

Impedance calculations for the MROD-X1 PCB

12 layers

PCB 1,6 mm (1600 μm)

Cu 35 μm (= 1,38 τ)

Prepreg thickness: $(1600 \mu\text{m} - 12 * 35 \mu\text{m}) / (12 - 1) = 107,3 \mu\text{m}$

$\epsilon_r = 4.2$ (mean between glass fiber $\epsilon_r = 6.1$ and resin $\epsilon_r = 3.2$; see:

<http://www.polarinstruments.com/support/cits/AP148.html>)

1. signal 50 Ω : 6 τ (49,5 Ω , figure 1)
2. power
3. signal 50 Ω : 3 τ (impractical, figure 1)
4. ground
5. signal 50 Ω : 5 τ (48,5 Ω , figure 1, 2)
6. signal 100 Ω diff: 5 τ -6 τ -5 τ (93.9 Ω , figure 1,2) / 50 Ω : 8 τ (53,8 Ω , figure 3)
7. signal 100 Ω diff: 5 τ -6 τ -5 τ (93.9 Ω , figure 2) / 50 Ω : 8 τ (53,8 Ω , figure 3)
8. signal 50 Ω : 5 τ (48,5 Ω , figure 2)
9. ground
10. signal 50 Ω : 3 τ (impractical)
11. power
12. signal 50 Ω : 6 τ (49,5 Ω)

The screenshot shows the 'Calculate Electrical Properties' dialog box. The 'Electrical class' is set to 'DAISY_CHAIN' and the 'Net Type Rule' is 'DEFAULT_NET_TYPE'. The 'Impedance (ohms)' is 50, 'Voltage swing (volts)' is 1, and 'Max. Crosstalk (volts)' is 0. The 'Rise time (ns)' is 1.

physical layer	layer thickness	trace width	T-T spacing	tpd ps/length	Zo ohms	diffpair Zo ohms	crosstalk volts	parallel length
TOP INSULATOR	0.05							
PHYSICAL_1	0.035	0.152	0.152	6.41	49.5	81.5	0.00109	1
INSULATOR_1	0.107							
PHYSICAL_2	0.035	Power						
INSULATOR_2	0.107							
PHYSICAL_3	0.035	0.076	0.127	6.84	47.2	83.9	0.000739	1
INSULATOR_3	0.107							
PHYSICAL_4	0.035	Power						
INSULATOR_4	0.107							
PHYSICAL_5	0.035	0.127	0.127	6.84	48.5	77.6	0.00133	1
INSULATOR_5	0.107							
PHYSICAL_6	0.035	0.127	0.152	6.84	64.1	93.9	0.00183	1

The dialog also includes options for 'Apply/Calculate', 'Calculate all layers to Target', and 'Field Solver Precision'. The 'Calculate all layers to Target' section has radio buttons for 'Impedance (trace width)', 'Crosstalk (spacing)', and 'Crosstalk (parallel length)'. The 'Field Solver Precision' is set to 'High' and the 'Length unit' is 'mm'.

Figure 1

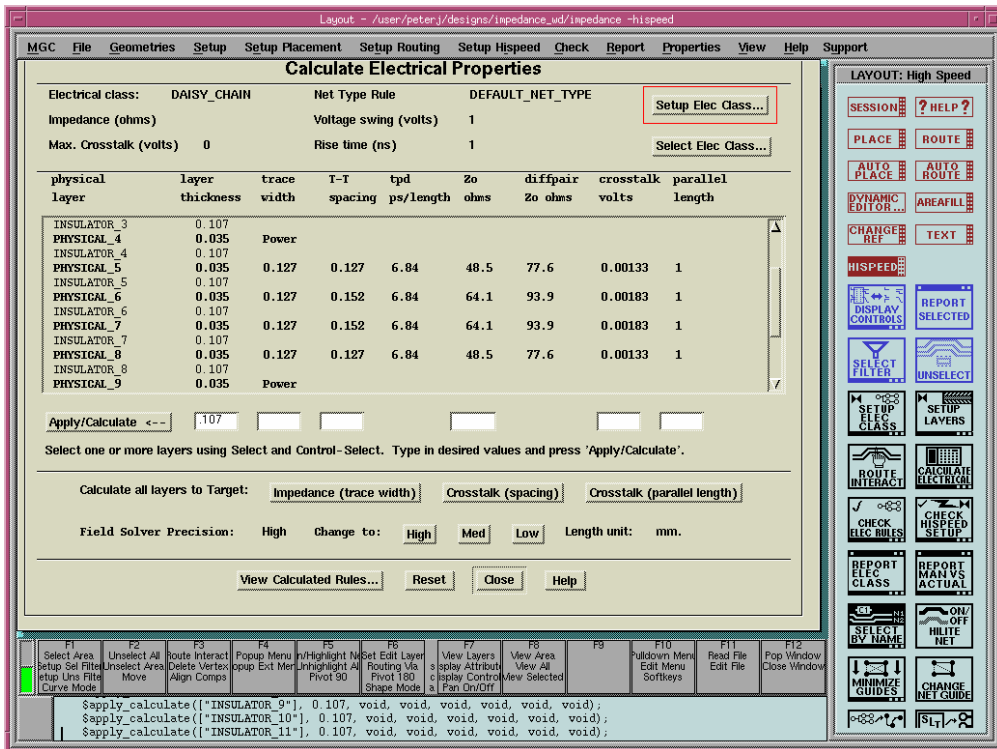


Figure 2

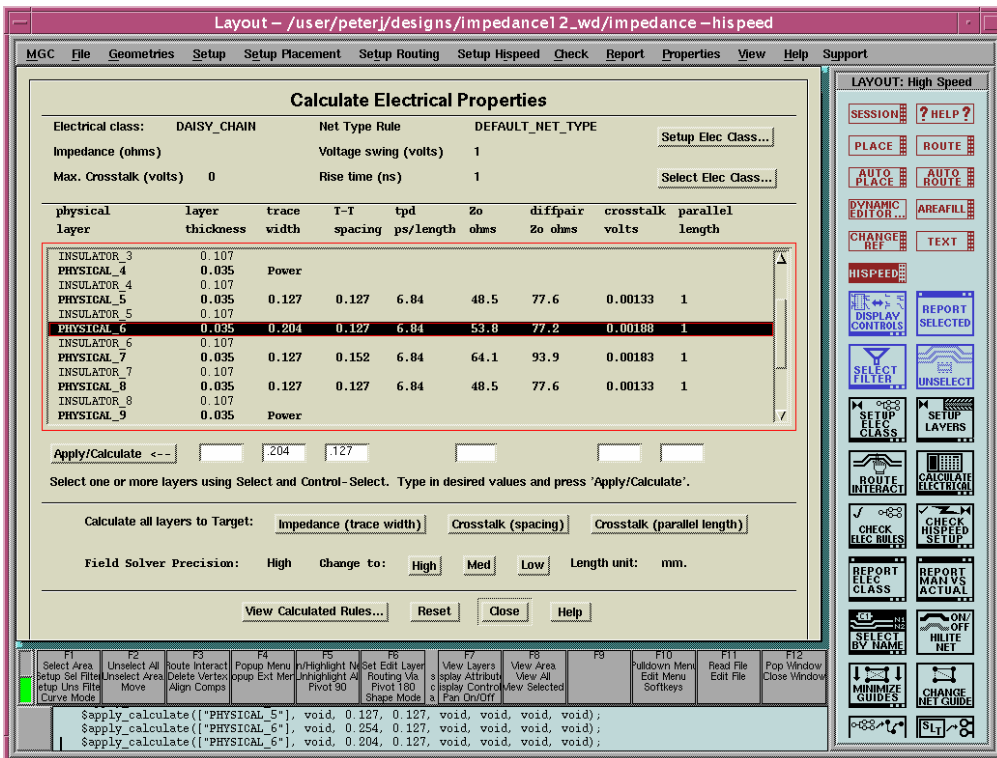


Figure 3