

# Differences Between DVI Connectors and Signals

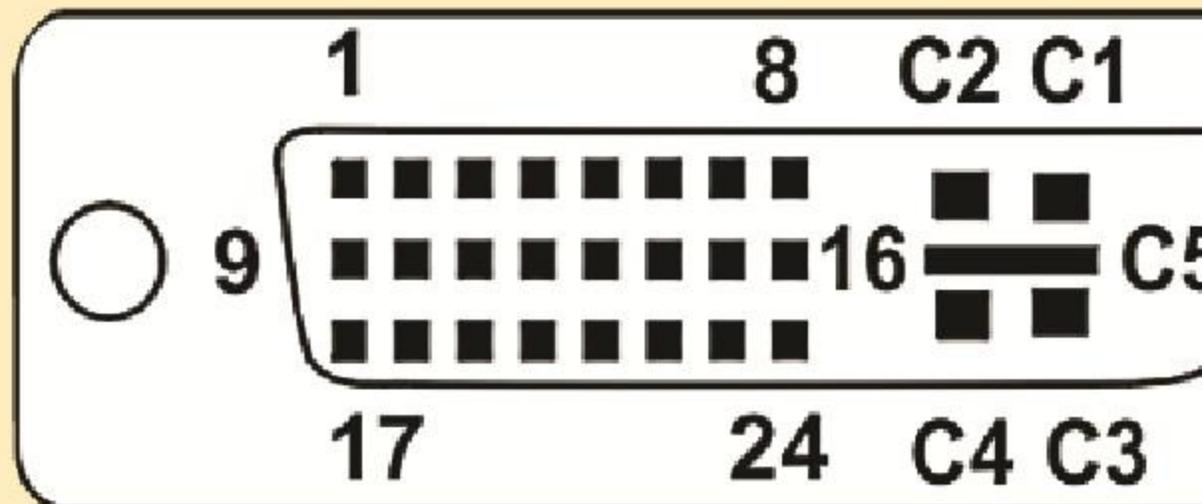
DVI connectors come in three types: DVI-A (analog), DVI-D (digital) and DVI-I (integrated; analog and digital). Both DVI-I and DVI-D connectors have two distinct data rates, also known as single-link and dual-link. Each link type has a maximum allowed data rate that ensures data is not corrupted when transferred from the video card to the monitor.

DVI uses Transition Minimized Differential Signaling (TMDS) to transmit data over one twisted wire pair. A single-link DVI connector consists of four TMDS links. Three of the four links correspond to the red, green, and blue RGB video signals, while the fourth is a clock control channel. Single-link connectors operate up to 165MHz and offer 1.65Gbps of bandwidth. They support resolutions up to 1920×1200 at a refresh rate of 60Hz.

Dual-link connections double the number of RGB TMDS pairs – excluding the clock pair – through parallel connections, thus enabling 2Gbps of bandwidth. They support higher resolutions up to 2560×1600 at a refresh rate of 60Hz. Dual-link connectors are fully backwards compatible with single-link operation unless a display mode uses more than 165MHz pixel clock frequency or 24 bits per pixel. In contrast, a single-link connector cannot support dual-link connections at any time; hence a dual-link connection is preferable in most cases.

DVI connection pins are comprised of the following potential components: parts of an 8×3 rectangle pinout supporting TMDS, DDC, analog vertical sync, power, hot plug detection and ground signals (Pin 1-24); 4 analog pins for RGB and horizontal sync (C1-C4); and a long flat pin for analog ground (C5).

# DVI



Mating face of DVI female

PIN#	SIGNAL	PIN#	SIGNAL
1	T.M.D.S DATA 2 -	16	HOT PLUG
2	T.M.D.S DATA 2 +	17	T.M.D.S DATA 1 -
3	T.M.D.S DATA 2/4 SHIELD	18	T.M.D.S DATA 1 +
4	T.M.D.S DATA 4 -	19	T.M.D.S DATA 3 -
5	T.M.D.S DATA 4 +	20	T.M.D.S DATA 3 +
6	DDC CLOCK	21	T.M.D.S DATA 5 -
7	DDC DATA	22	T.M.D.S DATA 5 +
8	ANALOG VERT SYNC	23	T.M.D.S DATA 6 -

DVI-A connectors have 17 (12+5) pins, do not have a dual-link option, and only carry analog signals. These signals are identical to VGA signals but are presented as an altered configuration. A VGA to DVI adapter is necessary to connect a VGA video card to a DVI-A monitor or a DVI-A video card to a VGA monitor. Due to VGA being the dominant connector for analog monitors and DVI as a standard for digital signals, DVI-A connectors are quite rare; instead, DVI-I and DVI-D connectors are more common. DVI-A cables will work with both DVI-A and DVI-I connectors. Male DVI-D cables may fit in a female DVI-A connector, but will not work as they do not carry any analog signals.

DVI-D connectors can only transfer digital video signals. Single-link DVI-D connectors have 19 pins (18+1) and dual-link DVI-D connectors have 25 pins (24+1). DVI-D cables will work with both DVI-D and DVI-I connectors. HDMI and DisplayPort connectors can support DVI-D video signals through an adapter, but DVI-D cannot support the additional features that HDMI and DisplayPort possess, such as integrated audio and CEC control. Most digital monitors have a DVI-D connector, while monitors which support both digital and analog signals usually have a DVI-D and VGA connector. Note that female DVI-D connectors will not accept male DVI-A or DVI-I cables as those connectors have the additional 4 analog pins that DVI-D lacks.

DVI-I single-link connectors have 23 pins (18+5) and dual-link connectors have 29 pins (24+5). DVI-I connectors do not convert analog and digital signals but can accept digital or analog signals – just not both at the same time. If a video card, monitor and cable all have DVI-I connections with the ability to support both analog and digital signals, one mode of operation has to be selected. True to their purpose, DVI-I connectors will work with all three DVI cable types. However, a male DVI-I cable will not fit in a female DVI-D connector due to its additional analog pins. Hence, when considering the rarity of a DVI-A connector, a DVI-D cable is the most commonly applicable out of the three cable types.