

DIGITAL VISUAL INTERFACE

DVI OVERVIEW

DVI (Digital Visual Interface), an uncompressed, digital video interface, was originally developed for the PC industry which was seeking a low-cost, high-bandwidth digital connection between PCs and digital monitors (such as LCDs). DVI is now the most widely used digital display interface in the PC industry and is available on most LCD monitors, as well as many PC display projectors and plasma panels.

The Consumer Electronics Association wrote a specification (EIA/CEA 861) that defines how DVI is used in consumer electronics products for connecting a video source device to a digital television monitor (DTV Monitor)¹. In addition, DVI, when combined with High-bandwidth Digital Content Protection (HDCP) technology, creates a protected digital connection that may be required in the future for viewing some high value digital content on compatible DTV Monitors. This will be the first uncompressed digital interface solution for DTV monitors, providing consumers with digital quality and functionality.

Members of the Cable and Satellite distribution industries are supporting DVI with HDCP as part of their complete digital interface solutions. For example, DVI more easily supports the overlay of high-resolution graphics needed by some electronic program guide navigation and other interactive services. On July 25, 2001, a press release announced that 4 of the 7 major motion picture studios joined the Cable and Satellite industries in endorsing DVI with HDCP. Those in the content community who support DVI with HDCP content protection feel that it provides a protected connection whose video signal cannot be recorded. Cable, Satellite and the content community also agree that IEEE-1394 with DTCIP and other secure interfaces could be provided for certain applications, including home recording and networking².

Release of this document does not constitute an endorsement of this or any particular technology nor a commitment by CEA members to implement it in current or future products.

DVI STANDARDS & SPECIFICATIONS

The Digital Display Working Group – DDWG – originally standardized DVI Version 1.0 on April 2, 1999.

High-bandwidth Digital Content Protection – HDCP – published February 17, 2000.

EIA published EIA/CEA 861 in January 2001.

EIA recently adopted EIA/CEA-861-A creating a clear upgrade path for future versions of DVI.

¹ DTV Monitor refers to a product that conforms to the CEA definition for an HDTV Monitor or EDTV Monitor.

² DirecTV press release dated July 25, 2001: “Satellite and Cable TV Industries Announce Support for DVI (Digital Visual Interface) in New HDTV Set-Top Boxes.”

Q & A

Q1 – What are some important advantages of the DVI Interface over existing analog interfaces such as composite, s-video, or component video interface?

1. DVI with HDCP content protection provides a protected interface which may improve the availability of high value content such as premium high-definition video.
2. DVI supports up to 24-bit digital RGB data for each pixel for the highest image quality
3. For digital display technologies such as LCD, plasma and DLP based displays, DVI enables an all-digital rendering of video without the losses associated with an analog interface.
4. DVI adds the quality and functionality of a digital interface while maintaining the simplicity of supporting uncompressed video formats.

Q2 – Have motion picture studios expressed support for DVI with HDCP?

Short Answer – Yes, 5 of the 7 major motion picture studios have endorsed DVI with HDCP.

A – On January 4, 2001 the first major motion picture studio joined Silicon Image and others in expressing support for DVI with HDCP. On July 25, 2001 four additional major motion picture studios issued a joint press release with DirecTV and others in expressing support for DVI with HDCP.

Q3 – Can I record DVI?

Short Answer – No

A – The DVI interface was designed for connection to a display device not a recording device. Given current consumer level recording technology, the high bandwidth DVI bitstream is not recordable.

Q4 – What is the purpose of HDCP?

A – The presence of HDCP content protection technology provides additional security against recording. According to the HDCP Licensing Agreement, decryption keys may be licensed for display devices, but will not be licensed to companies intending to implement such keys in any type of data or video recorder.

Q5 – Is it a problem that DVI cannot be recorded?

A – DVI was not designed as an input to a recording device. It is optimized for the specific purpose of transporting an uncompressed digital data stream from a digital source device to a digital display. There are other digital interfaces like IEEE-1394 that address other capabilities like networking and recording.

Q6 – What are the most significant differences between DVI and 1394?

A – DVI carries uncompressed video data while 1394 carries compressed video and audio data and control signals.

DVI is a unidirectional point-to-point display interface while 1394 is bi-directional interface designed for connecting multiple devices.

Q7 – What about DTV monitors that don't have DVI inputs?

A – You must have a DVI input to utilize DVI bitstreams.

Q8 – Is there an adapter or converter that can convert from DVI to 1394?

Short Answer – No

A – Because DVI carries uncompressed digital video, and 1394 carries MPEG2 compressed digital video, compression would be the key element of such a converter. However, because MPEG2 HD level compression is highly complex, an adapter to perform such a conversion is not practical and therefore unlikely to be available to consumers in the near future.

Q9 – Is there a way to add a DVI input to my DTV if it does not already have one?

Short Answer – No

A – Because of the level of integration necessary, it would be extremely difficult for anyone other than the manufacturer of the set to design the interface between the DVI input and the video circuitry of the imaging device.

Q10 – What is the history of DVI?

- Digital Display Working Group (DDWG) was formed in 1998 to address the need for a single, universal digital interface standard between a host and a display.
- The group's initial members included Compaq, Fujitsu, Hewlett-Packard, IBM, Intel, NEC, and Silicon Image.
- The DVI specification was based on Silicon Image's TMDS(R) technology.
- The DVI 1.0 specification was released in April 1999.
- DVI was rapidly adopted as the standard PC digital interface, and by November 2001, over 25 million DVI compliant transmitters and receivers were supplied to the PC and display industry.
- The Consumer Electronics Association developed a specification (EIA/CEA 861) in January 2001 that describes how DVI is to be used in a consumer electronics interface.
- The Consumer Electronics Association approved a specification (EIA/CEA 861 A) in November 2001.

Q11 – How Fast is DVI

Short Answer – For HD 1080i, the data rate is 1.78 Gigabits per second (Gb/s)

A – DVI supports a maximum of 24 video bits per pixel at a maximum clock rate of 165MHz. This translates to 3.96 Gigabits per second of pixel data. A 1080i HDTV signal is transmitted over a DVI interface at a rate of 1.78 Gigabits per second.