HDMI

By Group 15

Introduction

HDMI (High-Definition Multimedia Interface) is a proprietary audio/video interface for transmitting uncompressed video data and compressed or uncompressed digital audio data from an HDMI-compliant source device, such as a display controller, to a compatible computer monitor, video projector, digital television, or digital audio device.

HDMI can cut down on the number of cables required to connect components, and it can even reduce the number of remote controls needed to watch a movie.

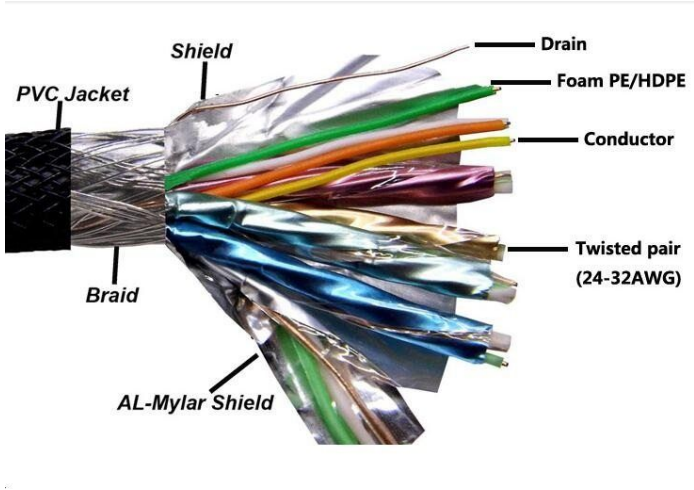
Working

HDMI uses **transition minimized differential signaling (TMDS)** to move information from one place to another. TMDS is a way of encoding the signal to protect it from degrading as it travels down the length of the cable. Here's what happens:

- The sending device, such as an HD-DVD player, encodes the signal to reduce the number of transitions between one (on) and zero (off). Think of each transition as a sharp drop-off -- as the signal travels, this drop-off can begin to wear away, degrading the signal. The encoding step helps protect signal quality by reducing the number of chances for the signal to degrade.

Working

- One of the cables in the twisted pair carries the signal itself. The other carries an inverse copy of the signal.
- The receiving device, such as an HDTV, decodes the signal. It measures the differential, or the difference between the signal and its inverse. It uses this information to compensate for any loss of signal along the way.



Pins

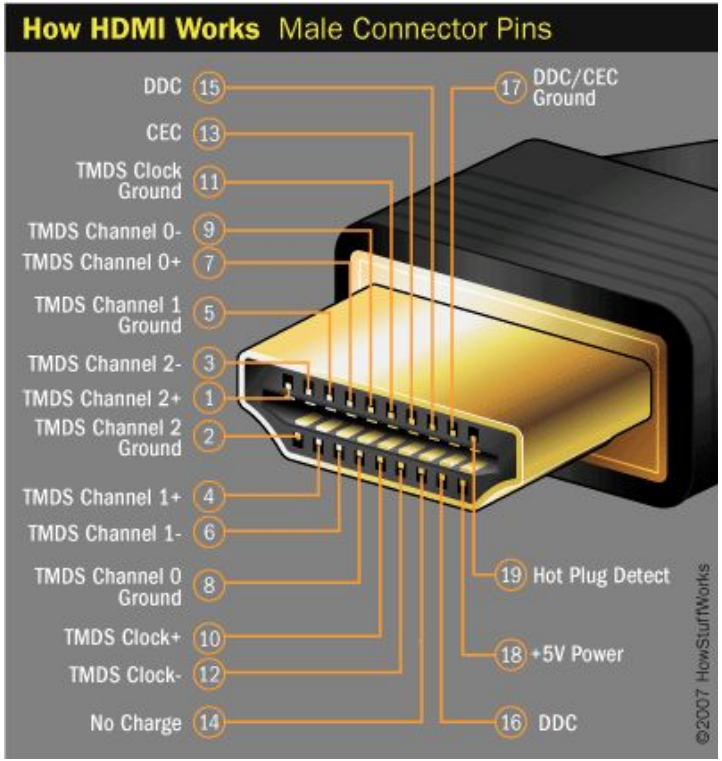
Three audio and video channels travel through two pins each, for a total of six pins.

The TMDS clock, which allows devices to synchronize the incoming data, travels through one pair of pins.

consumer electronics channel (CEC) allows devices to send instructions to one another.

The hot plug detect channel senses when you plug in or unplug a device, re-initializing the HDMI link if necessary.

Display data channel (DDC) carries device information and the HDCP encryption information.



Transition Minimized Differential Signaling

- **Differential Signaling** - The signal is sent over two separate lines, out of phase with each other. When it gets to the other end, the signals are merged back into one, eliminating any static gremlins, which won't have its corresponding out of phase signal on the other line.
- Travels over **Twisted Pairs** - Twisted pairs, rather than coaxial cables actually provide for lower electrical interference. Any interference picked up at a point along the way (say from being too close to an electrical power line) will only get onto one of the wires, allowing it to be eliminated by the differential signaling.

Transition Minimized Differential Signaling (cont.)

- **Low-Voltage Differential Signaling (LVDS)**: The two signals are compared to each other instead of to ground. Thus, signal is unaffected by spurious noise that gets onto one of the lines, making "ground" not really be ground; it's going to be compared to the other anyway. The comparing circuitry is just going to look for differences between highs and lows.
- **DC balanced**: There should be as many bits that are ones as there are zeroes. DC balancing reduces the "charge" on the line, which resists further changes from ones to zeros.
- **Transition Minimized**: The number of transitions from one to zero is reduced, making the likelihood of data loss by a transition being slow from the "ramp up" from zero to one.

Transition Minimized Differential Signaling (cont.)