Design Rules

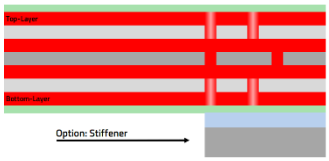
ADVANCED.**hdi** x-2b-x

These design rules apply to:

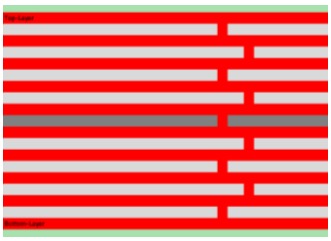
Anylayer Microvia PCBs made of base material ANSI GPY/42 for **interposers and modules**.

- With 4 to 10 layers, stacked and staggered Microvias.
- Optionally with glued mechanical stiffener (-Ri = Stiffener) or solder carrier (for extra charge).
- No UL-marking. All materials are UL-listed.
- Examples:

ADVANCED.hdi 1-2b-1
Only microvias used



ADVANCED.hdi (1-2b-1)-Ri
Option: Solder carrier



ADVANCED.hdi 4-2b-4

Nomenclature: ADVANCED.hdi x-2b-x or (x-2b-x)-Ri,

- x = number of sequential build-up copper layers,
- Ri = Stiffener or solder carrier out of FR-4.0

Layer count	PCB total thickness without Stiffener/solder carrier	Nomenclature	Material
4	0.25 mm	ADVANCED.hdi 1-2b-1	GPY/42
6	0.36 mm	ADVANCED.hdi 2-2b-2	GPY/42
8	0.47 mm	ADVANCED.hdi 3-2b-3	GPY/42
10	0.58 mm	ADVANCED.hdi 4-2b-4	GPY/42

Basic instructions

- Please comply with general standards, such as IPC or IEC, if applicable
- Please refer to our Design Guide HDI.
- We will be happy to create the optimal delivery panel for you (best price!).
- ANSI grade GPY/42 is a higher quality base material. It is also cycle-proof like FR4.1, but also offers lower thermal expansion in the x and y axes. The tendency to twist and warp is considerably reduced.
  → Data sheet see page 5.
- Only laser microvias are allowed.

Design Rules

ADVANCED.**hdi** x-2b-x

Material specifications

Material	Standard	Sheet#	Description	Application, *keywords (IPC-4101)*
Base material	IPC-4101	42	ANSI: GPY/42 Tg 260 °C CTE X/Y-axis 4-6 ppm/K	Semiconductor packages, moduls Low X-/Y-axis CTE, thermocycle-proof, considerably reduced tendency to twist and warp *Polyimide / Epoxy / Woven Glass* *High Reliability, Fillers*
Soldermask	IPC-SM840 JIS C 5012		green, photosensitive	Standard

Standard Stackups

Standard stackups see https://www.we-online.com/hdi-stackups-en

ADVANCED.**hdi**_1-2b-1

PCB Thickness : 0,26 mm +/-0,05mm

Rigid area Structure		Rigid area Thickness	Material description	rigid area		Viatypes	Layer usage	Impedance Er	Impedance Z[Ohm] / Line / Space
		20	Soldermask photosensitive						
L1		25	9µm copper foil + plating	Top-Layer					
		35	GPY/42-prepreg						
L2		25							
		50	GPY/42-core						
L3		25							
		35	GPY/42-prepreg						
L4		25	9µm copper foil + plating	Bottom-Layer					
		20	Soldermask photosensitive						

ADVANCED.**hdi**_ 4-2b-4

PCB Thickness : 0,62 mm +/-0,05mm

Rigid area Structure		Rigid area Thickness	Material description	rigid area		Viatypes	Layer usage	Impedance Er	Impedance Z[Ohm] / Line / Space
		20	Soldermask photosensitive						
L1		25	9µm copper foil + plating	Top-Layer					
		35	GPY/42-prepreg						
L2		25							
		35	GPY/42-prepreg						
L3		25							
		35	GPY/42-prepreg						
L4		25							
		35	GPY/42-prepreg						
L5		25							
		50	GPY/42-core						
L6		25							
		35	GPY/42-prepreg						
L7		25							
		35	GPY/42-prepreg						
L8		25							
		35	GPY/42-prepreg						
L9		25							
		35	GPY/42-prepreg						
L10		25	9µm copper foil + plating	Bottom-Layer					
		20	Soldermask photosensitive						

Standard design

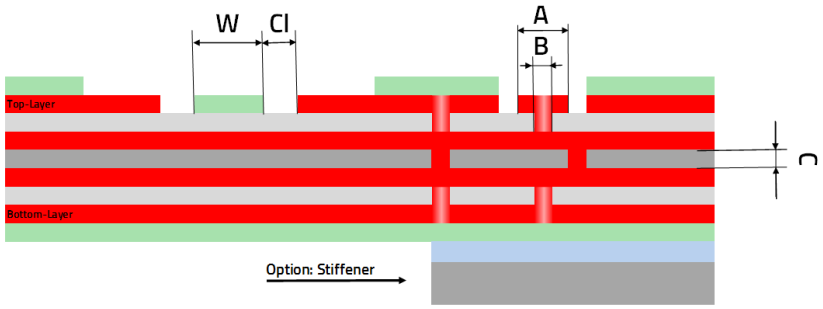
1. ANSI GPY/42 core
2. Sequential build-up of anylayer pairs with base material
   - GPY/42 prepreg 35 µm
3. Copper foil thickness 9 µm + electroplating
4. Photosensitive solder resist green
5. Standard vias are laser drilled microvias as anylayer connections, plating thickness according to IPC-6012
6. Outline lasered or milled, smallest milling diameter 1.6 mm. **V-scoring not permitted!**
7. Solderable surface ENIG (electroless Nickel – immersion Gold)
8. Packaged in ESD shrink wrap

Design Rules

ADVANCED.**hdi** x-2b-x

Stackup ADVANCED.**hdi (1-2b-1)-Ri**

Microvias only



Symbol	Desicription	Technical Standard	Advanced requirements
	Line width and spacing → microvias only	75 µm / 75 µm	50 µm / 50 µm
A	Minimum pad diameter for microvia	225 µm	200 µm
B	Finished hole diameter of lasered microvia, typical	85 µm	70 µm
	For all Pad-connections Teardrops are recommended!		
-	Distance copper to outline	≥ 300 µm	≥ 225 µm
-	Number of copper layers in total	4 to 10	
C	Thickness of core (ANSI GPY/42, halogenfree, filled)	50 µm	100 µm
-	Thickness of cold-bonded stiffener made of FR-4.0 material	0.8 mm	1.00 mm – 1.55 mm
	Thickness of cold-bonded solder carrier made of FR-4.0	0.8 mm	0.8 mm
-	Thickness of glue for stiffener or solder carrier	50 µm	
W	Minimum bridge width photosensitive solder mask	70 µm	50 µm
Cl	Minimum clearance of copper pad with solder mask, circumferential	40 µm	35 µm

Further specifications available on request, please contact us: slim.hdi@we-online.com

BASE MATERIAL DATA SHEET

Classification in reference to IPC-4101/42, ANSI: GPY/42

Base material: copper clad laminate: Glass type E, Resin: Polyimide, Epoxy, high Tg, halogen free, filled

Application: Substrates and modules in ADVANCED.hdi technology

Low CTE values in X,Y directions and reduced warpage of package substrate significantly, Cycle-proof.

Characteristics					
Item		**Condition**[3]	**Unit**	**Actual Value ANSI: GPY/42**	**Reference (IPC-TM-650)**
Tg	TMA method	A	°C	260-280	2.4.24
	DMA method	A		300-330	
CTE[1]	X (30-120 °C)	A	ppm/°C	4,0-6,0	
	Y (30-120°C)			4,0-6,0	
Solder Heat Resistance (260 °C)		A	sec.	>=300	
T260 (without cuopper)		A	min.	>=60	
T288 (without copper)				>=60	2.4.24.1
Decomposition Temperature (TGA methode, 5% Weight Loss)		A	°C	430-450	2.3.40
Heat Resistance for HDI Proces (Semi-Additive)		260°C Reflow	cycles	>=20	
Copper Peel Strength	12 µm	A	kN/m	0,7-0,9	2.4.8
	18 µm			0,8-1,0	
Surface Roughness (Ra)		A	µm	2-3	2.2.17
Flexural Modulus (Lengthwise)[4]		A	Gpa	30-32	
Dielectric Constant	10 GHz[2]	A		4.2-4.4	
Dissipation Factor	10 GHz[2]	A		0,006-0,008	
Volume Resistivity		C-96/40/90	Ω*cm	$1x10^{14}$ - $1x10^{16}$	2.5.17
Survace Resistance		C-96/40/90	Ω	$1x10^{13}$ - $1x10^{15}$	
Insulation Resistance		A	Ω	$1x10^{14}$ - $1x10^{16}$	
		D-2/100		$1x10^{12}$ - $1x10^{14}$	

1: Heating Rate: 10°C/min

2: Measured by SPDR

3: Room Temperature, rel. Air Humidity of 50%

4: Material Thinckness: 0,8 mm

0,4mm thickness core is used depending on test item

Above data are experimental result and not guaranteed

Materials Available

Prepreg					
Part Number	**Type**		**Glass Cloth Stiyle**	**Properties Resin Content %**	**Dielectric Thickness after Lamination in mm**
ANSI: GPY/42	0,04	(1037N72)	1037	72 +/- 2	0,03

Copper clad Laminate				
Part Number	**Type**	**copper Foil Thickness**		**Laminate Thickness**
ANSI: GPY/42	R	12 µm		0,05
		12 µm		0,1