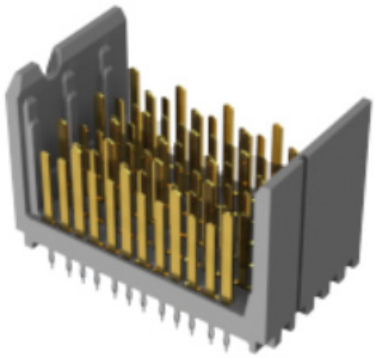
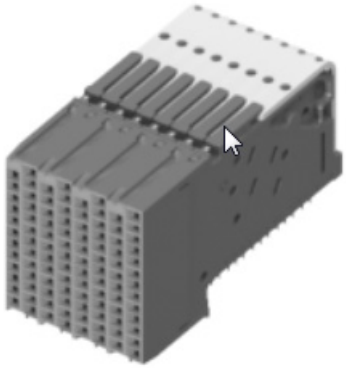
High Speed Characterization Report

HDTM-4-06-2-S-VT-0-3



HDTF-4-06-S-RA-HS-100



Description:

XCede® HD 1.80 mm Backplane Connector, Vertical Header mating to 100-ohm Right-Angle Receptacle

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Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

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Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

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Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

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Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Connector Overview

The Samtec XCede® HD 1.80 mm high speed backplane connector system features a HDTM series vertical header mated to a HDTF-RA series right angle receptacle. At the time of testing, the HDTx connectors have 3-, 4-, 6-pairs and 4, 6, 8 columns design. It is available for 85 ohms and 100 ohms options. The data in this report is applicable to the 4-pair, 100 ohm “HS” wafer option.

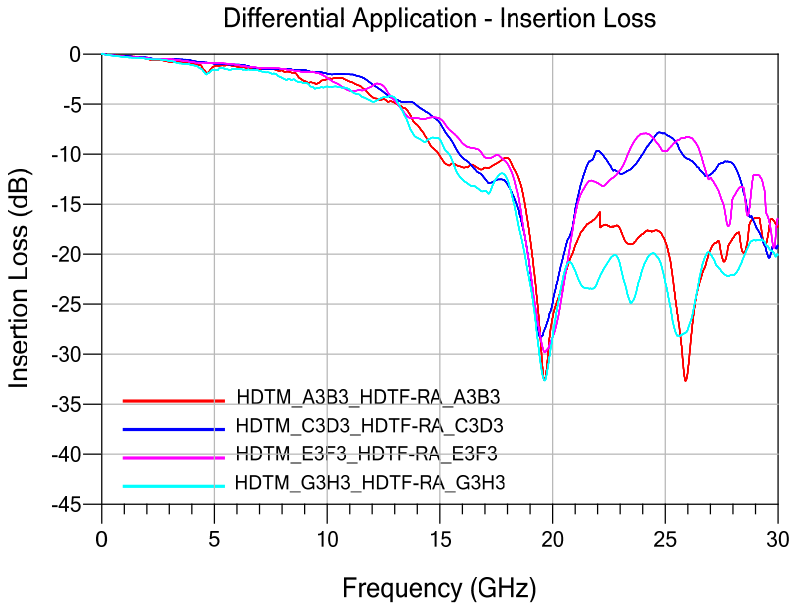
For the purpose of data labelling, the HDTM-4-06-2-S-VT-0-3 will be referred to as “Samtec HDTM”, the HDTF-4-06-S-RA-HS-100 will be referred to as “Samtec HDTF-RA”. For any inquiries about the DUT or test plan, please contact sig@samtec.com.

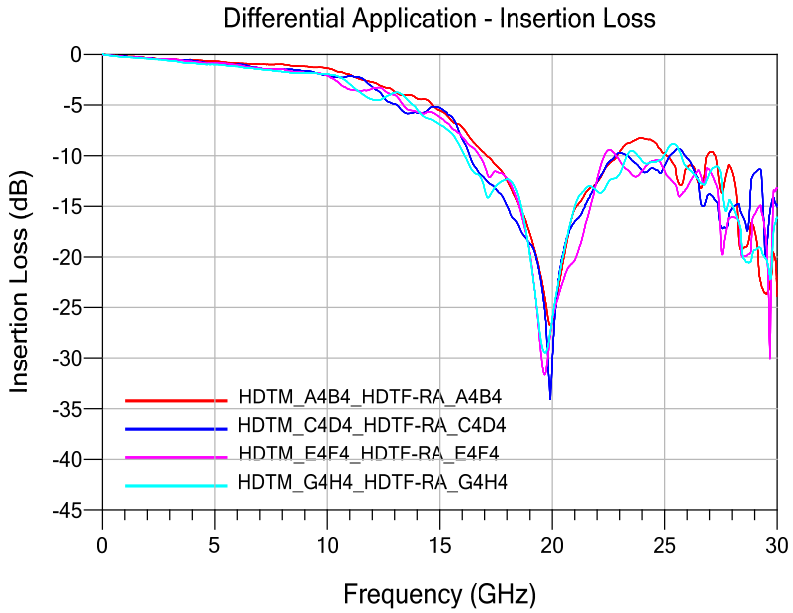
Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Frequency Domain Data Summary

Differential Insertion Loss

Samtec HDTF-RA mating to Samtec HDTM





Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Time Domain Data Summary

Table 1 - Differential Impedance (Ω)				
Diff Pair Combination	**Signal Rise-time**	**30ps**	**50ps**	**100ps**
A3-B3	**Maximum Impedance**	101.0	100.0	99.3
	Minimum Impedance	89.8	90.1	90.9
C3-D3	**Maximum Impedance**	102.0	101.0	99.2
	Minimum Impedance	88.7	89.7	91.0
E3-F3	**Maximum Impedance**	101.0	99.8	99.3
	Minimum Impedance	89.4	90.0	90.9
G3-H3	**Maximum Impedance**	101.0	101.0	99.9
	Minimum Impedance	88.8	89.1	89.5
A4-B4	**Maximum Impedance**	98.4	98.1	97.5
	Minimum Impedance	88.6	90.0	91.3
C4-D4	**Maximum Impedance**	103.0	102.0	99.9
	Minimum Impedance	89.6	90.7	92.0
E4-F4	**Maximum Impedance**	103.0	101.0	99.6
	Minimum Impedance	90.0	90.4	91.5
G4-H4	**Maximum Impedance**	99.2	99.1	98.8
	Minimum Impedance	89.2	89.8	90.7

Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

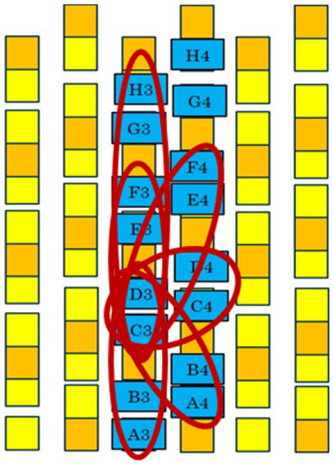
Table 2 - Differential Crosstalk (%) – A3B3						
	Input(t_r)	Driver	Receiver	30ps	50ps	100ps
	NEXT	HDTF-RA_A3B3	HDTF-RA_A4B4	0.8	0.6	0.4
		HDTF-RA_A3B3	HDTF-RA_C3D3	0.6	0.5	0.3
		HDTF-RA_A3B3	HDTF-RA_C4D4	0.3	0.2	0.1
		HDTF-RA_A3B3	HDTF-RA_E3F3	0.2	0.1	<0.1
	FEXT	HDTF-RA_A3B3	HDTM_A4B4	1.1	0.9	0.5
		HDTF-RA_A3B3	HDTM_C3D3	1.1	0.8	0.5
		HDTF-RA_A3B3	HDTM_C4D4	0.3	0.2	0.1
		HDTF-RA_A3B3	HDTM_E3F3	0.2	0.1	0.1

Differential Crosstalk Pin Map for A3B3:

Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Table 3 - Differential Crosstalk (%) – C3D3						
	Input(t_r)	**Driver**	**Receiver**	**30ps**	**50ps**	**100ps**
	NEXT	HDTF-RA_C3D3	HDTF-RA_A3B3	0.6	0.5	0.3
		HDTF-RA_C3D3	HDTF-RA_A4B4	0.6	0.5	0.4
		HDTF-RA_C3D3	HDTF-RA_C4D4	0.2	0.2	0.1
		HDTF-RA_C3D3	HDTF-RA_E3F3	0.5	0.4	0.3
		HDTF-RA_C3D3	HDTF-RA_E4F4	0.3	0.2	0.1
		HDTF-RA_C3D3	HDTF-RA_G3H3	0.3	0.1	0.1
	FEXT	HDTF-RA_C3D3	HDTM_A3B3	0.7	0.5	0.3
		HDTF-RA_C3D3	HDTM_A4B4	0.1	0.1	<0.1
		HDTF-RA_C3D3	HDTM_C4D4	0.3	0.2	0.1
		HDTF-RA_C3D3	HDTM_E3F3	0.5	0.4	0.3
		HDTF-RA_C3D3	HDTM_E4F4	0.2	0.2	0.1
		HDTF-RA_C3D3	HDTM_G3H3	0.2	0.2	0.1

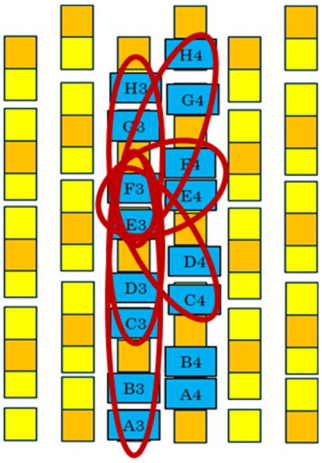
Differential Crosstalk Pin Map for C3D3:



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Table 4 - Differential Crosstalk (%) – E3F3						
	Input(t_r)	**Driver**	**Receiver**	**30ps**	**50ps**	**100ps**
	NEXT	HDTF-RA_E3F3	HDTF-RA_A3B3	0.2	0.1	<0.1
		HDTF-RA_E3F3	HDTF-RA_C3D3	0.5	0.4	0.3
		HDTF-RA_E3F3	HDTF-RA_C4D4	0.5	0.4	0.4
		HDTF-RA_E3F3	HDTF-RA_E4F4	0.3	0.2	0.2
		HDTF-RA_E3F3	HDTF-RA_G3H3	1.0	0.5	0.2
		HDTF-RA_E3F3	HDTF-RA_G4H4	0.3	0.2	0.1
	FEXT	HDTF-RA_E3F3	HDTM_A3B3	0.2	0.2	0.1
		HDTF-RA_E3F3	HDTM_C3D3	0.5	0.4	0.2
		HDTF-RA_E3F3	HDTM_C4D4	0.1	0.1	0.1
		HDTF-RA_E3F3	HDTM_E4F4	0.3	0.3	0.2
		HDTF-RA_E3F3	HDTM_G3H3	1.2	1.0	0.6
		HDTF-RA_E3F3	HDTM_G4H4	0.2	0.1	0.1

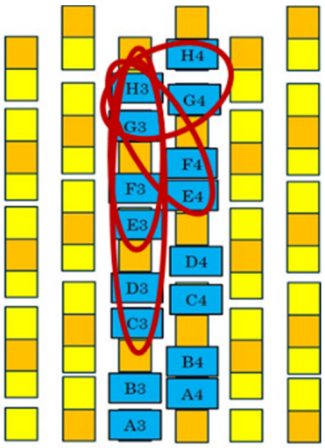
Differential Crosstalk Pin Map for E3F3:



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Table 5 - Differential Crosstalk (%) – G3H3						
	Input(t_r)	**Driver**	**Receiver**	**30ps**	**50ps**	**100ps**
	NEXT	HDTF-RA_G3H3	HDTF-RA_C3D3	0.7	0.3	0.1
		HDTF-RA_G3H3	HDTF-RA_E3F3	1.0	0.5	0.3
		HDTF-RA_G3H3	HDTF-RA_E4F4	0.6	0.4	0.3
		HDTF-RA_G3H3	HDTF-RA_G4H4	0.7	0.4	0.2
	FEXT	HDTF-RA_G3H3	HDTM_C3D3	0.3	0.2	0.1
		HDTF-RA_G3H3	HDTM_E3F3	1.2	0.9	0.5
		HDTF-RA_G3H3	HDTM_E4F4	0.2	0.1	0.1
		HDTF-RA_G3H3	HDTM_G4H4	0.8	0.7	0.4

Differential Crosstalk Pin Map for G3H3:



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

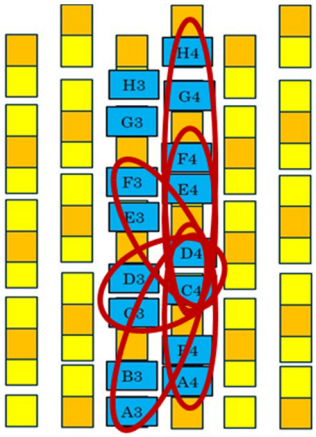
Table 6 - Differential Crosstalk (%) – A4B4						
	Input(t_r)	**Driver**	**Receiver**	**30ps**	**50ps**	**100ps**
	NEXT	HDTF-RA_A4B4	HDTF-RA_A3B3	0.8	0.6	0.4
		HDTF-RA_A4B4	HDTF-RA_C3D3	0.6	0.5	0.4
		HDTF-RA_A4B4	HDTF-RA_C4D4	0.5	0.4	0.3
		HDTF-RA_A4B4	HDTF-RA_E4F4	0.1	0.1	<0.1
	FEXT	HDTF-RA_A4B4	HDTM_A3B3	1.2	1.0	0.7
		HDTF-RA_A4B4	HDTM_C3D3	0.2	0.2	0.1
		HDTF-RA_A4B4	HDTM_C4D4	0.5	0.4	0.2
		HDTF-RA_A4B4	HDTM_E4F4	0.1	<0.1	<0.1

Differential Crosstalk Pin Map for A4B4:

Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Table 7 - Differential Crosstalk (%) – C4D4						
	Input(t_r)	**Driver**	**Receiver**	**30ps**	**50ps**	**100ps**
	NEXT	HDTF-RA_C4D4	HDTF-RA_A3B3	0.3	0.2	0.1
		HDTF-RA_C4D4	HDTF-RA_A4B4	0.5	0.4	0.3
		HDTF-RA_C4D4	HDTF-RA_C3D3	0.2	0.1	0.1
		HDTF-RA_C4D4	HDTF-RA_E3F3	0.5	0.4	0.4
		HDTF-RA_C4D4	HDTF-RA_E4F4	0.6	0.4	0.3
		HDTF-RA_C4D4	HDTF-RA_G4H4	0.1	0.1	<0.1
	FEXT	HDTF-RA_C4D4	HDTM_A3B3	0.2	0.2	0.1
		HDTF-RA_C4D4	HDTM_A4B4	0.4	0.2	0.1
		HDTF-RA_C4D4	HDTM_C3D3	0.5	0.4	0.2
		HDTF-RA_C4D4	HDTM_E3F3	0.2	0.1	0.1
		HDTF-RA_C4D4	HDTM_E4F4	0.4	0.2	0.1
		HDTF-RA_C4D4	HDTM_G4H4	0.1	0.1	<0.1

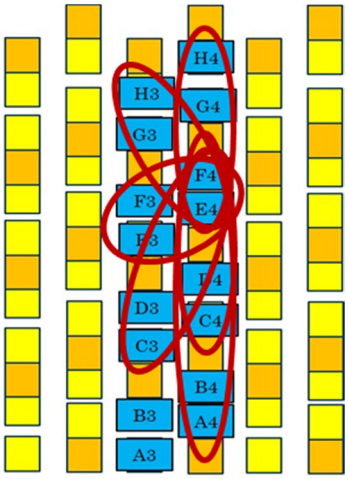
Differential Crosstalk Pin Map for C4D4:



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Table 8 - Differential Crosstalk (%) – E4F4						
	Input(t_r)	**Driver**	**Receiver**	**30ps**	**50ps**	**100ps**
	NEXT	HDTF-RA_E4F4	HDTF-RA_A4B4	0.1	0.1	<0.1
		HDTF-RA_E4F4	HDTF-RA_C3D3	0.3	0.2	0.1
		HDTF-RA_E4F4	HDTF-RA_C4D4	0.6	0.4	0.3
		HDTF-RA_E4F4	HDTF-RA_E3F3	0.3	0.3	0.2
		HDTF-RA_E4F4	HDTF-RA_G3H3	0.6	0.4	0.3
		HDTF-RA_E4F4	HDTF-RA_G4H4	0.6	0.3	0.2
	FEXT	HDTF-RA_E4F4	HDTM_A4B4	0.1	0.1	<0.1
		HDTF-RA_E4F4	HDTM_C3D3	0.2	0.1	0.1
		HDTF-RA_E4F4	HDTM_C4D4	0.5	0.3	0.1
		HDTF-RA_E4F4	HDTM_E3F3	0.7	0.5	0.3
		HDTF-RA_E4F4	HDTM_G3H3	0.3	0.2	0.1
		HDTF-RA_E4F4	HDTM_G4H4	0.4	0.4	0.2

Differential Crosstalk Pin Map for E4F4:



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Table 9 - Differential Crosstalk (%) – G4H4						
	Input(t_r)	**Driver**	**Receiver**	**30ps**	**50ps**	**100ps**
	NEXT	HDTF-RA_G4H4	HDTF-RA_C4D4	0.2	0.1	<0.1
		HDTF-RA_G4H4	HDTF-RA_E3F3	0.3	0.2	0.1
		HDTF-RA_G4H4	HDTF-RA_E4F4	0.6	0.3	0.2
		HDTF-RA_G4H4	HDTF-RA_G3H3	0.7	0.4	0.2
	FEXT	HDTF-RA_G4H4	HDTM_C4D4	0.1	0.1	<0.1
		HDTF-RA_G4H4	HDTM_E3F3	0.1	0.1	0.1
		HDTF-RA_G4H4	HDTM_E4F4	0.8	0.6	0.3
		HDTF-RA_G4H4	HDTM_G3H3	1.2	1.0	0.5

Differential Crosstalk Pin Map for G4H4:

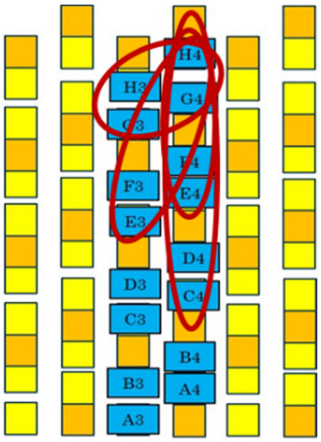


Table 10 - Propagation Delay	
Differential (A3B3)	182 ps
Differential (C3D3)	205 ps
Differential (E3F3)	233 ps
Differential (G3H3)	269 ps
Differential (A4B4)	168 ps
Differential (C4D4)	196 ps
Differential (E4F4)	226 ps
Differential (G4H4)	259 ps

Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Characterization Details

This report presents data that characterizes the signal integrity response of a connector pair in a controlled printed circuit board (PCB) environment. All efforts are made to reveal typical best-case responses inherent to the system under test (SUT).

In this report, the SUT includes the connector pair and footprint effects on a typical multi-layer PCB. PCB effects (trace loss) are de-embedded from test data. Board related effects, such as pad-to-ground capacitance, are included in the data presented in this report.

Additionally, intermediate test signal connections can mask the connector's true performance. Such connection effects are minimized by using high performance test cables and adapters. Where appropriate, calibration and de-embedding routines are also used to reduce residual effects.

Differential and Single-Ended Data

Most Samtec connectors can be used successfully in both differential and single-ended applications. However, electrical performance will differ depending on the signal drive type. In this report, data is presented for differentially driven scenarios.

Connector Signal to Ground Ratio

Samtec connectors are most often designed for generic applications and can be implemented using various signal and ground pin assignments. In high speed systems, provisions must be made in the interconnect for signal return currents. Such paths are often referred to as "ground". In some connectors, a ground plane or blade, or an outer shield, is used as the signal return, while in others, connector pins are used as signal returns. Various combinations of signal pins, ground blades, and shields can also be utilized. Electrical performance can vary significantly depending upon the number and location of ground pins.

In general, the more pins dedicated to ground, the better electrical performance will be. But dedicating pins to ground reduces signal density of a connector. Therefore, care must be taken when choosing signal/ground ratios in cost or density-sensitive applications.

Series: HDTM / HDTF-RA
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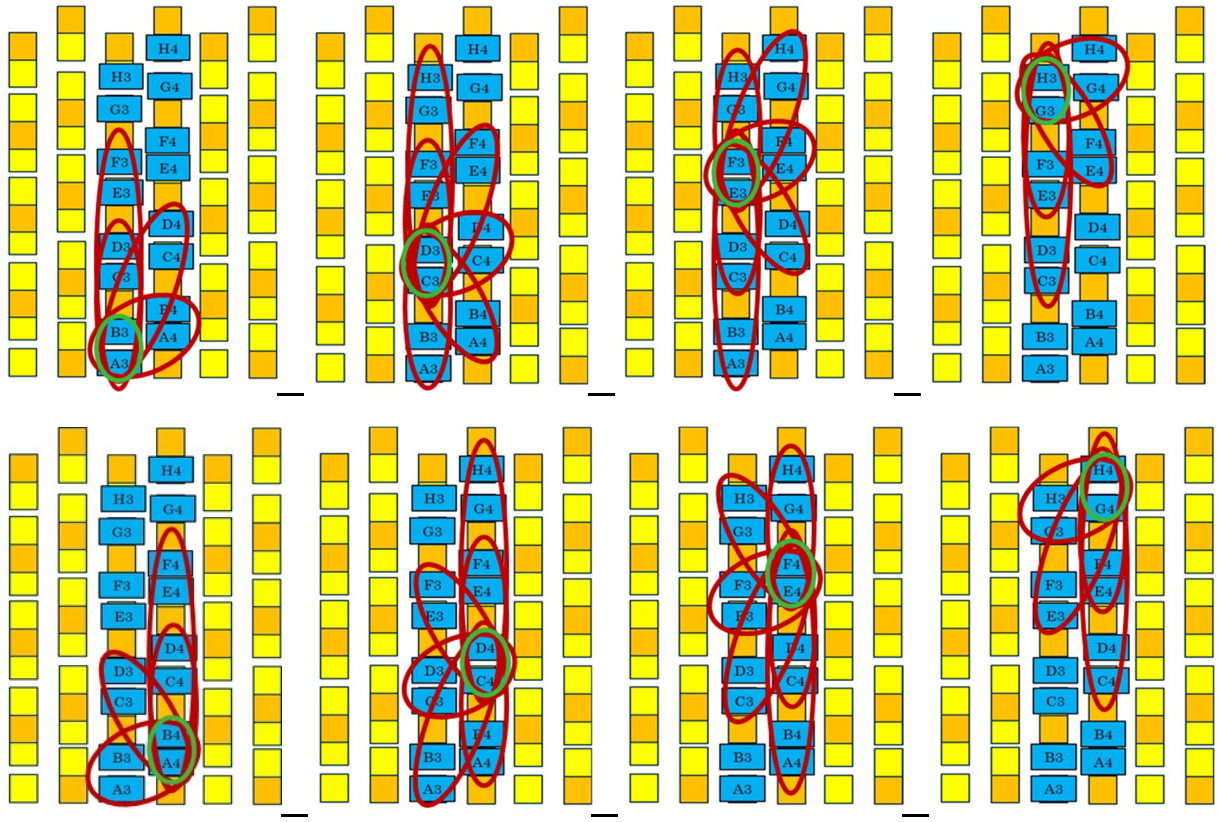
For this connector, the following array configurations were evaluated:



Differential Impedance (denoted by green circles)**:**

- GSSG (Ground-positive Signal-negative Signal-Ground)

Differential Crosstalk (denoted by red circles)**:**

- In row: from the terminals to the other terminals on the same row.
- Across row: from one row of terminals to the other row of terminals.

Only one differential pair was driven for crosstalk measurements.

Other configurations can be evaluated upon request. Please contact sig@samtec.com for more information.

In a real system environment, active signals might be located at the outer edges of the signal contacts of concern, as opposed to the ground signals utilized in laboratory testing. For example, in a single-ended system, a pin-out of “SSSS”, or four adjacent single ended signals might be encountered as opposed to the “GSG” and “GSSG” configura-

Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

tions tested in the laboratory. Electrical characteristics in such applications could vary slightly from laboratory results. But in most applications, performance can safely be considered equivalent.

Signal Edge Speed (Rise Time):
In pulse signaling applications, the perceived performance of the interconnect can vary significantly depending on the edge rate or rise time of the exciting signal. For this report, the fastest rise time used was 30 ps. Generally, this should demonstrate the worst-case performance.

In many systems, the signal edge rate will be significantly slower at the connector than at the driver launch point. To estimate interconnect performance at other edge rates, data is provided for several rise times between 30ps and 500ps.

For this report, measured rise times were at 10%-90% signal levels.

Frequency Domain Data
Frequency Domain parameters are helpful in evaluating the connector system's signal loss and crosstalk characteristics across a range of sinusoidal frequencies. In this report, parameters presented in the Frequency Domain are Insertion Loss, Return Loss, and Near-End and Far-End Crosstalk. Other parameters or formats, such as VSWR or S-Parameters, may be available upon request. Please contact our Signal Integrity Group at sig@samtec.com for more information.

Frequency performance characteristics for the SUT are generated directly from network analyzer measurements.

Time Domain Data
Time Domain parameters indicate impedance mismatch versus length, signal propagation time and crosstalk in a pulsed signal environment.

Impedance mismatch versus length is measured by DSA8200 Digital Serial Analyzer. Board related effects, such as pad-to-ground capacitance and trace loss, are included in the data presented in this report. The impedance data is provided in Appendix B of this report.

The measured S-Parameters from the network analyzer are post-processed using Keysight Advanced Design System to obtain the time domain response for signal propagation time and crosstalk. The Time Domain procedure is provided in Appendix E of this report. Parameters or formats not included in this report may be available upon re-

Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

quest. Please contact our Signal Integrity Group at sig@samtec.com for more information.

In this report, propagation delay is defined as the signal propagation time through the connector and connector footprint. It includes 80 mils of PCB trace on each side. Delay was measured at 100 picoseconds signal rise-time. Delay is calculated as the difference in time measured between the 50% amplitude levels of the input and output pulses.

Crosstalk or coupled noise data is provided for various signal configurations. All measurements are single disturber. Crosstalk is calculated as a ratio of the input line voltage to the coupled line voltage. The input line is sometimes described as the active or drive line. The coupled line is sometimes described as the quiet or victim line. Crosstalk ratio is tabulated in this report as a percentage. Measurements are made at both the near-end and far-end of the SUT.

Data for other configurations may be available. Please contact our Signal Integrity Group at sig@samtec.com for further information.

As a rule of thumb, 10% crosstalk levels are often used as a general first pass limit for determining acceptable interconnect performance. But modern system crosstalk tolerance can vary greatly. For advice on connector suitability for specific applications, please contact our Signal Integrity Group at sig@samtec.com.

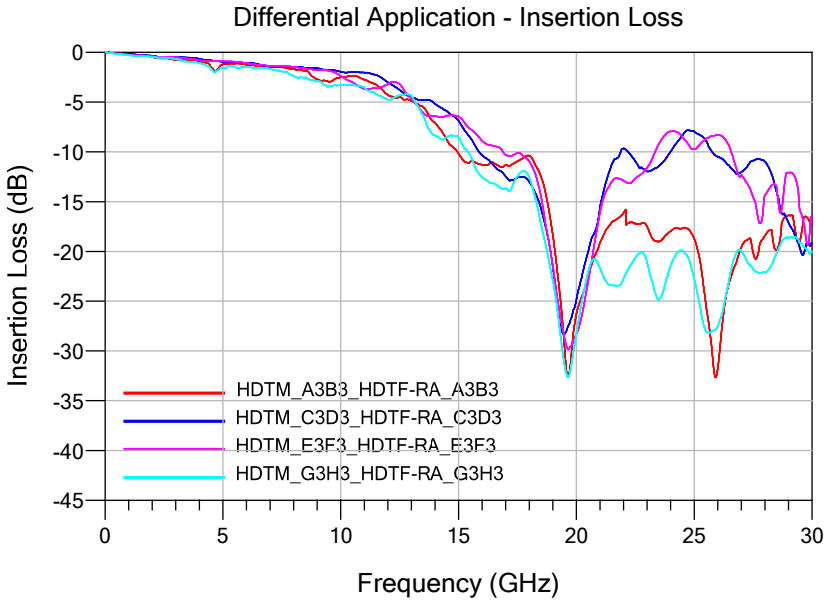
Additional information concerning test conditions and procedures is in the appendices of this report. Further information may be obtained by contacting our Signal Integrity Group at sig@samtec.com.

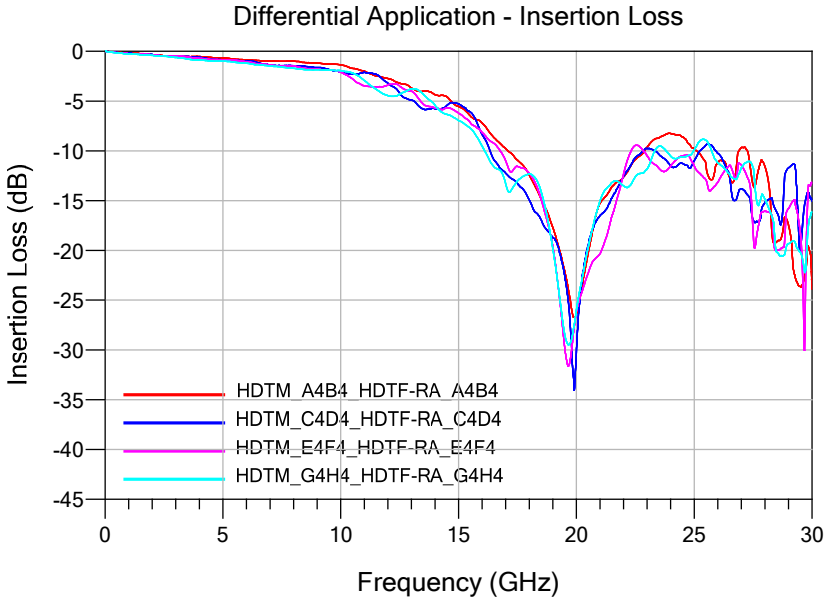
Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Appendix A – Frequency Domain Response Graphs

Differential Application – Insertion Loss

Samtec HDTF-RA mating to Samtec HDTM

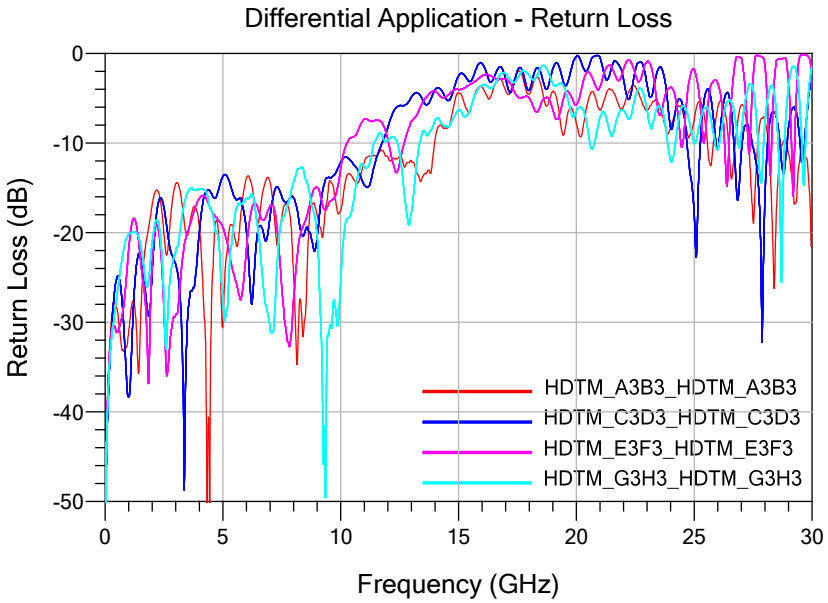


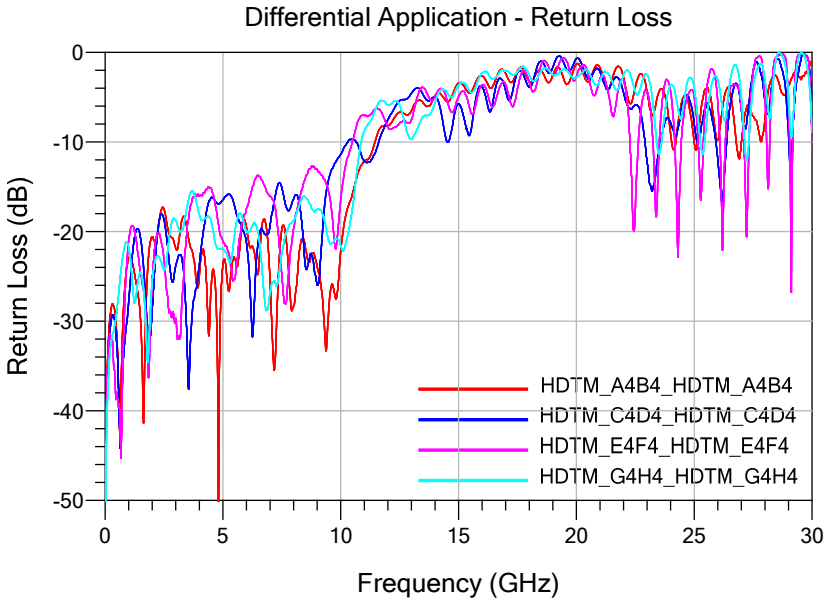


Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Differential Application – Return Loss

Samtec HDTF-RA mating to Samtec HDTM

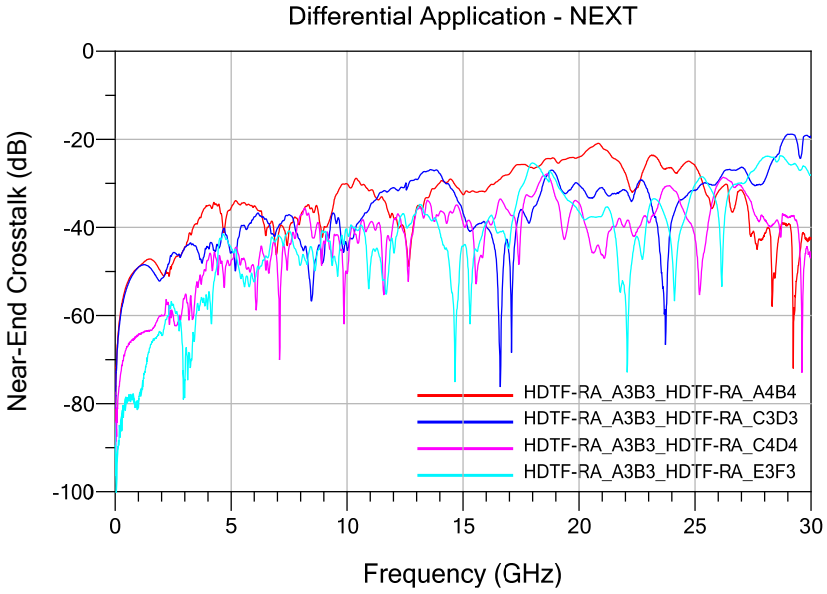




Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

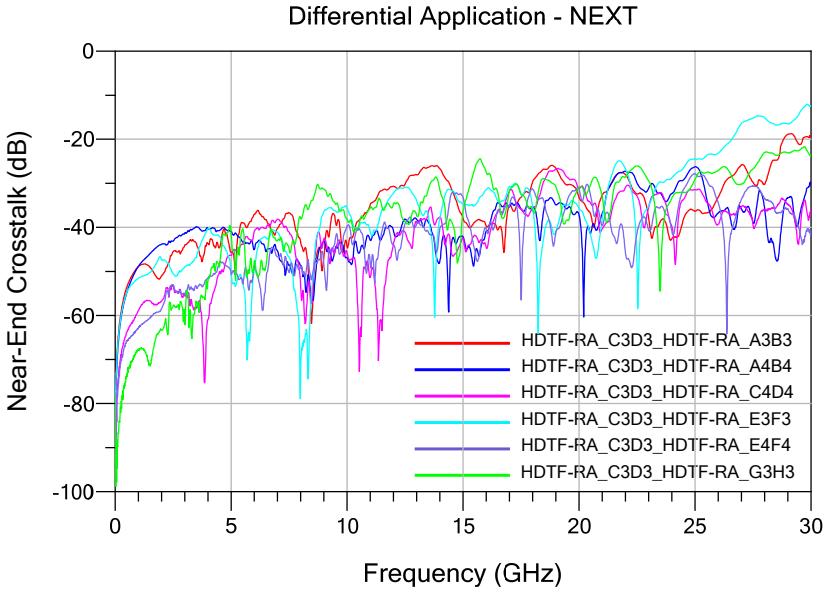
Differential Application – NEXT Configurations, A3B3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT Configurations, C3D3

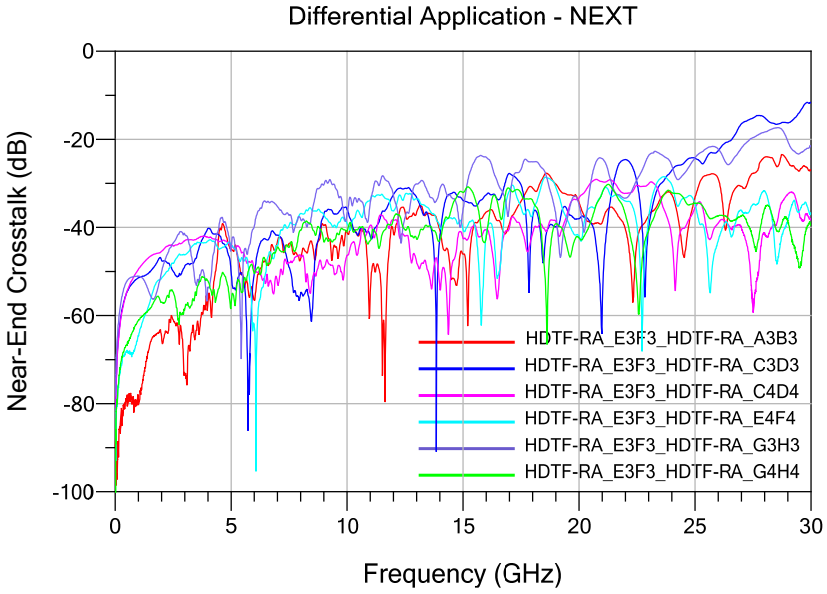
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

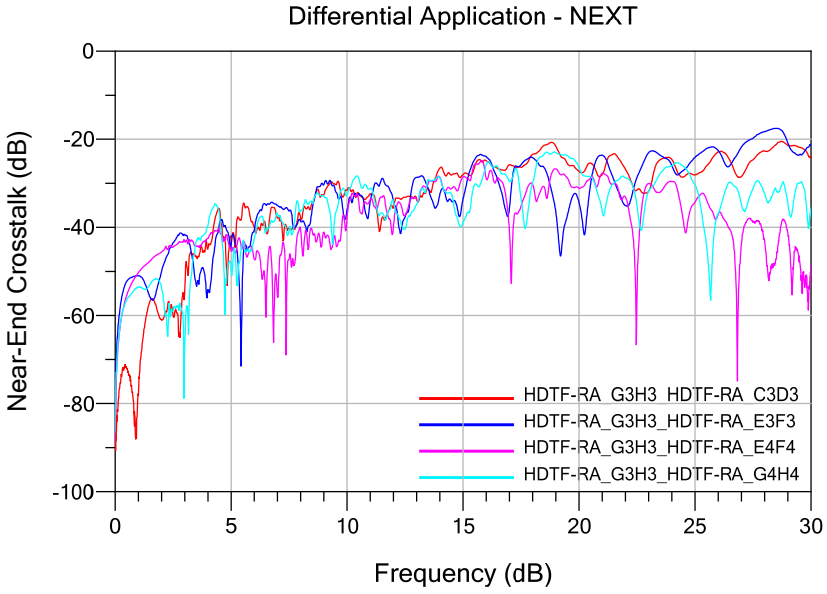
Differential Application – NEXT Configurations, E3F3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT Configurations, G3H3

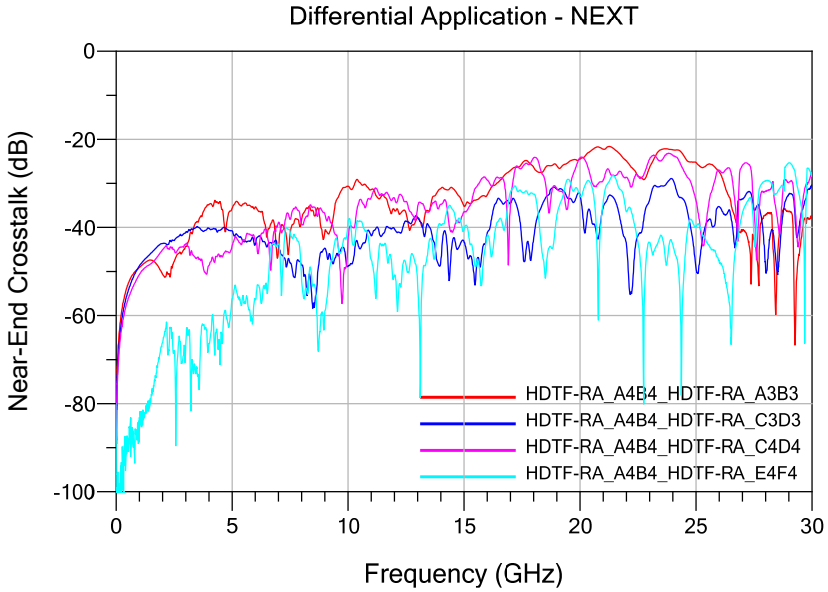
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

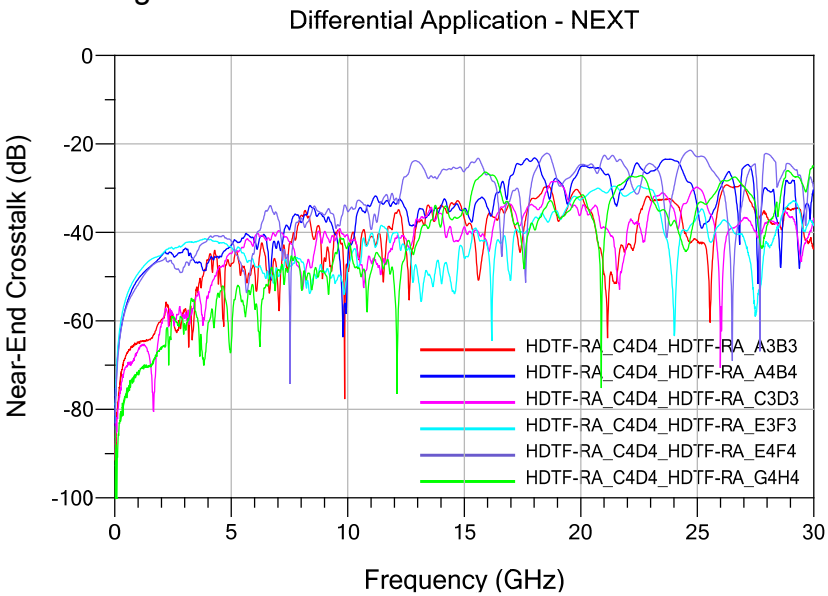
Differential Application – NEXT Configurations, A4B4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT Configurations, C4D4

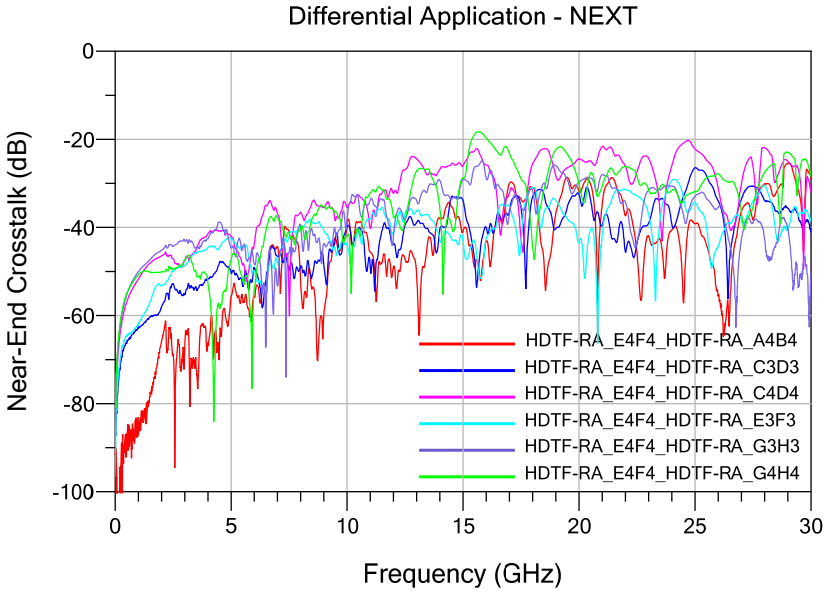
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

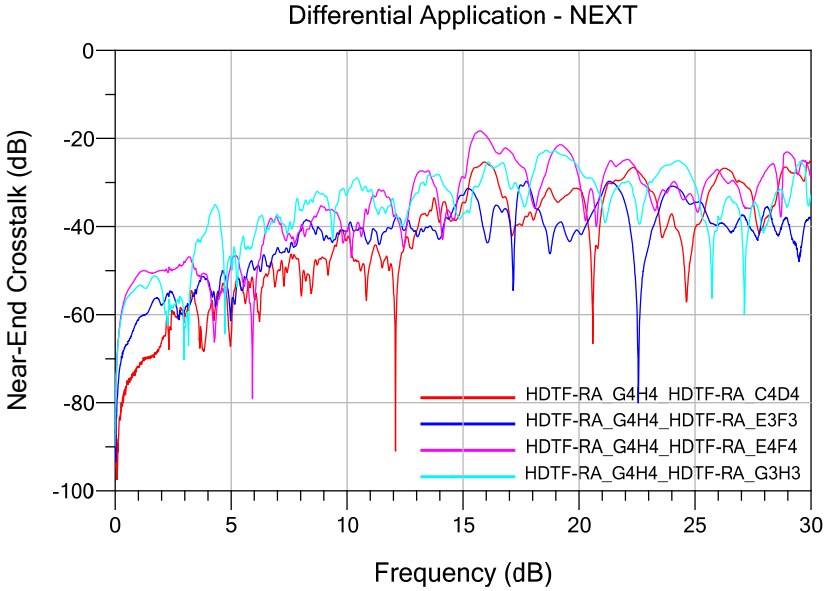
Differential Application – NEXT Configurations, E4F4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT Configurations, G4H4

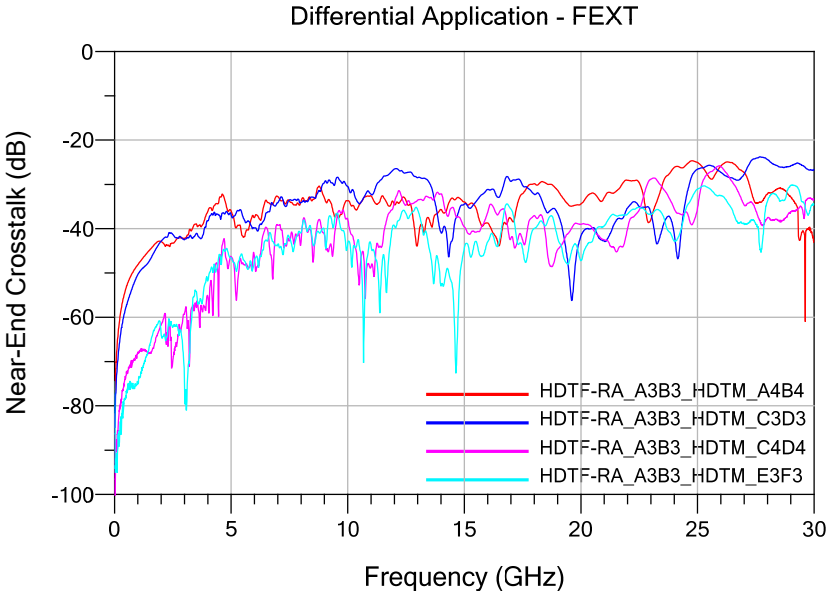
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

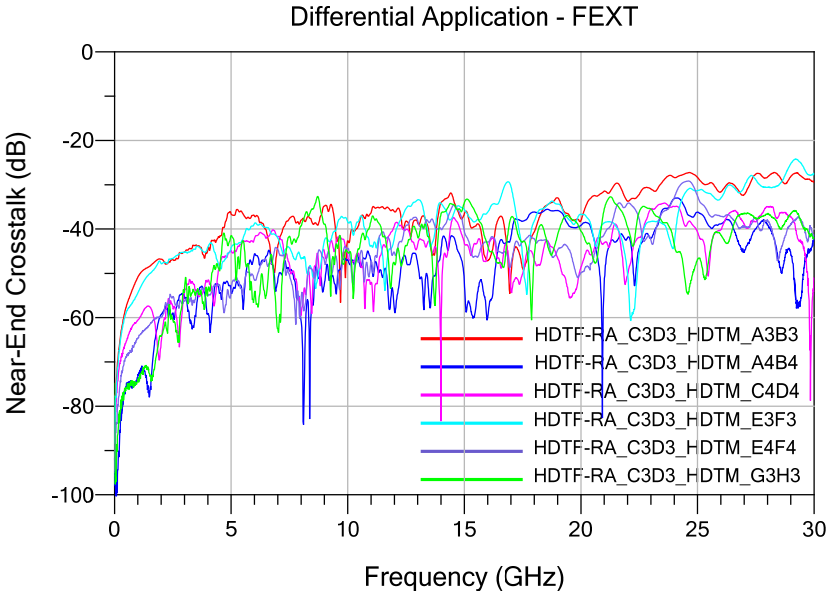
Differential Application – FEXT Configurations, A3B3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – FEXT Configurations, C3D3

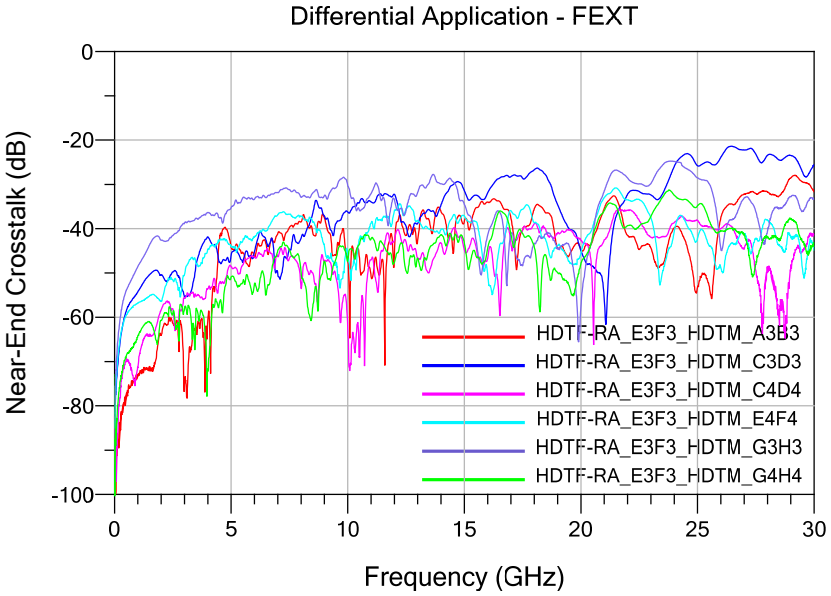
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

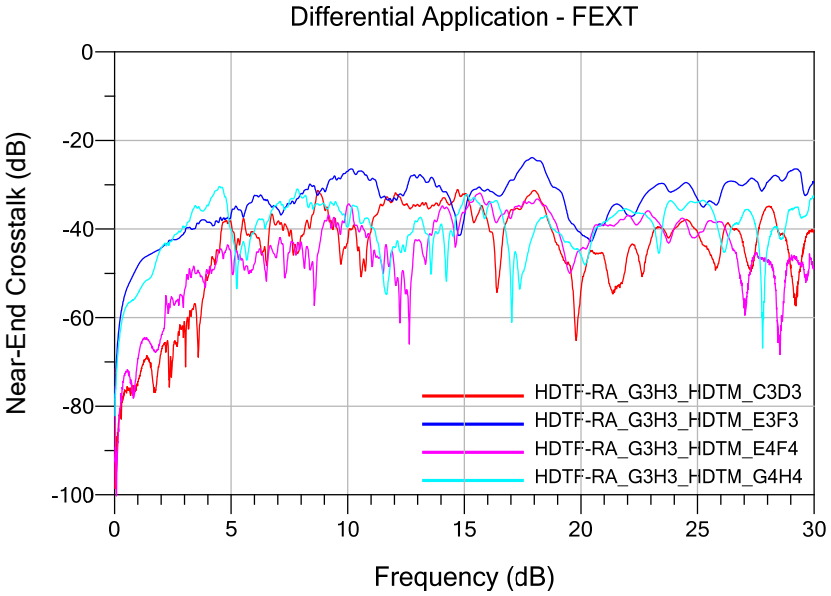
Differential Application – FEXT Configurations, E3F3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – FEXT Configurations, G3H3

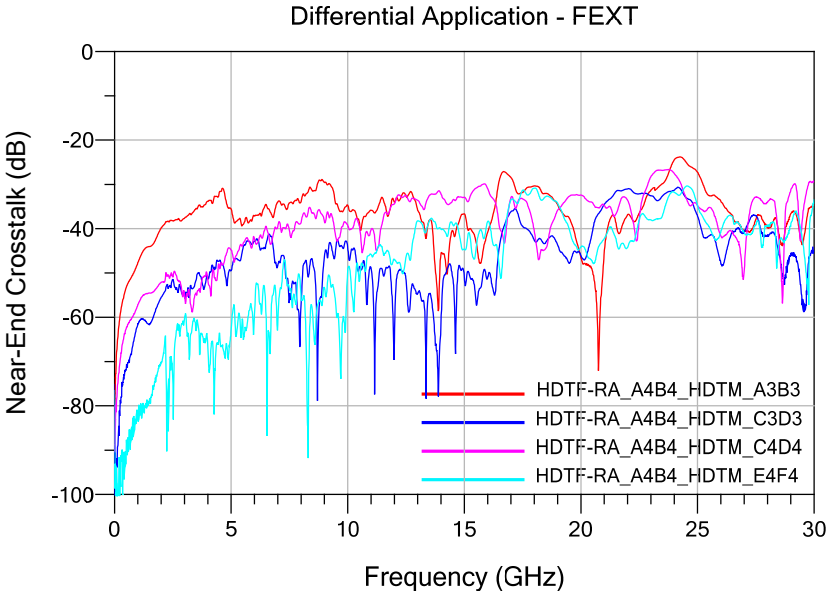
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

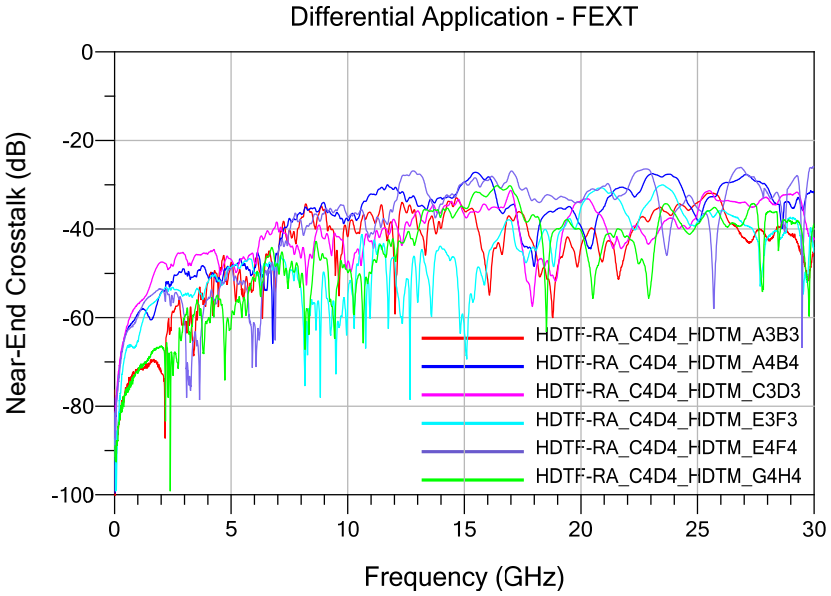
Differential Application – FEXT Configurations, A4B4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – FEXT Configurations, C4D4

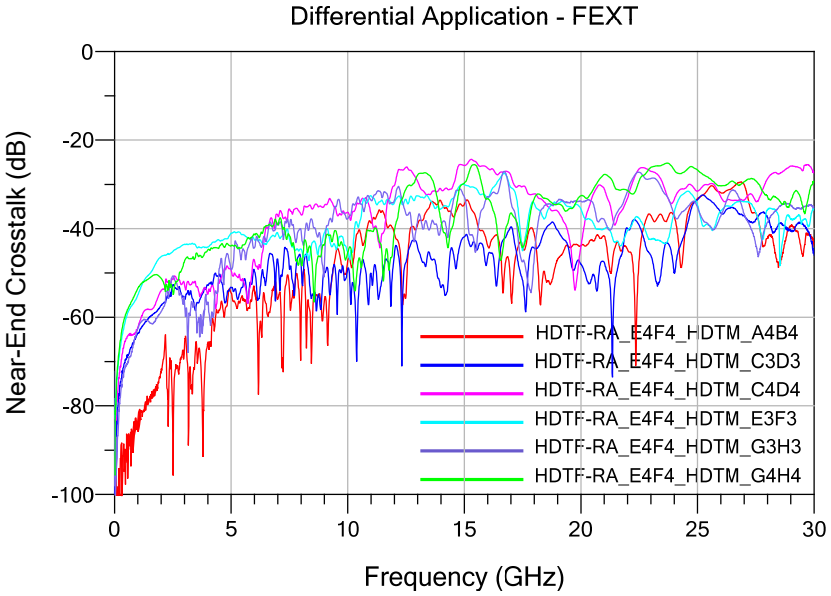
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

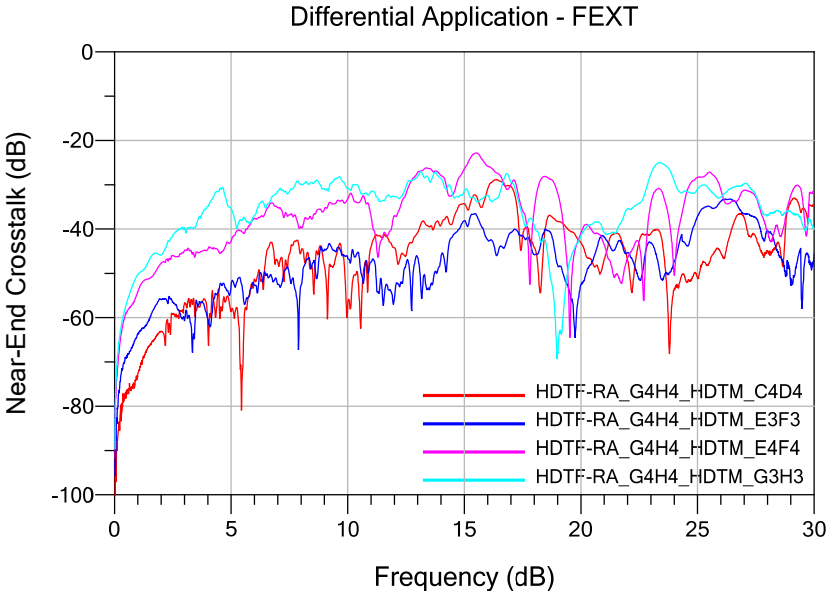
Differential Application – FEXT Configurations, E4F4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – FEXT Configurations, G4H4

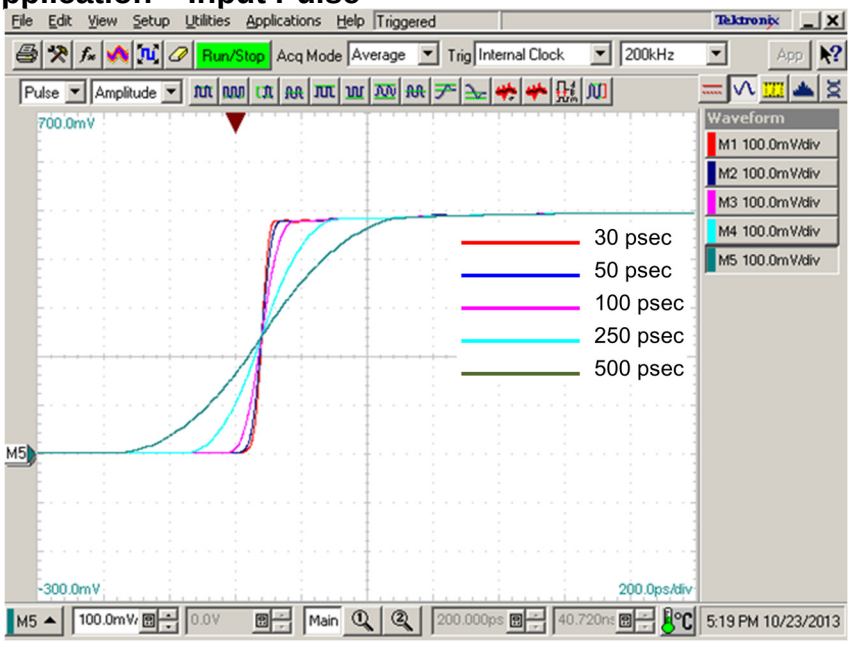
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Appendix B – Time Domain Response Graphs

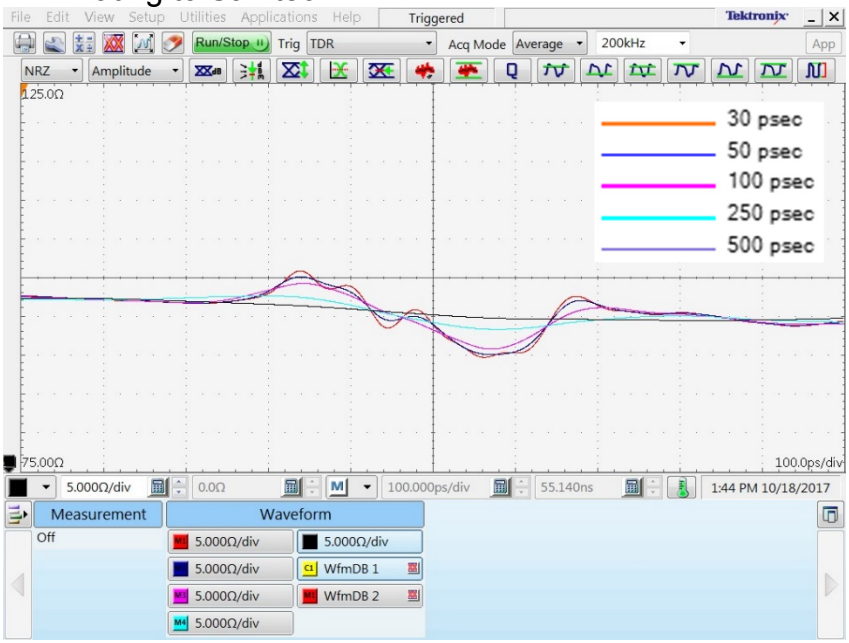
Differential Application – Input Pulse



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

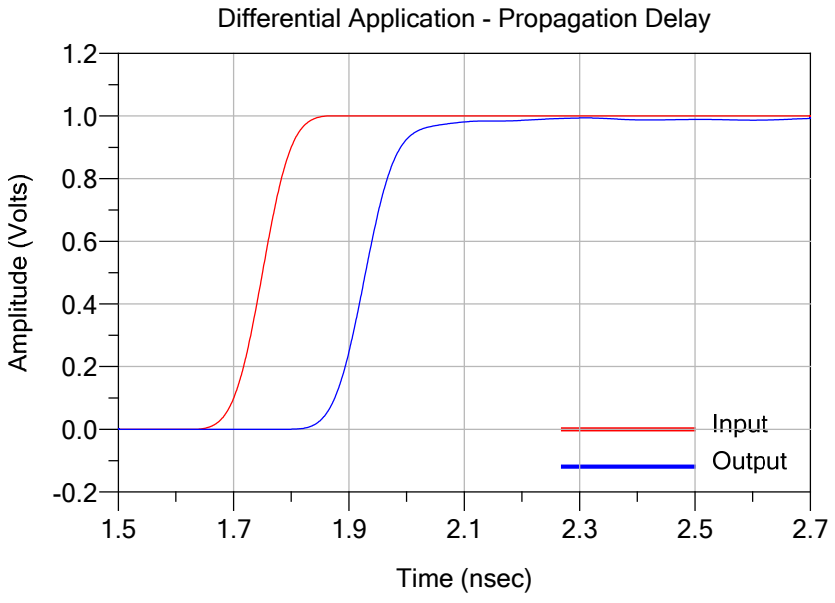
Differential Application – Impedance, HDTM_A3B3_HDTF-RA_A3B3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – Propagation Delay, HDTM_A3B3_HDTF-RA_A3B3

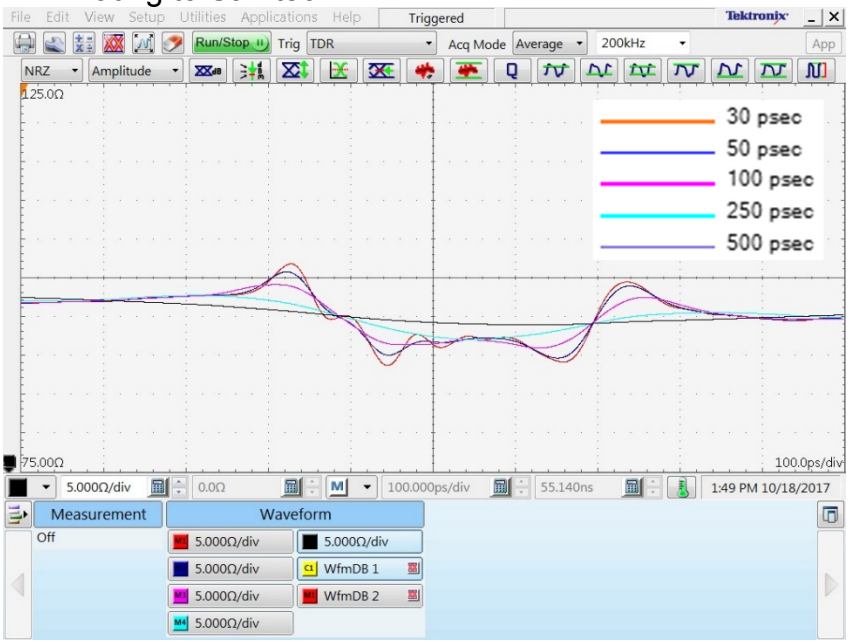
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

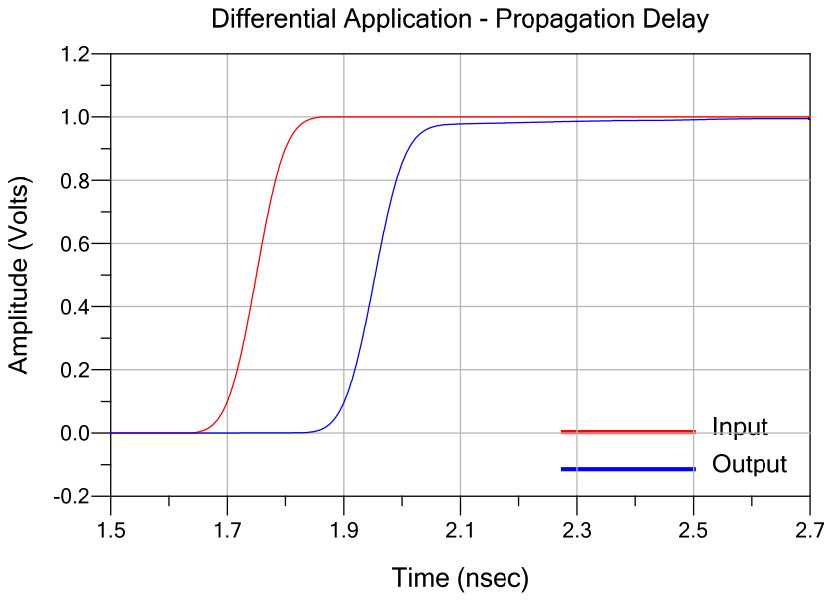
Differential Application – Impedance, HDTM_C3D3_HDTF-RA_C3D3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – Propagation Delay, HDTM_C3D3_HDTF-RA_C3D3

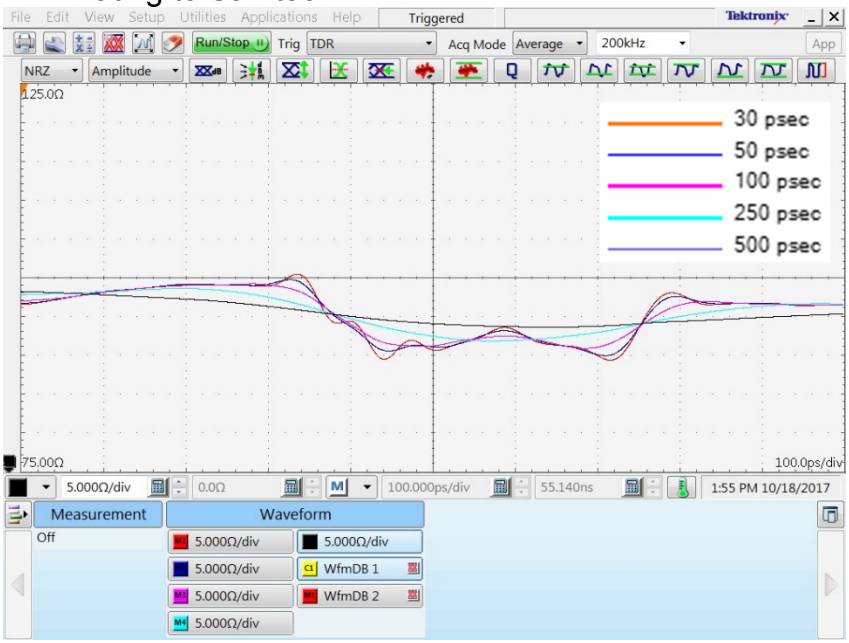
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

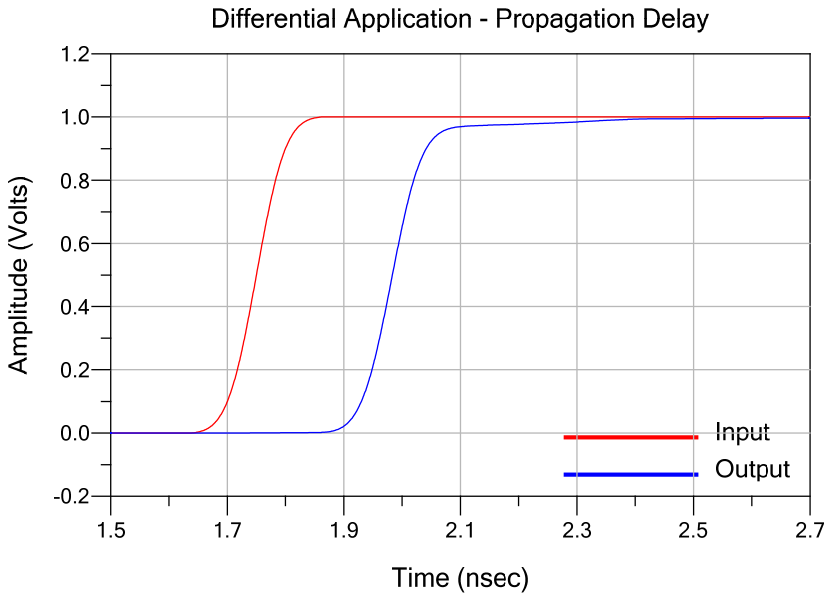
Differential Application – Impedance, HDTM_E3F3_HDTF-RA_E3F3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – Propagation Delay, HDTM_E3F3_HDTF-RA_E3F3

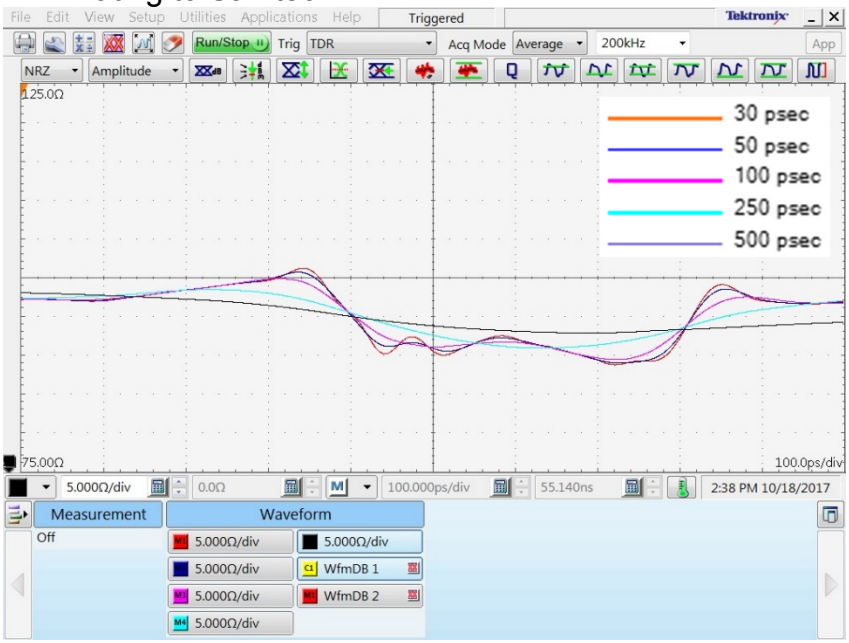
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

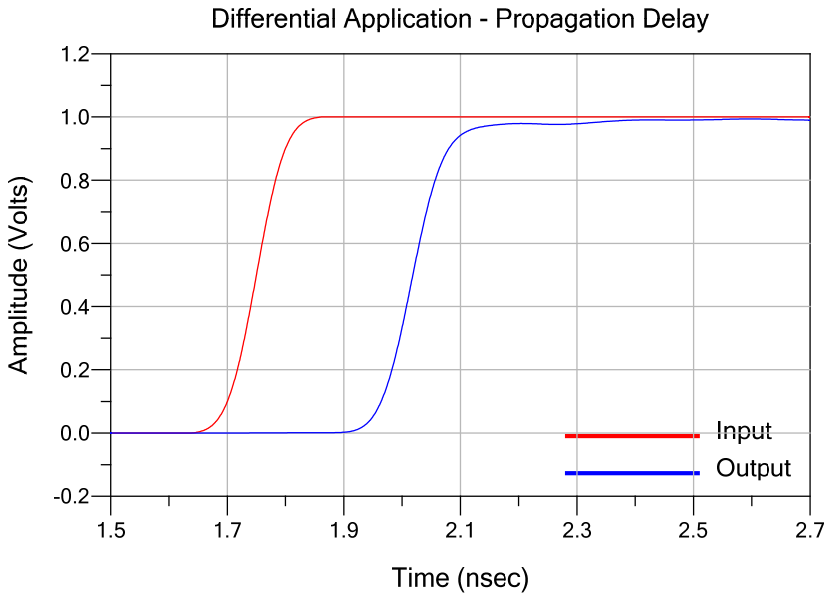
Differential Application – Impedance, HDTM_G3H3_HDTF-RA_G3H3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – Propagation Delay, HDTM_G3H3_HDTF-RA_G3H3

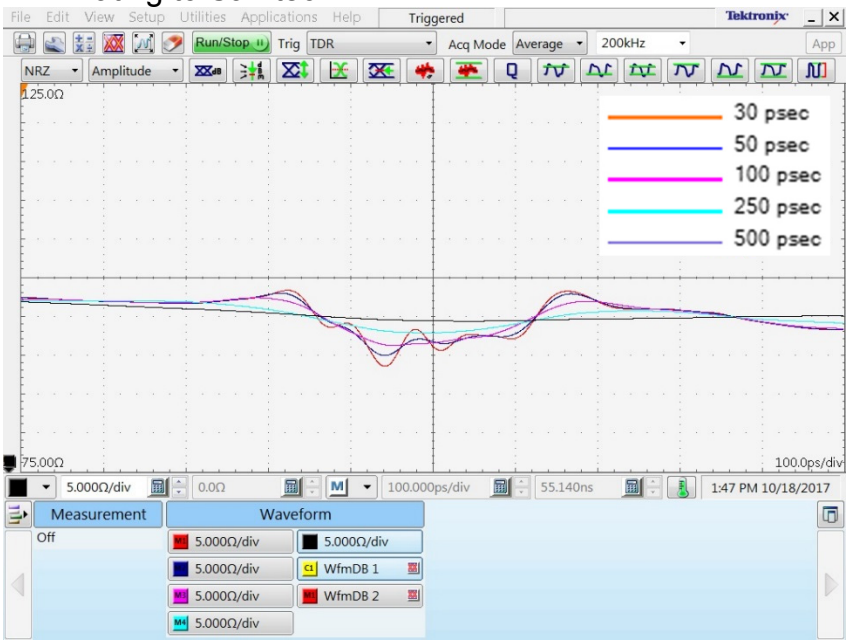
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

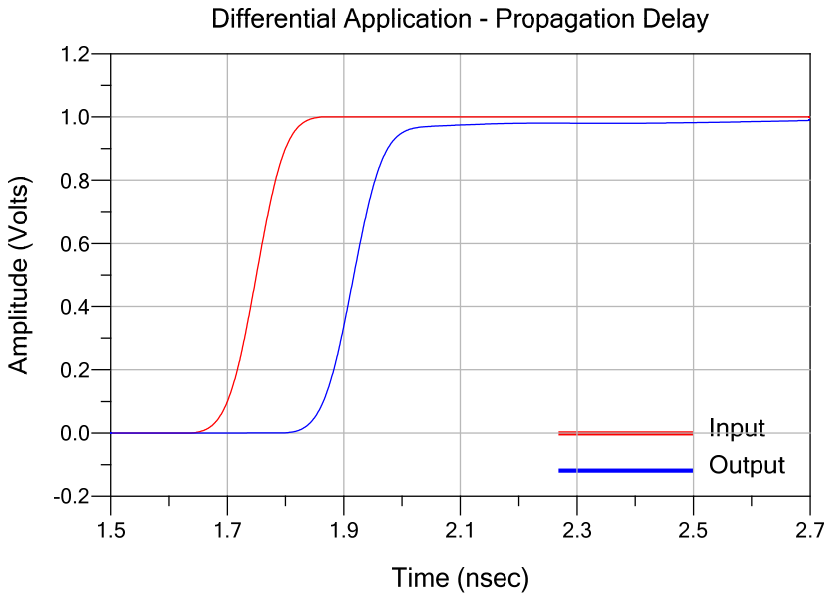
Differential Application – Impedance, HDTM_A4B4_HDTF-RA_A4B4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – Propagation Delay, HDTM_A4B4_HDTF-RA_A4B4

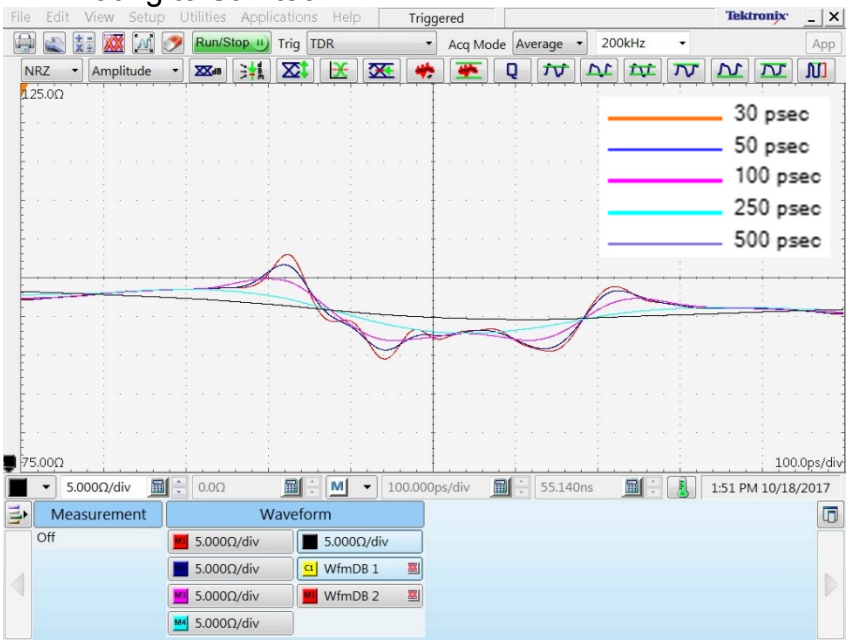
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

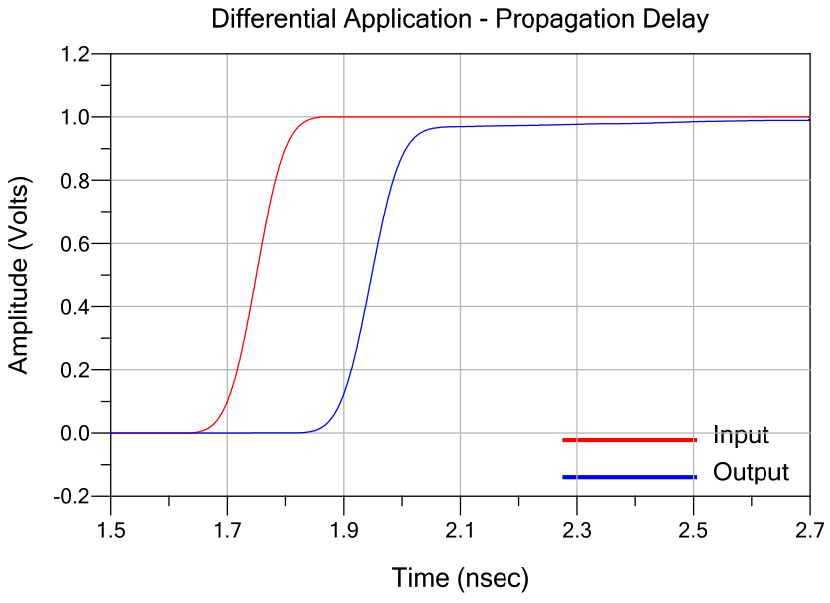
Differential Application – Impedance, HDTM_C4D4_HDTF-RA_C4D4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – Propagation Delay, HDTM_C4D4_HDTF-RA_C4D4

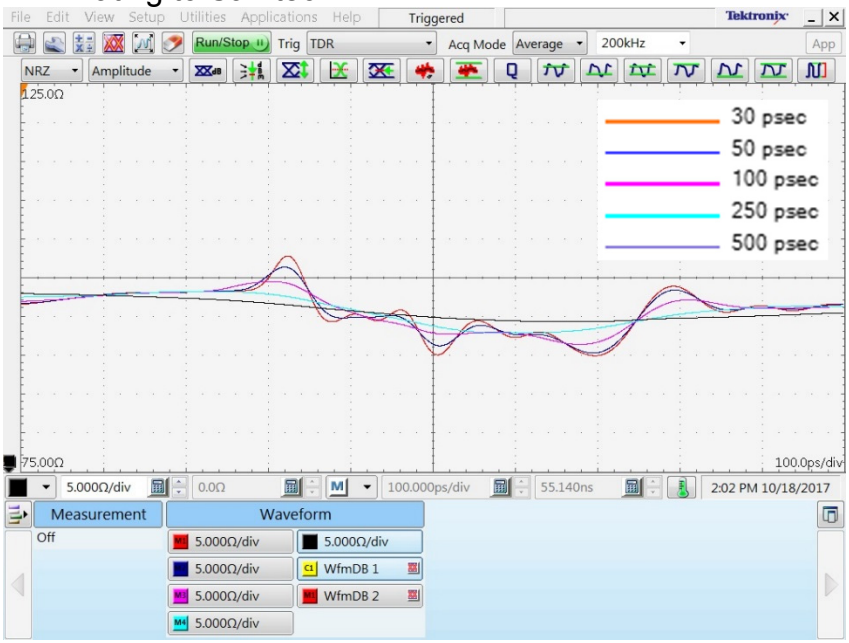
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

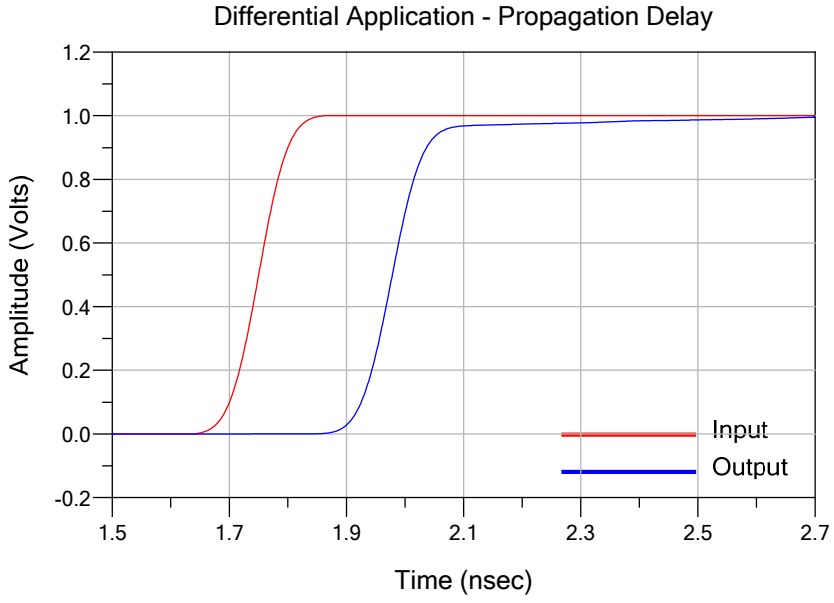
Differential Application – Impedance, HDTM_E4F4_HDTF-RA_E4F4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – Propagation Delay, HDTM_E4F4_HDTF-RA_E4F4

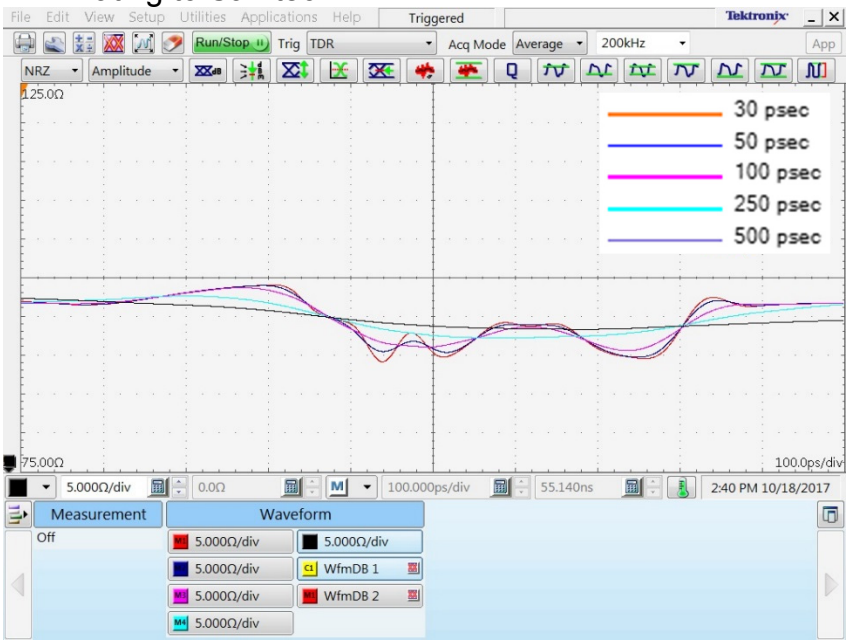
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

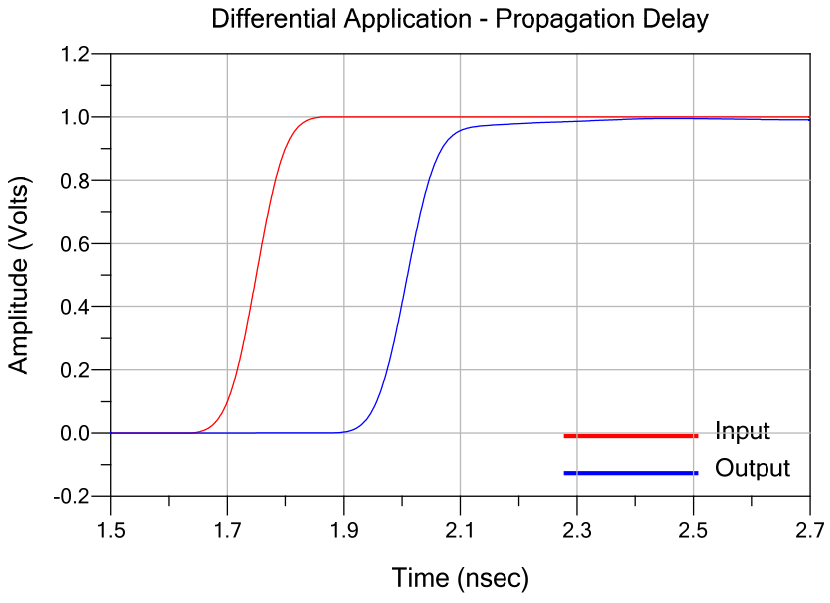
Differential Application – Impedance, HDTM_G4H4_HDTF-RA_G4H4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – Propagation Delay, HDTM_G4H4_HDTF-RA_G4H4

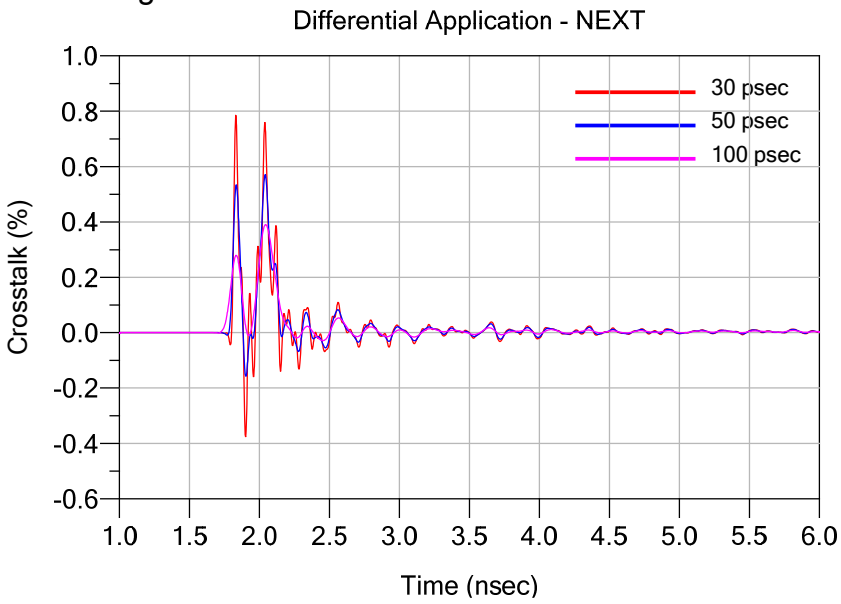
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

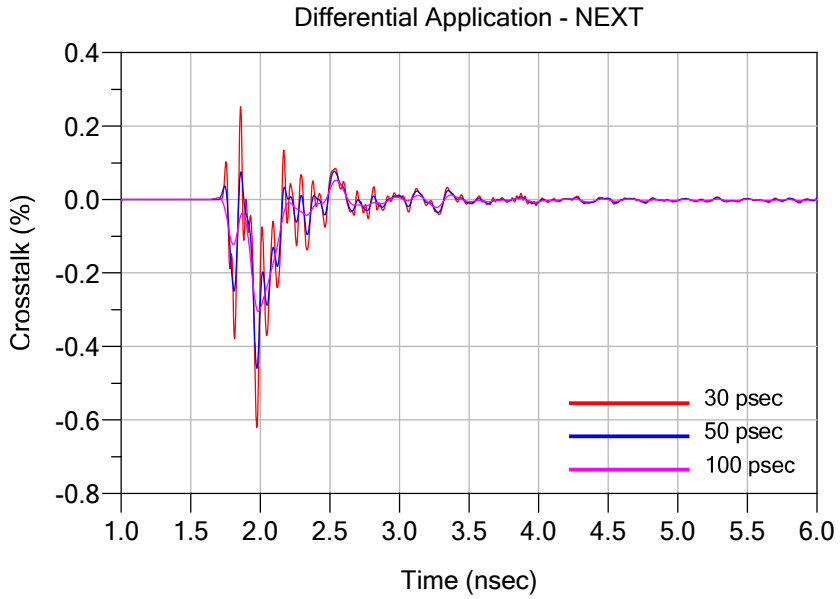
Differential Application – NEXT, HDTF-RA_A3B3_HDTF-RA_A4B4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT, HDTF-RA_A3B3_HDTF-RA_C3D3

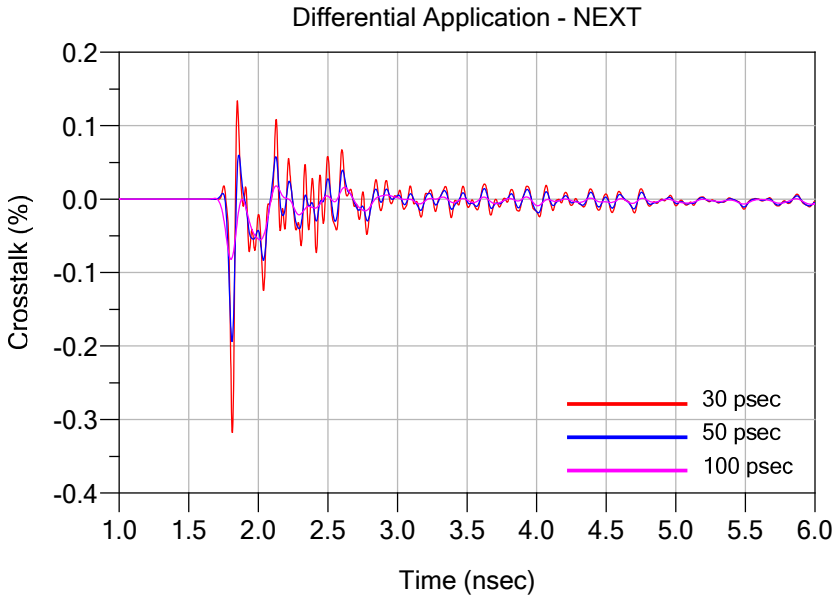
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

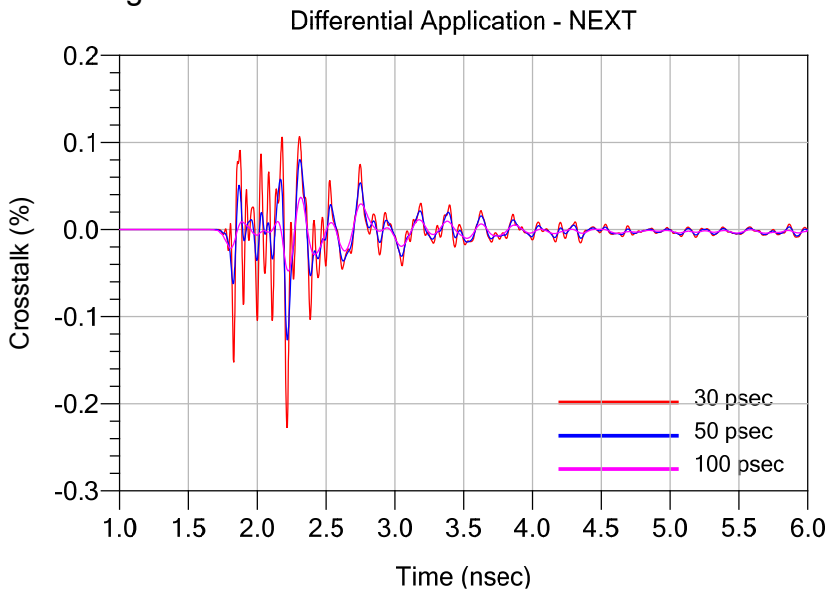
Differential Application – NEXT, HDTF-RA_A3B3_HDTF-RA_C4D4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT, HDTF-RA_A3B3_HDTF-RA_E3F3

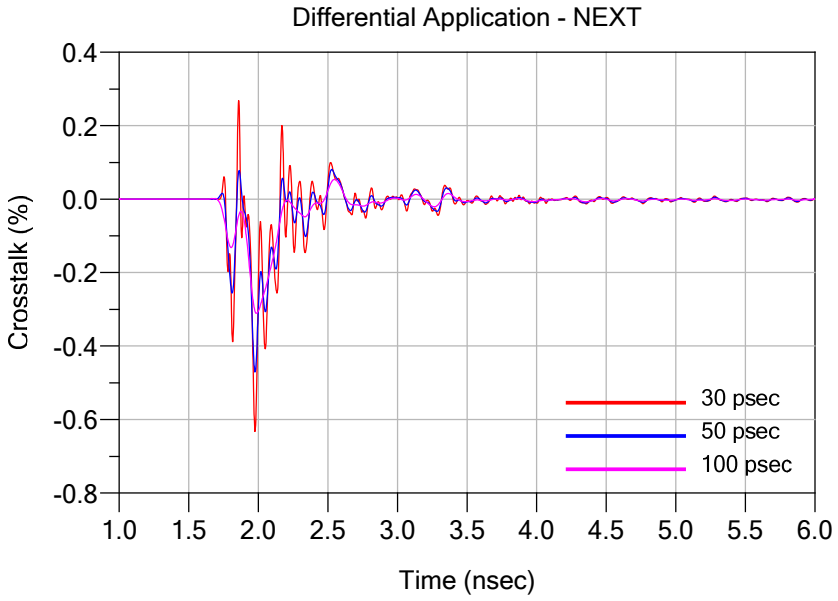
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

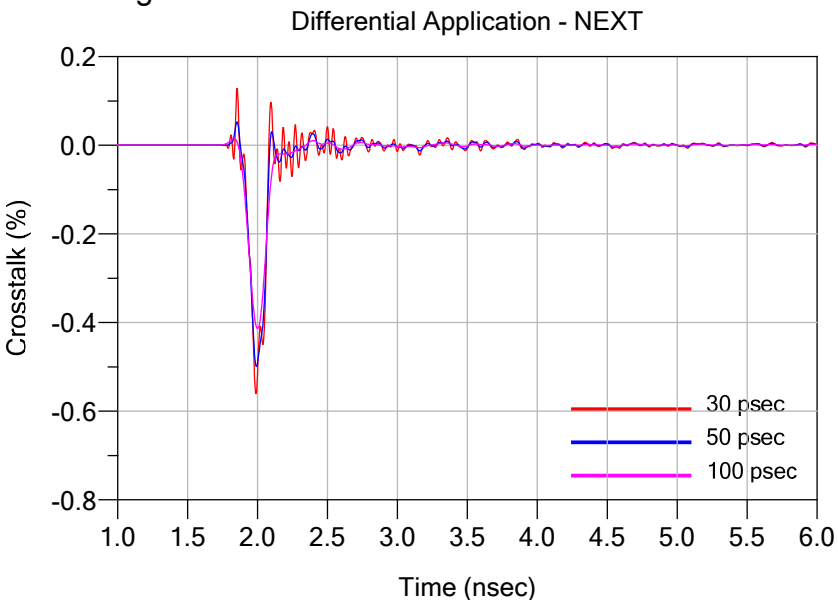
Differential Application – NEXT, HDTF-RA_C3D3_HDTF-RA_A3B3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT, HDTF-RA_C3D3_HDTF-RA_A4B4

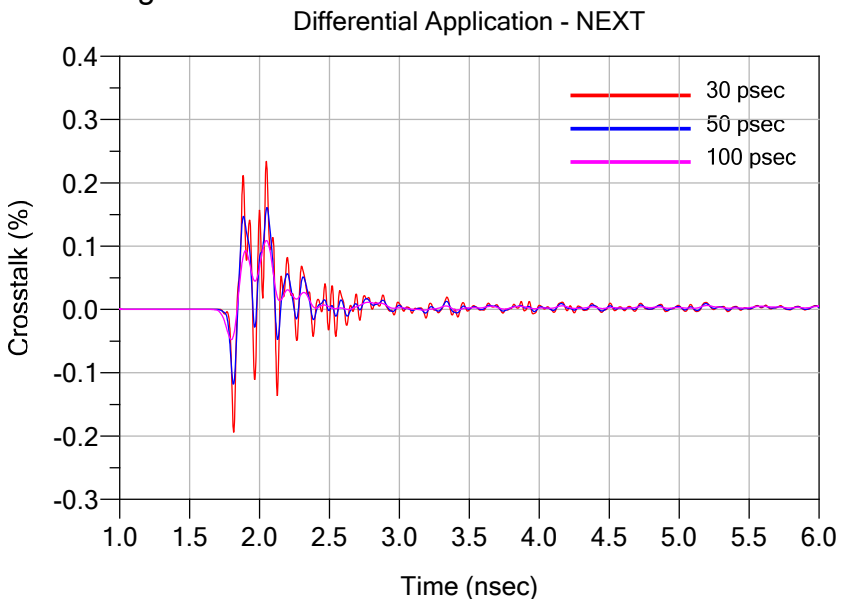
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

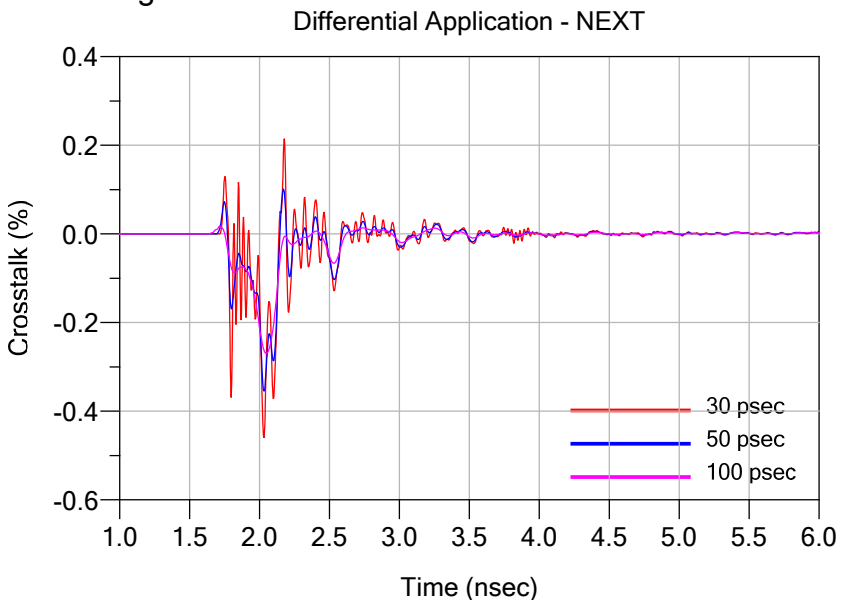
Differential Application – NEXT, HDTF-RA_C3D3_HDTF-RA_C4D4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT, HDTF-RA_C3D3_HDTF-RA_E3F3

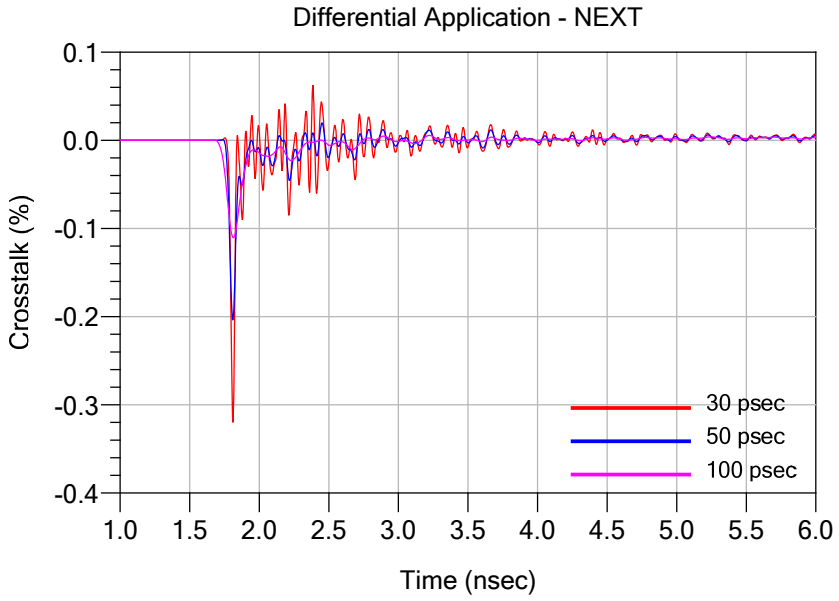
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

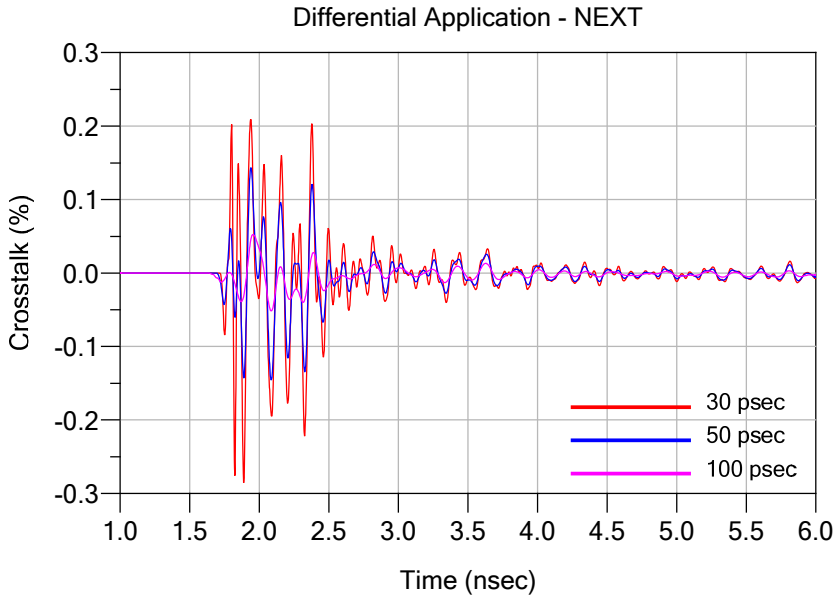
Differential Application – NEXT, HDTF-RA_C3D3_HDTF-RA_E4F4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT, HDTF-RA_C3D3_HDTF-RA_G3H3

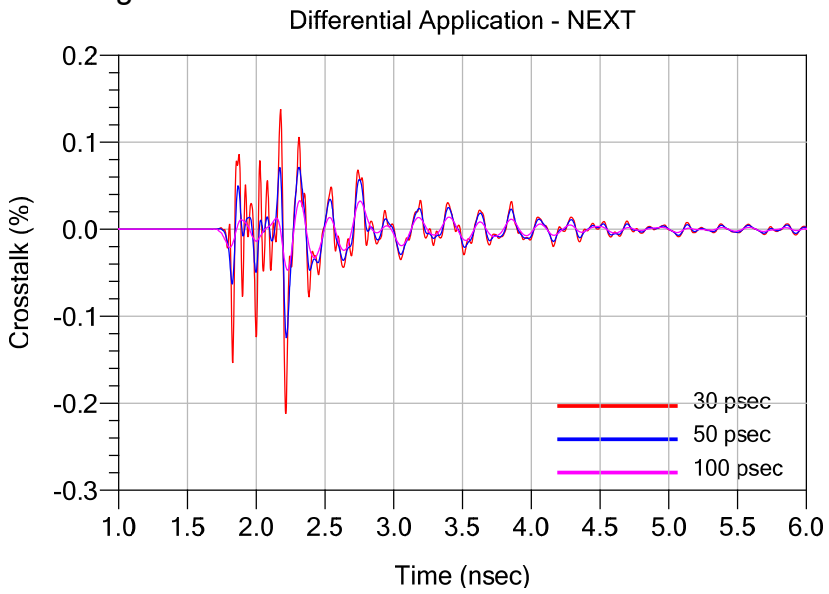
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

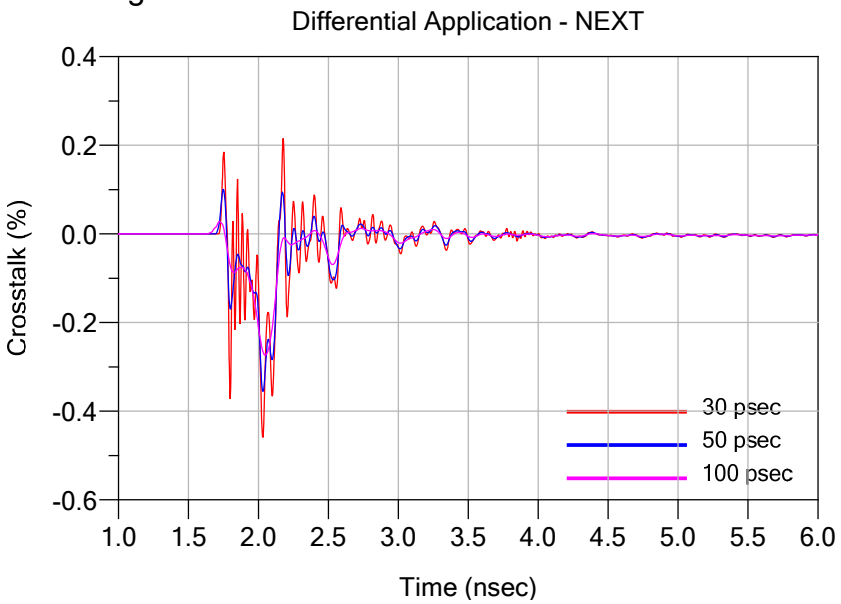
Differential Application – NEXT, HDTF-RA_E3F3_HDTF-RA_A3B3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT, HDTF-RA_E3F3_HDTF-RA_C3D3

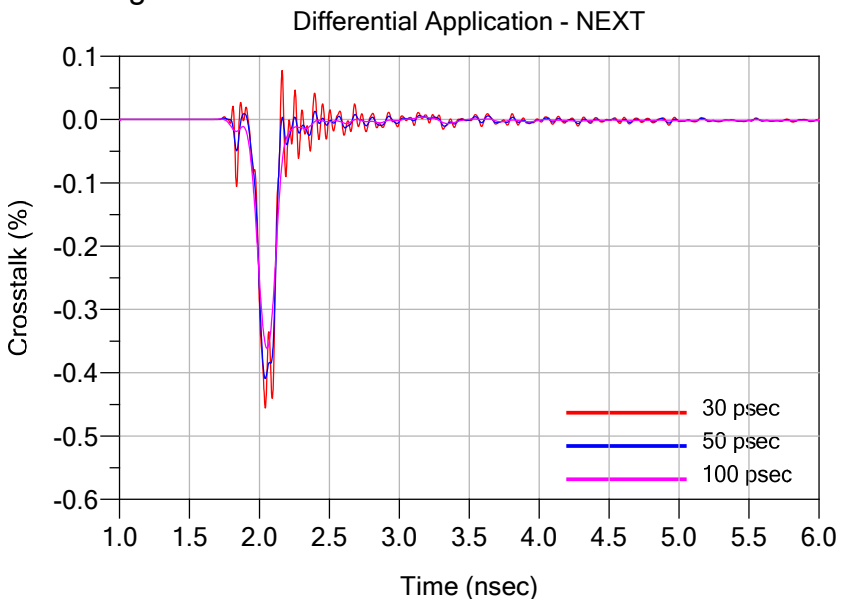
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

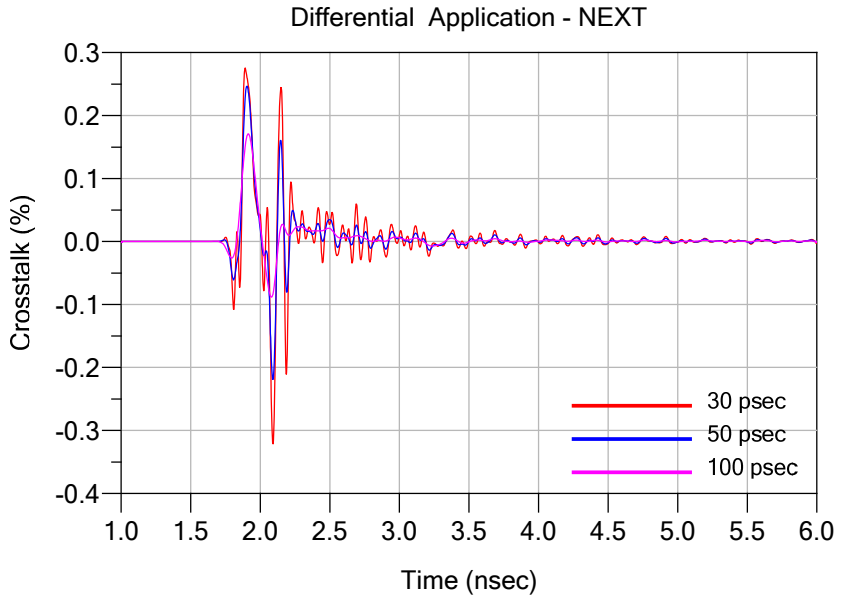
Differential Application – NEXT, HDTF-RA_E3F3_HDTF-RA_C4D4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT, HDTF-RA_E3F3_HDTF-RA_E4F4

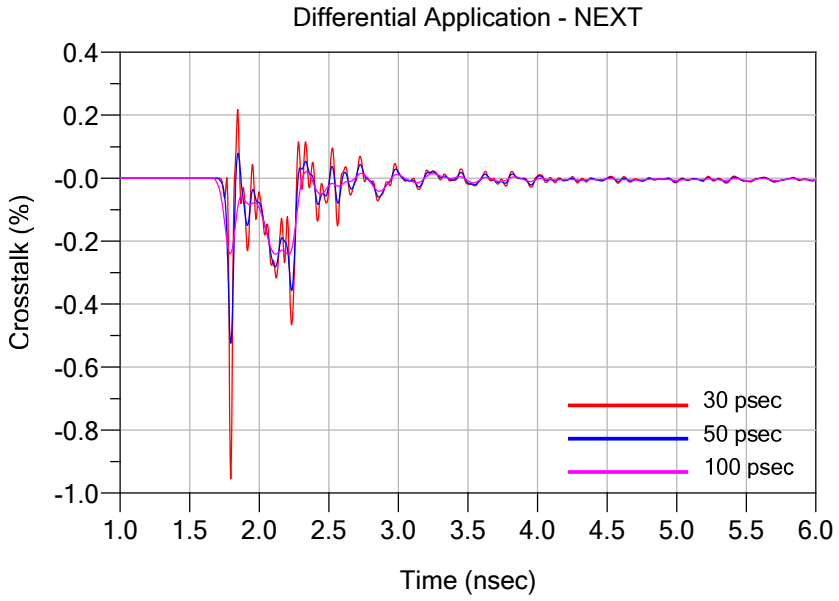
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

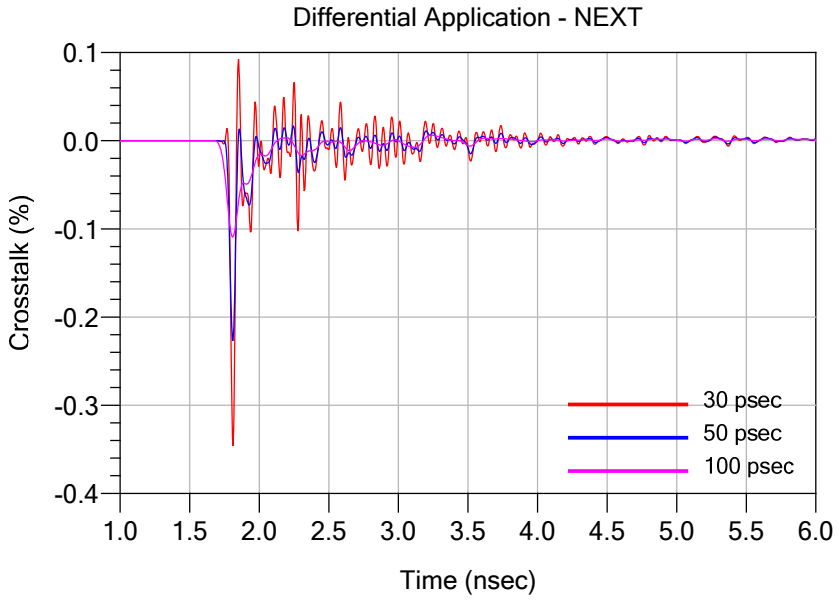
Differential Application – NEXT, HDTF-RA_E3F3_HDTF-RA_G3H3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT, HDTF-RA_E3F3_HDTF-RA_G4H4

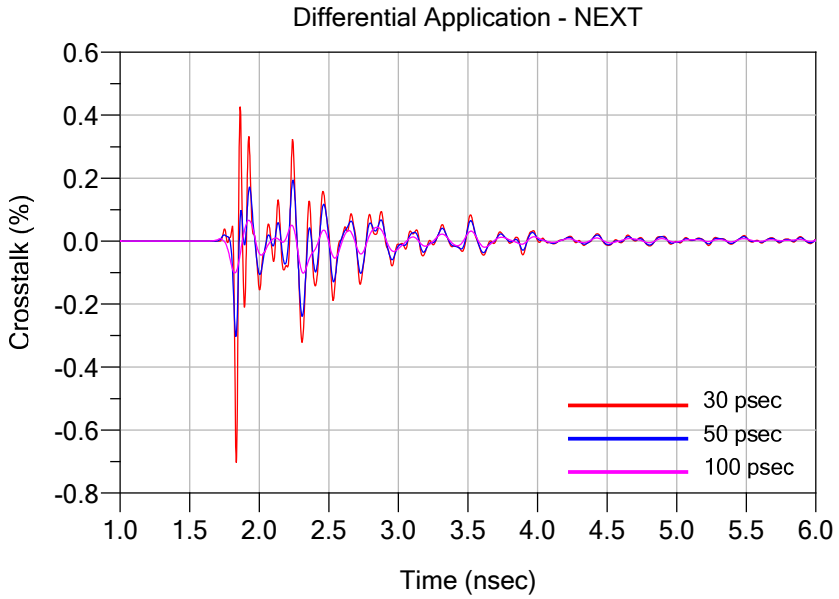
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

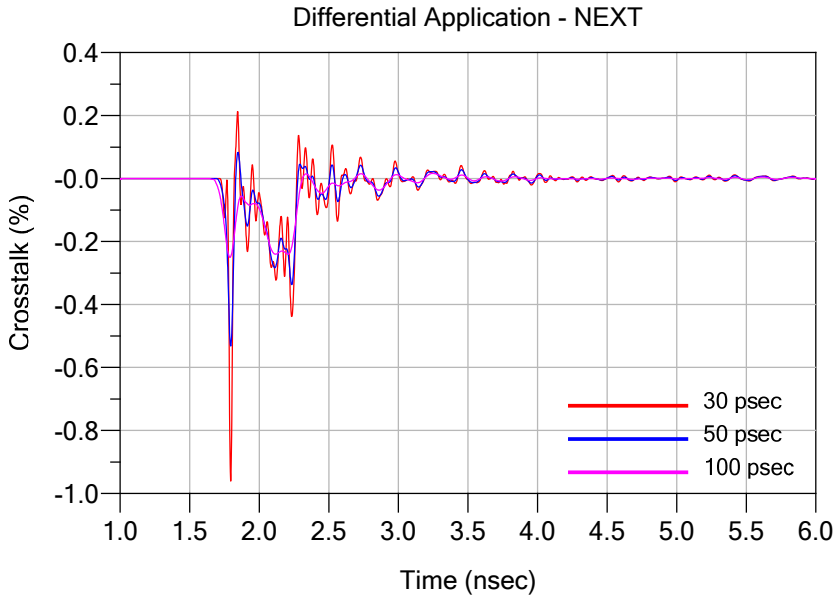
Differential Application – NEXT, HDTF-RA_G3H3_HDTF-RA_C3D3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT, HDTF-RA_G3H3_HDTF-RA_E3F3

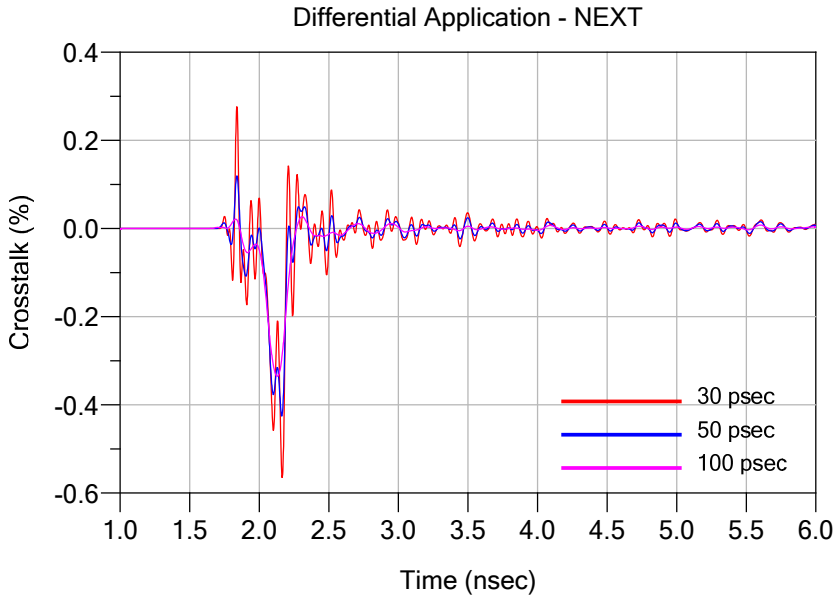
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

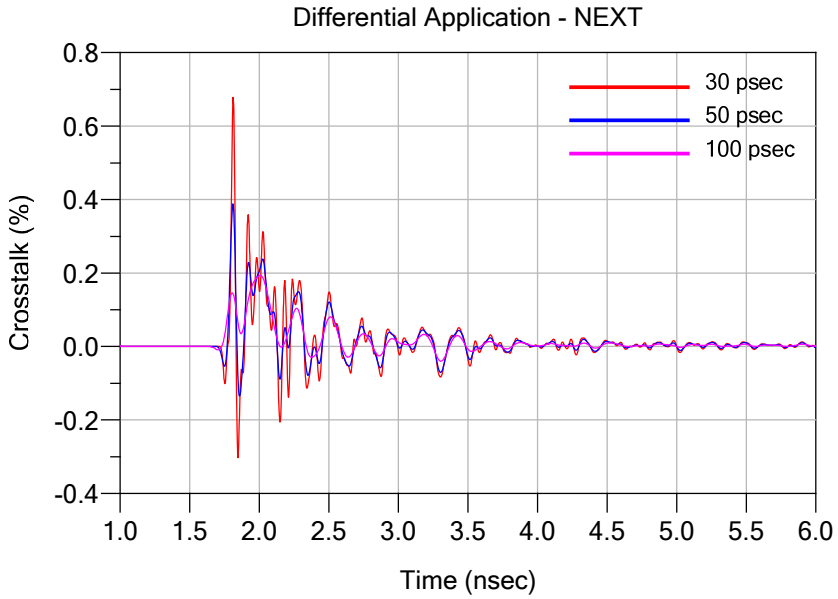
Differential Application – NEXT, HDTF-RA_G3H3_HDTF-RA_E4F4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT, HDTF-RA_G3H3_HDTF-RA_G4H4

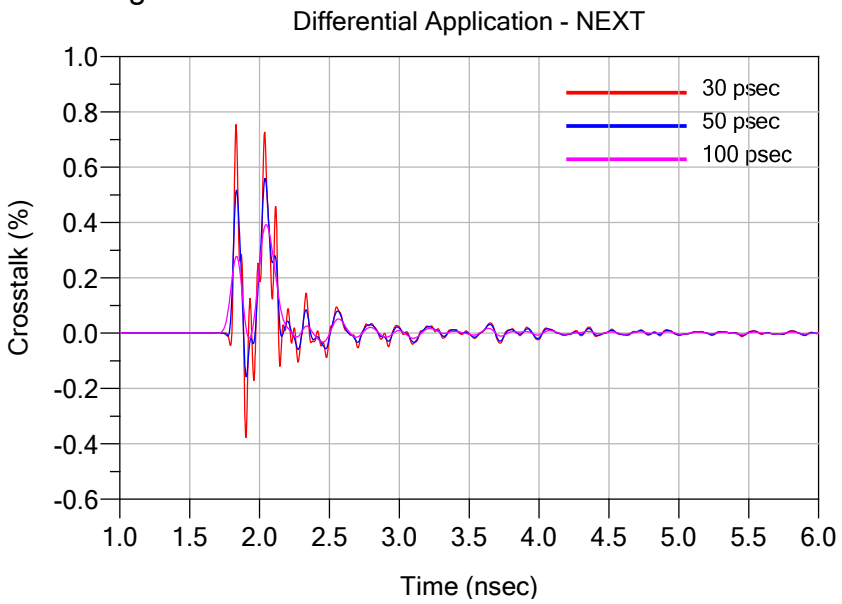
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

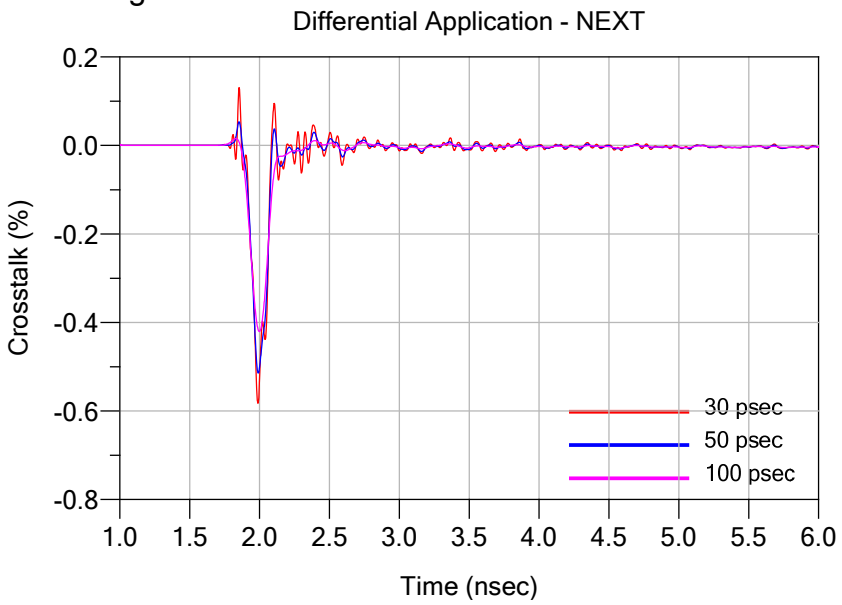
Differential Application – NEXT, HDTF-RA_A4B4_HDTF-RA_A3B3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT, HDTF-RA_A4B4_HDTF-RA_C3D3

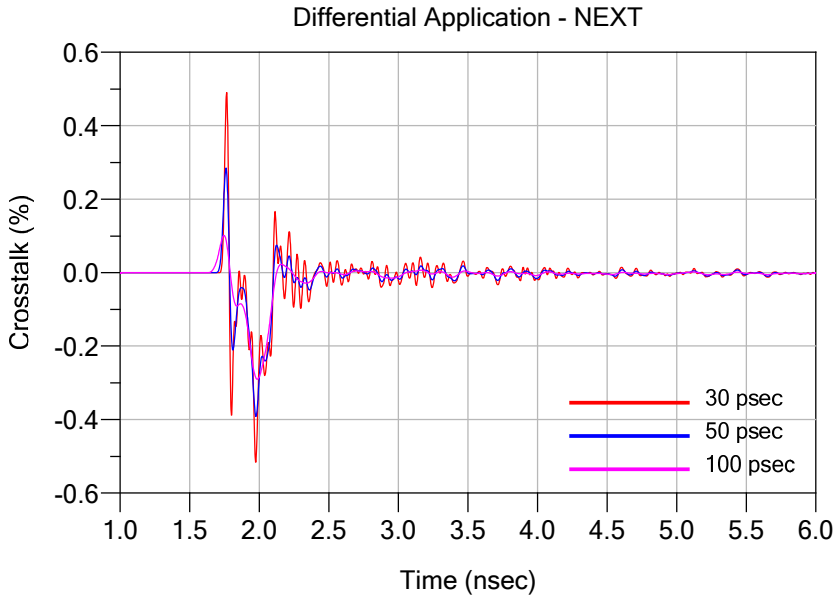
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

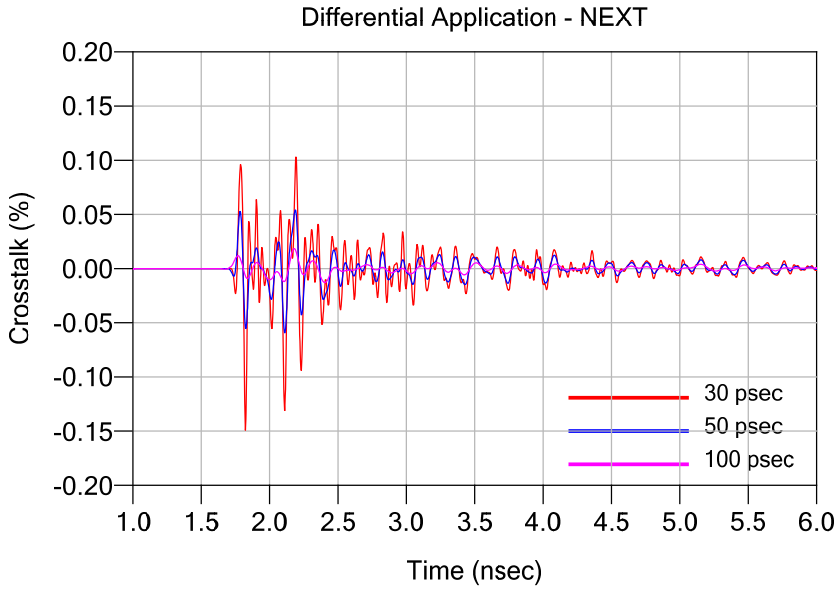
Differential Application – NEXT, HDTF-RA_A4B4_HDTF-RA_C4D4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT, HDTF-RA_A4B4_HDTF-RA_E4F4

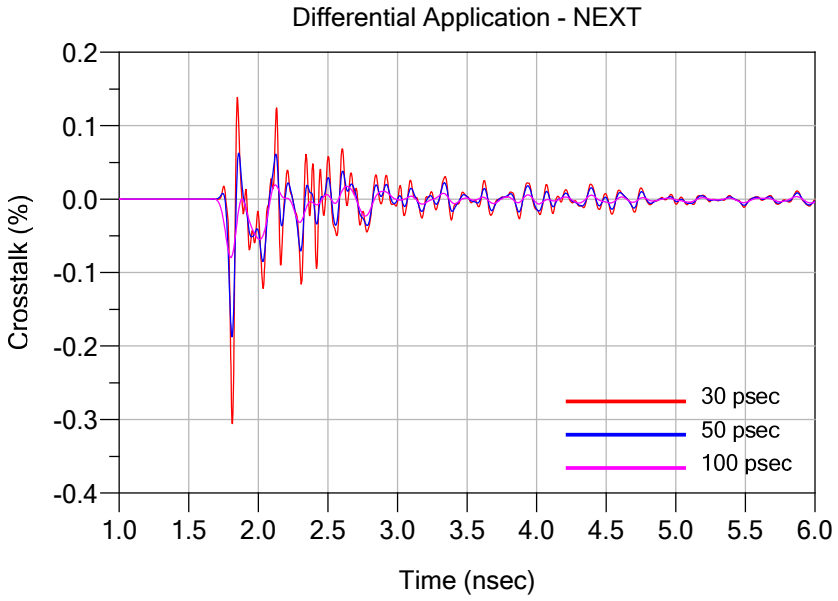
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

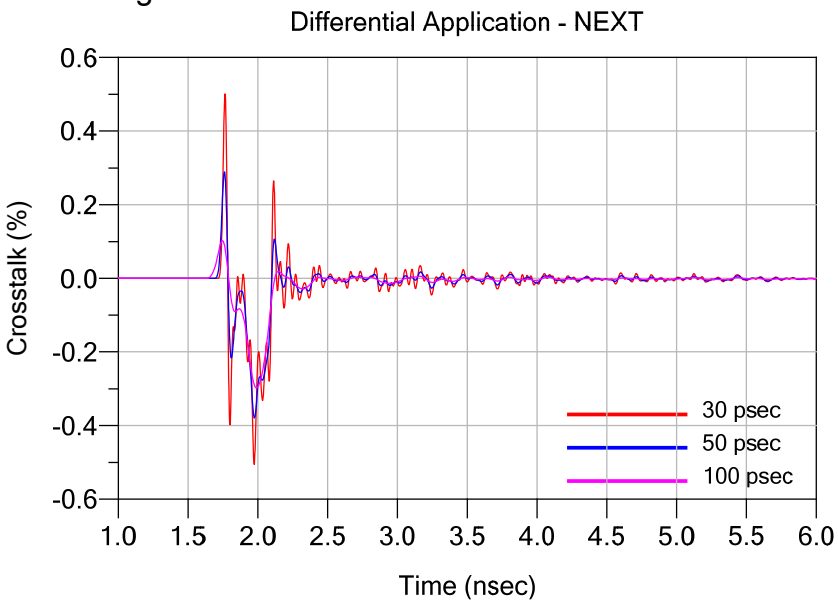
Differential Application – NEXT, HDTF-RA_C4D4_HDTF-RA_A3B3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT, HDTF-RA_C4D4_HDTF-RA_A4B4

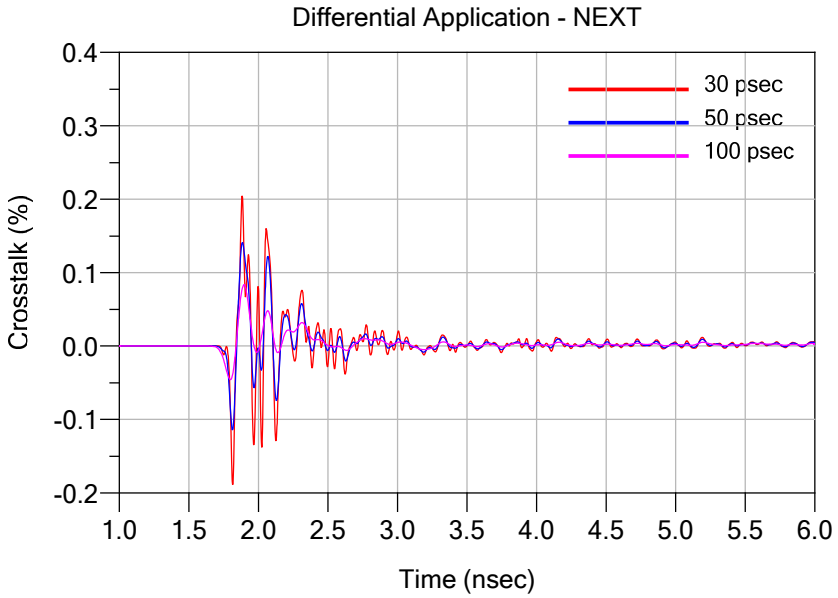
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

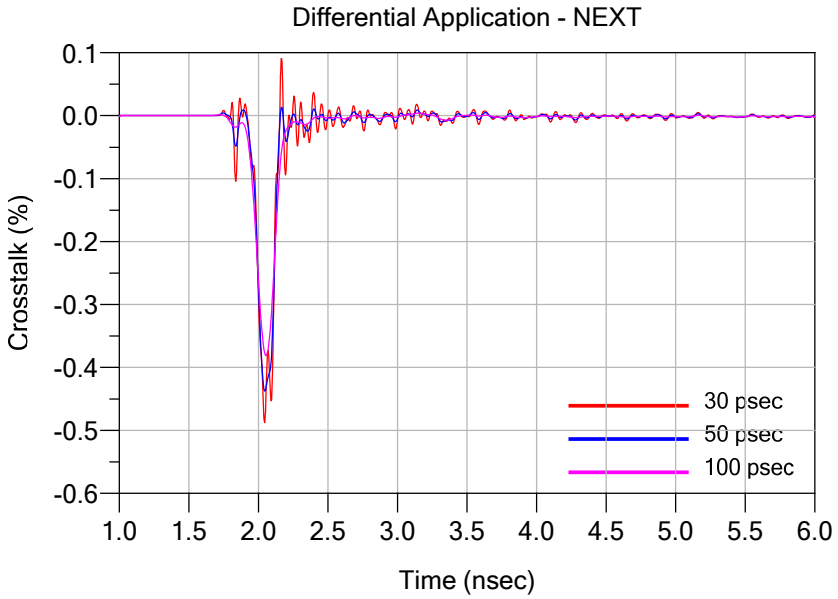
Differential Application – NEXT, HDTF-RA_C4D4_HDTF-RA_C3D3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT, HDTF-RA_C4D4_HDTF-RA_E3F3

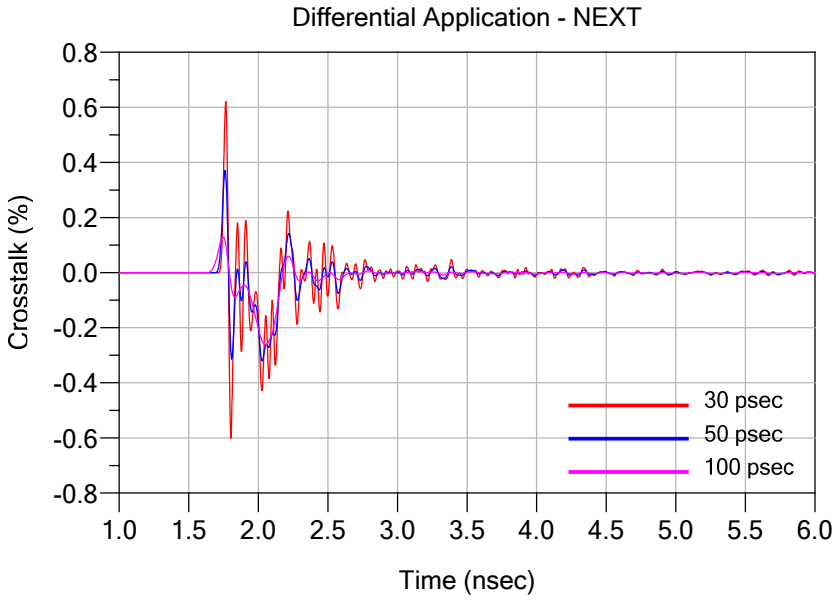
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

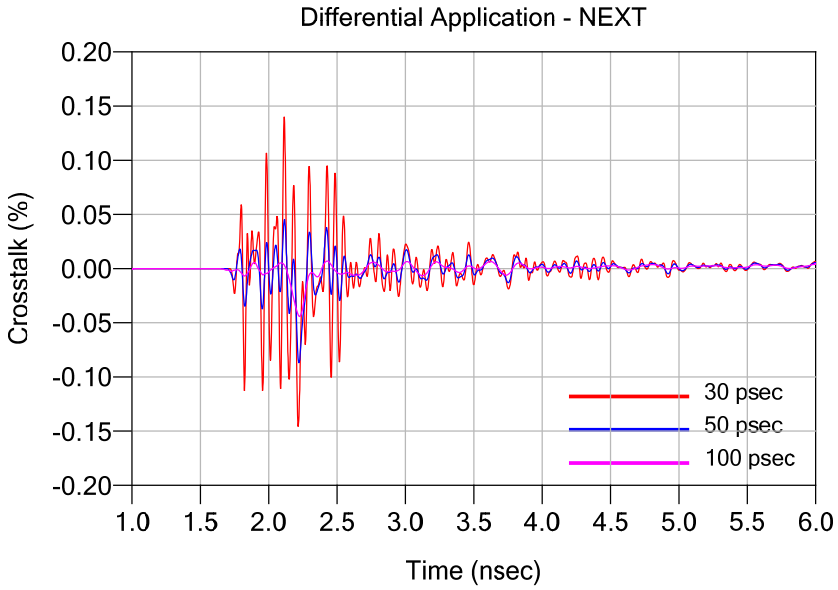
Differential Application – NEXT, HDTF-RA_C4D4_HDTF-RA_E4F4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT, HDTF-RA_C4D4_HDTF-RA_G4H4

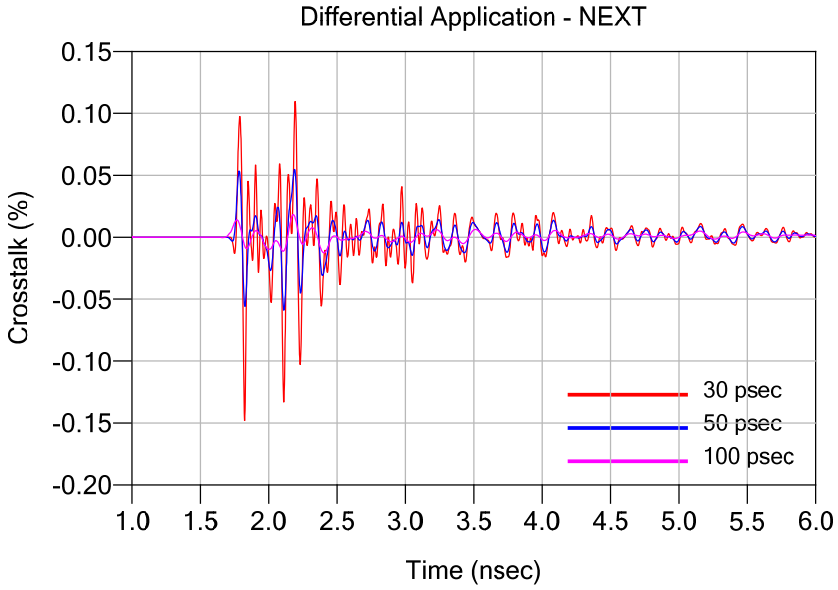
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

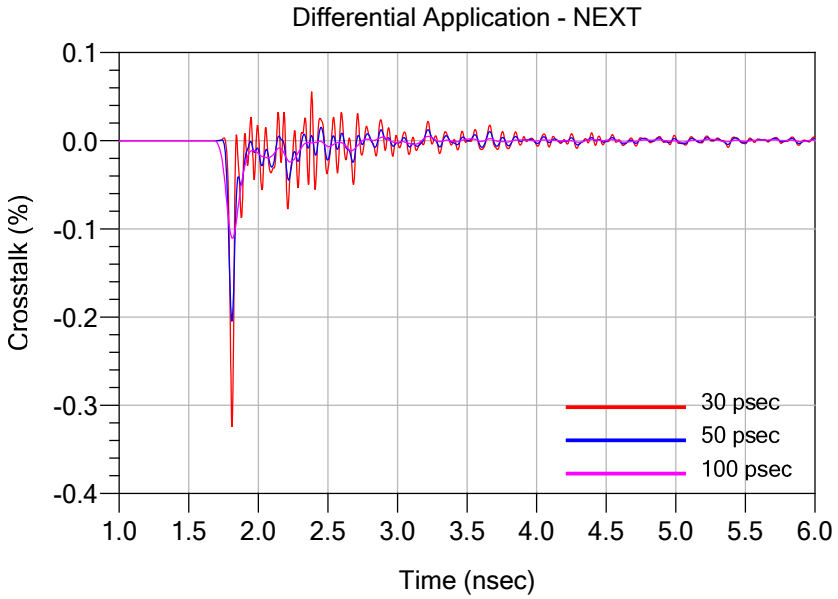
Differential Application – NEXT, HDTF-RA_E4F4_HDTF-RA_A4B4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT, HDTF-RA_E4F4_HDTF-RA_C3D3

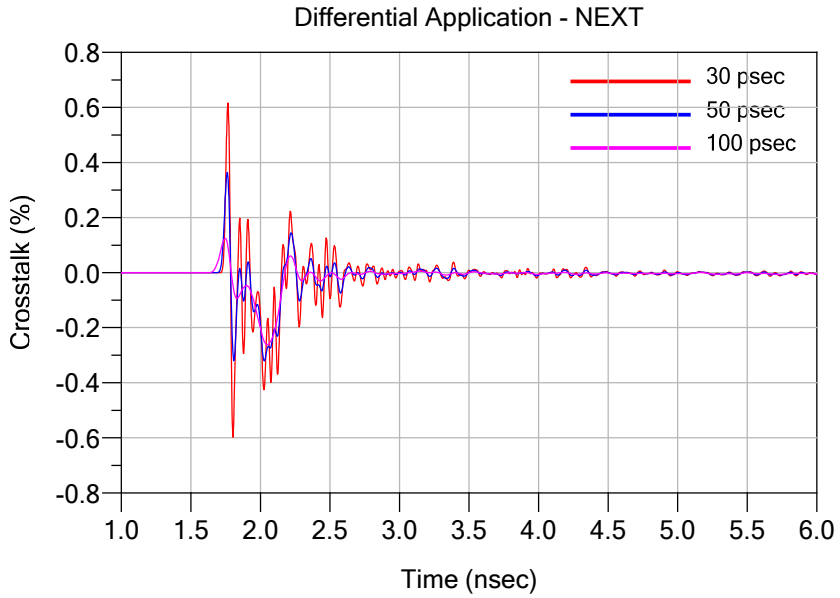
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

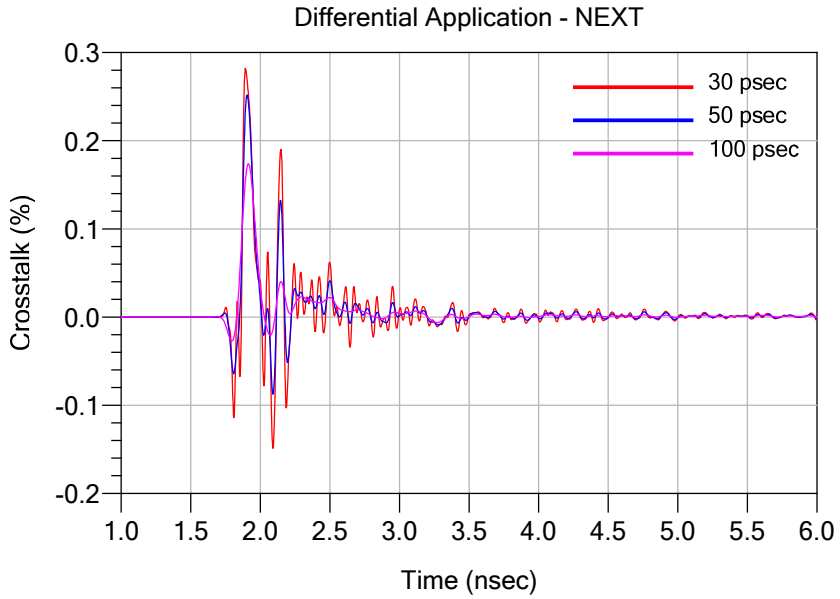
Differential Application – NEXT, HDTF-RA_E4F4_HDTF-RA_C4D4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT, HDTF-RA_E4F4_HDTF-RA_E3F3

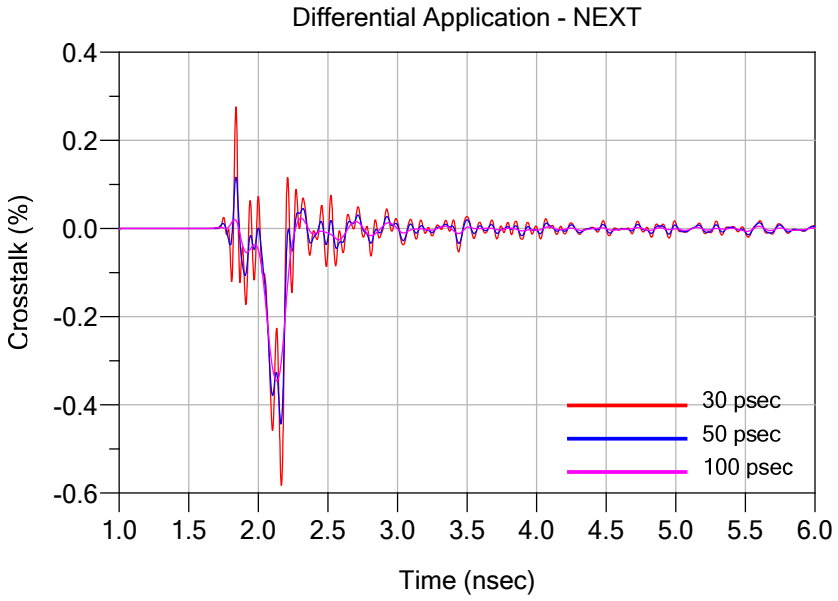
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

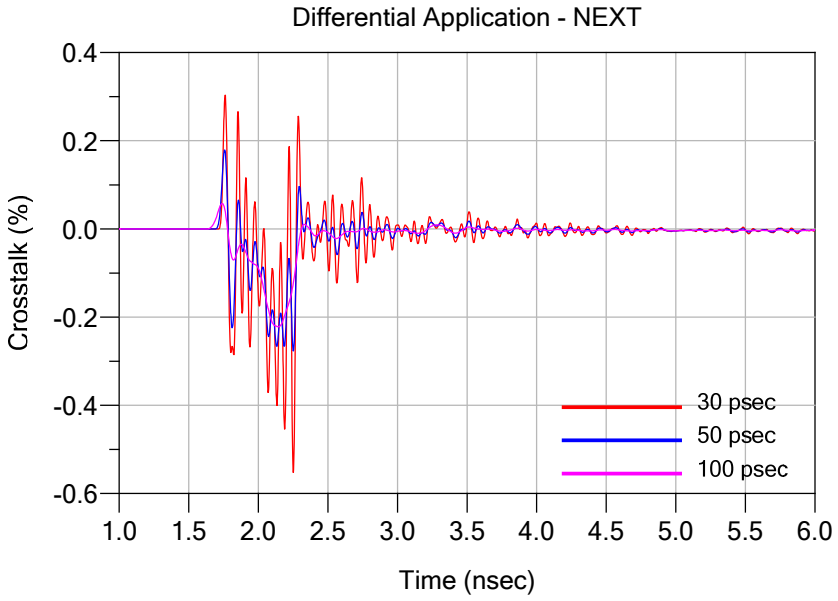
Differential Application – NEXT, HDTF-RA_E4F4_HDTF-RA_G3H3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT, HDTF-RA_E4F4_HDTF-RA_G4H4

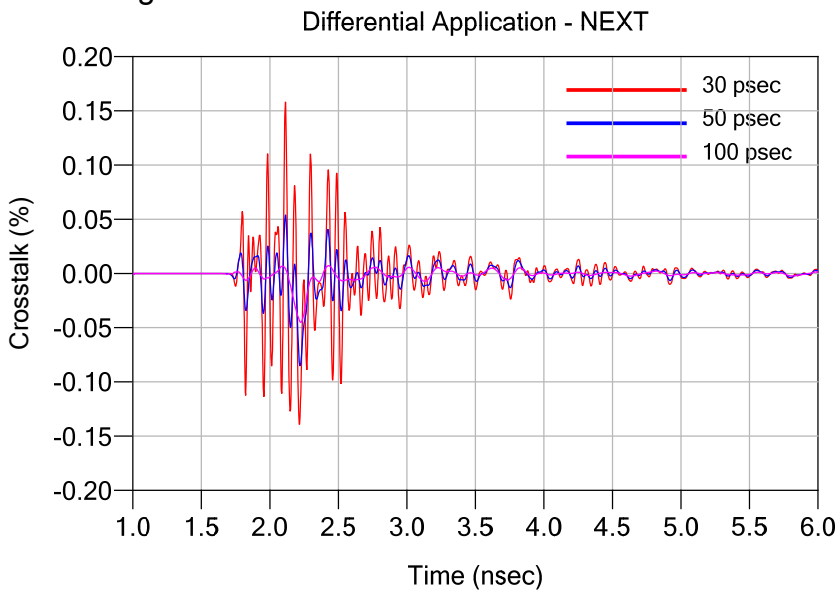
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

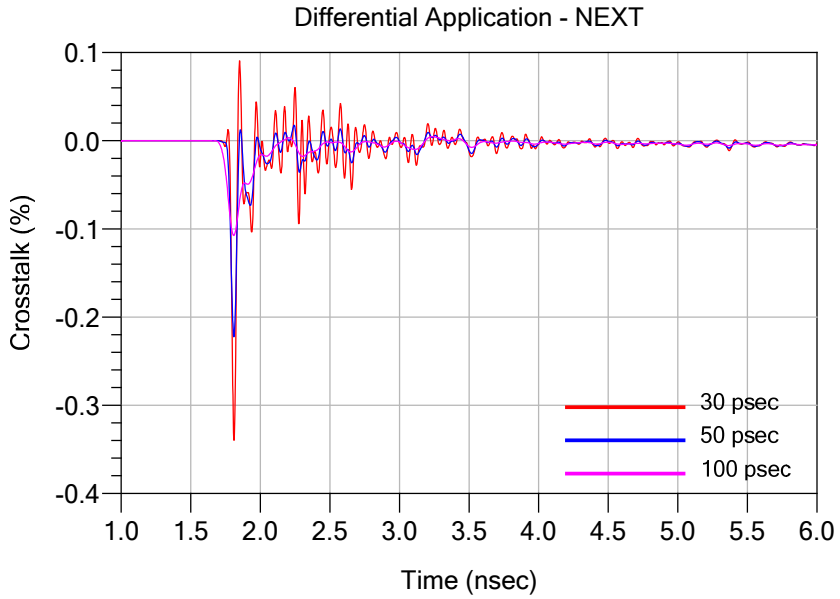
Differential Application – NEXT, HDTF-RA_G4H4_HDTF-RA_C4D4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT, HDTF-RA_G4H4_HDTF-RA_E3F3

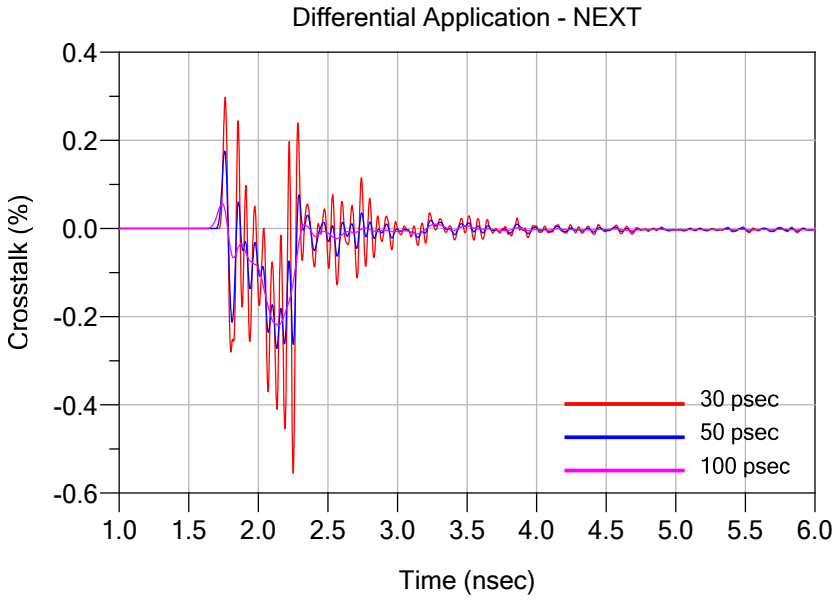
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

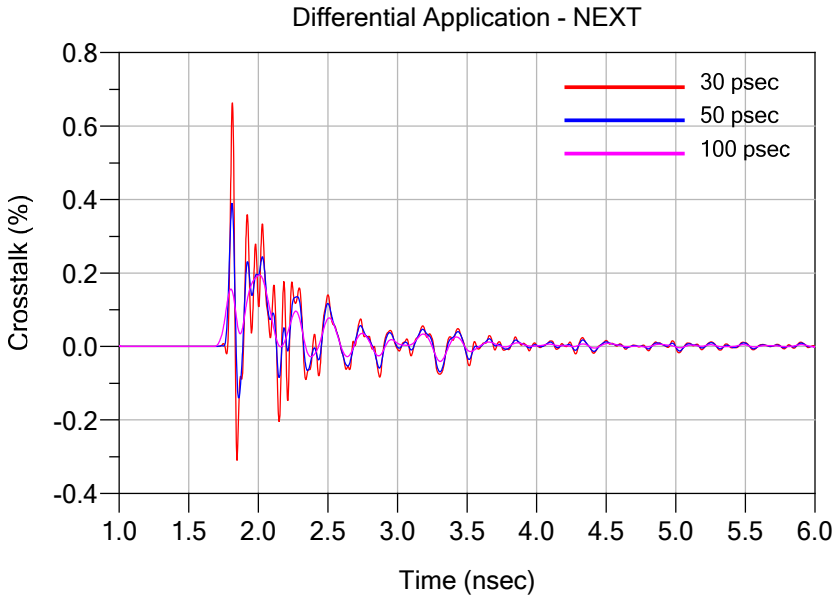
Differential Application – NEXT, HDTF-RA_G4H4_HDTF-RA_E4F4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – NEXT, HDTF-RA_G4H4_HDTF-RA_G3H3

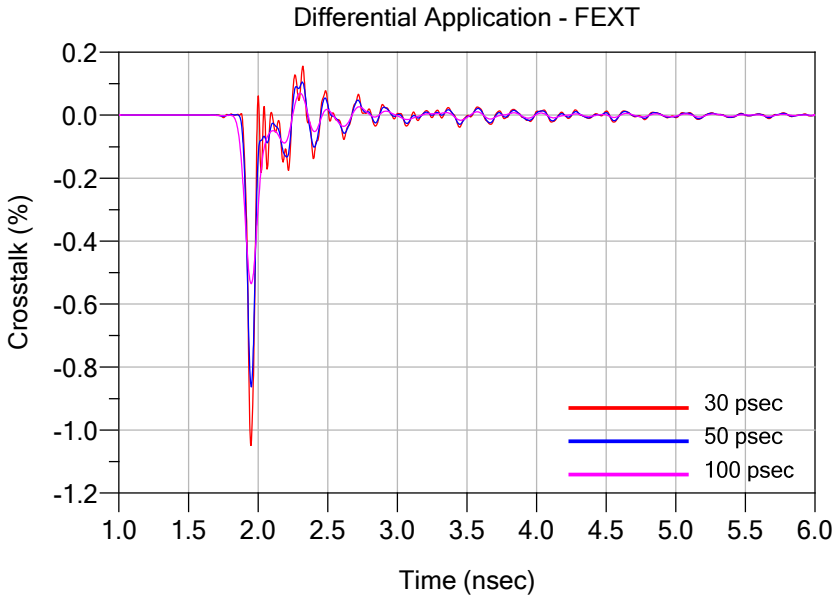
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

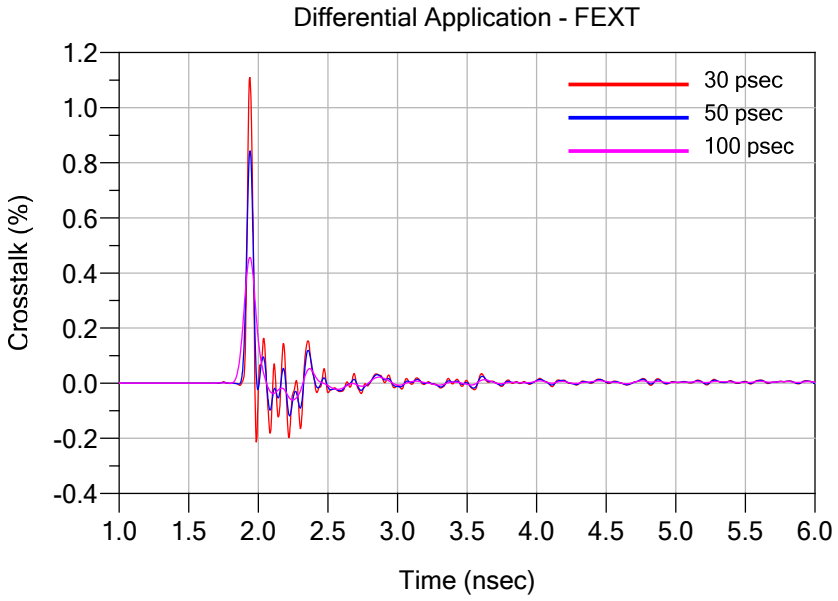
Differential Application – FEXT, HDTF-RA_A3B3_HDTM_A4B4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – FEXT, HDTF-RA_A3B3_HDTM_C3D3

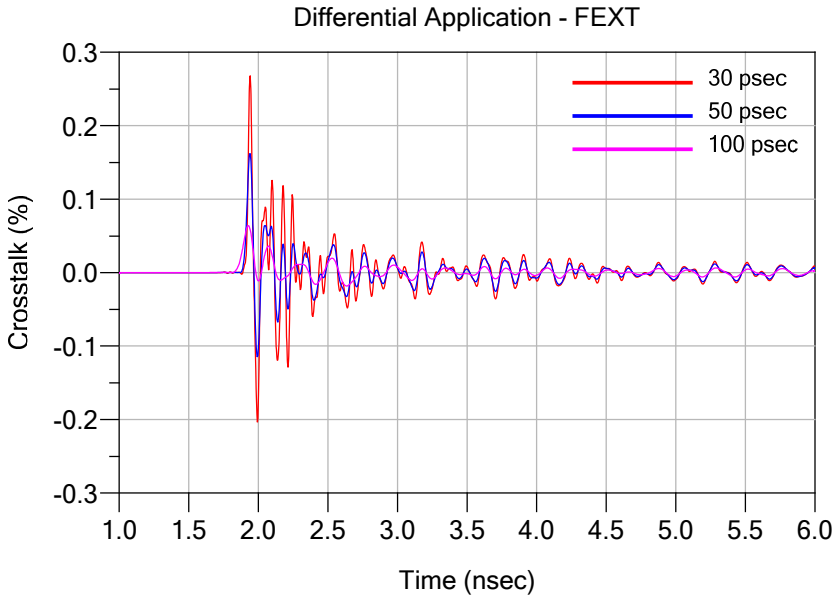
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

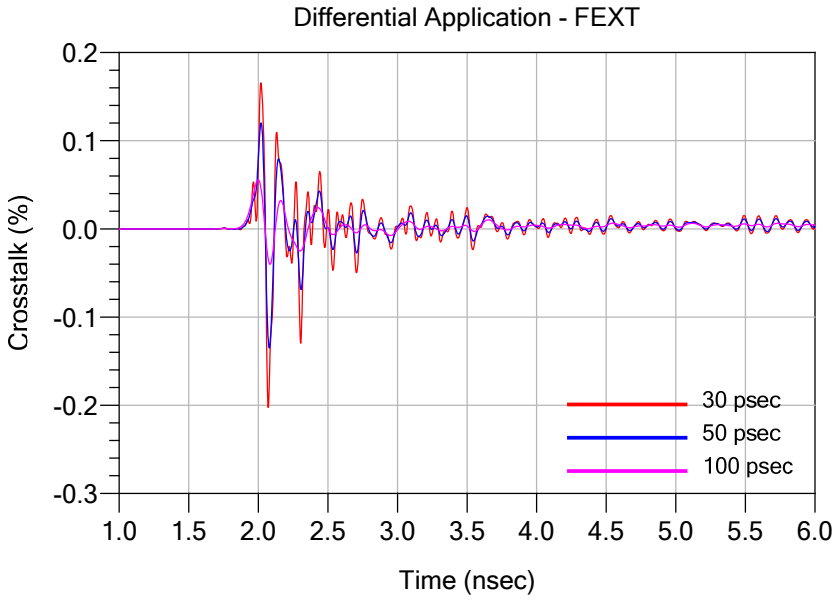
Differential Application – FEXT, HDTF-RA_A3B3_HDTM_C4D4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – FEXT, HDTF-RA_A3B3_HDTM_E3F3

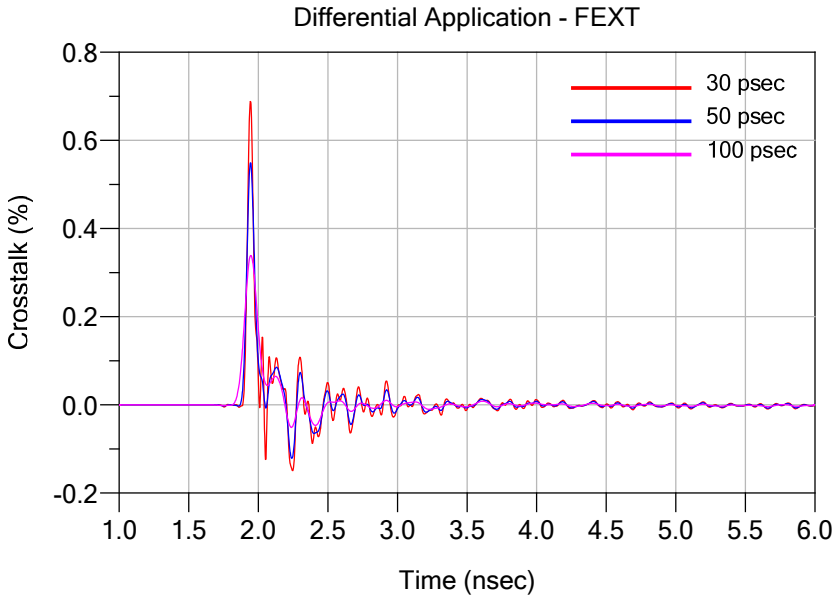
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Differential Application – FEXT, HDTF-RA_C3D3_HDTM_A3B3

Samtec HDTF-RA mating to Samtec HDTM



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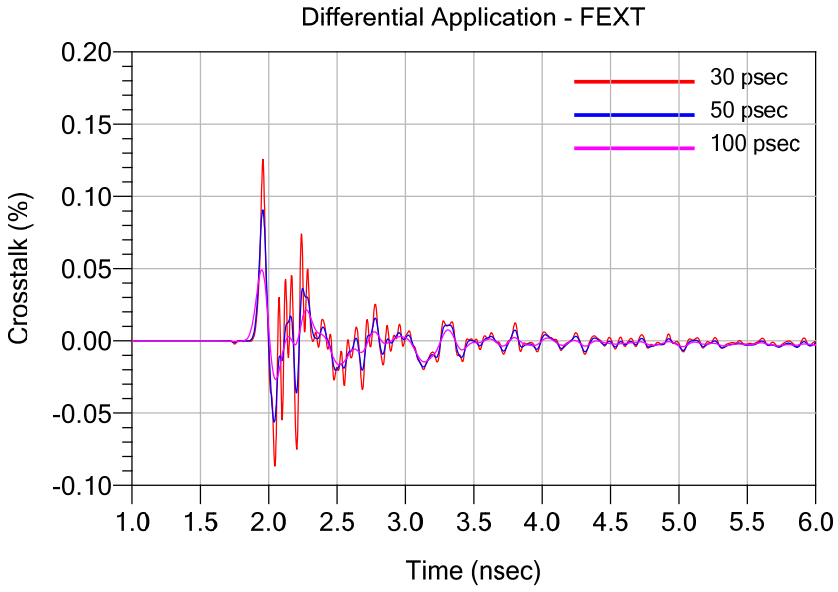
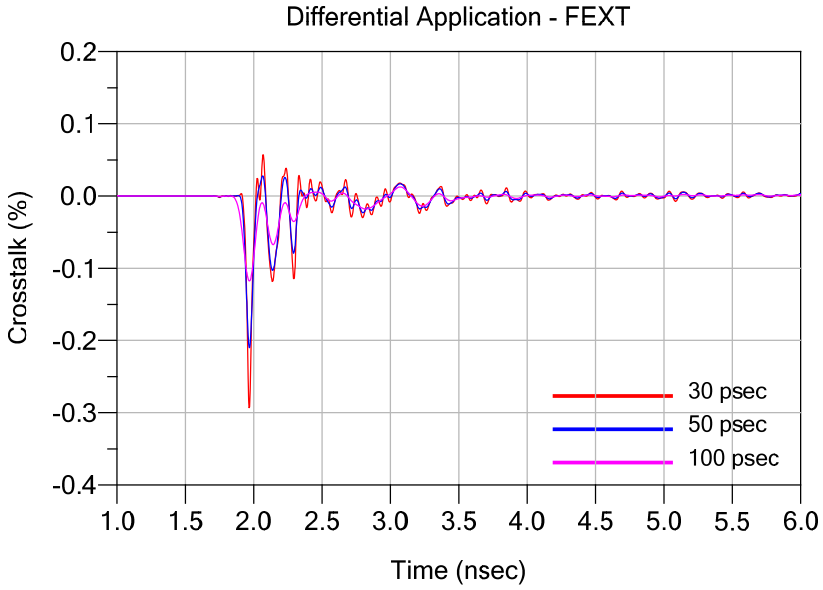
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

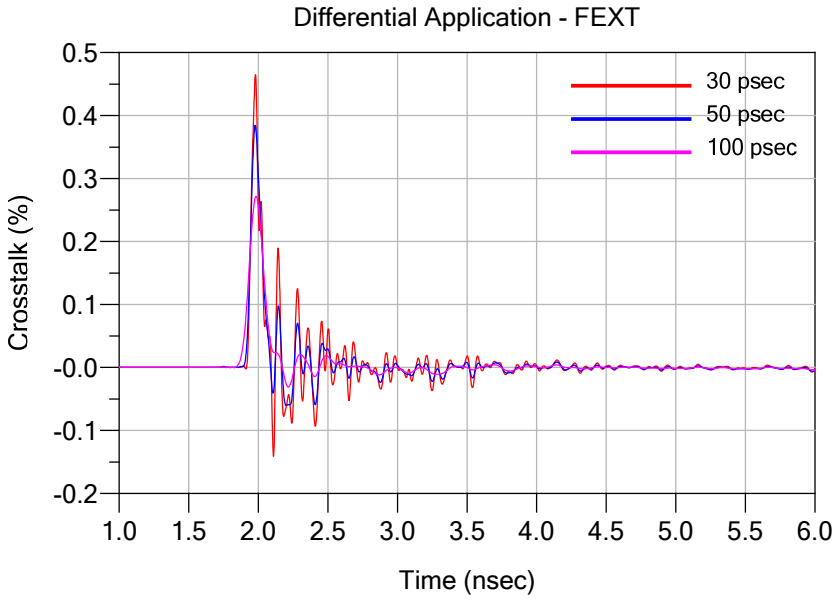
Differential Application – FEXT, HDTF-RA_C3D3_HDTM_C4D4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – FEXT, HDTF-RA_C3D3_HDTM_E3F3

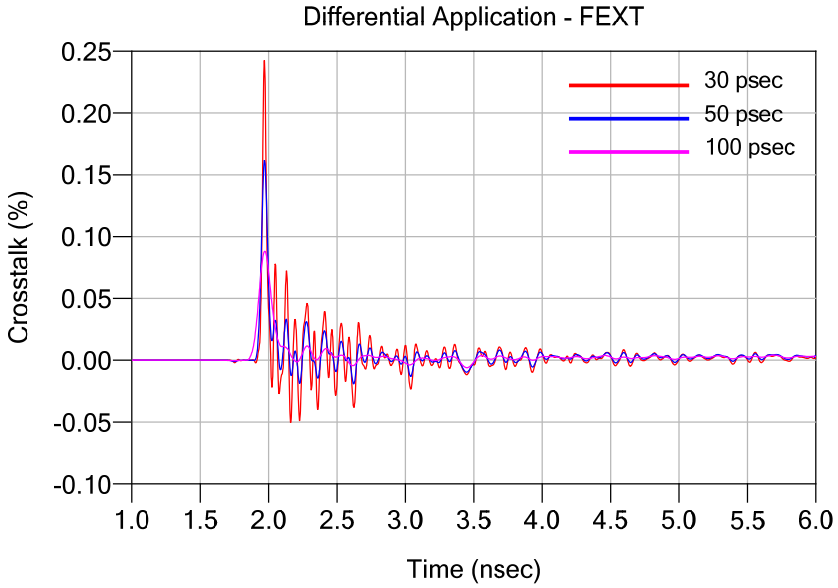
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

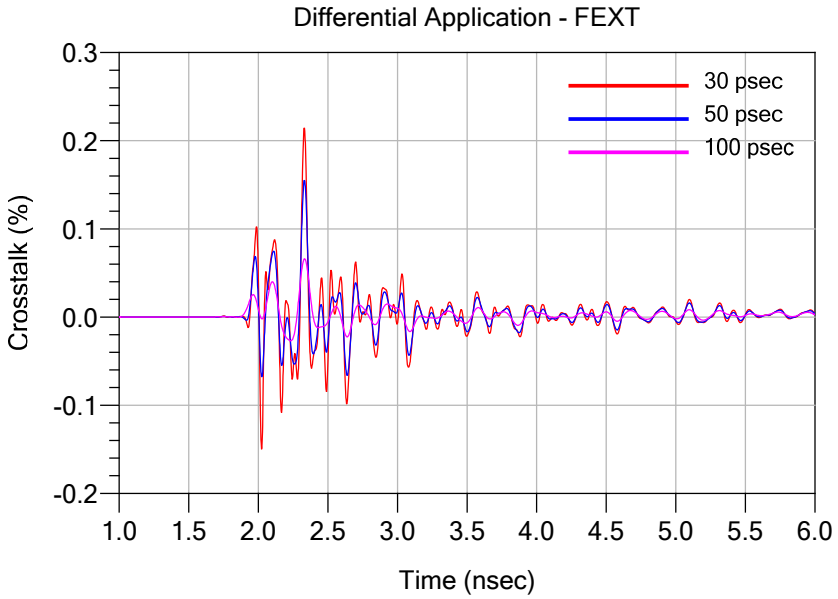
Differential Application – FEXT, HDTF-RA_C3D3_HDTM_E4F4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – FEXT, HDTF-RA_C3D3_HDTM_G3H3

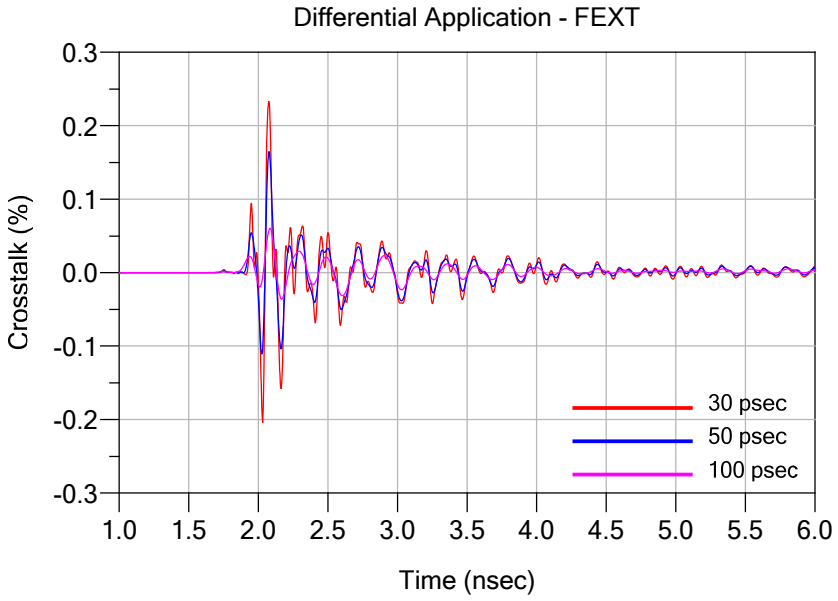
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

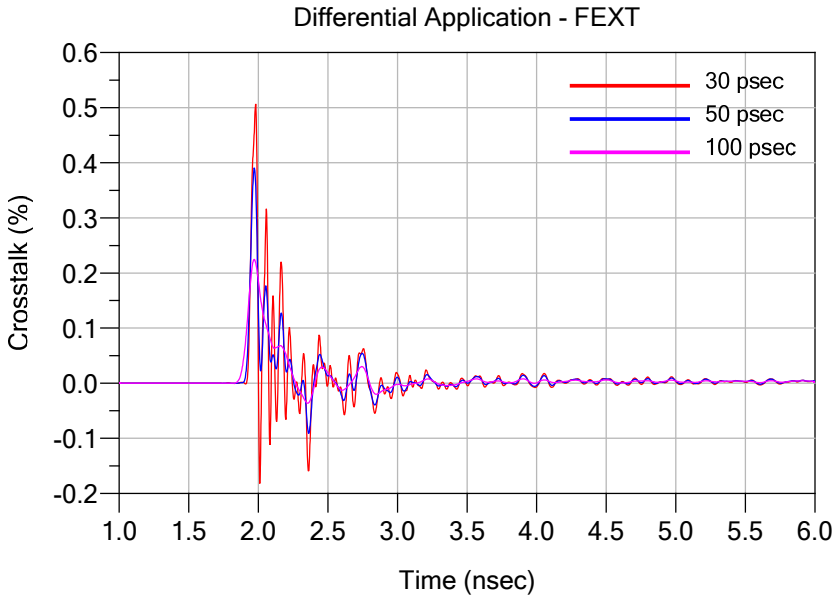
Differential Application – FEXT, HDTF-RA_E3F3_HDTM_A3B3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – FEXT, HDTF-RA_E3F3_HDTM_C3D3

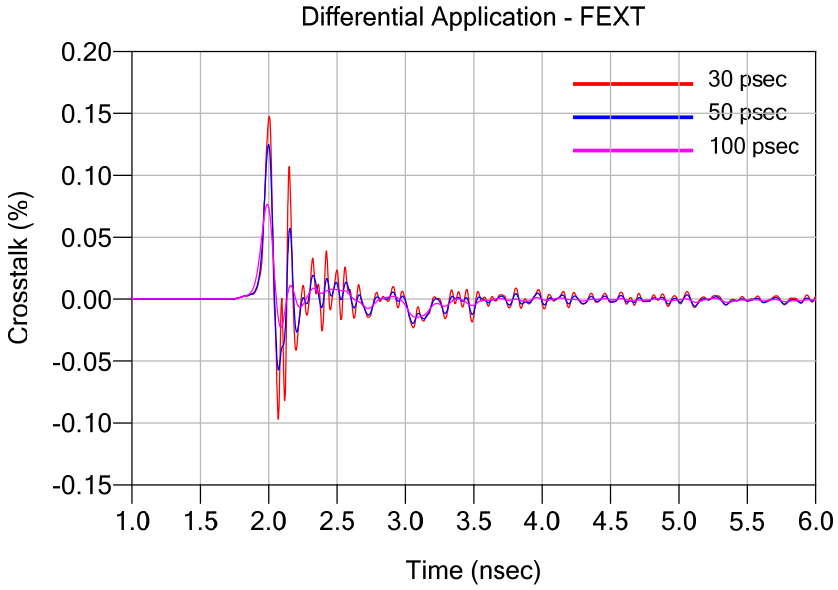
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

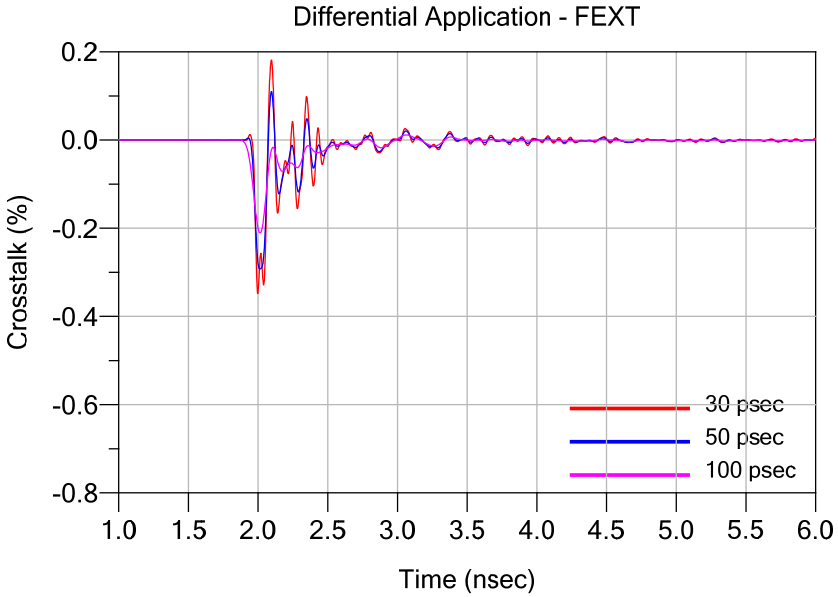
Differential Application – FEXT, HDTF-RA_E3F3_HDTM_C4D4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – FEXT, HDTF-RA_E3F3_HDTM_E4F4

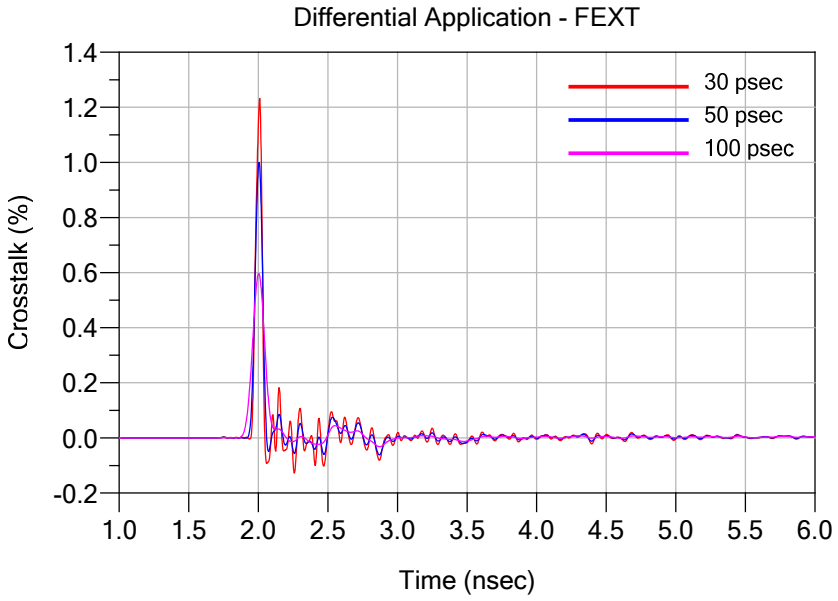
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

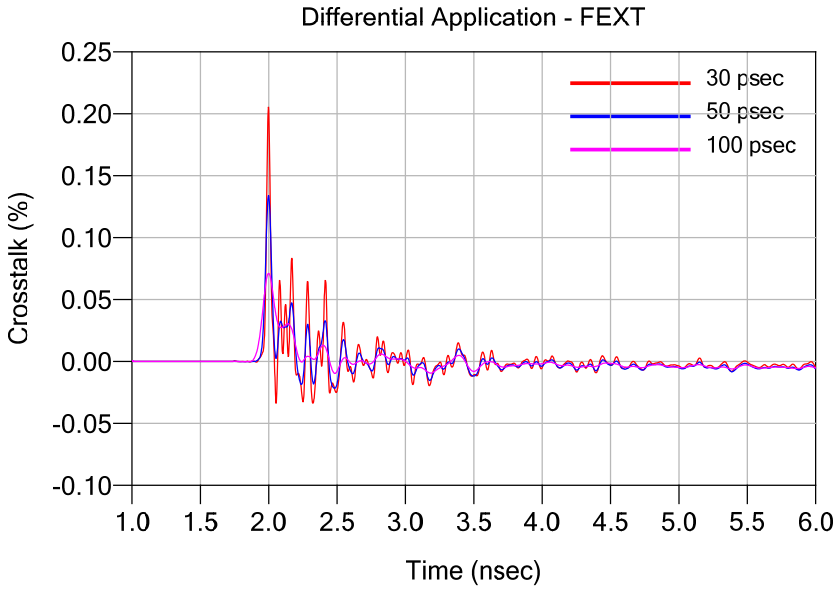
Differential Application – FEXT, HDTF-RA_E3F3_HDTM_G3H3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – FEXT, HDTF-RA_E3F3_HDTM_G4H4

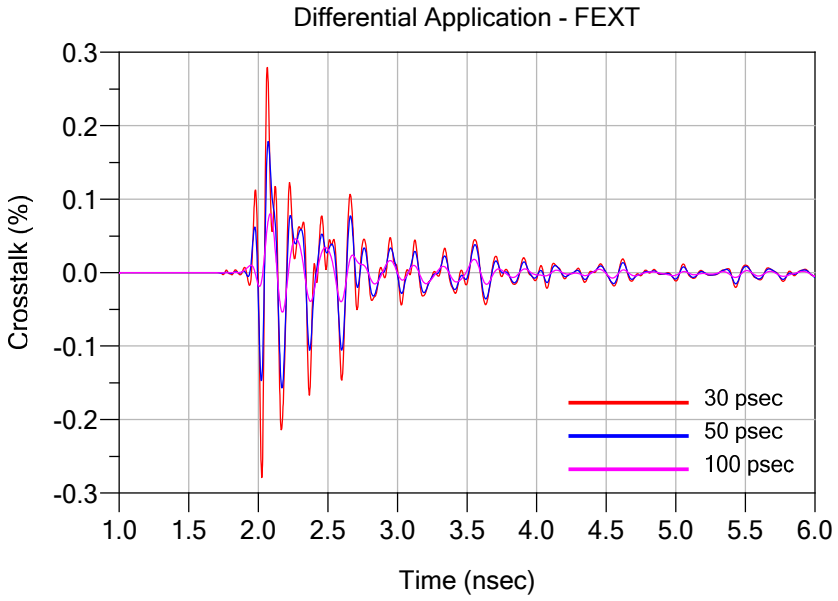
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

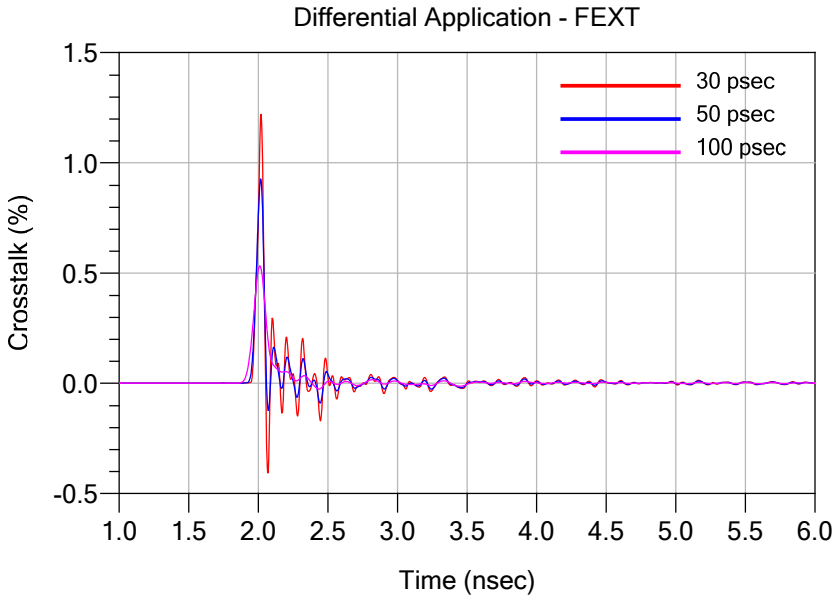
Differential Application – FEXT, HDTF-RA_G3H3_HDTM_C3D3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – FEXT, HDTF-RA_G3H3_HDTM_E3F3

Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Differential Application – FEXT, HDTF-RA_G3H3_HDTM_E4F4

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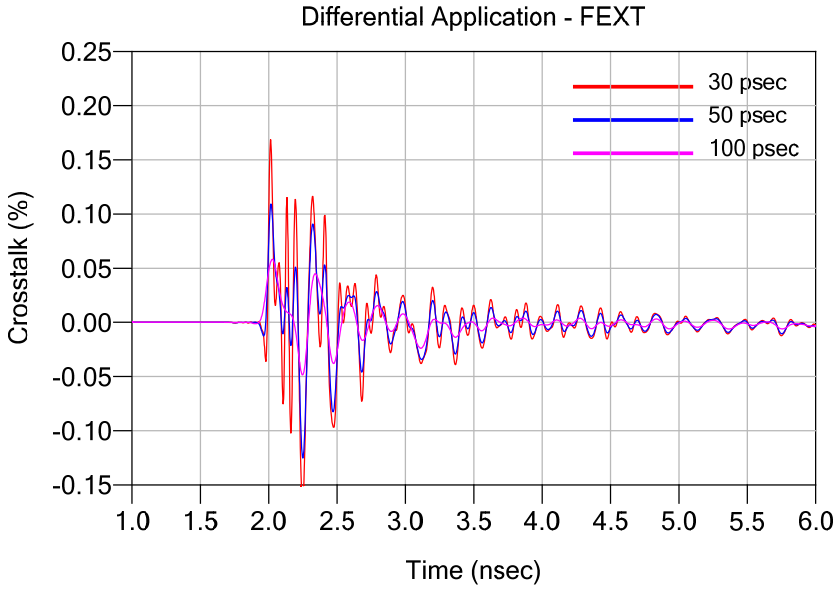
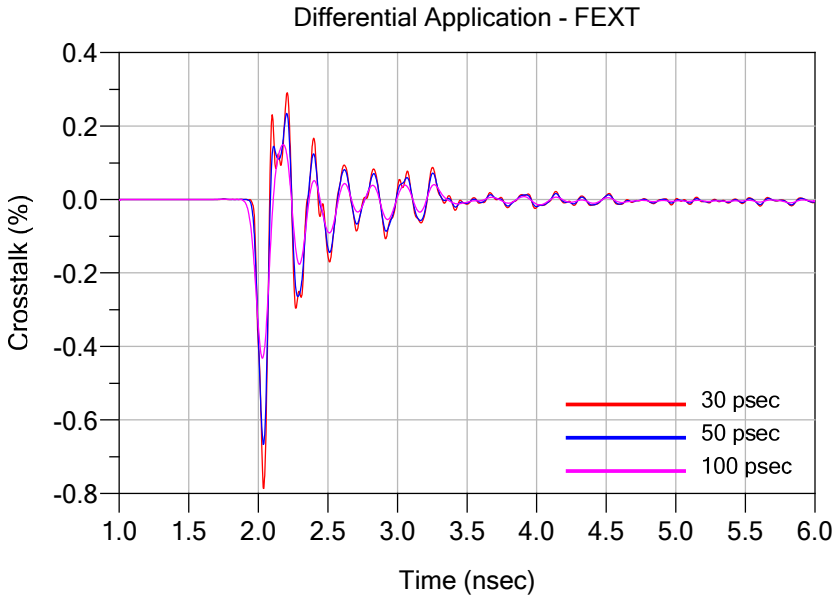


Differential Application – FEXT, HDTF-RA_G3H3_HDTM_G4H4

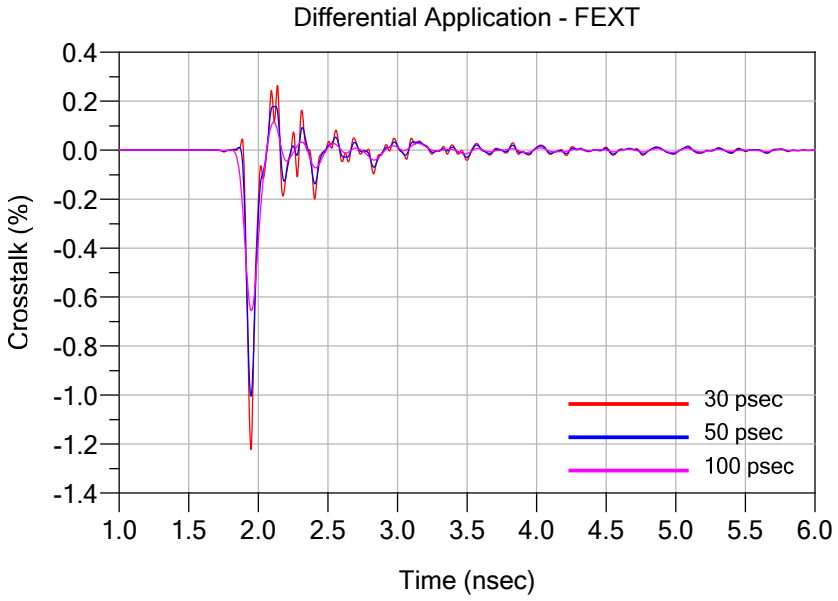
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

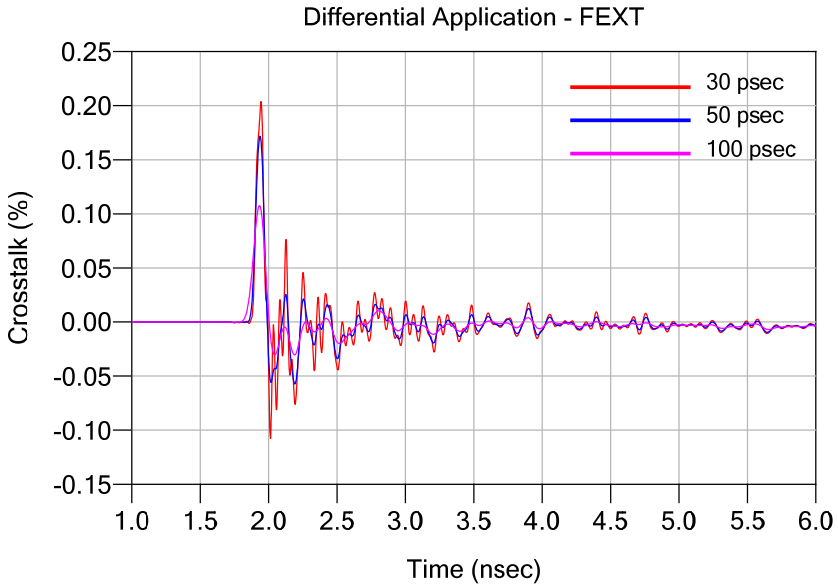
Differential Application – FEXT, HDTF-RA_A4B4_HDTM_A3B3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – FEXT, HDTF-RA_A4B4_HDTM_C3D3

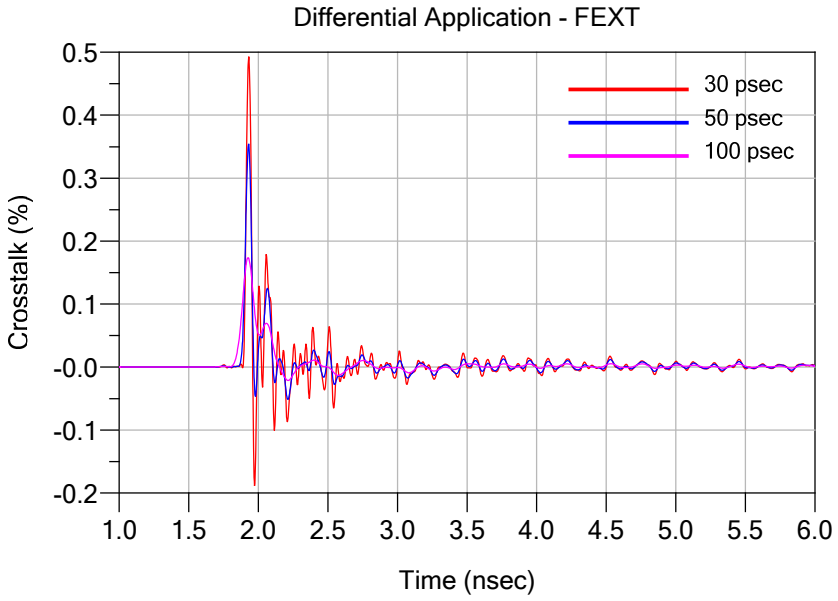
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

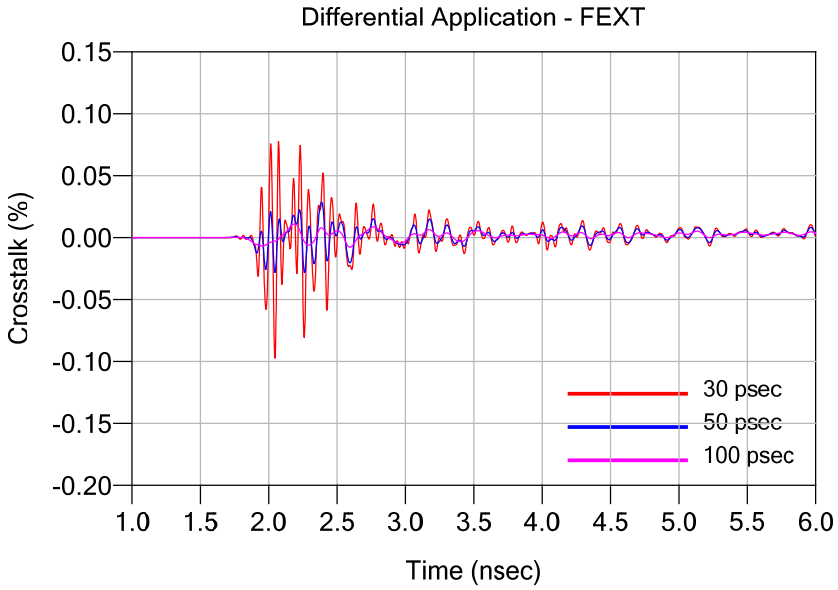
Differential Application – FEXT, HDTF-RA_A4B4_HDTM_C4D4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – FEXT, HDTF-RA_A4B4_HDTM_E4F4

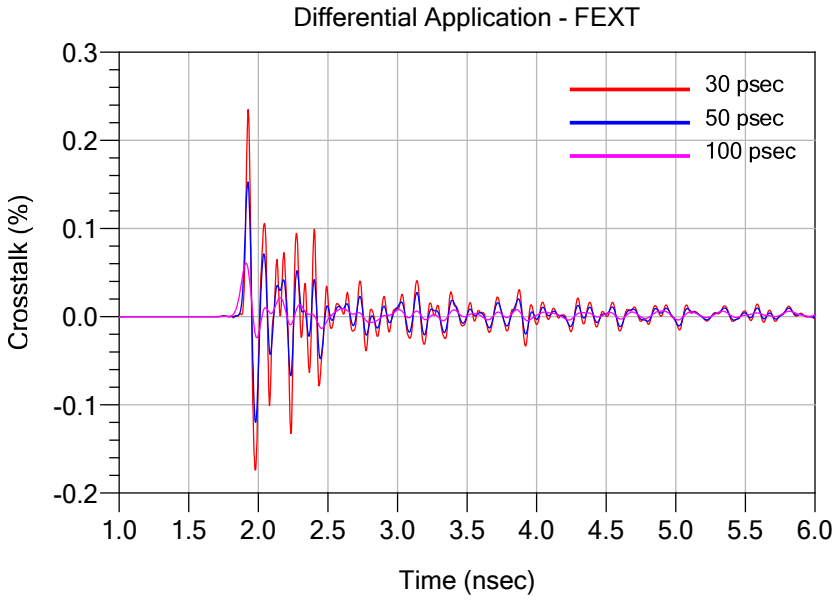
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

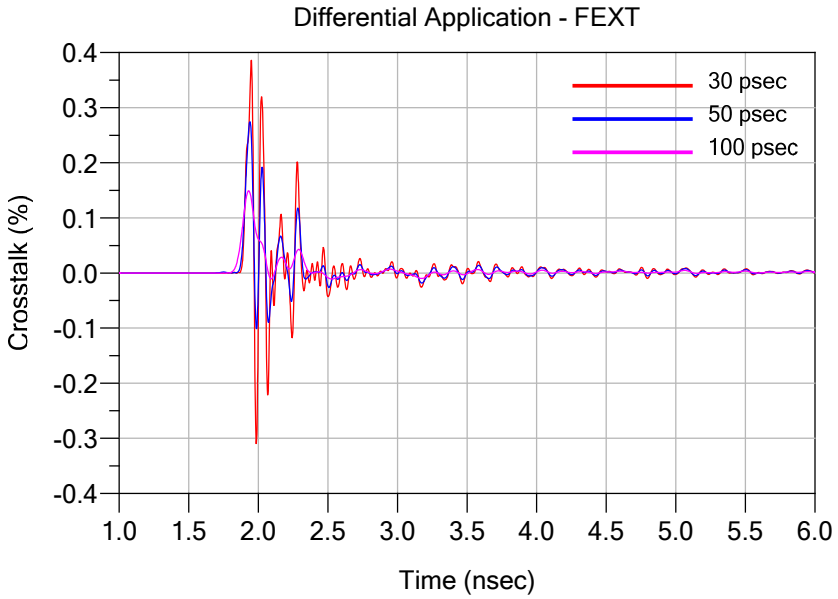
Differential Application – FEXT, HDTF-RA_C4D4_HDTM_A3B3

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – FEXT, HDTF-RA_C4D4_HDTM_A4B4

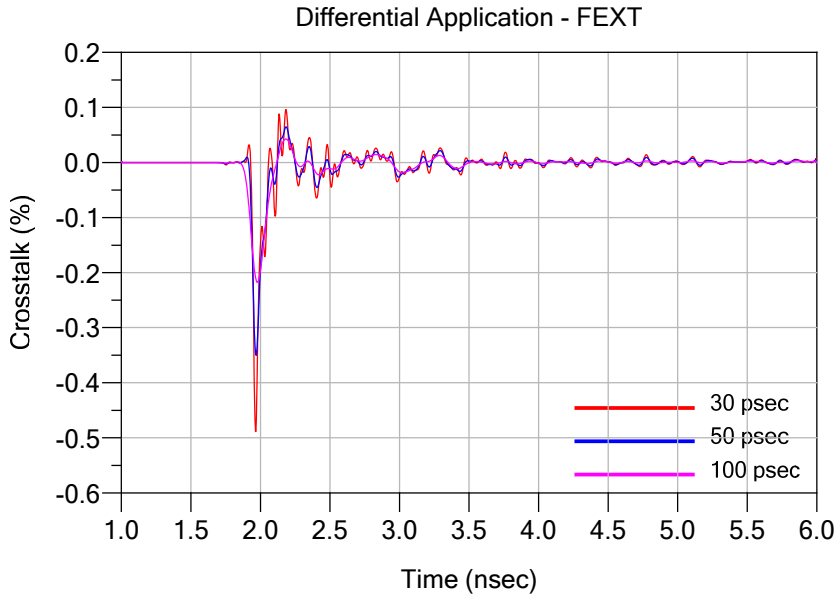
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Differential Application – FEXT, HDTF-RA_C4D4_HDTM_C3D3

Samtec HDTF-RA mating to Samtec HDTM



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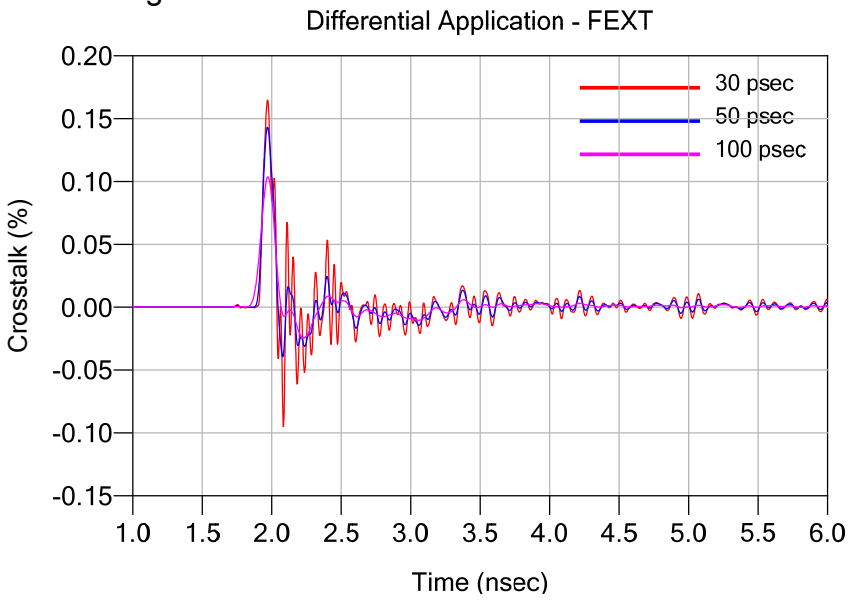

Series: HDTM / HDTF-RA
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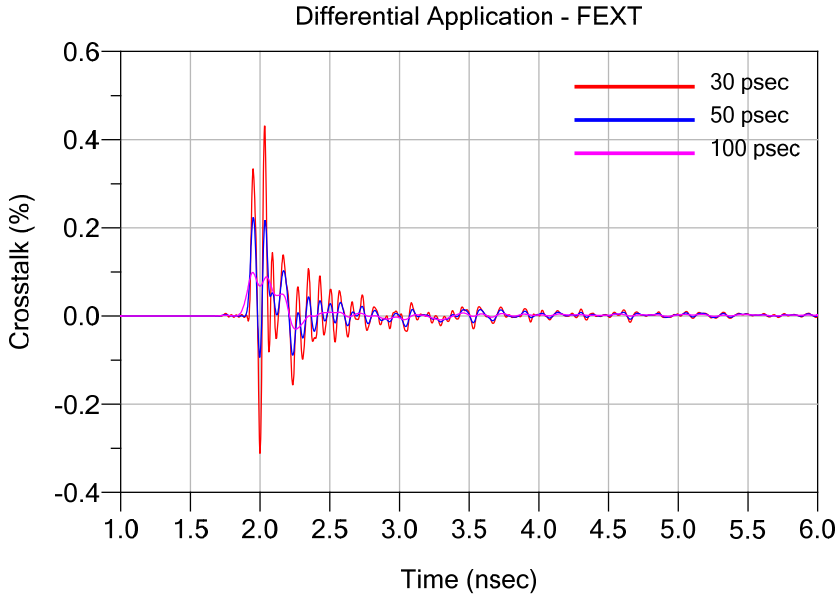
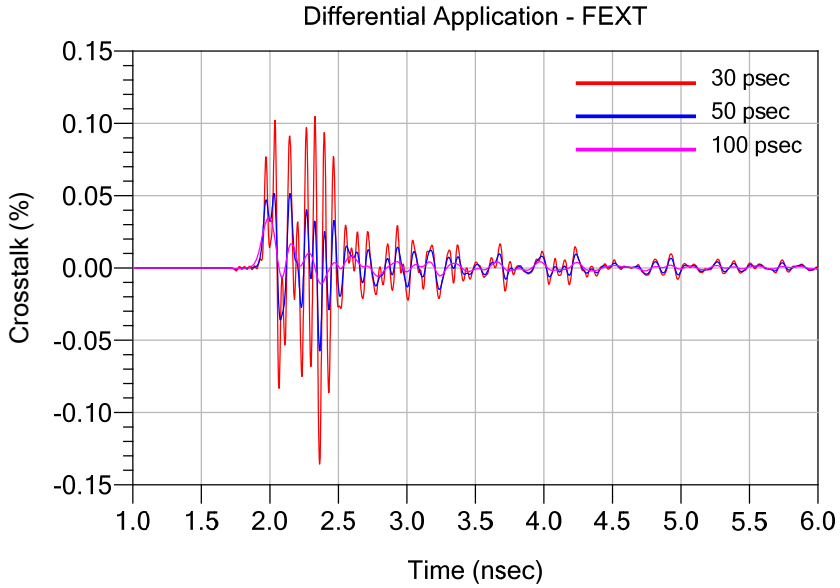


Differential Application – FEXT, HDTF-RA_C4D4_HDTM_G4H4

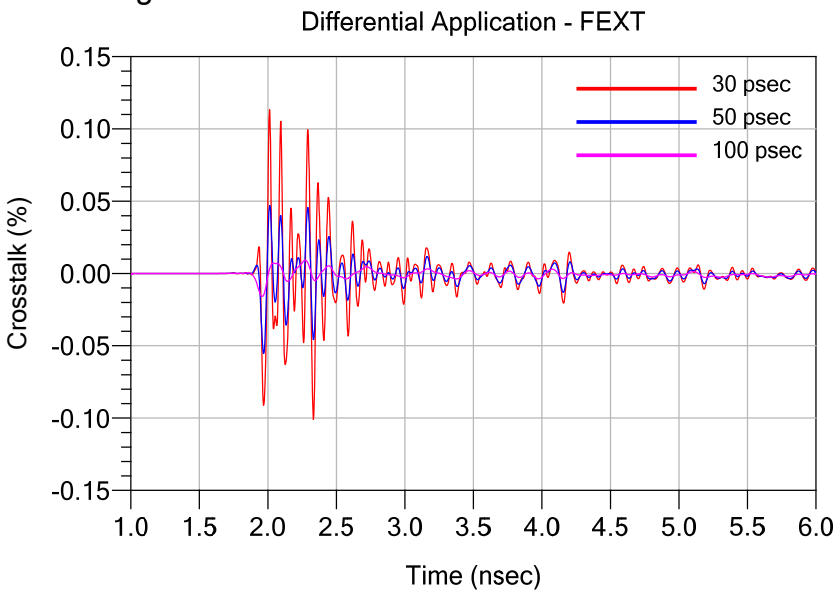
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Differential Application – FEXT, HDTF-RA_E4F4_HDTM_A4B4

Samtec HDTF-RA mating to Samtec HDTM



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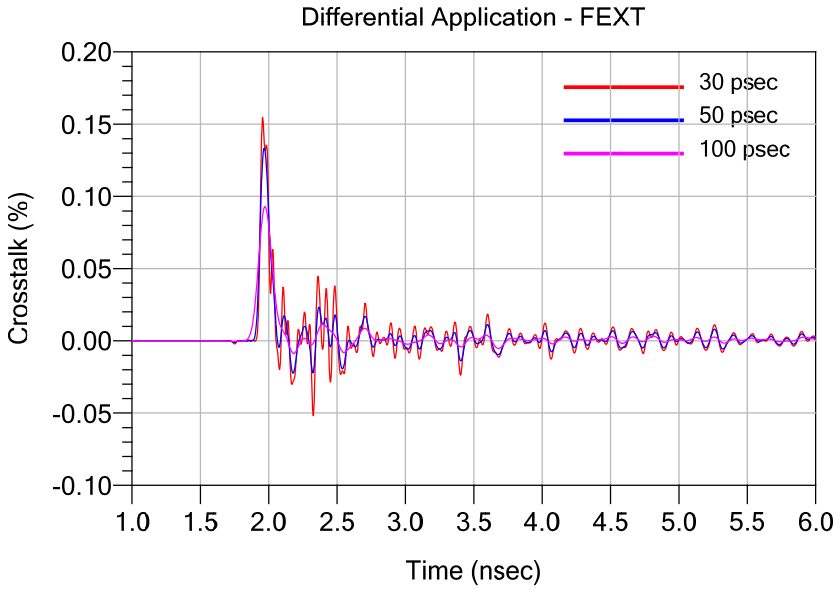

Series: HDTM / HDTF-RA
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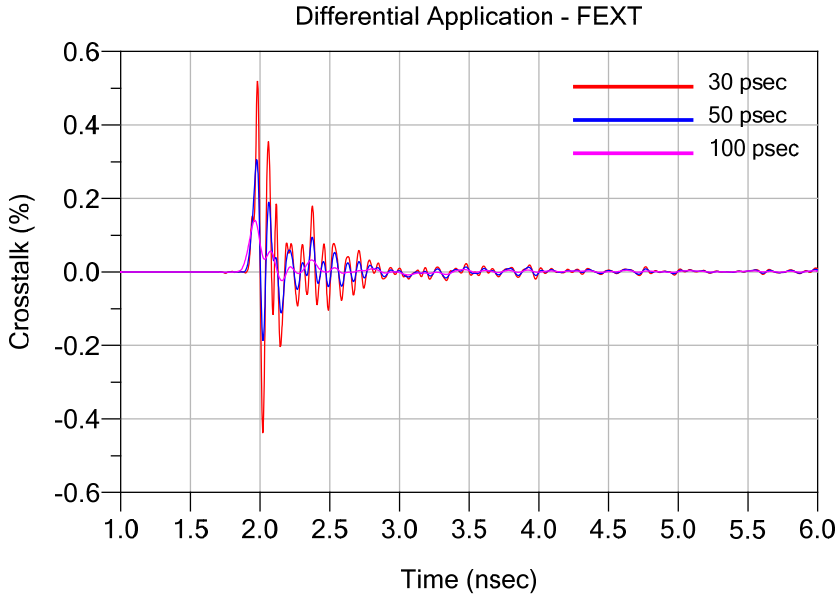

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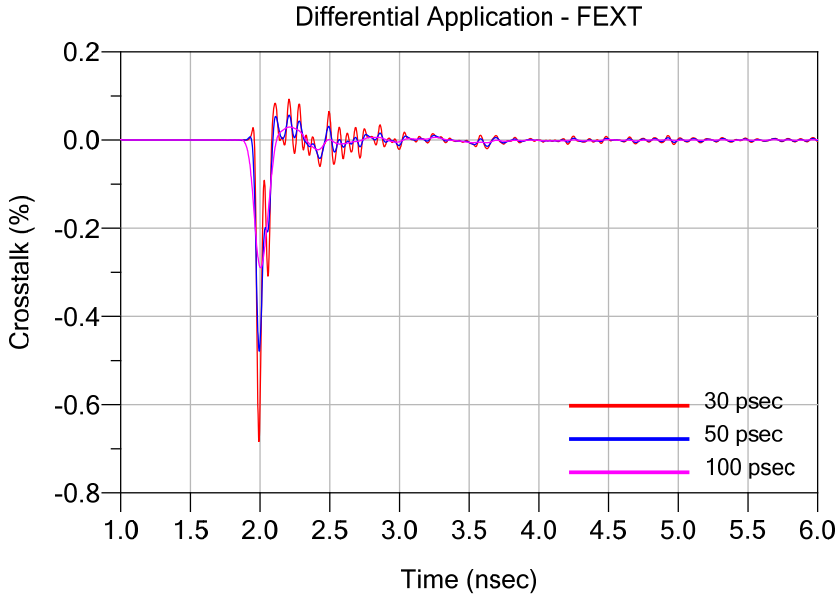

Series: HDTM / HDTF-RA
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Differential Application – FEXT, HDTF-RA_E4F4_HDTM_G3H3

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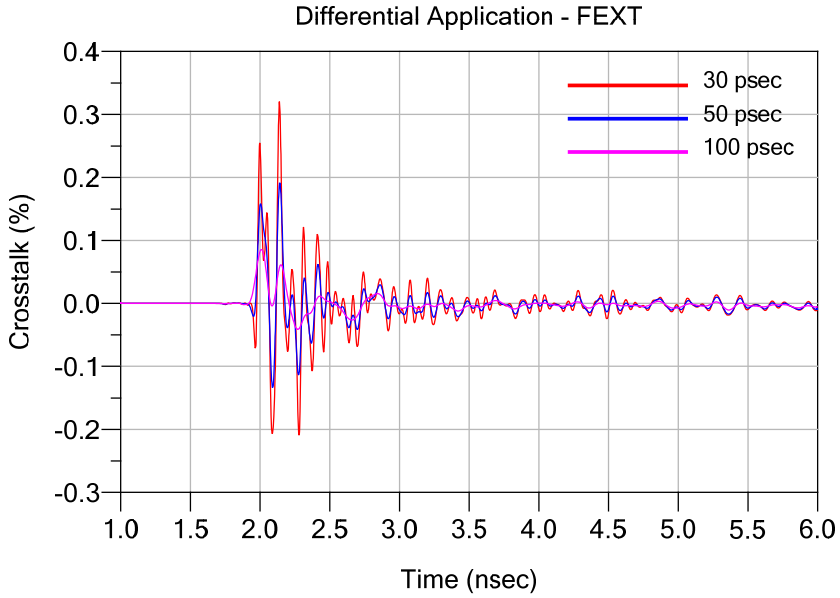
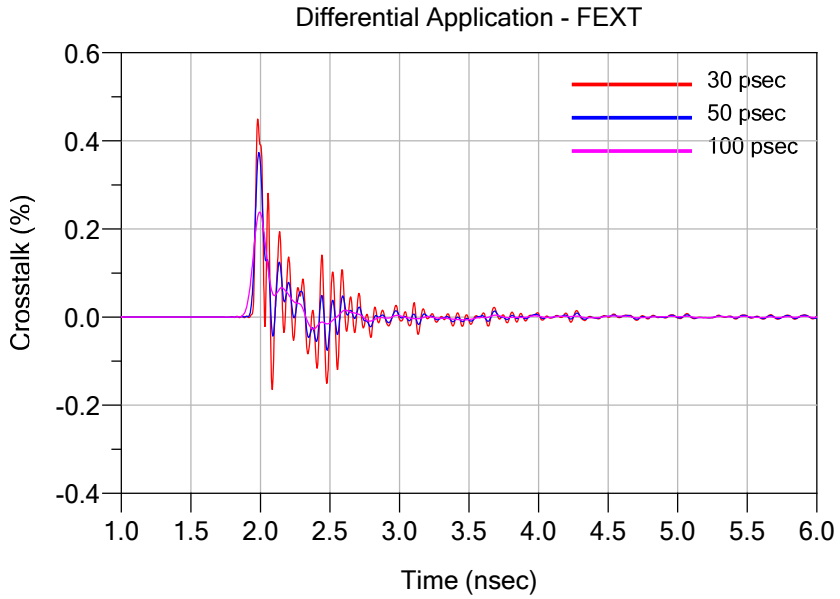


Differential Application – FEXT, HDTF-RA_E4F4_HDTM_G4H4

Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
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Differential Application – FEXT, HDTF-RA_G4H4_HDTM_C4D4

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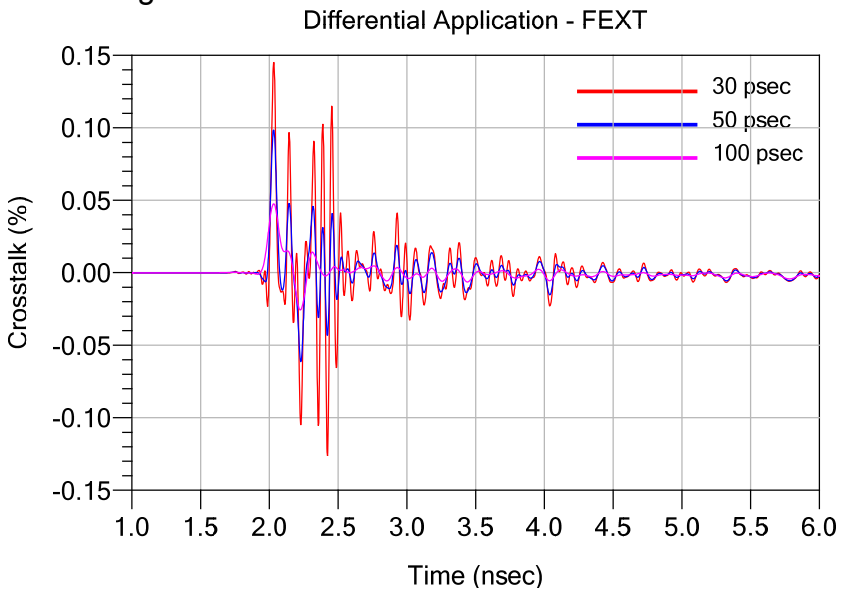
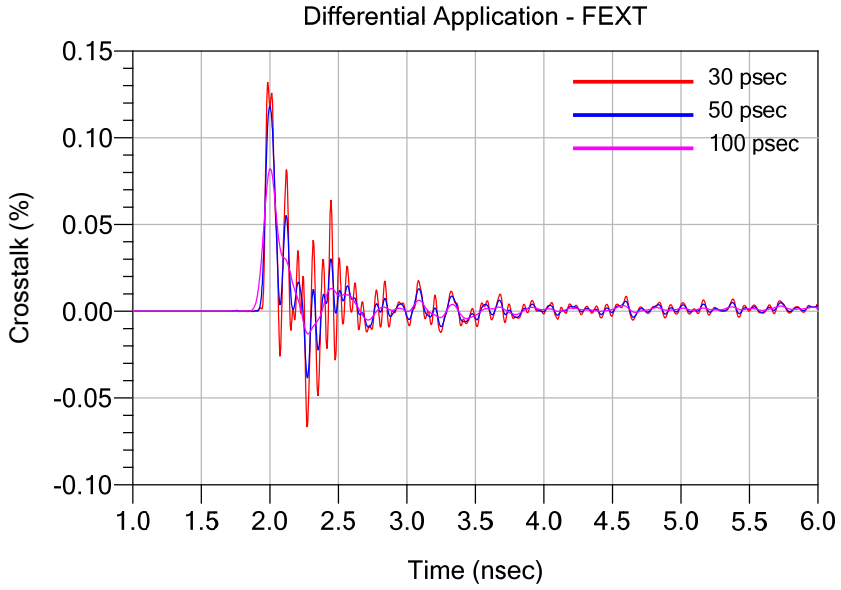


Differential Application – FEXT, HDTF-RA_G4H4_HDTM_E3F3

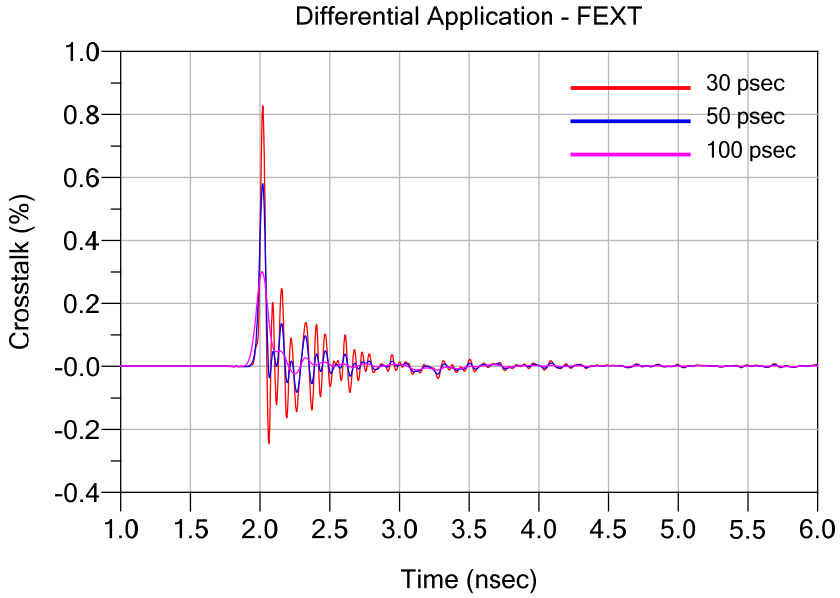
Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

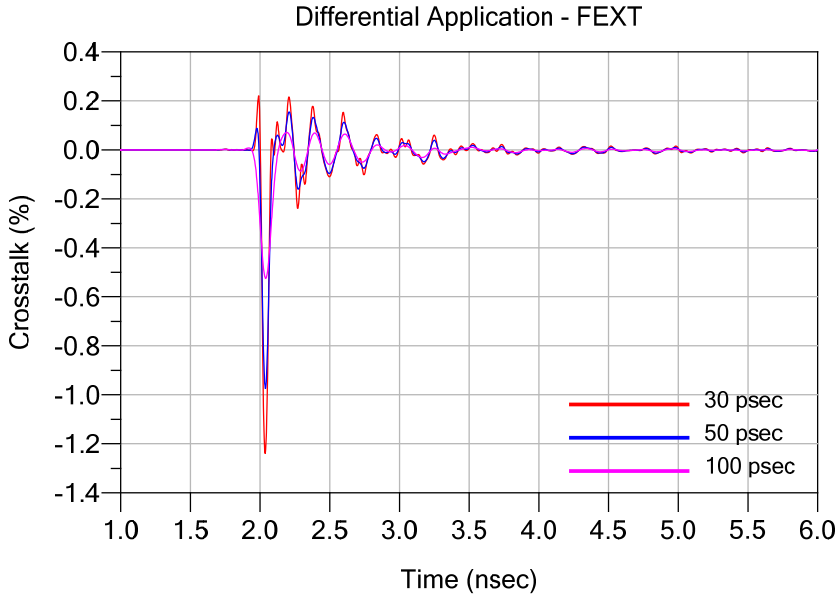
Differential Application – FEXT, HDTF-RA_G4H4_HDTM_E4F4

Samtec HDTF-RA mating to Samtec HDTM



Differential Application – FEXT, HDTF-RA_G4H4_HDTM_G3H3

Samtec HDTF-RA mating to Samtec HDTM



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Appendix C – Product and Test System Descriptions

Product Description

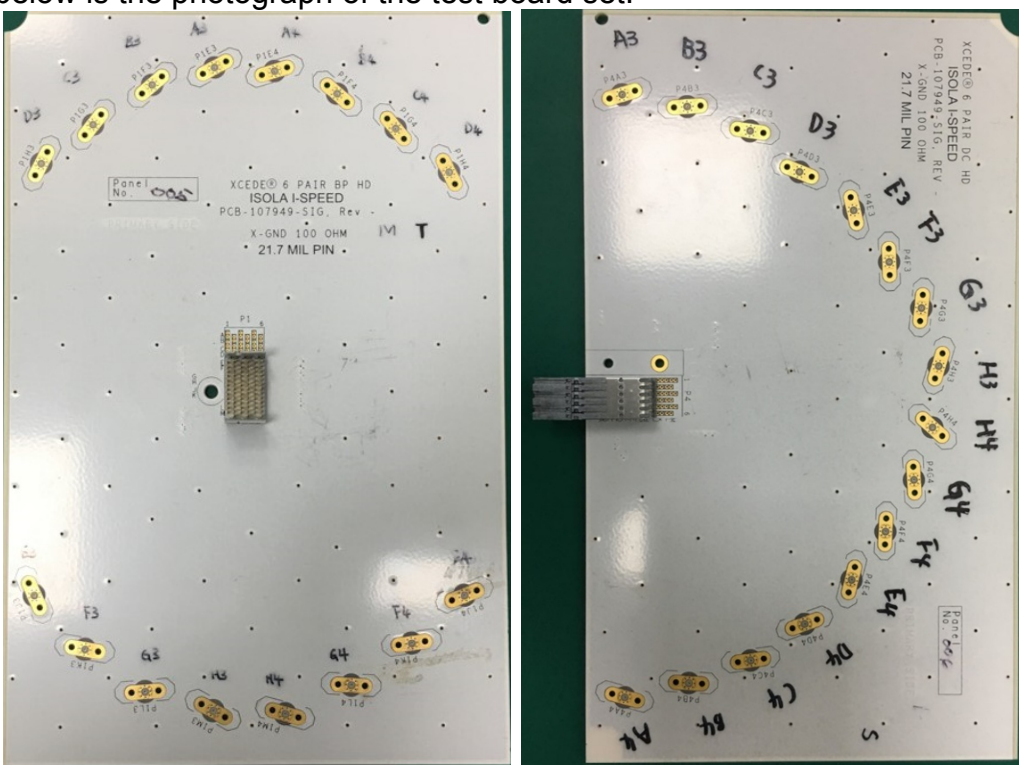
Product test samples are press-fit HDTx Series connectors. The part numbers included for testing were HDTF-4-06-S-RA-HS-100 and HDTM-4-06-2-S-VT-0-3. The HDTx Series connectors are available for standard or high-speed wafers. The modular design provides flexibility in applications. A photo of the test articles mounted to SI test boards is shown below.

Test System Description

The test fixtures are composed of four-layer FR-4 material with 50Ω signal trace and pad configurations designed for the electrical characterization of Samtec high speed connector products. A PCB mount 2.4mm connector is used to interface the VNA test cables to the test fixtures. Optimization of the 2.4mm connector launch was performed using full wave simulation tools to minimize reflections. The test fixtures and calibration kit are specific to the HDTx series connector set and identified by part number PCB-107949-SIG.

PCB-107949-SIG Test Fixtures

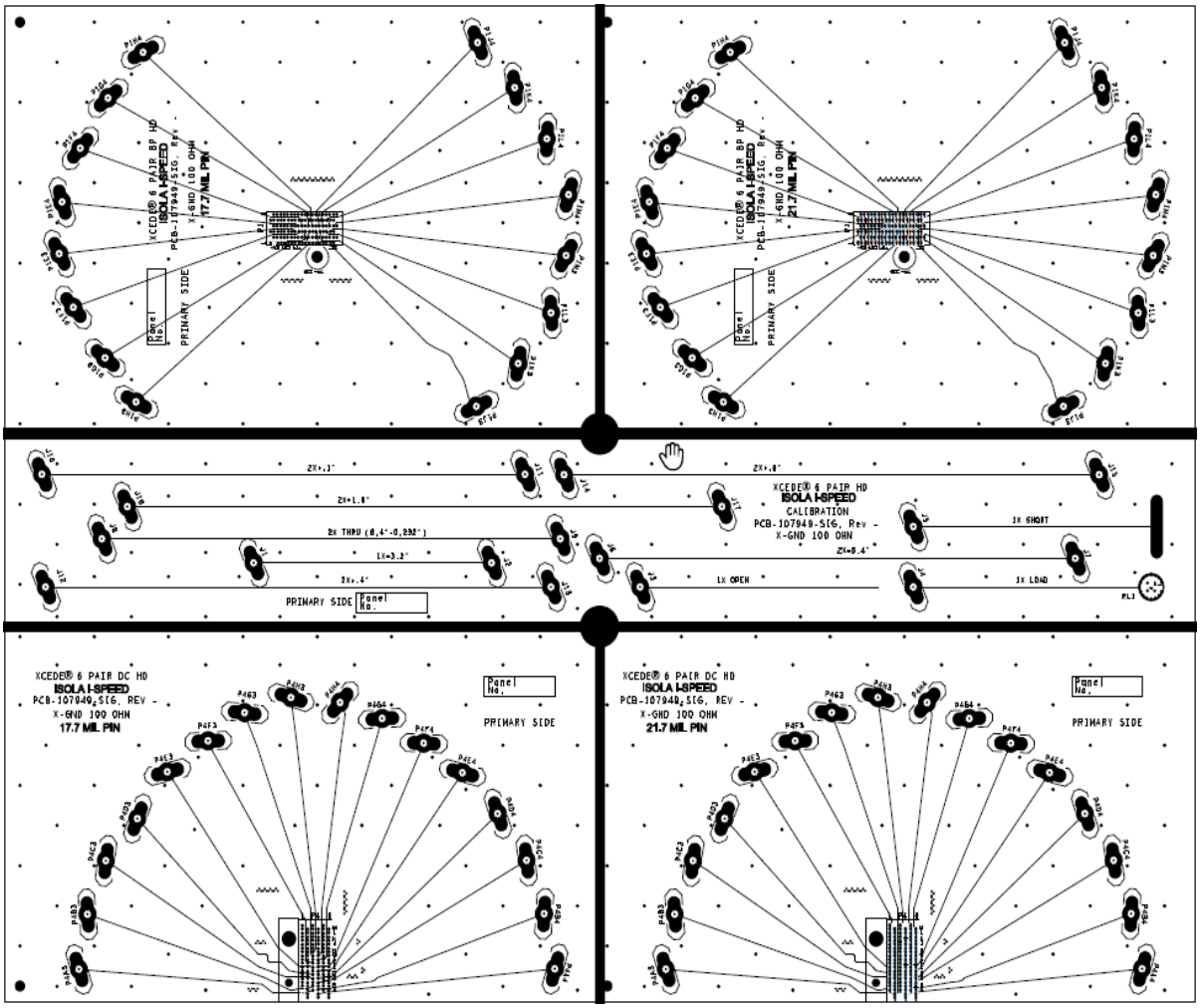
Shown below is the photograph of the test board set.



PCB-107949-SIG-XX PCB Layout Panel

Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Artwork of the PCB design is shown below.

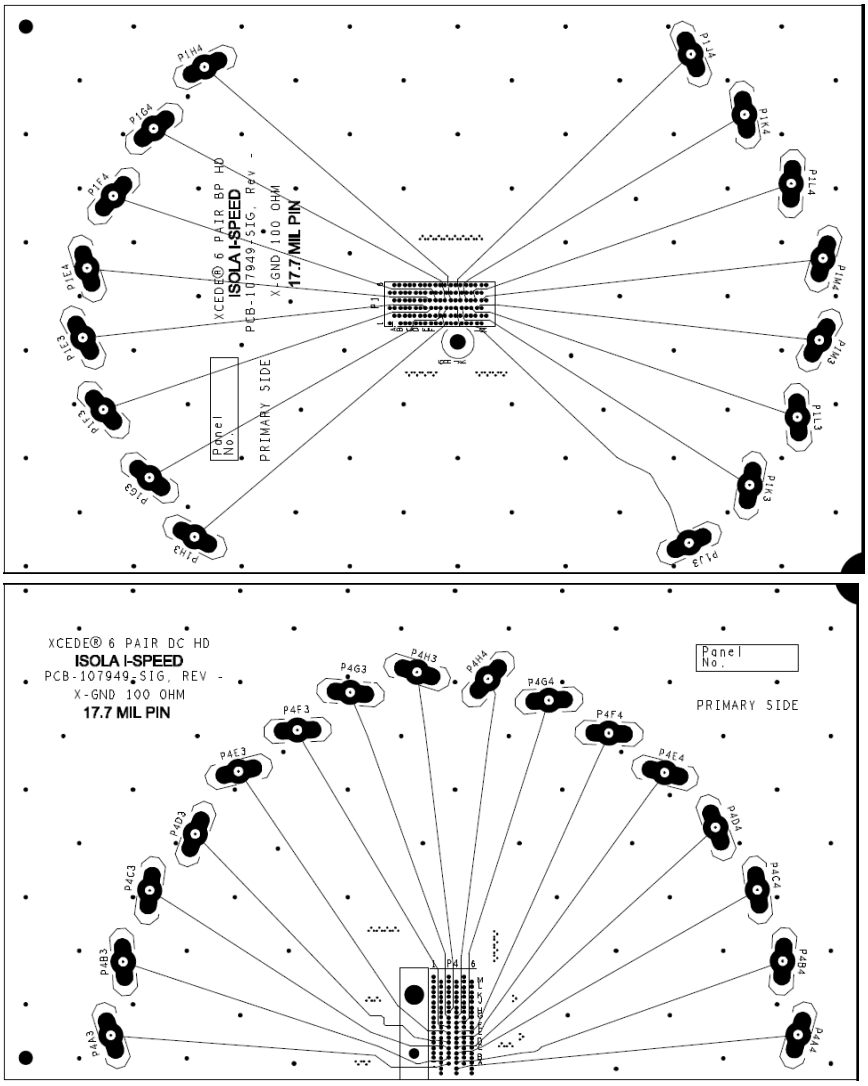


Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

PCB Fixtures

The test fixtures used are as follows:

PCB-107949-SIG – HDTF-RA Series Test Board
PCB-107949-SIG – HDTM Series Test Board



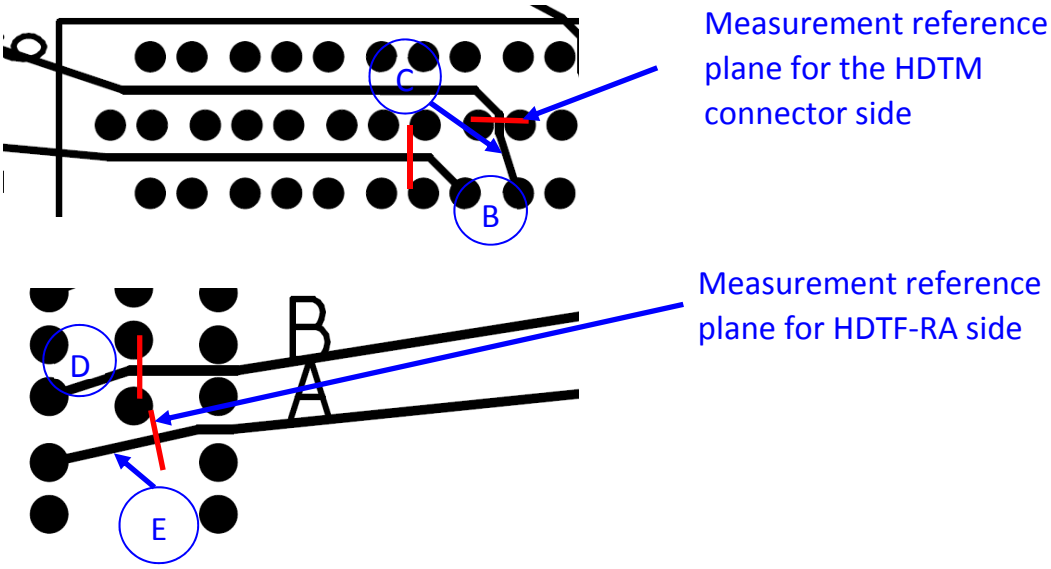
Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Measured from the center of the pad to the 2.4mm connector launch, all traces are length matched to 3.164". The AFR calibration effectively removes 3.084" length of the test board trace effects. This means that 80 mils of test board trace length effects are included in the measurement at each side.

The S-Parameter measurement includes:

A- The HDTM / HDTF-RA Series connector set
B- Test board vias, pads (footprint effects) for the HDTM connector side.
C- 80 mils of 8 mil wide stripline trace.
D- Test board vias, pads (footprint effects) for the HDTF-RA side.
E- 80 mils of 8 mil wide stripline trace.

The figure below shows the location of the measurement reference plane.



Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

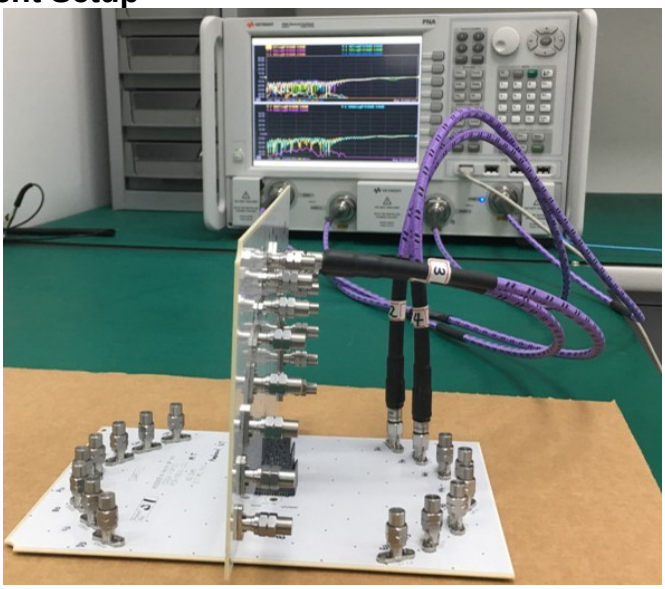
Appendix D – Test and Measurement Setup

For frequency domain measurements, the test instrument is the Keysight N5227A PNA-L network analyzer. Frequency domain data and graphs are obtained directly from the instrument. Post-processed time domain data and graphs are generated using convolution algorithms within Keysight ADS. The network analyzer is configured as follows:

Start Frequency – 10 MHz
Stop Frequency – 50 GHz
Number of points – 5000
IFBW – 1 KHz

With these settings, the measurement time is approximately 20 seconds.

N5227A Measurement Setup



Test Instruments

QTY	Description
1	Keysight N5227A PNA-L Network Analyzer (10 MHz to 67 GHz)
1	Keysight N4694-60003 ECAL Module (10 MHz to 67 GHz)

Test Cables & Adapters

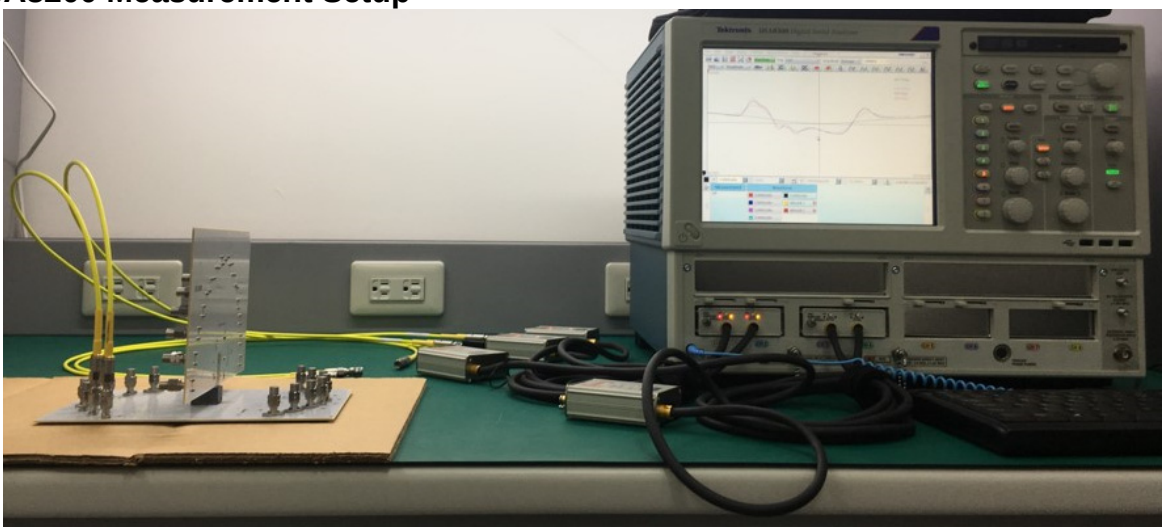
QTY	Description
4	Gore 0F0CACB036.0-LF (DC to 67 GHz)

Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

For impedance measurements, the test instrument is the Tektronix DSA8300 Digital Serial Analyzer mainframe and 80E08B sampling module. The impedance data and profiles are obtained directly from the instrument. The Digital Analyzer is configured as follows:

	Differential Signal
Vertical Scale:	5 ohm / Div:
Offset:	Default / Scroll
Horizontal Scale:	200ps/ Div
Record Length:	4000
Averages:	≥ 16

DSA8200 Measurement Setup



Test Instruments

QTY	Description
1	Tektronix DSA8300 Digital Serial Analyzer
2	Tektronix 80E08B Electrical Sampling Remote Module (DC to 30GHz)

Test Cables & Adapters

QTY	Description
2	Infinet CA2901-2901-DP (DC to 40GHz)

Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Appendix E - Frequency and Time Domain Measurements

Frequency (S-Parameter) Domain Procedures

The quality of any data taken with a network analyzer is directly related to the quality of the calibration standards and the use of proper test procedures. For this reason, extreme care is taken in the design of the through calibration standards, the SI test boards, and the selection of the PCB vendor.

A coaxial SOLT calibration is performed using a N4694-60003 ECAL module. Then DUT measurements are performed under SOLT calibration. The measurements include the effect of test fixture. The measurements of the 2X THRU line standards are required to remove the test fixture effect.

Time Domain Procedures

Mathematically, Frequency Domain data can be transformed to obtain a Time Domain response. Perfect transformation requires Frequency Domain data from DC to infinity Hz. Fortunately, a very accurate Time Domain response can be obtained with band-width-limited data, such as measured with modern network analyzer.

The Time Domain responses were generated using Keysight ADS 2016. This tool has a transient convolution simulator, which can generate a Time Domain response directly from measured S-Parameters. An example of a similar methodology is provided in the Samtec Technical Note on domain transformation.
http://www.samtec.com/Technical_Library/reference/articles/pdfs/tech-note_using-PLTS-for-time-domain-data_web.pdf

Propagation Delay (TDT)
The Propagation Delay is a measure of the Time Domain delay through the connector and footprint. A step pulse is applied to the touchstone model of the connector and the transmitted voltage is monitored. The same pulse is also applied to a reference channel with zero loss, and the Time Domain pulses are plotted on the same graph. The difference in time, measured at the 50% point of the step voltage is the propagation delay.

Near-End Crosstalk (TDT) & Far End Crosstalk (TDT)
A step pulse is applied to the touchstone model of the connector and the coupled voltage is monitored. The amplitude of the peak-coupled voltage is recorded and reported as a percentage of the input pulse.

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Impedance (TDR)

Measurements involving digital pulses are performed using either Time Domain Reflectometer (TDR) or Time Domain Transmission (TDT) methods. The TDR method is used for the impedance measurements in this report.

The signal line(s) of the SUT's is energized with a TDR pulse and the far-end of the energized signal line is terminated in the test systems characteristic impedance (e.g.; 50Ω or 100Ω terminations). By terminating the adjacent signal lines in the test systems characteristic impedance, the effects on the resultant impedance shape of the waveform is limited. The "best case" signal mapping was tested and is presented in this report.

Series: HDTM / HDTF-RA
Description: XCede® HD 1.80 mm Backplane Connector, 4-pair, 100 ohm Version

Appendix F – Glossary of Terms

ADS – Advanced Design Systems
BC – Best Case crosstalk configuration
DUT – Device under test, term used for TDA IConnect & Propagation Delay waveforms
FD – Frequency domain
FEXT – Far-End Crosstalk
GSG – Ground–Signal-Ground; geometric configuration
GSSG - Ground–Signal-Signal-Ground; geometric configuration
HDV – High Density Vertical
NEXT – Near-End Crosstalk
OV – Optimal Vertical
OH – Optimal Horizontal
PCB – Printed Circuit Board
PPO – Pin Population Option
SE – Single-Ended
SI – Signal Integrity
SUT – System Under Test
S – Static (independent of PCB ground)
SOLT – acronym used to define Short, Open, Load & Thru Calibration Standards
TD – Time Domain
TDA – Time Domain Analysis
TDR – Time Domain Reflectometry
TDT – Time Domain Transmission
WC – Worst Case crosstalk configuration
Z – Impedance (expressed in ohms)