KEMSYS TECHNOLOGIES
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Single Board Computer
On

Qualcomm snapdragon

SKATE-212 Datasheet

Rev.1.1
28th August 2018

SKATE

Revision History

Rev No	Date	Major Changes	Author	Approved & Released By
1.0	04-Aug-2017	Initial release	Hardware Team	Hardware Team
2.0	28-Aug-2018	GPS part updated	Hardware Team	Hardware Team

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Table 1 - Abbrevations

SBC	Single Board Computer
LPDDR	Low Power Double Data Rate memory
OTG	On-The-Go
eMMC	embedded Multi-Media Controller
SD Card	Secure Digital Card
RDS	Radio Data System
RBDS	Radio Broadcast Data System
BLE	Bluetooth Low Energy
GPU	Graphics Processing Unit
GPS	Global Positioning System
GLONASS	Global Navigation Satellite System
GNSS	Global Navigation Satellite System
QZSS	Quasi-Zenith Satellite System
DSI	Display Serial Interface
CSI	Camera Serial Interface
TBD	To Be Decided
DNI	Do Not Import
DNP	Do Not Populate

SKATE-212 - Qualcomm® Snapdragon™ 212 Single Board Computer (SBC)

1. Introduction

The new SKATE-212, is a member from Kemsys SKATE BOARD family of Single Board Computers and is powered by the Qualcomm® Snapdragon™ 212 application processor. SKATE-212 is an ultra-small (90mm x 70mm) development kit features quad core A7 class computing with easy access to industry standard I/O's which creates the perfect environment for a variety of Android based applications including digital signage, industrial automation and video conferencing. Unique features include support for Wi-Fi/BLE, GPS, HDMI displays, dual-MIPI-CSI cameras, MIPI-DSI, and RJ45 interfaces.

2. Purpose of the document

Purpose of this document is to provide brief technical details of hardware design of Skate Board.

3. Block Diagram of Skate Board

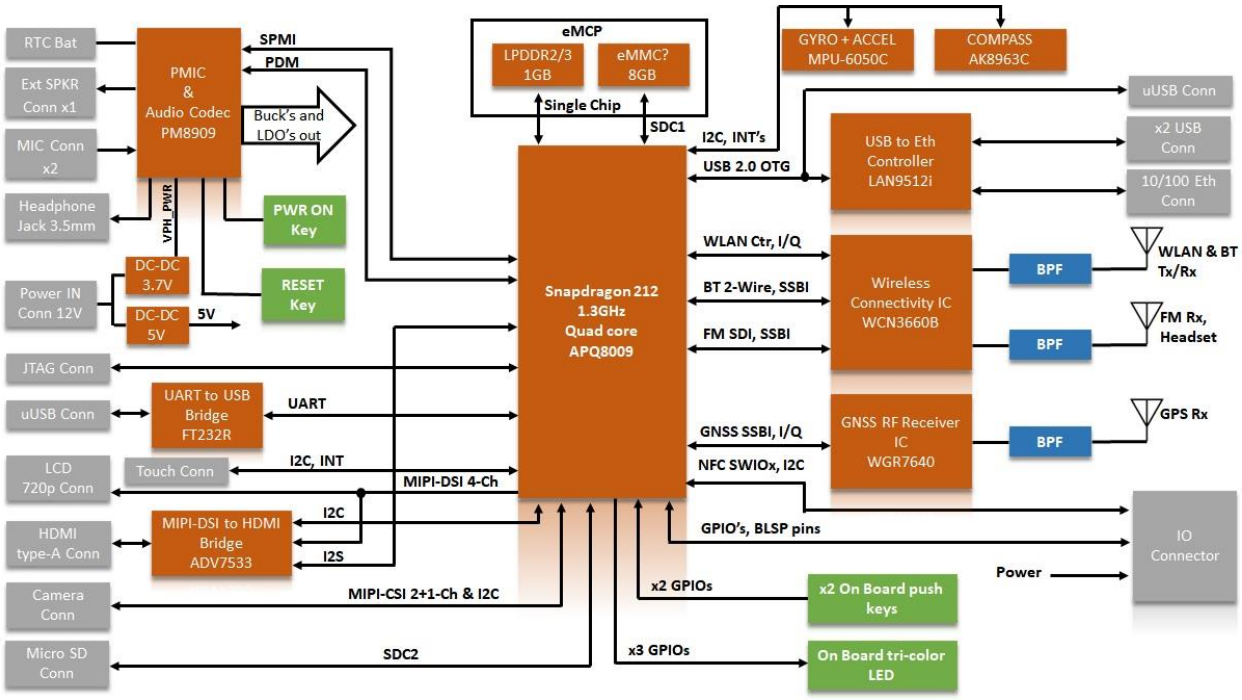

Figure 1: Block Diagram

4. Layout and Components

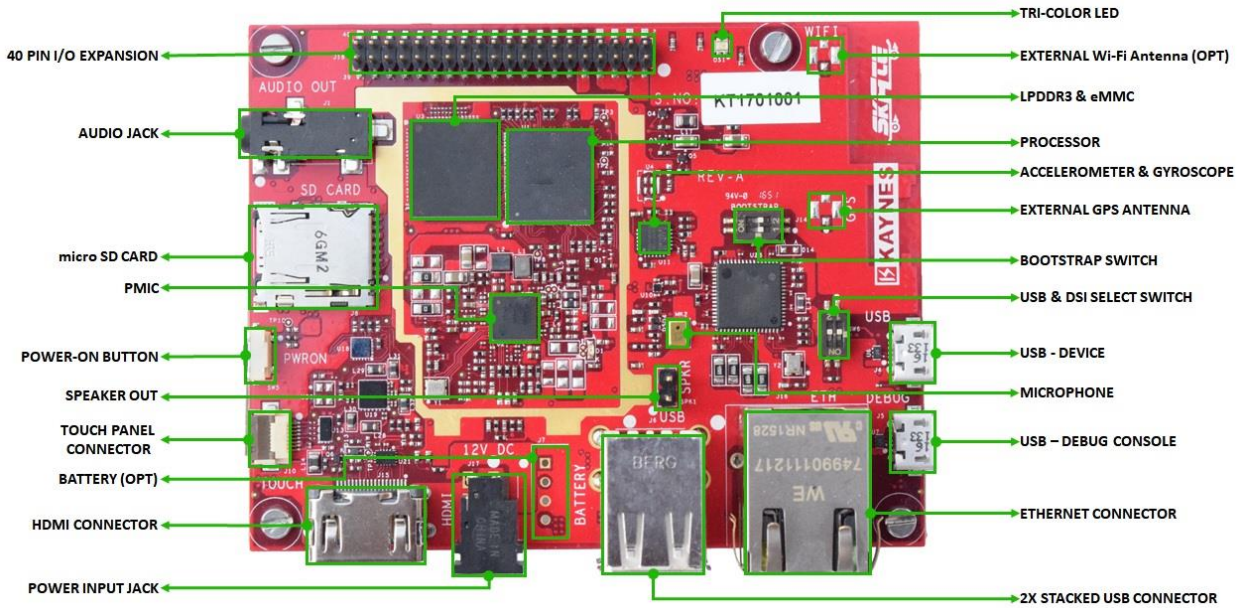

Figure 2: Layout Top View

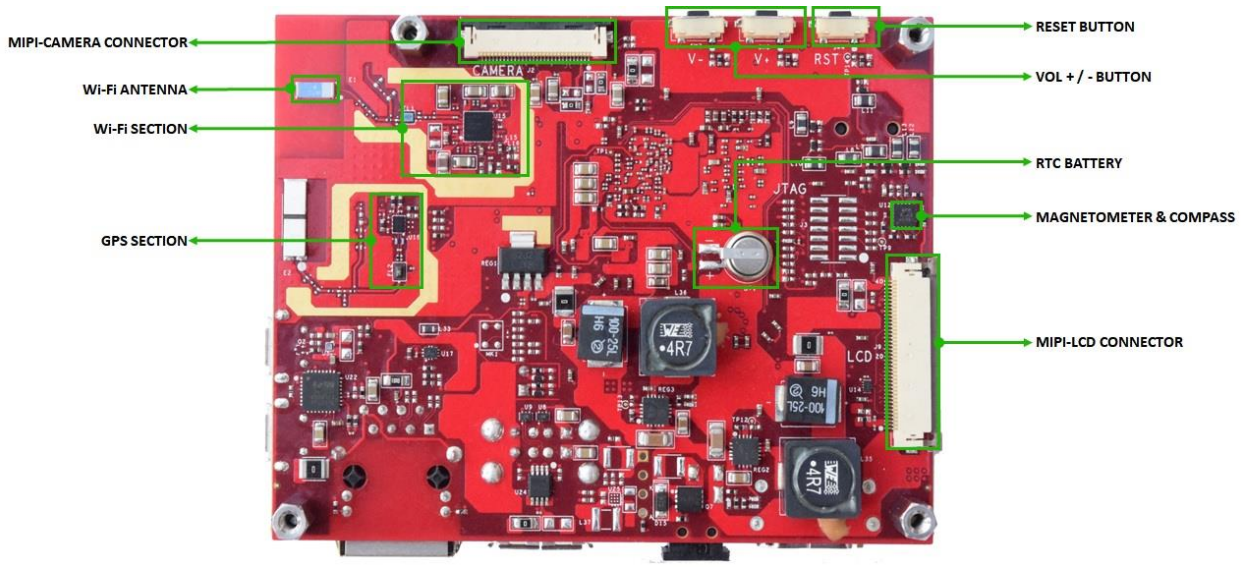

Figure 3: Layout Bottom View

4.1 Handling and Testing

The Skate board is ESD sensitive device, hence safety precautions are mandatory
1. We recommend you to handle the device under an ESD controlled chamber.
2. Should not touch the development board with a bare hand or dropping on the ground may cause the board permanently damaged.

5. SKATE-212 Specifications

Table 2 - SKATE-212 Specifications

Processor and Memory	Description
Processor	Qualcomm Snapdragon™ – 212, 1.3 GHz
Graphics	Adreno 304 GPU, OpenGL ES 3.0, OpenCL, DirectX support
RAM	1 GB LPDDR3 (expandable up to 2GB)
Built in Memory	8 GB eMMC
SD Card	Yes, micro SD slot

Communication Interface	
USB device	Yes, USB 2.0 device micro USB connector [1]
USB host	2x USB type A [1]
USB debug Console	Yes, UART to USB
Ethernet	Yes [1]

Wireless & Connectivity	
Bluetooth	BLE 4.x
Wi-Fi	802.11 b/g/n WAN
GSM/GPRS/3G/4G	No
GPS	Yes

Camera (add on board)	
Primary Camera	Yes, 8 MP
Secondary Camera	Yes, 2 MP
LED Flash	No

Display & Touch	
LCD	7inch
Touch	Yes, Capacitive
HDMI	Full size HDMI [2]

Audio	
Loud Speakers	Mono loudspeaker output
Audio jack	3.5mm stereo audio jack with mic
Microphone	On board dual microphone [3]

Sensors	
Gyroscope / Accelerometer	6-axis MEMS gyroscope & Accelerometer
Compass / Magnetometer	3-axis Magnetometer
Power supply	
Primary power supply	12 VDC power adapter
Battery	3.7 V, 2500mA battery [4]

Note:

[1] USB device or 2X USB host and Ethernet, anyone can be used at a time and once USB device port is plugged in, 2X USB host and Ethernet will be disabled automatically.

[2] Either HDMI or LCD can be used at a time. HDMI supports max 720P only.

[3] one microphone is available in SBC. Dual microphone is an optional

[4] Battery is an optional

5.1 Processor

SKATE-212 houses a powerful Qualcomm® Snapdragon™ 212 ARM Cortex-A7 quad core 1.3 GHz application processors with Adreno 304 GPU supports OpenGL ES 3.0, Hexagon DSP, OpenCL and DirectX.

5.2 Memory

This SBC is powered with 1GB mobile LPDDR3 RAM operates at 533 MHz clock. Expandable up to 2GB.

5.3 Storage

The onboard storage module is 8GB eMMC version 4.51 compliant. Additionally, micro SD card slot is provided for external memory up to 32GB.

5.4 Communication

- SPI, I2C, and UART
- One USB 2.0 device with micro USB connector for fast boot [5]
- 2X USB host [5]
- 10/100 Ethernet [5]
- UART to USB (Micro USB) for debug.
- BT 4.x + BR/EDR + BLE
- Wi-Fi - IEEE 802.11b/g/n
- GPS supported with external antenna.
- On board chip antenna for BT, Wi-Fi.

5.5 Connectors

- 40-pin I/O expansion header
- 14-pin JTAG debug connector
- 3.5 mm stereo Audio jack with Mic
- Micro SD card slot (push to eject/lock)
- 40-pin 720P LCD connector with touch interface
- 8-pin dedicated touch panel connector
- 30-pin camera interface connector
- Standard 5 mm power jack

Note:

[5] USB device or 2X USB host and Ethernet, anyone can be used at a time and once USB device port is plugged in, 2X USB host and Ethernet will be disabled automatically.

5.6 Display

The SBC supports 720P display via LCD/HDMI connector, any one display mode can be used at a time by enabling it from software or through a forced hardware switch.

5.7 Audio

- Mono speaker output for 8 Ohm Magnetic Speaker 1W 550Hz ~ 18kHz, 83dB[6]
- On board, dual microphone support. Either one microphone is default mounted
- 3.5mm audio jack with Mic, pin details in below fig

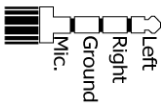

Figure 4: Audio Jack pinout

5.8 Switches, Button, and LED's

- 4 user push buttons (Power, Reset, Volume Up, Volume Down)
- 2 X Dip switches (HDMI/LCD & USB/Ethernet selection)
- One tri-color LED (RGB)

5.9 Sensors

- 3-axis magnetometer device suitable for compass application
- 3-axis MEMS gyroscope
- 3-axis MEMS accelerometer

5.10 RTC

On board coin battery is provided for retaining calendar and time information if battery and main power is not present.

Note: [6] Loud-speaker is not included in SBC

5.11 Power

The primary power source for this SBC would be a power adapter. As an additional option, to support field applications, we provide external battery interface.

The power adapter should meet the following specification.

Table 3 – Adapter Power Requirement

Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Input Voltage	Operating Voltage	100		240	VAC
Input Frequency		50		60	Hz
Output Voltage			12	17	VDC
Output Current		1	1.5	2	A
Output Ripple & Noise				250	mVp-p
Protection	Over voltage protection (OVP), Over Load Protection (OLP), Short circuit protection				
Automatic Recovery	Automatic recovery when removal of protect condition. Any protect condition shall cause no damage and no component fail. (<0.03 ohm)				

Table 4 – SKATE-212 Power Requirement

Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Input Voltage		8	12	16	VDC
Current Consumption	At typical operation voltage 12Vdc. Without LCD connected	200	250		mA
	At typical operation voltage 12Vdc. With LCD connected, USB pen drive and mouse connected	300	650		

6. BOOT CONFIG

The boot sequence of SBC can be configured using a dip switch and the truth table for boot-configuration as shown in figure 5.

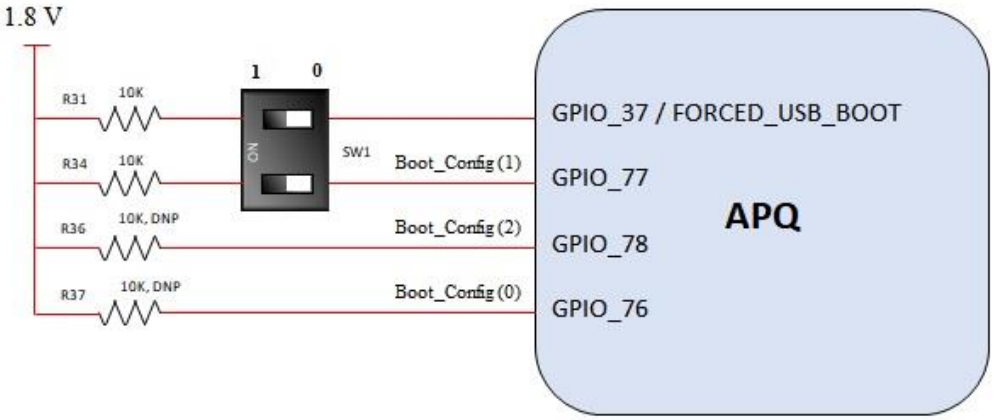

Figure 5: Boot Config

Default Boot Config (0b000) is eMMC on the SDC1.

BOOT_CONFIG [3:1]	BOOT OPTIONS
0b000	EMMC → USB2.0
0b001	SDC2 → EMMC
0b010	EMMC
0b011	USB2.0

7. Peripheral Interfaces Pinouts and Descriptions

7.1 I/O Expansion connector pinouts

SKATE-212 has a 40 pin I/O expansion connector which can be used for connecting external modules or sensor to the SBC. The pin description is mentioned in the below table.

P- Power; D- Digital; A- Analog; O- Output; I- Input;

Table 5 - I/O Expansion pinout

Pin No	Pin Type	Pin Name	BLSP #	Description
1	P – O	5V		Supply for external peripherals or modules. Maximum output current is 500mA.
2		GND		
3	P – O	5 V		Supply for external peripherals or modules. Maximum output current is 500mA.
4		GND		
5	P – O	3.7 V		Supply for external peripherals or modules. Maximum output current is 500mA.
6		GND		
7	P – O	3.7 V		Supply for external peripherals or modules. Maximum output current is 500mA.
8		GND		
9	P – O	1.8V		low power output. Maximum output current is 50mA
10	D – O	UART_APQ_TX / GPIO_4	BLSP1_3	Serial debug interface Transmit. I/O level is 1.8V.
11	D – I	UART_APQ_RX / GPIO_5	BLSP1_2	Serial debug interface Receive. I/O level is 1.8V.
12		GND		
13	D – O	APQ_RESOUT_N		Reset out from processor for external devices or modules.
14		GND		
15	D – I/O	GPIO_69		I/O level is 1.8V.
16	D – I/O	GPIO_70		I/O level is 1.8V.
17	D – I/O	GPIO_68		I/O level is 1.8V.
18	D – I/O	GPIO_67		I/O level is 1.8V.
19	D – I/O	GPIO_66		I/O level is 1.8V.

20	D – I/O	GPIO_52		I/O level is 1.8V.
21	D – I/O	GPIO_51		I/O level is 1.8V.
22	D – I/O	GPIO_50		I/O level is 1.8V.
23	D – I/O	GPIO_53		I/O level is 1.8V.
24	D – I/O	GPIO_56		I/O level is 1.8V.
25	D – I/O	GPIO_54		I/O level is 1.8V.
26	D – I/O	GPIO_55		I/O level is 1.8V.
27	D – I/O	GPIO_112/SPI_CLK/ UART_RFR_N/I2C_SCL	BLSP2_0	I/O level is 1.8V.
28	D – I/O	GPIO_21/SPI_MISO/UA RT_RX	BLSP2_2	I/O level is 1.8V.
29	D – I/O	GPIO_20/SPI_MOSI/UA RT_TX	BLSP2_3	I/O level is 1.8V.
30	D – I/O	GPIO111/SPI_CS_N/UA RT_CTS_N / I2C_SDA	BLSP2_1	I/O level is 1.8V.
31	D – O	BBCLK2_CONN		I/O level is 1.8V.
32	D – O	BBCLK2_EN_NFC		I/O level is 1.8V.
33	D – I/O	GPIO_11 / SPI_CLK / I2C_SCL	BLSP6_0	I/O level is 1.8V.
34	D – I/O	GPIO_10 / SPI_CS_N/ I2C_SDA	BLSP6_1	I/O level is 1.8V.
35	D – I	GPIO_9 / SPI_MISO	BLSP6_2	I/O level is 1.8V.
36	D – O	GPIO_8 / SPI_MOSI	BLSP6_3	I/O level is 1.8V.
37		PM_MPP2/4_HEADER		Multipurpose pin / GPIO from PMIC
38		PM_MPP3_HEADER		Multipurpose pin / GPIO from PMIC
39		GND		
40		GND		

7.2 LCD Connector Pinouts

Table 6 - LCD connector pinout

Pin No	Pin Type	Pin Name	Description
1		NC	
2	P – O	2.85V	Supply for LCD. Maximum output current is 200mA
3			
4		GND	
5	D – O	LCD_RST_N_720P_CON/ GPIO_25	LCD reset – active high. I/O level is 1.8V.
6		NC	

7		GND	
8	D – O	MIPI_DSI0_LANE0_N_LCD	Negative DSI0 lane 0 differential
9	D – O	MIPI_DSI0_LANE0_P_LCD	Positive DSI0 lane 0 differential
10		GND	
11	D – O	MIPI_DSI0_LANE1_N_LCD	Negative DSI0 lane 1 differential
12	D – O	MIPI_DSI0_LANE1_P_LCD	Positive DSI0 lane 1 differential
13		GND	
14	D – O	MIPI_DSI0_CLK_N_LCD	Negative DSI0 clock differential
15	D – O	MIPI_DSI0_CLK_P_LCD	Positive DSI0 clock differential
16		GND	
17	D – O	MIPI_DSI0_LANE2_N_LCD	Negative DSI0 lane 2 differential
18	D – O	MIPI_DSI0_LANE2_P_LCD	Positive DSI0 lane 2 differential
19		GND	
20	D – O	MIPI_DSI0_LANE3_N_LCD	Negative DSI0 lane 3 differential
21	D – O	MIPI_DSI0_LANE3_P_LCD	Positive DSI0 lane 3 differential
22		GND	
23		NC	
24		NC	
25		GND	
26		NC	
27	D – O	WLED_PWM_MPP2	PWM signal for LED driver from PMIC
28		NC	
29		NC	
30		GND	
31		GND	
32		GND	
33		NC	
34		NC	
35		NC	
36		NC	
37		NC	
38		NC	
39	P – O	5V	Supply for Backlight LED driver. Maximum output current is 600mA. KY-SBC122 does not have an on-board LED driver.
40			

7.3 Touch panel Connector Pinouts

Table 7 - Touch connector pinout

Pin No	Pin Type	Pin Name	BLSP #	Description
1	D – O	TS_RESOUT_N / GPIO_12		Touch panel reset – active high. I/O level is 1.8V.
2	D – O	TS_INT_N / GPIO_13		Touch panel interrupt – active high. I/O level is 1.8V.
3		GND		
4	D – B	TS_I2C_SDA / GPIO_18	BLSP5_1	Touch panel I2C serial data. I/O level is 1.8V.
5	D – O	TS_I2C_SCL / GPIO_19	BLSP5_0	Touch panel I2C serial clock. I/O level is 1.8V.
6		GND		
7		GND		
8	P – O	2.85V		Supply for LCD. Maximum output current is 15mA

7.4 Camera Connector Pinouts

Table 8 - Camera connector pinout

Pin No	Pin Type	Pin Name	BLSP #	Description
1	P – O	2.85V		Analog/AF supply for camera. Maximum output current is 100mA
2	P – O	1.2V		Supply for camera. Maximum output current is 250mA
3	P – O	2.9V		Analog/AF supply for camera module. Maximum output current is 300mA
4	P – O	1.8V		I/O supply for camera module.
5		GND		
6	D – I	MIPI_CSI1_CLK_N		Negative CSI1 clock differential
7	D – I	MIPI_CSI1_CLK_P		Positive CSI1 clock differential
8		GND		
9	D – I	MIPI_CSI1_LANE0_P		Positive CSI1 lane 0 differential
10	D – I	MIPI_CSI1_LANE0_N		Negative CSI1 lane 0 differential
11		GND		

12	D – O	CAM1_MCLK / GPIO_27		Camera 1 master clock. I/O level is 1.8V.
13	D – O	CAM1_STANDBY_N / 33		Camera 1 stand-by – active high. I/O level is 1.8V.
14	D – O	CAM1_RESET_N / GPIO_28		Camera 1 reset – active high. I/O level is 1.8V.
15		GND		
16	D – I	MIPI_CSI0_LANE1_N		Negative CSI0 lane 1 differential
17	D – I	MIPI_CSI0_LANE1_P		Positive CSI0 lane 1 differential
18		GND		
19	D – I	MIPI_CSI0_LANE0_N		Negative CSI0 lane 0 differential
20	D – I	MIPI_CSI0_LANE0_P		Positive CSI0 lane 0 differential
21		GND		
22	D – I	MIPI_CSI0_CLK_P		Positive CSI0 clock differential
23	D – I	MIPI_CSI0_CLK_N		Negative CSI0 clock differential
24		GND		
25	D – O	CAM0_MCLK / GPIO_26		Camera 0 master clock. I/O level is 1.8V.
26	D – O	CAM0_RESET_N / GPIO_35		Camera 0 reset – active high. I/O level is 1.8V.
27	D – O	CAM0_STANDBY_N/ PIO_34		Camera 0 stand-by – active high. I/O level is 1.8V.
28	D – O	CAM_VCM_PWDN/ PIO_97		Voice coil motor power down pin. Active low. I/O level is 1.8V.
29	D – O	CAM_I2C_SCL / GPIO_30	BLSP3_2	Camera I2C serial clock. I/O level is 1.8V.
30	D – B	CAM_I2C_SDA / GPIO_29	BLSP3_3	Camera I2C serial data. I/O level is 1.8V.

8. USB and DSI Switch

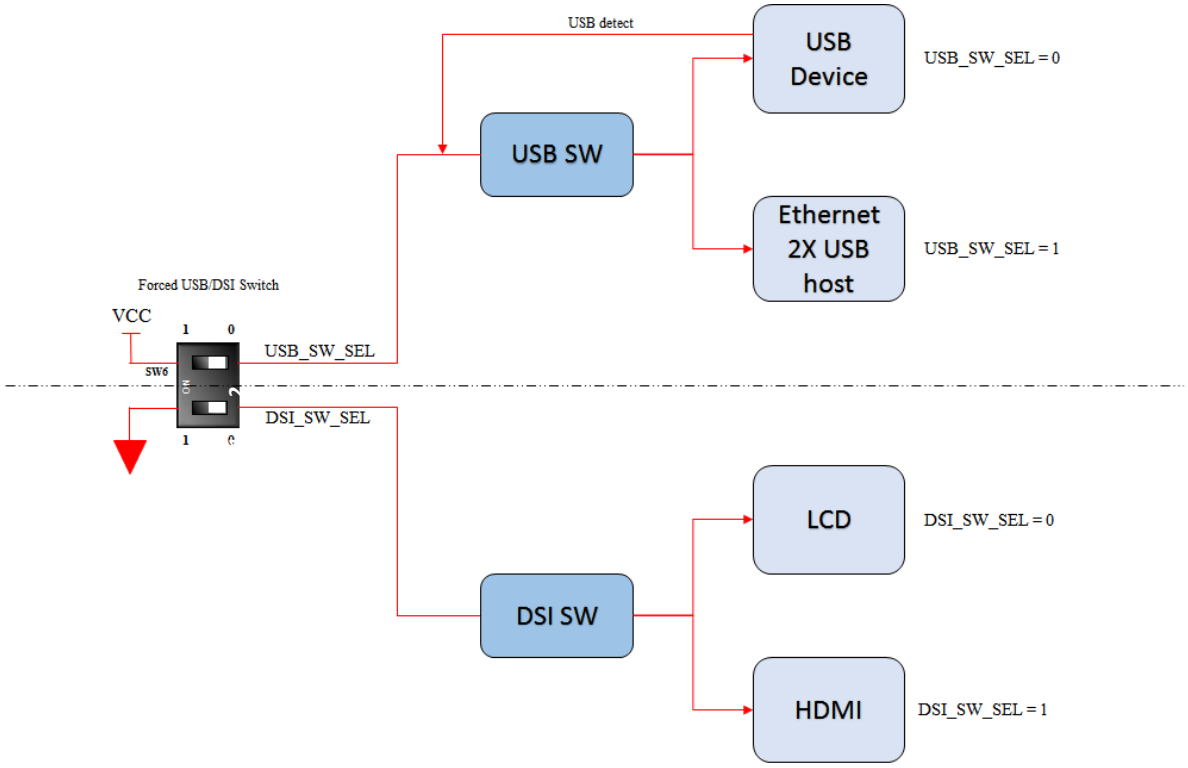

Figure 6: USB and DSI SW select

USB_SW_SEL	USB mode
0	High priority USB device mode (for fastboot and adb access)
1	Forced Eth & 2x USB host

DSI_SW_SEL	Display mode
0	HDMI
1	LCD

8.1 USB Switch

Qualcomm® Snapdragon™ 212 does not have an inbuilt Ethernet controller. To provide Ethernet facility, the SKATE-212 is modified with a USB to Ethernet & 2X USB host controller. Hence, either USB device or 2X USB host and Ethernet can be used at a time.

And, when USB device port is plugged in, Ethernet and 2X USB will be disabled automatically. Forced USB host option is also available. It is provided by a hardware switch. If this switch is enabled Ethernet and 2X USB host works continuously without any interrupt even when USB device port is plugged in. The functional block diagram of USB switch is shown in figure 6.

Note: It is mandatory to remove USB device cable before switching SW6-2, otherwise the switching of device/host will not work.

8.2 DSI Switch

Qualcomm® Snapdragon™ 212 don't have an inbuilt HDMI controller. To facilitate, the HDMI interface on our SBC, MIPI – DSI to HDMI bridge convertor has been used. Either direct MIPI-DSI LCD or HDMI can be used at a time.

The display mode can be selected by hardware switch as in figure 6 or software automatically identifies which display during boot. If HDMI is connected before device boot, the device will identify the HDMI monitor and loads the driver.

9. Things to consider while designing enclosure

If customer wants to design enclosure for SKATE-212 should take care of any metal parts should not cover the GPS and Wi-Fi antenna area.

For any Queries, kindly write to salesEDS@kemsys.com or call us at +1 408 641 4272