



DFM GUIDELINES

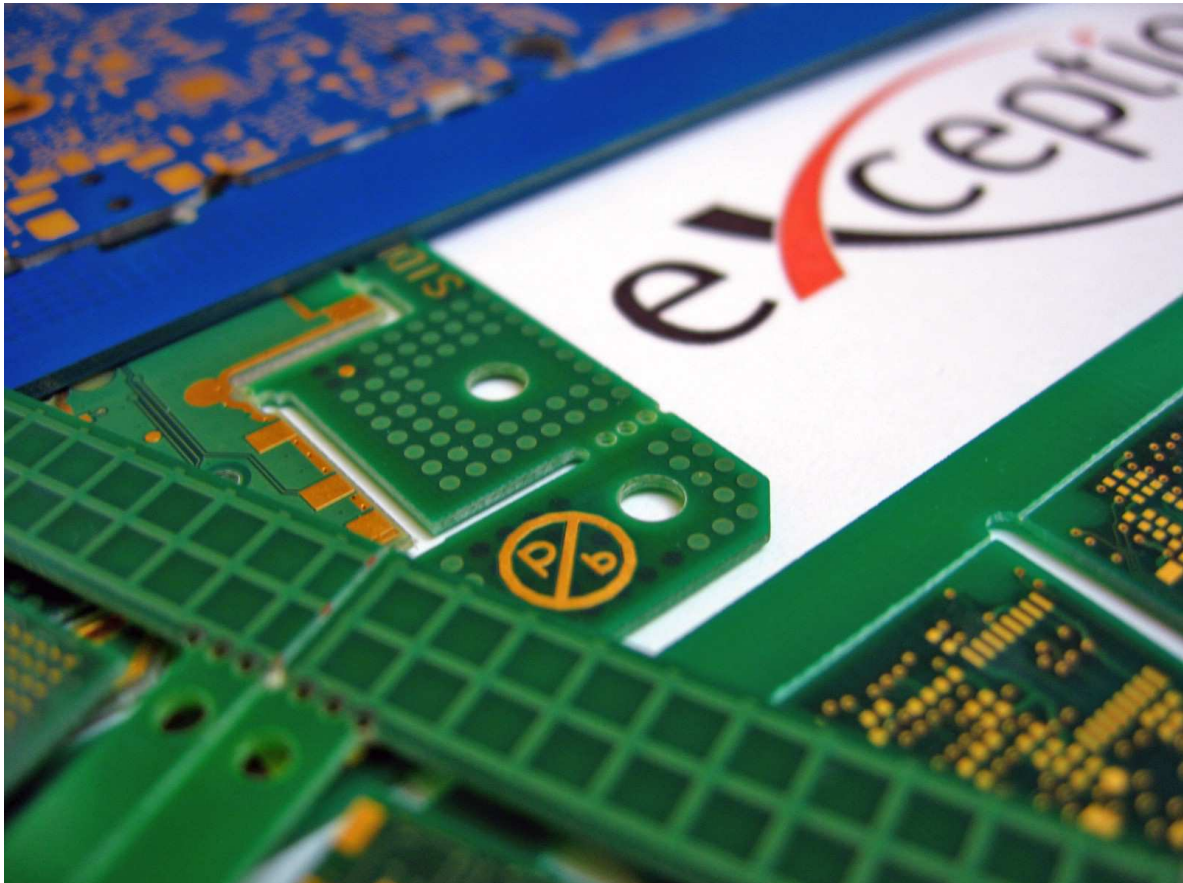
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EPC-05-01 /TDFM.1



Data Transfer

Method	Preferred	Acceptable	Non Preferred
eXception	<u>FTP</u>	Email	All Others

Note:

All data sets should be in a compressed format

A readme file should be included giving details of contact, part number and issue level

For security, the following e-mail attachments cannot be accepted: .EXE, .VB?, .COM, .BAT

For a secure FTP account please contact Phil Danter on mail to: phil.danter@exceptionpcb.com

Format	Preferred	Acceptable	Non Preferred
eXception	ODB++	RS-274-X Gerber with CAD Netlist	All Others

Note:

90% of all CAD systems can now post process ODB++ format in place of Gerber

All Gerber pads should be flashed

IPC356 or Mentor Neutral netlist is preferred

Standard Edits	<ul style="list-style-type: none"> • Non Functional Pad Removal with Customer approval • Addition of Teardrop Pads with Customer approval • Addition of ATE Tooling with Customer approval • Addition of Copper in Waste Area with Customer approval • Addition of Blind/Buried via Pull Through Pads • Copper Etch Compensation • Solder Mask Optimisation • Silk Screen Optimisation • Manufacturing tooling to be included in waste areas • Vias in pad to be filled (might affect the price of the board) • Stepped paste data can be supplied only if we receive the past files.
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* Please incorporate at design stage or indicate acceptance for eXception PCB to edit as applicable.

Fabrication

Panelisation	Manufacturing panel size	Usable area without impedance	Usable area with impedance *
	457mm x 609mm 530mm x 609mm 304mm x 457mm 406mm x 457mm	420mm x 571mm 495mm x 571mm	355 mm x 508mm 430mm x 508mm

* Usable area with impedance depends on the number of coupons needed and based on how many different impedance tracks are required for the project.

PCB thickness	Standard processing	Technical processing	Advanced processing
Rigid overall thickness	0.8mm – 3.2mm	0.20 – 5.00mm	Upon Agreement
	Tolerance: +/- 10% (min 100um)	Tolerance: +/- 10% (min 100um)	-
Flexi-Rigid overall thickness	0.8mm – 3.2mm	0.5mm – 5.00mm	Upon Agreement
	Tolerance: +/- 10% (min 100um)	Tolerance: +/- 10% (min 100um)	-
Pure Flexi overall thickness	0.25mm – 1mm	0.2mm – 1.6mm	Upon Agreement
	Tolerance: +/- 10% (min 100um)	Tolerance: +/- 10% (min 100um)	-
Stiffeners thickness	0.5mm – 1.6mm	0.1 mm – 3.2mm	-

Note: the overall thickness depends on layout/aspect ratio, please contact Qta.technical@exceptionpcb.com department.

ML Lay up	Standard processing	Technical processing	Advanced processing
Bond Cycles	2	3	4+*
Rigid Layer Count	Up to 18	Up to 32	33+
Flexi-Rigid Layer Count	Up to 12	13 – 16	16+
Pure Flexi Layer Count	Up to 4	4 – 12	12+

*Number of bond cycles are dependent on materials; above 4 cycles FR4 designs must be transferred onto Halogen Free material.

M/L Rigid	Standard processing	Technical processing	Advanced processing
Foil	17um - 105um	9um - 140um	5um - 210um
Laminate Core	0.076mm	0.050mm	0.025mm

Flatness	Standard processing	Technical processing	Advanced processing
Bow & Twist	1.0%	0.75%	-

Note: Dependent on design. Test method as per IPC-TM-650.

Flexi-Rigid	Standard processing	Technical processing	Advanced processing
Flex Base Laminate	0.075mm - 0.15mm	0.025mm - 0.075mm	-
Coverlay Thickness	C/L 0.025 - 0.05mm Adhesive 0.025 - 0.05mm	C/L 0.013 - 0.076mm Adhesive 0.013 - 0.076mm	Photo Imageable Liquid Coverlay
Liquid Coverlay	PSR-9000 FXT, Green or NPR80 -Amber		
Flexibility ratio Radius: thickness	10:1	12:1	-

Lyr to Lyr Registration	Standard processing	Technical processing	Advanced processing
Rigid	0.1mm	0.05mm	-
Flexible	0.15mm	0.1mm	-

*Based on 1 bond cycle with common material in build

Materials	Standard processing	Technical processing	Advanced processing
Types	FR4 (low - high Tg) Polyimide, Rogers 4000 series, (Epoxy & Polyimide variants) Halogen free materials, High Frequency Laminates.	Rogers 3000 series, Aramid, Hybrid constructions, Metal Core Constructions, PTFE, IMS	Buried Capacitance Buried Resistance Buried Inductance Embedded Active and Passive Components
Material	UL / RoHS compliant		

Note: Material data sheets are available under request.

Please contact Qta.technical@exceptionpcb.com

Layout

Track & Gap Plate & Etch (Outer layers)	Standard processing	Technical processing	Advanced processing
35um Finished track height	100um T/G	75um T/G	50um T/G**
70um Finished track height	150um T/G	125um T/G	
105um Finished track height	200um T/G	175um T/G	

Note: Please contact Qta.technical@exceptionpcb.com for further information regarding higher copper weight

** Max 30um copper weight and point to point gap (pad to pad or pad to track)

Track & Gap Print & Etch (Inner Layers)	Standard processing		Technical processing		Advanced processing
	Track	Gap	Track	Gap	
17um Finished track height	100um	100um	75um	75um	50um Tracks
35um Finished track height	150um	150um	90um	110um	75um Tracks
70um finished track height	200um	200um	120um	170um	100um Track
105um finished track height					200 track / 250 gaps
140um finished track height					200 track / 300 gaps

Figures quoted are for parallel tracking; narrower point-point gaps may be achievable.

Values out with Technical processing limits will require non-standard line operation by process team and can have an impact on yields.

105 & 140 finished copper thickness will require assessment to ensure prepreg specified is suitable to encompass during lamination.

Annular Ring Outer layers	Standard processing*	Technical processing*	Advanced processing*
Mechanical	100um	75um	50um
Microvias entry /stop pad	75um	50um	-
Flex-Rigid	100um	75um	-
Pure Flexible	125um	100um	-

Note: These values may give tangency (IPC Class 2) – and are to be in ADDITION to any minimum finished values. Use of tear dropping is recommended.

*: Values are based on drilled hole.

Annular Ring Inner layer	Standard processing*	Technical processing*	Advanced processing*
Mechanical	100um	75um	-
Microvias entry /stop pad	75um	50um	-
Flex-Rigid	150um	100um	-
Pure flexible	150um	100um	-

Note: These values may give tangency (IPC Class 2) – and are to be in ADDITION to any minimum finished values. Use of tear dropping is recommended. *: Values are based on drilled hole.

Hole to Copper	Standard processing*	Technical processing*	Advanced processing*
PTH to Inner	200um	165um	150um***
NPTH to Inner	200um	165mm	150um***
PTH to Outer	150um	125um	100um
NPTH to Outer	200um	152um	75um

Note: For NPTH in solid copper i.e. NPTH to Outer < Technical MIN, then 2nd stage drilling must be used.

*: Values are based on drilled hole.

*** 4 layers only

Flex-Rigid Hole to Rigid interface	Standard processing*	Technical processing*	Advanced processing*
Edge of Hole to transition edge	1.5mm	1.2mm	1.0mm

Profile Edge to Copper	Standard processing	Technical processing	Advanced processing
Rigid Inner Layer	0.25mm	0.2mm	0.15mm
Rigid Outer Layer	0.2mm	0.175mm	0.15mm
Flex-Rigid Inner Layer	0.4mm	0.3mm	0.25mm
Flex-Rigid Outer Layer	0.35mm	0.3mm	0.2mm

Profile edge to Rigid interface	Standard processing	Technical processing	Advanced processing
Interface edge	0.5mm	0.4mm	0.3mm

Note: This includes external profile and any inboard slots / cut-outs generated by Routing or Scoring.

Drilling

Positional Tolerance	Standard processing	Technical processing	Advanced processing
1 st Stage	100um	75um	50um
2 nd Stage NPTH	150um	100um	65um

Drill Sizes	Standard processing	Technical processing	Advanced processing
PTH	0.25mm	0.2mm	0.15mm***
NPTH	0.5mm	0.3mm	0.2mm
SLOTS diameter	1mm	0.8mm - 1mm	< 0.8mm**
SLOTS length	> 2.0 x diameter	---	≤ 2.0 x diameter

Note: Drill sizes are available in metric increments of 0.050mm. DRILL size is always INCREASED from FHS to allow for plating and finish.

*** – Subject to board thickness of max 1mm

** – Subject to max board thickness of 1.6mm

Back drilling	Standard processing	Technical processing	Advanced processing
Drill size	0.9mm - 3mm	0.5mm - 0.9mm	< 0.5mm
Depth tolerances	+/- 0.2mm	+/- 0.15mm	< +/- 0.15mm

FHS Tolerance	Standard processing	Technical processing	Advanced processing
PTH	+/- 0.1mm	+/- 0.05mm	-
NPTH	+/- 0.1mm	+/- 0.05mm	-
Press fit	+/- 0.075mm	+/- 0.05mm	-

Note: FHS mid tolerance should be a valid drill diameter size (0.002"/0.050mm increments). Where Finished Hole Size is not equal to a valid drill size eXception PCB will 'round up' to next available size.

Note: Please contact qta.technical@exceptionpcb.com for further information regarding Laser Drilling.

*: Please see Aspect ratio for Dielectric Thickness.

Laser Sizes	Standard processing	Technical processing	Advanced processing
Microvias	125um	100um	65um

Aspect Ratio	Standard processing	Technical processing	Advanced processing
Plated Holes	8:1	10.1(min 0.25 drill)	12.1
Microvias	0.75:1	1:1	-

Note: Please contact our Qta.technical@exceptionpcb.com department for further information regarding our expertise on microvias, *eXMT*[®](Cu filled microvia towers) and *eXFPT*[®] (Cu filled microvia and thru vias for flat SMT pad assembly assistance)

Profile

Scoring	Standard processing	Technical processing	Advanced processing
Angle	30 deg	-	45 deg
Aspect ratio	1/3 rd deep on top and bottom	-	-
Positional Tolerance	+/- 0.2mm	+/- 0.1mm	-
Panel thickness	1.6mm - 3.20mm	0.8mm	---

Routing	Standard processing	Technical processing	Advanced processing
Cutter Diameter	2mm	0.8mm*	0.6mm*
Positional Tolerance	+/- 0.2mm	+/- 0.15mm	+/-0.1mm**
Chamfer to Copper feature	150um	100um	< 100um

Note: Radii always generated for internal corners designed at 90° (½ of Cutter Diameter).

*Depend on board thickness

** - Subject to Design review

Countersink	Standard processing	Technical processing	Advanced processing
Angle	82deg, 90deg, 100deg	---	Other angles

Pure Flexible Laser Routing	Standard processing	Technical processing	Advanced processing
Positional Tolerance	+/- 0.1mm	+/- 0.05mm	-

Depth Milling	Standard processing	Technical processing	Advanced processing
Cutter Diameter	2mm	0.8mm	0.6mm
Depth tolerance	+/- 0.2mm	+/- 0.15mm	+/- 0.1mm
Positional Tolerances	+/- 0.2mm	+/- 0.15mm	+/- 0.1mm

Electrical Test

Test Dimensions	Standard processing	Technical processing	Advanced processing
Flying Probe (Takaya Test)	609mm x 609mm	Soft Touch Test (Wire Bond Applications)	-
Test rate	100%	100%	100%

Hi POT Test	Standard processing	Technical processing	Advanced processing
Max Voltage	5000 Vdc		
Max current	15 mA		
Continuity Values max	10 MΩ		

Note: Hi pot tests are provided under request; please contact our Ota.technical@exceptionpcb.com team for further information.

Impedance	Standard processing	Technical processing	Advanced processing
Rigid Ohms	10%	5% subject to construction	-
Flexi-Rigid Ohms	Min 15%		10%
Impedance Coupon's size	195mm X 20mm		

Note: Impedance coupons are designed and supplied by eXception PCB, please contact Ota.technical@exceptionpcb.com team for further information.

Our Technical support is available during design stage regarding stack up, materials and impedance simulation.

Solder Mask

Solder Mask Features	Standard processing	Technical processing	Advanced processing
Clearance (annular)	75um	50um	Solder mask defined. Min 15um overlap
Coverage	100um	75um	50um
Web	100um	75um**	-

Note: Colour must be defined – **GREEN** is standard, **Sun Chemical**

**** – ONLY WITH GREEN RESIST**

Other Solder Mask types and colours available (Blue, Purple, Red, Black, white) please contact our Qta.technical@exceptionpcb.com Team

Coverlay	Standard processing	Technical processing	Advanced processing
Clearance	0.4mm	0.3mm	-
Coverage	0.3mm	0.2mm	-
Web	0.25mm	0.2mm	-
Insulation under rigid interface	0.5mm	-	-

Surface Finish

Finish Thickness	Standard processing RANGE	Technical processing RANGE	Shelf life
SnPb HASL	1-50um		Up to 2 year*
Pb Free HASL	1-50um		Up to 2 year*
Electrolytic Nickel	3-8um	8-12um**	Up to 1 year*
Electrolytic Gold	1-3um	4-5um**	
Immersion NiAu	Ni: 3-7um Au: 0.05-0.10um	Ni: 7 - 9um** Au: 0.11-0.15um**	Up to 1 year*
OSP (Entek)	0.02-0.05um	-	Up to 6 months *
Immersion Tin	0.7 - 1.1um	1.1 - 1.5um **	Up to 6 Months*
Immersion Silver	0.07 - 0.25um	0.05 - 0.1um	Up to 6 Months*
Nickel Palladium Gold	Ni: 3-5um Pd: 0.2 - 0.5um Au: 0.04 - 0.06um	-	Up to 1 year*

*Shelf life is subject to the products are kept sealed in its original package as well as storage conditions: please contact Qta.technical@exceptionpcb.com for storage conditions.

** Any thickness required above the standard must be reviewed

Silk Screen

Peelable Mask	Standard processing	Technical processing	Advanced processing
Clearance	0.3mm	0.2mm	-
Coverage	0.4mm	0.2mm	-

Legend	Standard processing	Technical processing	Advanced processing
Resist + Clearance	0.15mm	0.1mm	-
Feature Width	0.2mm	0.15mm (inkjet)*	0.1mm (inkjet)*

Note: Colour must be defined – **WHITE** and **YELLOW** are standard, other colours by request.

- Inkjet white only
- Please contact Ota.technical@exceptionpcb.com Team

Cu Fill (<i>eXFPT</i> [®] : <i>eXVTEX</i> [®])	Standard processing	Technical processing	Advanced processing
Aspect ratio	8:1	6:1	-
CNC drilled hole	-	-	Technical review***
Laser drilled hole	100um	75um *	-
% Volume	IPC **	IPC**	-

Note: All our Cu filled vias are Flat pads.

** – Subject to IPC Specification on acceptable “dimple”

Resin Fill *	Standard processing	Technical processing	Advanced processing
Aspect ratio	8:1	10:1	-
Mechanical drilled hole min	0.25mm***	-	0.20mm***
% Volume	100%**	100%**	-

Note: For Via Fill design rules, please contact our Ota.technical@exceptionpcb.com Team

* Resin fill is available for mechanically drilled holes only: through holes, buried vias and blind vias.

** Subject to IPC Specification on acceptable “dimple”

*** There is an option to over plate and flat pad over resin fill holes.

Via Plug (solder Mask)	Standard processing	Technical processing	Advanced processing
Hole Size	0.5mm	0.3mm	-
% Volume plug vias	40%	60%	-

Note: For Plug design rules, please contact our Qta.technical@exceptionpcb.com Team

Carbon	Standard processing	Technical processing	Advanced processing
Clearance	0.3mm	0.2mm	-
Coverage	0.3mm	0.2mm	-

Note: For Carbon finished thickness > 0.0006" (15µm) Resistivity is < 25µm/sq.