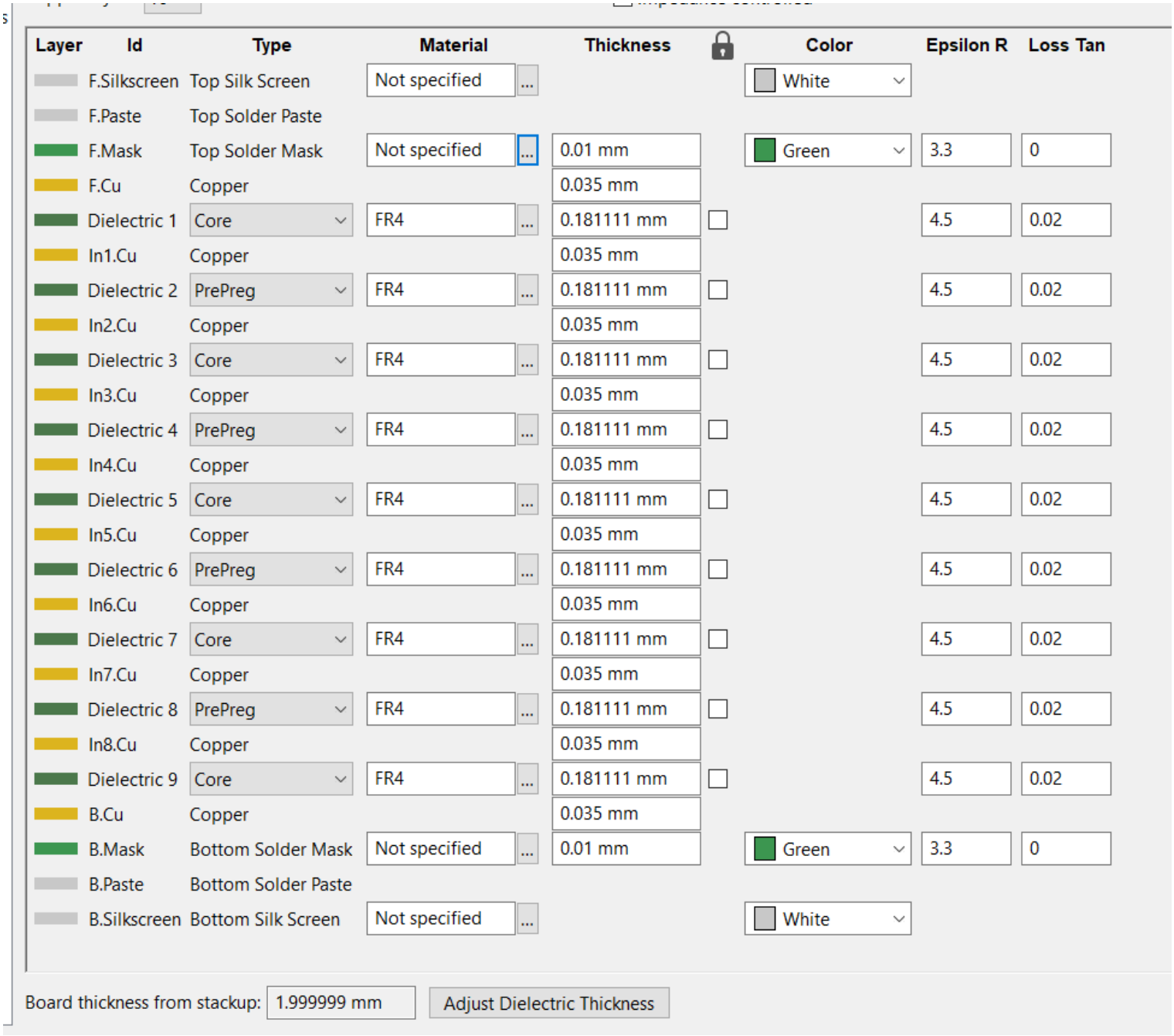
Stackup



Layer	Id	Type	Material	Thickness		Color	Epsilon R	Loss Tan
	F.Silkscreen	Top Silk Screen	Not specified			White		
	F.Paste	Top Solder Paste						
	F.Mask	Top Solder Mask	Not specified	0.01 mm		Green	3.3	0
	F.Cu	Copper		0.035 mm				
	Dielectric 1	Core	FR4	0.181111 mm	☐		4.5	0.02
	In1.Cu	Copper		0.035 mm				
	Dielectric 2	PrePreg	FR4	0.181111 mm	☐		4.5	0.02
	In2.Cu	Copper		0.035 mm				
	Dielectric 3	Core	FR4	0.181111 mm	☐		4.5	0.02
	In3.Cu	Copper		0.035 mm				
	Dielectric 4	PrePreg	FR4	0.181111 mm	☐		4.5	0.02
	In4.Cu	Copper		0.035 mm				
	Dielectric 5	Core	FR4	0.181111 mm	☐		4.5	0.02
	In5.Cu	Copper		0.035 mm				
	Dielectric 6	PrePreg	FR4	0.181111 mm	☐		4.5	0.02
	In6.Cu	Copper		0.035 mm				
	Dielectric 7	Core	FR4	0.181111 mm	☐		4.5	0.02
	In7.Cu	Copper		0.035 mm				
	Dielectric 8	PrePreg	FR4	0.181111 mm	☐		4.5	0.02
	In8.Cu	Copper		0.035 mm				
	Dielectric 9	Core	FR4	0.181111 mm	☐		4.5	0.02
	B.Cu	Copper		0.035 mm				
	B.Mask	Bottom Solder Mask	Not specified	0.01 mm		Green	3.3	0
	B.Paste	Bottom Solder Paste						
	B.Silkscreen	Bottom Silk Screen	Not specified			White		

Board thickness from stackup: 1.999999 mm

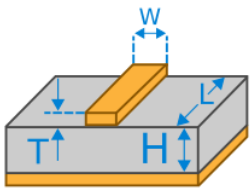
Adjust Dielectric Thickness

PCB Calculator

Regulators | RF Attenuators | E-Series | Color Code | TransLine | Via Size | Track Width | Electrical Spacing | Board Classes

Transmission Line Type

- (●) Microstrip Line
- ( ) Coplanar wave guide
- ( ) Coplanar wave guide w/ ground plane
- ( ) Rectangular Waveguide
- ( ) Coaxial Line
- ( ) Coupled Microstrip Line
- ( ) Stripline
- ( ) Twisted Pair



Substrate Parameters

εr:	4.5	
tan δ:	0.02	
ρ:	1.72e-08	
H:	0.181111	mm
H(top):	1e+20	mm
T:	0.035	mm
Roughness:	0	mm
μ(substrate):	1	
μ(conductor):	1	

Component Parameters

Frequency: 2 GHz

Physical Parameters

W:	0.32	mm
L:	200	mm

Analyze | Synthesize

Electrical Parameters

Z0:	50.0597	Ω
Ang_l:	14.8474	rad

Results

Effective εr:	3.13664
Conductor losses:	0.817246 dB
Dielectric losses:	1.12876 dB
Skin depth:	1.47594 μm

PCB Calculator

Regulators | RF Attenuators | E-Series | Color Code | TransLine | Via Size | Track Width | Electrical Spacing | Board Classes

Transmission Line Type

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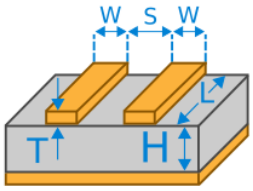
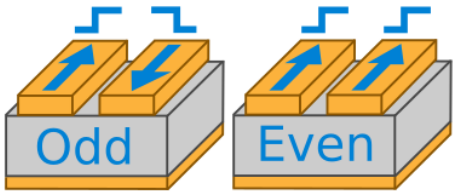


Substrate Parameters

εr:	4.5	
tan δ:	0.02	
ρ:	1.72e-08	
H:	0.1811	mm
H_t:	1e+20	mm
T:	0.0355	mm
Roughness:	0	mm
μ(conductor):	1	

Component Parameters

Frequency: 2000 MHz



Physical Parameters

W:	0.15	mm
S:	0.066	mm
L:	2000	mm

Analyze | Synthesize

Electrical Parameters

Zeven:	100.58	Ω
Zodd:	50.2071	Ω
Ang_l:	148.171	rad

Results

Effective εr (even):	3.36111
Effective εr (odd):	2.9033
Conductor losses (even):	7.47462 dB
Conductor losses (odd):	14.9602 dB
Dielectric losses (even):	12.0485 dB
Dielectric losses (odd):	10.4577 dB
Skin depth:	1.47594 μm
Differential Impedance (Zd):	100.516 Ω

Parameters

Current (I):	**1**	A
Temperature rise (ΔT):	10	°C
Conductor length:	50	mm
Copper resistivity:	1.72e-08	Ω·m

External Layer Traces

Trace width (W):	0.300387	mm
Trace thickness (H):	0.035	mm
Cross-section area:	0.0105135	mm²
Resistance:	0.0817994	Ω
Voltage drop:	0.0817994	V
Power loss:	0.0817994	W

Internal Layer Traces

Trace width (W):	0.781437	mm
Trace thickness (H):	0.035	mm
Cross-section area:	0.0273503	mm²
Resistance:	0.0314439	Ω
Voltage drop:	0.0314439	V
Power loss:	0.0314439	W

If you specify the maximum current, then the trace widths will be calculated to suit.

If you specify one of the trace widths, the maximum current it can handle will be calculated. The width for the other trace to also handle this current will then be calculated.

The controlling value is shown in bold.

The calculations are valid for currents up to 35 A (external) or 17.5 A (internal), temperature rises up to 100 °C, and widths of up to 400 mils (10 mm).

The formula, from IPC 2221, is

$$I = K \cdot \Delta T^{0.44} \cdot (W \cdot H)^{0.725}$$

where:
I is maximum current in A
ΔT is temperature rise above ambient in °C
W is width in mils
H is thickness (height) in mils
K is 0.024 for internal traces or 0.048 for external traces

Parameters

Current (I):	**10**	A
Temperature rise (ΔT):	10	°C
Conductor length:	50	mm
Copper resistivity:	1.72e-08	Ω·m

External Layer Traces

Trace width (W):	7.19434	mm
Trace thickness (H):	0.035	mm
Cross-section area:	0.251802	mm²
Resistance:	0.00341538	Ω
Voltage drop:	0.0341538	V
Power loss:	0.341538	W

Internal Layer Traces

Trace width (W):	18.7156	mm
Trace thickness (H):	0.035	mm
Cross-section area:	0.655047	mm²
Resistance:	0.00131288	Ω
Voltage drop:	0.0131288	V
Power loss:	0.131288	W

If you specify the maximum current, then the trace widths will be calculated to suit.

If you specify one of the trace widths, the maximum current it can handle will be calculated. The width for the other trace to also handle this current will then be calculated.

The controlling value is shown in bold.

The calculations are valid for currents up to 35 A (external) or 17.5 A (internal), temperature rises up to 100 °C, and widths of up to 400 mils (10 mm).

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