V
Max. Isolation Resistance	20M OHMS	20M OHMS	20M OHMS
Min. Continuity Resistance	20 OHMS	20 OHMS	20 OHMS
Hi Pot Test (Machine Capability)	No	Yes	Yes
Impedance Tolerance 51-100 ohms	+/- 15%	+/- 10%	+/- 10%
Impedance Tolerance 28-50 Ohms	+/- 10%	+/- 10%	+/- 10%
DC Resistance Testing	No	No	No
Kelvin Test	No	Yes	Yes
Signal Loss measurement	No	No	No
Latent Test	No	No	No

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 Time-To-Market Interconnect Solutions™	Forest Grove		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness	0.017	0.015	0.010
Max Board Thickness - All Finishes	0.126	0.24	0.275
Thickness Tolerance	+/- 10%	+/- 8%	
Through Hole Aspect Ratio	12.5:1	14:1	20:1
Bow and Twist (Balanced)	0.010 in/inch	0.0075 in/inch	0.005 in/inch
Panel Sizes	18 x 24 , 14 X 24, 21x24	16 x 18, 24 x 28	
<b>Technology</b>			
Microvias	Yes	Yes	Yes
Blind Vias	Yes	Yes	Yes
Buried Vias	Yes	Yes	Yes
Thin Core Pwr/Gnd	0.001		
Buried Resistor		YES	YES
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	.00325/.0035	.003/.00325	
1 oz	.004/.004	.0035/.004	
2 oz	.006/.006	.0055/.0055	
3 oz	NO	.008/.008	
4 oz	NO	.010/.010	
5 oz			
Feature Tolerance 1/2 - 1 oz	20%		
Feature Tolerance 2 - 5 oz	20%		
Innerlayer Cu to Edge			
PTH (DHS) to Copper (Drill to Copper)	0.0085	0.008	0.007
NPT Hole/Slot to Copper, Second Drill	+/- .005	+/- .003	
Antipad Size			
Annular Ring Requirements for Drilled Holes <			
Tangency	DHS+0.010	DHS+0.009	
1 mil Annular Ring	DHS+0.012		
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base	.003/.003	.003/.0275	.0025/.00275
1/2 oz Base	.00325/.0035	.003/.00325	.003/.003
1 oz Base	.004/.004	.0035/.004	.00325/.0035
2 oz Base	.006/.006	.0055/.0055	.005/.0055
3 oz Base	NO	.008/.008	.0075/.0075
4 oz Base	NO	.010/.010	NO
5 oz Base	NO	NO	NO
Feature Attributes			
PTH to Copper	0.008	0.0075	0.007
NPT Hole/Slot to Copper	0.01	0.008	0.002
Rout to O/L Copper	0.012	0.008	0.002
Score to O/L Copper	0.012	0.008	0.005

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 Time-To-Market Interconnect Solutions™	Forest Grove		
	Standard	Advanced	Development
<b>Drill</b>			
Min. Drill Size	0.010	0.008	
Min. Blind Drill Hole Size (Controlled Depth Drilling)	0.010	0.008	
Min. Slot Width - Std.	0.062	0.062 - 0.031	
Min. Positional Tolerance	0.007	0.006	0.005" Vision
Min. PTH Tolerance (Primary Drill)	+/- .003	+/- .002	
Min. Tolerance of Plated Cut Out	+/-0.005	+/-0.004	+/-0.003
Counter Bore/Sink Tolerance	+/- 0.008	+/- 0.006	+/- 0.005
Max. NPT (hole/slot) in Primary Drill	0.200	0.250	
Backdrill Size Over Primary Drill	0.010	0.008	0.006
Backdrill Stub Length	0.009+/-0.007	0.008+/-0.006	0.007+/-0.005
<b>Microvia</b>			
Laser via diameter	0.004	0.004	
Capture/Target pads	mvia + .010	mvia + .006	mvia + .005
Aspect Ratio	.75:1	.85:1	
1 Layer Build Up	YES	YES	
2 Layer Build Up	YES	YES	
3+ Layer Build Up	No	YES	
4+ Layer Build Up	No	Yes	
AnyLayer	No	No	No
Laser Via Stacked on Buried Via	Yes; however not preferred due to long term reliability is unknown		
Skip Via (ex 1-3)	Yes		
<b>Via in Pad (through hole)</b>			
Non-Conductive Via Fill	YES	YES	
Line width and Spacing (wrap)	.004 / .0045	.004/ .004 with Class II Wrap	.0035/.0035 with flat wrap
Microvia Non-Conductive Via Fill	YES	YES	
Conductive Via Fill	Outsource		
Laser Direct Imaging	Yes		
<b>Plating/Surface Finish</b>			
HASL	Yes		
Immersion Gold (ENIG)	Yes		
Immersion Ni/Pd/Au	Outsource		
Electrolytic Ni/Au Tab Plating	YES		
Electrolytic Ni/Au (Hard Gold)	YES		
Organic Solderability Preservative	Yes		
Immersion Silver	Yes		
Immersion Tin	Yes		
Selective ENIG or ENEPIG	YES		
Wirebondable Soft Au	YES		
OSP + Electroplate Ni-Au	YES		
Fused Tin/Lead	Outsource		

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 Time-To-Market Interconnect Solutions™	Forest Grove		
	Standard	Advanced	Development
Soldermask			
Type	TAIYO PSR4000HFX, PSR4000MP, PSR4000BN		Dry Film
Colors	GREEN	RED, BLUE, BLACK, CLEAR	
Thickness	IPC SPEC COVERAGE		
3/8 - 1 oz Base Copper	(SPC RANGES .0002 - .003 TYPICAL = .0007 over conductor)		
Min. Web	0.003	0.002	
Min. Clearance	0.005	0.004	0.003 (LDI)
Legend			
Text Width	0.004		
Color	White, Black, Yellow		
LPI	White, Black		
Inkjet	White		
Fabrication			
Rout			
Diameter Router Bits Available	0.063, 0.093, 0.125	0.031, 0.039	
Edge to Edge Tolerance	+/- 0.005	+/- 0.004	
Score			
Score Angles	30°	30°/15° (half blade)	
Positional Tolerance to Datum	+/- 0.005	+/-0.002	
Front to Back Tolerance	0.008	0.005	0.004
Remaining Web Tolerance	+/- 0.003	+/- 0.002	
Bevel			
Bevel Angles	49°, 45°, 40°	30°, 20°	
Depth Tolerance	+/- 0.008	+/- 0.005	
Electrical Test & Performance			
Min. Component Pitch	0.020 fixture/0.010 FP (flying probe)	0.016 fixture/0.005 FP	
Max. Test Voltage	250V/1000V	250V/1000V	
Max. Isolation Resistance	10M OHMS	100M OHMS	
Min. Continuity Resistance	20 OHMS	5 OHMS	
Hi Pot Test (Machine Capability)	YES	YES	
Impedance Tolerance 51-100 ohms	+/- 10%	+/- 10%	+/- 7.5%
Impedance Tolerance 28-50 Ohms	+/- 10%	+/- 7.5%	+/- 5%
DC Resistance Testing	No	YES	
Kelvin Test		Yes	
Signal Loss measurement	Yes		
Latent Test			
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 Time-To-Market Interconnect Solutions™	Toronto		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness	0.010	0.008	0.005
Max Board Thickness - All Finishes	≤ 0.200"	≤ 0.250"	
Thickness Tolerance	+/-10%	+/- 8%	+/-5%
Through Hole Aspect Ratio	13:1	16:1	20:1
Bow and Twist (Balanced)	0.008 in/inch	0.007 in/inch	0.005 in/inch
Panel Sizes	12X18/18 x 24/21x24		Flex & Rigid Flex PCB 12 X 18/18 X 24
<b>Technology</b>			
Microvias	Yes		
Blind Vias	Yes		
Buried Vias	Yes		
Thin Core Pwr/Gnd	Yes		
Buried Resistor	Yes (Ticer)		
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	.003/.003	.0025/.0025	
1 oz	.004/.004	.0035/.0035	.003/.003
2 oz	.006/.006	.0055/.0055	
3 oz	.008/.008	.0075/.0075	
4 oz	.009/.009		
5 oz	.010/.010		
Feature Tolerance 1/2 - 1 oz	+/- 0.0003		
Feature Tolerance 2 - 5 oz	+/- 0.0005		
Innerlayer Cu to Edge			
PTH (DHS) to Copper (Drill to Copper)	0.010	0.008	0.006
NPT Hole/Slot to Copper, Second Drill	0.010	0.008	
Antipad Size	DHS +0.02	DHS +0.016	DHS +0.012
Annular Ring Requirements for Drilled Holes <			
Tangency	DHS+0.010	DHS+0.009	DHS+0.008
1 mil Annular Ring	DHS+0.012	DHS+0.011	DHS+0.010
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base	0.003/0.003		
1/2 oz Base	0.0035/0.0035		
1 oz Base	0.00475/0.00475		
2 oz Base	0.007/0.007		
3 oz Base	0.009/0.009		
4 oz Base	0.0105/0.0105		
5 oz Base	0.012/0.012		
Feature Attributes			
PTH to Copper	0.010		
NPT Hole/Slot to Copper	0.010	0.008	
Rout to O/L Copper	0.010	0.008	
Score to O/L Copper	0.010		

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 Time-To-Market Interconnect Solutions™	Toronto		
	Standard	Advanced	Development
<b>Drill</b>			
Min. Drill Size	0.008	0.006	0.005
Min. Blind Drill Hole Size (Controlled Depth Drilling)	0.008	0.006	
Min. Slot Width - Std.	0.062	0.062 -0.031	0.02
Min. Positional Tolerance	0.007	0.006	0.004
Min. PTH Tolerance (Primary Drill)	+/- .003	+/- .002	0.015
Min. Tolerance of Plated Cut Out	+/-0.005	+/-0.004	+/-0.003
Counter Bore/Sink Tolerance	+/-0.005	+/-0.003	
Max. NPT (hole/slot) in Primary Drill	0.180	0.200	
Backdrill Size Over Primary Drill	0.010	0.008	0.006
Backdrill Stub Length	0.009+/-0.007	0.008+/-0.006	0.007+/-0.005
<b>Microvia</b>			
Laser via diameter	0.012 - 0.004		
Capture/Target pads	mvia + .006	mvia + .004	
Aspect Ratio	0.9:1	1:1	
1 Layer Build Up	YES		
2 Layer Build Up	YES		
3+ Layer Build Up	YES		
4+ Layer Build Up	YES		
AnyLayer	NO		
Laser Via Stacked on Buried Via	YES		
Skip Via (ex 1-3)	YES		
<b>Via in Pad (through hole)</b>			
Non-Conductive Via Fill	Sanei PHP	Taiyo DX1	Taiyo PIHP
Line width and Spacing (wrap)	0.004 / 0.004	0.003 / 0.003	
Microvia Non-Conductive Via Fill	YES		
Conductive Via Fill	Sub (CB100/AE3030)		
Laser Direct Imaging	Yes		
<b>Plating/Surface Finish</b>			
HASL	Yes		
Immersion Gold (ENIG)	Yes		
Immersion Ni/Pd/Au	Yes		
Electrolytic Ni/Au Tab Plating	see next line		
Electrolytic Ni/Au (Hard Gold)	Yes		
Organic Solderability Preservative	Yes		
Immersion Silver	Yes		
Immersion Tin	Yes		
Selective ENIG or ENEPIG	ENIG only		
Wirebondable Soft Au	No		
OSP + Electroplate Ni-Au	Yes		
Fused Tin/Lead	Sub (other division)		


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 Time-To-Market Interconnect Solutions™	Toronto		
	Standard	Advanced	Development
Soldermask			
Type	Taiyo PSR4000-BN, MP, HFX, LEW1, LDI, G23K - Probimer 77 - Dryfilm		
Colors	LDI -GREEN	BLUE, RED, PURPLE, CLEAR and BLACK	
Thickness	IPC SPEC COVERAGE (other on request)		
3/8 - 1 oz Base Copper	(Single Coat .0002 - .0015 over conductor)		
Min. Web	0.004	0.003	0.002
Min. Clearance	0.002	0.001	
Legend			
Text Width	0.005	0.004	
Color	WHITE	Black, Yellow	
LPI	YES - WHITE		
Inkjet	YES - WHITE		
Fabrication			
Rout			
Diameter Router Bits Available	.058, .070, .093	0.031	0.020
Edge to Edge Tolerance	+/- 0.005	+/- 0.004	+/- 0.002
Score			
Score Angles	20° /30° /45° /60°		
Positional Tolerance to Datum	+/- .005	+/- .003	+/- .002
Front to Back Tolerance	+/- 0.005	+/- 0.003	
Remaining Web Tolerance	+/- .003	+/- .002	
Bevel			
Bevel Angles	20°, 30°, 45°, 60°		
Depth Tolerance	+/- .005	+/- .003	+/- .002
Electrical Test & Performance			
Min. Component Pitch	0.020 fixture/0.008 FP (flying probe)	0.016 fixture/0.004 FP (flying probe)	
Max. Test Voltage	250V	500V	
Max. Isolation Resistance	10M OHMS	100M OHMS	2G OHMS
Min. Continuity Resistance	10 OHMS		
Hi Pot Test (Machine Capability)	YES		
Impedance Tolerance 51-100 ohms	+/- 10%	+/- 5%	
Impedance Tolerance 28-50 Ohms	+/- 10%	+/- 5%	
DC Resistance Testing	No		
Kelvin Test	Yes		
Signal Loss measurement	No		
Latent Test	No		
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 Time-To-Market Interconnect Solutions™	Sterling		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness	0.015	0.01	0.008
Max Board Thickness - All Finishes	0.250"	0.250"	0.250"
Thickness Tolerance	+/- 10%	+/- 7%	+/- 5%
Through Hole Aspect Ratio	10:1	12:1	14:1
Bow and Twist (Balanced)	0.0075 in/inch	0.005 in/inch	0.005 in/inch
Panel Sizes	12 x 18, 18 x 24, 21x24		
<b>Technology</b>			
Microvias	Yes	Yes	Yes
Blind Vias	Yes	Yes	Yes
Buried Vias	Yes	Yes	Yes
Thin Core Pwr/Gnd	0.001	0.0005	
Buried Resistor	Yes (Ohmega & Ticer)		
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	.003/.0035	.003/.003	.0023/.0025
1 oz	.004/.004	.0035/.0035	.003/.003
2 oz	.0050/.0050	.0045/.0045	.004/.005
3 oz	.008 / .008	.006/.007	.006 / .006
4 oz	.010/.010	.008 / .008	.0075/.008
5 oz	NA	NA	NA
Feature Tolerance 1/2 - 1 oz	+/-0.0005	+/-0.0003	+/-0.00025
Feature Tolerance 2 - 5 oz	+/-0.0015	+/-0.001	+/-0.00075
Innerlayer Cu to Edge			
PTH (DHS) to Copper (Drill to Copper)	0.009	0.008	0.0065
NPT Hole/Slot to Copper, Second Drill	0.009	0.008	0.0065
Antipad Size	DHS +0.018	DHS +0.016	DHS +0.013
Annular Ring Requirements for Drilled Holes <			
Tangency	DHS+0.010	DHS+0.009	DHS+0.008
1 mil Annular Ring	DHS+0.012	DHS+0.010	DHS+0.009
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base	.003/.0035	.003/.003	.0023/.0025
1/2 oz Base	.003/.0035	.003/.003	.0023/.0025
1 oz Base	.004/.004	.0035/.0035	.003/.003
2 oz Base	.0050/.0050	.0045/.0045	.004/.005
3 oz Base	NA	NA	NA
4 oz Base	NA	NA	NA
5 oz Base	NA	NA	NA
Feature Attributes			
PTH to Copper	0.007	0.005	0.004
NPT Hole/Slot to Copper	0.009	0.008	0.007
Rout to O/L Copper	0.015	0.01	.002 (LENZ)
Score to O/L Copper	0.018	0.015	NA

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 Time-To-Market Interconnect Solutions™	Sterling		
	Standard	Advanced	Development
<b>Drill</b>			
Min. Drill Size	0.01	0.008	0.006
Min. Blind Drill Hole Size (Controlled Depth Drilling)	0.010	0.008	0.006
Min. Slot Width - Std.	0.062	0.062 - 0.024	0.024 - 0.016
Min. Positional Tolerance	0.008	0.006	0.004
Min. PTH Tolerance (Primary Drill)	+/- 0.003	+/- 0.002	+/- 0.002
Min. Tolerance of Plated Cut Out	+/-0.005	+/-0.004	+/-0.002 (LENZ)
Counter Bore/Sink Tolerance	+/-0.005	+/-0.004	+/-0.002 (LENZ)
Max. NPT (hole/slot) in Primary Drill	0.170	0.185	0.200
Backdrill Size Over Primary Drill	0.008	0.006	0.005
Backdrill Stub Length	0.009+/-0.007	0.008+/-0.006	0.007+/-0.005
<b>Microvia</b>			
Laser via diameter	0.005	0.004	0.004
Capture/Target pads	mvia + .006	mvia + .005	mvia + .004
Aspect Ratio	.75:1	.85:1	.85:1
1 Layer Build Up	YES	YES	YES
2 Layer Build Up	YES	YES	YES
3+ Layer Build Up	YES	YES	YES
4+ Layer Build Up	YES	YES	YES
AnyLayer	NA	No	No
Laser Via Stacked on Buried Via	Yes; however not preferred due to long term reliability is unknown		
Skip Via (ex 1-3)	Yes		
<b>Via in Pad (through hole)</b>			
Non-Conductive Via Fill	YES	YES	YES
Line width and Spacing (wrap)	.0045/ .005	.004/ .004 with Class II Wrap or flat wrap	.0035/.0035 with flat wrap
Microvia Non-Conductive Via Fill	YES	YES	YES
Conductive Via Fill	YES	YES	YES
Laser Direct Imaging	YES	YES	YES
<b>Plating/Surface Finish</b>			
HASL	YES		
Immersion Gold (ENIG)	YES		
Immersion Ni/Pd/Au	YES		
Electrolytic Ni/Au Tab Plating	YES		
Electrolytic Ni/Au (Hard Gold)	YES		
Organic Solderability Preservative	YES		
Immersion Silver	YES		
Immersion Tin	Outsource		
Selective ENIG or ENEPIG	YES		
Wirebondable Soft Au	YES		
OSP + Electroplate Ni-Au	YES		
Fused Tin/Lead	YES		

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 Time-To-Market Interconnect Solutions™	Sterling		
	Standard	Advanced	Development
<b>Soldermask</b>			
Type	Taiyo PSR4000BN, Taiyo LDI, Dry Film		
Colors	GREEN	Red, Blue, Black, Clear	Teal, Purple Orange
Thickness	IPC SPEC COVERAGE		
3/8 - 1 oz Base Copper	(SPC RANGES .0002 - .003 TYPICAL = .0007 over conductor)		
Min. Web	0.003	0.0025	0.002
Min. Clearance	0.006	0.005	0.004
<b>Legend</b>			
Text Width	0.005	0.0045	0.004
Color	White	Black, Yellow	
LPI	0.004	0.003	0.0025
Inkjet	0.004	0.0035	0.003
<b>Fabrication</b>			
<b>Rout</b>			
Diameter Router Bits Available	0.063, 0.093, 0.125	0.031, 0.039	.016, .0240
Edge to Edge Tolerance	+/- 0.005	+/- 0.004	+/-0.002 (lenz)
<b>Score</b>			
Score Angles	30°	30°	30°
Positional Tolerance to Datum	+/- 0.005	+/-0.002	+/-0.002
Front to Back Tolerance	0.008	0.005	0.005
Remaining Web Tolerance	+/- 0.003	+/- 0.002	+/- 0.002
<b>Bevel</b>			
Bevel Angles	45°, 30°, 20°	45°, 30°, 20°	45°, 30°, 20°
Depth Tolerance	+/- 0.008	+/- 0.005	+/- 0.005
<b>Electrical Test &amp; Performance</b>			
Min. Component Pitch	0.020 fixture/0.010 FP (flying probe)	0.016 fixture/0.005 FP	
Max. Test Voltage	100V	250V	500V(flying probe only)
Max. Isolation Resistance	20M Ohm	50M Ohm	100M Ohm
Min. Continuity Resistance	10 ohm	7 ohm (gold pins- fixture)	5 ohm (flying probe only)
Hi Pot Test (Machine Capability)	Yes	Yes	Yes
Impedance Tolerance 51-100 ohms	+/- 10%	+/- 10 %	+/- 5%
Impedance Tolerance 28-50 Ohms	+/- 10%	+/-7.5%	+/- 5%
DC Resistance Testing	YES	YES	
Kelvin Test	YES		
Signal Loss measurement	No		
Latent Test	IST		

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 Time-To-Market Interconnect Solutions™	Anaheim		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness	0.014	0.012	0.005
Max Board Thickness - All Finishes	0.250"	0.280"	0.300"
Thickness Tolerance	+/-10%	+/-8%	+/-8%
Through Hole Aspect Ratio	10:1	16:1	25:1 (DFM reqd.)
Bow and Twist (Balanced)	0.007 in/inch	0.007 in/inch	0.005 in/inch
Panel Sizes	18 x 24	18 x 24, 21 x 24, 24 x 30	
<b>Technology</b>			
Microvias	Yes	Yes	Yes
Blind Vias	Yes	Yes	Yes
Buried Vias	Yes	Yes	Yes
Thin Core Pwr/Gnd	0.001		
Buried Resistor	Yes (Ohmega & Ticer)		
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	0.0035/0.0035	0.003/0.003	0.275/0.003
1 oz	0.005/0.005	0.004/0.004	0.003/0.003
2 oz	0.007/0.007	0.006/0.006	0.005/0.005
3 oz	0.009/0.009	0.008/0.008	No
4 oz	No	No	No
5 oz	No	No	No
Feature Tolerance 1/2 - 1 oz	+/-0.0005 to +/-0.001		
Feature Tolerance 2 - 5 oz	+/-0.002 to +/-0.005		
Innerlayer Cu to Edge			
PTH (DHS) to Copper (Drill to Copper)	0.008	0.007	.005
NPT Hole/Slot to Copper, Second Drill	0.008	0.007	.005
Antipad Size	DHS +0.014	DHS +0.010	DHS +0.006
Annular Ring Requirements for Drilled Holes <			
Tangency	DHS+0.010	DHS+0.009	DHS+0.008
1 mil Annular Ring	DHS+0.012	DHS+0.011	DHS+0.010
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base	0.00350/0.0035	0.003/0.003	0.0025/0.0025
1/2 oz Base	0.004/0.004	0.0035/0.0035	0.003/0.003
1 oz Base	0.006/0.006	0.0055/0.0055	0.005/0.005
2 oz Base	0.0075/0.0075	0.007/0.007	0.0065/0.0065
3 oz Base			
4 oz Base			
5 oz Base			
Feature Attributes			
PTH to Copper	0.005	0.005	0.005
NPT Hole/Slot to Copper	0.005	0.005	0.005
Rout to O/L Copper	0.005	0.004	0.002
Score to O/L Copper	0.005	0.005	0.005

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 Time-To-Market Interconnect Solutions™	Anaheim		
	Standard	Advanced	Development
<b>Drill</b>			
Min. Drill Size	0.010	0.008	0.006
Min. Blind Drill Hole Size (Controlled Depth Drilling)	0.016	0.012	0.010
Min. Slot Width - Std.	0.062	0.031	0.016
Min. Positional Tolerance	.007	.006	.004
Min. PTH Tolerance (Primary Drill)	+/- .003	+/- .002	+/- .002
Min. Tolerance of Plated Cut Out	+/-0.005	+/-0.004	+/-0.004
Counter Bore/Sink Tolerance	+/-0.005	+/-0.004	+/-0.004
Max. NPT (hole/slot) in Primary Drill	0.125	0.150	0.175
Backdrill Size Over Primary Drill	0.010	0.008	0.008
Backdrill Stub Length	0.009+/-0.007	0.008+/-0.006	0.007+/-0.005
<b>Microvia</b>			
Laser via diameter	0.005	0.004	0.003
Capture/Target pads	uvia +.006	uvia +.005	uvia+0.004
Aspect Ratio	0.5:1	0.75:1	1.2:1
1 Layer Build Up	YES	YES	YES
2 Layer Build Up	YES	YES	YES
3+ Layer Build Up	YES	YES	YES
4+ Layer Build Up	YES	YES	YES
AnyLayer	YES	YES	YES
Laser Via Stacked on Buried Via	YES	YES	YES
Skip Via (ex 1-3)	YES	YES	YES
<b>Via in Pad (through hole)</b>			
Non-Conductive Via Fill	YES	YES	YES
Line width and Spacing (wrap)	0.004/0.004	0.0035/0.0035	0.0035/0.0035
Microvia Non-Conductive Via Fill	YES		
Conductive Via Fill	Outsource		
Laser Direct Imaging	Yes		
<b>Plating/Surface Finish</b>			
HASL	Outsource		
Immersion Gold (ENIG)	Yes		
Immersion Ni/Pd/Au	Yes		
Electrolytic Ni/Au Tab Plating	Yes		
Electrolytic Ni/Au (Hard Gold)	YES		
Organic Solderability Preservative	Yes		
Immersion Silver	Yes		
Immersion Tin	Outsource		
Selective ENIG or ENEPIG	Yes		
Wirebondable Soft Au	Yes		
OSP + Electroplate Ni-Au	Design specific - contact ANA engineering		
Fused Tin/Lead	No	No	Yes

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 Time-To-Market Interconnect Solutions™	Anaheim		
	Standard	Advanced	Development
Soldermask			
Type	Taiyo PSR4000 LDI	Taiyo PSR4000BN, HFX, MP, AUS5	Dry Film - design specific application
Colors	GREEN, BLUE RED	GREEN, BLUE RED	BLACK, CLEAR,
Thickness	0.007-0.0012	0.007-0.0012	0.005-0.001
3/8 - 1 oz Base Copper	TYPICAL = 0.0007 (over conductor)		
Min. Web	0.004	0.003	0.003
Min. Clearance	0.005	0.004	0.002
Legend			
Text Width	0.005	0.004	0.003
Color	WHITE	WHITE, BLACK	YELLOW
LPI	Yes	Yes	Yes
Inkjet	WHITE ONLY		
Fabrication			
Rout			
Diameter Router Bits Available	0.093 & 0.062	0.031	0.016
Edge to Edge Tolerance	+/-0.005	+/-0.005	+/-0.003
Score			
Score Angles	45	20,30,60	Custom tools
Positional Tolerance to Datum	0.008	0.008	0.008
Front to Back Tolerance	+/-0.005	+/-0.005	+/-0.005
Remaining Web Tolerance	+/-0.007	+/-0.005	+/-0.004
Bevel			
Bevel Angles	45	30	20
Depth Tolerance	+/-0.008	+/-0.007	+/-0.007
Electrical Test & Performance			
Min. Component Pitch	0.006 FP (flying probe)	0.003 FP	
Max. Test Voltage	100V	250V	1000V
Max. Isolation Resistance	100 MOHMS	>100 MOHMS	>100 MOHMS
Min. Continuity Resistance	20 OHMS	10 OHMS	5 OHMS
Hi Pot Test (Machine Capability)	2000 DC	3000 DC	3000 DC
Impedance Tolerance 51-100 ohms	+/-10%	+/-7%	+/-5%
Impedance Tolerance 28-50 Ohms	+/-10%	+/-7%	+/-5%
DC Resistance Testing	NO	NO	YES
Kelvin Test	NO		
Signal Loss measurement			YES
Latent Test			
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 Time-To-Market Interconnect Solutions™	San Jose (SV)		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness	0.017	0.015	<0.015
Max Board Thickness - All Finishes	0.126	0.240"	
Thickness Tolerance	+/- 10%	+/- 8%	
Through Hole Aspect Ratio	10:1	12:1	
Bow and Twist (Balanced)	0.010 in/inch	0.0075 in/inch	0.005 in/inch
Panel Sizes	18 X 24, 12 X 18	16x18	
<b>Technology</b>			
Microvias	Yes	Yes	Yes
Blind Vias	Yes	Yes	Yes
Buried Vias	Yes	Yes	Yes
Thin Core Pwr/Gnd	0.002	0.002	0.001
Buried Resistor	No		
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	.00325/.0035	.0025/.003	
1 oz	.004/.004	.0035/.0035	
2 oz	.006/.006	.0055/.0055	
3 oz	.008/.008	.007/.007	
4 oz	NO	NO	
5 oz	NO	NO	
Feature Tolerance 1/2 - 1 oz	+/- .0015	+/- .001	+/- .0005
Feature Tolerance 2 - 5 oz	+/- .004	+/- .0035	+/- .003
Innerlayer Cu to Edge			
PTH (DHS) to Copper (Drill to Copper)	0.0085	0.008	0.006
NPT Hole/Slot to Copper, Second Drill	0.008	0.008	0.005
Antipad Size	DHS+0.017	DHS+0.016	DHS+0.012
Annular Ring Requirements for Drilled Holes <			
Tangency	DHS+0.010	DHS+0.009	DHS+0.008
1 mil Annular Ring	DHS+0.012	DHS+0.011	
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base	.00325/.0035	.0025/.003	
1/2 oz Base	0.0035/0.0035	0.003/0.003	
1 oz Base	0.0035/0.004	0.003/0.0035	
2 oz Base	0.0055/0.006	0.004/0.005	
3 oz Base	NO	NO	
4 oz Base	NO	NO	
5 oz Base	NO	NO	
Feature Attributes			
PTH to Copper	0.0085	0.008/ 0.007 with CAF matl	0.006
NPT Hole/Slot to Copper	0.012	0.011	
Rout to O/L Copper	0.008	0.007	
Score to O/L Copper	Design dependent		

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 Time-To-Market Interconnect Solutions™	San Jose (SV)		
	Standard	Advanced	Development
<b>Drill</b>			
Min. Drill Size	0.010	0.009	
Min. Blind Drill Hole Size (Controlled Depth Drilling)	0.008	0.006	
Min. Slot Width - Std.	0.062	0.062 - 0.031	
Min. Positional Tolerance	0.005	0.004	
Min. PTH Tolerance (Primary Drill)	+/- .003	+/- .002	
Min. Tolerance of Plated Cut Out	+/-0.005	+/-0.004	
Counter Bore/Sink Tolerance	+/- 0.010	+/- .009	
Max. NPT (hole/slot) in Primary Drill	0.200	0.250	
Backdrill Size Over Primary Drill	0.010	0.006	0.004
Backdrill Stub Length	0.010+/-0.008	0.009+/-0.007	0.007+/-0.005
<b>Microvia</b>			
Laser via diameter	0.004	0.004	
Capture/Target pads	mvia + .010	mvia + .006	mvia + .005
Aspect Ratio	.75:1	0.85:1	1:01
1 Layer Build Up	YES	YES	
2 Layer Build Up	YES	YES	
3+ Layer Build Up	No	YES	
4+ Layer Build Up		YES	
AnyLayer	No		
Laser Via Stacked on Buried Via	YES	YES	
Skip Via (ex 1-3)	No		
<b>Via in Pad (through hole)</b>			
Non-Conductive Via Fill	YES	YES	
Line width and Spacing (wrap)	.004 / .004	.003 / .003	
Microvia Non-Conductive Via Fill	YES	YES	
Conductive Via Fill	Outsource		
Laser Direct Imaging	Yes		
<b>Plating/Surface Finish</b>			
HASL	YES		
Immersion Gold (ENIG)	Yes		
Immersion Ni/Pd/Au	Outsource		
Electrolytic Ni/Au Tab Plating	NO		
Electrolytic Ni/Au (Hard Gold)	Outsource		
Organic Solderability Preservative	Yes		
Immersion Silver	Yes		
Immersion Tin	Yes		
Selective ENIG or ENEPIG	NO		
Wirebondable Soft Au	Outsource		
OSP + Electroplate Ni-Au	YES		
Fused Tin/Lead	NO		

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 Time-To-Market Interconnect Solutions™	San Jose (SV)		
	Standard	Advanced	Development
<b>Soldermask</b>			
Type	Taiyo PSR4000 LDI	Taiyo PSR4000 HFX	
Colors	GREEN	BLUE, RED, BLACK	MATTE GREEN, YELLOW, CLEAR, PURPLE
Thickness	IPC SPEC COVERAGE		
3/8 - 1 oz Base Copper	(SPC RANGES .0002 - .003 TYPICAL = .0007 over conductor)		
Min. Web	0.002	0.002	
Min. Clearance	0.004	0.003	
<b>Legend</b>			
Text Width	0.006	0.005	0.005
Color	WHITE	BLACK, YELLOW	WHITE
LPI		BLUE	
Inkjet	0.005	0.005	0.004
<b>Fabrication</b>			
<b>Rout</b>			
Diameter Router Bits Available	0.093 & 0.125	0.062,0.039,0.031	0.020
Edge to Edge Tolerance	+/- 0.005	+/- 0.004	
<b>Score</b>			
Score Angles	30° / 45°	30° / 45°	
Positional Tolerance to Datum	+/- .005	+/- .003	
Front to Back Tolerance	+/-0.010	+/- 0.005	
Remaining Web Tolerance	+/-0.005	+/-0.003	
<b>Bevel</b>			
Bevel Angles	45°	30° / 20°	
Depth Tolerance	+/- .010	+/- .005	
<b>Electrical Test &amp; Performance</b>			
Min. Component Pitch	0.008 FP (flying probe)	0.008 FP	
Max. Test Voltage	100V	200V	
Max. Isolation Resistance	10M OHMS	50M OHMS	
Min. Continuity Resistance	20 OHMS	10 OHMS	
Hi Pot Test (Machine Capability)	NO	YES	
Impedance Tolerance 51-100 ohms	+/- 15%	+/- 10%	
Impedance Tolerance 28-50 Ohms	+/- 10%	+/- 7.5%	+/- 5%
DC Resistance Testing	No	YES	
Kelvin Test	Outsource		
Signal Loss measurement	No		
Latent Test			

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 Time-To-Market Interconnect Solutions™	Milpitas (SV)		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness	0.015	0.008	0.008
Max Board Thickness - All Finishes	0.005 to .250	0.005 to .250	0.250 Max
Thickness Tolerance	+/- 10%	+/- 8%	+/- 5%
Through Hole Aspect Ratio	10:1	18:1	30:1
Bow and Twist (Balanced)	0.01	0.008	0.005
Panel Sizes	18.5 x 24.5, 21.5x 24.5, 24.5 x 27.5, 21.5 x 27.5		
<b>Technology</b>			
Microvias	Yes	Yes	Yes
Blind Vias	Yes	Yes	Yes
Buried Vias	Yes	Yes	Yes
Thin Core Pwr/Gnd	0.001		
Buried Resistor	No	No	No
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	.004/.004	.003/.003	.0025/.0025
1 oz	.0045/.0045	.0035/.004	.003 / .004
2 oz	.005/.006	.0045/.006	.004/.006
3 oz	.008/.008	.007/.008	.006/.008
4 oz	.010/.010	.008/.010	.006/.010
5 oz	N/A	N/A	N/A
Feature Tolerance 1/2 - 1 oz	+/- .0015	+/- .001	+/- .0005
Feature Tolerance 2 - 5 oz	+/- .004	+/- .0035	+/- .003
Innerlayer Cu to Edge			
PTH (DHS) to Copper (Drill to Copper)	0.008	0.006	0.0038
NPT Hole/Slot to Copper, Second Drill	0.008	0.008	0.005
Antipad Size	DHS +0.02	DHS +0.014	DHS +0.008
Annular Ring Requirements for Drilled Holes <			
Tangency	DHS+0.010	DHS+0.008	DHS+0.006
1 mil Annular Ring	DHS+0.012	DHS+0.010	DHS+0.0089
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base	.004/.004	.003/.003	.0025/.0025
1/2 oz Base	.004/.004	.003/.003	.0025/.0025
1 oz Base	.0045/.0045	.0035/.004	.003 / .004
2 oz Base	.005/.006	.0045/.006	.004/.006
3 oz Base	.008/.008	.007/.008	.006/.008
4 oz Base	.010/.010	.008/.010	.006/.010
5 oz Base	N/A	N/A	N/A
Feature Attributes			
PTH to Copper	0.008	0.006	0.0038
NPT Hole/Slot to Copper	0.008	0.008	0.005
Rout to O/L Copper	0.005	0.005	0.002
Score to O/L Copper	0.03	0.03	0.02

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 Time-To-Market Interconnect Solutions™	Milpitas (SV)		
	Standard	Advanced	Development
<b>Drill</b>			
Min. Drill Size	0.008	0.006	0.005*
Min. Blind Drill Hole Size (Controlled Depth Drilling)	0.008	0.006	0.005
Min. Slot Width - Std.	>0.062	0.062 - 0.031	0.031 - 0.010
Min. Positional Tolerance	0.006	0.005	0.002
Min. PTH Tolerance (Primary Drill)	+/- .003	+/- .002	
Min. Tolerance of Plated Cut Out	+/-0.005	+/-0.004	+/-0.003
Counter Bore/Sink Tolerance	+/-0.005	+/-0.004	+/-0.003
Max. NPT (hole/slot) in Primary Drill	0.186	0.186	0.186
Backdrill Size Over Primary Drill	0.008	0.006	0.004
Backdrill Stub Length	0.010+/-0.008	0.009+/-0.007	0.007+/-0.005
<b>Microvia</b>			
Laser via diameter	0.004	0.004	0.003
Capture/Target pads	mvia + .005	mvia + .004	mvia + .003
Aspect Ratio	0.8	0.9	1:1
1 Layer Build Up	YES	YES	YES
2 Layer Build Up	YES	YES	YES
3+ Layer Build Up	YES	YES	YES
4+ Layer Build Up	Yes	Yes	Yes
AnyLayer	Yes	Yes	Yes
Laser Via Stacked on Buried Via	Yes	Yes	Yes
Skip Via (ex 1-3)	No	No	No
<b>Via in Pad (through hole)</b>			
Non-Conductive Via Fill	Yes	Yes	Yes
Line width and Spacing (wrap)	.003/.0035	.003/.0035	.003/.003
Microvia Non-Conductive Via Fill	Yes	Yes	Yes
Conductive Via Fill	Yes	Yes	Yes
Laser Direct Imaging	Yes		
<b>Plating/Surface Finish</b>			
HASL	Yes		
Immersion Gold (ENIG)	Yes		
Immersion Ni/Pd/Au	Outsource		
Electrolytic Ni/Au Tab Plating			
Electrolytic Ni/Au (Hard Gold)	Yes		
Organic Solderability Preservative	Yes		
Immersion Silver	Yes		
Immersion Tin	Outsource		
Selective ENIG or ENEPIG	Yes on ENIG		
Wirebondable Soft Au	Outsource		
OSP + Electroplate Ni-Au	Yes		
Fused Tin/Lead	No		

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 Time-To-Market Interconnect Solutions™	Milpitas (SV)		
	Standard	Advanced	Development
<b>Soldermask</b>			
Type	Taiyo PSR4000 LDI		Taiyo PSR4000 BN
Colors	Green, Blue	Black, Red, Purple	Custom colors
Thickness	IPC SPEC COVERAGE		
3/8 - 1 oz Base Copper	(SPC RANGES .0002 - .003 TYPICAL = .0007 over conductor)		
Min. Web	0.004	0.003	0.003
Min. Clearance	0.004	0.003	0.002
<b>Legend</b>			
Text Width	0.005	0.004	0.003
Color	White	Black, Yellow	Custom colors
LPI	Yes	Yes	Yes
Inkjet	White	White	White
<b>Fabrication</b>			
<b>Rout</b>			
Diameter Router Bits Available	0.062	0.062	0.031
Edge to Edge Tolerance	+/- 0.005	+/- 0.004	+/- .003
<b>Score</b>			
Score Angles	30° / 45°	30° / 45°	30° / 45°
Positional Tolerance to Datum	+/- .005	+/- .003	+/- .002
Front to Back Tolerance	0.010	0.005	0.003
Remaining Web Tolerance	+/-0.005	+/- 0.003	+/- 0.002
<b>Bevel</b>			
Bevel Angles	20°, 30°, 45°	20°, 30°, 45°	n/a
Depth Tolerance	+/- 0.010	+/- 0.005	+/- 0.005
<b>Electrical Test &amp; Performance</b>			
Min. Component Pitch	0.020 FP (flying probe)	0.015 FP	0.010 FP
Max. Test Voltage	100V	500V	
Max. Isolation Resistance	10M OHMS	100M OHMS	
Min. Continuity Resistance	20 OHMS	10 OHMS	5 OHMS
Hi Pot Test (Machine Capability)	Yes	Yes	Yes
Impedance Tolerance 51-100 ohms	+/- 10%	+/-7%	+/-5%
Impedance Tolerance 28-50 Ohms	+/- 10%	+/- 5%	
DC Resistance Testing	No	No	No
Kelvin Test	No		
Signal Loss measurement	Yes		
Latent Test			

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 Time-To-Market Interconnect Solutions™	North Jackson		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness	0.010	0.007	0.004
Max Board Thickness - All Finishes	≤ 0.125	≤ 0.220	≤ 0.250
Thickness Tolerance	+/- 10%	+/- 8%	
Through Hole Aspect Ratio	10:1	12.5:1	16:1
Bow and Twist (Balanced)	0.010	0.008	0.005
Panel Sizes	12 x 18 18 x 24		14 x 18 6 x 38
<b>Technology</b>			
Microvias	Yes	Yes	Yes
Blind Vias	Yes	Yes	Yes
Buried Vias	Yes	Yes	Yes
Thin Core Pwr/Gnd	0.001		
Buried Resistor		Yes (Outside Service)	
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	0.0035/0.0035	0.003/0.003	0.003/0.0025
1 oz	.004/.004	.0035/.0035	
2 oz	.006/.006	.0055/.0055	
3 oz	0.009/0.009	0.0085/0.0085	
4 oz	0.014/0.014	0.012/0.0105	
5 oz			
Feature Tolerance 1/2 - 1 oz	+/-0.001	+/-0.001	+/-0.0005
Feature Tolerance 2 - 5 oz	+/-0.003	+/-0.0025	+/-0.002
Innerlayer Cu to Edge			
PTH (DHS) to Copper (Drill to Copper)	0.010	0.008	
NPT Hole/Slot to Copper, Second Drill	0.010	0.008	0.007
Antipad Size	DHS+0.020	DHS+0.016	DHS+0.014
Annular Ring Requirements for Drilled Holes <			
Tangency	DHS+0.010	DHS+0.009	
1 mil Annular Ring	DHS+0.012	DHS+0.010	-
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base	0.00375/0.00375	0.00325/0.00325	
1/2 oz Base	0.004/0.004	0.0035/0.0035	
1 oz Base	0.005/0.005	0.0045/0.0045	
2 oz Base	0.006/0.006	0.0055/0.0055	
3 oz Base	-	0.010/0.010	-
4 oz Base	-	-	-
5 oz Base	-	-	-
Feature Attributes			
PTH to Copper	0.01	0.008	
NPT Hole/Slot to Copper	0.01	0.008	0.007
Rout to O/L Copper	0.01	0.008	0.007
Score to O/L Copper	0.015	0.012	0.01

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 Time-To-Market Interconnect Solutions™	North Jackson		
	Standard	Advanced	Development
<b>Drill</b>			
Min. Drill Size	0.0098	0.008	
Min. Blind Drill Hole Size (Controlled Depth Drilling)	0.010	0.008	0.006
Min. Slot Width - Std.	>0.050	0.050 - 0.031	0.031 - 0.016
Min. Positional Tolerance	0.008	0.006	0.003
Min. PTH Tolerance (Primary Drill)	+/-0.003	+/-0.002	
Min. Tolerance of Plated Cut Out	+/-0.005	+/-0.004	+/-0.003
Counter Bore/Sink Tolerance	+/-0.005	+/-0.004	+/-0.003
Max. NPT (hole/slot) in Primary Drill	0.200	0.250	0.250 x 1.0 slots
Backdrill Size Over Primary Drill	0.010	0.008	
Backdrill Stub Length	0.009+/-0.007	0.008+/-0.006	0.007+/-0.005
<b>Microvia</b>			
Laser via diameter	0.004	0.004	0.002
Capture/Target pads	mvia + .010	mvia + .006	mvia + .005
Aspect Ratio	0.75:1	0.85:1	1:1
1 Layer Build Up	Yes		
2 Layer Build Up	Yes		
3+ Layer Build Up	Yes		
4+ Layer Build Up	-	-	-
AnyLayer	-	-	-
Laser Via Stacked on Buried Via	-	-	-
Skip Via (ex 1-3)	Yes		
<b>Via in Pad (through hole)</b>			
Non-Conductive Via Fill	YES		
Line width and Spacing (wrap)	.005/ .005 Class 3 Wrap	.004/ .004 with Class 3 Wrap	.005/ .005 double or triple Class 3 wrap
Microvia Non-Conductive Via Fill	Yes		
Conductive Via Fill	Yes		
Laser Direct Imaging	Yes		
<b>Plating/Surface Finish</b>			
HASL	Yes		
Immersion Gold (ENIG)	Yes		
Immersion Ni/Pd/Au	Outsource		
Electrolytic Ni/Au Tab Plating			
Electrolytic Ni/Au (Hard Gold)	Yes		
Organic Solderability Preservative	Outsource		
Immersion Silver	Yes		
Immersion Tin	Yes		
Selective ENIG or ENEPIG		Yes	
Wirebondable Soft Au	Outsource		
OSP + Electroplate Ni-Au	Yes		
Fused Tin/Lead	YES		

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 Time-To-Market Interconnect Solutions™	North Jackson		
	Standard	Advanced	Development
Soldermask			
Type	PSR 4000-BN & PSR4000-MP		PSR9000-FXT
Colors	GREEN, RED	BLUE, BLACK, YELLOW, CLEAR	LPI Coverlay Amber Clear
Thickness	IPC SPEC COVERAGE		
3/8 - 1 oz Base Copper	(SPC RANGES .0002 - .003 TYPICAL = .0007 over conductor)		
Min. Web	Image + 0.003	Image + 0.0025	
Min. Clearance	0.005	0.004	
Legend			
Text Width	0.005	0.004	0.0035
Color	White, Black, & Yellow	White & Yellow	White & Yellow
LPI	PSR 4001W	PSR 4001W	PSR 4001W
Inkjet	IJR-4000 MW300		
Fabrication			
Rout			
Diameter Router Bits Available	0.031 0.050 0.063 0.0945 0.125		0.016 0.020
Edge to Edge Tolerance	+/- 0.005	+/- 0.004	+/-0.002
Score			
Score Angles	30° 60° 90° 120°		
Positional Tolerance to Datum	0.008	0.006	0.005
Front to Back Tolerance	0.010	0.005	0.003
Remaining Web Tolerance	+/-0.005	+/-0.003	+/-0.003
Bevel			
Bevel Angles	15° 30° 45° 60°		
Depth Tolerance	+/- .005	+/- .003	
Electrical Test & Performance			
Min. Component Pitch	0.016 fixture/0.004 FP (flying probe)		
Max. Test Voltage	250V	500V	
Max. Isolation Resistance	10 Mohms		
Min. Continuity Resistance	10 Ohms		
Hi Pot Test (Machine Capability)	YES (6000 VAC, VDC)		
Impedance Tolerance 51-100 ohms	+/- 10%	+/- 7.5%	+/-5%
Impedance Tolerance 28-50 Ohms	+/- 10%	+/- 7.5%	+/-5%
DC Resistance Testing	YES		
Kelvin Test		Yes	
Signal Loss measurement	No	No	No
Latent Test	Outsourced	Outsourced	Outsourced
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 Time-To-Market Interconnect Solutions™	Cleveland		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness	0.006	0.005	0.004
Max Board Thickness - All Finishes	≤ 0.130	≤ 0.175	≤ 0.200
Thickness Tolerance	+/- 10%	+/- 8%	
Through Hole Aspect Ratio	10:1	12.5:1	16:1
Bow and Twist (Balanced)	0.010 in/inch	0.0075 in/inch	0.005 in/inch
Panel Sizes	18x24	18x24	18x24
<b>Technology</b>			
Microvias	Outsource	Outsource	Outsource
Blind Vias	Yes	Yes	Yes
Buried Vias	Yes	Yes	Yes
Thin Core Pwr/Gnd	0.001	0.001	0.001
Buried Resistor	No	No	No
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	0.0035/0.0035	0.003/0.003	0.003/0.0025
1 oz	.004/.004	.0035/.0035	
2 oz	.006/.006	.0055/.0055	
3 oz	0.009/0.009	0.0085/0.0085	
4 oz	0.014/0.014	0.012/0.0105	
5 oz	0.016/0.015		
Feature Tolerance 1/2 - 1 oz	+/-0.001	+/-0.001	+/-0.001
Feature Tolerance 2 - 5 oz	+/-0.002	+/-0.002	+/-0.002
Innerlayer Cu to Edge			
PTH (DHS) to Copper (Drill to Copper)	0.010	0.008	
NPT Hole/Slot to Copper, Second Drill	0.006	0.004	0.002
Antipad Size	DHS +0.024	DHS +0.016	DHS + 0.012
Annular Ring Requirements for Drilled Holes <			
Tangency	DHS+0.012	DHS+0.010	DHS+0.009
1 mil Annular Ring	DHS+0.014	DHS+0.013	DHS+0.012
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base	0.004/0.004	0.0035/0.0035	0.003/0.003
1/2 oz Base	0.004/0.004	0.0035/0.0035	0.003/0.003
1 oz Base	0.005/0.005	0.004/0.004	
2 oz Base	0.006/0.006	0.005/0.005	
3 oz Base	0.008/0.008		
4 oz Base	0.010/0.010		
5 oz Base	0.012/0.012		
Feature Attributes			
PTH to Copper	0.008	0.007	
NPT Hole/Slot to Copper	0.005	0.003	0.001
Rout to O/L Copper	0.005	0.002	0
Score to O/L Copper	0.005	0.002	0


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 Time-To-Market Interconnect Solutions™	Cleveland		
	Standard	Advanced	Development
<b>Drill</b>			
Min. Drill Size	0.012	0.010	
Min. Blind Drill Hole Size (Controlled Depth Drilling)	0.010	0.008	0.006
Min. Slot Width - Std.	.0050	0.050 - 0.031	
Min. Positional Tolerance	0.008	0.006	0.003
Min. PTH Tolerance (Primary Drill)	+/- 0.003	+/- 0.002	
Min. Tolerance of Plated Cut Out	+/- 0.005	+/- 0.004	+/- 0.003
Counter Bore/Sink Tolerance	+/- 0.010	+/- 0.008	+/- 0.005
Max. NPT (hole/slot) in Primary Drill	0.250	0.250	0.250 x 1.0 slots
Backdrill Size Over Primary Drill	0.010	0.008	
Backdrill Stub Length	0.010+/-0.008	0.009+/-0.007	0.007+/-0.005
<b>Microvia</b>			
Laser via diameter	0.004	0.004	0.002
Capture/Target pads	mvia + .010	mvia + .006	mvia + .005
Aspect Ratio	0.75:1	0.85:1	1:1
1 Layer Build Up	0.75:1	0.85:1	1:1
2 Layer Build Up	0.75:1	0.85:1	1:1
3+ Layer Build Up	No	No	No
4+ Layer Build Up	No	No	No
AnyLayer	No	No	No
Laser Via Stacked on Buried Via	No	No	No
Skip Via (ex 1-3)	0.75:1	0.85:1	1:1
<b>Via in Pad (through hole)</b>			
Non-Conductive Via Fill	Outsource	Outsource	Outsource
Line width and Spacing (wrap)	.005/ .005 Class 3 Wrap	.004/ .004 with Class 3 Wrap	.005/ .005 double or triple Class 3 wrap
Microvia Non-Conductive Via Fill	Outsource	Outsource	Outsource
Conductive Via Fill	Outsource	Outsource	Outsource
Laser Direct Imaging	Outsource	Outsource	Outsource
<b>Plating/Surface Finish</b>			
HASL	Yes	Yes	Yes
Immersion Gold (ENIG)	Outsource	Outsource	Outsource
Immersion Ni/Pd/Au	Outsource	Outsource	Outsource
Electrolytic Ni/Au Tab Plating	Outsource	Outsource	Outsource
Electrolytic Ni/Au (Hard Gold)	Outsource	Outsource	Outsource
Organic Solderability Preservative	Outsource	Outsource	Outsource
Immersion Silver	Outsource	Outsource	Outsource
Immersion Tin	Outsource	Outsource	Outsource
Selective ENIG or ENEPIG	Outsource	Outsource	Outsource
Wirebondable Soft Au	Outsource	Outsource	Outsource
OSP + Electroplate Ni-Au	YES	Yes	YES
Fused Tin/Lead	YES	YES	YES


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	Cleveland		
	Standard	Advanced	Development
<b>Soldermask</b>			
Type	PSR 4000-BN, PSR 4000-MP & PSR 9000-FXT		
Colors	GREEN BLUE RED	BLACK, YELLOW, CLEAR	LPI Coverlay Amber Clear
Thickness	IPC SPEC COVERAGE		
3/8 - 1 oz Base Copper	(SPC RANGES .0002 - .003 TYPICAL = .0007 over conductor)		
Min. Web	0.003	0.0025	
Min. Clearance	0.005	0.004	
<b>Legend</b>			
Text Width	0.005	0.004	0.0035
Color	White, Black, & Yellow	White & Yellow	White & Yellow
LPI	PSR 4001W - Outsource		
Inkjet	IJR-4000 MW300 - Inhouse		
<b>Fabrication</b>			
<b>Rout</b>			
Diameter Router Bits Available	0.031 0.050 0.063 0.0945 0.125	0.016 0.020	
Edge to Edge Tolerance	+/- 0.005	+/- 0.004	+/-0.002
<b>Score</b>			
Score Angles	30° 60° 90° 120°		
Positional Tolerance to Datum	0.008	0.007	0.006
Front to Back Tolerance	+/-0.005	+/-0.003	+/-0.003
Remaining Web Tolerance	+/-0.005	+/-0.003	+/-0.003
<b>Bevel</b>			
Bevel Angles	15° 30° 45° 60°		
Depth Tolerance	+/-0.005	+/-0.003	+/-0.003
<b>Electrical Test &amp; Performance</b>			
Min. Component Pitch	0.016 fixture/0.004 FP (flying probe)	0.016 fixture/0.004 FP (flying probe)	0.016 fixture/0.004 FP (flying probe)
Max. Test Voltage	500V	500V	500V
Max. Isolation Resistance	10 Mohms	10 Mohms	10 Mohms
Min. Continuity Resistance	10 Ohms	1 Ohm	1 Ohm
Hi Pot Test (Machine Capability)	YES	YES	YES
Impedance Tolerance 51-100 ohms	+/- 10%	+/- 7.5%	+/-5%
Impedance Tolerance 28-50 Ohms	+/- 10%	+/- 7.5%	+/-5%
DC Resistance Testing	YES	YES	YES
Kelvin Test	Outsourced	Outsourced	Outsourced
Signal Loss measurement			
Latent Test			


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 Time-To-Market Interconnect Solutions™	Denver		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness	0.015	0.010	0.005
Max Board Thickness - All Finishes	.126	0.240"	0.250"
Thickness Tolerance	+/- 10%	+/- 8%	+/- 8%
Through Hole Aspect Ratio	10:1	12:1	14:1
Bow and Twist (Balanced)	0.0075 in/inch	0.005 in/inch	0.0025 in/inch
Panel Sizes	18 X 24, 12 X 18		
<b>Technology</b>			
Microvias	Yes	Yes	Yes
Blind Vias	Yes	Yes	Yes
Buried Vias	Yes	Yes	Yes
Thin Core Pwr/Gnd	0.002	0.002	0.002
Buried Resistor	No	No	Yes
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	.00325/.0035	.003/.00325	.003/.00325
1 oz	.004/.0045	.0035/.004	.0035/.004
2 oz	.006/.0065	.006/.006	.006/.006
3 oz	.008/.0085	.007/.0085	.007/.0085
4 oz	.010/.012	.008/.011	.008/.011
5 oz	.012/.014	.010/.013	.010/.013
Feature Tolerance 1/2 - 1 oz	+/- .001	+/- .0005	+/- .0005
Feature Tolerance 2 - 5 oz	+/- .003	+/- .002	+/- .001
Innerlayer Cu to Edge			
PTH (DHS) to Copper (Drill to Copper)	0.0085	0.008	0.007
NPT Hole/Slot to Copper, Second Drill	0.01	0.009	0.008
Antipad Size	DHS+0.017	DHS+0.016	DHS+0.014
Annular Ring Requirements for Drilled Holes <			
Tangency	DHS+0.010	DHS+0.009	DHS+0.008
1 mil Annular Ring	DHS+0.012	DHS+0.011	DHS+0.010
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base	.00325/.0035	.003/.00325	.003/.003
1/2 oz Base	.0035/.0035	.003/.00325	.003/.00325
1 oz Base	.004/.0045	.0035/.004	.0035/.004
2 oz Base	.006/.0065	.006/.006	.006/.006
3 oz Base	.008/.0085	.007/.0085	.007/.0085
4 oz Base	.010/.012	.008/.011	.008/.011
5 oz Base	.012/.014	.010/.013	.010/.013
Feature Attributes			
PTH to Copper	0.015	0.01	0.008
NPT Hole/Slot to Copper	0.01	0.008	0.005
Rout to O/L Copper	0.01	0.008	0.005
Score to O/L Copper	0.01	0.0075	0.0075

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 Time-To-Market Interconnect Solutions™	Denver		
	Standard	Advanced	Development
<b>Drill</b>			
Min. Drill Size	0.0098	0.0079	0.0059
Min. Blind Drill Hole Size (Controlled Depth Drilling)	0.008	0.006	0.006
Min. Slot Width - Std.	>0.062	0.062 - 0.031	0.02
Min. Positional Tolerance	0.007	0.006	0.004
Min. PTH Tolerance (Primary Drill)	+/- .003	+/- .002	+/- .0015
Min. Tolerance of Plated Cut Out	+/-0.005	+/-0.003	+/-0.002
Counter Bore/Sink Tolerance	+/-0.005	+/-0.005	+/-0.003
Max. NPT (hole/slot) in Primary Drill	0.257	0.257	0.257
Backdrill Size Over Primary Drill	0.012	0.010	0.010
Backdrill Stub Length	0.010+/-0.008	0.009+/-0.007	0.007+/-0.005
<b>Microvia</b>			
Laser via diameter	0.004	0.004	0.004
Capture/Target pads	mvia + .010	mvia + .006	mvia + .005
Aspect Ratio	.75:1	.85:1	.85:1
1 Layer Build Up	YES	YES	YES
2 Layer Build Up	NO	YES	YES
3+ Layer Build Up	NO	YES	YES
4+ Layer Build Up	NO	YES	YES
AnyLayer	NO	YES	YES
Laser Via Stacked on Buried Via	NO	YES	YES
Skip Via (ex 1-3)	NO	NO	YES
<b>Via in Pad (through hole)</b>			
Non-Conductive Via Fill	YES	YES	YES
Line width and Spacing (wrap)	.004 / .0045	.004/ .004 with Class II Wrap	.003" / .003" waive Wrap Spec
Microvia Non-Conductive Via Fill	YES	YES	YES
Conductive Via Fill	YES	YES	YES
Laser Direct Imaging	Yes	YES	YES
<b>Plating/Surface Finish</b>			
HASL	YES	YES	YES
Immersion Gold (ENIG)	YES	YES	YES
Immersion Ni/Pd/Au	Outsource	Outsource	Outsource
Electrolytic Ni/Au Tab Plating	YES	YES	YES
Electrolytic Ni/Au (Hard Gold)	YES	YES	YES
Organic Solderability Preservative	Outsource	Outsource	Outsource
Immersion Silver	Outsource	Outsource	Outsource
Immersion Tin	YES	YES	YES
Selective ENIG or ENEPIG	NO	YES	YES
Wirebondable Soft Au	YES	YES	YES
OSP + Electroplate Ni-Au	Outsource	Outsource	Outsource
Fused Tin/Lead	YES	YES	YES

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	Denver		
	Standard	Advanced	Development
<b>Soldermask</b>			
Type	Taiyo PSR4000BN PSR4000-LDI PSR4000MP	Taiyo PSR4000BN PSR4000-LDI PSR4000MP	Taiyo PSR4000BN PSR4000-LDI PSR4000MP
Colors	GREEN	BLUE, RED, BLACK	YELLOW, CLEAR
Thickness	IPC SPEC COVERAGE		
3/8 - 1 oz Base Copper	(SPC RANGES .0002 - .003 TYPICAL = .0007 over conductor)		
Min. Web	0.004	0.0035	0.003
Min. Clearance	0.005	0.004	0.002 LDI
<b>Legend</b>			
Text Width	0.006	0.005	0.004
Color	WHITE	BLACK, YELLOW	RED, BLUE
LPI	Yes	Yes	Yes
Inkjet	Yes	Yes	Yes
<b>Fabrication</b>			
<b>Rout</b>			
Diameter Router Bits Available	0.062 0.093 0.125	0.047,0.039,0.031	.0236 .020
Edge to Edge Tolerance	+/- 0.005	+/-0.004	+/-0.003
<b>Score</b>			
Score Angles	30°	30° / 45°	30° / 45°
Positional Tolerance to Datum	.008	.006	.004
Front to Back Tolerance	0.007	0.005	0.003
Remaining Web Tolerance	+/-0.005	+/-0.003	+/-0.003
<b>Bevel</b>			
Bevel Angles	45° / 30° / 20°	45° / 30° / 20°	45° / 30° / 20°
Depth Tolerance	+/- .010	+/- .005	+/- .005
<b>Electrical Test &amp; Performance</b>			
Min. Component Pitch	0.020 fixture/0.008 FP (flying probe)	0.016 fixture/0.004 FP (flying probe)	0.016 fixture/0.004 FP (flying probe)
Max. Test Voltage	30V min. 100V	250V	500V max.
Max. Isolation Resistance	10M OHMS	100M OHMS	150M ohms
Min. Continuity Resistance	20 OHMS	< 20 OHMS	< 20 OHMS
Hi Pot Test (Machine Capability)	YES	YES	YES
Impedance Tolerance 51-100 ohms	+/- 10%	+/- 10%	+/- 10%
Impedance Tolerance 28-50 Ohms	+/- 10%	+/- 7.5%	+/- 5%
DC Resistance Testing	No	YES	YES
Kelvin Test	Outsource		
Signal Loss measurement	No		
Latent Test			

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 Time-To-Market Interconnect Solutions™	OPC		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness	0.020"	0.007"	0.007"
Max Board Thickness - All Finishes	0.325"	0.325"	0.325"
Thickness Tolerance	+/-10% for >0.8mm board	+/-10% for >0.8mm board	+/-10% for >0.8mm board
Through Hole Aspect Ratio	16:1 for > 0.3mm,	16:1 for > 0.3mm,	18:1 for > 0.3mm,
Bow and Twist (Balanced)	0.7%	0.5%	NA
Panel Sizes	24" x 20"	24" x 20"	24" x 20"
<b>Technology</b>			
Microvias	Yes	Yes	Yes
Blind Vias	Yes	Yes	Yes
Buried Vias	Yes	Yes	Yes
Thin Core Pwr/Gnd			
Buried Resistor	No	No	No
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	0.003"/0.003"	0.0024"/0.0024"	0.002"/0.002"
1 oz	0.004"/0.004"	0.004"/0.004"	NA
2 oz	0.005"/0.005"	0.005"/0.005"	NA
3 oz	0.007"/0.007"	0.007"/0.007"	NA
4 oz	NA	0.009"/0.009"	NA
5 oz	NA	0.011"/0.011"	NA
Feature Tolerance 1/2 - 1 oz			
Feature Tolerance 2 - 5 oz			
Innerlayer Cu to Edge			
PTH (DHS) to Copper (Drill to Copper)	0.008"	0.007"	NA
NPT Hole/Slot to Copper, Second Drill	0.005"	0.004"	NA
Antipad Size	DHS+0.016"	DHS+0.014"	NA
Annular Ring Requirements for Drilled Holes <			
Tangency	DHS+0.016"	DHS+0.016"	NA
1 mil Annular Ring	DHS+0.018"	DHS+0.018"	NA
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base	0.003"/0.003"	0.003"/0.003"	0.0024"/0.0024"
1/2 oz Base	0.003"/0.003"	0.003"/0.003"	NA
1 oz Base	0.004"/0.004"	0.0035"/0.0035"	NA
2 oz Base	0.005"/0.005"	0.005"/0.005"	NA
3 oz Base	0.007"/0.007"	0.007"/0.007"	NA
4 oz Base	0.009"/0.009"	0.009"/0.009"	NA
5 oz Base			
Feature Attributes			
PTH to Copper	0.008"	0.007"	NA
NPT Hole/Slot to Copper	0.005"	0.004"	NA
Rout to O/L Copper			
Score to O/L Copper			

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 Time-To-Market Interconnect Solutions™	OPC		
	Standard	Advanced	Development
<b>Drill</b>			
Min. Drill Size	0.006	0.006	0.006
Min. Blind Drill Hole Size (Controlled Depth Drilling)	0.018	0.016	NA
Min. Slot Width - Std.	0.016	0.016	NA
Min. Positional Tolerance	0.003	0.002	NA
Min. PTH Tolerance (Primary Drill)	0.003	0.002	NA
Min. Tolerance of Plated Cut Out			
Counter Bore/Sink Tolerance	0.010	0.010	NA
Max. NPT (hole/slot) in Primary Drill	Slot length: (0.7 ~ 10+W) mm	Slot length: (0.7 ~ 10+W) mm	NA
Backdrill Size Over Primary Drill			
Backdrill Stub Length	0.002+0.012/-0	0.002+0.010/-0	NA
<b>Microvia</b>			
Laser via diameter	0.003	0.003	0.003
Capture/Target pads			
Aspect Ratio	0.85:1, and 0.80:1 for keip via	0.85:1, and 0.80:1 for keip via	0.9:1, and 0.85:1 for keip via
1 Layer Build Up	Yes	Yes	Yes
2 Layer Build Up	Yes	Yes	Yes
3+ Layer Build Up	Yes	Yes	Yes
4+ Layer Build Up	Yes	Yes	Yes
AnyLayer	Yes	Yes	Yes
Laser Via Stacked on Buried Via	Yes	Yes	Yes
Skip Via (ex 1-3)	Yes	Yes	Yes
<b>Via in Pad (through hole)</b>			
Non-Conductive Via Fill	Yes	Yes	Yes
Line width and Spacing (wrap)			
Microvia Non-Conductive Via Fill	Yes	Yes	Yes
Conductive Via Fill	Yes	Yes	Yes
Laser Direct Imaging	Yes	Yes	Yes
<b>Plating/Surface Finish</b>			
HASL	Yes ( none lead free)	Yes ( none lead free)	Yes ( none lead free)
Immersion Gold (ENIG)	Yes	Yes	Yes
Immersion Ni/Pd/Au	Yes	Yes	Yes
Electrolytic Ni/Au Tab Plating	Yes	Yes	Yes
Electrolytic Ni/Au (Hard Gold)	Yes	Yes	Yes
Organic Solderability Preservative	Yes	Yes	Yes
Immersion Silver	Yes	Yes	Yes
Immersion Tin	Yes	Yes	Yes
Selective ENIG or ENEPIG	Yes	Yes	Yes
Wirebondable Soft Au	Yes	Yes	Yes
OSP + Electroplate Ni-Au	Gold Finger, Selective hard gold, Soft Gold, Flash Gold	Gold Finger, Selective hard gold, Soft Gold, Flash Gold	Gold Finger, Selective hard gold, Soft Gold, Flash Gold
Fused Tin/Lead			

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 Time-To-Market Interconnect Solutions™	OPC		
	Standard	Advanced	Development
<b>Soldermask</b>			
Type	LPI	LPI	NA
Colors	Glossy green, matte green, red, blue, black, green	Glossy green, matte green, red, blue, black, green	NA
Thickness	10um min on conductor surface; 5um min on isolated conductor surface; 4um min for conductor corner; 10um min for copper GND	15um min on conductor surface; 5um min on isolated conductor surface; 4um min for conductor corner; 15um min for copper GND	NA
3/8 - 1 oz Base Copper			
Min. Web			
Min. Clearance	0.005	0.005	NA
<b>Legend</b>			
Text Width	0.006	0.005	NA
Color	White, yellow, black, red, blue	White, yellow, black, red, blue	NA
LPI	Yes	Yes	Yes
Inkjet	Yes		
<b>Fabrication</b>			
<b>Rout</b>			
Diameter Router Bits Available	0.8~2.0 mm		
Edge to Edge Tolerance	+/-0.004	+/-0.004	+/-0.004
<b>Score</b>			
Score Angles	+/-5	+/-5	NA
Positional Tolerance to Datum	+/-0.005	+/-0.004	NA
Front to Back Tolerance	+/-0.004	+/-0.004	NA
Remaining Web Tolerance			
<b>Bevel</b>			
Bevel Angles	20, 30,45	20, 30,45	NA
Depth Tolerance	+/-0.004	+/-0.004	NA
<b>Electrical Test &amp; Performance</b>			
Min. Component Pitch	0.015	0.015	NA
Max. Test Voltage	300V for Manson machine, 250V for Emmaflyng probe	300V for Manson machine, 250V for Emmaflyng probe	NA
Max. Isolation Resistance	100MΩ	100MΩ	NA
Min. Continuity Resistance	20Ω max.	20Ω max.	NA
Hi Pot Test (Machine Capability)	Yes		
Impedance Tolerance 51-100 ohms	+/-8% for >75um line width, +/-	+/-8% for >75um line width, +/-	+/-8% for >75um line width, +/-
Impedance Tolerance 28-50 Ohms	+/-4ohm for >75um line width,	+/-4ohm for >75um line width,	+/-4ohm for >75um line width,
DC Resistance Testing	Micro resistance meter		
Kelvin Test	4 wire tester		
Signal Loss measurement			
Latent Test			


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 Time-To-Market Interconnect Solutions™	SME		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness	0.018" (10L anylayer)	0.018" (10L anylayer)	0.016" (10L anylayer)
Max Board Thickness - All Finishes	0.157"	0.157"	0.157"
Thickness Tolerance	+/-10% for >0.8mm board	+/-10% for >0.8mm board	+/-10% for >0.8mm board
Through Hole Aspect Ratio	4.67:1 for 0.15 mm	4.67:1 for 0.15 mm	4.67:1 for 0.15 mm
Bow and Twist (Balanced)	0.7%	0.5%	NA
Panel Sizes	22"x19"	22"x19"	22"x19"
<b>Technology</b>			
Microvias	Yes	Yes	Yes
Blind Vias	Yes	Yes	Yes
Buried Vias	Yes	Yes	Yes
Thin Core Pwr/Gnd			
Buried Resistor	Distributed	Distributed	Distributed
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	0.002"/0.002"	0.0016"/0.0018"	0.0016"/0.0016"
1 oz	0.0035"/0.0035"	0.003"/0.003"	NA
2 oz	0.006"/0.006"	0.0055"/0.0055"	NA
3 oz			
4 oz			
5 oz			
Feature Tolerance 1/2 - 1 oz			
Feature Tolerance 2 - 5 oz			
Innerlayer Cu to Edge			
PTH (DHS) to Copper (Drill to Copper)	0.008"	0.007"	NA
NPT Hole/Slot to Copper, Second Drill	0.005"	0.004"	NA
Antipad Size	DHS+0.016"	DHS+0.014"	NA
Annular Ring Requirements for Drilled Holes <			
Tangency	DHS+0.016"	DHS+0.016"	NA
1 mil Annular Ring	DHS+0.018"	DHS+0.018"	NA
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base	0.0016"/0.002"	0.0016"/0.002"	0.0016"/0.0016"
1/2 oz Base	0.003"/0.003"	0.003"/0.003"	NA
1 oz Base	0.005"/0.005"	0.005"/0.005"	NA
2 oz Base			
3 oz Base			
4 oz Base			
5 oz Base			
Feature Attributes			
PTH to Copper	0.008"	0.007"	NA
NPT Hole/Slot to Copper	0.005"	0.004"	NA
Rout to O/L Copper			
Score to O/L Copper			


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 Time-To-Market Interconnect Solutions™	SME		
	Standard	Advanced	Development
<b>Drill</b>			
Min. Drill Size	0.004	0.004	0.004
Min. Blind Drill Hole Size (Controlled Depth Drilling)	NA	NA	NA
Min. Slot Width - Std.	0.016	0.016	NA
Min. Positional Tolerance	0.003	0.002	NA
Min. PTH Tolerance (Primary Drill)	0.003	0.002	NA
Min. Tolerance of Plated Cut Out			
Counter Bore/Sink Tolerance	0.008	0.004	NA
Max. NPT (hole/slot) in Primary Drill	Slot length: (0.7 ~ 10+W) mm	Slot length: (0.7 ~ 10+W) mm	NA
Backdrill Size Over Primary Drill			
Backdrill Stub Length	NA	NA	NA
<b>Microvia</b>			
Laser via diameter	0.0024	0.0024	0.002
Capture/Target pads			
Aspect Ratio	0.8:1	0.8:1	0.8:1
1 Layer Build Up	Yes	Yes	Yes
2 Layer Build Up	Yes	Yes	Yes
3+ Layer Build Up	Yes	Yes	Yes
4+ Layer Build Up	Yes	Yes	Yes
AnyLayer	Yes	Yes	Yes
Laser Via Stacked on Buried Via	Yes	Yes	Yes
Skip Via (ex 1-3)	Yes	Yes	Yes
<b>Via in Pad (through hole)</b>			
Non-Conductive Via Fill	Yes	Yes	Yes
Line width and Spacing (wrap)			
Microvia Non-Conductive Via Fill	Yes	Yes	Yes
Conductive Via Fill	Yes	Yes	Yes
Laser Direct Imaging	Yes	Yes	Yes
<b>Plating/Surface Finish</b>			
HASL	Outsource	Outsource	Outsource
Immersion Gold (ENIG)	Yes	Yes	Yes
Immersion Ni/Pd/Au	Outsource	Outsource	Outsource
Electrolytic Ni/Au Tab Plating	Yes	Yes	Yes
Electrolytic Ni/Au (Hard Gold)	Yes	Yes	Yes
Organic Solderability Preservative	Yes	Yes	Yes
Immersion Silver	Yes	Yes	Yes
Immersion Tin	Yes	Yes	Yes
Selective ENIG or ENEPIG	Outsource	Outsource	Outsource
Wirebondable Soft Au	NA	NA	NA
OSP + Electroplate Ni-Au	Yes	Yes	Yes
Fused Tin/Lead	NA	NA	NA


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 Time-To-Market Interconnect Solutions™	SME		
	Standard	Advanced	Development
<b>Soldermask</b>			
Type	LPI	LPI	NA
Colors	Green, matte green, black, red, blue, matte black, purple, white	Green, matte green, black, red, blue, matte black, purple, white	NA
Thickness	10um min on conductor surface; 5um min on isolated conductor surface; 4um min for conductor corner; 15um min for copper GND	10um min on conductor surface; 10um min on isolated conductor surface	NA
3/8 - 1 oz Base Copper			
Min. Web			
Min. Clearance	0.005	0.005	NA
<b>Legend</b>			
Text Width	0.005 (negative) or 0.004 (positive)	0.005 (negative) or 0.004 (positive)	NA
Color	White, yellow, black	White, yellow, black	NA
LPI	NA	NA	NA
Inkjet			
<b>Fabrication</b>			
Rout			
Diameter Router Bits Available	0.8~2.0 mm		
Edge to Edge Tolerance	+/-0.004	+/-0.004	+/-0.004
Score			
Score Angles	+/-3	+/-2	NA
Positional Tolerance to Datum	+/-0.005	+/-0.004	NA
Front to Back Tolerance	+/-0.004	+/-0.004	NA
Remaining Web Tolerance			
Bevel			
Bevel Angles	20~45	20~45	NA
Depth Tolerance	+/-0.004	+/-0.004	NA
<b>Electrical Test &amp; Performance</b>			
Min. Component Pitch	0.012	0.012	NA
Max. Test Voltage	200V	200V	NA
Max. Isolation Resistance	50MΩ for 2-wire machine, 100MΩ for 4-wire machine	50MΩ for 2-wire machine, 100MΩ for 4-wire machine	NA
Min. Continuity Resistance	500MΩ max. for 2-wire machine 1-100KΩ for 4-wire machine	500MΩ max. for 2-wire machine 1-100KΩ for 4-wire machine	NA
Hi Pot Test (Machine Capability)	Yes		
Impedance Tolerance 51-100 ohms	+/-8% for >75um line width, +/-	+/-8% for >75um line width, +/-	+/-8% for >75um line width, +/-
Impedance Tolerance 28-50 Ohms	+/-4ohm for >75um line width,	+/-4ohm for >75um line width,	+/-4ohm for >75um line width,
DC Resistance Testing	Micro resistance meter		
Kelvin Test	4 wire tester		
Signal Loss measurement			
Latent Test			

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 Time-To-Market Interconnect Solutions™	DMC		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness	0.020"	0.016"	0.016"
Max Board Thickness - All Finishes	0.315"	0.315"	0.315"
Thickness Tolerance	+/-10% for >0.8mm board	+/-10% for >0.8mm board	+/-8% for >0.8mm board
Through Hole Aspect Ratio	13:1 (line card)	13:1 (line card)	15:1 (line card)
Bow and Twist (Balanced)	0.7%	0.5%	NA
Panel Sizes	40" x22"	40" x22"	40" x22"
<b>Technology</b>			
Microvias	Yes	Yes	Yes
Blind Vias	Yes	Yes	Yes
Buried Vias	Yes	Yes	Yes
Thin Core Pwr/Gnd			
Buried Resistor	No	No	No
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	0.003"/0.0035"	0.003"/0.003"	0.003"/0.003"
1 oz	0.004"/0.004"	0.0035"/0.003"	NA
2 oz	0.006"/0.006"	0.006"/0.006"	NA
3 oz	0.008"/0.008"	0.008"/0.008"	NA
4 oz			
5 oz			
Feature Tolerance 1/2 - 1 oz			
Feature Tolerance 2 - 5 oz			
Innerlayer Cu to Edge			
PTH (DHS) to Copper (Drill to Copper)	0.008"	0.007"	NA
NPT Hole/Slot to Copper, Second Drill	0.008"	0.006"	NA
Antipad Size	DHS+0.016"	DHS+0.014"	NA
Annular Ring Requirements for Drilled Holes <			
Tangency	DHS+0.020"	DHS+0.016"	NA
1 mil Annular Ring	DHS+0.022"	DHS+0.018"	NA
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base	0.0035"/0.0035"	0.003"/0.0035"	0.003"/0.003"
1/2 oz Base	0.004"/0.004"	0.004"/0.004"	NA
1 oz Base	0.005"/0.005"	0.005"/0.005"	NA
2 oz Base	0.008"/0.008"	0.008"/0.008"	NA
3 oz Base			
4 oz Base			
5 oz Base			
Feature Attributes			
PTH to Copper	0.008"	0.007"	NA
NPT Hole/Slot to Copper	0.008"	0.006"	NA
Rout to O/L Copper			
Score to O/L Copper			

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 Time-To-Market Interconnect Solutions™	DMC		
	Standard	Advanced	Development
<b>Drill</b>			
Min. Drill Size	0.008	0.008	0.008
Min. Blind Drill Hole Size (Controlled Depth Drilling)	0.018	0.016	NA
Min. Slot Width - Std.	0.020	0.016	NA
Min. Positional Tolerance	0.003	0.002	NA
Min. PTH Tolerance (Primary Drill)	0.003	0.002	NA
Min. Tolerance of Plated Cut Out			
Counter Bore/Sink Tolerance	0.008	0.006	NA
Max. NPT (hole/slot) in Primary Drill	Slot length: (0.7 ~ 10+W) mm	Slot length: (0.7 ~ 10+W) mm	NA
Backdrill Size Over Primary Drill			
Backdrill Stub Length	0.009+/-0.007	0.007+/-0.005	NA
<b>Microvia</b>			
Laser via diameter	0.005	0.005	0.005
Capture/Target pads			
Aspect Ratio	0.6:1 for 1+ laser, 0.66:1 for skip via	0.6:1 for 1+ laser, 0.66:1 for skip via	0.6:1 for 1+ laser, 0.66:1 for skip via
1 Layer Build Up	Yes	Yes	Yes
2 Layer Build Up	only for Skip via	only for Skip via	only for Skip via
3+ Layer Build Up	No	No	No
4+ Layer Build Up	No	No	No
AnyLayer	No	No	No
Laser Via Stacked on Buried Via	No	No	No
Skip Via (ex 1-3)	Yes	Yes	Yes
<b>Via in Pad (through hole)</b>			
Non-Conductive Via Fill	Yes	Yes	Yes
Line width and Spacing (wrap)			
Microvia Non-Conductive Via Fill	Yes	Yes	Yes
Conductive Via Fill	Yes	Yes	Yes
Laser Direct Imaging	NA	NA	NA
<b>Plating/Surface Finish</b>			
HASL	Yes ( none lead free)	Yes ( none lead free)	Yes ( none lead free)
Immersion Gold (ENIG)	Yes	Yes	Yes
Immersion Ni/Pd/Au	NA	NA	NA
Electrolytic Ni/Au Tab Plating	Yes	Yes	Yes
Electrolytic Ni/Au (Hard Gold)	Yes	Yes	Yes
Organic Solderability Preservative	Yes	Yes	Yes
Immersion Silver	Yes	Yes	Yes
Immersion Tin	Yes	Yes	Yes
Selective ENIG or ENEPIG	NA	NA	NA
Wirebondable Soft Au	Yes	Yes	Yes
OSP + Electroplate Ni-Au	Selective hard gold, Soft Gold	Gold Finger, Selective hard gold, Soft Gold, Flash Gold	Gold Finger, Selective hard gold, Soft Gold, Flash Gold
Fused Tin/Lead	NA	NA	NA


 Time-To-Market Interconnect Solutions™	DMC		
	Standard	Advanced	Development
<b>Soldermask</b>			
Type	LPI	LPI	NA
Colors	Glossy green, matte green, black, red, blue, matte black	Glossy green, matte green, black, red, blue, matte black	NA
Thickness	10um min on conductor surface; 5um min on isolated conductor surface; 4um min for conductor corner; 15um min for copper GND	13um min on conductor surface; 5um min on isolated conductor surface; 4um min for conductor corner; 15um min for copper GND	NA
3/8 - 1 oz Base Copper			
Min. Web			
Min. Clearance	0.005	0.005	NA
<b>Legend</b>			
Text Width	0.005	0.004	NA
Color	White, yellow, black	White, yellow, black	NA
LPI	NA	NA	NA
Inkjet			
<b>Fabrication</b>			
Rout			
Diameter Router Bits Available	0.8~2.0 mm		
Edge to Edge Tolerance	+/-0.004	+/-0.004	+/-0.004
Score			
Score Angles	+/-5	+/-5	NA
Positional Tolerance to Datum	+/-0.005	+/-0.004	NA
Front to Back Tolerance	+/-0.004	+/-0.002	NA
Remaining Web Tolerance			
Bevel			
Bevel Angles	19~45	19~45	NA
Depth Tolerance	+/-0.005	+/-0.004	NA
<b>Electrical Test &amp; Performance</b>			
Min. Component Pitch	0.010 for fly probe, 0.015 for fixture	0.010 for fly probe, 0.015 for fixture	NA
Max. Test Voltage	300V for Manson and ATG fly probe machine, 250V for Emmafly probe	300V for Manson and ATG fly probe machine, 250V for Emmafly probe	NA
Max. Isolation Resistance	100MΩ	100MΩ	NA
Min. Continuity Resistance	20Ω max	20Ω max	NA
Hi Pot Test (Machine Capability)	Yes		
Impedance Tolerance 51-100 ohms	+/-8% for >75um line width	+/-8% for >75um line width	+/-8% for >75um line width
Impedance Tolerance 28-50 Ohms	+/-4ohm for >75um line width	+/-4ohm for >75um line width	+/-4ohm for >75um line width
DC Resistance Testing	Micro resistance meter		
Kelvin Test	4 wire tester		
Signal Loss measurement	SPP		
Latent Test			

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 Time-To-Market Interconnect Solutions™	GME		
	Standard	Advanced	Development
<b>Physical Characteristics</b>			
Min. Board Thickness	0.021" (10L anylayer)	0.021" (10L anylayer)	0.018" (10L anylayer)
Max Board Thickness - All Finishes	0.126"	0.157"	0.157"
Thickness Tolerance	+/-10% for >0.8mm board	+/-10% for >0.8mm board	+/-10% for >0.8mm board
Through Hole Aspect Ratio	5:1 for 0.15 mm	5:1 for 0.15 mm	5:1 for 0.15 mm
Bow and Twist (Balanced)	0.7%	0.5%	NA
Panel Sizes	22"x19"	22"x19"	22"x19"
<b>Technology</b>			
Microvias	Yes	Yes	Yes
Blind Vias	Yes	Yes	Yes
Buried Vias	Yes	Yes	Yes
Thin Core Pwr/Gnd			
Buried Resistor	No	No	No
<b>Inner Layers</b>			
Minimum Line/Space			
H oz	0.002"/0.002"	0.0016"/0.0016"	0.0016"/0.0016"
1 oz	0.003"/0.003"	0.003"/0.003"	NA
2 oz	0.003"/0.005"	0.003"/0.005"	NA
3 oz	0.004"/0.007"	0.004"/0.007"	NA
4 oz			
5 oz			
Feature Tolerance 1/2 - 1 oz			
Feature Tolerance 2 - 5 oz			
Innerlayer Cu to Edge			
PTH (DHS) to Copper (Drill to Copper)	0.008"	0.007"	NA
NPT Hole/Slot to Copper, Second Drill	0.006"	0.006"	NA
Antipad Size	DHS+0.016"	DHS+0.014"	NA
Annular Ring Requirements for Drilled Holes <			
Tangency	DHS+0.016"	DHS+0.016"	NA
1 mil Annular Ring	DHS+0.018"	DHS+0.018"	NA
<b>Outer Layers</b>			
Minimum Line/Space			
3/8 oz Base	0.0016"/0.002"	0.0016"/0.002"	0.0016"/0.0016"
1/2 oz Base	0.003"/0.003"	0.003"/0.003"	NA
1 oz Base	0.005"/0.005"	0.005"/0.005"	NA
2 oz Base			
3 oz Base			
4 oz Base			
5 oz Base			
Feature Attributes			
PTH to Copper	0.008"	0.007"	NA
NPT Hole/Slot to Copper	0.006"	0.006"	NA
Rout to O/L Copper			
Score to O/L Copper			

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 Time-To-Market Interconnect Solutions™	GME		
	Standard	Advanced	Development
<b>Drill</b>			
Min. Drill Size	0.006	0.006	0.004
Min. Blind Drill Hole Size (Controlled Depth Drilling)	0.018	0.016	NA
Min. Slot Width - Std.	0.020	0.016	NA
Min. Positional Tolerance	0.003	0.002	NA
Min. PTH Tolerance (Primary Drill)	0.003	0.002	NA
Min. Tolerance of Plated Cut Out			
Counter Bore/Sink Tolerance	0.010	0.008	NA
Max. NPT (hole/slot) in Primary Drill	Slot length: (0.7 ~ 10+W) mm	Slot length: (0.7 ~ 10+W) mm	NA
Backdrill Size Over Primary Drill			
Backdrill Stub Length	nomial +/- 0.005, or 0.002 min.	0.002 min.	NA
<b>Microvia</b>			
Laser via diameter	0.003	0.003	0.0024
Capture/Target pads			
Aspect Ratio	0.8:1	0.8:1	0.8:1
1 Layer Build Up	Yes	Yes	Yes
2 Layer Build Up	Yes	Yes	Yes
3+ Layer Build Up	Yes	Yes	Yes
4+ Layer Build Up	Yes	Yes	Yes
AnyLayer	Yes	Yes	Yes
Laser Via Stacked on Buried Via	Yes	Yes	Yes
Skip Via (ex 1-3)	Yes	Yes	Yes
<b>Via in Pad (through hole)</b>			
Non-Conductive Via Fill	Yes	Yes	Yes
Line width and Spacing (wrap)			
Microvia Non-Conductive Via Fill	Yes	Yes	Yes
Conductive Via Fill	Yes	Yes	Yes
Laser Direct Imaging	Yes	Yes	Yes
<b>Plating/Surface Finish</b>			
HASL	Outsource	Outsource	Outsource
Immersion Gold (ENIG)	Yes	Yes	Yes
Immersion Ni/Pd/Au	NA	NA	NA
Electrolytic Ni/Au Tab Plating	Yes	Yes	Yes
Electrolytic Ni/Au (Hard Gold)	Yes	Yes	Yes
Organic Solderability Preservative	Yes	Yes	Yes
Immersion Silver	Yes	Yes	Yes
Immersion Tin	NA	NA	NA
Selective ENIG or ENEPIG	NA	NA	NA
Wirebondable Soft Au	NA	NA	NA
OSP + Electroplate Ni-Au	Yes	Yes	Yes
Fused Tin/Lead	NA	NA	NA

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 Time-To-Market Interconnect Solutions™	GME		
	Standard	Advanced	Development
<b>Soldermask</b>			
Type	LPI	LPI	NA
Colors	Green, matte green, black, blue, red, matte black	Green, matte green, black, blue, red, matte black	NA
Thickness	10um min on conductor surface; 5um min on isolated conductor surface; 15um min for copper GND	10um min on conductor surface; 5um min on isolated conductor surface; 15um min for copper GND	NA
3/8 - 1 oz Base Copper			
Min. Web			
Min. Clearance	0.005	0.005	NA
<b>Legend</b>			
Text Width	0.005	0.004	NA
Color	White, yellow, black	White, yellow, black	NA
LPI	Yes	Yes	Yes
Inkjet			
<b>Fabrication</b>			
Rout			
Diameter Router Bits Available	0.8~2.0 mm		
Edge to Edge Tolerance	+/-0.004	+/-0.004	+/-0.004
Score			
Score Angles	+/-5	+/-5	NA
Positional Tolerance to Datum	+/-0.005	+/-0.004	NA
Front to Back Tolerance	+/-0.004	+/-0.004	NA
Remaining Web Tolerance			
Bevel			
Bevel Angles	15~45	15~45	NA
Depth Tolerance	+/-0.005	+/-0.004	NA
<b>Electrical Test &amp; Performance</b>			
Min. Component Pitch	0.012	0.012	NA
Max. Test Voltage	250V for LM/ATG/EMMA fly probe machine, 300V for Mason machine.	250V for LM/ATG/EMMA fly probe machine, 300V for Mason machine.	NA
Max. Isolation Resistance	100MΩ	100MΩ	NA
Min. Continuity Resistance	1Ω-10kΩ	1Ω-10kΩ	NA
Hi Pot Test (Machine Capability)	Yes		
Impedance Tolerance 51-100 ohms	+/-8% for >75um line width, +/-	+/-8% for >75um line width, +/-	+/-8% for >75um line width, +/-
Impedance Tolerance 28-50 Ohms	+/-4ohm for >75um line width, +/-	+/-4ohm for >75um line width, +/-	+/-4ohm for >75um line width, +/-
DC Resistance Testing	Micro resistance meter		
Kelvin Test	4 wire tester		
Signal Loss measurement	VNA		
Latent Test			

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