

IM1 - HDMI 1.4a

This course covers the HDMI multimedia interface

Objectives

- ▶ The course describes the architecture of a HDMI source-cable-sink system.
- ▶ An introduction to Video and Audio standards is done prior to clarifying how this standards are transported through HDMI.
- ▶ The analog interface is studied in detail, particularly the TMDS specification.
- ▶ The course clarifies information coding / decoding schemes.
- ▶ Content protection mechanisms are explained.
- ▶ Ethernet connectivity and audio return channel are also covered.

- ▶ This course has been delivered to several companies developing mobile phone chipsets.

A more detailed course description is available on request at training@ac6-training.com

Prerequisites

- ▶ Experience of a digital bus is recommended.

Plan

First day

INTRODUCTION TO HDMI

- ▶ Digital link between audio / video source and display or video-projector
- ▶ Pinout, source and sink requirements
- ▶ Status exchange through VESA DDC channel
- ▶ Optional HDMI Ethernet and Audio Return Channel (HEAC)
- ▶ Content protection technology
- ▶ Compatibility with Digital Visual Interface [DVI], adapter
- ▶ Mechanical specification, connectors Type A, B, C, D and E
- ▶ Dual link capability
- ▶ Maximum possible bit rates

PHYSICAL LAYER

- ▶ TMDS character time definition
- ▶ Single-ended differential signal, definition of the swing
- ▶ Sink clock recovery
- ▶ Line termination and equalization
- ▶ Source pre-emphasis
- ▶ Source and sink TMDS characteristics, eye diagrams

- ▶ I2C and CEC signal requirements
- ▶ Interface testing (compliance checklist)
- ▶ Lecroy QualiPHY HDMI test solution
- ▶ HEAC physical layer, MLT-3 signaling
- ▶ Simultaneous transmitting ARC and MLT-3 100BASE-TX signals
- ▶ Differential mode and common mode transmission characteristics

SIGNALING AND ENCODING

- ▶ Clock channel, pixel rate
- ▶ Encoder mux
- ▶ Leading and trailing guard bands and preamble
- ▶ TERC4 data coding scheme
- ▶ Video data coding
- ▶ Purpose of auxiliary data
- ▶ Error correction
- ▶ Packet formats

VIDEO STREAMS

- ▶ Video standard basics, SDTV, EDTV, HDTV
- ▶ 3D video format structure
- ▶ 3D transmission video formats
- ▶ Video data coding 24, 30, 36 or 48 bits
- ▶ Video control signals HSYNC, VSYNC
- ▶ Video data decoding
- ▶ Video format timing specification
- ▶ Color depth requirements
- ▶ Gamut-related metadata

Second day

AUDIO STREAMS

- ▶ Audio basics, L-PCM coding, IEC standards
- ▶ Audio sample clock capture and regeneration, N and CTS parameters
- ▶ Using a CEC feedback channel to adjust the clock in the Source device
- ▶ Audio, video synchronization
- ▶ Audio data packetization
- ▶ DST usage
- ▶ HEAC audio return channel

CONTROL AND CONFIGURATION

- ▶ I2C basics
- ▶ The Display Data Channel [DDC] usage during configuration
- ▶ VESA enhanced display data channel standard
- ▶ Physical address discovery algorithm
- ▶ AVI info frame
- ▶ Audio info frame
- ▶ E-EDID data structure
- ▶ CEA extension
- ▶ HDMI vendor-specific data block
- ▶ DVI / HDMI device discrimination
- ▶ Consumer Electronic Control
- ▶ CEC command description, remote control, AV-link protocol
- ▶ HEAC capability discovery and control

- ▶ CDC arbitration
- ▶ Channel states and transitions
- ▶ Activation of an HDMI channel
- ▶ HEC control for adjacent devices
- ▶ Message description
- ▶ Networking using 100BASE-TX
- ▶ Connection to internet via home network
- ▶ Switching, loop detection and removal

CONTENT PROTECTION

- ▶ HDCP specification (DRM)
- ▶ Authentication of devices
- ▶ Computation of shared key
- ▶ Multimedia contents encryption
- ▶ HDCP over HDMI
- ▶ ACP packets

Renseignements pratiques

Durée : 2 jours
Prix : 1970 € HT