

## ***iWave Systems Technologies***

# **Video IP Cores & Solutions & Case Study “Image Capture / Display” Based on “WLAN 802.11b/g”**

- **Video IPs List**
- **iWave Image Capture / Display Solution Case study**
  - **Sample Applications**
  - **Block Diagram**
  - **Features**
  - **FPGA Blocks Description**
- **What we offer**

- iW-LCD Interface
- iW-Video Scalar
- iW-Color Space Converter
- iW-Chroma Resampler
- iW-Video DeInterlacer
- iW-Alpha Blender
- iW-Camera Interface
- iW-Video Encoder Interface
- iW-Video Decoder Interface
- iW-Image Rotation

# Few Sample Applications

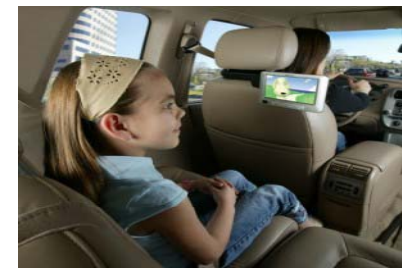
Rear View Camera  
Dash Board Display



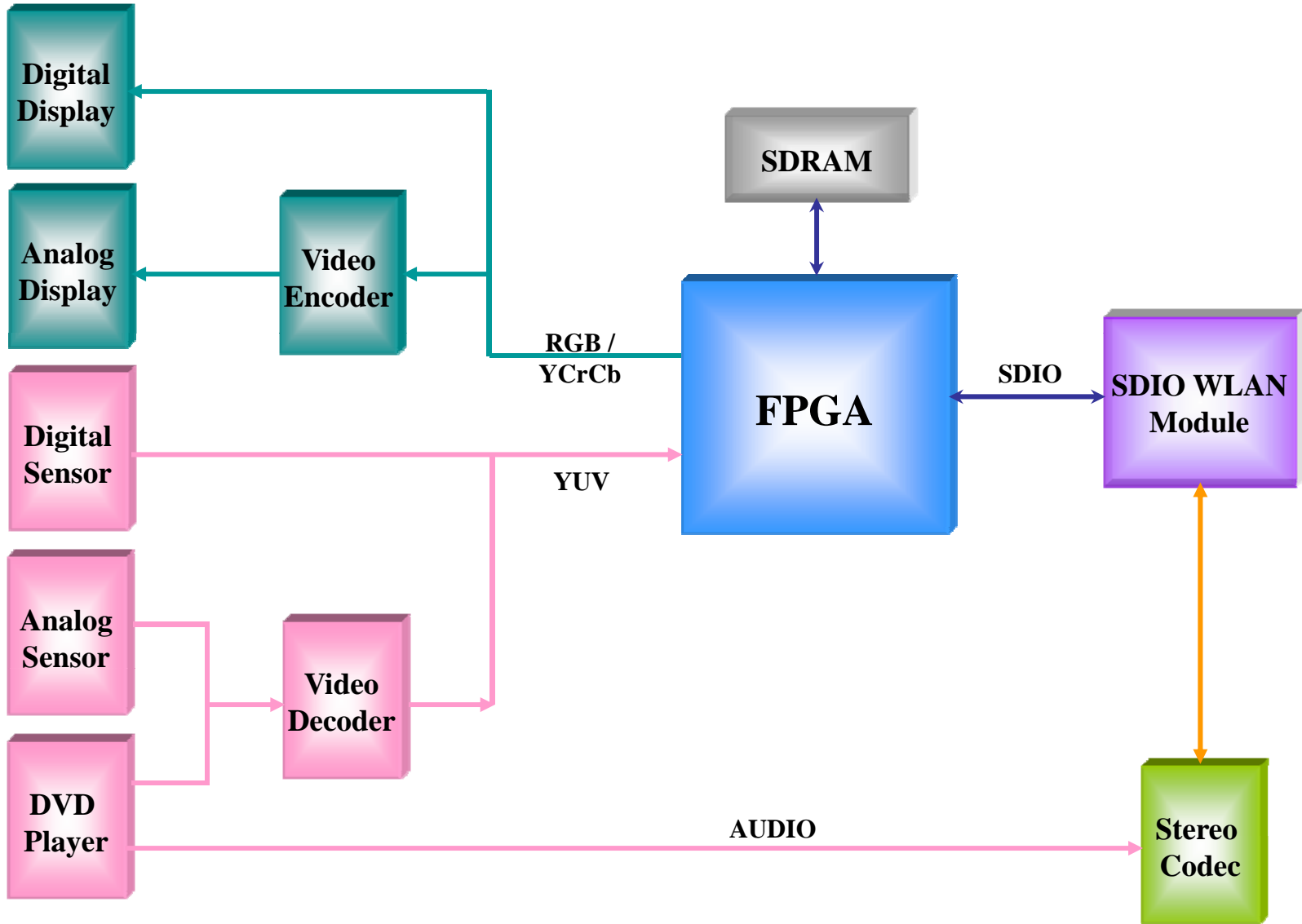
Security Surveillance  
Camera



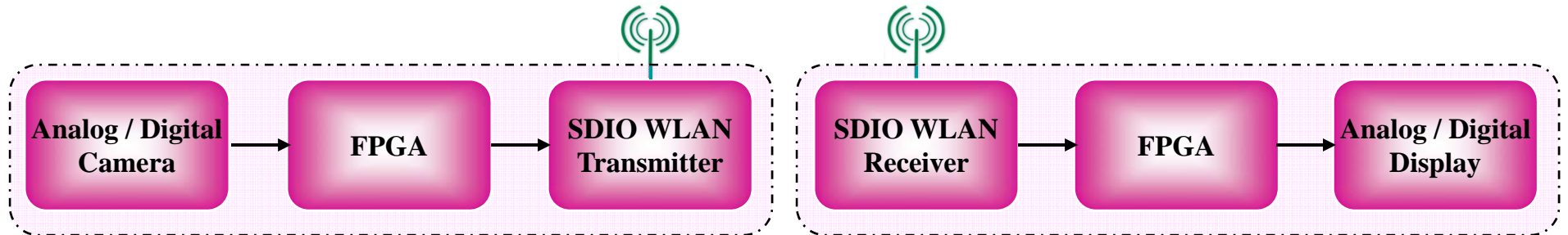
Car Rear Seat  
Entertainment



# Case Study... Block Diagram



## Case Study... Features



- Board takes analog/digital camera input & displays the image on analog/digital LCD
- Camera input to one board & display output from the second board
- WiFi communication using Marvell WiFi 88W8688 Chipset
- SDIO Interface between FPGA & processor, with SDIO controller implemented in FPGA
- JPEG Encoder/Decoder implemented in FPGA
- Audio & single board camera/display loop back option to support DVD player

Cont..

### Camera Transmit Data path :

- Camera interface logic is built in the FPGA.
- The NTSC interlaced analog channel received from Analog Image sensor is digitized by an ADC and sent to FPGA for capture and further processing.

### DVD Player Transmit Data path :

- The DVD Player generates NTSC streams which are digitized by an Analog to Digital Converter.
- ADC converts standard analog baseband television signals compatible with NTSC standards into 4:2:2 component video data compatible with ITU-R BT.601 standard.
- These are then delivered to Camera interface built in the FPGA for capture and further processing.
- The RCA jack used for the Analog Image Sensor is used to incur the NTSC video interface from DVD Player.

Cont..

### **WiFi Interface with Video ADC :**

- ADC converts standard analog baseband television signals compatible with worldwide NTSC into 4:2:2 component video data compatible with the 8-bit ITU-R BT.601 (YCrCb) interface standard.
- NTSC Interlaced Video received from Analog Image sensor or DVD monitor are given to ADC to digitize into YUV formats which is then sent to Camera interface reside in the FPGA.

### **FPGA Interface with Digital Image Sensor :**

- The Digital Image sensors built with integrated ADC generates YUV/RGB signals.
- These are then sent via Camera interface in the FPGA for capture and further processing. The Digital image sensor has an image array capable of operating at up to 60 fps in VGA with complete user control over image quality, formatting and output data transfer.

**Cont..**



### **WiFi Interface with Digital Image Sensor :**

- Digital image sensor supports an image array capable of operating at up to 60 fps in VGA with complete user control over image quality, formatting and output data transfer.

### **WiFi Interface with FPGA :**

- WLAN Module supports a SDIO device that allows a host controller using the SDIO bus protocol to access the WLAN device.
- WLAN Module acts as the device on the SDIO bus. FPGA can access registers of SDIO interface directly and can access the shared memory in the device.

### **FPGA Interface with SDRAM :**

- The SDRAM is used for the Frame buffering in FPGA.
- The device is configured in 1 meg x 32 x 4 banks.
- Supports 12 rows (A0-A11) and 8 column addressing (A0-A7). It is available with CAS latency 3 with 143 MHz clock frequency.

**Cont..**

### **FPGA Interface with Digital Display :**

- The LCD Controller in the FPGA supports RGB 8:8:8, RGB 6:6:6, RGB 5:6:5, RGB 5:5:5 and RGB 4:4:4 data formats.
- Connector is used for the module electronic interface.

### **WiFi Interface with Video DAC :**

- The DAC provides the support for composite (CVBS) analog outputs in standard-definition (SD) format.

### **WiFi Interface with Stereo CODEC :**

- Low power audio codec offers a combination of high quality audio and advanced features for digital audio applications.
- Has three flexible stereo analog input channels which can be configured as line inputs, differential microphone inputs or single ended microphone inputs.

**Cont..**

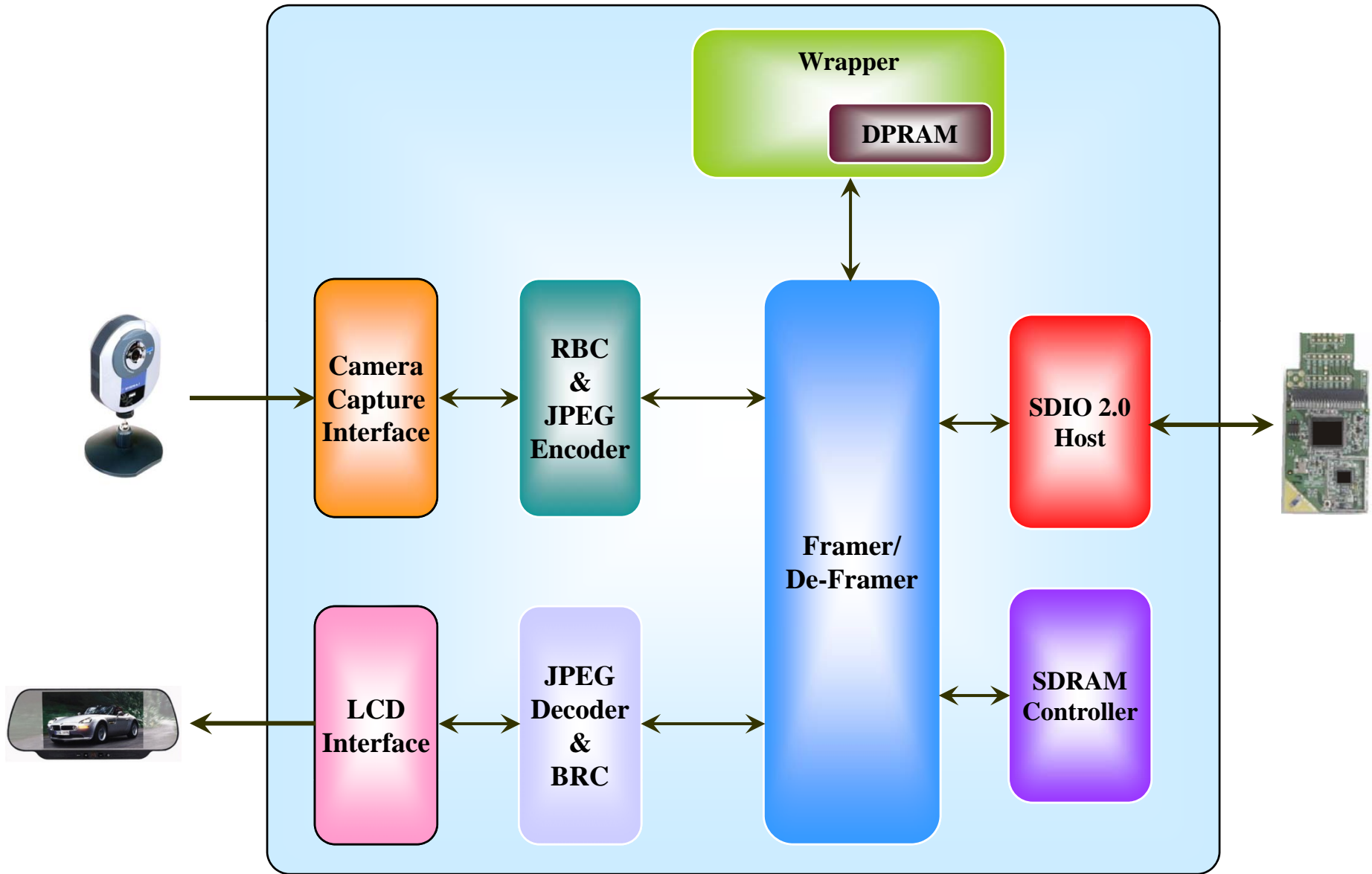
### **WiFi Interface with DVD Player :**

- WiFi UART is supported to control the DVD Player.
- A Standard D-sub 9 female connector is provided on the board.
- The WiFi UART TXD for Transmit, RXD for Receive, RTS and CTS lines for hardware flow control were supported.

### **Analog Display Receiver Data path :**

- The LCD controller in the FPGA supports 16 bit YCrCb/RGB 8:8:8 formats.
- The DAC accepts 16 Bit YCrCb data received from FPGA and converts into Composite (CVBS) analog output. This will be sent to DVD Monitor to visualize the image.
- The RCA connector used for the CRT monitor will be used to interconnect DVD monitor.

# FPGA – Block Diagram



- **Camera Capture Interface**

Interfaces to a camera sensor and captures data.

- **LCD Interface**

The logic required to drive an LCD to display the image. Also the color conversion and image scaling features.

- **JPEG Encoder (includes Raster-to-Block Converter)**

A high-performance image encoder (*licensed from 3<sup>rd</sup> party*) that complies with baseline ISO/IEC 10918-1 JPEG standard.

- **JPEG Decoder (includes Block-to-Raster Converter)**

An image or video decoder (*licensed from 3<sup>rd</sup> party*) that complies with baseline ISO/IEC 10918-1 JPEG standard.

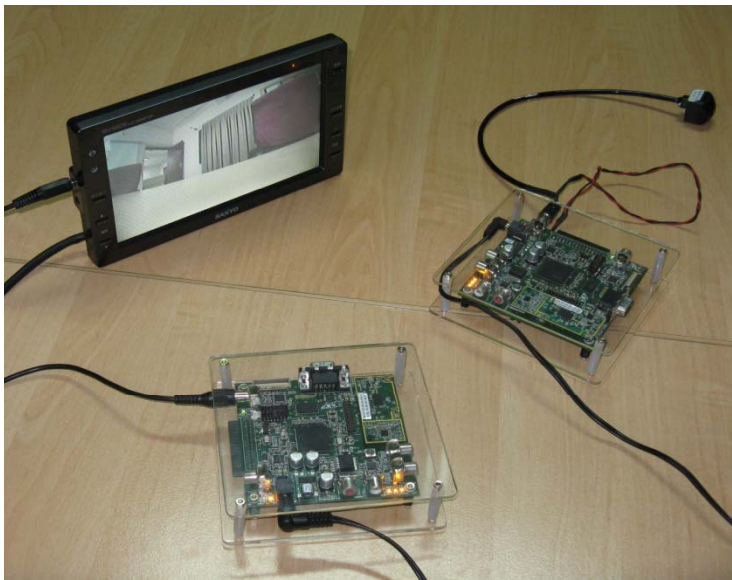
- **SDIO Host Controller**

The SDIO host to initiate a command/data send and receive response/data between the WLAN module and the imaging module.

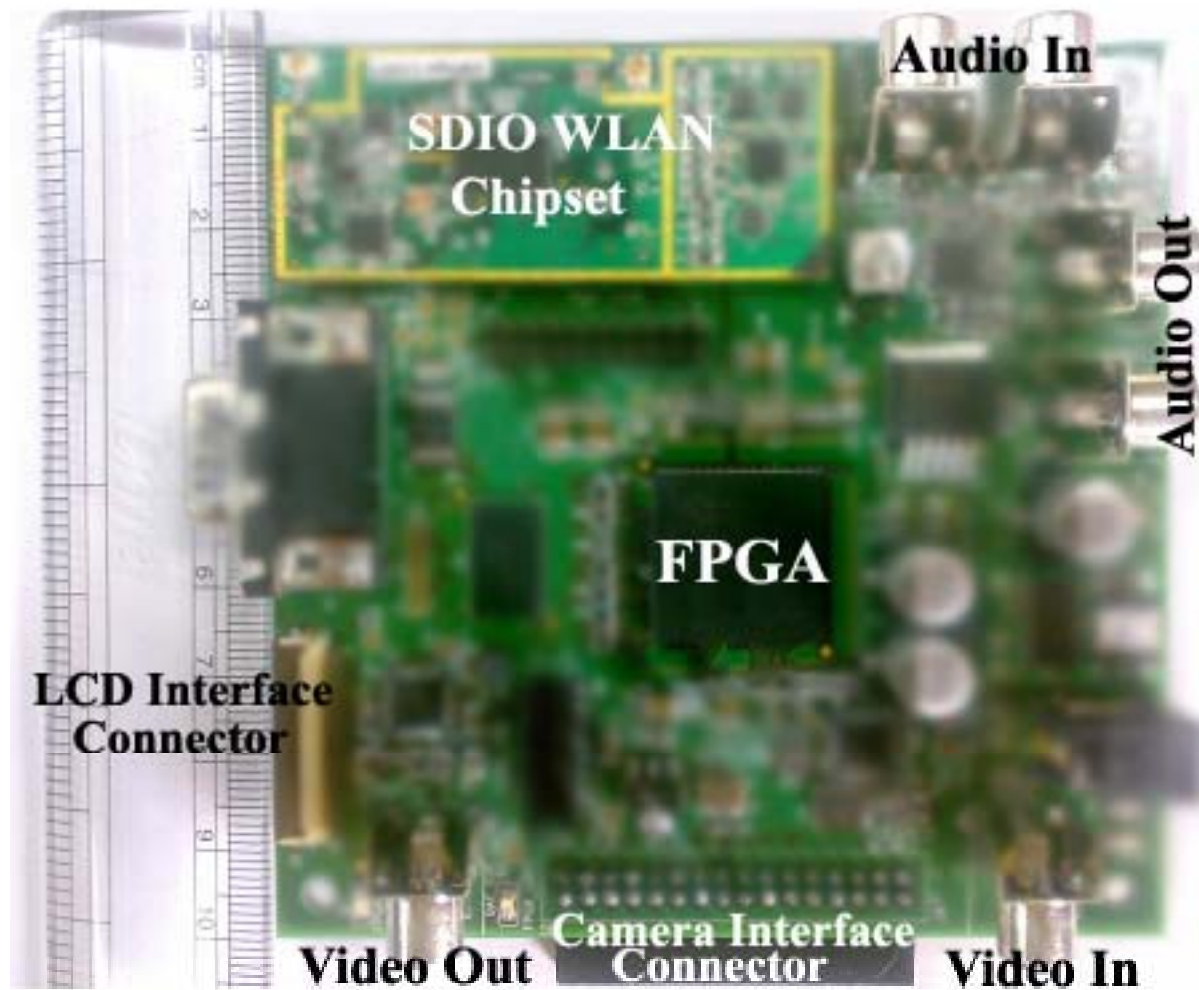
- **SDRAM Controller**

Image buffer read/write from/to the SDRAM.

# Setup - Image

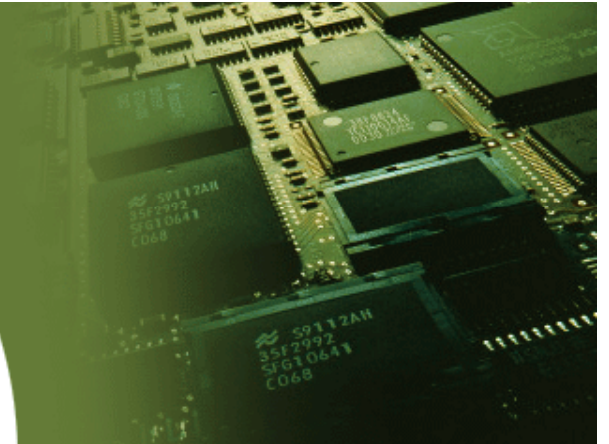


## Single Board - Image



- **Image Capture / Display Turnkey solution**
  - **Using iWave's Comprehensive, Proven, FPGA IPs**
  - **Total System Design, Ready to manufacture**
  - **High performance / Optimized BOM**
  - **Customization services for the Board, FPGA and Embedded Software**





***Thank You***

**For further info. : [mktg@iwavesystems.com](mailto:mktg@iwavesystems.com)**