



# **SYS644X-xx-P1**

## **Hardware Reference Manual**

**001692 Rev B**

**27 August, 2014**

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## Revision History

Revision	Date	Description	Author
A	30/May/2013	Initial Release	Sujith K J
B	27/August/2014	Updated trademark and product attribution statements along with register and trademark symbols for Qualcomm Snapdragon & Adreno	Kavitha R

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Function	Position	Name	Date
Checked By	Project Engineer	Sujith K J	27/August/2014
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# Preface

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This Hardware Reference Manual explains about hardware, software, mechanical specifications of SYS644X system.

## Intended Audience

This document is intended for technically qualified personnel. It is not intended for general audiences.

## Intended Use

All Inforce boards are evaluated as Information Technology Equipment (I.T.E.) for use in personal computers (PC) for installation in homes, offices, schools, computer rooms, and similar locations. The suitability of this product for other PC or embedded non-PC applications or other environments, such as medical, industrial, alarm systems, test equipment, etc. may not be supported without further evaluation by Inforce Computing.

## Document Organization

The chapters in this document are arranged as follows:

1. Scope
2. Overview
3. Terms and Abbreviations
4. Conventions
5. References
6. Hardware specification
7. Software specification
8. Mechanical specification
9. PCB Specification
10. Appendix
11. Company contact information

## Conventions

The following conventions are used in this document:



### CAUTION

Cautions warn the user about how to prevent damage to hardware or loss of data.



### NOTE

Notes call attention to important information.

## REFERENCES

1. [Qseven-Spec\\_2.0](#)

### Note

This document is subject to change without notice.

### Support Information

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# Terminology

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The table below gives descriptions to some common terms used in the User Guide.

<b>Term</b>	<b>Description</b>
ANC	Active Noise Cancellation
CSI	Camera Serial Interface
CSTN	Color Super-Twisted Nematic
DAC	Digital to Analog Converter
DSI	Display Serial Interface
DDR	Double Data Rate
eMMC	Embedded MultiMedia Card
ESD	Electrostatic discharge
FIFO	First In First Out
GbE	Gigabit Ethernet
GNSS	Global Navigation Satellite System
GPS	Global Positioning system
GPU	Graphical Processing Unit
HD	High Definition
HDMI	High Definition Multimedia Interface
I2C	Inter Integrated Circuit
IR	Infrared
JTAG	Joint Test Action Group
LED	Light Emitting Diode
LTPS	Low-temperature Polycrystalline Silicon
LVDS	Low Voltage Differential Signaling
MAC	Media Access Control
MIPI	Mobile Industry Processor Interface
NFC	Near Field Communication
OLED	Organic Light Emitting Diode
OS	Operating System
OTG	On The Go
PCIe	Peripheral Component Interconnect Express
S/PDIF	Sony/Philips Digital Interconnect Format
SATA	Serial Advanced Technology Attachment
SDIO	Secured Data Input/output
SIM	Subscriber identity module
SDC	Secure Digital Controller
SPI	Serial Peripheral Interface
TFT	Thin Film Transistor
TSIF	Transport Stream Interface
UART	Universal Asynchronous Receiver Transmitter

UIM	User Identity Module
USB	Universal Serial Bus

# Table of Content

---

<b>1 OVERVIEW</b> .....	<b>2</b>
<b>2 HARDWARE SPECIFICATION</b> .....	<b>3</b>
2.1 ARCHITECTURE .....	3
2.1.1 SYSTEM OVERVIEW .....	3
2.1.2 QUALCOMM PROCESSOR APQ8064 .....	4
2.1.3 DDR3 INTERFACE .....	6
2.1.4 EMMC INTERFACE .....	6
2.1.5 DISPLAY INTERFACES .....	7
2.1.6 X1 PCIE INTERFACE .....	13
2.1.7 MINI PCIE/MSATA INTERFACE.....	13
<b>3 ELECTRICAL SPECIFICATION</b> .....	<b>23</b>
3.1 OVERVIEW.....	23
3.2 POWER SEQUENCING AND MANAGEMENT .....	23
3.3 CPU POWER SEQUENCING REQUIREMENT.....	23
3.4 POWER CONSUMPTION .....	24
3.5 CLOCK SCHEME .....	24
3.5.1 PCIE REF CLOCK .....	25
3.5.2 SATA REF CLOCK .....	25
3.6 RESET .....	26
3.6.1 OVERVIEW .....	26
<b>4 MECHANICAL SPECIFICATION</b> .....	<b>27</b>
4.1 CPU BOARD DIMENSIONS .....	27
4.2 CARRIER BOARD DIMENSIONS .....	28
<b>5 SOFTWARE SPECIFICATION</b> .....	<b>29</b>
5.1 OPERATING SYSTEM.....	29
<b>6 PCB SPECIFICATION</b> .....	<b>30</b>
6.1 FLOOR PLAN - CARRIER CARD .....	30
6.2 FLOOR PLAN - Q7 MODULE.....	32
<b>7 APPENDIX A</b> .....	<b>34</b>
7.1 LVDS HEADER PIN OUT .....	34
7.2 MIPI DISPLAY PIN OUT .....	35
7.3 PRIMARY CAMERA PIN OUT .....	36
7.4 SECONDARY CAMERA PIN OUT .....	37
7.5 NFC PIN OUT .....	38
7.6 QUAD MIC HEADER .....	38
7.7 JTAG PIN OUT .....	39
7.8 FRONT PANEL AUDIO HEADER .....	39
7.9 FRONT PANEL POWER AND RESET HEADER .....	40

7.10 EDUCATION CONNECTOR PIN OUT ..... 40

7.11 SENSOR HEADER AND CONNECTORS ..... 41

    7.11.1 GEN6 SENSOR MODULE HEADER ..... 41

    7.11.2 PLCC SOCKET ..... 42

    7.11.3 SPI HEADER ..... 42

7.12 TSIF/SPDIF HEADER ..... 43

7.13 EXPANSION CONNECTOR..... 45

7.14 ANTENNA CABLE LOCATION ..... 48

**8 APPENDIX B ..... 49**

    8.1 IFC6400 - HIGH LEVEL BOM ..... 49

    8.2 IOC6440 - HIGH LEVEL BOM..... 50

**9 CONTACT INFORMATION ..... 52**

## Table of Figure

---

Figure 1: Block Diagram.....	3
Figure 2: DDR3 Configuration .....	6
Figure 3: eMMC .....	6
Figure 4: LVDS Connector .....	8
Figure 5: HDMI Interface.....	9
Figure 6: MIPI DSI .....	9
Figure 7: Display Adapter board with LCD (3D CAD images).....	10
Figure 8: MIPI CSI .....	11
Figure 9: Camera Module .....	11
Figure 10: PCIe Block Diagram.....	12
Figure 11: Gigabit Ethernet Transceiver Interface.....	12
Figure 12: x1 PCIe interface.....	13
Figure 13: mSATA/mini PCIe Interface .....	13
Figure 14: Audio Implementation .....	14
Figure 15: Audio Power Amplifier.....	14
Figure 16: ANC headset.....	15
Figure 17: 2.1.7.4 QUAD MIC .....	15
Figure 18: Front panel Audio header.....	15
Figure 19: SD Card Interface .....	16
Figure 20: USB Interface.....	16
Figure 21: SATA Interface.....	17
Figure 22: UART Interface .....	18
Figure 23: Education Connector.....	18
Figure 24: Sensor implementation.....	18
Figure 25: I2C Scheme .....	19
Figure 26: UIM Interface .....	20
Figure 27: NFC .....	20
Figure 28: GPS Implementation.....	21
Figure 29: WIFI and Bluetooth Implementation .....	21
Figure 30: FRONT PANEL HEADER .....	22
Figure 31: Clock scheme .....	24
Figure 32: Reset Scheme .....	26
Figure 33: Q7 Mechanical Dimensions.....	27
Figure 34: mini ITX Mechanical Dimensions .....	28
Figure 35: Carrier - Floor Plan (Top) .....	30
Figure 36: Carrier - Floor plan (Bottom) .....	31
Figure 37: Q7 - Floor plan (Top).....	32
Figure 38: Q7 - Floor plan (Bottom).....	33

# Table of Table

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Table 1: SYS644x Board overview.....	2
Table 2: USB port mapping.....	17
Table 3: Major Clock Signals.....	25

# SCOPE

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This document describes the electrical, mechanical and functional specification of Qualcomm APQ8064 based SYS644X system which includes both carrier and Q7 module.

# 1 OVERVIEW

Below Table presents a brief overview of SYS644X board

**Table 1: SYS644x Board overview**

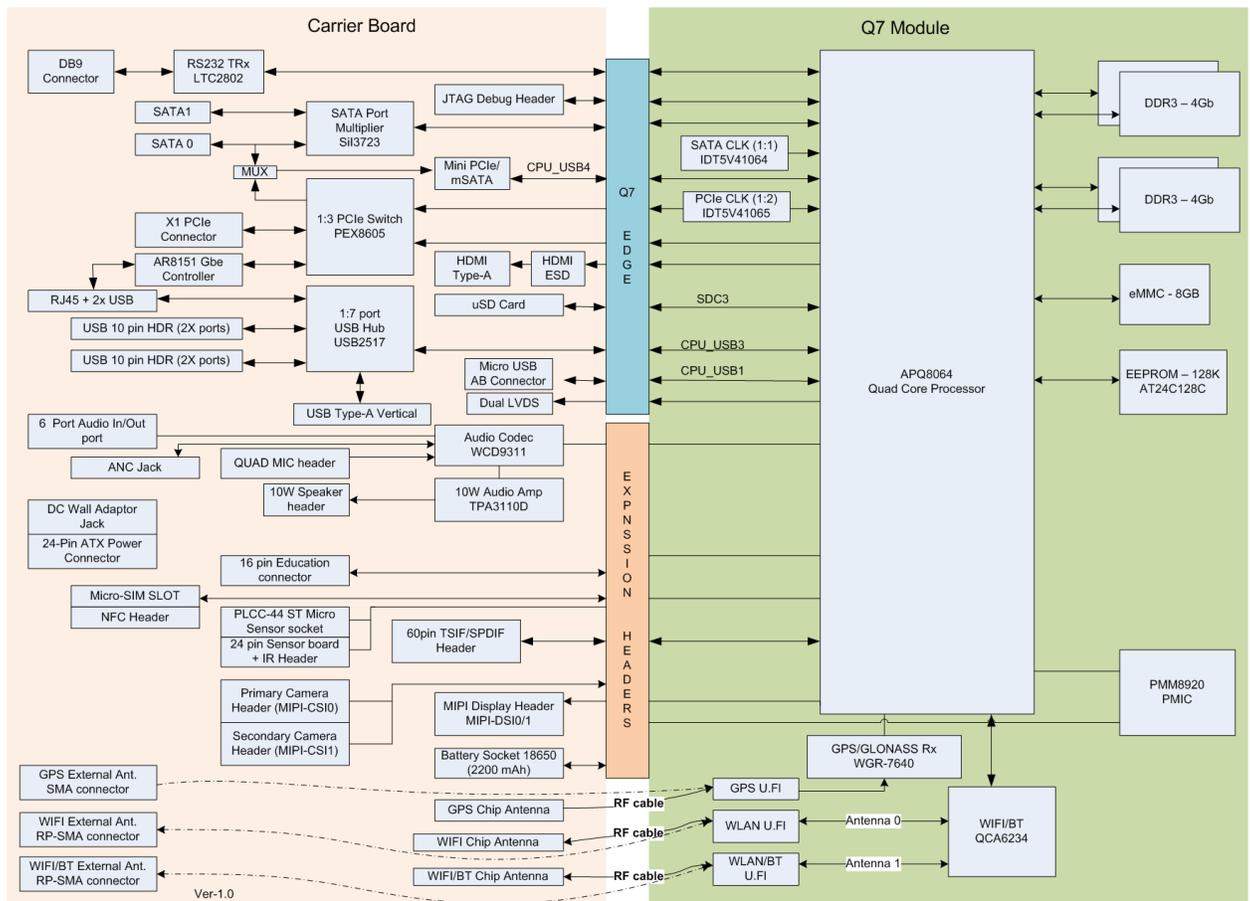
<b>Processor and Peripherals</b>	
Processor	Qualcomm® Snapdragon™ APQ8064 [23mmx23mm package]
<b>Memory Devices</b>	
Main Memory	2GB onboard DDR3
eMMC	4GB (expandable up to 64GB)
<b>I/O interfaces</b>	
I/O Connectors	3 x USB 2.0, 1 Gig LAN port, DC Power Jack, 2x SATA, HDMI, 2x MIPI CSI, Audio/Mic Jack, Micro SIM Slot, 10W Speaker, mSATA/Mini PCIe
I/O Expansion Card	1 PCIe x1, uSD card
On Board Headers	LVDS with backlight, 4x USB 2.0, Quad Mic, NFC, MIPI Display, TSIF, SPDIF, Sensor.
Others	
<b>Form Factor</b>	
Mechanical form factor	IOC644x Mini-ITX (17cm x 17cm ) IFC6400 Qseven Spec v2.0 (70mm x 70mm)
<b>Power</b>	
Power Input	5V DC input, ATX 24 Pin
<b>Others</b>	
Temperature Specification	Commercial

# 2 HARDWARE SPECIFICATION

## 2.1 ARCHITECTURE

The functional diagram of both carrier and Q7 module is shown below

**Figure 1: Block Diagram**



### 2.1.1 SYSTEM OVERVIEW

This system is based on Qualcomm quad-core APQ8064 and Power management chip PMM8920. This has mainly 2 boards: Carrier and Q7 modules. This gives the flexibility for the future expansion. In addition to this, it contains Peripherals like Display adapter board, Camera module, Battery, DC power adapter, sensor module etc.

### 2.1.1.1 FEATURES

- Q7 and carrier architecture for future expansion.
- eMMC booting. 4GB (Supports up to 64GB)
- Micro SD card.
- Power options: DC Jack, micro USB, and ATX supply
- Battery backup ( 2200mAh)
- Display : MIPI (Primary), HDMI and dual LVDS support
- Camera: primary and secondary camera using MIPI interface
- Giga bit Ethernet LAN port
- USB: 3x Type Connector, 1x micro USB and 4x on header
- X1 PCIe card slot.
- Mini PCIe / mSATA connector
- AUDIO: 5.1 Port and 10W speaker out, ANC, Quad mic support
- TSIF and SPDIF
- Sensor cards using custom board and PLCC socket.
- GPS
- Dual stream dual band WIFI
- Bluetooth
- X2 SATA
- NFC ( Near field communication)
- UIM
- Debug interfaces: JTAG, UART

### 2.1.2 QUALCOMM PROCESSOR APQ8064

The quad-core APQ8064 will be designed to meet the performance requirements of the next generation of computing and entertainment devices while minimizing power consumption. The Snapdragon Quad-core Processor APQ8064 is the next-generation Snapdragon CPU. The new processor micro-architecture, in the next-generation Snapdragon will redefine performance for the industry, offering speeds of up to 2.5GHz per core and delivering 150 percent higher overall performance, as well as 65 percent lower power than currently available ARM-based CPU cores. This chipset includes a new Qualcomm® Adreno™ GPU series with up to four 3D cores. The chipset integrates a quad-combo of connectivity solutions — WiFi, GPS, Bluetooth and FM — and include support for near field communication (NFC), as well as stereoscopic 3D (S3D) video and photo capture and playback. Support for every major operating system, across all tiers of products, comes standard on all Snapdragon chipsets.

#### 2.1.2.1 FEATURES OF PROCESSOR

- APQ8064 S4 Pro Processor, Quad-Core,1.7GHz
- 2-wide instruction decode and in-order execution
- 2MB L2 Cache

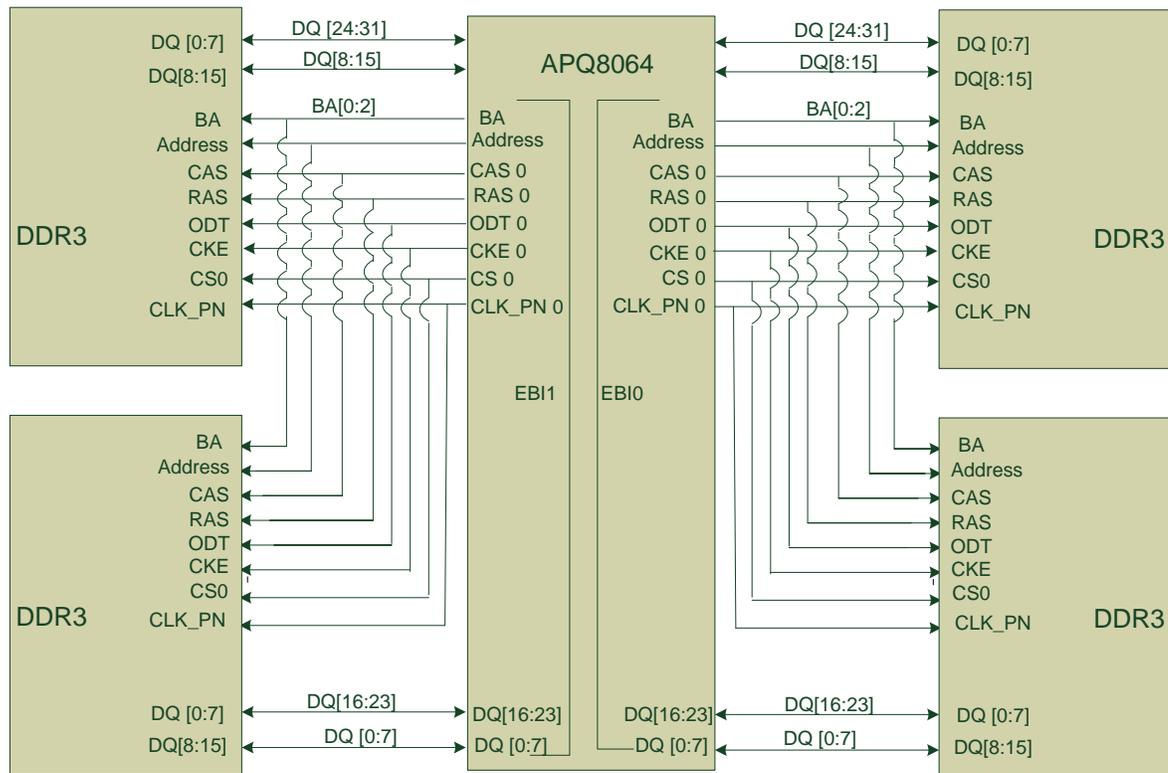
## 2.1.2.2 PROCESSOR INTERFACE

- X3 USB
- SATA (Serial Peripheral Interface)
- PCI Express x1
- UART
- UIM interface (User identity module)
- SDCC (Secure digital card controller)
- I2C (Inter-integrated circuit)
- SPI (Serial peripheral interface)
- PCM (Pulse code modulation) port
- TSIF (Transport stream interface)
- I2S
- Slimbus
- Dual Channel x32 dual rank DDR3 Interface
- Dual LVDS
- HDMI
- MIPI - CSI
- MIPI - DSI
- GPS
- JTAG

### 2.1.3 DDR3 INTERFACE

- Dual Channel DDR3 memory controller with 32-bit data bus.
- Supports DDR3 533 MHz data rates.
- Configured as single rank.
- Total memory size is 2 GB. 1GB under each DDR3 controller.

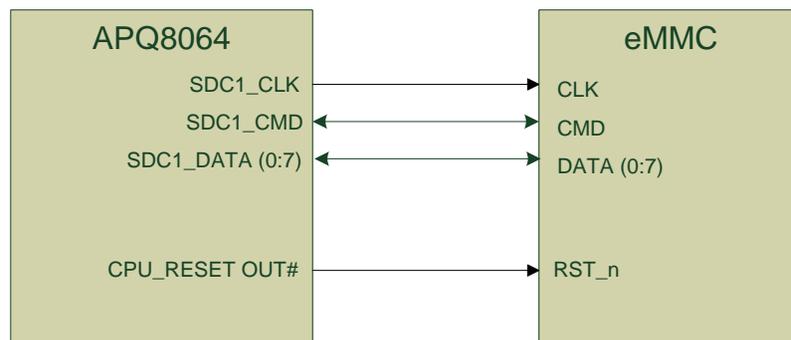
Figure 2: DDR3 Configuration



### 2.1.4 EMMC INTERFACE

eMMC is interfaced to the CPU via SDC1 interface. This is the default primary boot location. It can support up to 64GB. Default stuffed memory size is 4GB.

Figure 3: eMMC



## 2.1.5 DISPLAY INTERFACES

SYS6440 supports the following interface for Display, of which two displays can be used concurrently.

- Dual LVDS
- HDMI
- MIPI – DSI (0/1)

Below given is the display capability of APQ8064

### Dual Display configurations:

Primary MIPI (Up to WQXGA (2048 × 1536), 24 bpp, 60 Hz refresh) + Secondary MIPI (Up to QHD (960 × 540), 24 bpp, 60 Hz refresh) - > **Independent content on both displays** Primary MIPI (Up to WQXGA (2048 × 1536), 24 bpp, 60 Hz refresh) + HDMI (1080p, 60 Hz refresh) - > **GUI on Primary + Video, TVout on HDMI** Primary LVDS (Up to WQXGA (2048 × 1536), 24 bpp, 60 Hz refresh) + Secondary MIPI (Up to QHD (960 × 540), 24 bpp, 60 Hz refresh) - > **Independent content on both displays** Primary LVDS (Up to WQXGA (2048 × 1536), 24 bpp, 60 Hz refresh) + HDMI (1080p, 60 Hz refresh) - > **GUI on Primary + Video, TVout on HDMI**

### Tertiary Display configurations:

Primary MIPI (Up to WQXGA (2048 × 1536), 24 bpp, 60 Hz refresh) + Secondary MIPI (Up to QHD (960 × 540), 24 bpp, 60 Hz refresh) + HDMI (1080p, 60 Hz refresh) - > **Independent content on both displays + Video, TVout on HDMI** Primary LVDS (Up to WQXGA (2048 × 1536), 24 bpp, 60 Hz refresh) + Secondary MIPI (Up to QHD (960 × 540), 24 bpp, 60 Hz refresh) + HDMI (1080p, 60 Hz refresh) - > **Independent content on both displays + Video, TVout on HDMI**

### 2.1.5.1 DUAL LVDS INTERFACE

The Qualcomm APQ8064 supports a Dual Low-Voltage Differential Signalling interface that allows the Graphics and Video adaptor to communicate directly to an onboard flat-panel display. The LVDS interface supports maximum resolution up to WQXGA 2560 x 1600; dual channel. The processor does provide LVDS backlight control related signal in order to support LVDS panel backlight adjustment.

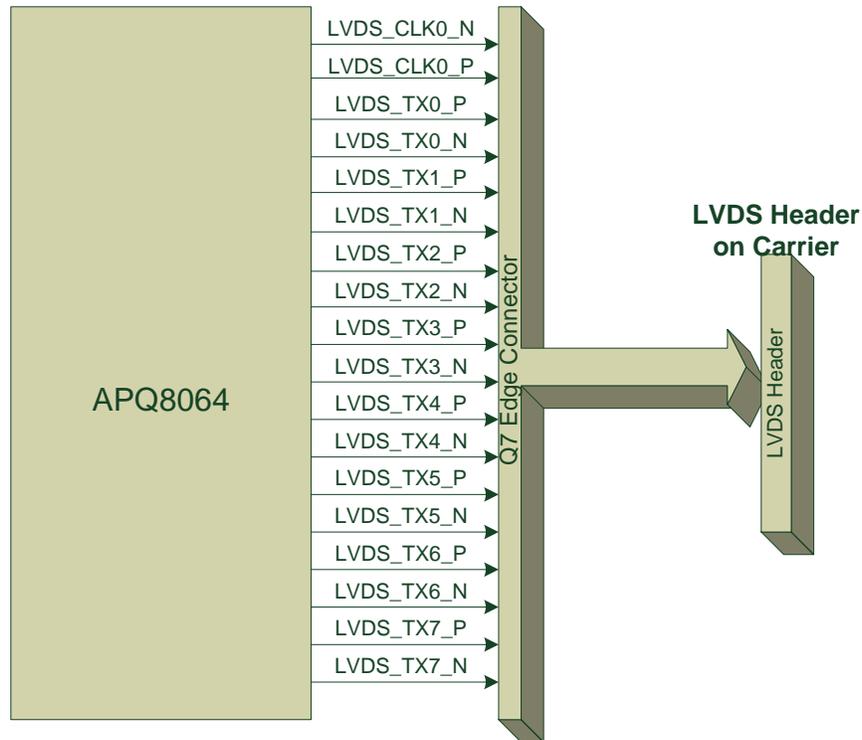
#### Specifications

- Dual display with up to 60 Hz refresh
- Primary via dual-link MIPI-DSI, 1 Gbps per lane, up to QXGA (2048 x 1536)
- Secondary via 4-lane MIPI-DSI, 1 Gbps per lane, up to QHD (960 x 540)
- Simultaneous dual-display, primary MIPI DSI or LVDS up to QXGA (2048 x 1536), and secondary up to QHD (960 x 540)
- Alternative primary display via dual LVDS, up to QXGA (2048 x 1536)

**Implementation**

In SYS644X has a dedicated 41 pin dual LVDS header is provided for LVDS output. An optional power header is provided on board for additional backlight power requirements.

**Figure 4: LVDS Connector**



**Voltage Selection**

Voltage for the LVDS connector can be selected either 12V or 5V by placing the jumper shunt as shown in the table below.

Voltage	Description
12V	P510 (Pin 1-2)
5V	P510 (Pin 2-3)

**Connector Specification**

MFG	MFG part No	Description	Refdes
Hirose	DF9-41P-1V(32)	CONN,HDR,VT,WTH FIT&BOS,41P,1MM,SMD	P508

### 2.1.5.2 HDMI INTERFACE

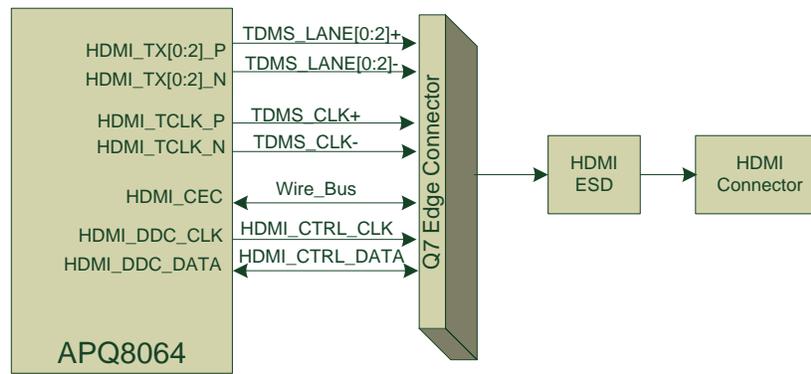
The Qualcomm Processor APQ8064 supports HDMI (Rev 1.4a) output. The processor has integrated Tx core and HDMI Phy. It supports resolution of 1080p at 60Hz refresh rate, 24-bit RGB colour. The HDMI has a 8 channel audio with 7.1 channel surround sound, with support to Dolby digital plus, Dolby True HD and DTS-HD master.

Type - A HDMI port is present on board which can support a primary or a secondary display. The HDMI signals are routed to the Q7 edge connector as per Q7.

#### Specifications

- TV output via HDMI
- Color depth: 24-bit
- Types: TFT, LTPS, CSTN, and OLED

Figure 5: HDMI Interface



### 2.1.5.3 MIPI DISPLAY INTERFACE

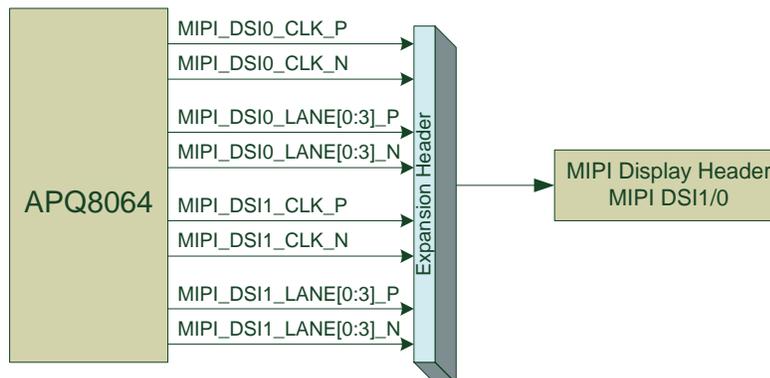
The Qualcomm APQ8064 has Mobile Industry Processor Interface (MIPI) support for displays

- 4-lane primary display serial interface (DSI);
- 4-lane secondary DSI

#### MIPI-DSI Display support

- Primary via dual-link MIPI DSI, 1 Gbps per lane, up to QXGA (2048 x 1536)
- Secondary via 4-lane MIPI DSI, 1 Gbps per lane, up to QHD (960 x 540)

Figure 6: MIPI DSI



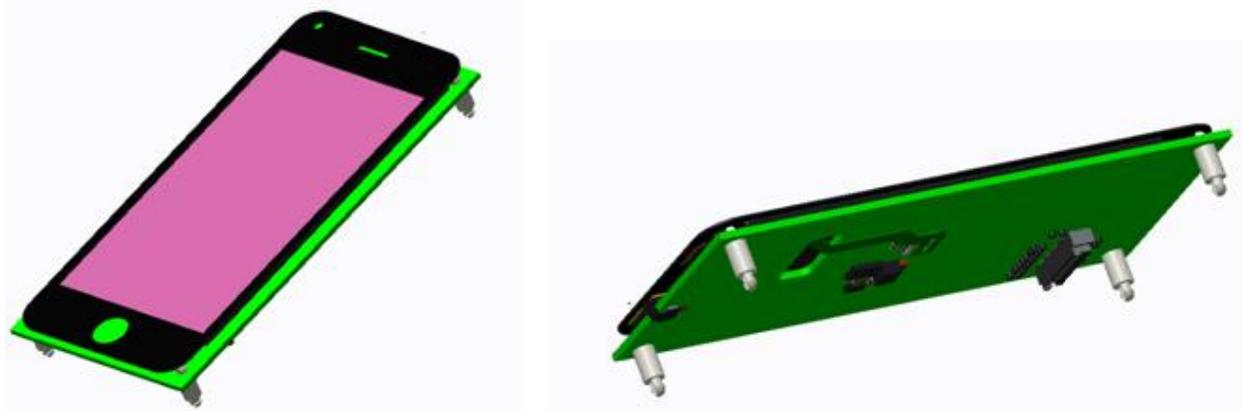
### Connector Specification

MFG	MFG part No	Description	Refdes
FCI	10106813-064112LF	CONN,MEZZO STAK,60P,0.5MM,H=3.5,SMD	J502

#### 2.1.5.4 DISPLAY ADAPTER BOARD

The system MIPI-DSI display is implemented as an adaptor card which can be placed over the carrier board on standoffs. This adaptor card is interfaced to the carrier board using a 60 pin connector.

**Figure 7: Display Adapter board with LCD (3D CAD images)**



 **NOTE**

*Refer Appendix A for pin-out of the display connector*

#### 2.1.5.5 CAMERA INTERFACE

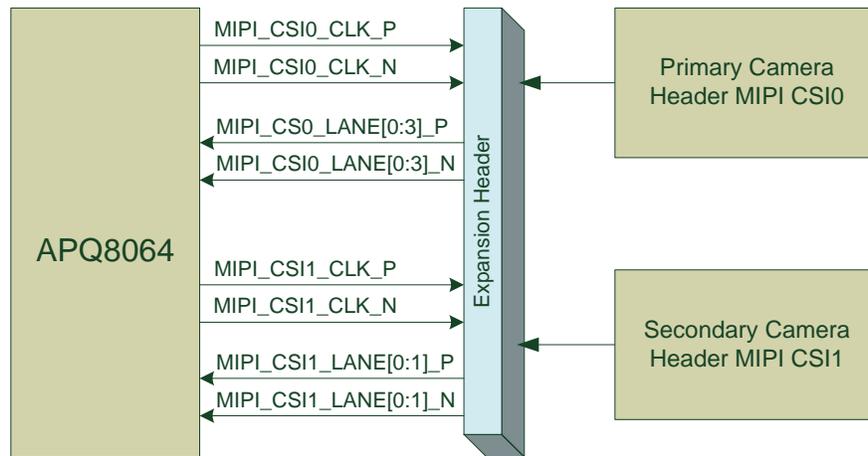
The Qualcomm APQ8064 has Mobile Industry Processor Interface (MIPI) support for Camera.

- 4-lane primary camera serial interface (CSI);
- 2-lane secondary CSI; 1-lane 3D CSI

**Camera interfaces:**

- Primary (via 4-lane MIPI\_CSI) – supports CMOS and CCD sensors
  - Up to 20 MP in-line JPEG encode at 15 fps
  - 60 fps WXGA viewfinder frame rate
  - A wide variety of pixel manipulation, camera modes, image effects, and
  - Post-processing techniques are supported, including defective pixel correction.
  - VFE raw dump of CSI data at line rate (4 Gbps) to PC DDR3
  - SMIA++ support
  - Plus inter-integrated circuit (I2C) or SPI control
- Secondary (via 2-lane MIPI\_CSI) – provides webcam functions
  - Up to 8 MP

**Figure 8: MIPI CSI**



Camera	MFG	MFG part No	Description	Ref des
Primary	Samtec	LSHM-120-03.0-L-DV-A-S-K-TR	CONN, 2x20P,SMD	S500
Secondary	Samtec	LSHM-120-03.0-L-DV-A-S-K-TR	CONN, 2x20P,SMD	S501

**2.1.5.6 CAMERA MODULE**

The system cameras are implemented as accessory adaptor card(s). There are two connectors available for camera interface, one is a 4 lane primary camera interface and the other one is a 2 lane secondary (webcam) interface. Both interfaces are 40pin connector.

**Figure 9: Camera Module**



 **NOTE**

*Refer Appendix A for pin-out of the camera interface connector.*

### 2.1.5.7 PCI EXPRESS INTERFACE

The Qualcomm Processor APQ8064 supports x1 lane PCI Express (PCIe) (PCIe REV2.0). The PCIe lane is connected to the PCIe switch PEX8605 from PLX. From the switch three PCIe lanes are brought out. PEX8605 has the capability to provide the ref clock for the downstream devices.

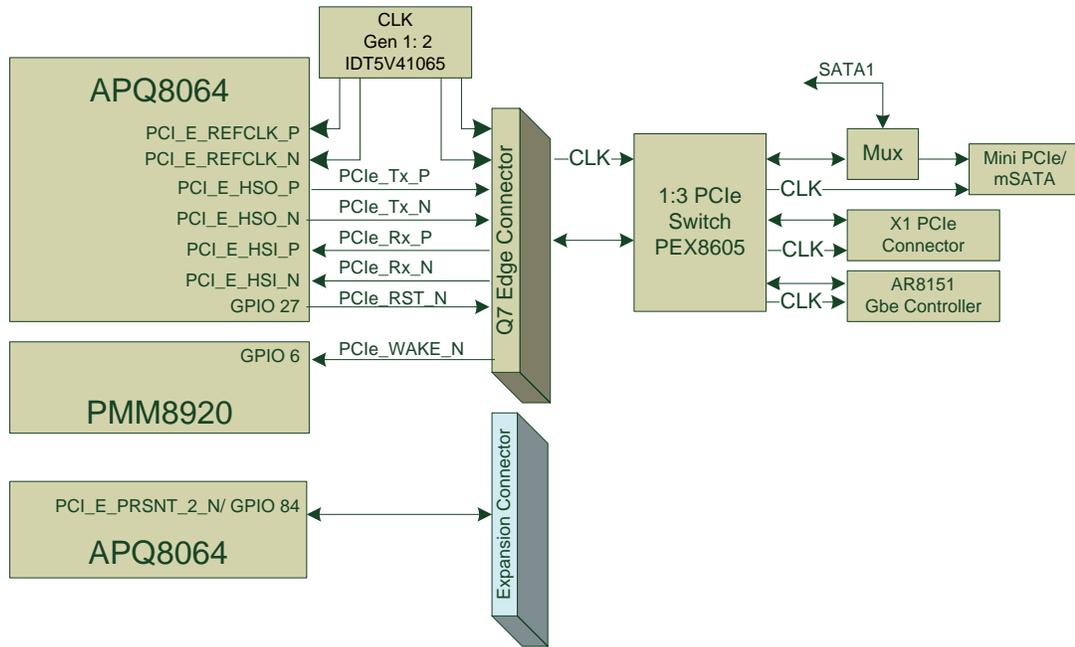
Lane 0 of PCIe switch used as the upstream port towards CPU.

Lane 1 of PCIe switch is used for interfacing the Gigabit Ethernet controller AR8151

Lane 2 of PCIe switch is used for Mini PCIe connector.

Lane 3 of PCIe switch goes to x1 PCIe connector.

**Figure 10: PCIe Block Diagram**

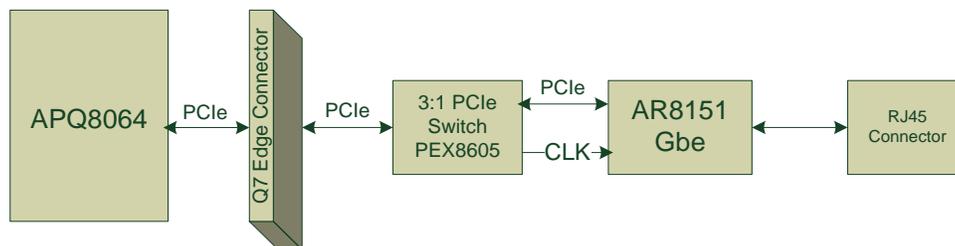


### 2.1.5.8 ETHERNET INTERFACE

The Ethernet interface is implemented via PCIe Ethernet controller AR8151 controller from Qualcomm Atheros. The Qualcomm Atheros PHY controller fully supports PCIe power saving features as well as extensive low power Ethernet features. The Qualcomm Atheros controller supports PCIe ver1.1 and speeds up to 10/100/1000 Mbps (Gbe).

The AR8151 is a high performance, fully integrated Ethernet LOM/NIC controller that provides physical layer functions for half/full duplex 10-BASE-T, 100-BASE-TX, 1000-BASE-T Ethernet to transmit and receive high-speed data over standard category 5 (CAT5) unshielded twisted pair cable. It also combines echo canceller, feedback equalizer and timing recovery to enhance signal performance in noisy environments. It employs a 16-KB internal SRAM as the Tx FIFO and Rx FIFO for data traffic elasticity

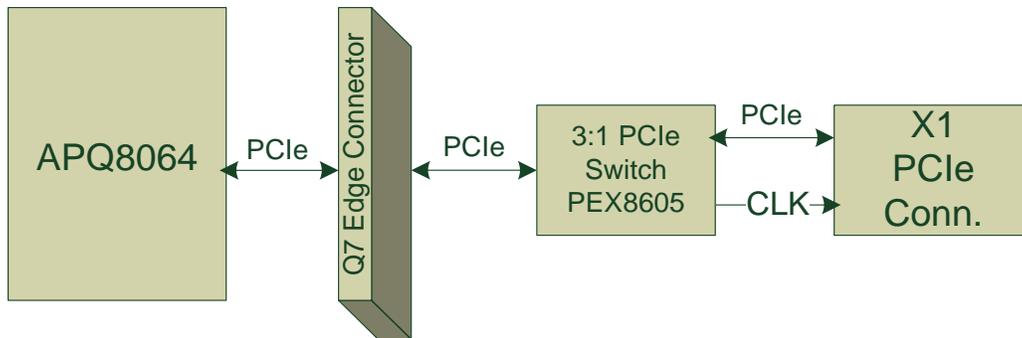
**Figure 11: Gigabit Ethernet Transceiver Interface**



## 2.1.6 X1 PCIE INTERFACE

x1 PCIe interface is provided via PCIe switch PEX8605.

Figure 12: x1 PCIe interface



## 2.1.7 MINI PCIE/MSATA INTERFACE

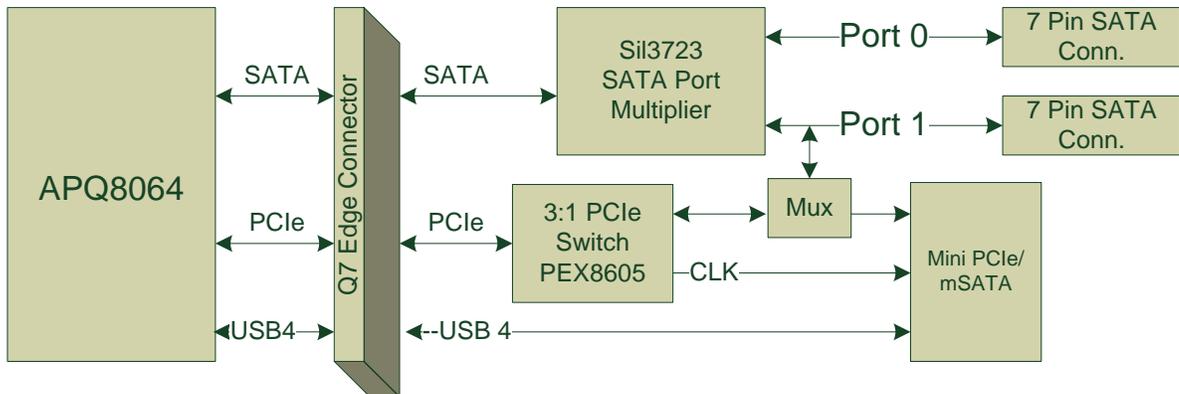
PCIe and SATA ports are multiplexed using CBTL02042ABQ from NXP. Interface PCIe or SATA will be automatically selected on the detection of the corresponding cards mSATA or mini PCIe.

SATA Port 1 from SATA port multiplier sil3723 has tripad capacitor stuffing option for configuring either as 7 pin SATA connector or mini PCIe connector for mSATA interface.

**mSATA:** Mount Capacitor C521, C524, C525 and C528 (default)

**SATA port:** Mount Capacitor C520, C523, C526 and C529

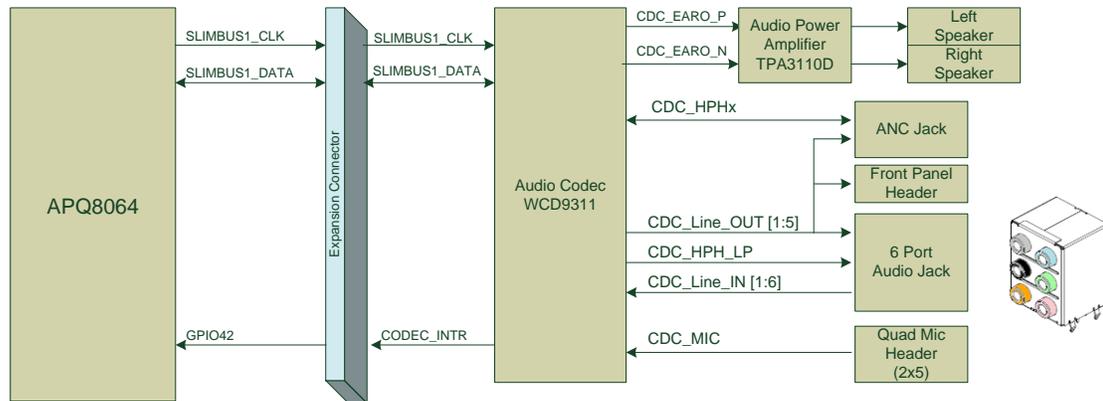
Figure 13: mSATA/mini PCIe Interface



### 2.1.7.1 AUDIO INTERFACE

Audio implementation is done using the codec WCD9311. This is interfaced to the processor via SLIMbus. The other audio signals are routed to the SPDIF connector over I2S interface.

**Figure 14: Audio Implementation**



#### WCD9311 features

- 6 digital Mics configured in pairs
- 6 analog inputs
- 1 multi-button headset detect input
- 7 concurrent DAC outputs
- 1 Ear amplifier output
- Stereo headphone output
- 5 single ended line outputs
- SLIMbus
- Stereo headset

The output of the codec is routed to 6 port audio Jack, ANC Jack and a Quad Mic header. It is also routed to the audio Amplifier which gives 2 Channels speaker

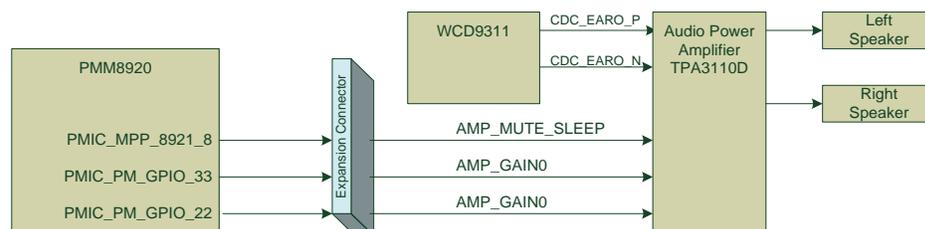
### 2.1.7.2 AUDIO POWER AMPLIFIER

The TPA3110D2 is a 15-W (per channel) efficient, Class-D audio power amplifier for driving bridged-tied stereo speakers. Advanced EMI Suppression Technology enables the use of inexpensive ferrite bead filters at the outputs while meeting EMC requirements.

The TPA3110D2 can drive stereo speakers as low as 4  $\Omega$ . The high efficiency of the TPA3110D2, 90%, eliminates the need for an external heat sink when playing music.

The Audio source is coming from the audio codec WCD9311.

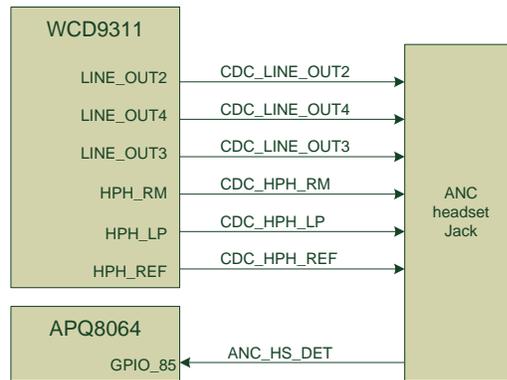
**Figure 15: Audio Power Amplifier**



### 2.1.7.3 ANC CONNECTOR

SYS644X provides one ANC (Active noise control) connector to support Qualcomm’s ANC headset as well as off the shelf 3.5mm headsets. ANC headphones are devices that reduce unwanted ambient sounds. This involves using one or more microphones placed near the ear, and electronic circuitry which uses the microphone signal to generate an "antinoise" signal.

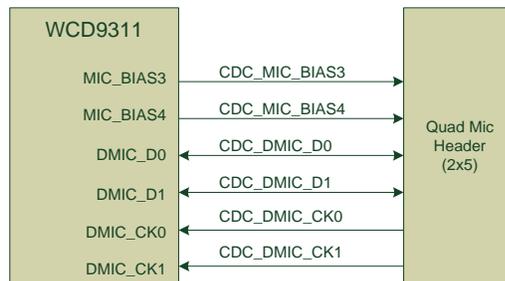
**Figure 16: ANC headset**



### 2.1.7.4 QUAD MIC

The system consists of a 10 pin header for digital MIC interface. This header consists of two digital microphone lanes along with two mic bias lines, which can be used for Dual/Quad MIC implementation.

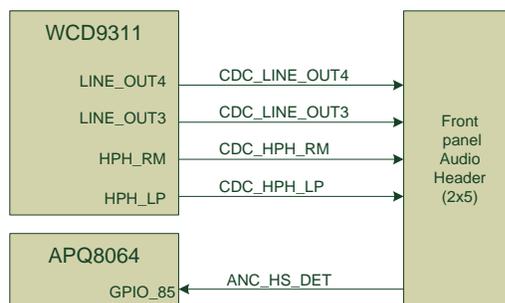
**Figure 17: 2.1.7.4 QUAD MIC**



### 2.1.7.5 FRONT PANEL AUDIO HEADER

This provides the audio connectivity via regular 2x5 header for standard Mini-ITX enclosure.

**Figure 18: Front panel Audio header**



### 2.1.7.6 TSIF/SPDIF

TSIF and SPDIF signals are terminated on a single 60 pin connector. This can be configured as either TSIF or SPDIF by resistor mounting option

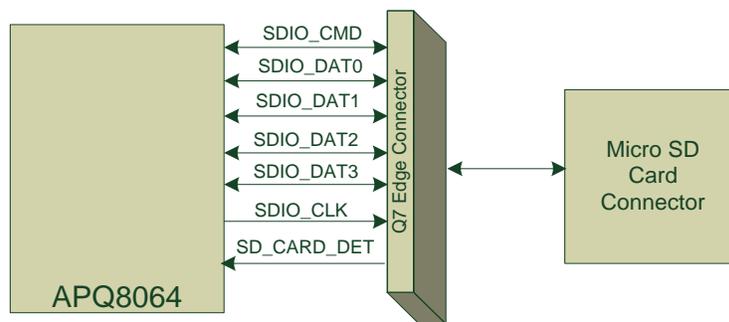
#### TSIF

- The Qualcomm APQ8064 processor supports Dual TSIF interfaces
- Can be used for future expansion, no planned peripherals.
- Can also be used as GSB (I2C, SPI, GPIO, etc).
- Brings TSIF ports to 0.1" header connectors
- Connector supplies power to drive various peripherals

### 2.1.7.7 MICRO-SD CARD INTERFACE

SYS644X supports micro SD card. This is interfaced via SDC3 interface. This can be used as boot location by changing the boot configuration selection switch

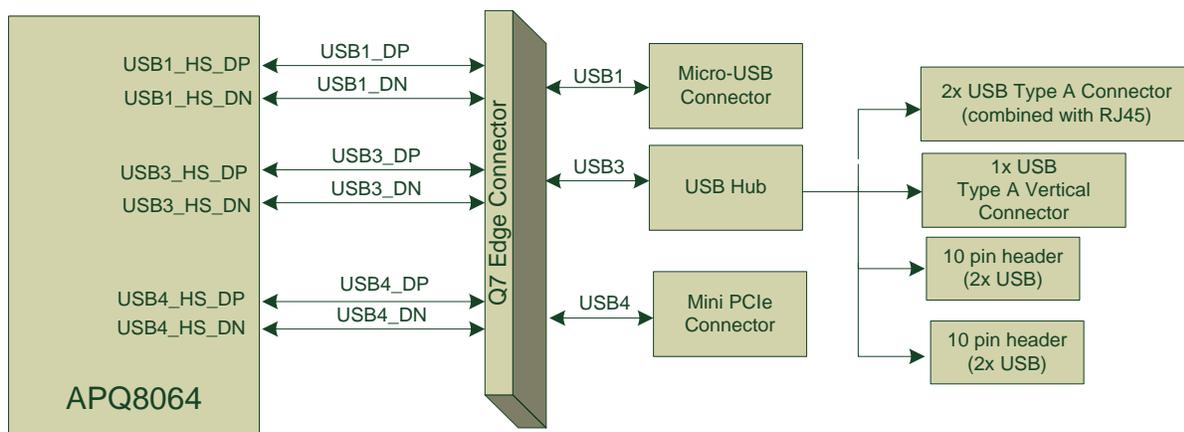
Figure 19: SD Card Interface



### 2.1.7.8 UNIVERSAL SERIAL BUS

The Qualcomm APQ8064 supports three USB 2.0 HS ports with built-in PHY (480 Mbps). Additionally available USB port via HSIC is not used. USB port 1 is used as the OTG port. Following block diagram shows the overall USB implementation. USB port 3 is routed to a 1:7 hub USB2517 from SMSC.

Figure 20: USB Interface



**Table 2: USB port mapping**

SI.No	Port	Ref Des	Function
1	CPU USB Port1	J516	Micro USB AB (OTG)
2	CPU USB Port3	U521	USB Hub
3	CPU USB Port4	J504	mini PCIe Connector
4	Hub USB port1	J516	Vertical USB port
5	Hub USB port2	J522	Type A connector with LAN port
6	Hub USB port3	J522	
7	Hub USB port4	P516 (10 pin HDR)	Pin-2 5V Pin-4 D- Pin-6 D+ Pin-8 GND
8	Hub USB port5	P516 (10 pin HDR)	Pin-1 5V Pin-3 D- Pin-5 D+ Pin-7 GND
9	Hub USB port6	P515 (10 pin HDR)	Pin-2 5V Pin-4 D- Pin-6 D+ Pin-8 GND
10	Hub USB port7	P515 (10 pin HDR)	Pin-1 5V Pin-3 D- Pin-5 D+ Pin-7 GND

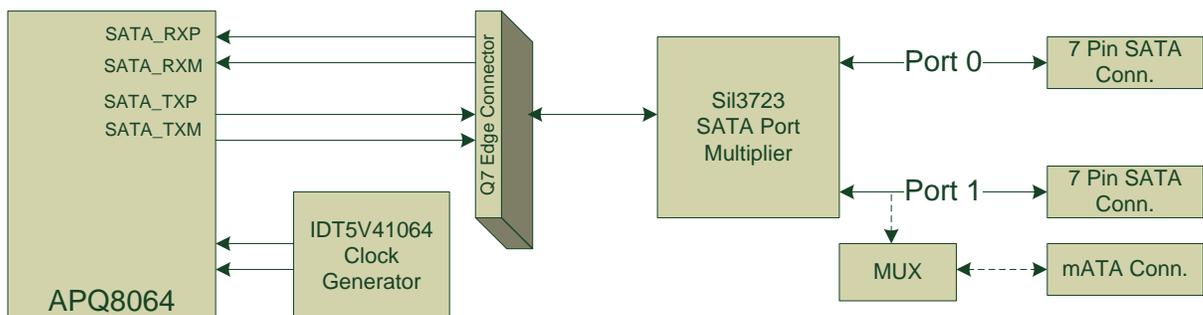
**2.1.7.9 SATA INTERFACE**

The Qualcomm APQ8064 contains one Serial ATA (SATA) interface. Hence a multiplier is use for providing additional SATA port. Port 0 is directly connected to 7 pin SATA connector. Port 1 has capacitor stuffing option using tripad for configuring either as 7 pin SATA connector or mini PCIe connector for mSATA interface.

Sil3723 is a one to two SATA port multiplier designed to provide a high-performance link between a single SATA host port and two SATA device ports. The Sil3723 supports host and device link rates of 1.5Gbps or 3Gbps with auto-negotiation, giving system designers or end users the flexibility to choose 1.5Gbps or 3Gbps SATA hard drives.

Sil3723 features two operating modes. In SATA command-based switching mode, Sil3723 operates like a multiplexing switch whereby each drive is visible and the target is addressed using a single hardware queue in the SATA host controller. In FIS-based switching mode, Sil3723 operates like a smart multiplexor

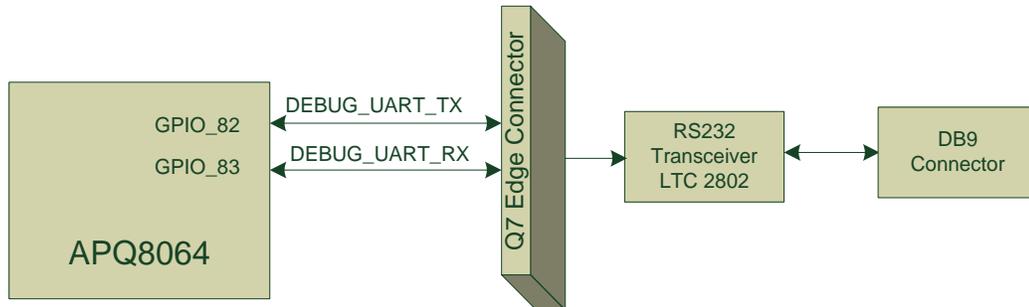
**Figure 21: SATA Interface**



### 2.1.7.10 DEBUG UART INTERFACE

Debug interface for the CPU Qualcomm APQ8064 is UART which is implemented via GPIOs. These signals are available on carrier board DB9 connector as RS232 signalling.

Figure 22: UART Interface

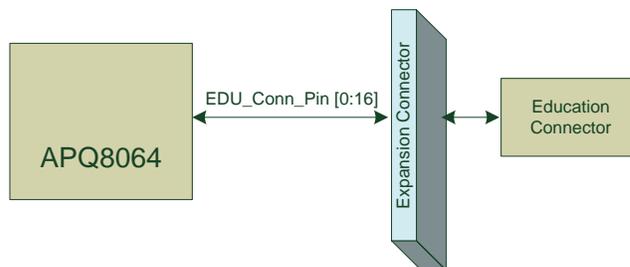


### 2.1.7.11 EDUCATION CONNECTOR

The SYS644X board provides a 16 pin Education connector header

- Brings GPIOs, Linear Pattern Generator, LED driver, and power to 16-pin header for students
- Brings GSB1 port which can be configured as GPIO, SPI, I2C, UART, etc.
- All pins shifted to 3.3V levels with ESD protection for student lab use

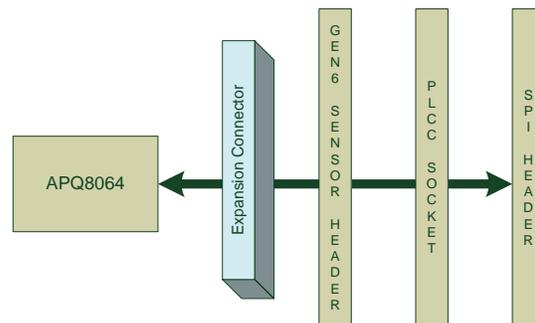
Figure 23: Education Connector



### 2.1.7.12 SENSOR BOARD CONNECTOR

The system has 2 sockets for sensor implementation. One is PLCC Socket and other one is 24 pin (2x12, 2.54mm) for custom sensor board. In addition to this 10 pin header is provided for SPI interface.

Figure 24: Sensor implementation



### 2.1.7.13 SERIAL PERIPHERAL INTERFACE

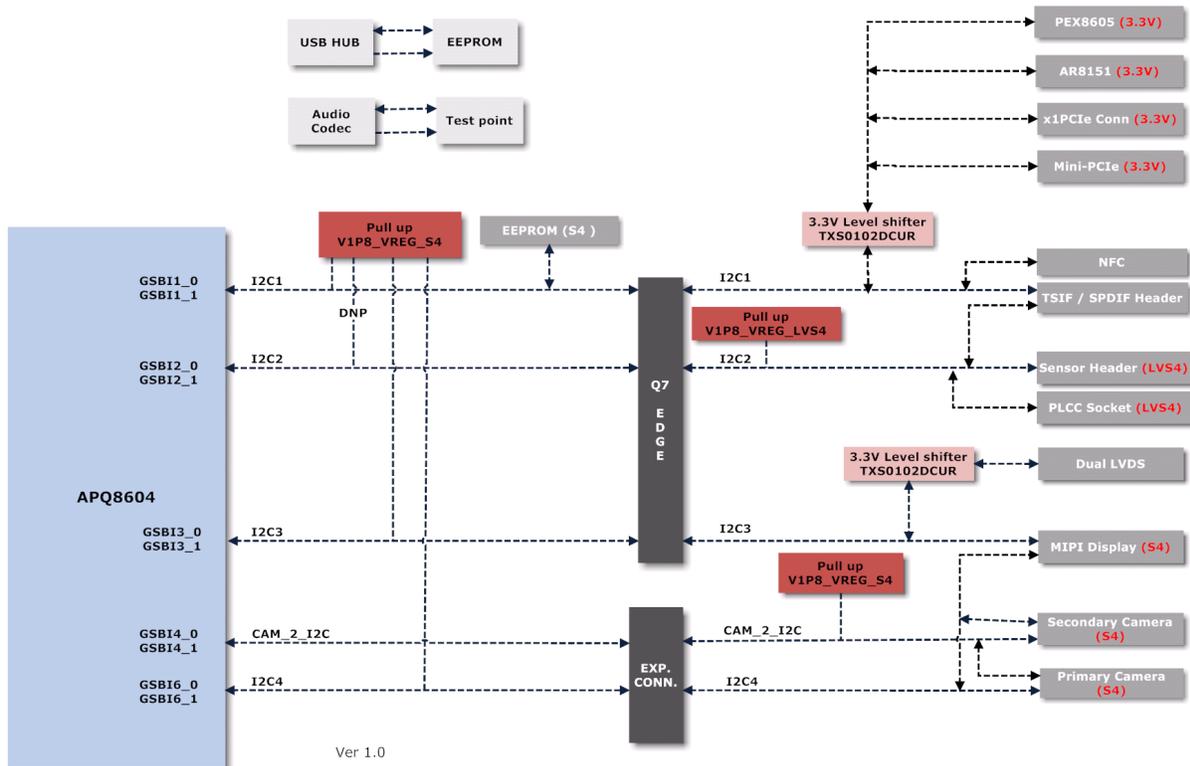
The Qualcomm APQ8064 processor supports SPI, it is for future expansion and there is no immediate peripherals. The processor supports 52 MHz Clock

- SPI master support only
- Camera sensor/module controls
- External sensors and audio
- NOR memory support (with user-modified software)
- Possibly sensors like accelerometer, compass, ambient light can be interfaced

### 2.1.7.14 INTER-INTEGRATED CIRCUIT (I2C) INTERFACE

The Qualcomm APQ8064 processor supports 400 KHz I2C. The interfaces on I2C are shown in the bellow block diagram.

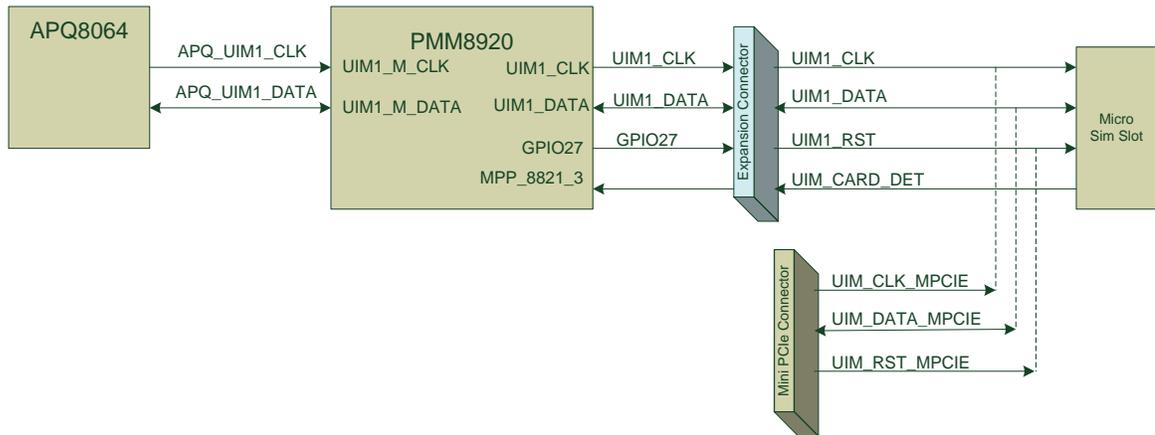
Figure 25: I2C Scheme



### 2.1.7.15 UIM INTERFACE

The Qualcomm APQ8064 processor supports UIM interface for interfacing SIM card for NFC applications. This is routed via PMM8920 and for level shifting to 3.3V range. A Micro SIM card slot and NFC header is provided on the SYS644X board. Same micro SIM slot is shared for the mini-PCle socket. This can be selected by stuffing the resistor option.

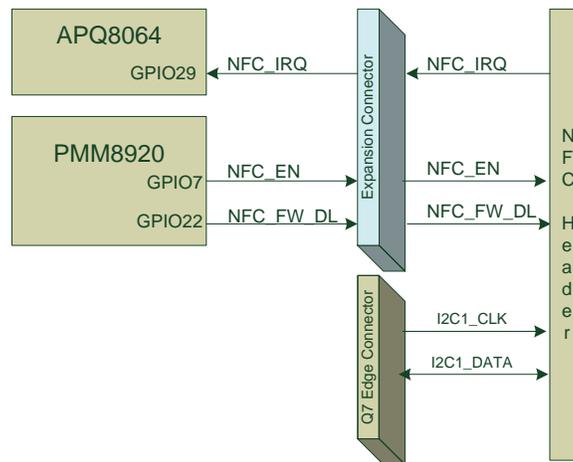
**Figure 26: UIM Interface**



### 2.1.7.16 NFC (NEAR FIELD COMMUNICATION)

The Qualcomm APQ8064 processor supports NFC. This is implemented via GPIOs

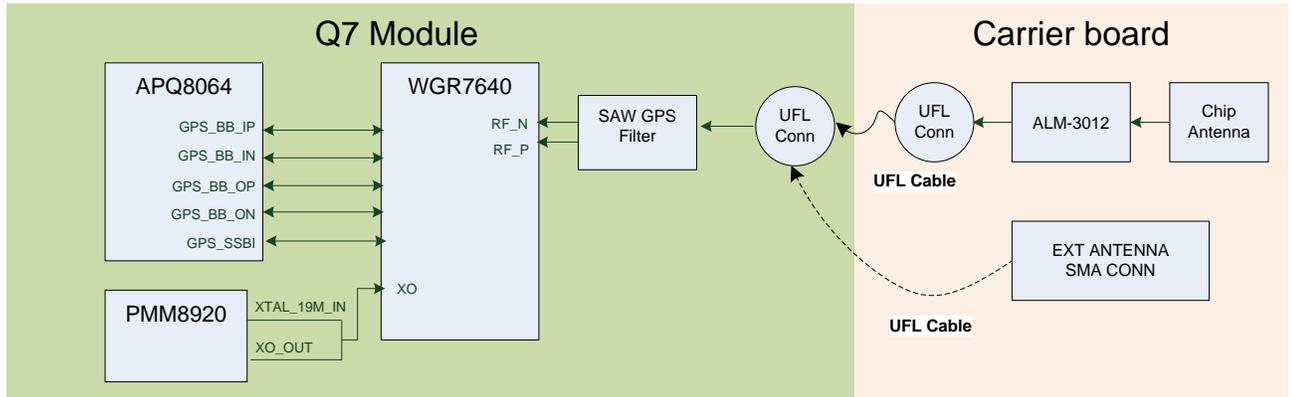
**Figure 27: NFC**



### 2.1.7.17 GPS INTERFACE

The APQ8064 supports GPS interface. The WGR7640 GPS receiver is an integrated GPS front-end for use with the SYS644X. The SYS644X includes both a GPS chip antenna and an optional external antenna. On the carrier we have on board chip antenna also external antenna. Through cable we can connect either chip antenna or external antenna.

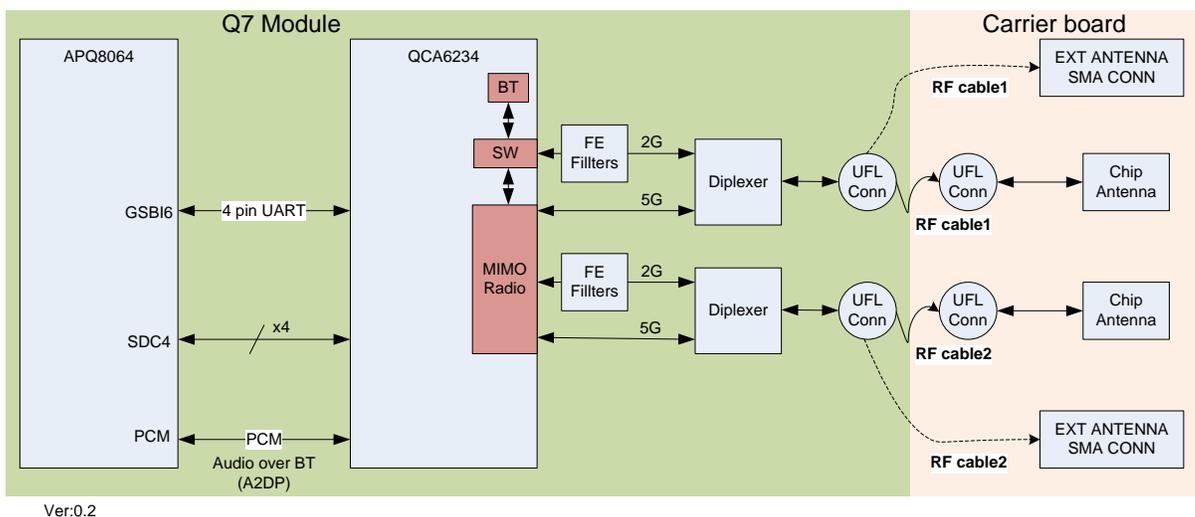
Figure 28: GPS Implementation



### 2.1.7.18 WIFI AND BLUETOOTH INTERFACE

The Qualcomm Atheros QCA6234X BT/Wi-Fi is used to bring out the WIFI and Bluetooth interfaces. SYS644X supports 2 stream dual band WIFI. RF signals are terminated on UFL connector on CPU module. Onboard chip antenna and External antenna connector is provided on the carrier board. This can be selected by plugging the UFL cable on appropriate Connector.

Figure 29: WIFI and Bluetooth Implementation

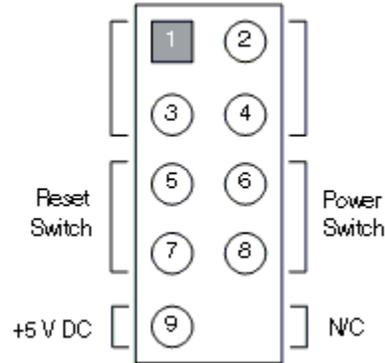


Ver:0.2

### 2.1.7.19 FRONT PANEL HEADER

The front panel header in SYS64XX is provided to give the user the access to power button, reset button and status LEDs of the HDD and the board.

**Figure 30: FRONT PANEL HEADER**



# 3 ELECTRICAL SPECIFICATION

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## 3.1 OVERVIEW

SYS644X board is operated from following sources:

- 5V DC Jack
- ATX power supply
- Battery

USB OTG port

## 3.2 POWER SEQUENCING AND MANAGEMENT

The PMM8920 includes power on circuits that provide the proper power sequencing for the entire APQ8064 23 x 23 chipset. The supplies are turned on as groups of regulators that are selected by the hardware configuration of some PMIC pins. The PMM8920 device is a module that integrates two power management die (PM8921 and PM8821 die) in to a single package. Like the individual PMICs, the PMM8920 device functionality is partitioned into five major blocks.

- Input power management
- Output power management
- General housekeeping
- User interfaces
- IC interfaces

## 3.3 CPU POWER SEQUENCING REQUIREMENT

A high-level summary of the APQ8064 23 x 23's required early power up sequence is:

- VDD\_MEM / VDD\_PLL1
- VDD\_CORE
- VDD\_P3(GPIO)
- VDD\_P1(EBI)
- VREF\_DDR\_C1 / VREF\_DDR\_C2
- VDD\_PXO
- VDD\_USBPHYX\_1P8 (HS USB 1.8 V)
- VDD\_P2 (SDC 2.95 V)
- T-FLASH (SD VDD)
- VDD\_USBPHYX\_3P3 (HS USB 3.3 V)
- eMMC VCC

**Comments regarding this sequence:**

- The core voltage (VDD\_CORE) needs to power up before the pad circuits (VDD\_PX) so that internal circuits can take control of the I/Os and pads. If pad voltages power up first, the output drivers might be stuck in unknown states, and might cause large leakage currents until VDD\_CORE powers on.
- The pad voltages need to precede the analog voltages (VDD\_AX), since the SSBI is initialized to their default states before VDD\_AX powers up (analog circuits are controlled by SSBI).
- VDD\_QDSP6, VDD\_KR0, VDD\_KR1, VDD\_KR2 and VDD\_KR3 (QDSP and Krait core circuits) can be powered up by software after the APQ has completed the boot process.
- Other non-critical supplies are included within the power-on sequence. Any other desired supplies can be powered on by software after the sequence is completed.
- Each domain needs to reach its 90% value before the next domain starts ramping up. For example, when VDD\_CORE reaches 90% of its value, the VDD\_P3 supply can start ramping up.
- VDD\_QFUSE\_PRG must be powered down before any of the pad power supplies are powered down.

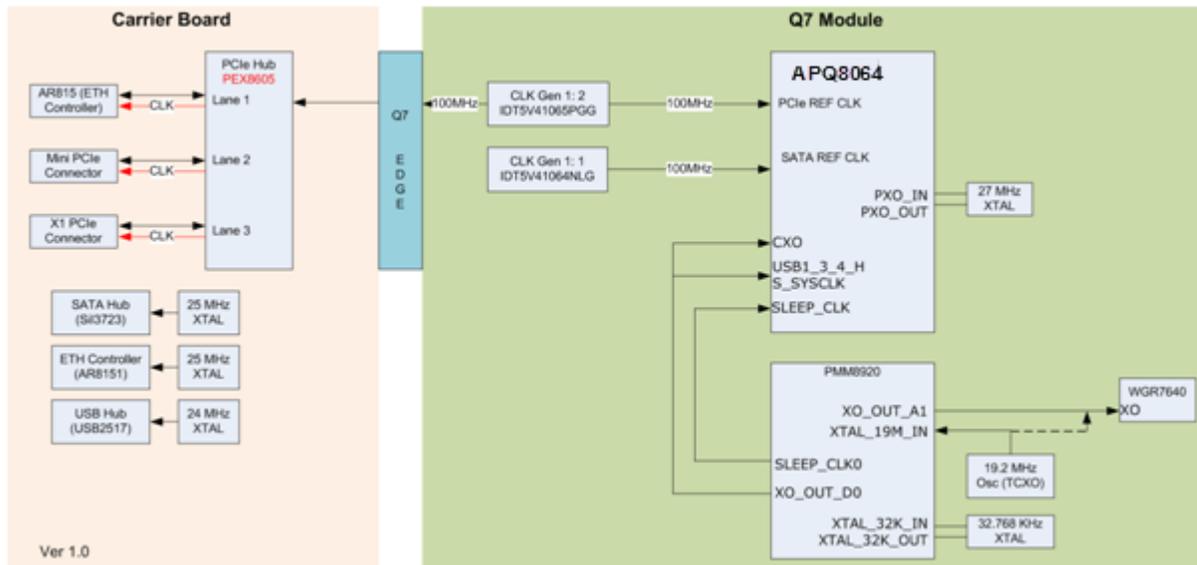
## 3.4 POWER CONSUMPTION

Total approximate power of SYS644x is **70W**.

## 3.5 CLOCK SCHEME

Following diagram shows the overall clock distribution.

**Figure 31: Clock scheme**



**Table 3: Major Clock Signals**

SL No.	Clock Group	Signal	Description
1	PCIe Ref CLK	CLK_100M_EDGE_PCIE_CLK_P/N	100 MHz differential clock connects to PCIe hub via Q7 edge
2		CLK_100M_CPU_PCIE_CLK_P/N	100 MHz differential clock connects to CPU APQ8064 as PCIe ref CLK
3	SATA ref CLK	CLK_100M_CPU_SATA_CLK_P/N	100 MHz differential clock connects to CPU APQ8064 as SATA ref CLK

### 3.5.1 PCIE REF CLOCK

PCIe reference clock is generated from onboard dual O/P clock generator. This is spread spectrum enabled clock generator. It can support up to -0.75. One of the outputs from this source is fed to the CPU APQ8064. Other one is fed to the PCIe hub PEX8605, via Q7 edge connector. Hub itself provides the reference clock for the down devices.

### 3.5.2 SATA REF CLOCK

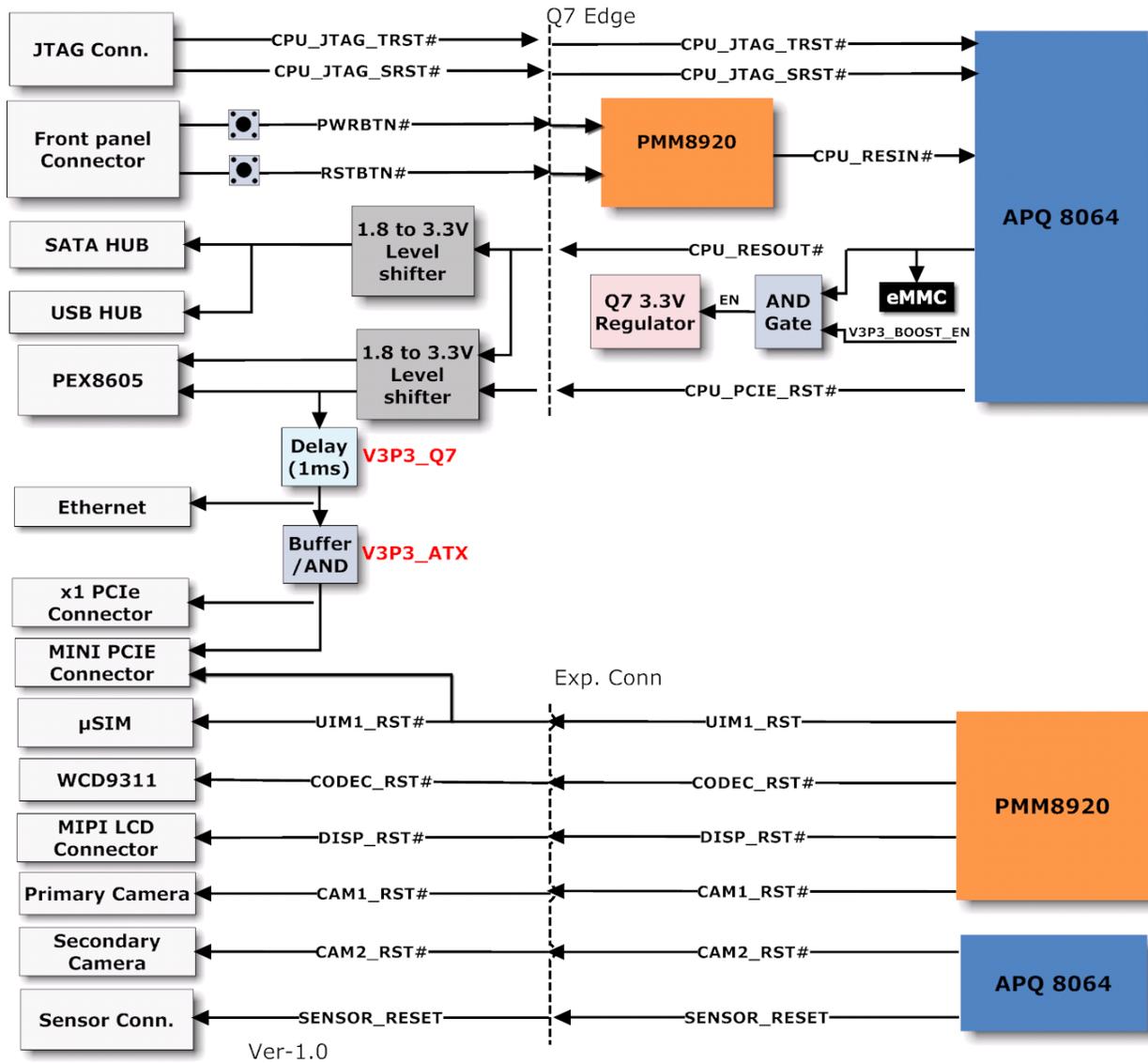
SATA reference clock is generated from onboard clock generator. This is spread spectrum enabled. It can support up to -0.5.

### 3.6 RESET

#### 3.6.1 OVERVIEW

Reset can be manually given by pressing the reset button. This is fed to the power management chip PMM8920. This gives the CPU reset in to CPU. Following diagram shows the reset scheme.

Figure 32: Reset Scheme



# 4 MECHANICAL SPECIFICATION

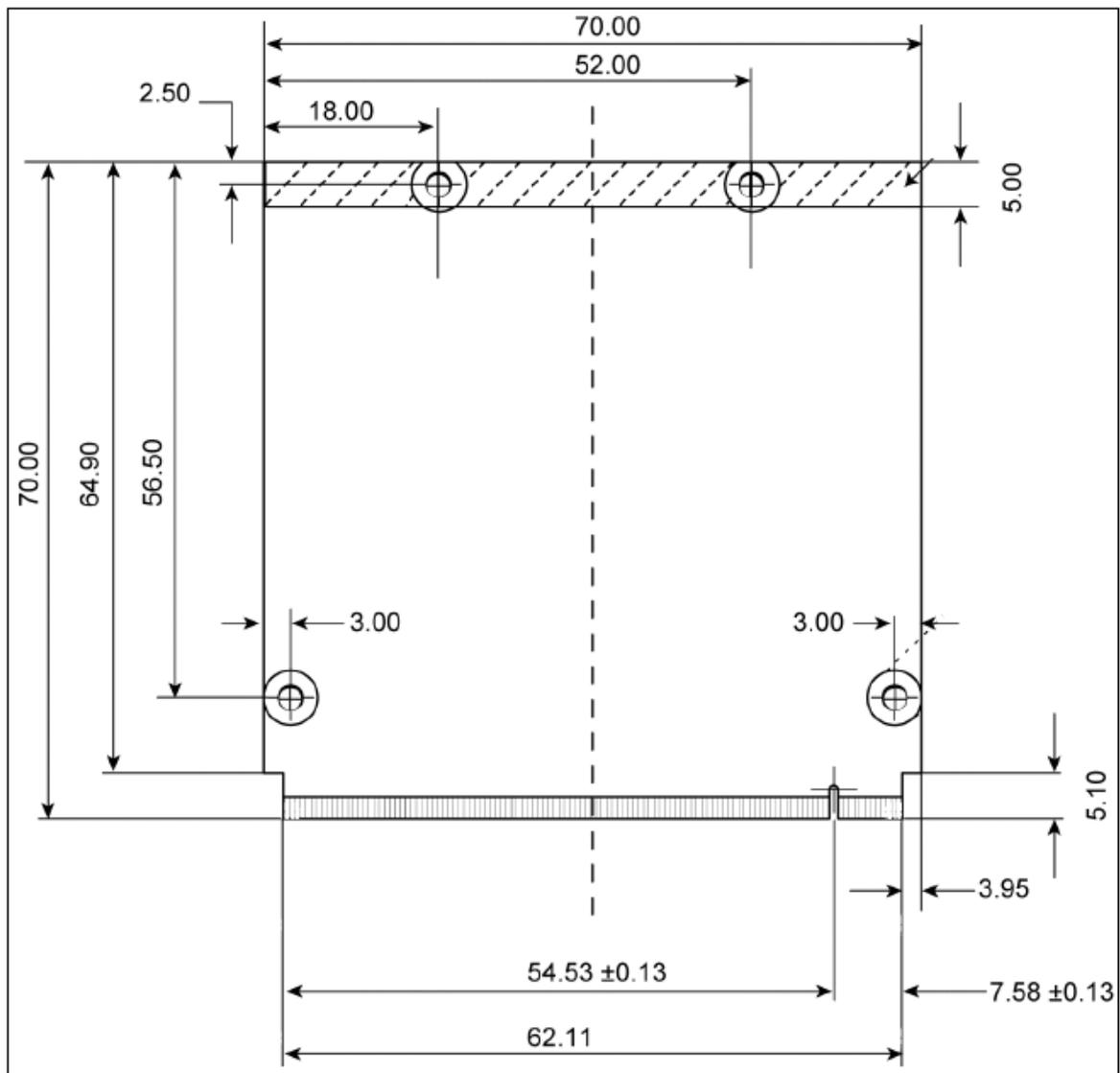
## 4.1 CPU BOARD DIMENSIONS

CPU board is based on standard Q7 form factor. Qseven concept is an off-the-shelf, multivendor, Single-Board Computer that integrates all the core components of a common PC and is mounted onto an application specific carrier board. Qseven modules have a standardized form factor of 70mm x 70mm and have specified pinouts based on the high speed MXM system connector.

Layer: 10

Thickness: 1.2mm

Figure 33: Q7 Mechanical Dimensions



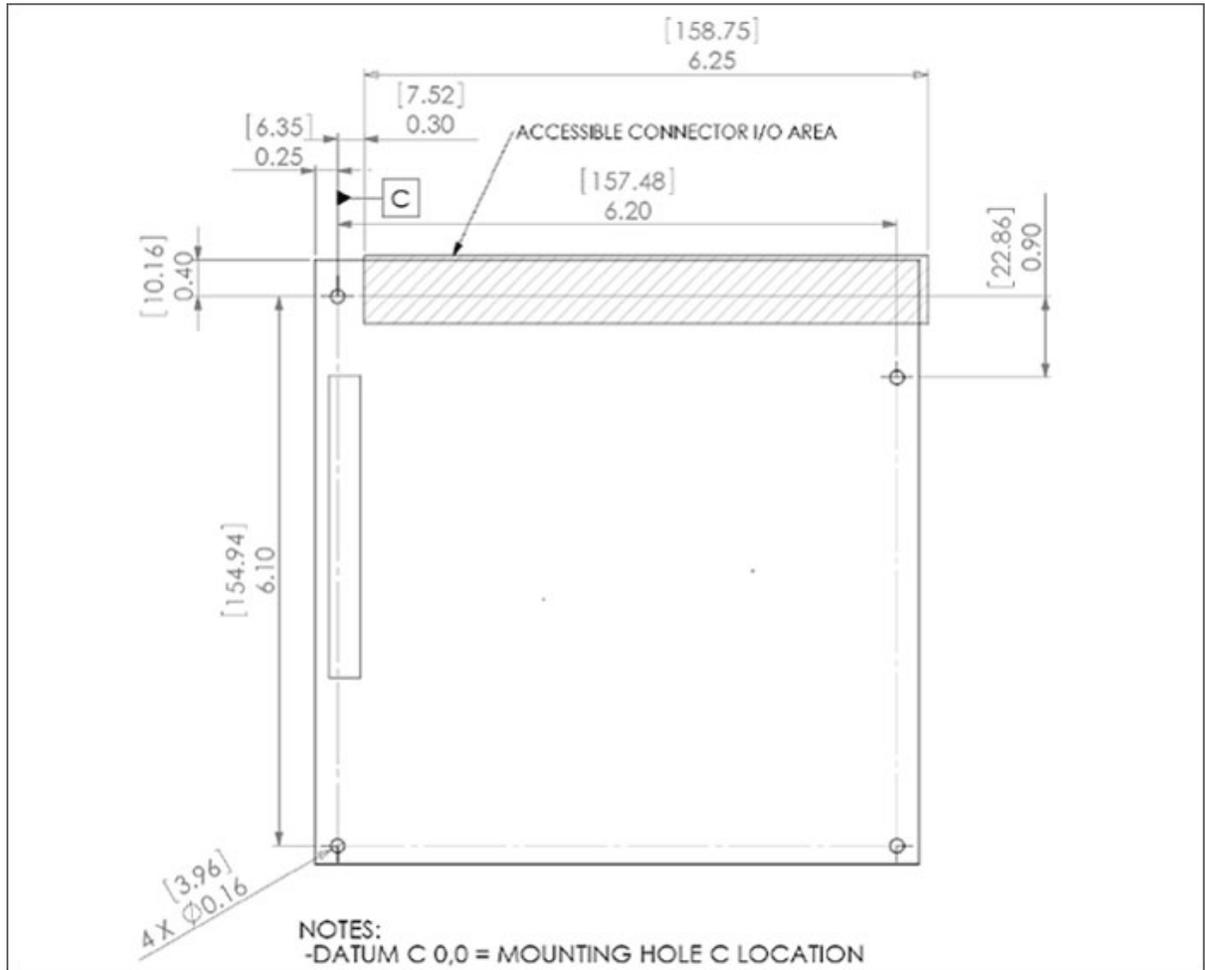
## 4.2 CARRIER BOARD DIMENSIONS

Carrier board is based on standard Mini-ITX form factor. Mini-ITX is a 17×17 cm (6.7×6.7 inches) low-power motherboard form factor developed by VIA Technologies. They are commonly used in small form factor (SFF) computer systems

Layer: 6

Thickness: 1.6mm

Figure 34: mini ITX Mechanical Dimensions



# 5 SOFTWARE SPECIFICATION

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## 5.1 OPERATING SYSTEM

Operating system used in SYS644X is Android™ Jelly Bean 4.1.2 Version.

# 6 PCB SPECIFICATION

## 6.1 FLOOR PLAN - CARRIER CARD

Figure 35: Carrier - Floor Plan (Top)

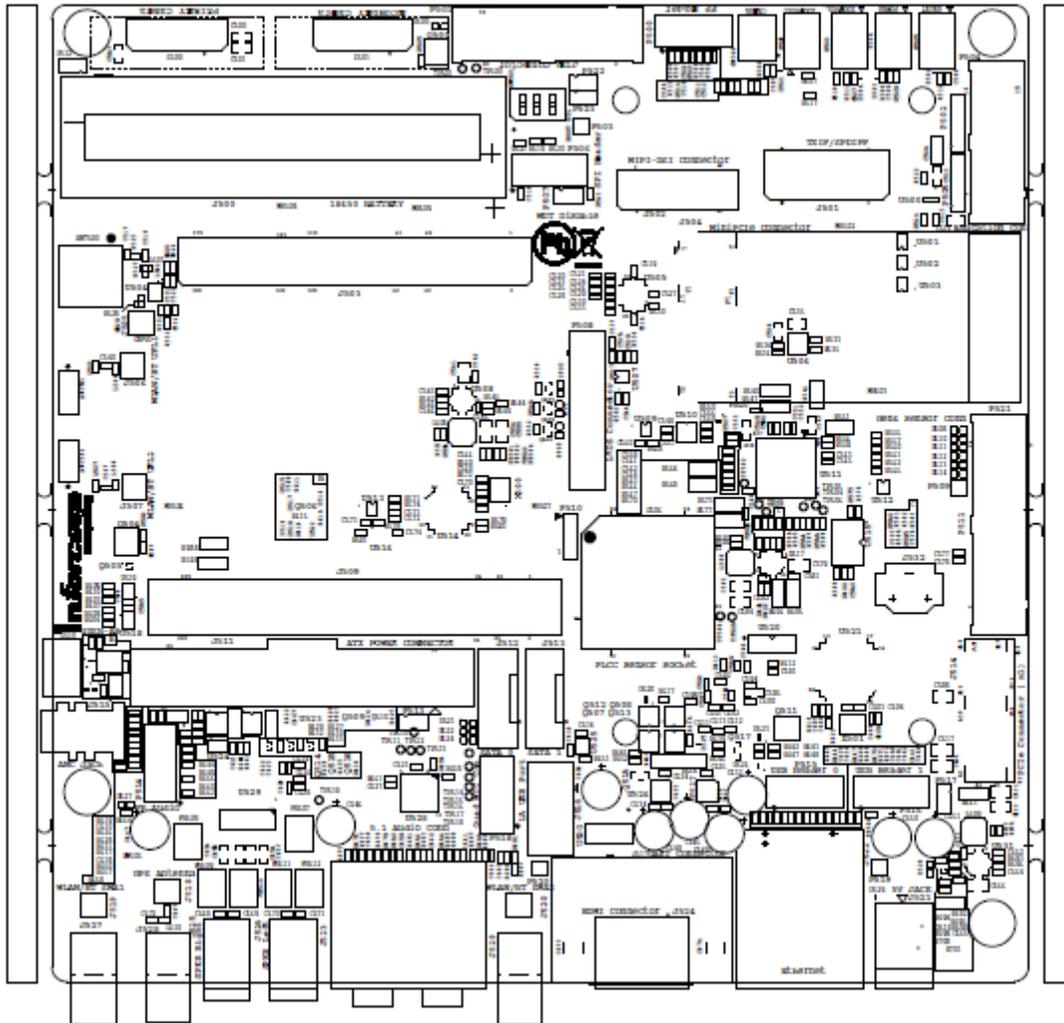
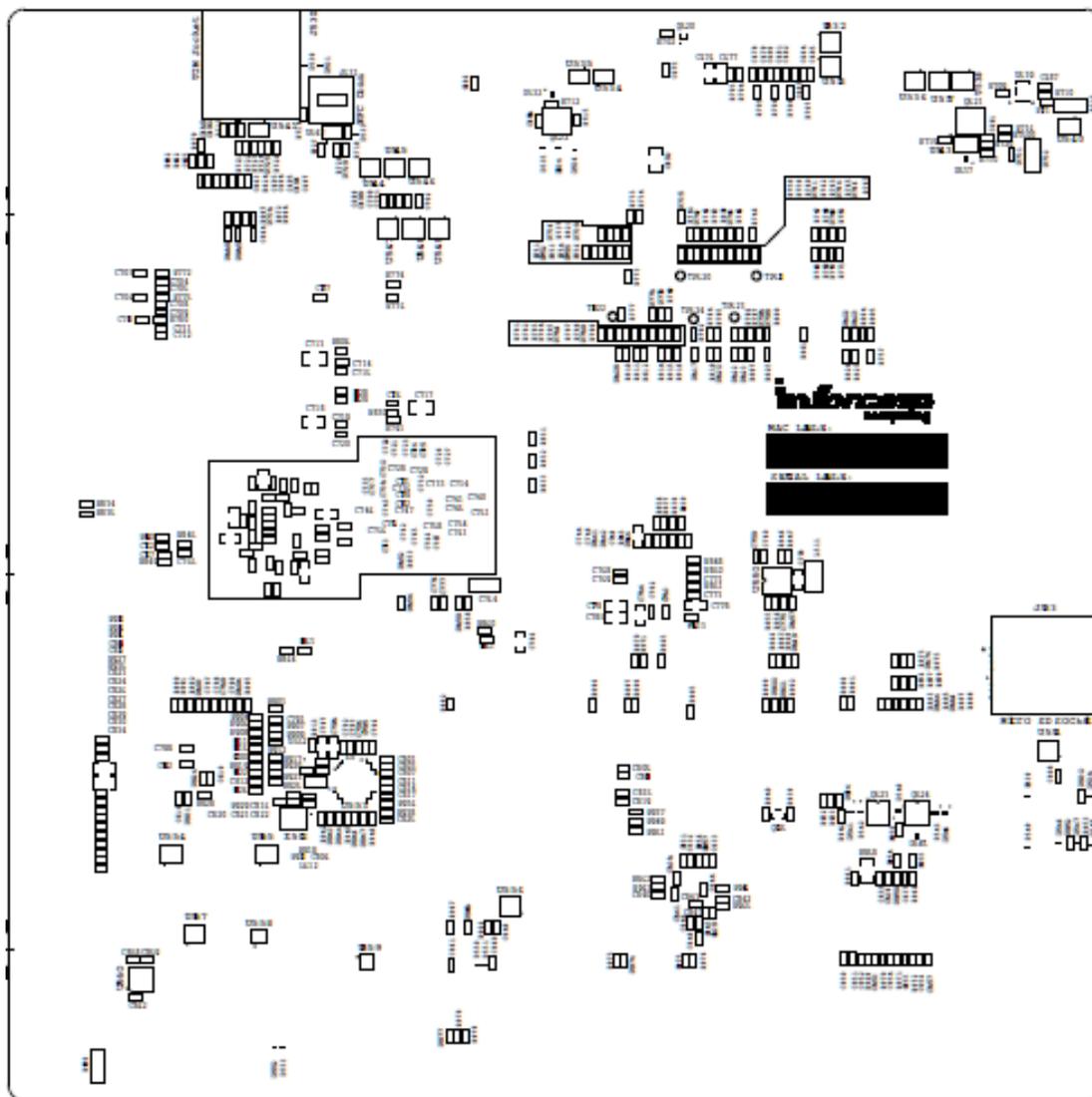


Figure 36: Carrier - Floor plan (Bottom)



## 6.2 FLOOR PLAN - Q7 MODULE

Figure 37: Q7 - Floor plan (Top)

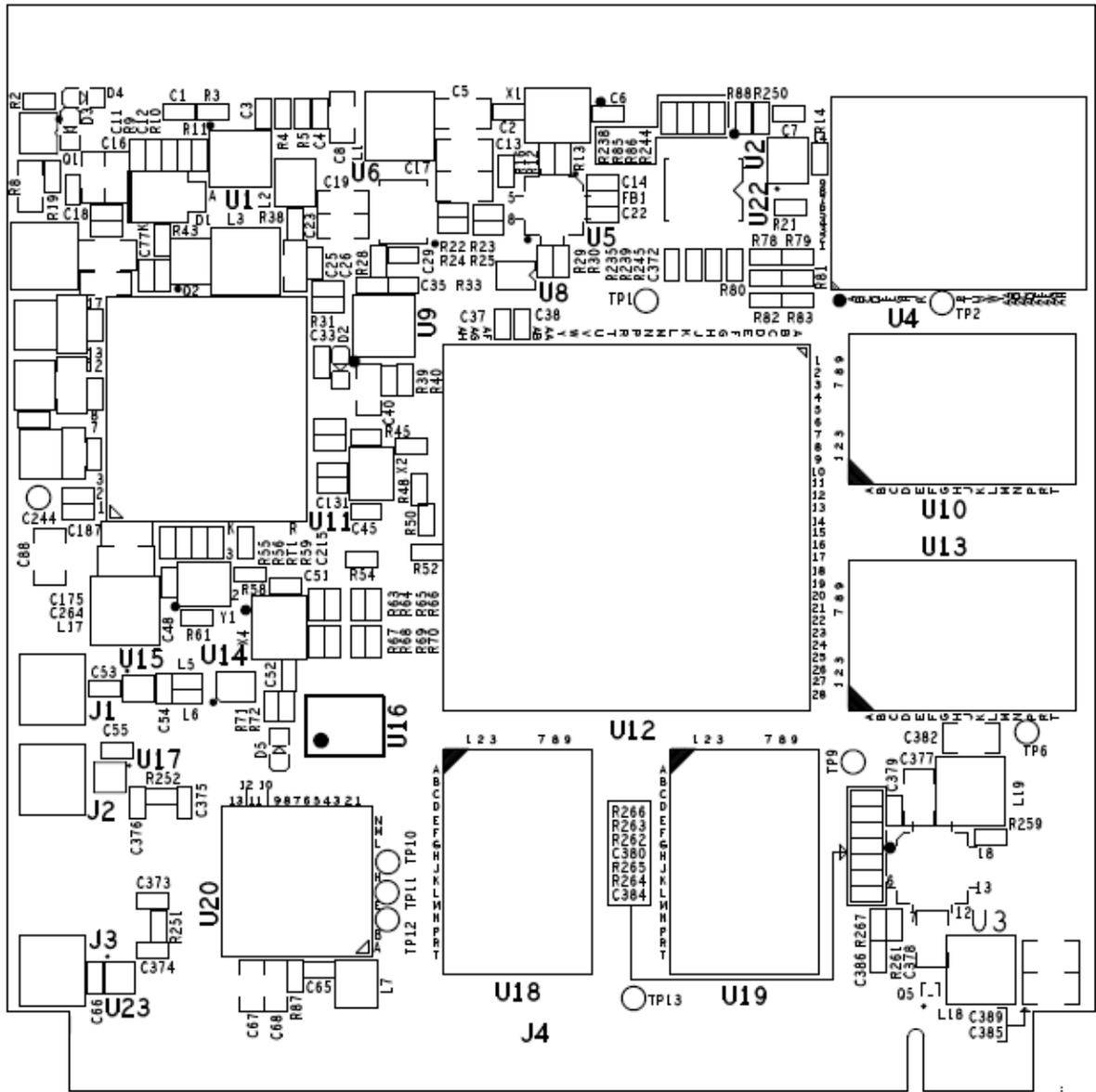
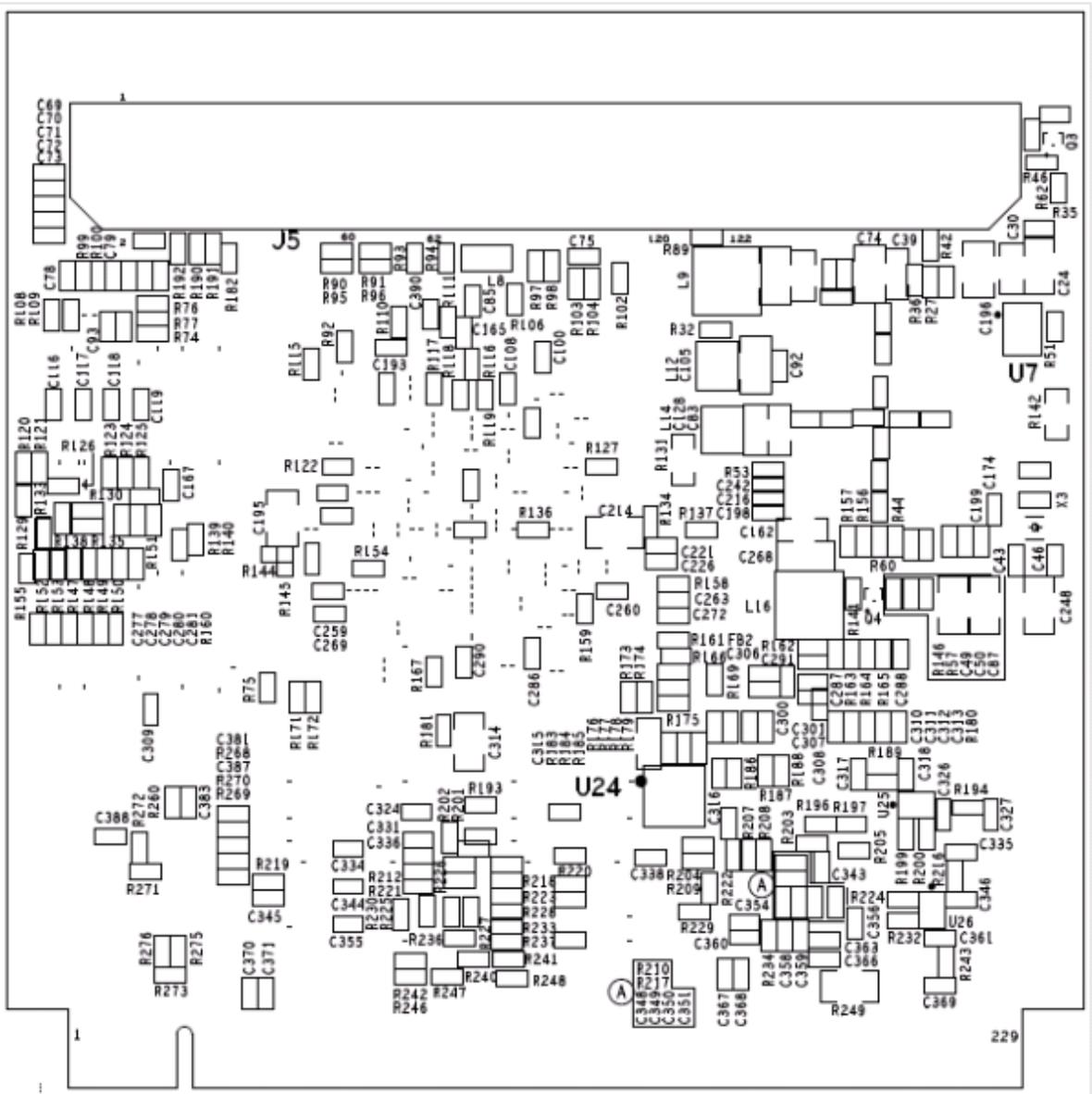


Figure 38: Q7 - Floor plan (Bottom)



# 7 APPENDIX A

## CONNECTOR PIN ASSIGNMENTS

### 7.1 LVDS HEADER PIN OUT

Manufacturer part number: DF9-41P-1V(32)

Manufacturer: Hirose

Pin Number	Signal name	Comment
1,2	V3P3_ATX	
3,4,17,18,29,30,38,40	GND	
5	LVDS_TX0_P	
6	LVDS_TX0_N	
7	LVDS_TX1_P	
8	LVDS_TX1_N	
9	LVDS_TX2_P	
10	LVDS_TX2_N	
11	LVDS_TX3_P	
12	LVDS_TX3_N	
13	CLK_170M_0_LVDS_P	
14	CLK_170M_0_LVDS_N	
15	I2C3_DATA_3P3_LVDS	
16	I2C3_CLK_3P3_LVDS	
19	LVDS_TX4_P	
20	LVDS_TX4_N	
21	LVDS_TX5_P	
22	LVDS_TX5_N	
23	LVDS_TX6_P	
24	LVDS_TX6_N	
25	LVDS_TX7_P	
26	LVDS_TX7_N	
27	CLK_170M_1_LVDS_P	
28	CLK_170M_1_LVDS_N	
31	DISP_PWR_EN_N	
32	DISPLAY_GPIO_3	
33	DISP_RST#	
34	DISPLAY_GPIO_2	
35	BACKLIGHT_PWM_EN	
36	V1P8_VREG_S4	
37	LVDS_CONN_HV_SUPPLY	12V : P510 (Pin 1-2) 5V : P510 (Pin 2-3)
39	LVDS_CONN_HV_SUPPLY	12V : P510 (Pin 1-2) 5V : P510 (Pin 2-3)

41	NC	
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## 7.2 MIPI DISPLAY PIN OUT

Manufacturer part number: 10106813-064112LF

Manufacturer: FCI

Pin Number	Signal name	Comment
44	DISP_CONN_MIPI_DSI0_CLK_N	
46	DISP_CONN_MIPI_DSI0_CLK_P	
50	DISP_CONN_MIPI_DSI0_LANE0_N	
52	DISP_CONN_MIPI_DSI0_LANE0_P	
56	DISP_CONN_MIPI_DSI0_LANE1_N	
58	DISP_CONN_MIPI_DSI0_LANE1_P	
32	DISP_CONN_MIPI_DSI0_LANE2_N	
34	DISP_CONN_MIPI_DSI0_LANE2_P	
40	DISP_CONN_MIPI_DSI0_LANE3_N	
38	DISP_CONN_MIPI_DSI0_LANE3_P	
5	DISP_CONN_MIPI_DSI1_CLK_N	
3	DISP_CONN_MIPI_DSI1_CLK_P	
9	DISP_CONN_MIPI_DSI1_LANE0_N	
11	DISP_CONN_MIPI_DSI1_LANE0_P	
15	DISP_CONN_MIPI_DSI1_LANE1_N	
17	DISP_CONN_MIPI_DSI1_LANE1_P	
23	DISP_CONN_MIPI_DSI1_LANE2_N	
21	DISP_CONN_MIPI_DSI1_LANE2_P	
27	DISP_CONN_MIPI_DSI1_LANE3_N	
29	DISP_CONN_MIPI_DSI1_LANE3_P	
10	BACKLIGHT_PWM_EN	
4	DISP_PWR_EN_N	
6	DISP_RST#	
8	DISPLAY_GPIO_0	
47	DISPLAY_GPIO_1	
43	DISPLAY_GPIO_2	
41	DISPLAY_GPIO_3	
57	DISPLAY_GPIO_4	
20	I2C3_CLK	
18	I2C3_DATA	
16	I2C4_CLK	
14	I2C4_DATA	
51	TS_ATTEN	
45	TS_LDO_EN	
55	TS_S_RDY	
53	TS_XRES	

1,2,7,12,13,19,22,25,30, 31,36,39,42,48,49,54,59,60	GND	
24, 26	VPH	
28	V1P8_VREG_S4	
33	V1P8_VREG_L23	
37	V2P8_VREG_L16	
35	V3P0_VREG_L8	

## 7.3 PRIMARY CAMERA PIN OUT

Manufacturer part number: LSHM-120-03.0-L-DV

Manufacturer: Samtec

Pin Number	Signal name	Comment
7	CAM_2_I2C_CLK	
5	CAM_2_I2C_DATA	
8	CAM_MCLK0	
6	CAM1_RST#	
23	CAM1_STANDBY	
38	CLK_MIPI_CSIO_EMI_N	
36	CLK_MIPI_CSIO_EMI_P	
15	FLASH_CTRL_EN1	
13	FLASH_NOW	
3,9,10,16,17, 22,25,28,29, 33,34,37,40	GND	
21	I2C4_CLK	
19	I2C4_DATA	
32	MIPI_CSIO_LANE0_EMI_N	
30	MIPI_CSIO_LANE0_EMI_P	
26	MIPI_CSIO_LANE1_EMI_N	
24	MIPI_CSIO_LANE1_EMI_P	
20	MIPI_CSIO_LANE2_EMI_N	
18	MIPI_CSIO_LANE2_EMI_P	
14	MIPI_CSIO_LANE3_EMI_N	
12	MIPI_CSIO_LANE3_EMI_P	
11	NC	
27	V1P2_CAMD	
35	V1P8_CAMD	
39	V2P8_CAMA	
31	V2P8_VACT	
1,2,4	VPH	

## 7.4 SECONDARY CAMERA PIN OUT

Manufacturer part number: LSHM-120-03.0-L-DV

Manufacturer: Samtec

Pin Number	Signal name	Comment
7	CAM_2_I2C_CLK	
5	CAM_2_I2C_DATA	
8	CAM_MCLK1	
6	CAM2_RST#	
23	CAM2_STANDBY	
38	CLK_MIPI_CSI1_EMI_N	
36	CLK_MIPI_CSI1_EMI_P	
15	FLASH_CTRL_EN2	
13	FLASH_NOW	
3,9,10,16,17, 22,25,28,29, 33,34,37,40	GND	
21	I2C4_CLK	
19	I2C4_DATA	
32	MIPI_CSI1_LANE0_EMI_N	
30	MIPI_CSI1_LANE0_EMI_P	
26	MIPI_CSI1_LANE1_EMI_N	
24	MIPI_CSI1_LANE1_EMI_P	
27	V1P2_CAMD	
35	V1P8_CAMD	
39	V2P8_CAMA	
31	V2P8_VACT	
1,2,4	VPH	
11,12,14,18,20	NC	

## 7.5 NFC PIN OUT

Manufacturer part number: 54722-0164

Manufacturer: Molex

Pin Number	Signal name	Comment
5	CONN_NFC_I2C_CLK	
3	CONN_NFC_I2C_DATA	
6,8,10,11,15,16	GND	
1	NFC_EN	
9	NFC_FW_DL	
7	NFC_IRQ	
13	NFC_SWP	
4	VBATT_NFC	
12	VREG_L15_NFC	
14	VREG_NFC_UIM_VCC	
2	VREG_S4_NFC	

## 7.6 QUAD MIC HEADER

Manufacturer part number: [standard 2.54mm pitch 10pin header]

Pin Number	Signal name	Comment
7	CDC_DMIC_CK0	
8	CDC_DMIC_CK1	
3	CDC_DMIC_D0	
4	CDC_DMIC_D1	
1	CDC_MIC_BIAS3	
2	CDC_MIC_BIAS4	
5,6	GND	
9,10	NC	

## 7.7 JTAG PIN OUT

Manufacturer part number: [standard 2.54mm pitch 20pin header]

Pin Number	Signal name	Comment
11	CPU_JTAG_RTCK	
15	CPU_JTAG_SRST#	
9	CPU_JTAG_TCK	
5	CPU_JTAG_TDI	
13	CPU_JTAG_TDO	
7	CPU_JTAG_TMS	
3	CPU_JTAG_TRST#	
4,6,8,10,12,14,16,18	GND	
20	JTAG_CONN_DET#	
1	JTAG_CONN_VREF	
2	NC	
17	TP	
19	TP	

## 7.8 FRONT PANEL AUDIO HEADER

Manufacturer part number: [standard 2.54mm pitch 10pin header]

Pin Number	Signal name	Comment
1	FP_AUDIO_PORT1_L	
3	FP_AUDIO_PORT1_R	
9	FP_AUDIO_PORT2_L	
5	FP_AUDIO_PORT2_R	
7	FP_AUDIO_SNS_SEND	
6	FP_AUDIO_SNS1_RET	
10	FP_AUDIO_SNS2_RET	
2	GND	
4,8	NC	

## 7.9 FRONT PANEL POWER AND RESET HEADER

Manufacturer part number: [standard 2.54mm pitch 10pin header]

Pin Number	Signal name	Comment
9	FP_5V	
1	FP_HDD_LED	
3	FP_HDD_LED#	
6	FP_PWR_BTN#	
2	FP_PWR_LED_MAIN	
7	FP_RST_BTN#	
4	GND	
5	GND	
8	GND	
10	NC	

## 7.10 EDUCATION CONNECTOR PIN OUT

Manufacturer part number: [standard 2.54mm pitch 16pin header]

Pin Number	Signal name	Comment
1	EDU_CONN_PIN1_3P3	
10	EDU_CONN_PIN10	
11	EDU_CONN_PIN11_3P3	
12	EDU_CONN_PIN12	
13	EDU_CONN_PIN13	
14	EDU_CONN_PIN14	
16	EDU_CONN_PIN16	
3	EDU_CONN_PIN3_3P3	
4	EDU_CONN_PIN4	
5	EDU_CONN_PIN5_3P3	
6	EDU_CONN_PIN6	
7	EDU_CONN_PIN7_3P3	
8	EDU_CONN_PIN8	
9	EDU_CONN_PIN9_3P3	
15	GND	
2	V3P3_EDU_CONN	

## 7.11 SENSOR HEADER AND CONNECTORS

### 7.11.1 GEN6 SENSOR MODULE HEADER

Manufacturer part number: [standard 2.54mm pitch 24pin header]

Pin Number	Signal name	Comment
2	ACCEL_INT1	
4	ACCEL_INT2	
13	CLK_29M_SLIMBUS2	
9,10	GND	
6	GYRO_INT#	
3	I2C2_CLK	
1	I2C2_DATA	
16	MAG_INT	
18	PRESS_INT	
14	PROX_INT#	
5	SENSOR_RESET	
11	SLIMBUS2_DATA	
15	SNS_TST1	
17	SNS_TST2	
21	SPI_CLK	
19	SPI_CS1#	
24	SPI_GPIO	
23	SPI_INT	
22	SPI_MISO	
20	SPI_MOSI	
7	V1P8_VREG_LVS4	
8	V2P85_VREG_L9	
12	NC	

## 7.11.2 PLCC SOCKET

Manufacturer part number: PLCC-44-AT-SMT

Manufacturer: ADAM TECH

Pin Number	Signal name	Comment
27	AC0_PLCC	
28	AC1_PLCC	
41	ACCEL_INT1_PLCC	
42	ACCEL_INT2_PLCC	
7,18,40	GND	
20	GYRO_DRDY	
35	GYRO_INT1_PLCC	
1	I2C2_CLK	
44	I2C2_DATA	
15	MAG_DRDY_PLCC	
3	PRESS_INT1_PLCC	
4	PRESS_INT2_PLCC	
19	V1P8_VREG_S4	
38,39	V3P3_Q7	
2,5,6,8,9,10, 11,12,13,14,15,16,17, 21,22,23,24,25,26,29, 30,31,32,33,34,36,37,43	NC	

## 7.11.3 SPI HEADER

Manufacturer part number: [standard 2.54mm pitch 10pin header]

Pin Number	Signal name	Comment
7,8	GND	
6	SPI_CLK	
5	SPI_CS0#	
3	SPI_MISO	
4	SPI_MOSI	
1	V1P8_VREG_LVS4	
2	V1P8_VREG_LVS4	
9,10	NC	

## 7.12 TSIF/SPDIF HEADER

Manufacturer part number: QSH-030-01-F-D-A

Manufacturer: Samtec

Pin Number	Signal name	Comment
53	CODEC_MIC_I2S_MCLK	
4,7,8,11,12,15,16,19, 20,24,28,32,38,48	GND	
34	I2C_SPDIF_TSIF_1	
36	I2C_SPDIF_TSIF_2	
59	I2C2_CLK	
57	I2C2_DATA	
55	MI2S_MCLK	
49	MI2S_SCK	
9	MI2S_SD0	
13	MI2S_SD1	
47	MI2S_WS	
51	MIC_I2S_WS	
40	SPI_CLK	
46	SPI_CS1#	
44	SPI_MISO	
42	SPI_MOSI	
1	SPKR_I2S_DOUT	
5	SPKR_I2S_SCLK	
3	SPKR_I2S_WS	
43	TSIF_CIMAX_INT	
41	TSIF_CIMAX_RST	
50	TSIF_GPIO_1	
52	TSIF_GPIO_2	
54	TSIF_GPIO_3	
56	TSIF_GPIO_4	
58	TSIF_GPIO_5	
60	TSIF_GPIO_6	
45	TSIF_TV_DEMOD_INT	
2	TSIF1_CLK	
6	TSIF1_DATA	
10	TSIF1_EN	
14	TSIF1_SYNC	
18	TSIF2_CLK	
22	TSIF2_DATA	

26	TSIF2_EN	
30	TSIF2_SYNC	
17	V_NEG_12_ATX	
21,23	V12_ATX	
37,39	V1P225_VREG_S1	
33,35	V1P8_VREG_S4	
29,31	V3P3_ATX	
25,27	V5_ATX	

**NOTE**

*Refer Doc # 001686 (Carrier Board schematic) for detailed understanding of TSIF/SPDIF connector.*

## 7.13 EXPANSION CONNECTOR

Manufacturer part number: QSH-030-01-F-D-A

Manufacturer: Samtec

Pin Number	Signal name	Comment
41	CAM_2_I2C_CLK	
83	CAM_2_I2C_DATA	
80	CLK_29M_SLIMBUS1	
105	CLK_500M_MIPI_CSI0_N	
107	CLK_500M_MIPI_CSI0_P	
108	CLK_500M_MIPI_CSI1_N	
110	CLK_500M_MIPI_CSI1_P	
113	CLK_500M_MIPI_DSI0_N	
115	CLK_500M_MIPI_DSI0_P	
96	CLK_500M_MIPI_DSI1_N	
98	CLK_500M_MIPI_DSI1_P	
46	CPU_GPIO_0	
47	CPU_GPIO_2	
37	CPU_GPIO_22	
49	CPU_GPIO_23	
82	CPU_GPIO_28	
70	CPU_GPIO_29	
39	CPU_GPIO_3	
78	CPU_GPIO_31	
68	CPU_GPIO_32	
72	CPU_GPIO_33	
26	CPU_GPIO_34	
56	CPU_GPIO_35	
44	CPU_GPIO_36	
45	CPU_GPIO_37	
24	CPU_GPIO_38	
58	CPU_GPIO_39	
51	CPU_GPIO_4	
27	CPU_GPIO_42	
20	CPU_GPIO_47	
36	CPU_GPIO_48	
66	CPU_GPIO_49	
85	CPU_GPIO_5	
31	CPU_GPIO_50	
50	CPU_GPIO_55	
52	CPU_GPIO_56	
32	CPU_GPIO_57	
25	CPU_GPIO_58	
54	CPU_GPIO_59	
43	CPU_GPIO_6	
22	CPU_GPIO_60	
28	CPU_GPIO_61	
30	CPU_GPIO_62	
69	CPU_GPIO_7	

35	CPU_GPIO_80	
59	CPU_GPIO_84	
71	CPU_GPIO_85	
33	CPU_GPIO_86	
53	CPU_GPIO_88	
55	CPU_GPIO_89	
48	FLASH_NOW	
1,2,3,4,5,6,7,8,9,10, 11,12,13,14,15,18,23,38, 40,42,57,61,63,73,74,75,76, 81,124,131,178	GND	
87	I2C4_CLK	
65	I2C4_DATA	
99	MIPI_CSI0_LANE0_N	
97	MIPI_CSI0_LANE0_P	
101	MIPI_CSI0_LANE1_N	
103	MIPI_CSI0_LANE1_P	
111	MIPI_CSI0_LANE2_N	
109	MIPI_CSI0_LANE2_P	
118	MIPI_CSI0_LANE3_N	
120	MIPI_CSI0_LANE3_P	
112	MIPI_CSI1_LANE0_N	
114	MIPI_CSI1_LANE0_P	
104	MIPI_CSI1_LANE1_N	
106	MIPI_CSI1_LANE1_P	
92	MIPI_DSI0_LANE0_N	
94	MIPI_DSI0_LANE0_P	
117	MIPI_DSI0_LANE1_N	
119	MIPI_DSI0_LANE1_P	
93	MIPI_DSI0_LANE2_N	
95	MIPI_DSI0_LANE2_P	
91	MIPI_DSI0_LANE3_N	
89	MIPI_DSI0_LANE3_P	
100	MIPI_DSI1_LANE0_N	
102	MIPI_DSI1_LANE0_P	
84	MIPI_DSI1_LANE1_N	
86	MIPI_DSI1_LANE1_P	
64	MIPI_DSI1_LANE2_N	
62	MIPI_DSI1_LANE2_P	
88	MIPI_DSI1_LANE3_N	
90	MIPI_DSI1_LANE3_P	
138	PMIC_BAT_ID	
136	PMIC_BAT_THERM	
153	PMIC_BMS_CSN	
151	PMIC_BMS_CSP	
17	PMIC_MPP_8821_1	
21	PMIC_MPP_8821_2	
19	PMIC_MPP_8821_3	
135	PMIC_MPP_8921_10	

132	PMIC_MPP_8921_11	
125	PMIC_MPP_8921_12	
29	PMIC_MPP_8921_8	
137	PMIC_MPP_8921_9	
167	PMIC_PM_GPIO_18	
149	PMIC_PM_GPIO_22	
133	PMIC_PM_GPIO_23	
121	PMIC_PM_GPIO_27	
129	PMIC_PM_GPIO_28	
77	PMIC_PM_GPIO_31	
127	PMIC_PM_GPIO_33	
126	PMIC_PM_GPIO_34	
130	PMIC_PM_GPIO_35	
128	PMIC_PM_GPIO_37	
134	PMIC_PM_GPIO_38	
67	PMIC_PM_GPIO_40	
116	PMIC_PM_GPIO_5	
169	PMIC_PM_GPIO_7	
60	SLIMBUS1_DATA	
122	UIM1_CLK	
123	UIM1_DATA	
156	V1P05_VREG_L28	
179	V1P2_VREG_L12	
14,16	V1P2_VREG_L25	
174,176	V1P225_VREG_S1	
168,170	V1P3_VREG_S2	
172	V1P8_VREG_L15	
154	V1P8_VREG_L23	
158	V1P8_VREG_LVS4	
166	V1P8_VREG_LVS5	
147	V1P8_VREG_LVS7	
162,164	V1P8_VREG_S4	
175	V2P6_VREG_L22	
171	V2P8_VREG_L11	
160	V2P8_VREG_L16	
173	V2P85_VREG_L9	
155	V2P95_VREG_L6	
34	V2P95_VREG_L7	
180	V3P0_VREG_L8	
157,159	V3P3_Q7	
161,163	V5_OTG	
177	V5P0_VREG_HDMI	
140,142,144,146,148,150,152	VBATT	
139,141,143,145	VPH	
79,165	NC	

## 7.14 ANTENNA CABLE LOCATION

Antennas are connected using the UFL cables. Following table shows the corresponding UFL cable connections for antennas on the system.

Interface	Antenna type	RefDes on Q7 board	RefDes on Carrier board
WLAN Antenna0	Chip Antenna	J2	J506
	External Antenna	J2	J519
WLAN/BT Antenna1	Chip Antenna	J3	J507
	External Antenna	J3	J520
GPS	Chip Antenna	J1	J505
	External Antenna	J1	J518

# 8 APPENDIX B

## HIGH LEVEL BOM

### 8.1 IFC6400 - HIGH LEVEL BOM

Item	Description	Manufacturer	Manufacturer Part number
1	CONN,CO-AXIAL SMALL RCPT,H=1.25,SMD	Hirose	U.FL-R-SMT-1(01)
2	CONN,HDR,2x90P,0.5mm,H=4.27mm,SMD	Samtec	QTH-090-01-F-D-A
3	Diplexer,Mult-Layer,1.6x0.8,6P,SMD	TDK Corporation	DPX165950DT-8126A1
4	IC,BP FILTER,WLAN/BT,F0=2.45GHz,SMD	Murata Electronics	LFB212G45CGAD340
5	IC,BUCK-BST CONV,ADJ,4A SWCH,VSON14	Texas Instruments	TPS63020DSJT
6	IC,CLK GEN,PCIe GEN1/2,1:1,QFN-16	IDT	IDT5V41064NLG
7	IC,CLK GEN,PCIe GEN1/2,1:2,TSSOP16	IDT	IDT5V41065PGG
8	IC,DUAL BUCK CNV,DDR TERM,3A,QFN-24	Linear Technology	LTC3618EUF#PBF
9	IC,eMMC NAND FLASH,4Gb,FBGA-169	Kingston	KE4CN3K6A
10	IC,GNSS RF RECEIVER,WLNSP-17	Qualcomm	WGR-7640-0-17WLNSP-TR-00-0
11	IC,INTG LOAD SW,ADJ REV CUR,SOT23-5	Fairchild	FPF2124
12	IC,PROC,4core,S4,1.5GHz,FCBGA-784	Qualcomm	APQ-8064-0-784FCBGA-TR-00-0
13	IC,PWR MGMT MOD,FBGA-255	Qualcomm	PMM-8920-0-255FBGA-TR-04-0
14	IC,SAW FILTER,GPS/GLONAS,5P,SMD	Murata Electronics	SAFEA1G58FB0F00
15	IC,SDRAM,DDR3-1600,4Gb,1.35V,FBGA96	Micron Technology Inc	MT41K256M16HA-125:E
16	IC,STEP-UP PWM REG,ADJ,4A,TDFN-10	Intersil	ISL97656IRTZ
17	INT 2x2,2BND 802.11n+B/T 4.0,LGA113	Qualcomm	QCA6234X-XXXX
18	OSC,19.2MHz,0.2ppm,2.5x2x0.8mm,SMD	TXC CORPORATION	7L-19.200MCS-T

## 8.2 IOC6440 - HIGH LEVEL BOM

Item	Description	Manufacturer	Manufacturer Part number
1	Antenna,Dual band WiFi 2.4/5GHz,SMD	Fractus	FR05-S1-NO-1-004
2	Antenna,GPS Chip,1.48dB,10x10x0.9mm	Fractus	FR05-S1-E-0-103
3	CONN,AUD HD JACK,6 PRT,3.6mm,26P,TH	Foxconn	JAS3331-D1E2-4F
4	CONN,AUD JACK,SNG PRT,3.6mm,7P,SMD	Amphenol	103-C0680-00842
5	CONN,CO-AXIAL SMALL RCPT,H=1.25,SMD	Hirose	U.FL-R-SMT-1(01)
6	CONN,DC PWR JCK,24V,3.5A,3P,2mm,TH	Kycon Electronics	KLDX-0202-A
7	CONN,D-SUB,HIGH RAISE,RT,9P,TH	Amphenol	G17H21A0121EU
8	CONN,HDMI TYP A,RA,19P,H=6.11mm,SMD	Tyco electronics	1747981-1
9	CONN,HDR,VT,WTH FIT&BOS,41P,1MM,SMD	Hirose	DF9-41P-1V(32)
10	CONN,MEZZO STAK,60P,0.5MM,H=3.5,SMD	FCI	10106813-064112LF
11	CONN,MICR SIM CARD,STD,H=1.25mm,SMD	Alps	SCGD1B0201
12	CONN,MICR USB,SNG,TYP AB,H=2.35,SMD	Samtec	UUSB-AB-S-F-SM-TR
13	CONN,MICRO SD,STD,8P,H=1.68mm,SMD	Hirose	DM3AT-SF-PEJM5
14	CONN,MINI PCIe,52P,H=5.9mm,SMD	JAE Industry Ltd	MM60-52B1-E1-R650
15	CONN,MINIPcie,6P,FEM,RA,H=5.9mm,SMD	JAE Industry Ltd	MM60-EZH059-B5-R650
16	CONN,MXM,RA,230P,0.5mm,H=7.8mm,SMD	Foxconn	AS0B326-S78N-7F
17	CONN,PCIe,VT,36P,1mm,H=11,W=8.8,TH	Tyco electronics	1-1734654-3
18	CONN,PIN HDR,STRGHT,1X3P,2.54MM,TH	MOLEX Incorporated	90120-0763
19	CONN,PLCC SKT,44P,1.27mm,SMD	ADAM TECH	PLCC-44-AT-SMT
20	CONN,RECPT,VT,SLIM STK,2x8P,0.5,SMD	Molex Connectors	54722-0164
21	CONN,RJ45+2xUSB,wLEDs,1G,H=30.52,TH	Abracon Corporation	ARJU31B-MCSM-AD-B-GLT2
22	CONN,RPSMA JACK,FEM,RA,5P,TH	Linx Technologies Inc	CONREVSMA002
23	CONN,SATA HI-SPD HDR,0.38um Au,TH	MOLEX Incorporated	678008005
24	CONN,SKT,2x30P,0.5mm,H=3.25mm,SMD	Samtec	QSH-030-01-F-D-A
25	CONN,SKT,2x90P,0.5mm,H=3.25mm,SMD	Samtec	QSH-090-01-F-D-A
26	CONN,SKT,BAT HLDR,1xLi-Ion,18650,TH	Keystone Electronics	1043
27	CONN,SMA JACK,FEM,RA,5P,H=9.86MM,TH	Samtec	SMA-J-P-H-RA-TH1
28	CONN,TERM BLK,2 POLE,RA,4P,3.5MM,TH	WEIDMULLER	1824420000
29	CONN,TERM/SKT COMBO STRIP,2x20P,SMD	Samtec	LSHM-120-03.0-L-DV-A-S-K-TR
30	CONN,UNSHD VT HDR,2x12P,W/PG,4.2,TH	Tyco electronics	2-1586039-4
31	CONN,USB,SNG PRT,VT,TYP A,4P,H=15,TH	Tyco electronics	1734366-1
32	IC,2-DIFF CHN,2:1 MUX/DMUX,DHVQFN20	NXP	CBTL02042ABQ,115
33	IC,4LANE SWCH,4 PRT GEN2,QFN-136	PLX Technology	PEX 8605-AA50NI G
34	IC,7-PORT USB HUB CONTROLLER,QFN-64	SMSC	USB2517-JZX
35	IC,AUDIO CODEC,MULTI-SOLNS,CSP-86	Qualcomm	WCD9311-0-86CSP-TR-02-0
36	IC,CLASS-D AUD PWR AMP,15W,HTSSOP28	Texas Instruments	TPA3110D2PWP
37	IC,DUAL PWR SWITCH,500mA,DFN3030E-8	Diodes Inc	AP2152AFGEG-7
38	IC,DUAL SCHMIT TRIGGER N-INV,TSOP-6	NXP	74LVC2G17GV,125
39	IC,FXD CUR LIMIT LOAD SWI,1A,UDFN-6	ON Semiconductor	NCP380HMU10AATBG
40	IC,GbE LAN CNTRLR W/INT XCVR,QFN40	Qualcomm Atheros	AR8151-BL1A-R

41	IC,GNSS LNA-FILTR FNT-END MOD,MCOB8	Avago Technologies	ALM-3012-BLK
42	IC,HDMI COMP CHIP WTH I2C,TSSOP-24	Texas Instruments	TPD12S016PWR
43	IC,INTG LOAD SW,ADJ REV CUR,SOT23-5	Fairchild	FPF2124
44	IC,LDO,LOW NOISE&QSCNT CUR,1A,VDFN6	ST Microelectronics	LD39100PUR
45	IC,SATA PORT MULTIPLIER,QFN-40	Silicon Image	Sil3723CNU
46	IC,SGL RS232 TRNSCVR,1Mbps,DFN-12	Linear Technology	LTC2802CDE#PBF
47	IC,STEP-DWN CNVRTR,SYNC,2A,QFN-16	Texas Instruments	TPS54218RTER
48	IC,UHS 2-INP NAND GATE,SC70-5	Fairchild	NC7SZ38P5X
49	IC BAT PROT LI-ION/LI-POL 4.28V 5PIN	Seiko Instruments	S-8211CAM-M5T1U
50	SKT,BAT HOLDR,COIN CELL,6.8 DIA,SMD	Keystone Electronics	2998
51	SW,PUSH BUT,25A,50mV,SPST,VT,4P,SMD	Omron Electronics	B3FS-1000P
52	SW,SPST,20V,0.1A,3P,9.1x6.7x3.8,SMD	CTS	219-3MST
53	SW,TACT,SPDT,15V,20mA,6x6x0.9mm,SMD	Panasonic	EVQPRHA09
54	BAT,LI COIN CELL,RECHARGBLE,3V,5mAh	Panasonic - BSG	ML-621S/ZTN
55	BAT,LI ION,RECHARGABLE,3.7V,2200mAh	Autec power Systems	LIR18650
56	CABLE,USB B MICRO TO USB A Male,1M	Assmann	AK67421-1-R
57	CABLE,MICRO HI-FREQ RF,MHF1,100mm	Samtec	MH113-MH1RP-MH1RP-0100
58	DC PWR ADPTR,5V/3A,15W,50mV RIPPLE	Phihong	PSA15A-050PV

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