

HDMI Nano-D High-Speed Characterization

T180117 Rev1 – April 12, 2018



1. Product Description

- 1.1. **Assembly P/N:** A28882-XXX
- 1.2. **Connector Description:** 1-meter & 3-meter HDMI Nano-D Jumper
- 1.3. **Cable Primaries¹:** 32 AWG SPA ePTFE/PFA
- 1.4. **Cable Shield:** Braided Shielded (85% Min coverage) + Foil
- 1.5. **Cable Jacket:** Polyurethane UL94 V0 & LSZH Jacket
- 1.6. **Insulator:** 37-position (19 pins populated)

2. High-Speed Performance Targets²

- 2.1. **Connector Differential Impedance:** $100\Omega \pm 25\Omega$ based on 200 ps (10%-90%) T_{RISE}
- 2.2. **Cable Differential Impedance:** $100\Omega \pm 10\Omega$ based on 200 ps (10%-90%) T_{RISE}
- 2.3. **Differential Insertion Loss:** Defined by the following vertices:
 - (825 MHz, -5.0 dB)
 - (2.475 GHz, -12.0 dB)
 - (4.125 GHz, -20.0 dB)
 - (5.1 GHz, -25.0 dB)
- 2.4. **Differential Far-End Crosstalk:** Less than -20dB to 5.0 GHz
- 2.5. **Intra-Pair Skew:** Total skew less than 112ps

	Parameter	Spec	1-METER	3-METER	
2.1	Connector Differential Impedance	Z_{MIN}	75 Ω	98 Ω	98 Ω
		Z_{MAX}	125 Ω	124 Ω	124 Ω
2.2	Cable Differential Impedance	Z_{MIN}	90 Ω	96 Ω	96 Ω
		Z_{MAX}	100 Ω	105 Ω	106 Ω
2.3	Differential Insertion Loss	0.825 GHz	5 dB	5 dB	2 dB
		2.475 GHz	12 dB	9 dB	5 dB
		4.125 GHz	20 dB	12 dB	5 dB
		5.100 GHz	25 dB	15 dB	8 dB
2.4	Differential Far-End Crosstalk	$FEXT_{MAX}$	< -20dB	-31 dB	-38 dB
2.5	Intra-Pair Skew	$Skew_{MAX}$	112ps	15 ps	47 ps

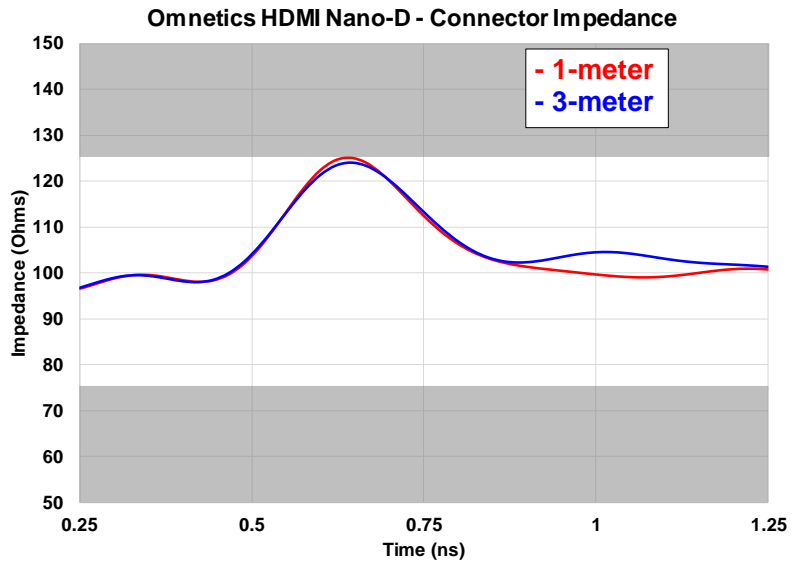
¹ Various cable options are available. Measurements shown above with cables manufactured in Asia.

² Per "High-Definition Multimedia Interface Specification Version 1.4", pages 21 (2.1-2.2), 65-66 (2.3-2.5), June 5, 2009.

2.1 Connector Differential Impedance

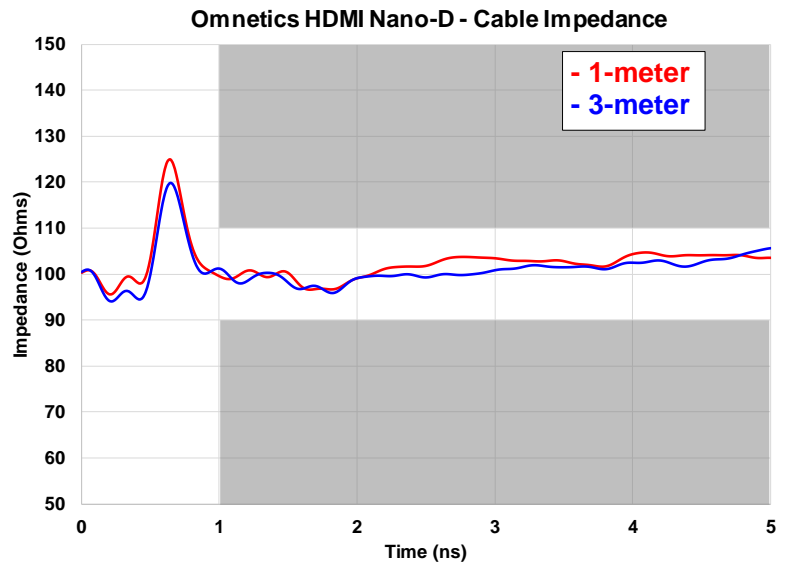
TDR (Time Domain Reflectometer) measures the impedance based on a 200ps (10%-90%) rise time.

	Spec	1-METER	3-METER
Z _{MIN}	75 Ω	98 Ω	98 Ω
Z _{MAX}	125 Ω	124 Ω	124 Ω



2.2 Cable Differential Impedance

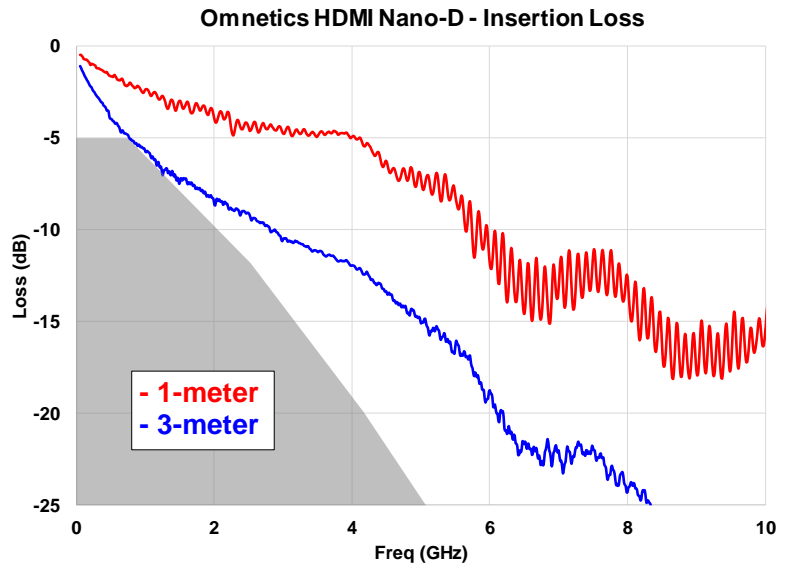
	Spec	1-METER	3-METER
Z _{MIN}	90 Ω	96 Ω	96 Ω
Z _{MAX}	100 Ω	105 Ω	106 Ω



2.3 Differential Insertion Loss

Insertion loss is the ratio of the transmitted signal to the incident signal.

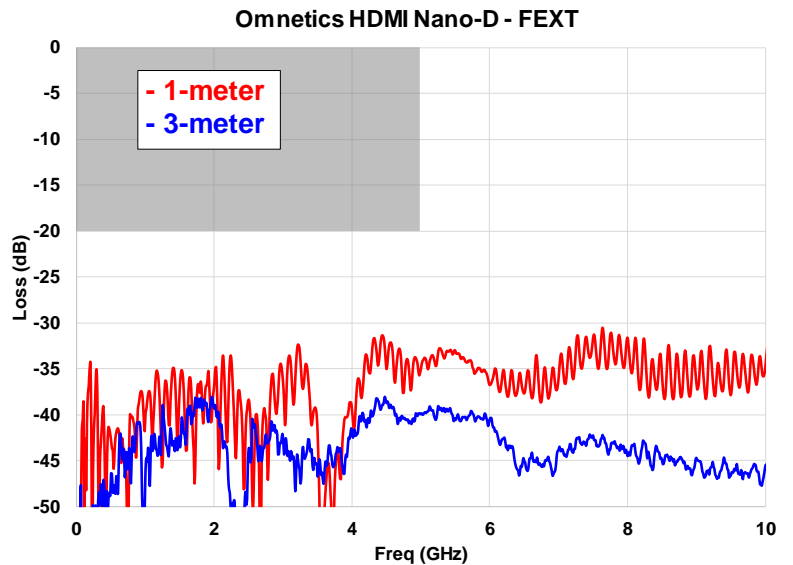
	Spec	1-METER	3-METER
0.825 GHz	5 dB	5 dB	2 dB
2.475 GHz	12 dB	9 dB	5 dB
4.125 GHz	20 dB	12 dB	5 dB
5.100 GHz	25 dB	15 dB	8 dB



2.4 Differential Far-End Crosstalk

Crosstalk measures the unwanted coupling between differential pairs.

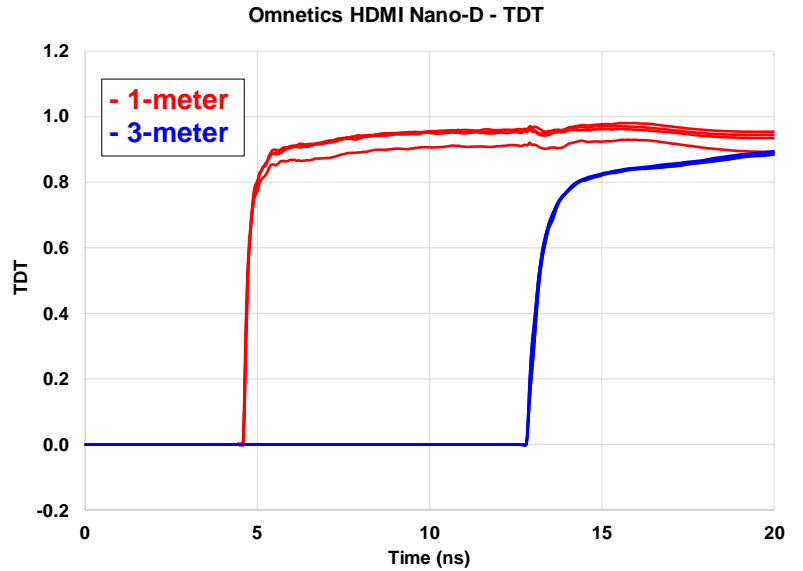
FEXT	SPEC	1-METER	3-METER
5 GHz	< -20dB	-31 dB	-38 dB



2.5 Intra-Pair Skew

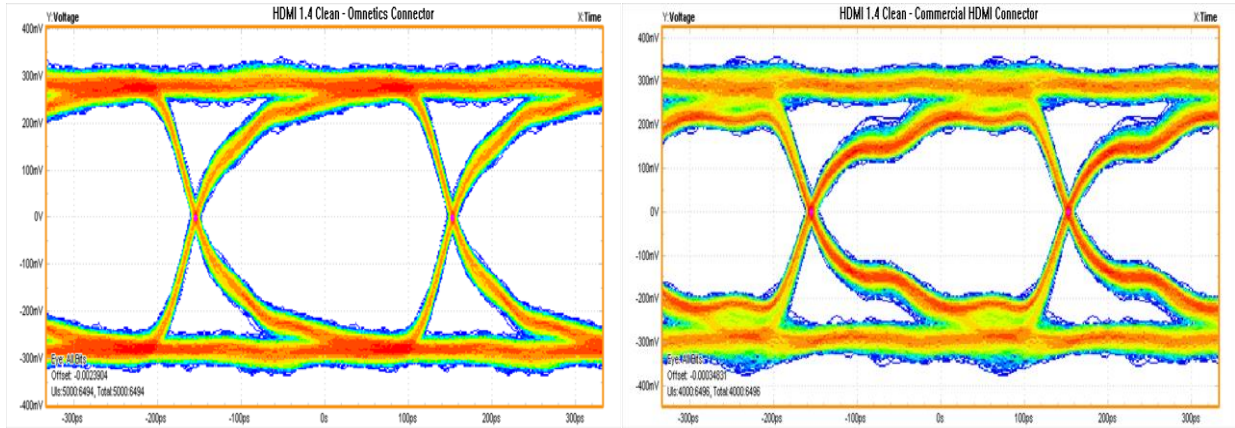
TDT (Time Domain Transmissometry) measures intra-pair skew, which is the difference in electrical length between to signals within a pair.

SKEW	SPEC	1-METER	3-METER
Pair 1	112 ps	15 ps	47 ps
Pair 2	112 ps	13 ps	32 ps



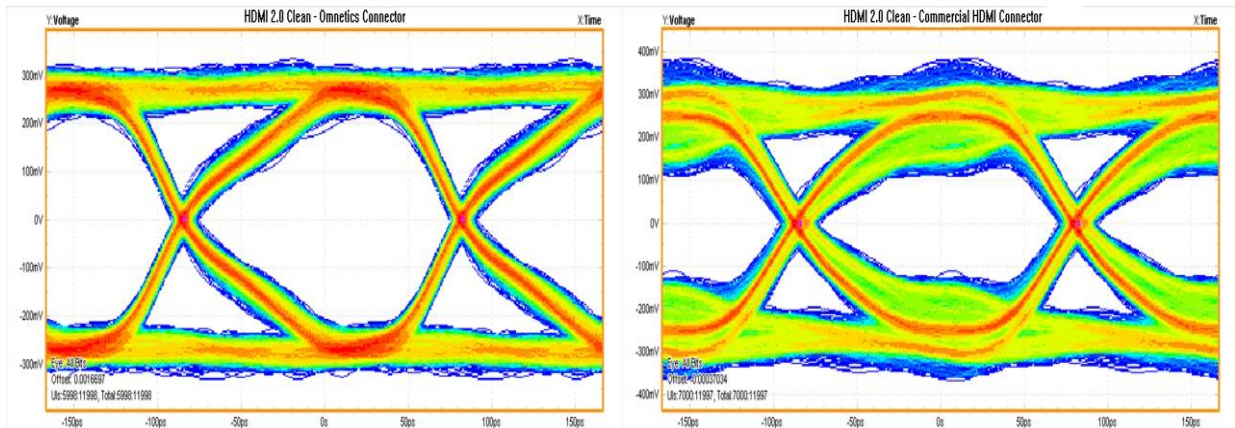
Appendix 1 – Eye Diagram Measurements

3.125 Gbps (HDMI 1.4)³ – Omnetics vs. Commercial



Description	Omnetics	Commercial
Total Jitter	25 ps	38 ps
Data-Dependent Jitter	5 ps	14 ps
Eye Width	295 ps	282 ps
Eye Height	433 mV	296 mV

6 Gbps (HDMI 2.0) – Omnetics vs. Commercial



Description	Omnetics	Commercial
Total Jitter	27 ps	45 ps
Data-Dependent Jitter	10 ps	24 ps
Eye Width	151 ps	131 ps
Eye Height	376 mV	236 mV

Test Equipment (Eye Diagrams Only)

Equipment Name	Manufacturer	P/N
Signal Generator	Keysight	M8020A
Real-time Oscilloscope	Tektronix	MSO73304DX

³ Eye diagram testing performed by Granite River Labs on a similar 1-foot cable assembly.

Appendix 2 - Equipment List:

VNA	Agilent 8722ES
Test Fixtures	Omnetics Custom

Revision Control:

Rev1	April 12, 2018
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