IFC6410

User Guide

001821 Rev F

February 25, 2015

Submit technical questions at:
http://www.inforcecomputing.com/techweb/

Confidential and Proprietary – Inforce Computing Inc.

NO PUBLIC DISCLOSURE PERMITTED: Please report postings of this document on public servers or web sites to: techsupport@inforcecomputing.com.

Restricted Distribution: Not to be distributed to anyone who is not an employee of either Inforce Computing or its subsidiaries without the express approval of Inforce Computing.

Not to be used, copied, reproduced, or modified in whole or in part, nor its contents revealed in any manner to others without the express written permission of Inforce Computing, Inc.

Inforce Computing is a trademark of Inforce Computing Incorporated, registered in the United States and other countries. All Inforce Computing Incorporated trademarks are used with permission. Other product and brand names may be trademarks or registered trademarks of their respective owners.

This technical data may be subject to U.S. and international export, re-export, or transfer (“export”) laws. Diversion contrary to U.S. and international law is strictly prohibited.

Inforce Computing Inc.
48820 Kato Road, # 600B
Fremont, CA 94538
U.S.A.

© 2015 Inforce Computing Inc.

* *Qualcomm and Snapdragon are trademarks of Qualcomm Incorporated, registered in the United States and other countries, used with permission.*
* *Qualcomm Snapdragon is a product of Qualcomm Technologies, Inc.*

Revision History

Revision	Date	Description	Author
A	13/May/2013	➢ Initial Release	Sujith K J
B	18/July/2013	➢ Updated Appendix A with header images ➢ Updated the document with LED position on board image	Soumya S
C	20/August/2013	➢ Updated board images	Soumya S
D	27/August/2014	➢ Updated trademark and product attribution statements along with register and trademark symbols for Qualcomm Snapdragon	Kavitha R
E	15/September/2014	➢ Rev P1 to A1 Connector Co-ordinates change updated on Section 2.2.3 ➢ Addition of Fastboot button added on Rev A1 added on Section 1.5 ➢ Net name on header P3 changed to V5_JACK_FUSE. Section 4.1.6	Sebastian V P
F	25/February/2015	➢ Updated Section 4.1.1	Anup Dasari

Approval Record

Function	Position	Name	Date
Checked By	Engineer-Customer Solutions	Anup Dasari	25/February/2015
Reviewed By	Project Engineer	Sujith K J	25/February/2015
Approved By	Project Manager	Devaraj P S	25/February/2015

MAY CONTAIN U.S. AND INTERNATIONAL EXPORT CONTROLLED INFORMATION
Confidential and Proprietary – Inforce Computing, Inc.
Provided under NDA

License Agreement

Your use of this document is subject to and governed by those terms and conditions in the Inforce Computing Purchase and Software License Agreement for the APQ8064 based IFC6410 development platform, which you or the legal entity you represent, as the case may be, accepted and agreed to when purchasing a IFC6410 development platform from Inforce Computing Inc. ("**Agreement**"). You may use this document, which shall be considered part of the defined term "Documentation" for purposes of the Agreement, solely in support of your permitted use of the IFC6410 development platform under the Agreement. Distribution of this document is strictly prohibited without the express written permission of Inforce Computing Inc. and its respective licensors, which they can withhold, condition or delay in its sole discretion.

Inforce Computing is a trademark of Inforce Computing Inc., registered in USA and other countries.

Qualcomm is a trademark of Qualcomm Inc., registered in the United States and other countries. Other product and brand names used herein may be trademarks or registered trademarks of their respective owners.

This document contains technical data that may be subject to U.S. and international export, re-export, or transfer ("export") laws. Diversion contrary to U.S. and international law is strictly prohibited.

Preface

This User Guide explains the hardware, software, setup and usage of system IFC6410.

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. Hardware Specification
3. System Setup and Usage
4. Software Specification
5. Appendix A
6. 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. APQ8064
2. Chipset Datasheet_001796_Rev B
3. Power Management Module Device Specification_001802_Rev B
4. PICO ITX Specification

Note

This document is subject to change without notice.

Support Information

Every effort has been made to ensure the accuracy of the document. If you have any comments, questions, or ideas regarding the User Guide, contact technical support: techsupport@inforcecomputing.com

Terminology

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

Term	Description
CSI	Camera Serial Interface
DDR	Double Data Rate
eMMC	Embedded Multimedia Card
HD	High Definition
HDMI	High-Definition Multimedia Interface
I2C	Inter-Integrated Circuit
JTAG	Joint Test Action Group
LED	Light Emitting Diode
LVDS	Low-Voltage Differential Signaling
MAC	Media Access Control
MIPI	Mobile Industry Processor Interface
OS	Operating System
OTG	On The Go
PCIe	Peripheral Component Interconnect Express
SATA	Serial Advanced Technology Attachment
SBC	Single-Board Computer
SDC	Secure Digital Controller
SPI	Serial Peripheral Interface
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus

MAY CONTAIN U.S. AND INTERNATIONAL EXPORT CONTROLLED INFORMATION
Confidential and Proprietary – Inforce Computing, Inc.
Provided under NDA

Table of Content

Table of Figure

MAY CONTAIN U.S. AND INTERNATIONAL EXPORT CONTROLLED INFORMATION
Confidential and Proprietary – Inforce Computing, Inc.
Provided under NDA

Table of Table

SCOPE

This document describes the system setup and usage of Qualcomm® Snapdragon™ S4 Pro APQ8064-based IFC6410 SBC.

Development Device Notice

This SBC device contains RF/digital hardware and software intended for engineering development, engineering evaluation, or demonstration purposes only and is intended for use in a controlled environment. This device is not being placed on the market, leased or sold for use in a residential environment or for use by the general public as an end-user device.

This SBC device is not intended to meet the requirements of a commercially available consumer device including those requirements specified in the European Union directives applicable for Radio devices being placed on the market, FCC equipment authorization rules or other regulations pertaining to consumer devices being placed on the market for use by the general public.

This SBC device may only be used in a controlled user environment where operators have obtained the necessary regulatory approvals for experimentation using a radio device and have appropriate technical training. The device may not be used by members of the general population or other individuals that have not been instructed on methods for conducting controlled experiments and taking necessary precautions for preventing harmful interference and minimizing RF exposure risks. Additional RF exposure information can be found on the FCC website at http://www.fcc.gov/oet/rfsafety/.

Anti-Static Handling Procedures

SBC has exposed PCB and chips. Accordingly, proper anti-static precautions should be employed when handling the kit, including:

- Use a grounded anti-static mat
- Use a grounded wrist or foot strap

Hardware Identification Labels

Labels are present on the IFC6410 board. The following information is conveyed on IFC6410 board:

- Serial Number
- Ethernet MAC Address
- Wi-Fi MAC Address
- Product Revision

1 HARDWARE SPECIFICATION

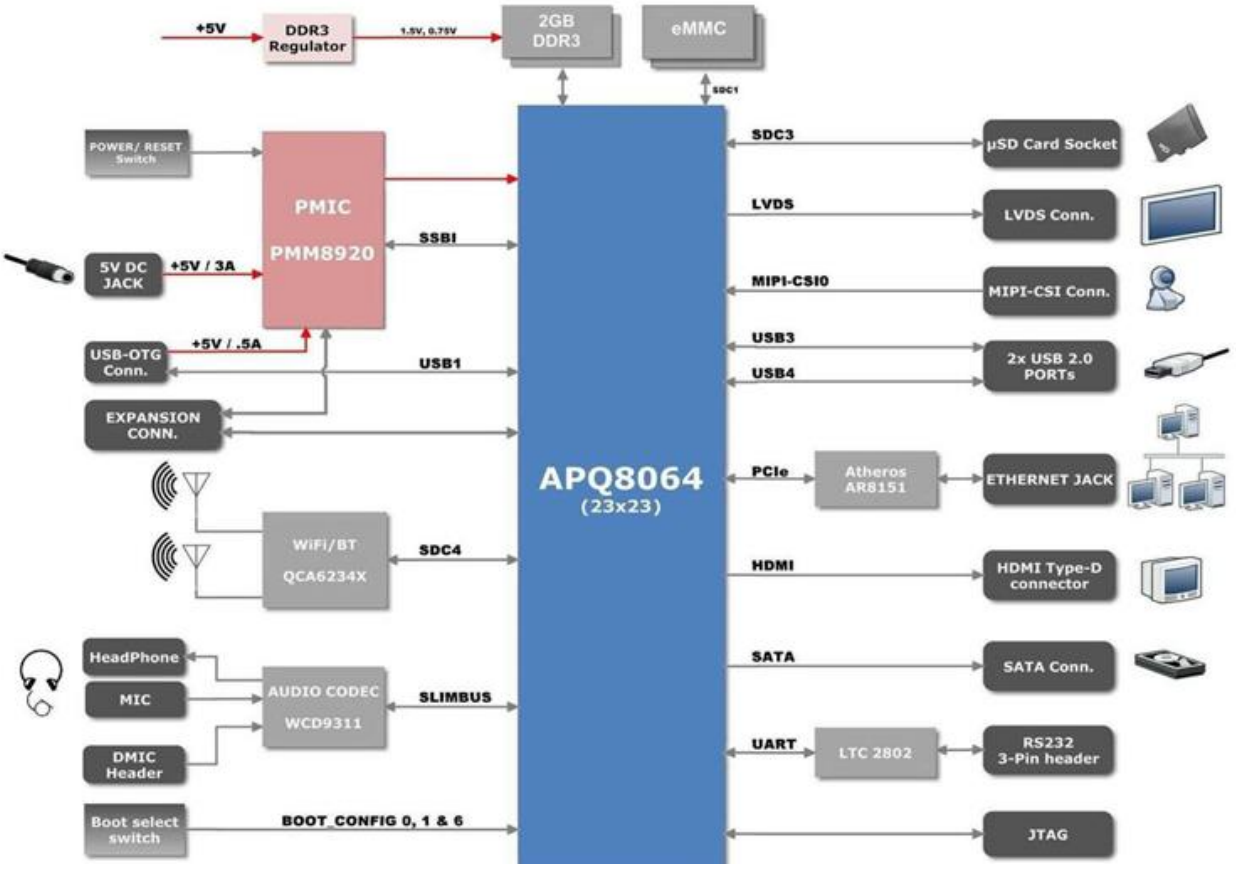
1.1 INTRODUCTION

IFC6410 SBC provides a reference design for Snapdragon S4 Pro APQ8064 where customers can design, develop, test, and deploy their product solutions around the processor.

1.2 ARCHITECTURE

The functional diagram of IFC6410 SBC is shown below.

Figure 1: Block Diagram



Confidential and Proprietary – Inforce Computing, Inc.
Provided under NDA

1.3 SYSTEM SPECIFICATION

The following table shows the hardware specification of IFC6410.

Table 1: System Hardware Specification

Processor and Peripherals	
Processor	Snapdragon S4 Pro APQ8064 (23mmx23mm package)
Memory Devices	
Main Memory	2GB DDR3
Storage	Up to 64GB eMMC
I/O Interfaces	
Interfaces	2x USB 2.0, 1x USB-OTG, 1x SATA, MICROSD Slot, HDMI, Dual LVDS, UART, 1x MIPI-CSI, GPIOs
Form Factor	
Mechanical	Pico-ITX (10cmx7cm)
Power	
Power Input	5V/3A DC
Others	
Temperature Specification	Commercial Grade

1.4 ELECTRICAL CHARACTERISTICS

Power Supplies

IFC6410 board is operated from the following sources:

- 5V DC Jack (5V, 3A)

Power Consumption

Total approximate power of IFC6410 is **12W**. This will be varied depending on the application and IOs used.

Confidential and Proprietary – Inforce Computing, Inc.
Provided under NDA

1.5 BOARD LAYOUT AND SUBSYSTEMS

Figure 2: IFC6410 Board (Top Side)

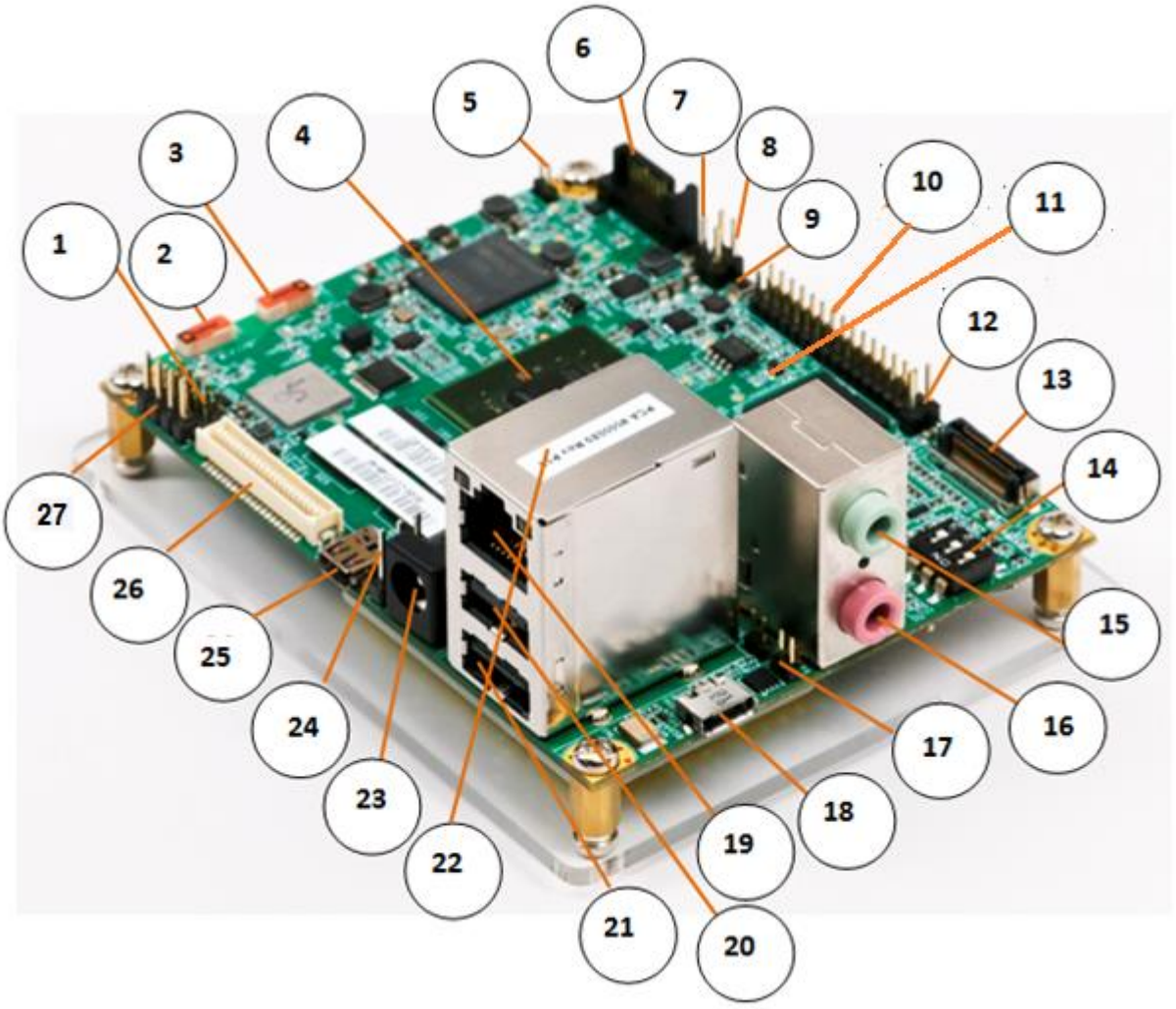


Table 2: IFC6410 Board Locations

1. JTAG	9. Reset Button	17. Dual MIC Header	25. Micro HDMI Connector
2. Antenna-Wi-Fi/BT	10. Expansion Header	18. Micro-USB Port	26. LVDS Connector
3. Antenna-Wi-Fi	11. Fastboot Button	19. Ethernet Jack	27. LVDS Optional Power Header
4. CPU	12. 5V Power Header	20. USB 2.0 Port 1	28. MicroSD™ Card Slot
5. RTC Battery Header	13. Camera Connector	21. USB 2.0 Port 2	29. Assembly Revision
6. SATA Connector	14. Boot Select Switch	22. PCA Label	
7. Power Button	15. Headphone Jack	23. DC Jack	
8. Power/Reset Header	16. Microphone Jack	24. RS232 Header	

Figure 3: IFC6410 Board (Bottom Side)

MAY CONTAIN U.S. AND INTERNATIONAL EXPORT CONTROLLED INFORMATION
Confidential and Proprietary – Inforce Computing, Inc.
Provided under NDA

2 SYSTEM SETUP AND USAGE

2.1 HARDWARE SETUP

Set the proper boot configuration using the boot-selection switch on board.

Refer Boot Configuration section, for more details on various boot configuration settings.

Refer Figure 5 LED locations on board.

Refer Steps to Boot IFC6410 section, for booting.

2.2 HARDWARE OPERATION

2.2.1 BOOT CONFIGURATION

Boot configuration can be done by selecting the switch (SW3) provided on the board.

CONFIG switch in **ON** position indicates **Level 0**.

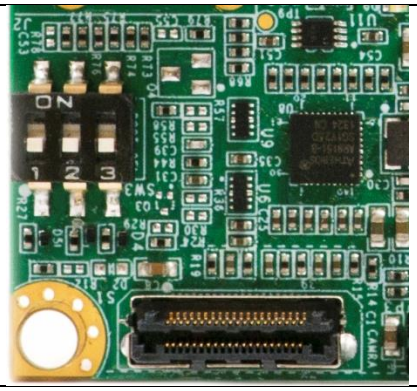
Table 3: Boot Selection

CONFIG_1 (Position-2)	CONFIG_0 (Position-1)	Function
0	0	EMERGENCY BOOT (SDC3 FOLLOWED BY USB HS)
0	1	SDC3 FOLLOWED BY SDC1 (eMMC)
1	0	SDC3 FOLLOWED BY SDC2 (Invalid)
1	1	SDC1 (eMMC) DEFAULT

Fast and Secure Boot Selection

CONFIG_6 (Position-3)	Function
0	SECURITY BOOT
1	FAST BOOT

Figure 4: Boot Selection Switch



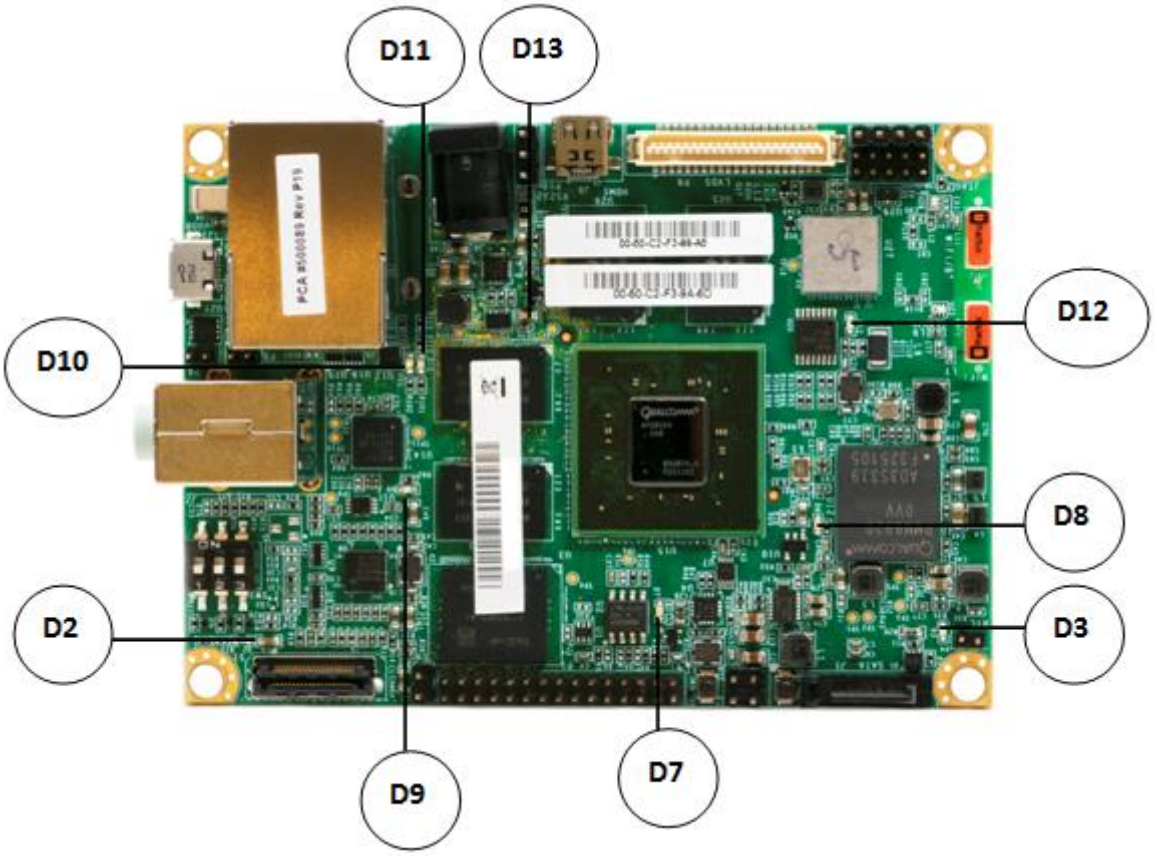
0	0	0
Config-0 (Pos1)	**Config-1 (Pos2)**	**Config-6 (Pos3)**
1	1	1

MAY CONTAIN U.S. AND INTERNATIONAL EXPORT CONTROLLED INFORMATION
Confidential and Proprietary – Inforce Computing, Inc.
Provided under NDA

2.2.2 LED INDICATIONS

Ref. Des.	Function	Comments
D2	Privacy LED for Camera	Not mounted on board
D3	User Configurable LED	Connected to PMIC LED DRV0 pin
D7	SATA Activity LED	
D8	VPH power rail indicator	
D9	Notification LED1	Connected to PMIC GPIO_18
D10	CPU Reset LED	
D11	S4 power rail indicator	
D12	Bluetooth indicator LED	
D13	5V power rail indicator	

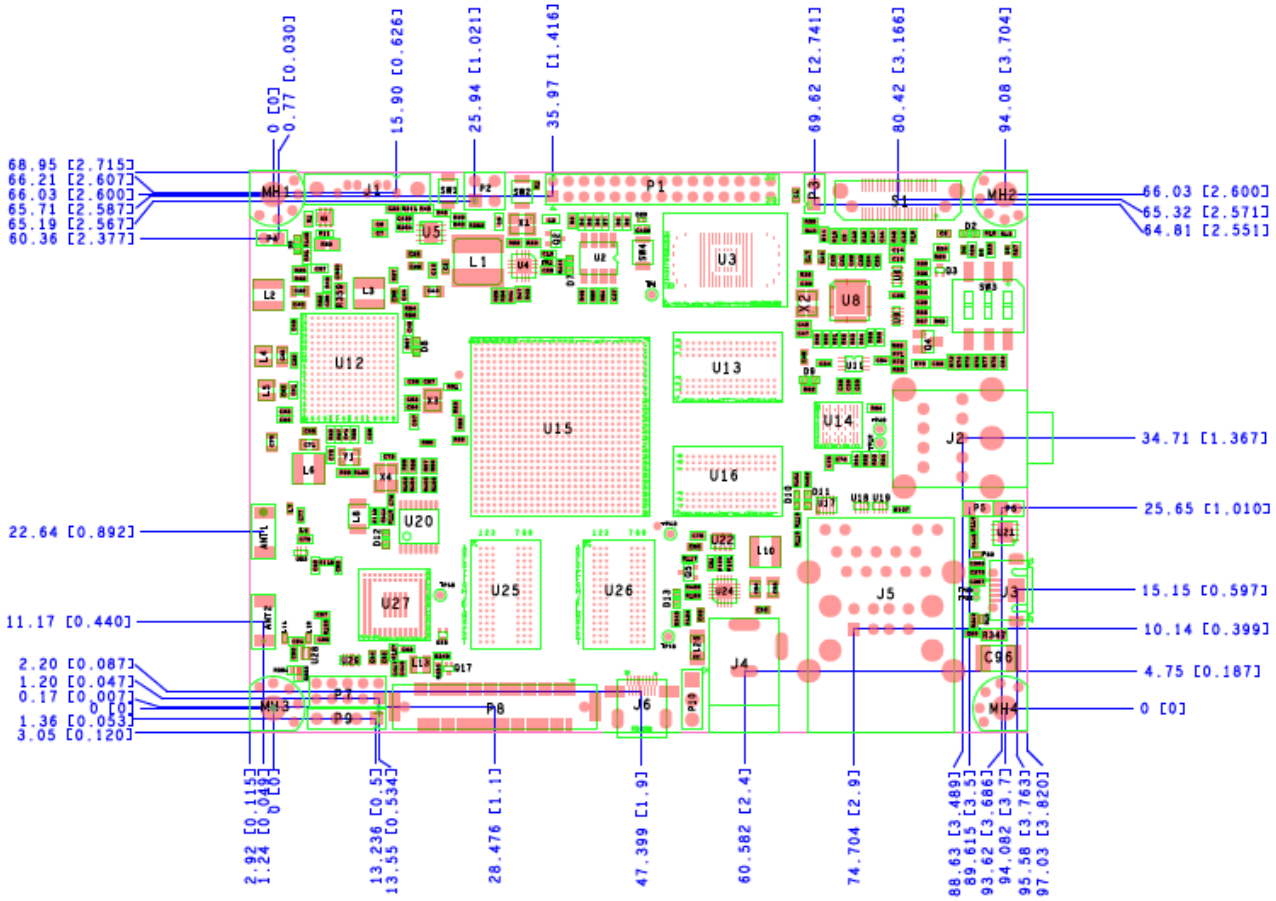
Figure 5: LED Locations on Board



MAY CONTAIN U.S. AND INTERNATIONAL EXPORT CONTROLLED INFORMATION
Confidential and Proprietary – Inforce Computing, Inc.
Provided under NDA

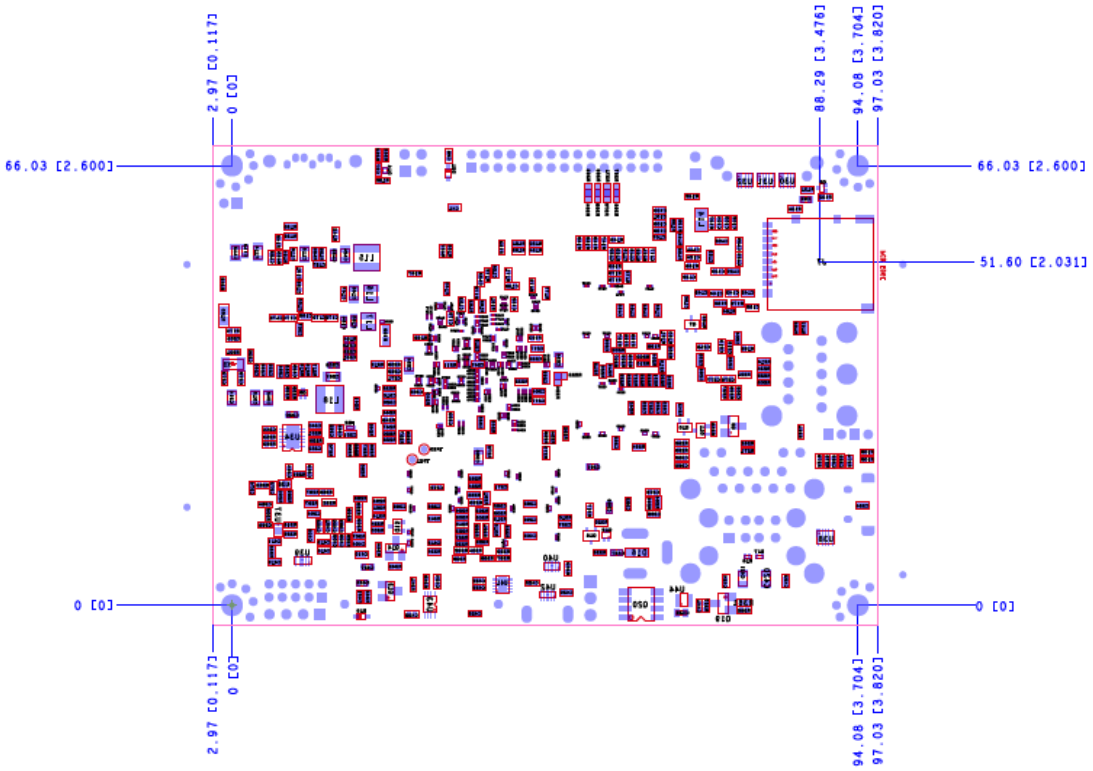
2.2.3 CONNECTOR COORDINATES

Figure 6: Connector Coordinates (Top)



MAY CONTAIN U.S. AND INTERNATIONAL EXPORT CONTROLLED INFORMATION
Confidential and Proprietary – Inforce Computing, Inc.
Provided under NDA

Figure 7: Connector Coordinates (Bottom)



2.2.4 STEPS TO BOOT IFC6410

1. Remove the IFC6410 board carefully from the anti-static bag.

   NOTE

   Handle with care, while plugging, to avoid physical damage.

2. Connect the display through HDMI/LVDS.
3. Connect the power adapter to the wall socket.

   NOTE

   Carefully connect the DC connector to the jack provided on the board.

   CAUTION

   - *Use the DC adaptor provided by Inforce Computing.*
   - *Do not use the third party DC adapter without our technical support, as it may damage your board.*

4. Switch ON the wall socket, the board boots up automatically.

   After a few seconds, the "*android*" logo, followed by the *lock screen* will be displayed on the screen as shown in Figure 8 and Figure 9.

Figure 8: Android

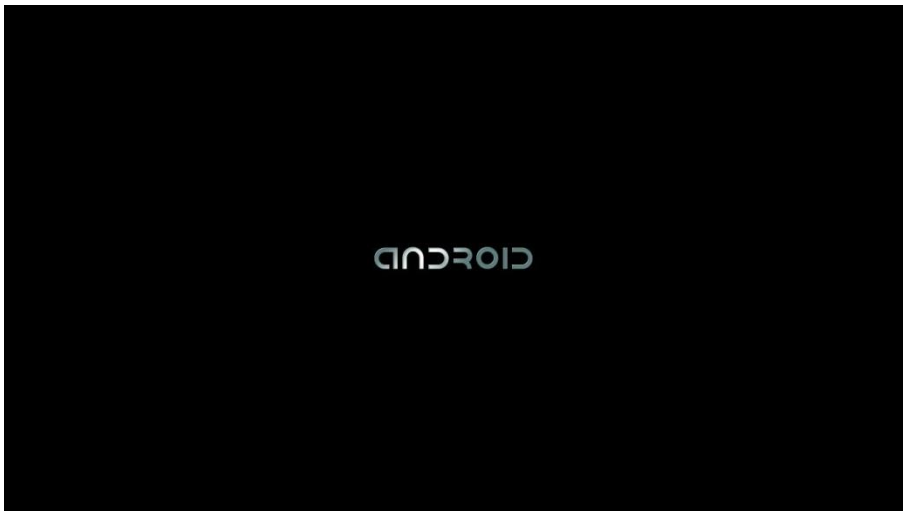
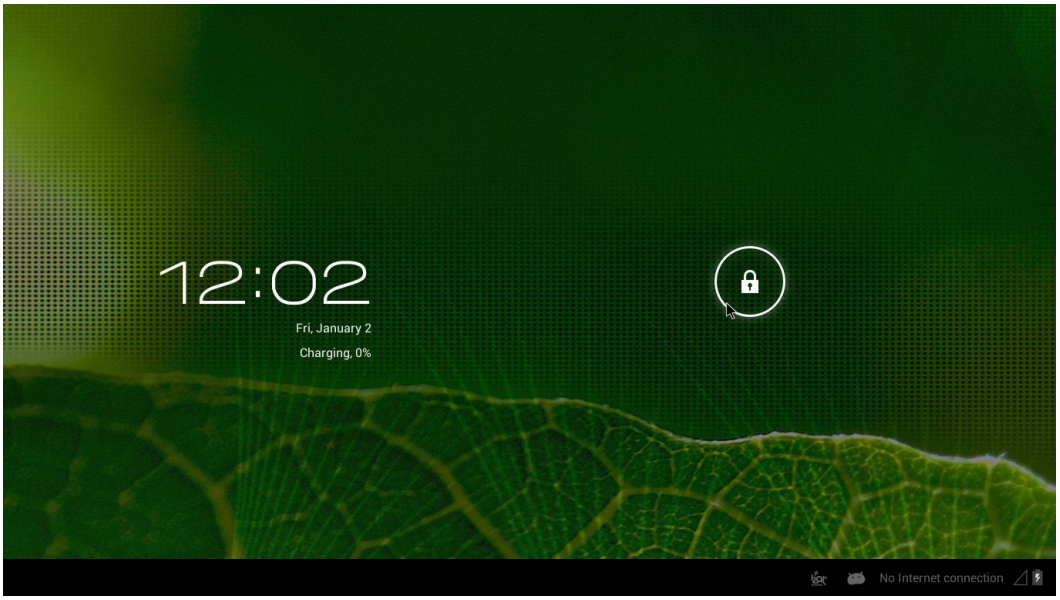


Figure 9: Lock Screen Display



NOTE

- *First time booting might take longer time than normal booting.*
- *Screenshots shown are for reference only, actual display may vary depending on the software release.*

3 SOFTWARE SPECIFICATION

3.1 OPERATING SYSTEM

Operating system used in IFC6410 is Android™ Jelly Bean 4.1.2 version or higher.

Confidential and Proprietary – Inforce Computing, Inc.
Provided under NDA

4 APPENDIX A

4.1 CONNECTOR PIN ASSIGNMENTS

4.1.1 EXPANSION CONNECTOR

Manufacturer part number: 951230-8622-AR

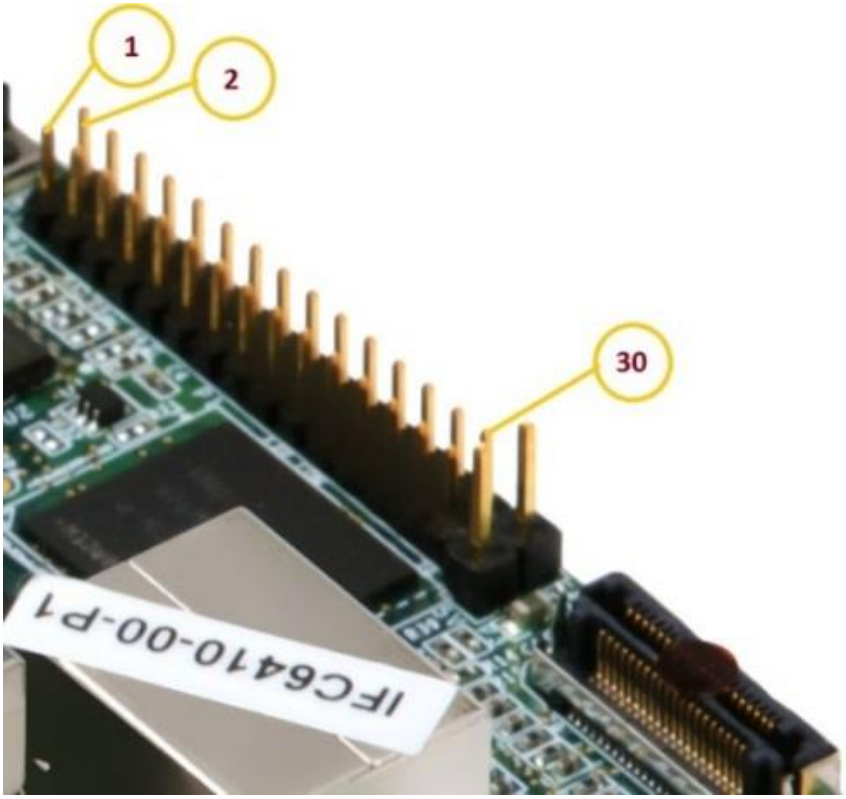
Manufacturer: 3M

Pitch: 2.0mm

Pin Number	Pin Name	Possible Configuration
12	CLK_29M_SLIMBUS2	GPIO_31/MI2S_SD1/AUD_SB1_CLK_B
21	EXP_CONN_GPIO_1	GPIO_6/SPI_CS2A_N_GSBI1/SSBI_TS/VFE_CAM_TIMER_4C/GSBI3_3/GPS_PPS_OUT/GPS_PPS_IN
22	EXP_CONN_GPIO_2	GPIO_7/SPI_CS1A_N_GSBI1/SPI_CS3B_N_GSBI1/TS_EOC/GSBI3_2
23	EXP_CONN_GPIO_3	MPP_8921_11 - PMIC ADC
24	EXP_CONN_GPIO_4	MPP_8921_12 - PMIC ADC
25	EXP_CONN_GPIO_5	UART_RX3/GPIO_35 - pmm
26	EXP_CONN_GPIO_6	Fastboot (Vol-)
27	EXP_CONN_GPIO_7	GPIO_22/GSBI2_3/GP_PDM_1A
28	EXP_CONN_GPIO_8	GPIO_23/GSBI2_2
1,3,5,7,8,9,10,19,20,29,30	GND	
13	I2C2_CLK	GPIO_25/GSBI2_0/GP_CLK_2B
11	I2C2_DATA	GPIO_24/GSBI2_1
14	SLIMBUS2_DATA	GPIO_30/MI2S_SD2/AUD_SB1_DATA_B
17	SPI_CLK	MIC_I2S_MCLK/UICC_DM/GSBI5_0/USB_FS1_SE0_A/GPIO_54
18	SPI_CS0#	GPIO_53/MIC_I2S_WS/UICC_DP/GSBI5_1
16	SPI_MISO	GPIO_52/MIC_I2S_SCK/GSBI5_2
15	SPI_MOSI	GPIO_51/MIC_I2S_DIN/VFE_CAM_TIMER_6A/GSBI5_3
2	V1P8_VREG_S4	Power → 1.8v
4	V3P3	Power → 3.3v
6	VPH	Power → 2.5v to 4.5v

Confidential and Proprietary – Inforce Computing, Inc.
Provided under NDA

Figure 10: Expansion Connector



MAY CONTAIN U.S. AND INTERNATIONAL EXPORT CONTROLLED INFORMATION
Confidential and Proprietary – Inforce Computing, Inc.
Provided under NDA

4.1.2 JTAG PIN OUT

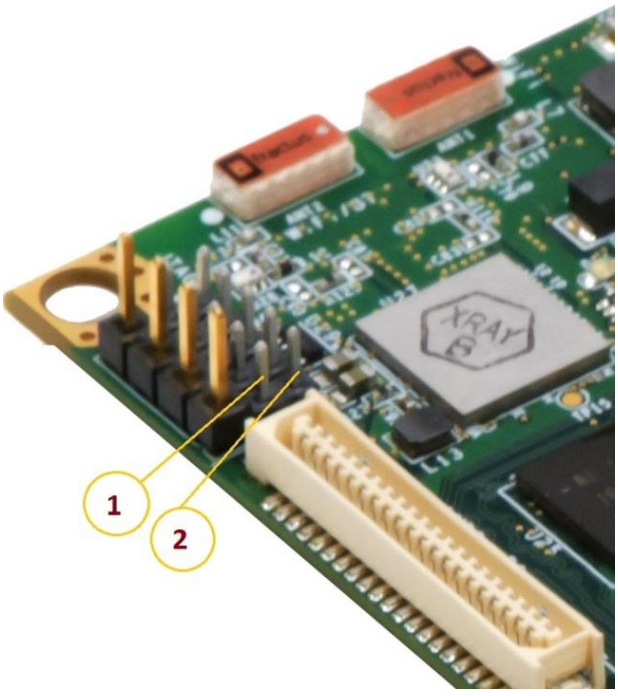
Manufacturer part number: TMM-105-02-T-D

Manufacturer: Samtec

Pitch: 2.0mm

Pin Number	Signal Name
4	CPU_JTAG_RTCK
2	CPU_JTAG_SRST#
8	CPU_JTAG_TCK
3	CPU_JTAG_TDI
6	CPU_JTAG_TDO
5	CPU_JTAG_TMS
1	CPU_JTAG_TRST#
9,10	GND
7	JTAG_CONN_DET#

Figure 11: JTAG Header



4.1.3 CAMERA CONNECTOR PINOUT

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

Manufacturer: Samtec

Pin Number	Signal Name
7	CAM_2_I2C_CLK
5	CAM_2_I2C_DATA
8	CAM_MCLK0
6	CAM1_RST#
23	CAM1_STANDBY
38	CLK_MIPI_CSI0_EMI_N
36	CLK_MIPI_CSI0_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_CSI0_LANE0_EMI_N
30	MIPI_CSI0_LANE0_EMI_P
26	MIPI_CSI0_LANE1_EMI_N
24	MIPI_CSI0_LANE1_EMI_P
20	MIPI_CSI0_LANE2_EMI_N
18	MIPI_CSI0_LANE2_EMI_P
14	MIPI_CSI0_LANE3_EMI_N
12	MIPI_CSI0_LANE3_EMI_P
11	NC
27	V1P2_CAMD
35	V1P8_CAMD
39	V2P8_CAMA
31	V2P8_VACT
1,2,4	VPH

MAY CONTAIN U.S. AND INTERNATIONAL EXPORT CONTROLLED INFORMATION
Confidential and Proprietary – Inforce Computing, Inc.
Provided under NDA

4.1.4 LVDS CONNECTOR PINOUT

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

Manufacturer: Hirose

Pin Number	Signal Name
1,2	V3P3
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_3P3_N
32	DISPLAY_GPIO_3
33	DISP_3P3_RST#
34	DISPLAY_GPIO_2
35	BACKLIGHT_PWM_3P3_EN
36	V1P8_VREG_S4
37,39	LVDS_CONN_HV_SUPPLY
41	NC

4.1.5 DISPLAY BACKLIGHT POWER HEADER PINOUT

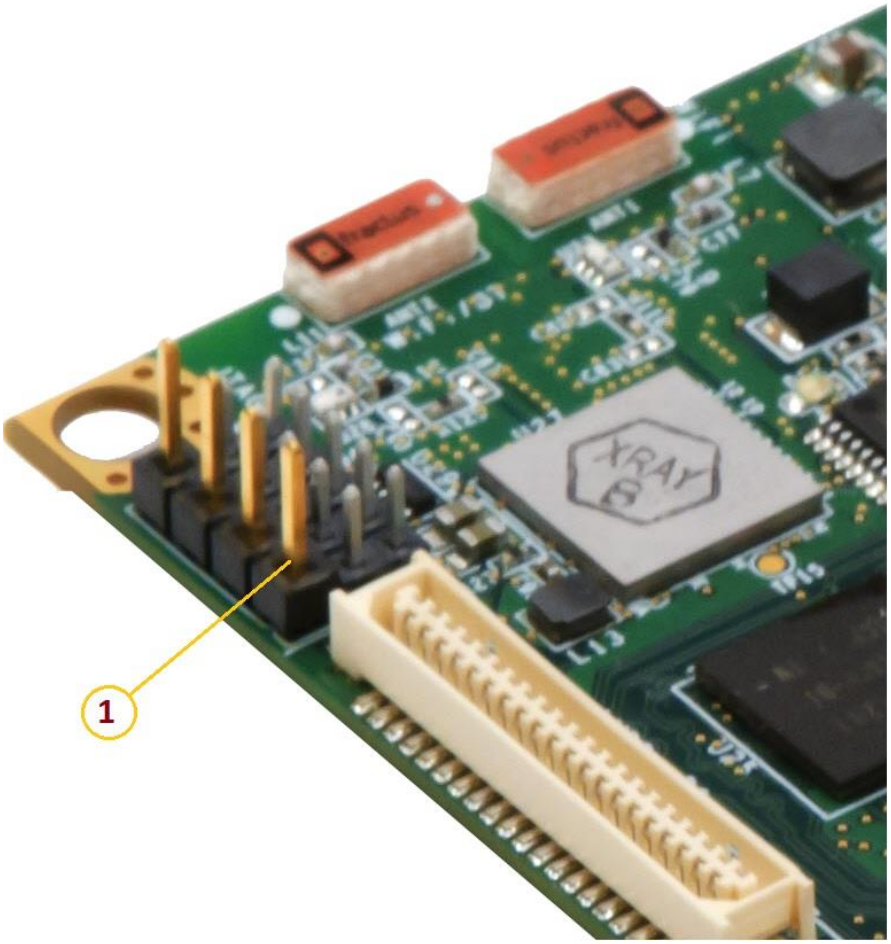
Manufacturer part number: 68031-104HLF

Manufacturer: FCI

Pitch: 2.54mm

Pin Number	Signal Name
1	DISP_PWR_EN_3P3_N
2	BACKLIGHT_PWM_3P3_EN
3	V5_JACK_FUSE
4	GND

Figure 12: Display Backlight Power Header



MAY CONTAIN U.S. AND INTERNATIONAL EXPORT CONTROLLED INFORMATION
Confidential and Proprietary – Inforce Computing, Inc.
Provided under NDA

4.1.6 POWER HEADER PINOUT

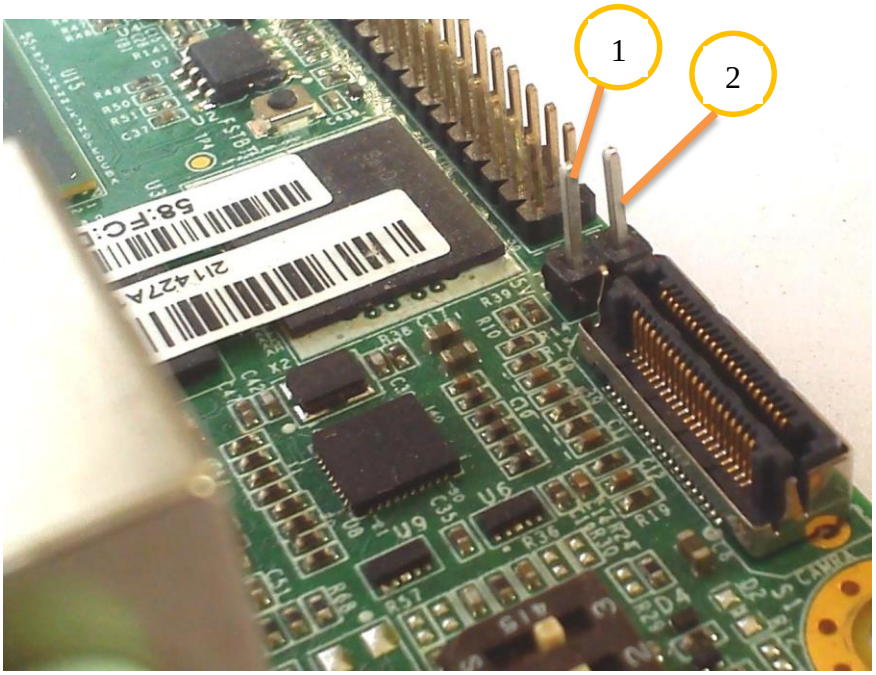
Manufacturer part number: 68031-102HLF

Manufacturer: FCI

Pitch: 2.54mm

Pin Number	Signal Name
1	V5_JACK_FUSE
2	GND

Figure 13: Power Header



MAY CONTAIN U.S. AND INTERNATIONAL EXPORT CONTROLLED INFORMATION
Confidential and Proprietary – Inforce Computing, Inc.
Provided under NDA

4.1.7 RTC HEADER PINOUT

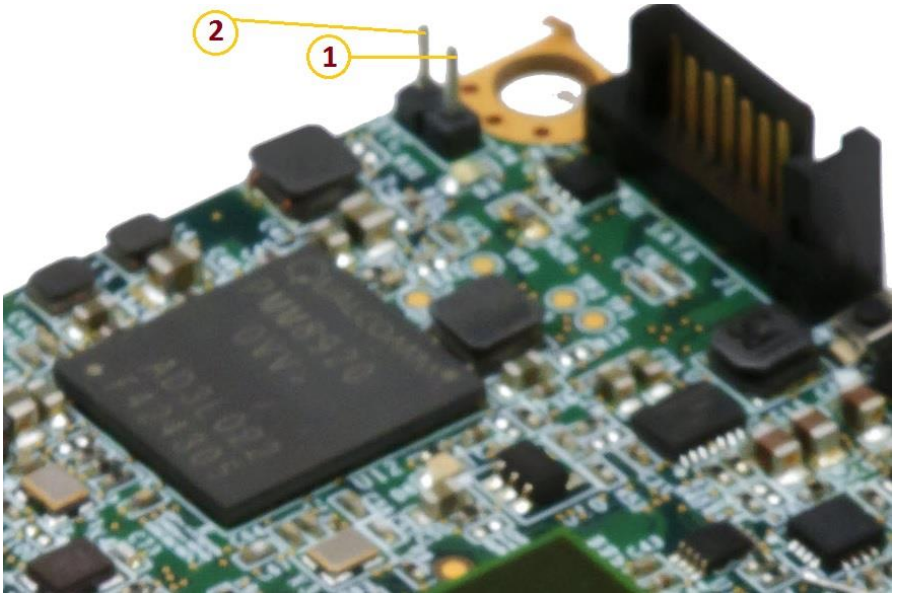
Manufacturer part number: TMM-102-03-T-S

Manufacturer: Samtec

Pitch: 2.0mm

Pin Number	Signal Name
1	GND
2	V3_COIN

Figure 14: RTC Header



4.1.8 POWER AND RESET HEADER PINOUT

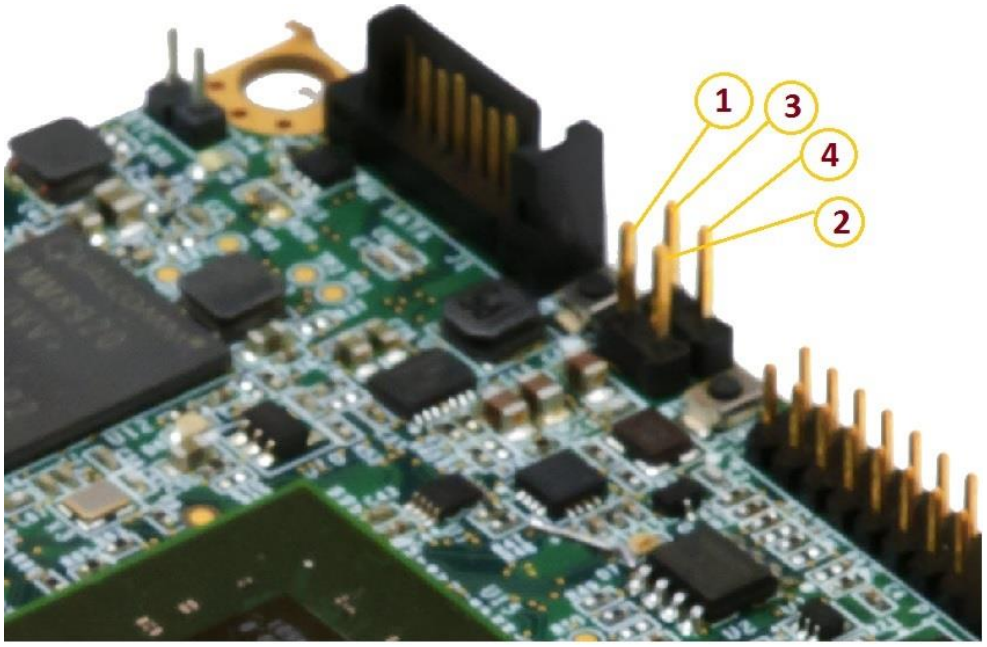
Manufacturer part number: 77313-818-04LF

Manufacturer: FCI

Pitch: 2.54mm

Pin Number	Signal Name
1	PWRBTN_R
2	GND
3	GND
4	RSTBTN_R

Figure 15: Power and Reset Header



4.1.9 DUAL MIC HEADER PINOUT

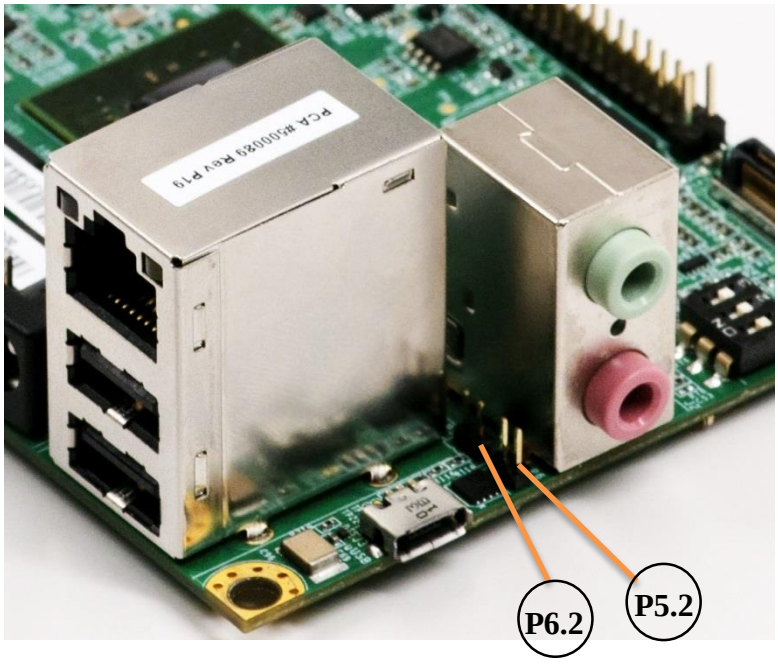
Manufacturer part number: TMM-102-03-T-S

Manufacturer: Samtec

Pitch: 2.0mm

Pin Number	Signal Name	Comment
1	CDC_DMIC_D0	P5.1 first pin of P5 header
2	CDC_DMIC_CK0	P5.2 second pin of P5 header
1	CDC_MIC_BIAS4	P6.1 First pin of P6 header
2	GND	P6.2 second pin of P6 header

Figure 16: Dual MIC Header



MAY CONTAIN U.S. AND INTERNATIONAL EXPORT CONTROLLED INFORMATION
Confidential and Proprietary – Inforce Computing, Inc.
Provided under NDA

4.1.10 RS232 HEADER PINOUT

Manufacturer part number: 22032031

Manufacturer: Molex Incorporated

Pitch: 2.54mm

Pin Number	Signal Name
1	UART_CONN_TX
2	GND
3	UART_CONN_RX

Figure 17: RS232 Header

MAY CONTAIN U.S. AND INTERNATIONAL EXPORT CONTROLLED INFORMATION
Confidential and Proprietary – Inforce Computing, Inc.
Provided under NDA

5 CONTACT INFORMATION

USA (Corporate Headquarters)
Inforce Computing Inc.
48820 Kato Road, # 600B
Fremont, California 94538 USA.
Phone: +1 510 683 9999
Fax: +1 510 683 9909

For technical assistance refer:	http://www.inforcecomputing.com/techweb
For technical support contact:	techsupport@inforcecomputing.com
For sales contact:	sales@inforcecomputing.com