IM6 - CSI-3

This course covers the Camera Serial Interface v3 (CSI-3)

Objectives

- The course starts with an overview of MIPI specification.
- Layers are described from bottom to top, starting with M-PHY, then UniPro and at last CSI-3.
- The startup sequence and the procedure to enter / exit Hibernate state are explained.
- Electrical characteristics of M-PHY are studied.
- CSI-3 packet format is described, including both Attributes PDU and CSI-3 packet header.
- The payload of image packet, including YUV, RGB and RAW data is explained, as well as raw data compression algorithms.
- The course also covers the test modes.
- Companies interested in attending this course must adhere to MIPI organization.
- This course has been designed for engineers in charge of SoC architecture, functional verification or silicon validation.

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

Course Environment

- Theoretical course
  - PDF course material (in English) supplemented by a printed version for face-to-face courses.
  - Online courses are dispensed using the Teams video-conferencing system.
  - The trainer answers trainees' questions during the training and provide technical and pedagogical assistance.
- At the start of each session the trainer will interact with the trainees to ensure the course fits their expectations and correct if needed

Target Audience

- Any embedded systems engineer or technician with the above prerequisites.

Course Outline

INTRODUCTION TO MIPI SPECIFICATIONS

M-PHY

- Termination scheme
- Signaling schemes
- Pulse Width Modulation
- M-PHY type I modules
- Control symbols
- PHY state definition
- Transitions between states
- Configuration attributes
- Multilane Operation in UniPro
- Test modes
- Electrical characteristics, eye-diagrams
- Electrical interconnect

- Recommended test functionality
- Test pattern generation and verification
- Optical Media Converter

UNIPRO

- Stack overview
- Level 1 based on M-PHY
- Level 1.5: PHY adapter layer
- Level 2: link layer
- Level 3: network layer
- Level 4: transport layer,
- Device Management Entity
- Test suites

DEVICE DESCRIPTOR BLOCK (DDB)

- The three levels of conformity
- Underlying interconnect requirements
- The four types of Service Primitives: request, indication, response, and confirm
- DDB protocol support for Level 1 and Level 2 services

CAMERA SERIAL INTERFACE (CSI-3)

- Overview of CSI-3
- Reset and boot procedure
- Attribute description
- Implementing virtual channels, pixel channel, notification channel
- Configuration Protocol for Camera, control flow
- CAL, description of attributes
- CSI-3 packet header
- Interleaving the streams
- Image format, RGB, YUV, RAW
- Transmitting an image frame and attribute packets
- Compressing RAW data
- Transporting JPEG images