

QUICK GUIDE

Relative Tuning



Why do we need relative tuning?

Most high-speed interfaces contain parallel buses that operate at high frequencies. For their proper operation, it is necessary to match lengths of the group of signals with some accuracy. Often this length matching must be associated with some timing signal. For example, DDR3/4 memory interface: each eight bits of data has an associated data strobe. Because the data is captured off the strobe, the data bits associated with the strobe must be length-matched closely to their strobe bit.



Properties

⊿ Pattern

0.559mm

3

Length tuning tools

Altium Designer has two tools for tuning:

Interactive Length Tuning – for single tracks;

Interactive Diff Pair Length Tuning - for differential pairs.

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uning Components (and 12 more) 🝸 🗸	Interactive Length Tuning Cor	nponents (and 12 more)	Interactive Length Tuning	Components (and 12 more)	
	Q Search		Q Search		
	. D				
	Pattern				
Trombone Sawtooth	Accordion	nbone Sawtooth	Accordion	Trombone Sawtooth	
	Hide preview		Hide preview		
e Step			Angle	Tooth Width	
– + 0.254mm			45	0.3mm	
	↓				
	Space	Step			
<u>←→</u> ?	0.2mm - +	0.1mm	Min Joint	Min Height	
Step	Miter	Step	Omm	0.1mm	
- + 0.254mm	20% – +	5%	Actual Height	Step	
Step	Style		1.1mm –	• + 0.1mm	
- + 5%	Mitered Lines 🔹	✓ Single Side	✓ Single Side	Fixed Size	
s 👻					
	1 object is selected		1 object is selected		

Accordion

object is sele

Trombone

Sawtooth

There are 3 patterns available for length tuning: Accordion, Trombone, and Sawtooth.

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Xsignals for length tuning

Before you start length tuning, you must create special net classes. After that, they can be used in the length tuning rules.

Both net classes and xSignals classes can be used for length tuning. But if we want to apply Relative tuning, only the xSignals classes must be used. You can create them manually or use a special wizard.

XSIGNALS



NETS C A Net 1: A-B-C D Net 2: D-E-F E

XSIGNALS MULTI-CHIP WIZARD

The Wizard can be used to automatically create xSignals, xSignal classes, and Matched Length rules for a number of different common interface and memory circuits.

xSignal Multi-Chip Wizard [mm]							
On-Board DDR3 / DD	DR4 - Data Group						
xSignal Classes will be created							
Define xSignal Class Name Syntax		4 Byte-Lane xSignal Classes Created with 11 xSignal Nets in each					
DATA_BL[#]		DATA_BL0	DATA_BL1	DATA_BL2_1	DATA_BL3_1		
Clarify Existing Net Names			DDR4_DQ8_BL1	DDR4_DQ16_BL2	DDR4_DQ24_BL3		
	DDR4_DQ[#] -	DDR4_DQ1_BL0	DDR4_DQ9_BL1	DDR4_DQ17_BL2	DDR4_DQ25_BL3		
		DDR4_DQ2_BL0	DDR4_DQ10_BL1	DDR4_DQ18_BL2	DDR4_DQ26_BL3		
Data Mask	DDR4 DMI#1 -	DDR4_DQ3_BL0		DDR4_DQ19_BL2	DDR4_DQ27_BL3		
		DDR4_DQ4_BL0		DDR4_DQ20_BL2	DDR4_DQ28_BL3		
	DDR4_DQS[#]_N	DDR4_DQ5_BL0	DDR4_DQ13_BL1	DDR4_DQ21_BL2	DDR4_DQ29_BL3		
		DDR4_DQ6_BL0	DDR4_DQ14_BL1	DDR4_DQ22_BL2			
Data Strobe P	DDK4_DQS[#]_P	DDR4_DQ7_BL0	DDR4_DQ15_BL1	DDR4_DQ23_BL2	DDR4_DQ31_BL3		
		DDR4_DM0_BL0	DDR4_DM1_BL1	DDR4_DM2_BL2	DDR4_DM3_BL3		
		DDR4_DQS0_N_BL0	DDR4_DQS1_N_BL1	DDR4_DQS2_N_BL2	DDR4_DQS3_N_BL3		
Analyze Syntax & Cre		DDR4_DQS0_P_BL0	DDR4_DQS1_P_BL1	DDR4_DQS2_P_BL2	DDR4_DQS3_P_8L3		
				<u>B</u> ack Ne			

Design > xSignals > Run xSignals Wizard

Length tuning rules

If you use the xSignals Multi-Chip Wizard, Matched Lengths rules will be created in addition to xSignals and xSignals classes.



In the Matched Lengths rules, there is a choice of source target to align track lengths of this group for a selected xSignals class.

Using the length tuning

After setting up the Matched Lengths rules, it is convenient to use the PCB panel to view the range of net lengths in the selected xSignals class.



The Margin column shows the target signal, as well as the deviation of the other signals lengths.

Signals marked in color require length tuning.

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Using the length tuning

Launch the Interactive Length Tuning tool and click on a track you want to extend.



- Press TAB at the moment the tool is active and select the tuning rule relative to the target circuit in the Properties panel.
- •• When the target length is reached, the length indicator will change color to green.