

WHAT IS PCB STACK-UP?

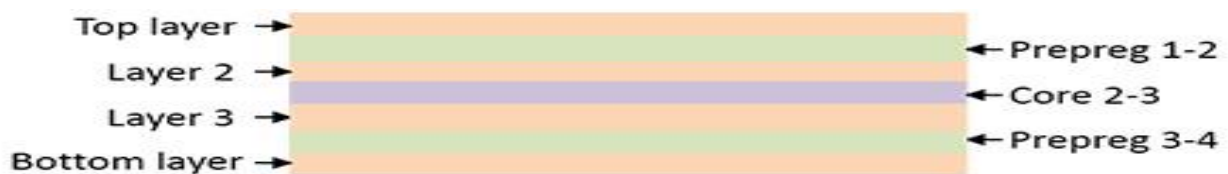
Stack-up refers to the arrangement of copper layers and insulating layers that make up a PCB prior to board layout design. While a layer stack-up allows you to get more circuitry on a single board through the various PCB board layers, the structure of PCB stackup design confers many other advantages:

- A PCB layer stack can help you minimize your circuit's vulnerability to external noise as well as minimize radiation and reduce impedance and crosstalk concerns on high-speed PCB layouts.
- A good layer PCB stack-up can also help you balance your need for low-cost, efficient manufacturing methods with concerns about signal integrity issues
- The right PCB layer stack can enhance the Electromagnetic Compatibility of your design as well.

For multilayer PCBs, general layers include ground plane (GND plane), power plane (PWR plane), and inner signal layers.

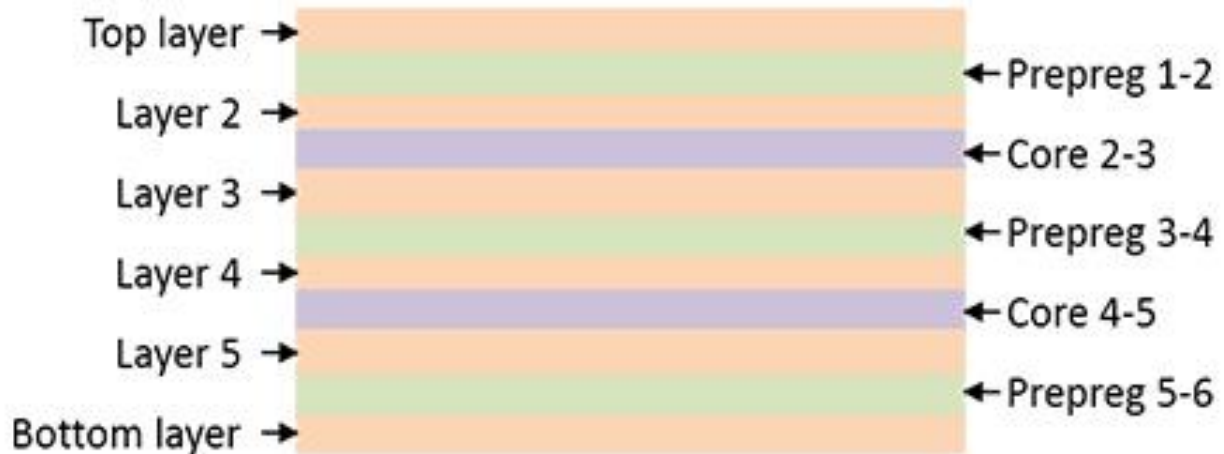
STANDARD MULTILAYER RIGID PCB LAYER STACK-UP AND THICKNESS

A commonly-used Layer Stackup for 4-layer PCBs and Thickness



Finished Thickness	Tolerance	Prepreg1-2	Core2-3	Prepreg3-4
0.4	±0.1	0.08	0.10	0.08
0.6	±0.1	0.14	0.13	0.14
0.8	±0.1	0.14	0.33	0.14
1.0	±0.1	0.24	0.33	0.24
1.2	±10%	0.24	0.53	0.24
1.6	±10%	0.31	0.73	0.31
2.0	±10%	0.24	1.33	0.24
2.5	±10%	0.24	1.83	0.24
3.0	±10%	0.31	2.13	0.31

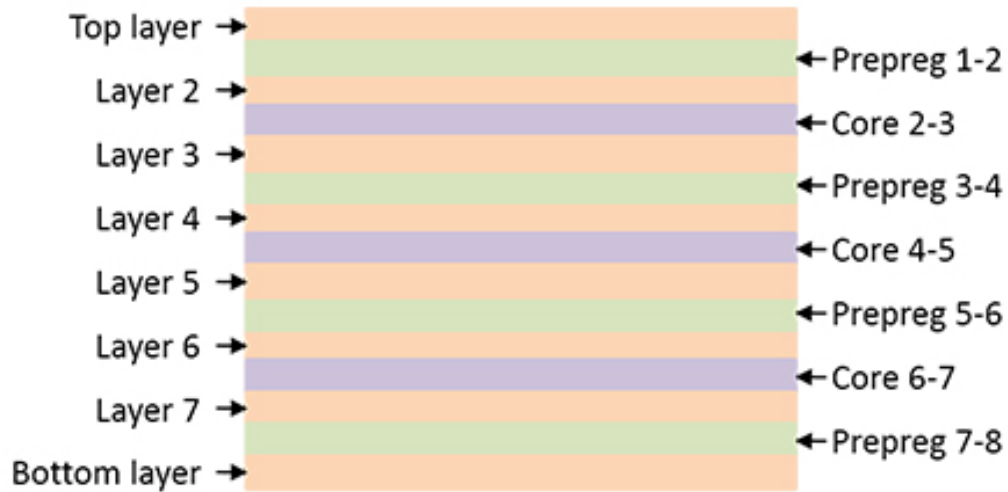
A COMMONLY-USED LAYER STACKUP FOR 6-LAYER PCBs AND THICKNESS



Stackup Thickness of 6-Layer PCB (unit: mm)

Finished Thickness	Tolerance	Prepreg 1-2	Core 2-3	Prepreg 3-4	Core 4-5	Prepreg 5-6
0.6	±0.1	0.08	0.065	0.14	0.065	0.08
0.8	±0.1	0.08	0.13	0.14	0.13	0.08
1.0	±0.1	0.14	0.13	0.24	0.13	0.14
1.2	±10%	0.24	0.13	0.24	0.13	0.24
1.6	±10%	0.24	0.33	0.14	0.33	0.24
2.0	±10%	0.24	0.53	0.24	0.53	0.24
2.5	±10%	0.24	0.73	0.24	0.73	0.24
3.0	±10%	0.31	0.93	0.24	0.93	0.31

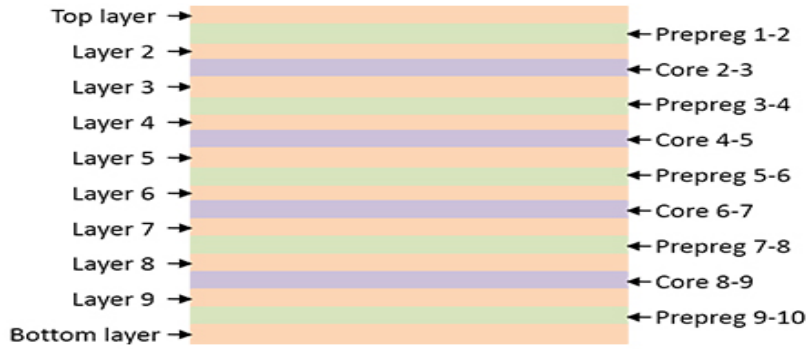
A COMMONLY-USED LAYER STACKUP FOR 8-LAYER PCBs



Stackup Thickness of 8-Layer PCB (unit: mm)

Finished Thickness	Tolerance	Prepreg 1-2	Core 2-3	Prepreg 3-4	Core 4-5	Prepreg 5-6	Core 6-7	Prepreg 7-8
1.0	±0.1	0.08	0.10	0.14	0.10	0.14	0.10	0.08
1.2	±10%	0.08	0.13	0.14	0.13	0.14	0.13	0.08
1.6	±10%	0.19	0.13	0.24	0.13	0.24	0.13	0.19
2.0	±10%	0.19	0.33	0.14	0.33	0.14	0.33	0.19
2.5	±10%	0.14	0.53	0.14	0.53	0.14	0.53	0.14
3.0	±10%	0.24	0.53	0.31	0.53	0.31	0.53	0.24

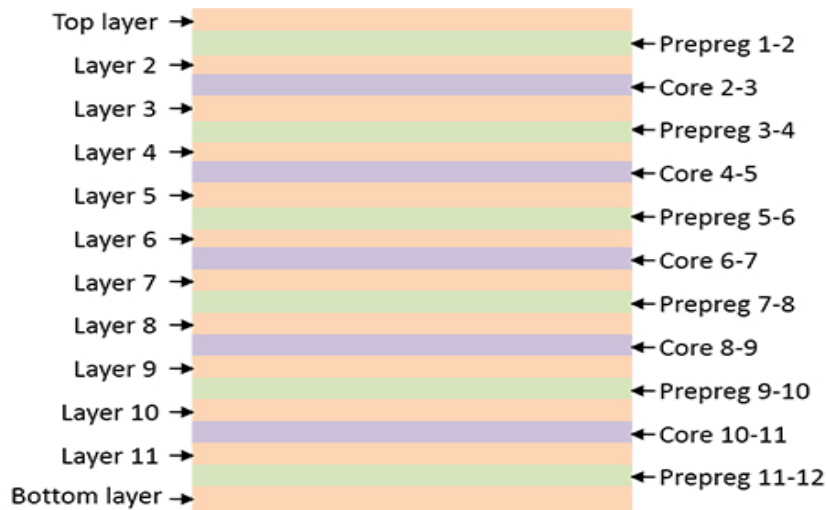
A COMMONLY-USED LAYER STACKUP FOR 10-LAYER PCBs



Stackup Thickness of 10-Layer PCB (unit: mm)

Finished Thickness	Tolerance	Prepreg 1-2	Core 2-3	Prepreg 3-4	Core 4-5	Prepreg 5-6	Core 6-7	Prepreg 7-8	Core 8-9	Prepreg 9-10
1.2	±10%	0.08	0.10	0.14	0.10	0.14	0.10	0.14	0.10	0.08
1.6	±10%	0.14	0.13	0.14	0.13	0.14	0.13	0.14	0.13	0.14
2.0	±10%	0.19	0.13	0.24	0.13	0.24	0.13	0.24	0.13	0.19
2.5	±10%	0.14	0.33	0.14	0.33	0.24	0.33	0.14	0.33	0.14
3.0	±10%	0.26	0.33	0.24	0.33	0.24	0.33	0.24	0.33	0.26

A COMMONLY-USED LAYER STACKUP FOR 12-LAYER PCBs



Stackup Thickness of 12-Layer PCB (unit: mm)

Finished Thickness	Tolerance	Prepreg 1-2	Core 2-3	Prepreg 3-4	Core 4-5	Prepreg 5-6	Core 6-7	Prepreg 7-8	Core 8-9	Prepreg 9-10	Core 10-11	Prepreg 11-12
1.6	±10%	0.19	0.065	0.14	0.065	0.14	0.065	0.14	0.065	0.14	0.065	0.19
2.0	±10%	0.14	0.10	0.14	0.10	0.24	0.10	0.24	0.10	0.14	0.10	0.14
2.5	±10%	0.19	0.13	0.24	0.13	0.24	0.13	0.24	0.13	0.24	0.13	0.19
3.0	±10%	0.14	0.33	0.14	0.33	0.14	0.33	0.14	0.33	0.14	0.33	0.14

STACK-UP AND THICKNESS FOR FPC

The following is the usual FPC stackup information. If you need custom FPC stackup, please make note and we will manufacture according to your requirement.

Polyimide (PI) is the most commonly used thermal curing insulating material in flexible circuit processing. The thickness range of the material is generally 12.5 μ m (0.5mil) and 125 μ m (5mil). Divided into with glue and without glue, the DK with glue is 3.5, and the DK without glue is 3.3.

SINGLE LAYER FPC STACKUP AND THICKNESS

0.08mm

Top Coverlay	PI	25um
	Adhesive	25um
Top Copper Layer	Copper	70um(Finished Copper thickness 70um)
	Adhesive	0um
	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)
Total Thickness		145um

0.1mm

Top Coverlay	PI	25um
	Adhesive	25um
Top Copper Layer	Copper	18um(Finished Copper thickness 18um)
	Adhesive	13um
	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)
Total Thickness		106um

0.13mm

Top Coverlay	PI	25um
	Adhesive	25um
Top Copper Layer	Copper	35um(Finished Copper thickness 35um)
	Adhesive	20um
	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)
Total Thickness		130um

0.15mm

Top Coverlay	PI	25um
	Adhesive	25um
Top Copper Layer	Copper	70um(Finished Copper thickness 70um)
	Adhesive	0um
	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)
Total Thickness		145um

2 LAYER FPC STACKUP AND THICKNESS**0.1mm**

Top Coverlay	PI	12.5um
	Adhesive	15um
Top Copper Layer	Copper	12um(Finished Copper thickness 18um)
	Adhesive	0um

	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)
	Adhesive	0um
Bottom Copper Layer	Copper	12um(Finished Copper thickness 18um)
Bottom Coverlay	Adhesive	15um
	PI	12.5um
Total Thickness		104um

0.13mm

Top Coverlay	PI	12.5um
	Adhesive	15um
Top Copper Layer	Copper	18um(Finished Copper thickness 35um)
	Adhesive	13um
	PI	12.5um
	Adhesive	13um
Bottom Copper Layer	Copper	18um(Finished Copper thickness 35um)
Bottom Coverlay	Adhesive	15um
	PI	12.5um
Total Thickness		129.5um

0.15mm

Top Coverlay	PI	12.5um
	Adhesive	15um
Top Copper Layer	Copper	18um(Finished Copper thickness 35um)
	Adhesive	20um
	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)

	Adhesive	20um
Bottom Copper Layer	Copper	18um(Finished Copper thickness 35um)
Bottom Coverlay	Adhesive	15um
	PI	12.5um
Total Thickness		156um

0.18mm

Top Coverlay	PI	25um
	Adhesive	25um
Top Copper Layer	Copper	18um(Finished Copper thickness 35um)
	Adhesive	13um
	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)
	Adhesive	13um
Bottom Copper Layer	Copper	18um(Finished Copper thickness 35um)
Bottom Coverlay	Adhesive	25um
	PI	25um
Total Thickness		187um

0.2mm

Top Coverlay	PI	25um
	Adhesive	25um
top Copper Layer	Copper	18um(Finished Copper thickness 35um)
	Adhesive	20um

	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)
	Adhesive	20um
Bottom Copper Layer	Copper	18um(Finished Copper thickness 35um)
Bottom Coverlay	Adhesive	25um
	PI	25um
Total Thickness		201um

0.23mm

Top Coverlay	PI	25um
	Adhesive	25um
top Copper Layer	Copper	35um(Finished Copper thickness 50um)
	Adhesive	20um
	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)
	Adhesive	20um
Bottom Copper Layer	Copper	35um(Finished Copper thickness 50um)
Bottom Coverlay	Adhesive	25um
	PI	25um
Total Thickness		235um

0.26mm

Top Coverlay	PI	25um
	Adhesive	25um
top Copper Layer	Copper	70um(Finished Copper thickness 70um)

	Adhesive	0um
	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)
	Adhesive	0um
Bottom Copper Layer	Copper	70um(Finished Copper thickness 70um)
Bottom Coverlay	Adhesive	25um
	PI	25um
Total Thickness		265um

4 LAYER FPC STACKUP AND THICKNESS

0.2mm

Top Coverlay	PI	12.5um
	Adhesive	15um
top Copper Layer	Copper	12um(Finished Copper thickness 18um)
	Adhesive	0um
	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)
	Pure gum	13um
copper 2 layer	Copper	12um
	Adhesive	0um
	PI	25um
	Adhesive	0um
copper 3 layer	Copper	12um
	Pure gum	13um

	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)
	Adhesive	0um
Bottom Copper Layer	Copper	12um(Finished Copper thickness 18um)
Bottom Coverlay	Adhesive	15um
	PI	12.5um
Total Thickness		204um

0.26mm

Top Coverlay	PI	12.5um
	Adhesive	15um
top Copper Layer	Copper	18um(Finished Copper thickness 35um)
	Adhesive	13um
	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)
	Pure gum	13um
copper 2 layer	Copper	18um
	Adhesive	13um
	PI	12.5um
	Adhesive	13um
copper 3 layer	Copper	18um
	Pure gum	13um
	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)
	Adhesive	13um

Bottom Copper Layer	Copper	18um(Finished Copper thickness 35um)
Bottom Coverlay	Adhesive	15um
	PI	12.5um
Total Thickness		267.5um

0.3mm

Top Coverlay	PI	25um
	Adhesive	25um
top Copper Layer	Copper	18um(Finished Copper thickness 35um)
	Adhesive	13um
	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)
	Pure gum	13um
copper 2 layer	Copper	18um
	Adhesive	0um
	PI	25um
	Adhesive	0um
copper 3 layer	Copper	18um
	Pure gum	13um
	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)
	Adhesive	13um
Bottom Copper Layer	Copper	18um(Finished Copper thickness 35um)
Bottom Coverlay	Adhesive	25um
	PI	25um

Total Thickness	299um
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4 LAYER RIGID-FLEX FPC STACKUP AND THICKNESS

1.6mm

Rigid part		Flex part		
	top soldermask layer	20um		
rigid-top Copper Layer	Copper	18um(Finished Copper thickness 35um)		
	FR4	680um	PI	12.5um
	Pure gum	13um	Adhesive	15um
flex-copper 2 layer	Copper	18um	Copper	18um
	Adhesive	13um	Adhesive	13um
	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)
	Adhesive	13um	Adhesive	13um
flex-copper 3 layer	Copper	18um	Copper	18um
	Pure gum	13um	Adhesive	15um
	FR4	680um	PI	12.5um
rigid-Bottom	Copper	18um(Finished Copper thickness 35um)		

Copper Layer				
	Bottom soldermask layer	20um		
	Total Thickness	1549um	FPC thickness	142um

6 LAYER FPC STACKUP AND THICKNESS

0.3mm

Top Coverlay	PI	12.5um
	Adhesive	15um
top Copper Layer	Copper	12um(Finished Copper thickness 18um)
	Adhesive	0um
	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)
	Pure gum	13um
copper 2 layer	Copper	12um
	Adhesive	0um
	PI	25um
	Adhesive	0um
copper 3 layer	Copper	12um
	Pure gum	13um
	Coverlay	27.5um
copper 4 layer	Copper	12um
	Adhesive	0um
	PI	25um

	Adhesive	0um
copper 5 layer	Copper	12um
	Pure gum	13um
	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)
	Adhesive	0um
Bottom Copper Layer	Copper	12um(Finished Copper thickness 18um)
Bottom Coverlay	Adhesive	15um
	PI	12.5um
Total Thickness		293.5um

0.37mm

Top Coverlay	PI	12.5um
	Adhesive	15um
top Copper Layer	Cooper	12um(Finished cooper thickness 18um)
	Adhesive	13um
	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)
	Pure gum	13um
copper 2 layer	Cooper	12um
	Adhesive	13um
	PI	25um
	Adhesive	13um
copper 3 layer	Cooper	12um
	Pure gum	13um

	Coverlay	27.5um
copper 4 layer	Cooper	12um
	Adhesive	13um
	PI	25um
	Adhesive	13um
copper 5 layer	Cooper	12um
	Pure gum	13um
	PI	25um dielectric constant 3.3~3.5 (The DK value is not absolute and will vary depending on the base material's models and thickness.)
	Adhesive	13um
Bottom Copper Layer	Cooper	12um(Finished cooper thickness 18um)
Bottom Coverlay	Adhesive	15um
	PI	12.5um
Total Thickness		371.5um