

HDMI2.0 and 2.1 Specification

1. Purpose

The technical indicators of hdmi2.0 and hdmi2.1 are compared to let customers know the functions and differences supported by the two versions.

2. Range

Applicable to our current hdmi 2.0 and hdmi2.1 modules (including the hdmi2.0 module for FA docking)

3. HDMI Summary

High-Definition Multimedia Interface (HDMI) is a digital video/audio interface technology. It is a dedicated digital interface suitable for image transmission. It can transmit audio and video signals at the same time. The maximum data transmission speed is 2.25GB. /s, HDMI, the full name of English is HighDefinition Multimedia Interface, Chinese name is the abbreviation of high-definition multimedia interface. HDMI delivers high-quality uncompressed HD video and multi-channel audio data at up to 5Gbps. At the same time, it is not necessary to perform digital/analog or analog/digital conversion before signal transmission, which can ensure the highest quality video and audio signal transmission.

3.1HDMI PIN:

HDMI has five types of pins A, B, C, D, and E. Currently, Type A is more common in the market. Type A has 19 needles, a width of 13.9 mm, and a thickness of 4.45 mm.

PIN	Signal Assignment
1	TMDS Data2+
3	TMDS Data2-
5	TMDS Data1 Shield
7	TMDS Data0+
9	TMDS Data0-
11	TMDS Clock Shield
13	CEC
15	SCL
17	DDC/CEC Ground
19	Hot Plug Detect

PIN	Signal Assignment
2	TMDS Data2 Shield
4	TMDS Data1+
6	TMDS Data1-
8	TMDS Data0 Shield
10	TMDS Clock+
12	TMDS Clock-
14	Utility
16	SDA
18	+5V Power

1-9 are the pins actually used by TMDS data transmission, divided into 0, 1, and 2 groups.

10-12 is the TMDS clock signal. The TMDS clock is like packing a pixel. One clock transmits one pixel of R, G, B (8bit) signals on three channels.

13 is CEC (consumer electronic control) similar to an extended HDMI function, CEC is a complete set of protocols, electronic devices can use CEC signals to allow users to control the devices connected to the HDMI interface.

14 is a reserved pin, unused (or one more pin can be provided for CEC)

15-16 is the I2C pin for DDC (mainly used for EDID and HDCP transmission).

17 is the ground pin

18 is 5v AC pin

19 For the Hotplug pin (used to monitor whether the HDMI device exists or not, if it exists (Hotplug is high) then the DDC can be read by the DDC

3.2 Transmission process

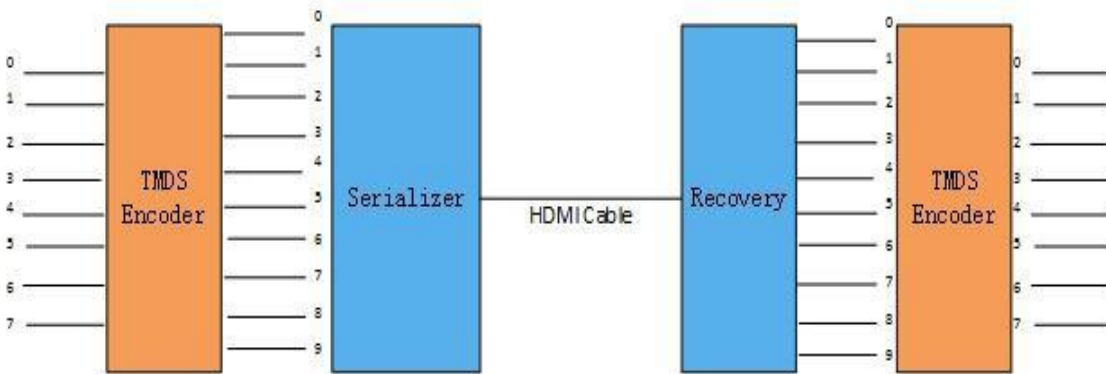
There are three types of data transmitted by HDMI TMDS (plus HSync and VSync even 4 kinds):

4.2.1 Preble (control information), mainly used to control the next transmission of data is Data Island or Video Data

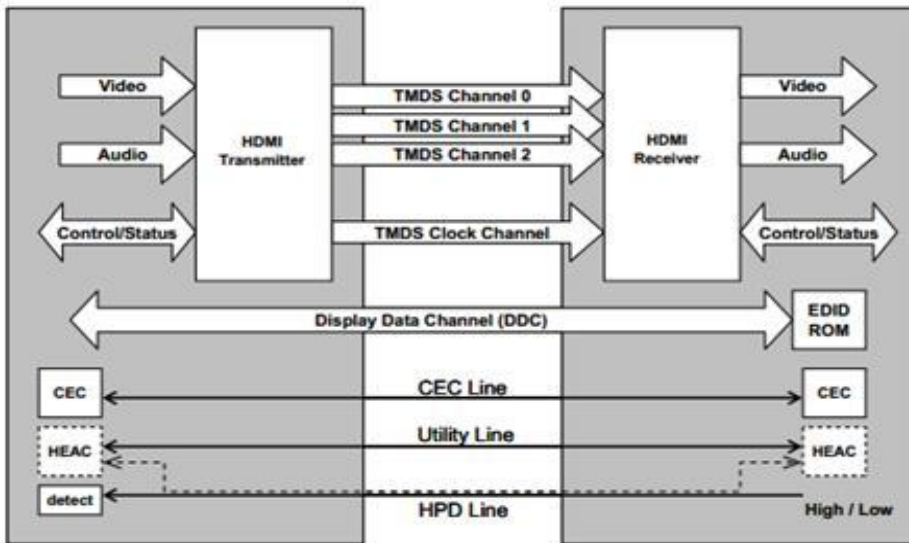
4.2.2 Data Island (packets), various types of packet information, including audio packets, image packets, etc.

4.2.3 Video Data (video information), video pixel data, HDMI can transmit pixel data in both RGB and YUV formats

4.2.4 There are also Hsync and Vsync, HDMI data transmission TMDS 0, TMDS1, TMDS2 three channels, each channel's transmission process is the same:



The transmission process is as follows:



TMDs high frequency signal is transmitted by optical fiber, CEC, heac and other control signals are transmitted by copper wire, which has good anti electromagnetic and radio frequency interference, and the product can work stably and reliably in challenging environment.

4. HDMI 2.0 and 2.1 performance parameters

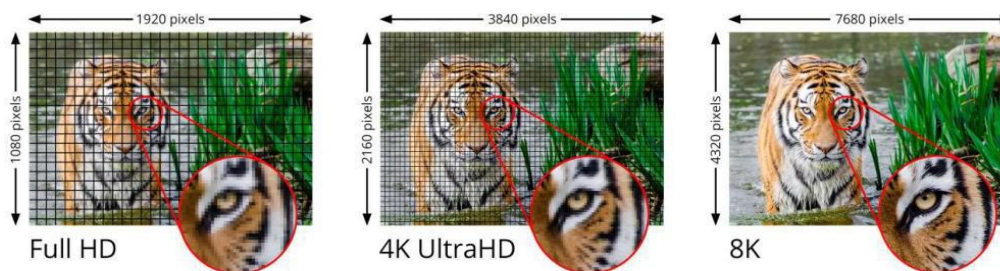
Compared with the previous version of HDMI 1.4, the transmission bandwidth of HDMI 2.0 is greatly improved, with the maximum support of 18gbps, plug and play and hot plug; secondly, it can achieve 4K 60Hz resolution and 50FPS, 60fps frame rate in various image formats;

In terms of audio, it supports up to 32 channels and up to 1536khz sampling rate; transmits dual video streams to let different users watch different videos on the same screen; transmits multiple audio streams to multiple users (up to 4); supports wide-angle movies to provide a new experience of wide-angle 21:9 aspect ratio; supports dynamic automatic audio-visual synchronization.

Compared with HDMI 2.0, the latest HDMI 2.1 specification has no change in audio channel and sampling rate, but the bandwidth is greatly improved, and the maximum support is 48Gbps; this means that HDMI 2.1 can support a series of higher resolutions and faster refresh frequencies.

The main features of HDMI2.1 include:

1.Higher resolution, faster refresh rate: the new version supports 8K 60Hz, 4K 120Hz, 10K resolution transmission. 8K will bring a immersive viewing experience, with a horizontal and vertical resolution of twice that of 4K and a pixel of four times that of 4K.



2.Dynamic HDR: dynamic HDR can significantly improve the overall quality of video images. Movies and other video content will be able to take advantage of HDR's wider contrast range, higher brightness and detail level. Dynamic HDR can ensure that every scene or even every frame of video will display the ideal values of depth of field, detail, brightness, contrast and a wider color range.

3. eARC: eARC simplifies connectivity, makes it easier to use, and supports the most advanced audio formats and the highest audio quality. eARC supports state-of-the-art audio formats such as object-based audio, uncompressed 5.1 and 7.1, and 32 channels of uncompressed audio. Object-based audio provides an immersive stereo experience with enhanced audio detail and bit depth.

4. Enhanced refresh rate: ensures smooth and seamless movement and conversion of games, movies and video footage.

5. Variable Refresh Rate (VRR): The variable refresh rate reduces the frequency and display synchronization by continuously changing the refresh rate on a frame-by-frame basis, eliminating hysteresis, jamming and tearing of the picture, resulting in smoother, more detailed details. Game experience.

6. Fast Media Switching (QMS): A fast media switching (QMS) source device can instantly switch the resolution or frame rate of its content without any display interruption, such as switching between 60fps and 24fps video. A QMS-capable display can instantly change the refresh rate; switch the resolution; use the correct viewing mode. The delay that can cause a black screen can be eliminated before the content is displayed.

7. Automatic Low Latency Mode (ALLM): Auto Low Latency mode automatically sets the ideal delay settings for smooth, hysteresis-free and uninterrupted viewing and interaction.

8. Fast frame transmission (QFT): the transmission speed of each video frame from the source is faster, even if the frame rate of the source has not been increased, so as to reduce the delay, which can reduce the delay of the game and real-time interactive virtual reality, so that the game and the implementation of interactive virtual reality have no delay and are smoother.

The following table shows the HDMI2.0 and HDMI 2.1 function support tables.

HDMI version	2.0	2.1	Remarks
Maximum bandwidth (Gbps)	18	48	
Maximum LPCM audio channel	32Channel	32Channel	
Maximum color depth	48	48	
Other functions			
SD: Rec. 601 (YCbCr)	√	√	
HD: Rec. 709 (sRGB)	√	√	
xvYCC	√	√	
Rec. 2020	√	√	
8-channel LPCM, 192Khz, 24bit audio transmission	√	√	
Blu-ray Dsc video audio full resolution support	√	√	
Consumer electronics control (CEC)	√	√	
DVD Audio	√	√	
Super Audio CD (DSD) support	√	√	
Deep Color Color depth technology	√	√	
Automatic sound and picture synchronization	√	√	
Doby TrueHD Audio	√	√	

DTS-HD Master Audio Audio	√	√	
Ethernet communication	√	√	
Audio Return Channel	√	√	
HDMI 3D Function	√	√	
Static HDR	√	√	
Dynamic HDR	×	√	
HDCP (1.4/2.2)	√	√	
eARC	×	√	
VRR	×	√	
QMS	×	√	
QFT	×	√	
ALLM	×	√	
VESA DSC 1.2a	×	√	

Format number rate change table

Resolution/fps	Chroma	Color Bit Depth	Eff Data Rate	Speed
UHD 4k/24-30p	4:2:2	8, 10 or 12	8.91Gbps	High Speed
	4:4:4/RGB	8	8.91Gbps	High Speed
	4:4:4/RGB	10	11.14Gbps	Premium
	4:4:4/RGB	12	13.37Gbps	Premium
	4:2:0	8	8.91Gbps	Premium
	4:2:0	10	11.14Gbps	Premium
		12	13.37Gbps	Premium

UHD 4k/48-60p	4:2:2	8, 10 or 12	17.82Gbps	Premium
	4:4:4/RGB	8	17.82Gbps	Premium
	4:4:4/RGB	10	20.05Gbps	Ultra High
	4:4:4/RGB	12	24.06Gbps	Ultra High
UHD 4k/100-120p	4:2:2	8, 10 or 12	32.08Gbps	Ultra High
	4:4:4/RGB	8	32.08Gbps	Ultra High
	4:4:4/RGB	10HDR	40.1Gbps	Ultra High
	4:4:4/RGB	12	48.11Gbps	Ultra High
5K/24-30p	4:2:2	8, 10 or 12	11.88Gbps	Premium
	4:4:4/RGB	8	11.88Gbps	Premium
	4:4:4/RGB	10	14.85Gbps	Premium
	4:4:4/RGB	12	17.82Gbps	Premium
5K/48-60p	4:2:2	8, 10 or 12	20.05Gbps	Ultra High
	4:4:4/RGB	8	20.05Gbps	Ultra High
	4:4:4/RGB	10	25.06Gbps	Ultra High
	4:4:4/RGB	12	30.07Gbps	Ultra High
5K/100-120p	4:2:2	8, 10 or 12	40.1Gbps	Ultra High
	4:4:4/RGB	8	40.1Gbps	Ultra High
8K/24-30p	4:2:2	8, 10 or 12	32.08Gbps	Ultra High
	4:4:4/RGB	10	40.1Gbps	Ultra High

	4:4:4/RGB	12	48.11Gbps	Ultra High
8K/48-60p	4:2:0	10	40.1Gbps	Ultra High
10K/24-30p	4:2:2	8, 10 or 12	40.1Gbps	Ultra High

The following table is chromaticity table:

	8-bit	10-bit	12-bit	16-bit
4K 24-60fps	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:0
4K 100 120fps	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:0
5K 24-60fps	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:0
5K 100 120fps	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:0
8K 24-30fps	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:0
8K 48-60fps	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:0
8K 100 120fps	RGB 4:4:4 4:2:2 4:2:0	4:2:2 4:2:0	4:2:2 4:2:0	4:2:0
10K 24 25 30fps	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:0
10K 48 50 60fps	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:2 4:2:0	RGB 4:4:4 4:2:2 4:2:0	4:2:0
10K 100 120fps	4:2:0	4:2:0	4:2:0	-

Formats in RED require Display Stream Compression (DSC)