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ACS CMIO PRODUCT OVERVIEW HDMI

Business Unit: CMIO

Presenter: Frank Hsu

Aug 16, 2022

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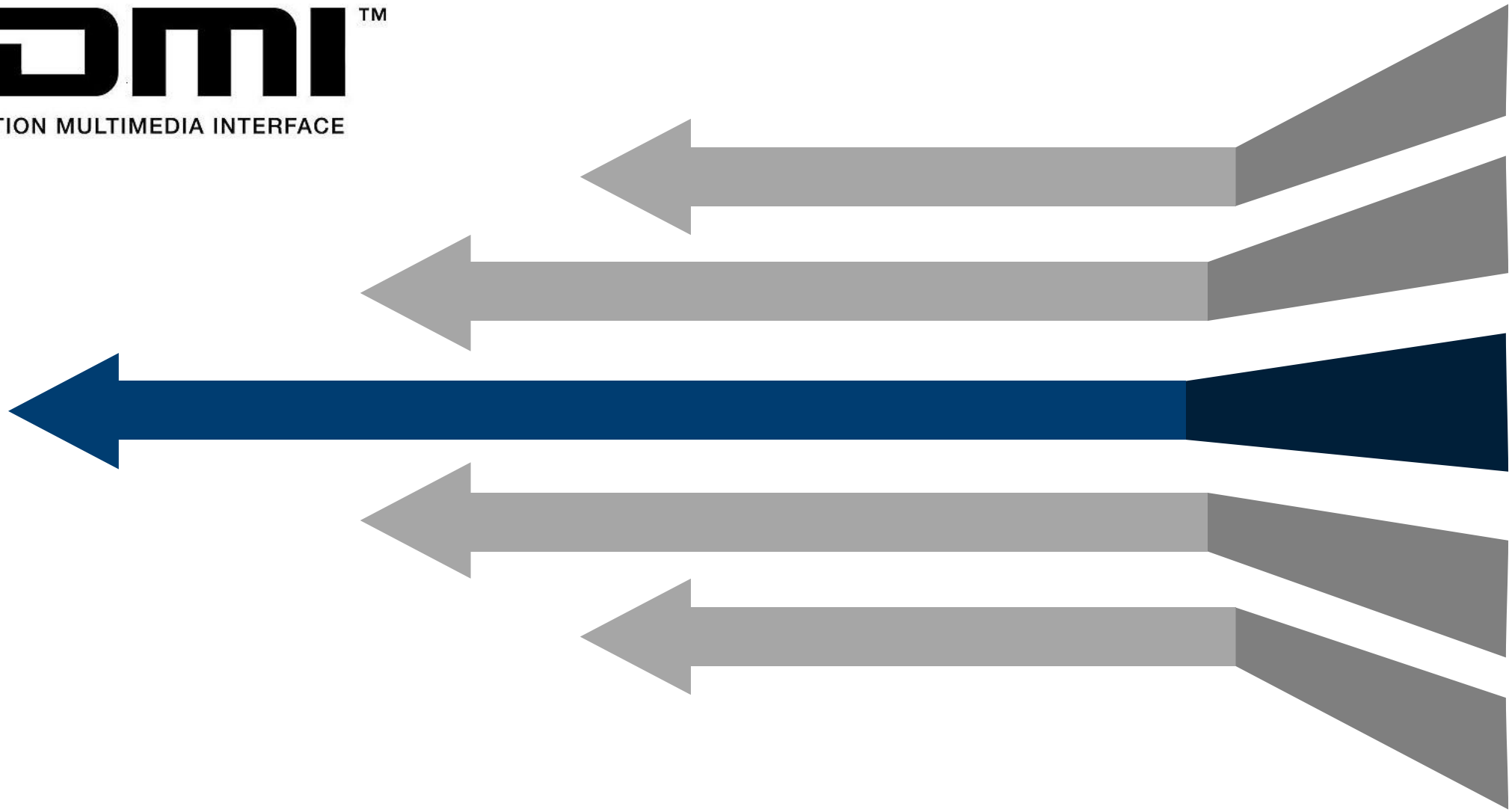
HDMI™
HIGH DEFINITION MULTIMEDIA INTERFACE



Application

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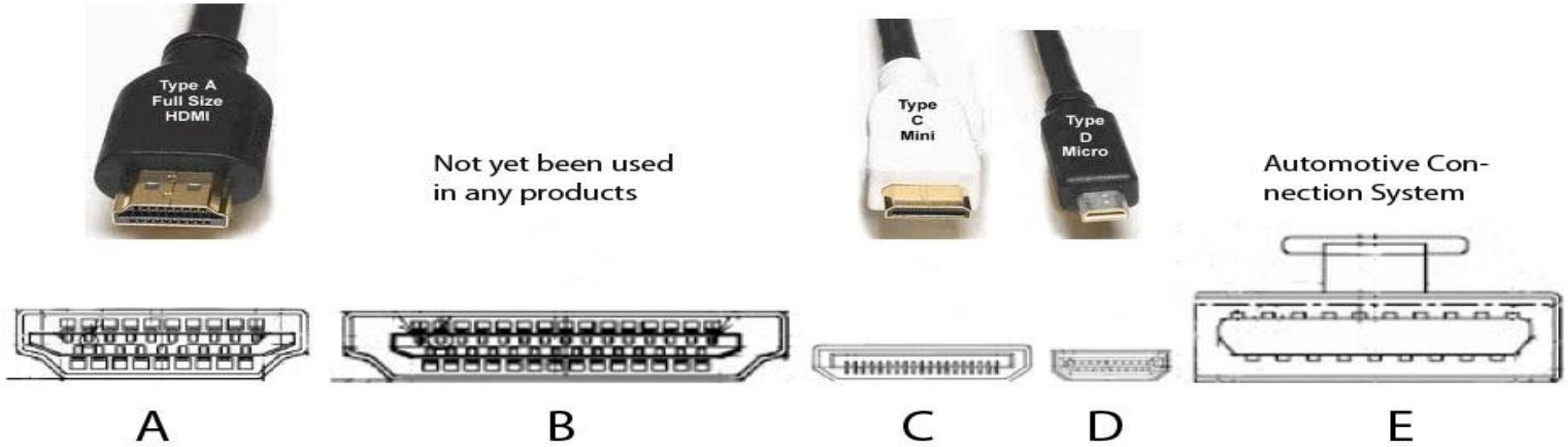
Applications

- Flat Panel TV
- DVD & Blu-ray player/recorder
- TV Set Top Box
- Media Stick
- Projector
- AV Receiver
- Video Game Console
- VR solution
- Digital Still Camera
- Digital Camcorder
- Wearable Camera

- Discrete Adapter Solution
- Desktop PC
- Notebook PC
- PC Tablet
- LCD PC Monitor
- Notebook PC Docking Station
- Smart Phone
- Media Tablet
- Karaoke Player
- Health Care AV

Milestone

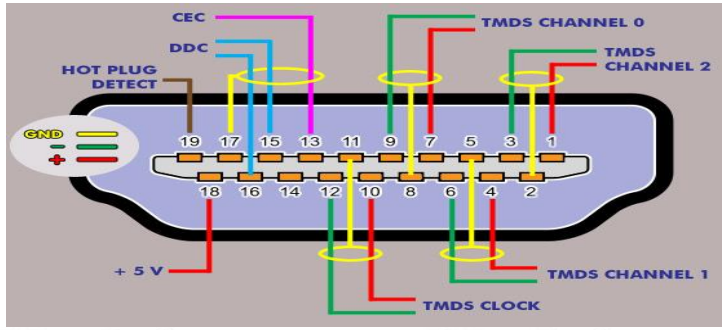
HDMI version	1.0	1.1	1.2	1.3	1.4	2.0	2.1
Date initially released	9-Dec-02	20-May-04	8-Aug-05	22-Jun-06	28-May-09	4-Sep-13	4-Nov-17
Maximum Bandwidth	4.95 Gbps	4.95 Gbps	4.95 Gbps	10.2 Gbps	10.2 Gbps	18 Gbps	48 Gbps
Maximum Resolution	1920×1200p/60 Hz	1920×1200p/60 Hz	1920×1200p/60 Hz progressive (1080p)	2560×1600p/60 Hz progressive (1440p)	3840×2160p/30 Hz 4096×2160p/24 Hz	4096×2160p/60 Hz	4K, 5K, 8K, 10K/120 Hz
Maximum Color Bit Depth	24 bits	24 bits	24 bits	48 bits	48 bits	48 bits	48 bits
Maximum LPCM & audio capability	8-channel	8-channel	8-channel	8-channel	8-channel	8-channel	32-channel



Major difference between 2.0 Ver. V.S 2.1 Ver.

	HDMI 2.0	HDMI 2.1
Signal Channels	Clock TMDS 0 (6Gbps) TMDS 1 (6Gbps) TMDS 2 (6Gbps)	Clock → Data 3 (12Gbps) Data 0 (12Gbps) Data 1 (12Gbps) Data 2 (12Gbps)
Data Rate per connector	3 x 6Gbps → up to 18Gbps	4 x 12Gbps → up to 48Gbps
SI parameters for connector	Impedance	Impedance Insertion Loss ACR (Attenuation to Crosstalk Ratio)

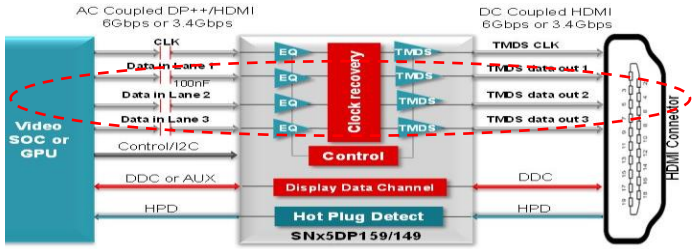
HDMI Pin Assignment



Pin#	Signal	Pin#	Signal
1	TMDS data 2+	11	TMDS clock shield
2	TMDS data 2 shield	12	TMDS clock-
3	TMDS data 2-	13	CEC
4	TMDS data 1+	14	No connected
5	TMDS data 1 shield	15	DDC clock
6	TMDS data 1-	16	DDC data
7	TMDS data 0+	17	Ground
8	TMDS data 0 shield	18	+5V power
9	TMDS data 0-	19	Hot plug detect
10	TMDS clock+		

HDMI 2.0 Three TMDS data channels, Total Maximum bandwidth up to 18Gbps

HDMI 2.1 Four TMDS data channels, Total Maximum bandwidth up to 48Gbps



HDMI 2.0 Connectors Overview

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Product Features and Benefits

- Compliant to HDMI 2.0 specification
- Insert molding process for better retention force and coplanarity
- EMI mounting Flange
- Tape-N-Reel Packaging
- Stainless Steel/SPCC shielding for higher strength
- Around shielding design
- Supports multiple audio and video formats
- Hot Plug Detect
- DVI Compatibility
- Full SMT, through hole and hybrid shell options available

- Compliant to HDMI 2.1 specification and Data Rate can support up to 48 Gbps
- Interface and Footprint can backward compatible 2.0

Standard A Type


R/A SMT


R/A SMT
With Flange


R/A Std
Sink


Sink Reverse type


V/T SMT


Upright
DIP


Upright with
EMI shell

Mini HDMI C Type


R/A SMT

Combo / Stack Type


R/A Dip HDMI
Over USB


3X Upright

Mini HDMI D Type


R/A SMT

Standard A Type FOR HDMI 2.1


R/A SMT


R/A SMT
With Flange


R/A SMT
With EMI Spring


Sink Reverse
type

HDMI 2.0 sink type solution

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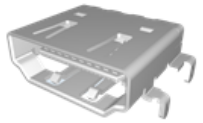
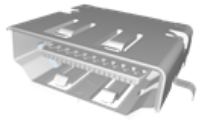
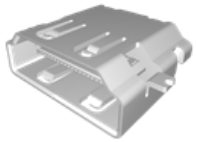
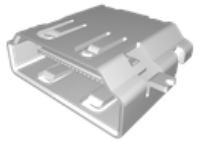
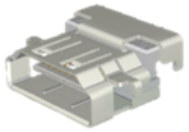
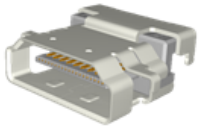
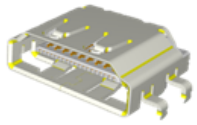
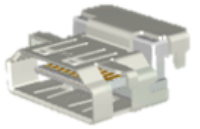
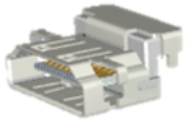
	Orientation Center Height	Sink 1.7	Sink 0.5	Sink 0.65	Sink 1.07	Sink 1.18	Sink 1.2	Sink 1.5	Sink 1.8	Sink 2.21	Sink 2.4
2.0 Sink	Standard										
	Reverse										

HDMI 2.0 Product List

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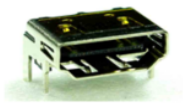
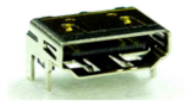
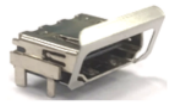
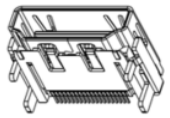
Photo	Part Number	Orientation	Tail	Height	Length	Flange	Plating	Description
	G45AA19X21000WHR	R/A	SMT	6.15mm	12.1mm	No	15u, 30u	HDMI 2.1, 19 Pins, 0.5mm pitch, R/A, SMT type
	HDMFA1910DDXXTR1	R/A	SMT	6.08mm	12.2mm	No	15u, 30u	HDMI 2.1, 19 Pins, 0.5pitch, R/A, SMT type
	G45AA19X21100WHR	R/A	SMT	6.15mm	12.1mm	Yes	15u, 30u	HDMI 2.1, 19 Pins, 0.5mm pitch, R/A with Flange 5.3mm Screw Hole, SMT type
	G45AA19X21100W1HR	R/A	SMT	6.15mm	12.1mm	Yes	15u, 30u	HDMI 2.1, 19 Pins, 0.5mm pitch, R/A with Flange 7.34mm Screw Hole, SMT type
	G45AA19X2100B1EU	R/A	SMT	6.10mm	12.1mm	No	G/F, 15u, 30u	HDMI 19 Pins, 0.5pitch, R/A, SMT type
	G45AA19X2110B1EU	R/A	SMT	6.10mm	12.1mm	Yes	G/F, 15u, 30u	HDMI 19 Pins, 0.5pitch, R/A with Flange 7.34mm Screw Hole SMT type
	G45AA19X2100HHR	R/A	SMT	6.18mm	12.2mm	Yes	G/F, 15u, 30u	HDMI 2.1, 19 Pins, 0.5mm pitch, R/A with EMI spring, SMT type
	G45AA19X2100H1HR	R/A	SMT	6.18mm	12.2mm	No	G/F, 15u, 30u	HDMI 19 Pins, Sink Type, SMT type

HDMI 2.0 Product List

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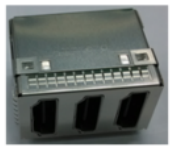
Photo	Part Number	Orientation	Tail	Height	Length	Flange	Plating	Description
	G45A19X1100XHHR	V/T	SMT	10.5mm	14.8mm	No	G/F, 15u, 30u	HDMI 19 Pins, Vertical, SMT type
	G45A19x7x083HR	UPRIGHT	DIP	16.4mm	26.46mm	No	G/F, 15u, 30u	HDMI 19 Pins, 0.75pitch, upright, Dip type
	G45A19X72XHR	UPRIGHT	DIP	16.82mm	26.46mm	No	G/F, 15u, 30u	HDMI 19 Pins, 0.75pitch, upright, Dip with EMI shell type
	G45B19x2004YEU	R/A	SMT	5mm	8mm	No	G/F, 15u, 30u	HDMI Type C (mini HDMI), 19 Pins, 0.4pitch, R/A, SMT type
	G45E19X2100H1HR	R/A	SMT	2.9mm	6.98mm	No	G/F, 15u	HDMI Type D (micro HDMI), 19 Pins, 0.4pitch, R/A, SMT type
	HDMF192081X2TR	UPRIGHT	PF	19.07mm	24.04mm	No	G/F, 15u, 30u	HDMI 19 Type, 3 Upright combo type
	G45AE5x1101PEU	R/A	DIP	18.1mm	20.6mm	No	G/F, 15u, 30u	USB2.0+HDMI STACK

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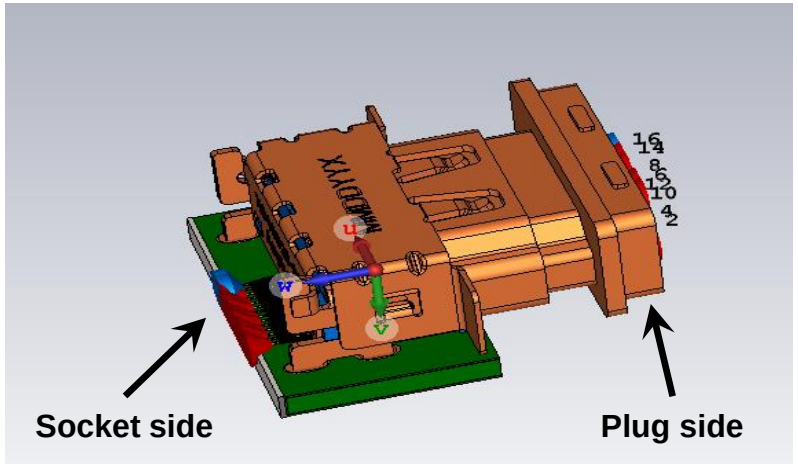
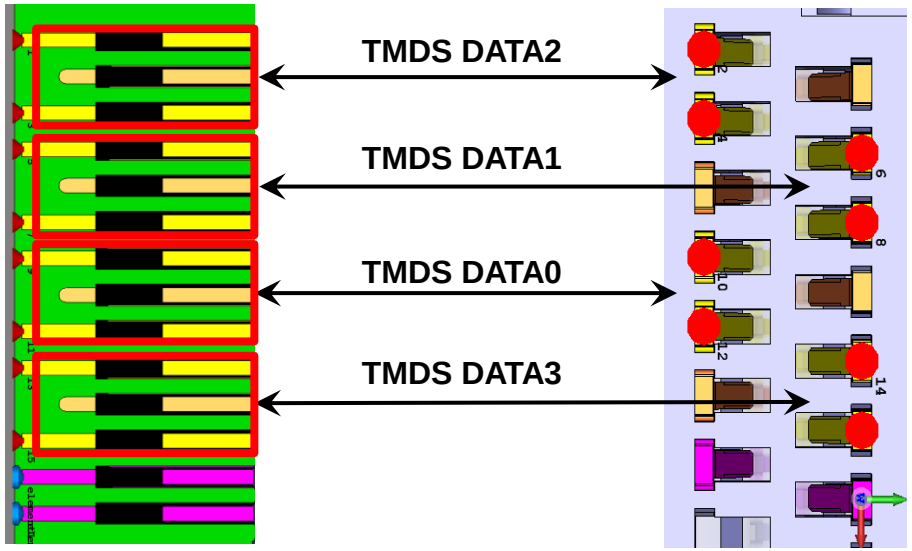
1. Simulated Model





Key Messages:

1: Simulation shows the results meet the HDMI 2.1 SI requirements.

2: Housing materials : high temperature plastic

3: Socket footprint was included in the model.
No any cable wire or assembly in the model.

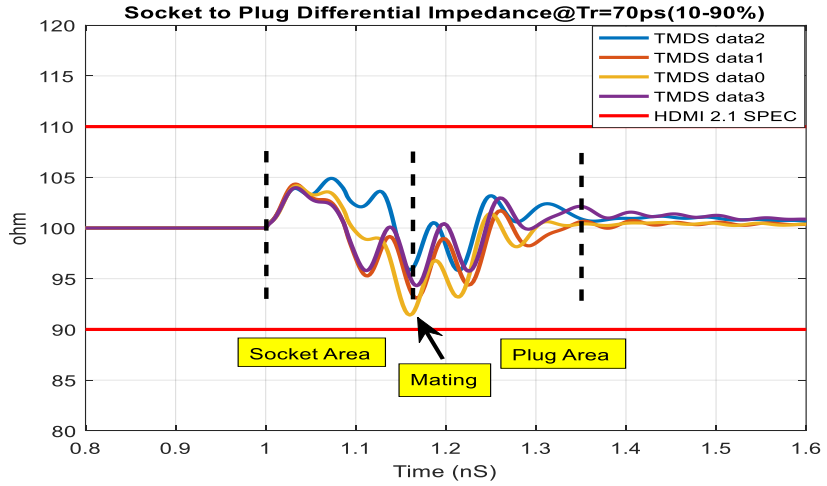
4: Socket footprint is same as the model HDMF191086xxtr

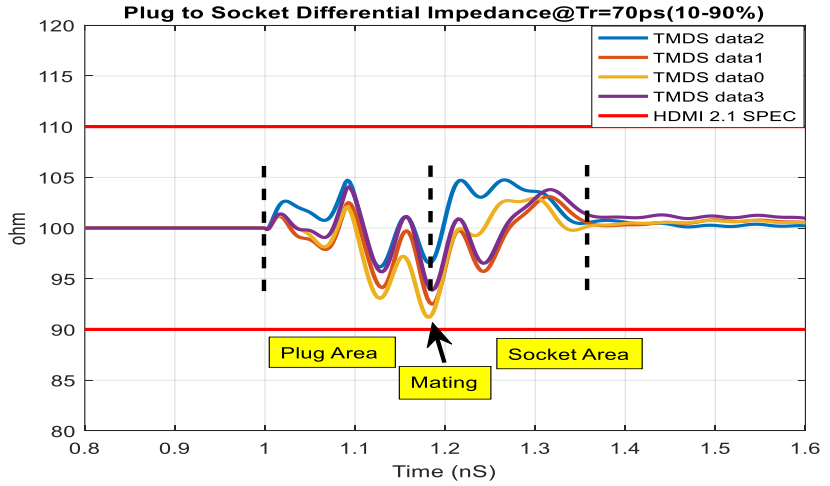
5: The signal integrity electrical specification showed in the following picture which from HDMI v0.8 draft spec r99 section 5.1.5.1.

Mated Connector Differential Impedance	Rise time ≤ 75 ps (10% to 90%). Differential Measurement Specimen Environment Impedance = 100 Ω differential Plug and receptacle connectors mounted on a controlled impedance PCB for micro-probing (ANSI/EIA-364-108)	100 Ω ±10%* *A single excursion is permitted out to a max/min of 100 Ω ±15% and of duration less than 150 ps.

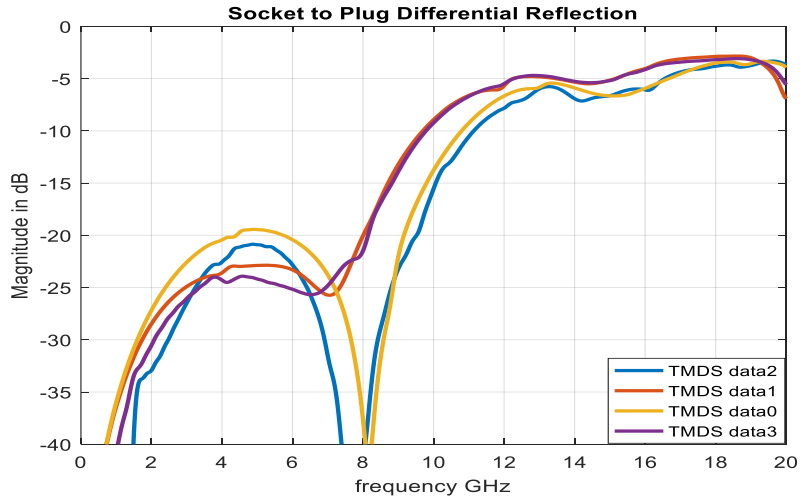
Item	Test Condition	Requirement
Mated Connector Attenuation (Differential Insertion Loss)	Differential Measurement Specimen Environment Impedance = 100 Ω differential Source-side receptacle connector mounted on a controlled impedance PCB fixture. (ANSI/EIA-364-101)	See Figure 5-4.
Mated Connector Attenuation (Differential Insertion Loss) to Crosstalk Ratio (ACR)	Differential Measurement Specimen Environment Impedance = 100 Ω differential Source-side receptacle connector mounted on controlled impedance PCB fixture. Driven pair and victim pair. (ANSI/EIA-364-90)	See Figure 5-5. ACR (dB) = $10\log\sum_{k=1}^{3}(FEXT_k)^2 - Attenuation(dB)$ $FEXT_k$: Far-end crosstalk to the victim channel

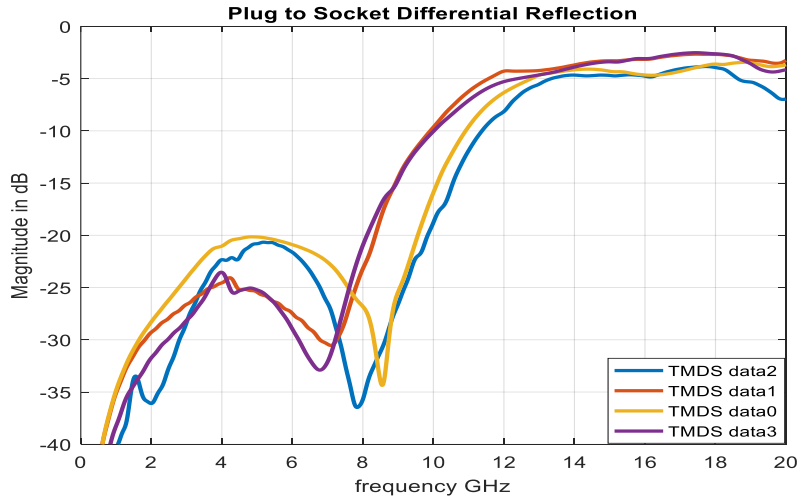
2. Time Domain Differential Impedance



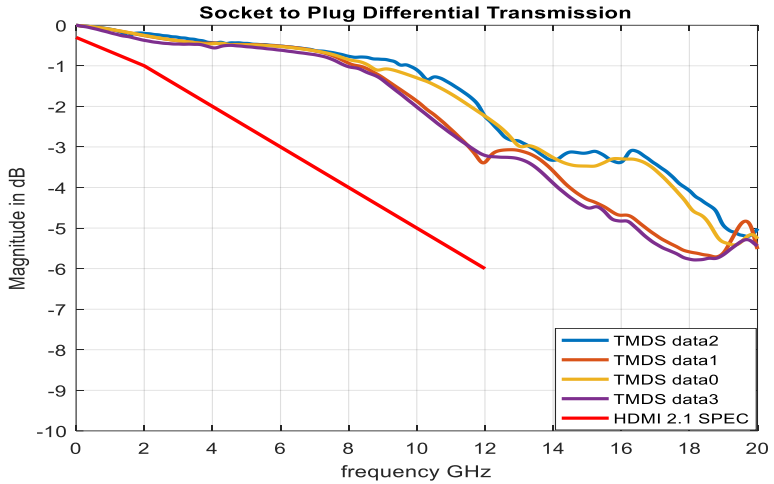


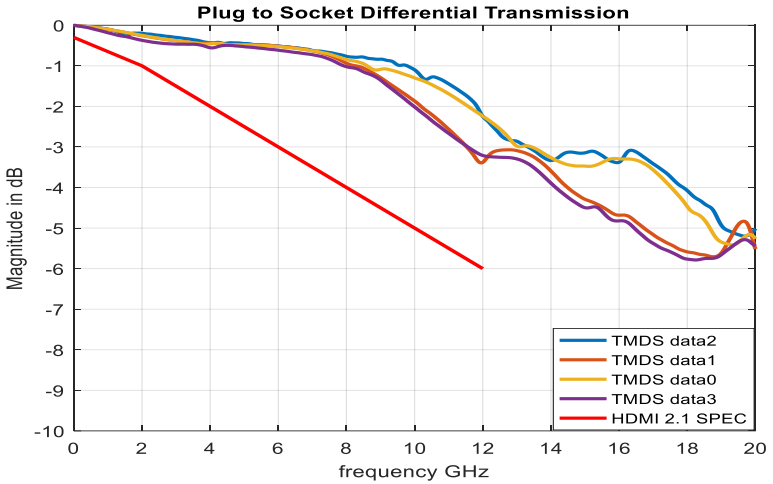
3. Differential Return Loss



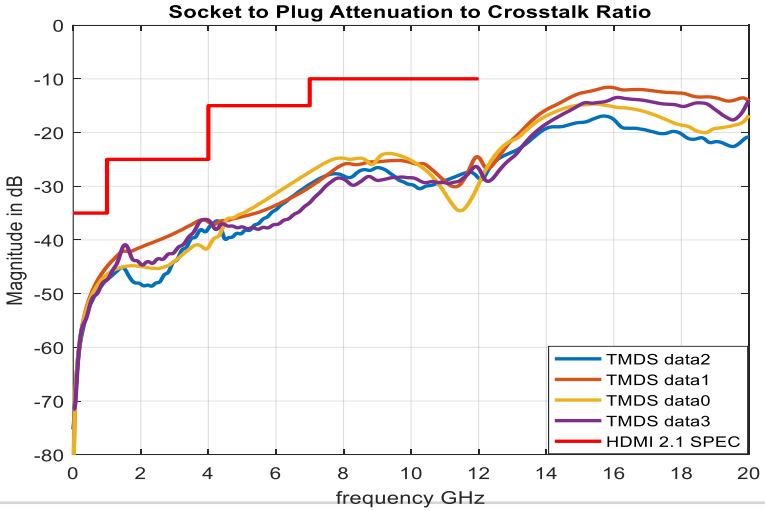


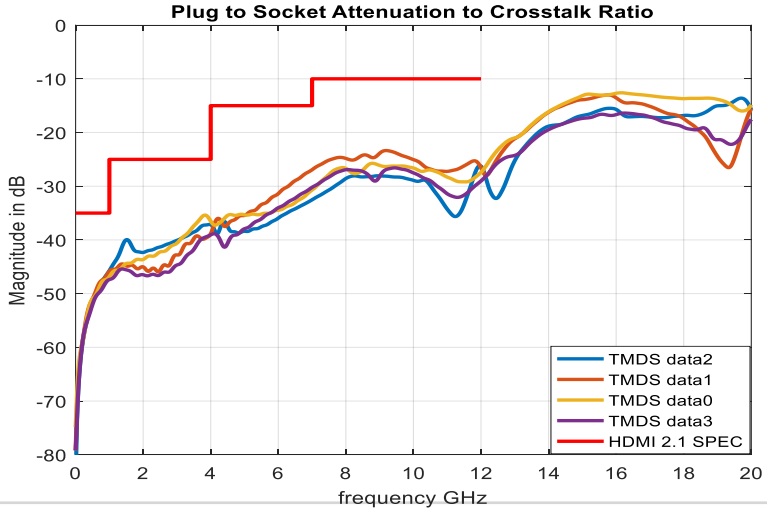
4. Differential Insertion Loss





5. Attenuation to Crosstalk Ratio (ACR)





HDMI 2.1 Product List

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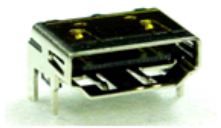
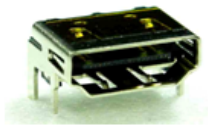
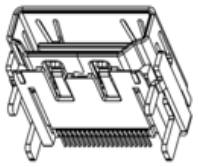
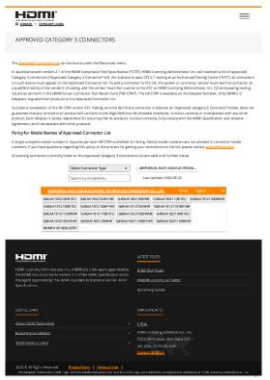
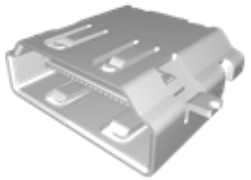
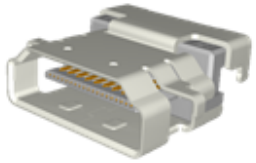
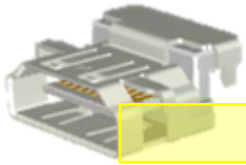
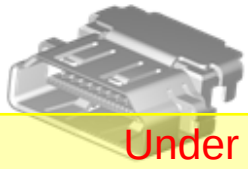
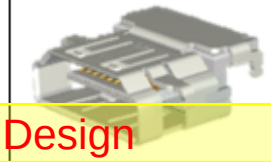
Photo	Part Number	Orientation	Tail	Height	Length	Flange	Plating	Description
	G45AA19X21000WHR	R/A	SMT	6.15mm	12.1mm	No	15u, 30u	HDMI 2.1, 19 Pins, 0.5mm pitch, R/A, SMT type
	HDMFA1910DDXXTR1	R/A	SMT	6.08mm	12.2mm	No	15u, 30u	HDMI 2.1, 19 Pins, 0.5pitch, R/A, SMT type
	G45AA19X21100WHR	R/A	SMT	6.15mm	12.1mm	Yes	15u, 30u	HDMI 2.1, 19 Pins, 0.5mm pitch, R/A with Flange 5.3mm Screw Hole, SMT type
	G45AA19X21100W1HR	R/A	SMT	6.15mm	12.1mm	Yes	15u, 30u	HDMI 2.1, 19 Pins, 0.5mm pitch, R/A with Flange 7.34mm Screw Hole, SMT type
	G45AA19X2100B1EU	R/A	SMT	6.10mm	12.1mm	No	G/F, 15u, 30u	HDMI 19 Pins, 0.5pitch, R/A, SMT type
	G45AA19X2110B1EU	R/A	SMT	6.10mm	12.1mm	Yes	G/F, 15u, 30u	HDMI 19 Pins, 0.5pitch, R/A with Flange 7.34mm Screw Hole SMT type

HDMI 2.1 Product List

Photo	Part Number	Orientation	Tail	Height	Length	Flange	Plating	Description
	G45AA19X2110B1EU	R/A	SMT	6.10mm	12.1mm	Yes	G/F, 15u, 30u	HDMI 19 Pins, 0.5pitch, R/A with Flange 7.34mm Screw Hole SMT type
	G45AA19X2100HHR	R/A	SMT	6.18mm	12.2mm	Yes	G/F, 15u, 30u	HDMI 2.1, 19 Pins, 0.5mm pitch, R/A with EMI spring, SMT type
	G45AA19X2100H1HR	R/A	SMT	6.18mm	12.2mm	No	G/F, 15u, 30u	HDMI 19 Pins, Sink Type, SMT type



HDMI 2.1 sink type solution

2.1	Orientation Center Height	Sink 0.5	Sink 1.2		Sink 2.21	Sink 1.07	Sink 1.52	Sink 0.65
	Reverse							

Under Design

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