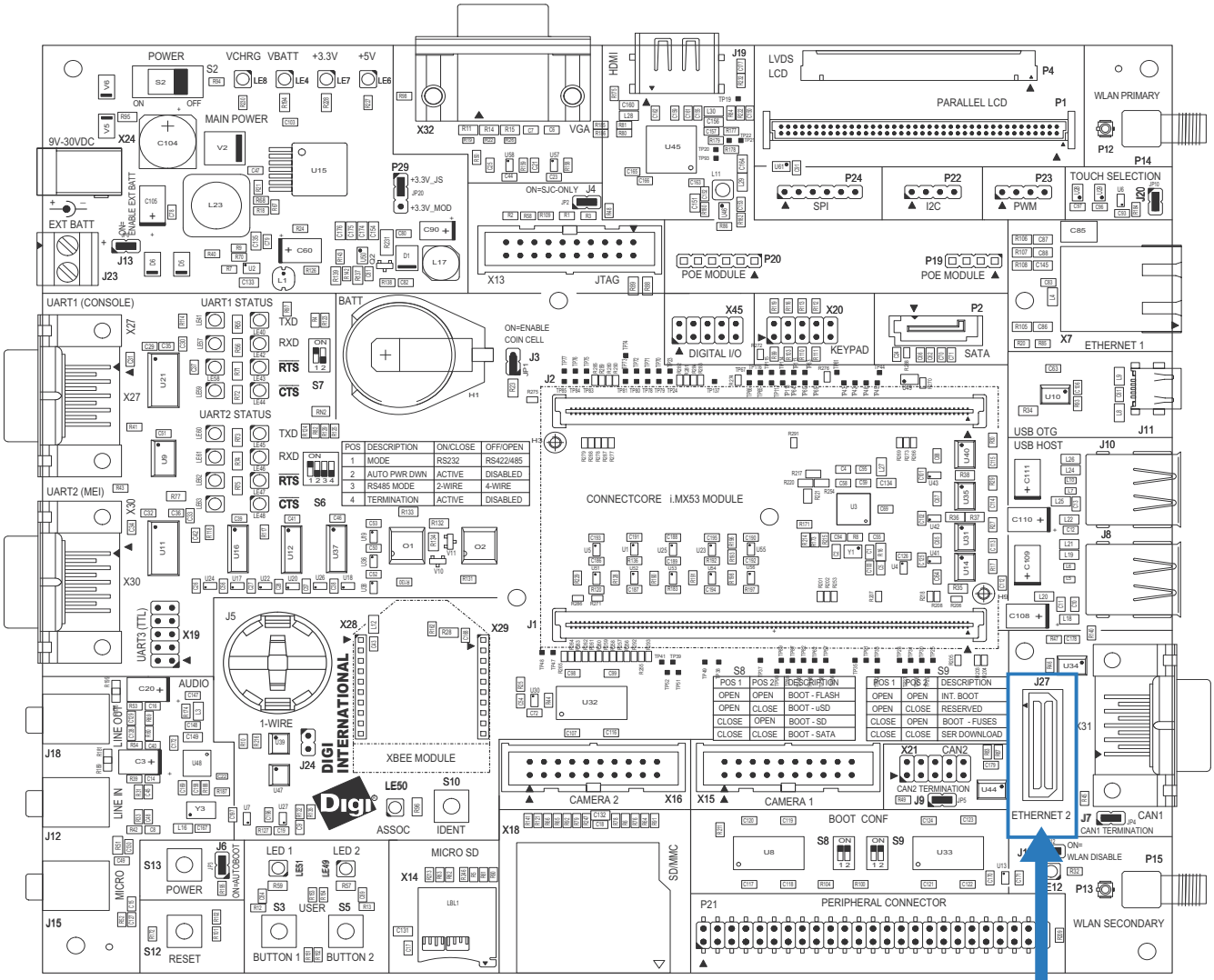
Ethernet 2 Interface



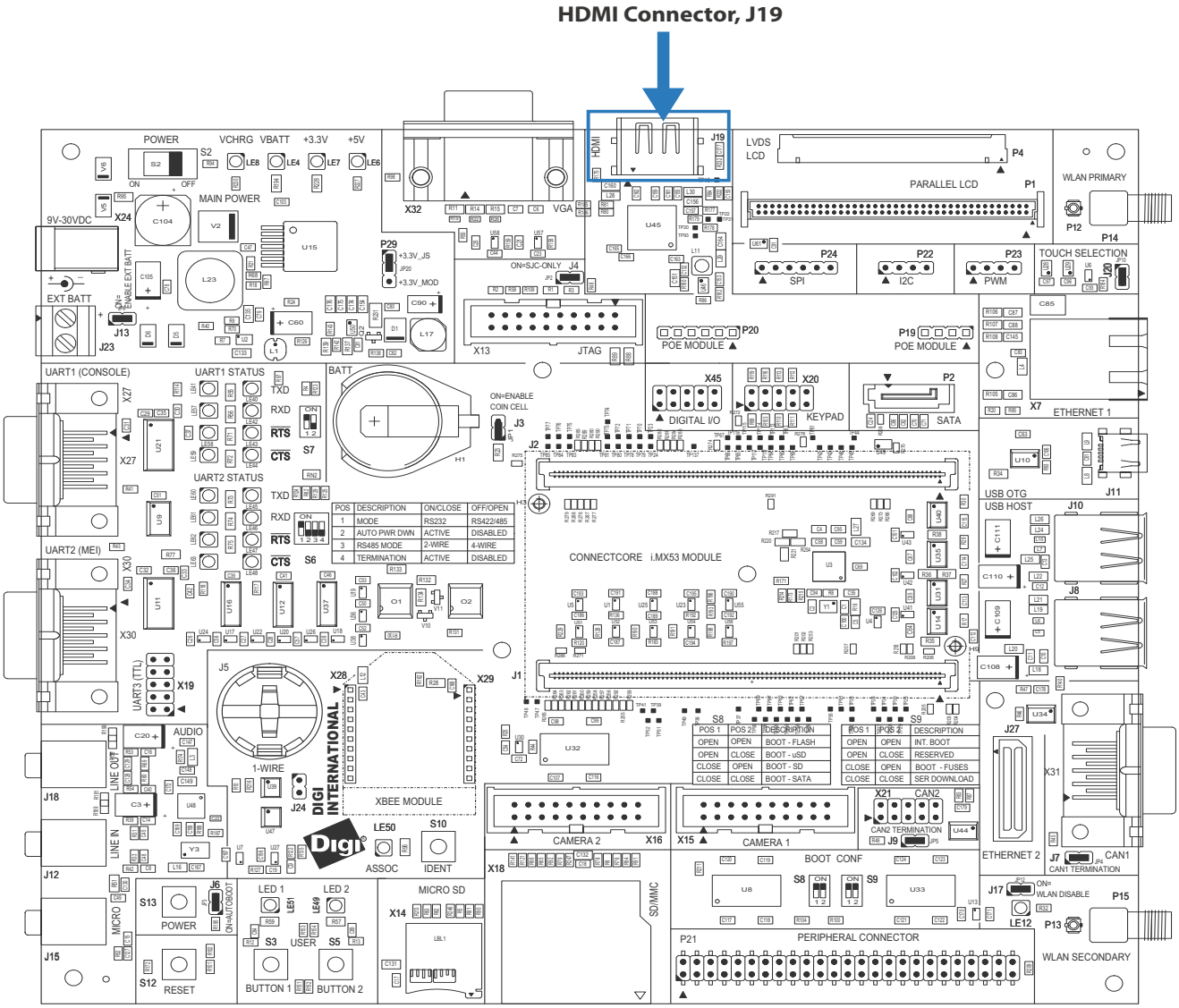
The development board provides a 2x20 expansion connector for connecting an optional Digi Ethernet adapter board (Digi P/N CC-ACC-ETHMX)) or a customer-specific setup. The Ethernet 2 interface is provided by an optional on-module Ethernet MAC/PHY.

Ethernet 2, Connector J17

The table below shows the pinout of the Ethernet 2 expansion connector.

Pin	Signal	Pin	Signal
1	GND	2	GND
3	ETH2_TX+	4	ETH2_RX+
5	ETH2_TX-	6	ETH2_RX-
7	GND	8	GND
9	-	10	-
11	-	12	-
13	GND	14	GND
15	ETH2_ACTIVITY#	16	ETH2_LINK#
17	+3.3V	18	+3.3V
19	-	20	-
21	-	22	-
23	-	24	-
25	-	26	-
27	-	28	-
29	-	30	-
31	-	32	-
33	-	34	-
35	-	36	-
37	-	38	-
39	-	40	-

HDMI Interface



The development board provides an HDMI interface connected to display interface 0 of the ConnectCore for i.MX53 CPU. The Analog Device AD9389 HDMI transmitter on the development board is controlled through the I^2C port 3 of the ConnectCore for i.MX53.

The HDMI transmitter uses the following I^2C device address:

Interface	I^2C Address (7 bits)
HDMI transmitter (AD9389)2	0 x 39

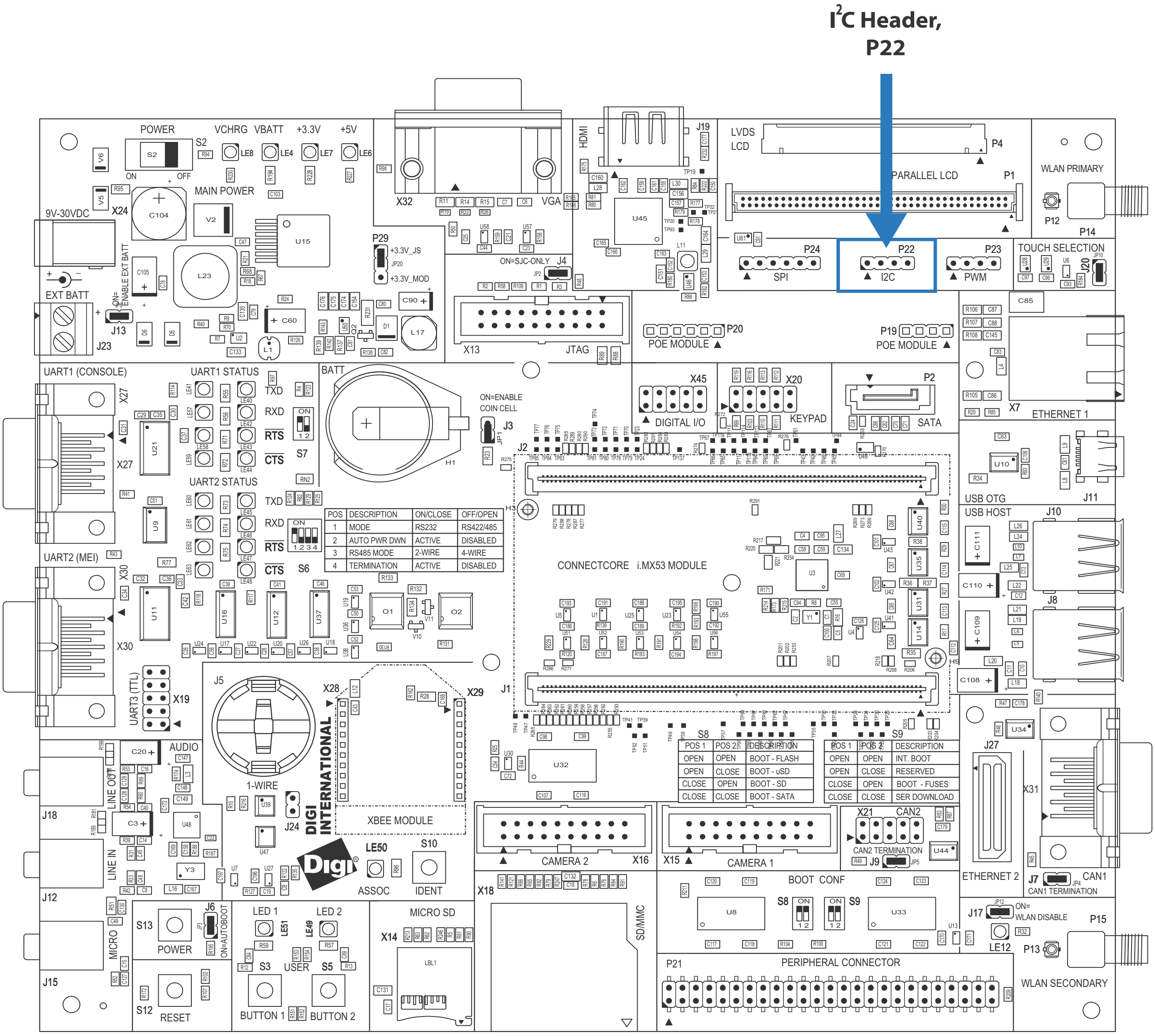
HDMI Connector, J19

The development board provides an HDMI connector, J19. The HDMI interface is connected to the Display 0 interface of the ConnectCore for i.MX53 CPU.

The table below shows the pinout of the HDMI connector:

Pin	Signal
1	HDMI_TX2+
2	GND
3	HDMI_TX2-
4	HDMI_TX1+
5	GND
6	HDMI_TX1-
7	HDMI_TX0+
8	GND
9	HDMI_TX0-
10	HDMI_TXC+
11	GND
12	HDMI_TXC-
13	NC
14	NC
15	HDMI_SCL
16	HDMI_SDA
17	GND
18	+5V
19	HOTPLUG_DET

I²C Interface



I²C Header, P22

Pin header P22 provides access to the ConnectCore for i.MX53 I²C port 3 interface.

The I²C port 3 is connected to the following headers/interfaces on the development board.

Interface	I²C Address (7 bits)
I²C Header	-
Camera 1	0 x 5C
Camera 2	0 x 48
HDMI Transmitter	0 x 39
Parallel LCD	-
Audio CODEC (SGTL 5000)	0 x 0A
Peripheral connector	-

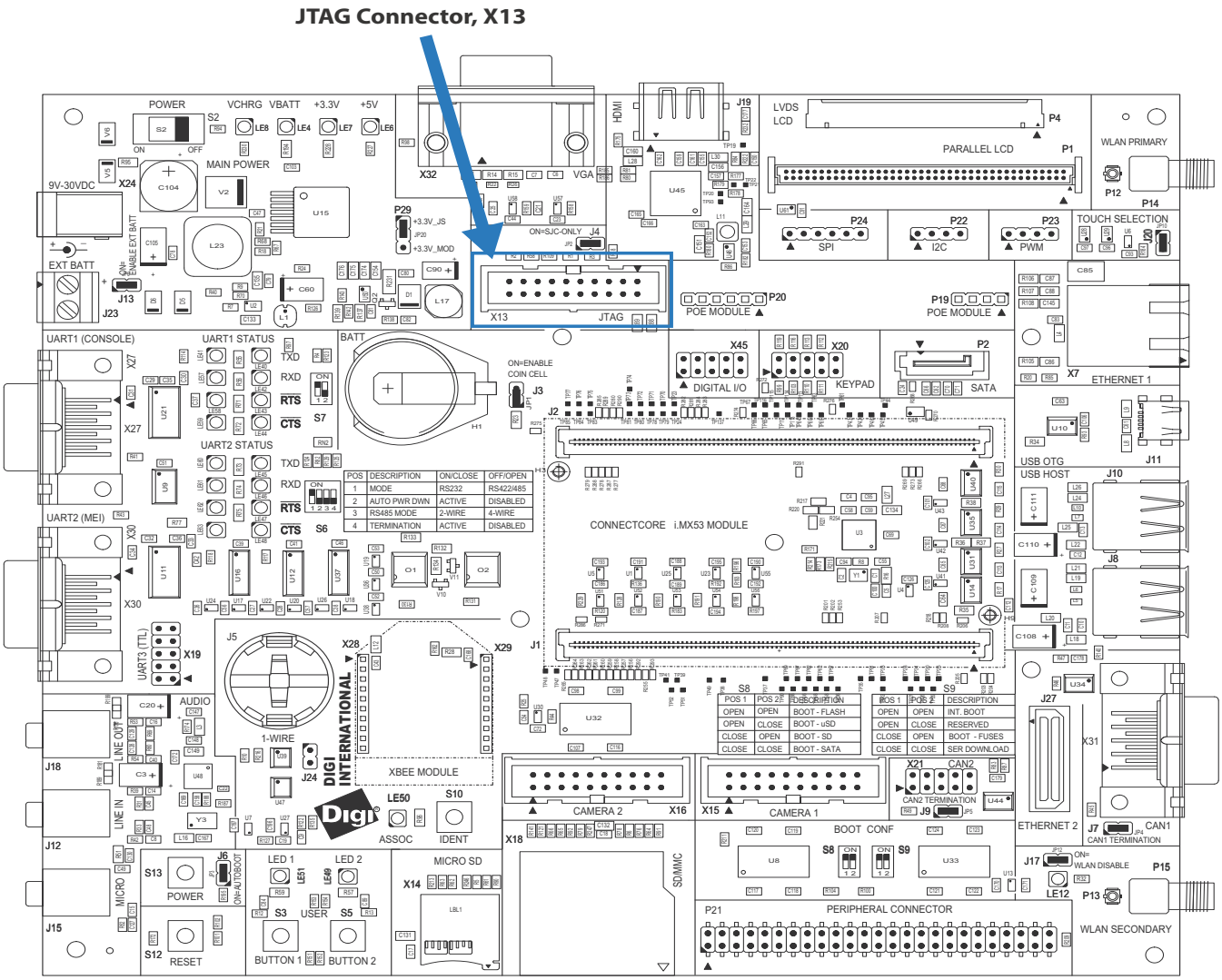
I²C port 3 is connected to the following interfaces of the ConnectCore for i.MX53 module:

Interface	I²C Address (7 bits)
DA9053 PMIC	0 x 68
Accelerometer (MMA7455L)	0 x 1D

The table below provides the pinout of connector P22:

Pin	Function
1	I²C_SDA
2	+2.775V
3	I²C_SCL
4	GND

JTAG Interface



POS	DESCRIPTION	ON/CLOSE	OFF/OPEN
1	MODE	RS232	RS422/485
2	AUTO PWR DWN	ACTIVE	DISABLED
3	RS485 MODE	2-WIRE	4-WIRE
4	TERMINATION	ACTIVE	DISABLED

POS 1	POS 2	DESCRIPTION
OPEN	OPEN	BOOT - FLASH
OPEN	CLOSE	BOOT - uSD
CLOSE	OPEN	BOOT - SD
CLOSE	CLOSE	BOOT - SATA

POS 1	POS 2	DESCRIPTION
OPEN	OPEN	INT. BOOT
OPEN	CLOSE	RESERVED
CLOSE	OPEN	BOOT - FUSES
CLOSE	CLOSE	SER DOWNLOAD

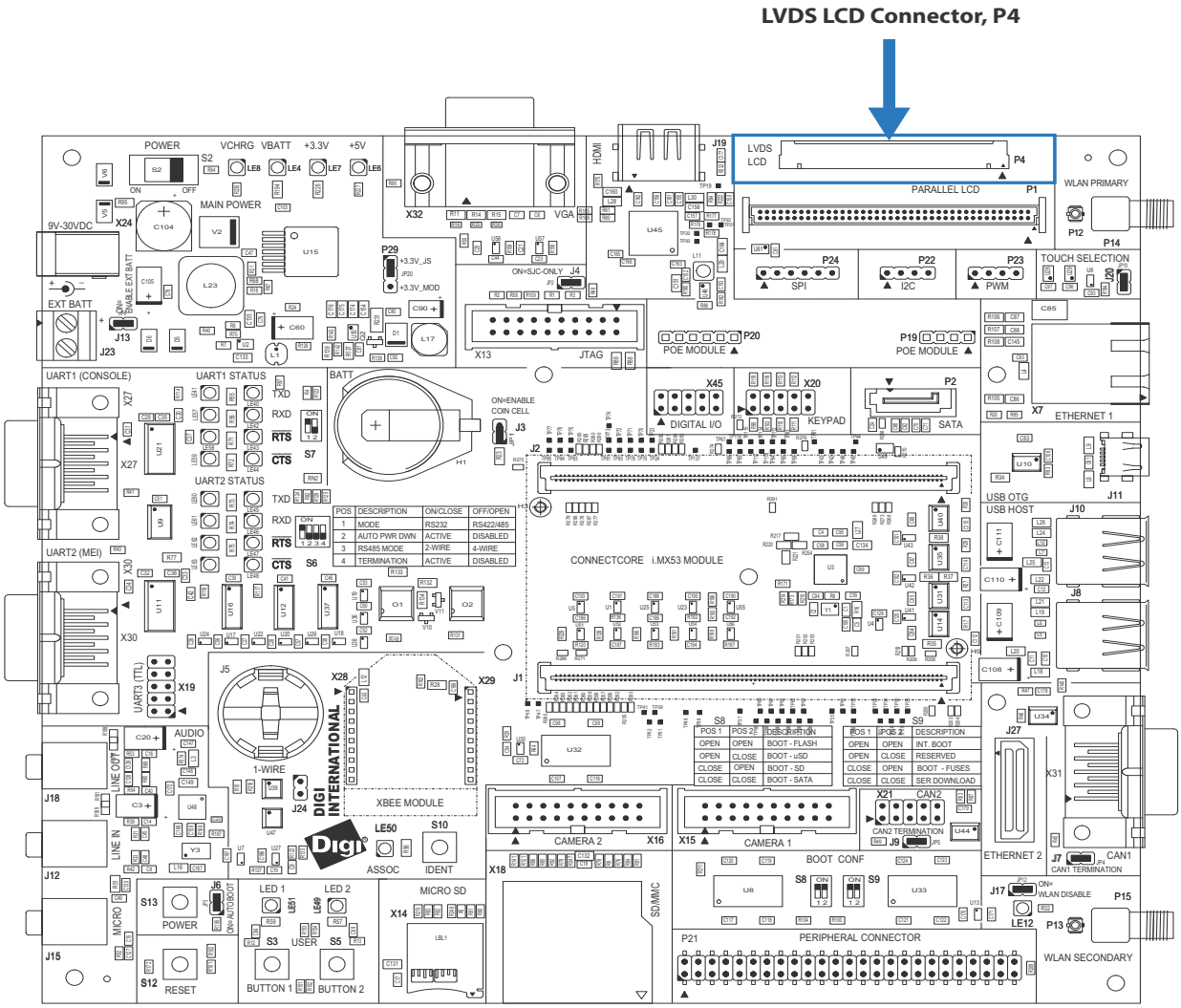
Standard JTAG ARM Connector, X13

The standard JTAG ARM connector is a 20-pin header and can be used to connect JTAG development tools.

Pin	Function	Pin	Function
1	+1.8V	2	+3.3V
3	JTAG_TRST#	4	GND
5	JTAG_TDI	6	GND
7	JTAG_TMS	8	GND
9	JTAG_TCK	10	GND
11	Reserved (RTCK)	12	GND
13	JTAG_TDO	14	GND
15	JTAG_RESET#	16	GND
17	JTAG_DE#	18	GND
19	GND	20	GND

Note: In order to enable ETM functionality, Digi offers an optional ETM adapter board (sold separately, Digi P/N CC-ACC-MX51-ETM).

LVDS LCD Interface



The development board provides a 30 pin, 1.25mm connector (Hirose DF14-30P-1.25H) for accessing the ConnectCore for i.MX53 LVDS 0 interface.

This connector provides access to the following LVDS LCD capabilities:

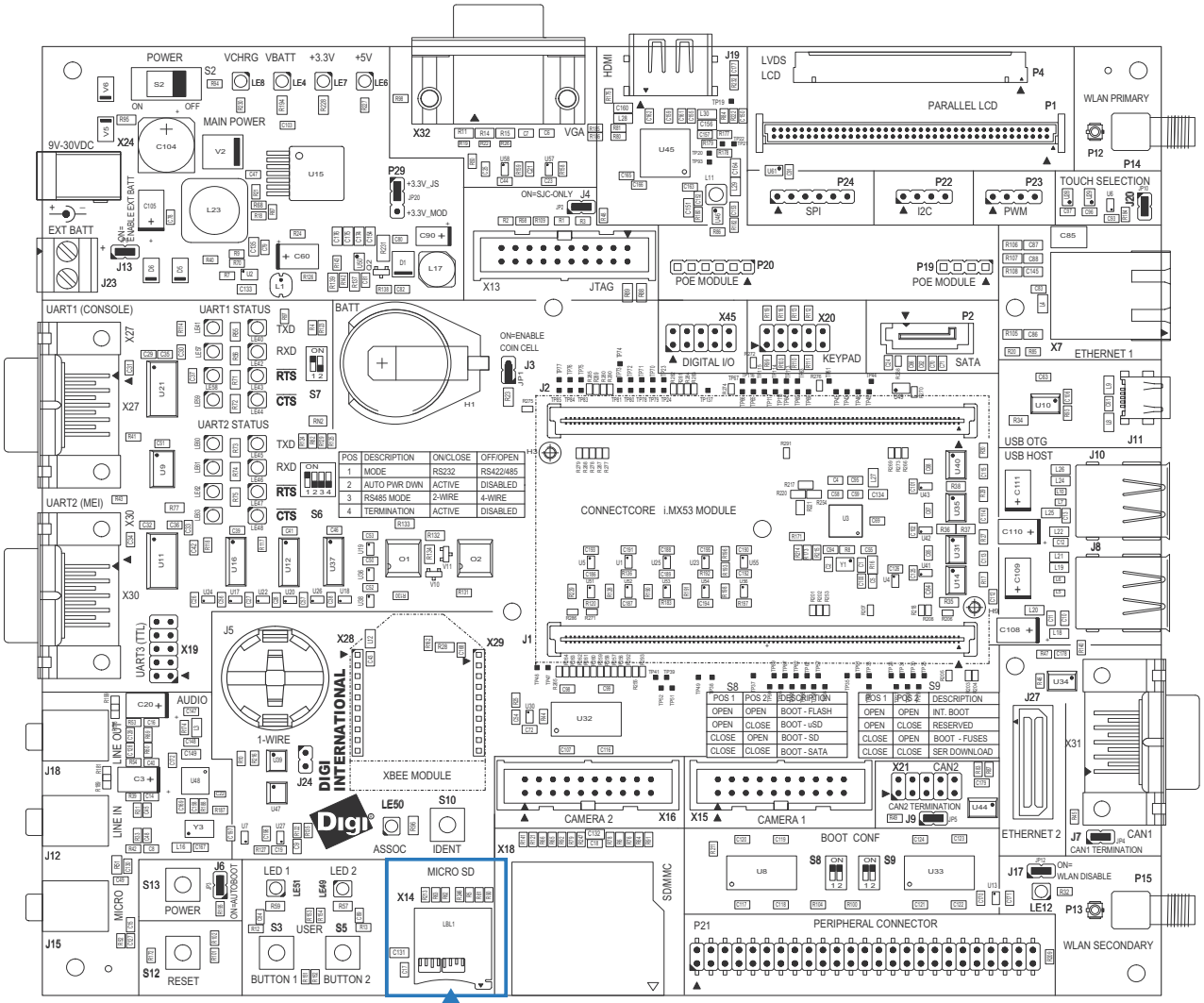
- 4 LVDS differential data pairs
- 1 LVDS differential clock pair
- SPI bus for an external touch screen controller
- Touch screen interface
- Interrupt input for touch screen
- PWM output to control the backlight brightness

- +3.3VDC supply and a 9-30VDC supply

The table below shows the pinout of the LVDS LCD connector, P4:

Pin	Function
1	+3.3V
2	+3.3V
3	GND
4	LVDS0_TX0_N
5	LVDS0_TX0_P
6	GND
7	LVDS0_TX1_N
8	LVDS0_TX1_P
9	GND
10	LVDS0_TX2_N
11	LVDS0_TX2_P
12	GND
13	LVDS0_CLK_N
14	LVDS0_CLK_P
15	GND
16	LVDS0_TX3_N
17	LVDS0_TX3_P
18	GND
19	TOUCH_Y1
20	TOUCH_X2
21	TOUCH_Y2
22	TOUCH_X1
23	LCD_PENIRQ#
24	ECSPI1_MOSI
25	ECSPI1_MISO
26	ECSPI1_MCLK
27	LVDS_ECSPI1_SS0
28	PMIC_GPIO15/PWM2
29	+9-30V
30	+9-30V

MicroSD™ Card Interface



MicroSD™ Connector, X14

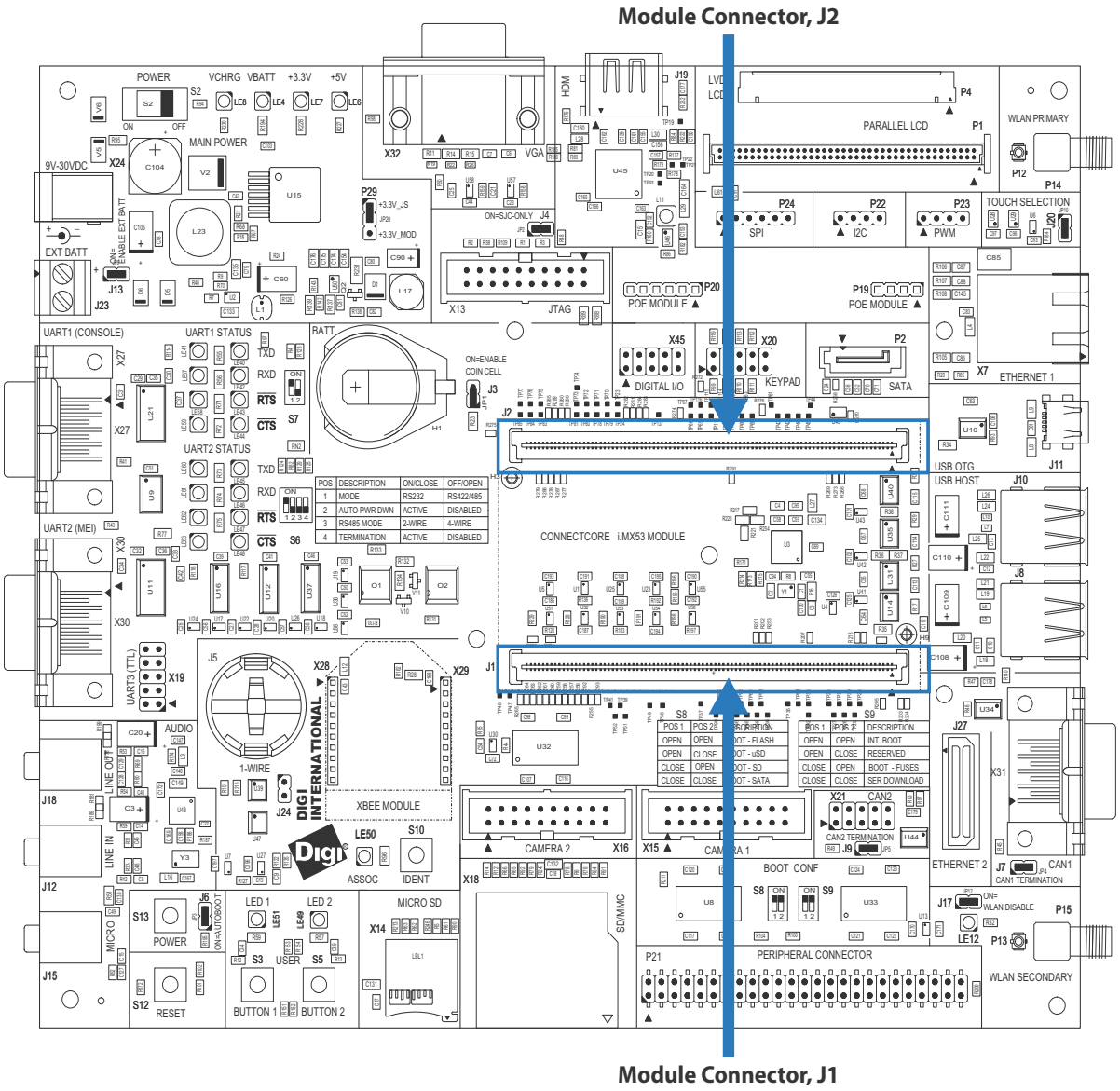
The development board provides one MicroSD™ card connector, X14. This interface is connected to the enhanced Secured Digital Host controller 1 (eSDHC3) of the i.MX53 CPU.

The MicroSD™ connector used on the development board does not provide a card detect pin (pin-9 and pin-10 are connected to chassis). Hot-plug insertion or removal is not possible with this connector.

The following table shows the pinout of the MicroSD™ connector:

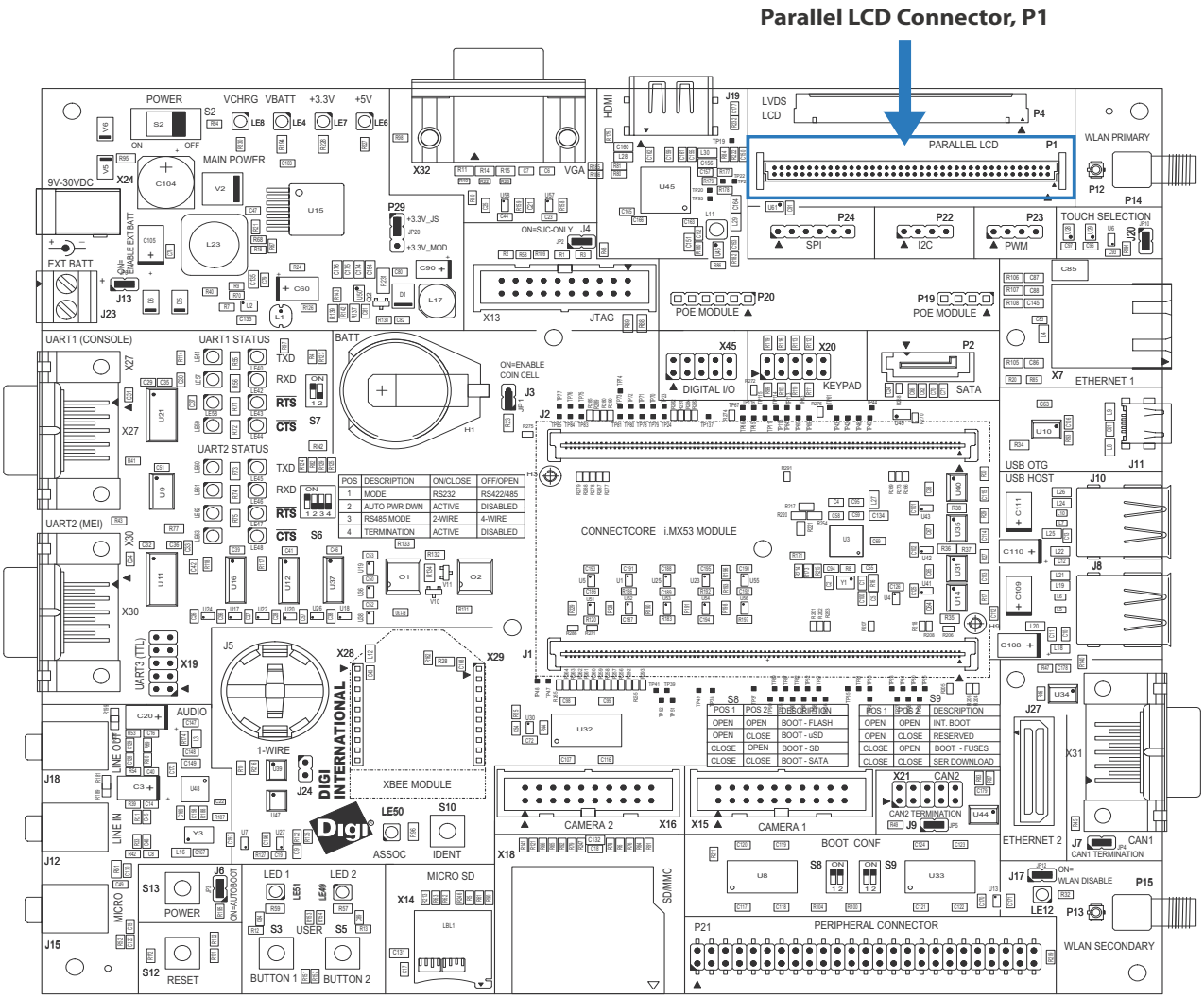
Pin	Signal
1	SD3_SATA2
2	SD3_DATA3
3	SD3_CMD
4	+3.15V
5	SD3_CLK
6	GND
7	SD3_DATA0
8	SD3_DATA1
9	SD3_CD (connected to chassis)
10	SD3_CD (connected to chassis)

Module Connectors, J1 and J2



Please see the “Module Pinout” section on page 17 for related information.

Parallel LCD Interface



The development board provides a 2x40 pin, 1.27mm connector for accessing the ConnectCore for i.MX53 parallel display 0. A Digi-provided LCD application board (CC-ACC-LCDW-70) or a user defined LCD application board can be connected to this parallel LCD connector.

The connector provides access to the following LCD capabilities:

- 24-bit (RGB x 8bit) LCD
- SPI bus for an external touch screen controller
- Touch screen interface
- Interrupt input for touch screen
- I^2C bus

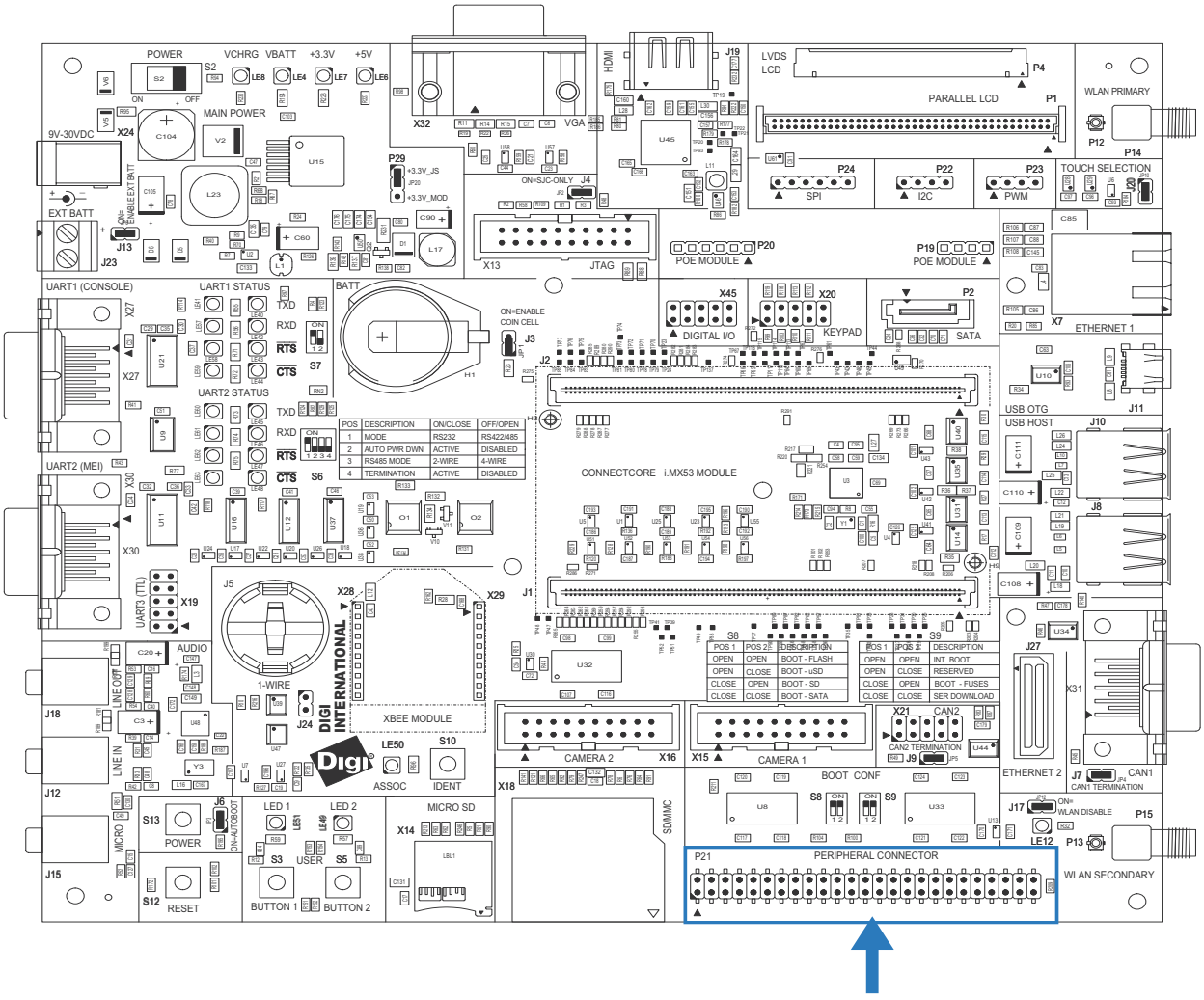
- 1 x GPIO
- +3.3VDC supply and a 9-30VDC supply

The table below shows the pinout of the parallel LCD connector, P1:

Pin	Signal	Pin	Signal
1	DISP0_DATA16 (R0)	2	DISP0_DATA17 (R1)
3	DISP0_DATA18 (R2)	4	DISP0_DATA19 (R3)
5	DISP0_DATA20 (R4)	6	DISP0_DATA21 (R5)
7	DISP0_DATA22 (R6)	8	DISP0_DATA23 (R7)
9	-	10	-
11	-	12	-
13	GND	14	GND
15	DISP0_DATA8 (G0)	16	DISP0_DATA9 (G1)
17	DISP0_DATA10 (G2)	18	DISP0_DATA11 (G3)
19	DISP0_DATA12 (G4)	20	DISP0_DATA13 (G5)
21	DISP0_DATA14 (G6)	22	DISP0_DATA15 (G7)
23	-	24	-
25	-	26	-
27	GND	28	GND
29	LCD1_DATA0 (B0)	30	DISP0_DATA1 (B1)
31	LCD1_DATA2 (B2)	32	DISP0_DATA3 (B3)
33	LCD1_DATA4 (B4)	34	DISP0_DATA5 (G5)
35	LCD1_DATA6 (B6)	36	DISP0_DATA7 (G7)
37	-	38	-
39	-	40	-
41	GND	42	GND
43	DISP0_DRDY	44	DISP0_PCLK
45	PWM1/LCD1_PWREN#	46	GND
47	DISP0_VSYNC	48	DISP0_HSYNC
49	-	50	-
51	-	52	-
53	-	54	-
55	GND	56	GND
57	TOUCH_X1	58	TOUCH_Y1

Pin	Signal	Pin	Signal
59	TOUCH_X2	60	TOUCH_Y2
61	I2C3_SDA	62	I2C3_SCL
63	LCD_SPI1_SS0#	64	SPI1_CLK
65	SPI1_MOSI	66	SPI1_MISO
67	POR#	68	TCH_INT/TCH_EXT#
69	DISP0_GPIO	70	-
71	LCD_PENIRQ#	72	GND
73	+3.3V	74	+3.3V
75	+9-30V	76	+9-30V
77	+9-30V	78	+9-30V
79	VSWLED	80	LED1_IN

Peripheral Application Header



Peripheral Application Header, P21

The development board provides one, 2x25-pin, 2.54mm pitch header for application-specific daughter cards/expansion boards. The following signals of the ConnectCore for i.MX53 are available for this connector:

- 16-bit EIM data bus
- 10-bit EIM address bus
- Control signals EIM_CS0#, EIM_OE#, EIM_WE#)
- I^2C3
- Power (+3.3V)
- Interrupt input

Peripheral Application Header, P21

Pin	Signal	Pin	Signal
1	GND	2	EIM_D16
3	EIM_D17	4	EIM_D18
5	EIM_D19	6	GND
7	EIM_D20	8	EIM_D21
9	EIM_D22	10	EIM_D23
11	GND	12	EIM_D24
13	EIM_D25	14	EIM_D26
15	EIM_D27	16	GND
17	EIM_D28	18	EIM_D29
19	EIM_D30	20	EIM_D31
21	GND	22	GND
23	GND	24	+3.3V
25	+3.3V	26	EIM_A0
27	EIM_A1	28	EIM_A2
29	EIM_A3	30	GND
31	EIM_A4	32	EIM_A5
33	EIM_A6	34	EIM_A7
35	GND	36	EIM_A8
37	EIM_A9	38	GND
39	EIM_CS0#	39	I2C3_SDA
41	EIM_WE#	42	EIM_OE#
43	I2C3_SCL	44	GPIO5_0/EIM_IRQ
45	+3.3V	46	+3.3V
47	EIM_BE2#	48	EIM_BE3#
49	EIM_BCLK	50	GND

The voltage level of the data, address and control signals provided by the module is +1.8V. A level shifter is provided on the development board to buffer and change the voltage level of the peripheral application signals on this header to +3.3V.

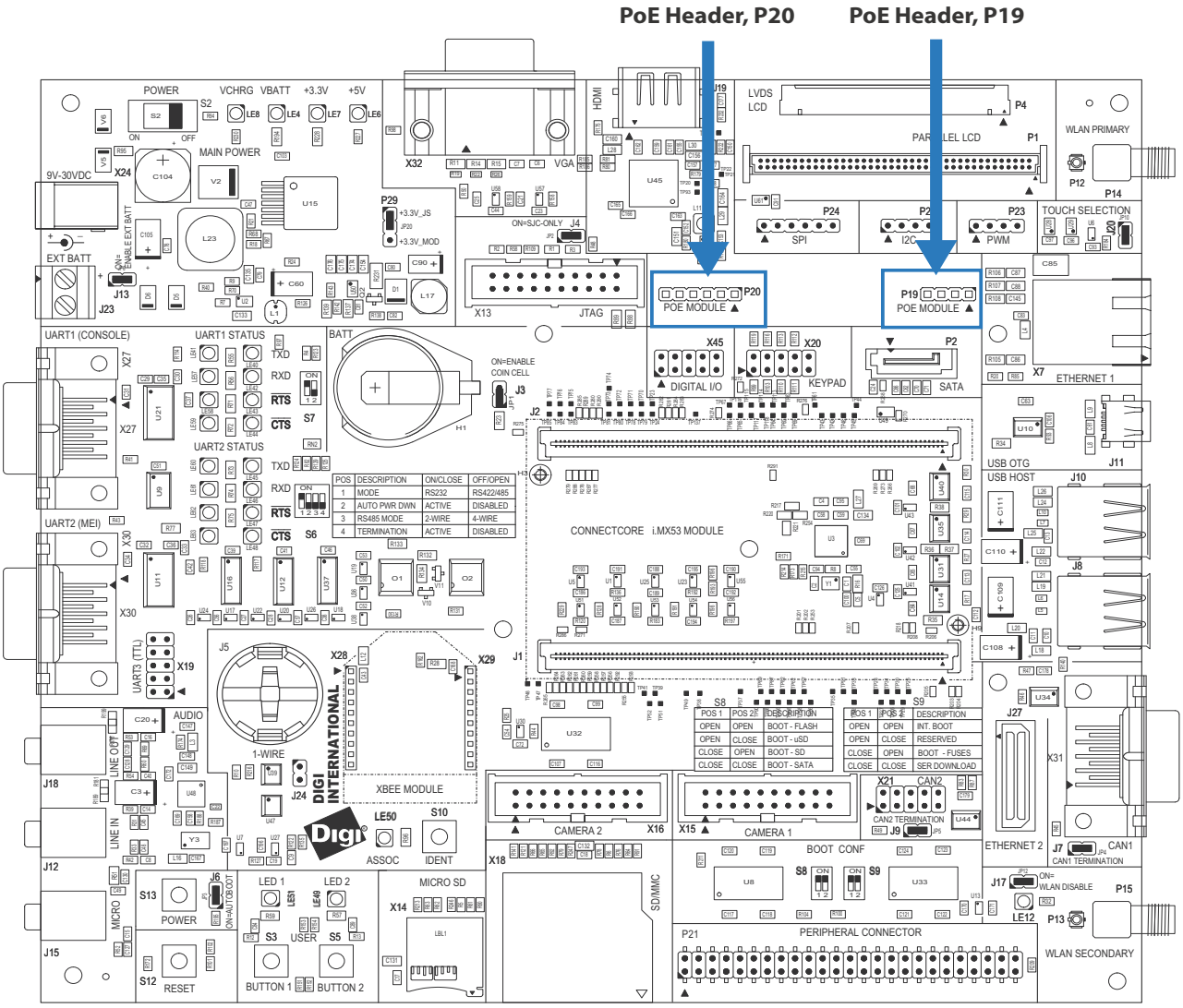
The EIM_BE2# signal is connected to the ConnectCore for i.MX53 byte enable 2 (D16 – D23).

The EIM_BE3# signal is connected to the ConnectCore for i.MX53 byte enable 3 (D24 – D31).

The BCLK signal corresponds to the ConnectCore for i.MX53 burst clock signal. This clock signal is not buffered, and its voltage level is +1.8V. This signal is connected to the peripheral connector through a 0R resistor. By default this resistor is not populated.

The I^2C interface corresponds to the ConnectCore for i.MX53 I^2C port 3. For more information refer to the "I2C" section on page 54 and "I2C Interface" section on page 105.

Power-Over-Ethernet (PoE) - IEEE802.3af



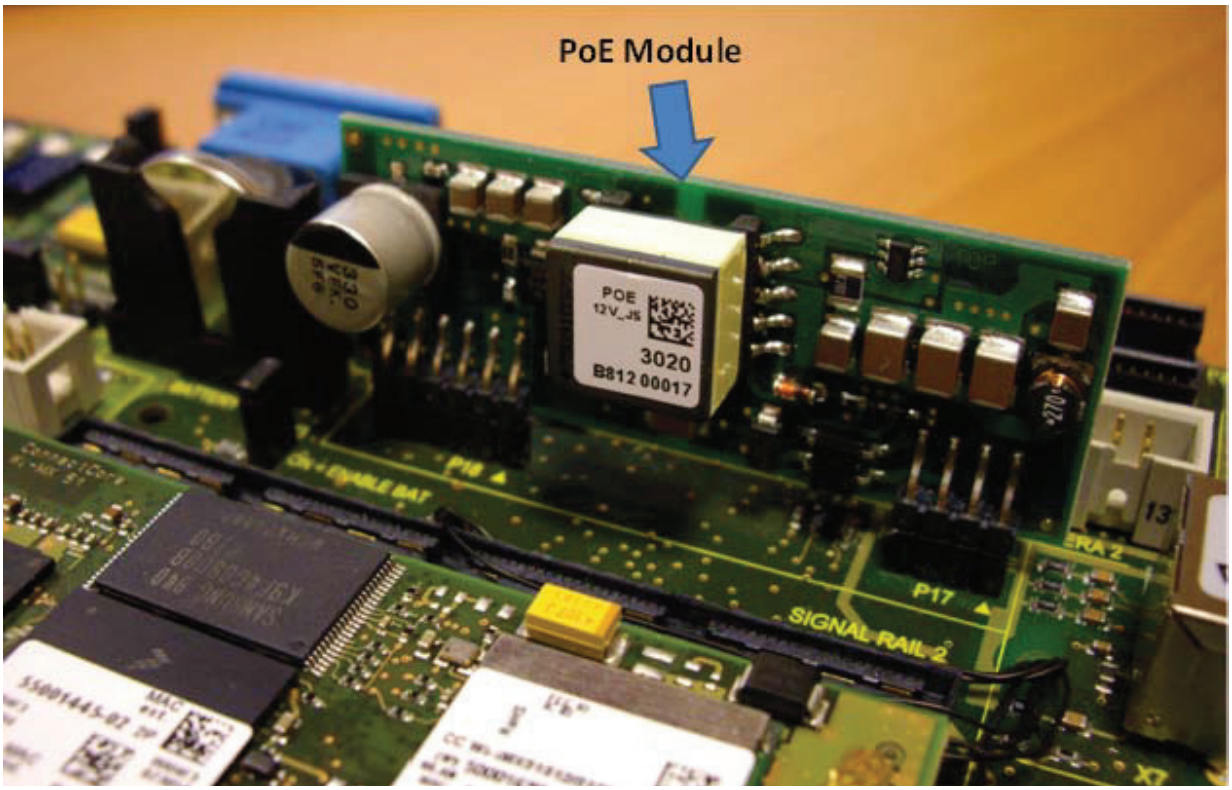
The development board provides two PoE module connectors, P19 and P20, to plug a Digi PoE module (DG-ACC-POE). The PoE module is an optional accessory item that can be plugged on the development board through the two connectors.

- P19, input connector: provides access to the PoE signals from the Ethernet connector
- P20, output connector: provides the output power supply from the PoE module

The PoE Module

Plug in the PoE module at a right angle to the development board, as shown in the picture below.

Note: The PoE module is part of the optional Digi 802.3af application kit (sold separately, Digi P/N DG-ACC-POE).



PoE Connector (power in), P19

The table below provides the pinout of the PoE input connector:

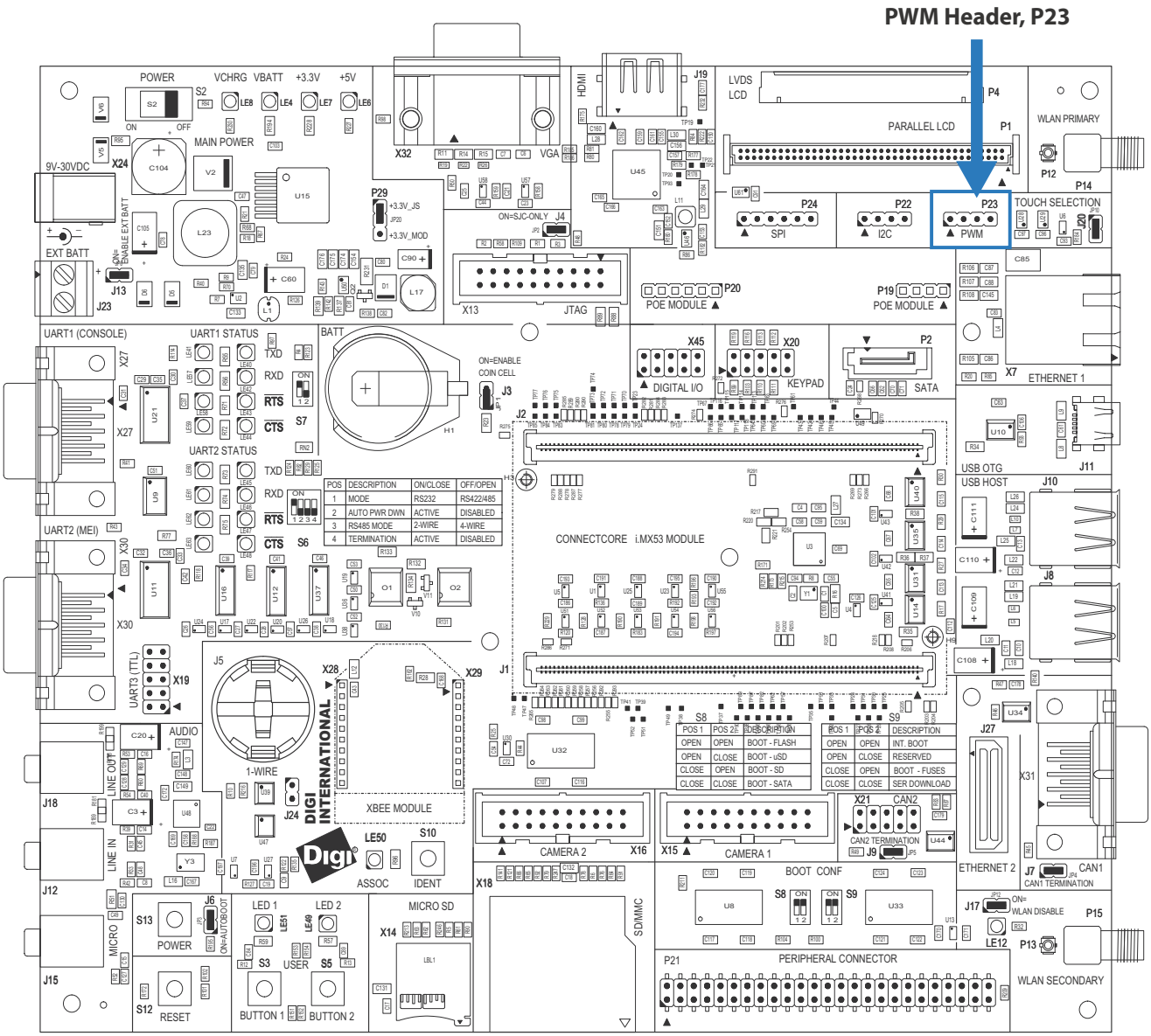
Pin	Signal
1	POE_TX_CT
2	POE_RX_CT
3	POE_RJ45_4/5
4	POE_RJ45_7/8

PoE Connector (power out), P20

The table below provides the pinout of the PoE output connector:

Pin	Signal
1	+12V_PoE
2	+12V_PoE
3	GND
4	GND
5	PoE_GND
6	PoE_GND

PWM Interface



Power Header, P23

The development board provides access to the two PWM signals generated on the module's DA9053 PMIC, through the PWM header P23.

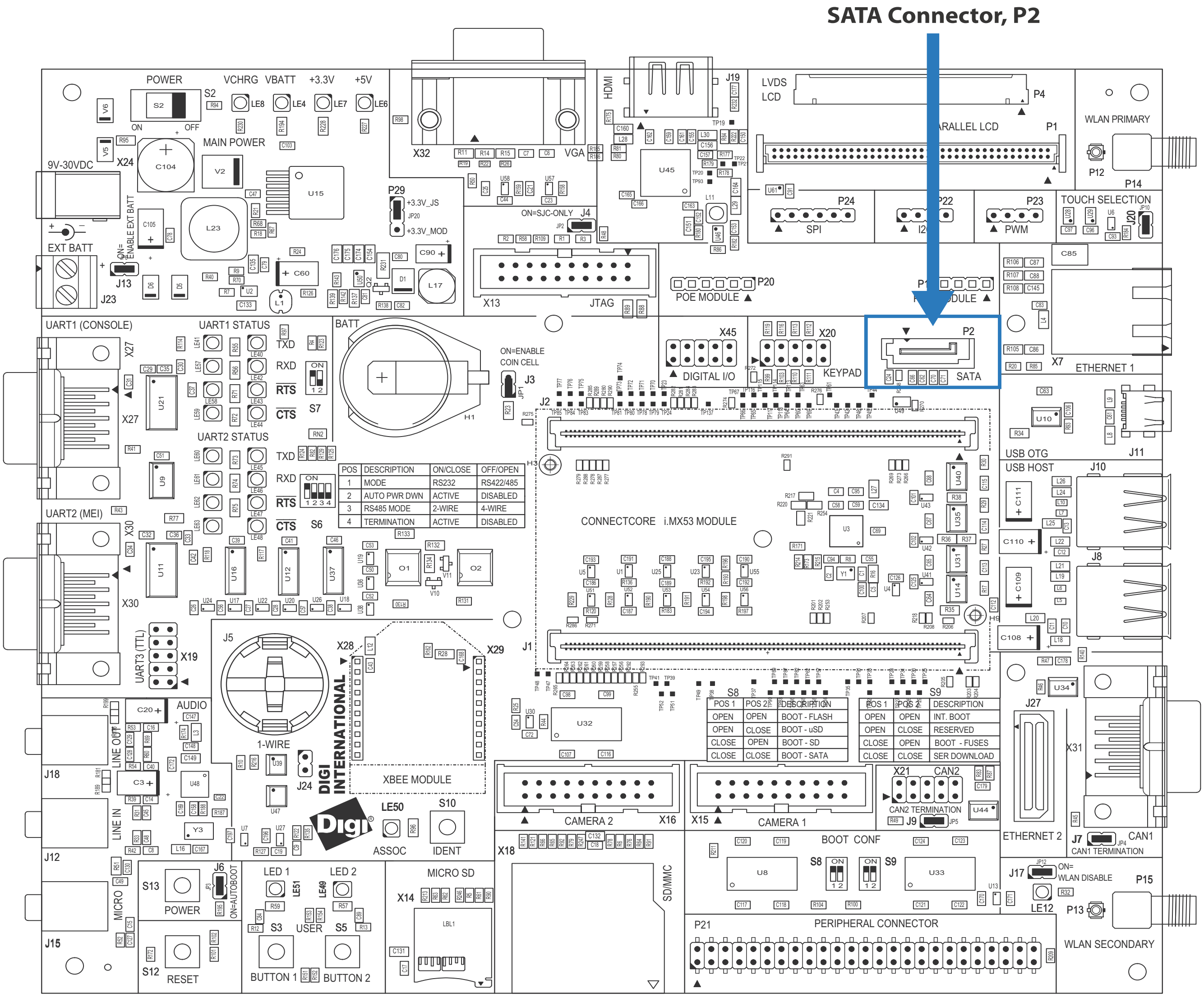
The PWM1 signal is also connected to the parallel LCD interface.

The PWM2 signal is also connected to the LVDS LCD interface.

The table below provides the pinout of the PWM header:

Pin	Function
1	+3.3V
2	PMIC_GPIO14/PWM1
3	PMIC_GPIO15/PWM2
4	GND

SATA Interface



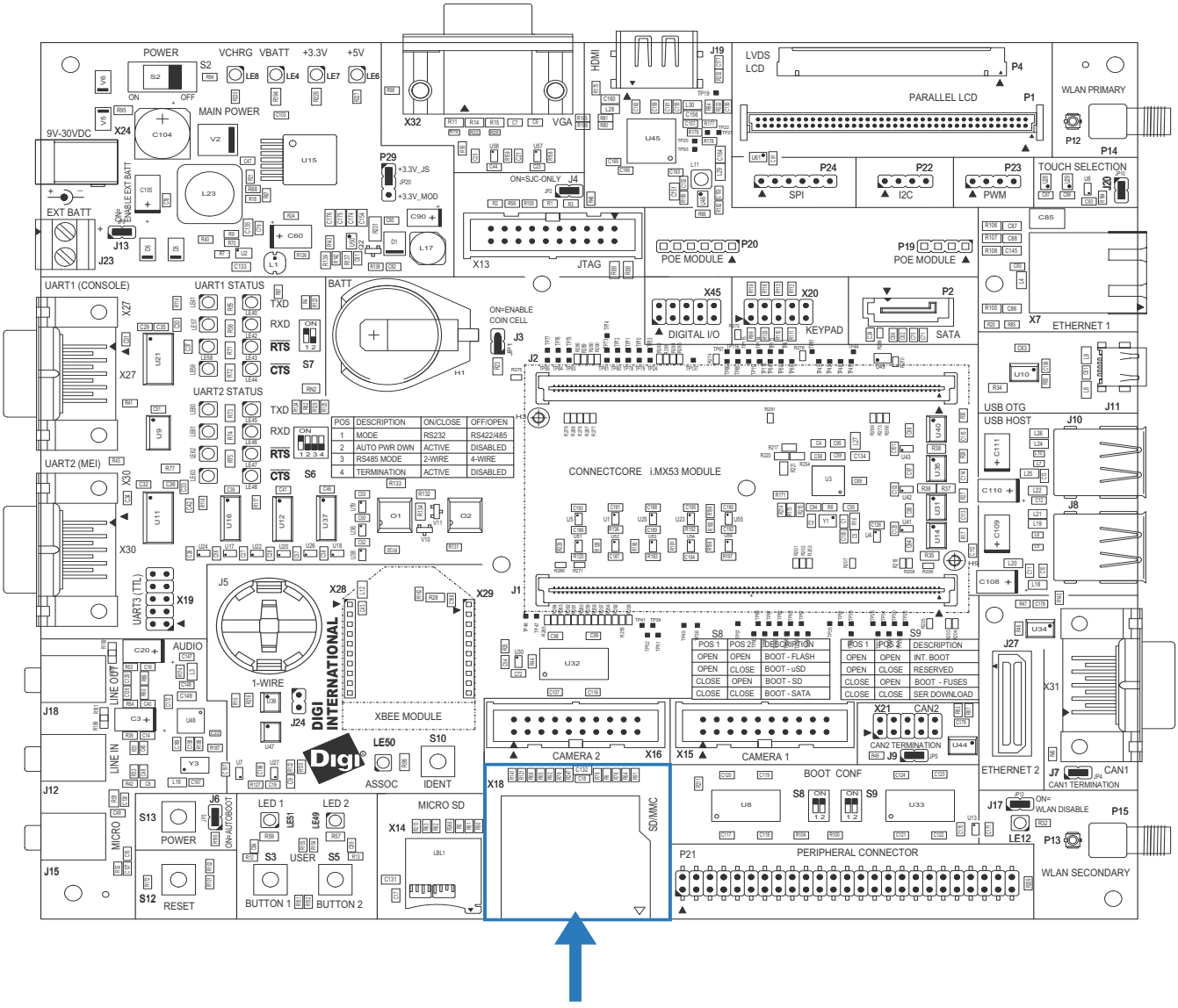
SATA Connector, P2

The development board provides access to the SATA interface on the module using the SATA connector, P2.

The table below provides the pinout of the SATA connector:

Pin	Function
1	GND
2	SATA_TXP
3	SATA_TXM
4	GND
5	SATA_RXM
6	SATA_RXP
7	GND

SD Card Interface



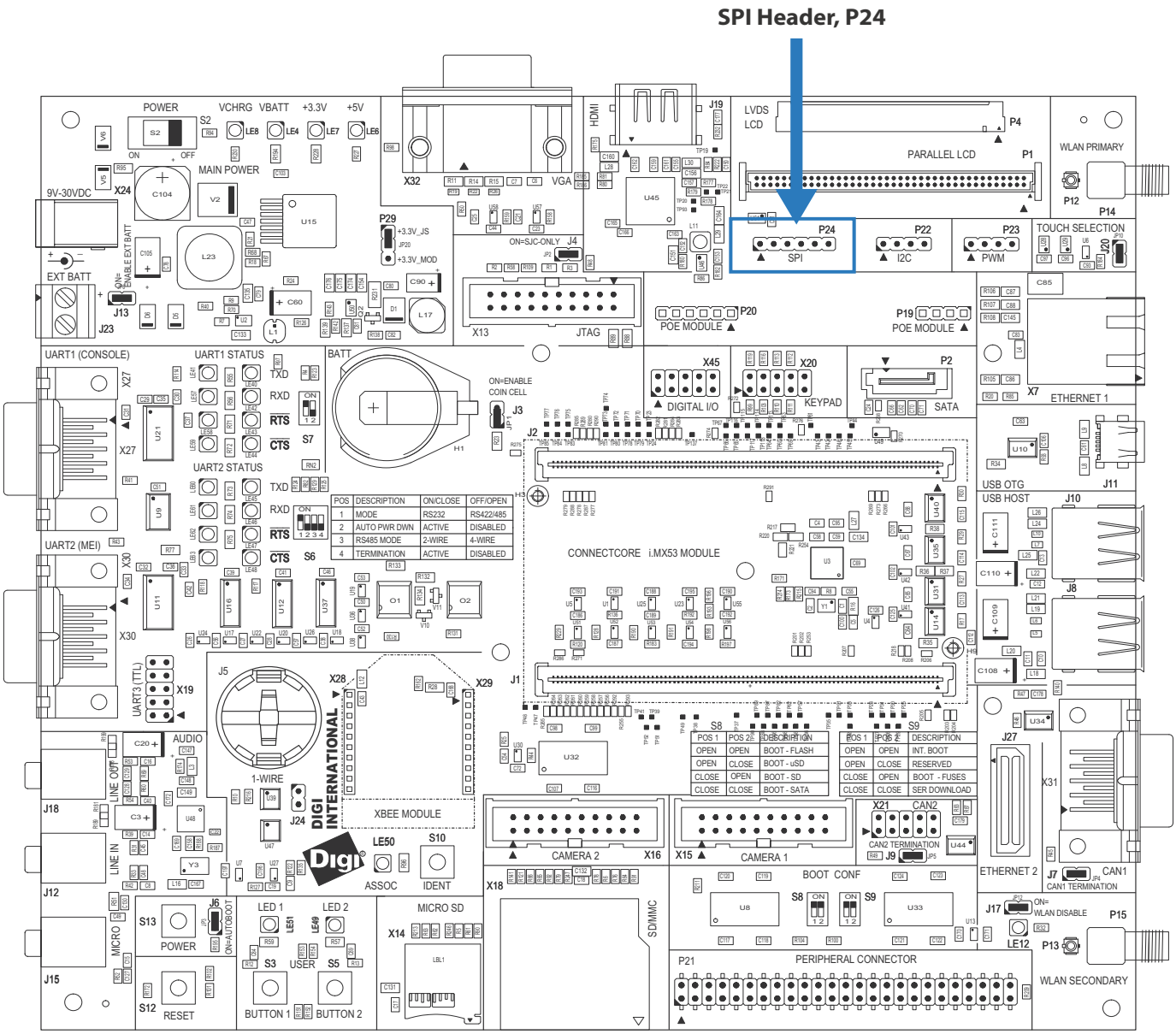
SD/MMC Connector, X18

The development board provides one SD/MMC card connector, X18. This interface is connected to the enhanced Secured Digital Host controller 2 (eSDHC2) of the ConnectCore for i.MX53 CPU.

The following table provides the pinout of the SD/MMC connector:

Pin	Function
1	SD_DATA3
2	SD2_CMD#
3	GND
4	+3.15V
5	SD2_CLK
6	GND
7	SD2_DATA0
8	SD2_DATA1
9	SD2_DATA2
10	SD2_DATA4
11	SD2_DATA5
12	SD2_DATA6
13	SD2_DATA7
14	SD2_CD#
15	SD2_WP#

SPI Interface



POS	DESCRIPTION	ON/CLOSE	OFF/OPEN
1	MODE	RS232	RS422/485
2	AUTO PWR DWN	ACTIVE	DISABLED
3	RS485 MODE	2-WIRE	4-WIRE
4	TERMINATION	ACTIVE	DISABLED

POS 1	POS 2	DESCRIPTION
OPEN	OPEN	BOOT - FLASH
OPEN	CLOSE	BOOT - uSD
CLOSE	OPEN	BOOT - SD
CLOSE	CLOSE	BOOT - SATA

POS 1	POS 2	DESCRIPTION
OPEN	OPEN	INT. BOOT
OPEN	CLOSE	RESERVED
CLOSE	OPEN	BOOT - FUSES
CLOSE	CLOSE	SER DOWNLOAD

SPI Header, P24

The development board provides access to the SPI interface on the module using the SPI header, P24. This interface is connected to the ConnectCore for i.MX53 ECSPI1 port.

The SPI bus is connected to the following interfaces on the development board:

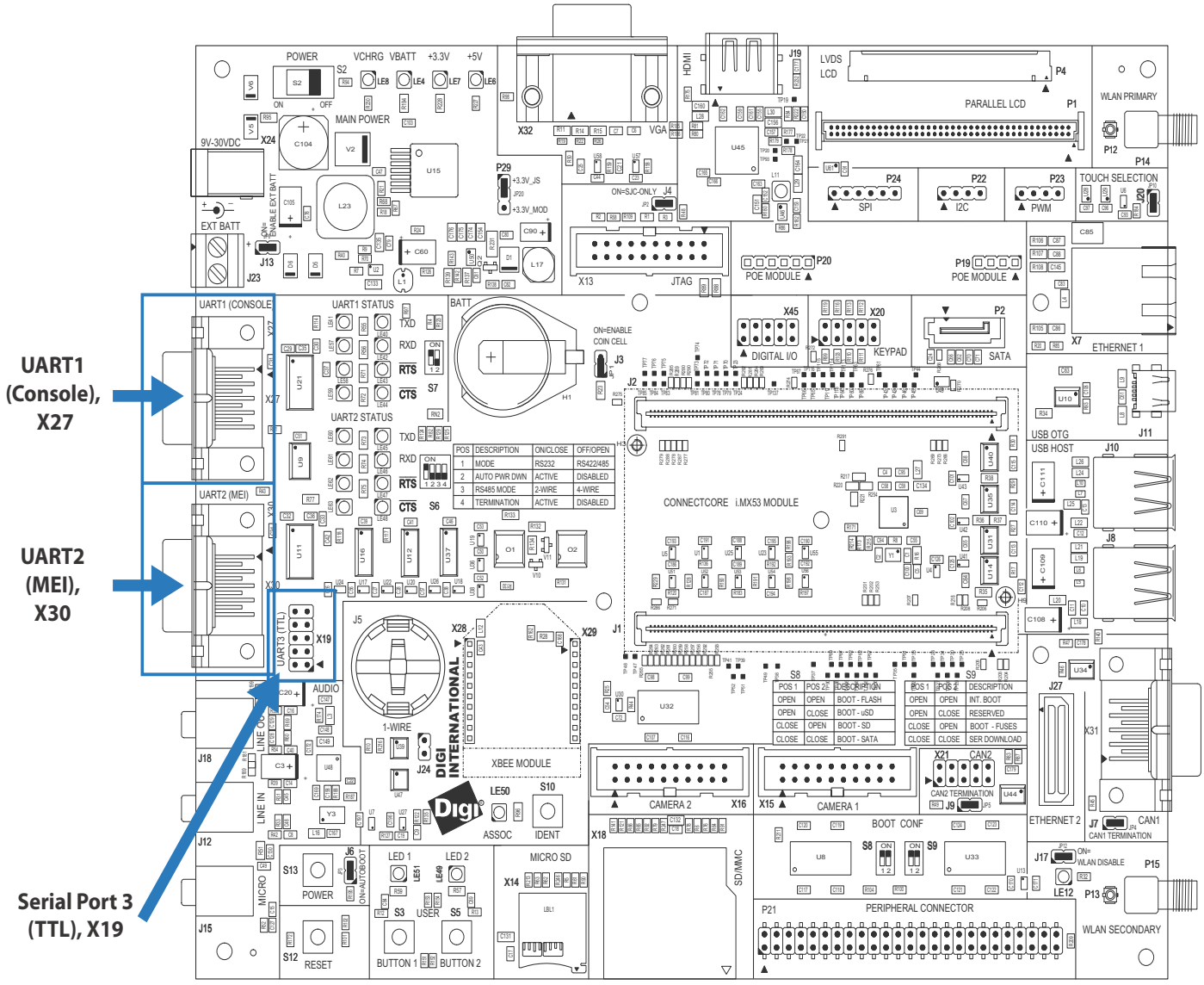
Interface	Chip Select
SPI Header	ECSPI1_SS1
Parallel LCD	ECSPI1_SS0 (*)
LVDC LCD	ECSPI1_SS0 (*)

(*) the SPI chip select signal for the two LCD interfaces is generated with a logic combination of ECSPI1_SS0 and the touch selection jumper (J20).

The table below provides the pinout of the SPI header:

Pin	Function
1	+2.775V
2	ECSPI1_MOSI
3	ECSPI1_MISO
4	ECSPI1_MCLK
5	ECSPI1_SS1
6	GND

UART Interface



UART 1 (Console), X27

The UART 1 connector X27, is a DB-9 male connector. This port is used as the standard console port. This asynchronous serial port is operating in DTE mode and requires a nullmodem cable to connect to a computer serial port. One RS232 transceiver is used on the Development board. The transceiver can be enabled or disabled using switch S7. See the “Switches and Push-buttons” section on page 73 for more information.

UART 1 pins are allocated as shown:

Pin	Function
1	NC
2	RXD2
3	TXD2
4	NC
5	GND
6	NC
7	RTS2#
8	CTS2#
9	NC

UART 2 (MEI), X30

UART 2 connector X30, is a DB-9 male connector. This asynchronous serial port is operating in DTE mode and requires a null-modem cable to connect to a computer serial port.

The UART 2 is used on the development board as MEI (multiple electrical interface) interface. RS232 and RS485 transceiver are used in the Development board. The transceivers are configured using the switch S6. Refer to the “Switches and Push-buttons” section on page 73 for more information.

UART 2 pins are allocated as shown:

Pin	RS232 Function	RS485 Function
1	-	CTS-
2	RXD	RX+
3	TXD	TX+
4	-	RTS-
5	GND	GND
6	-	RX-
7	RTS#	RTS+
8	CTS#	CTS+
9	-	TX-

UART 3 (TTL Interface), X19

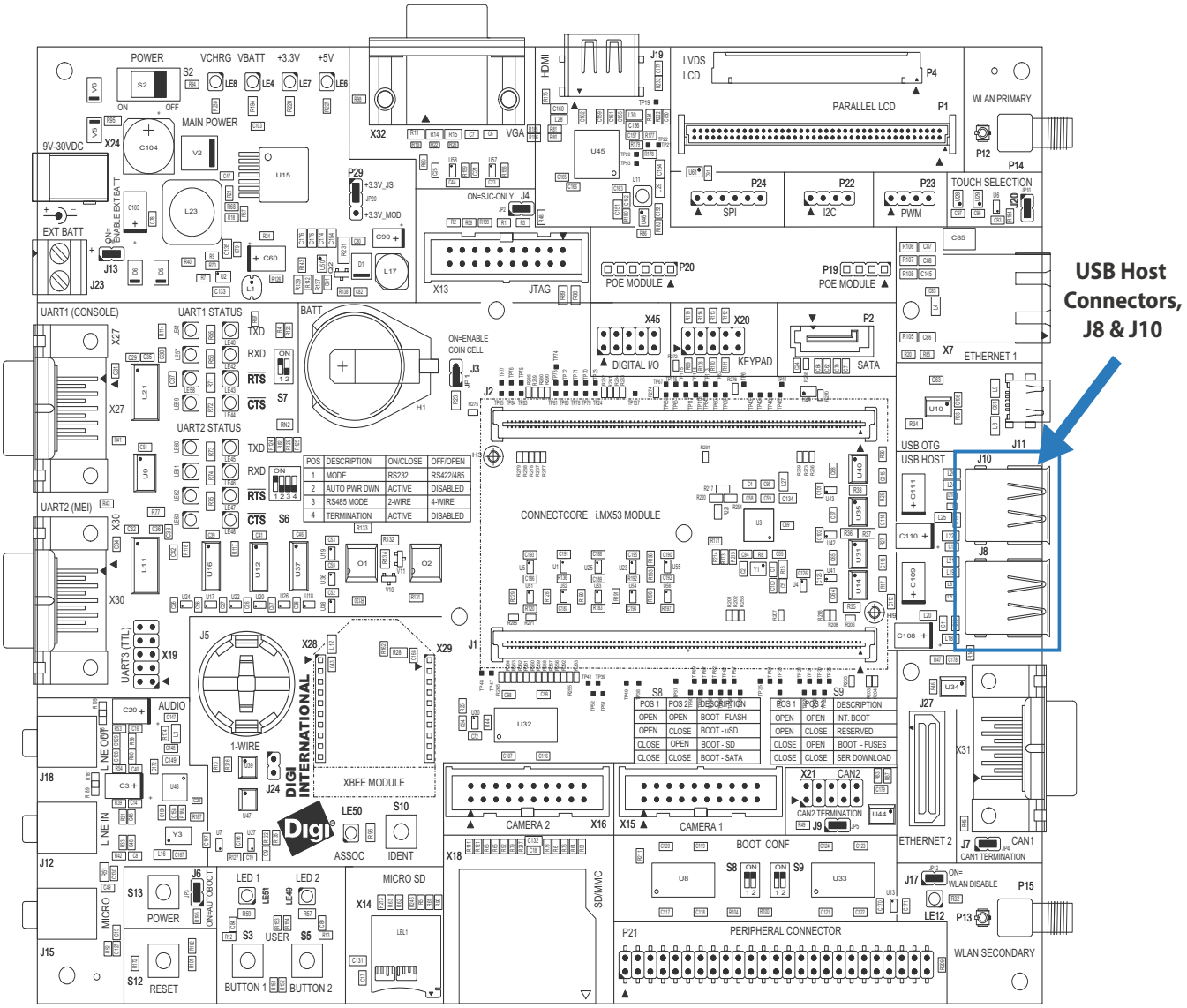
The UART 3 interface is a TTL interface connected to a 2x5 pin, 2.54mm pin header. The connector supports only TTL level signals.

UART 3 pins are allocated as shown:

Pin	Function
1	-
2	-
3	RXD
4	RTS#
5	TXD
6	CTS#
7	-
8	-
9	GND
10	+3.3V

UART 3 is connected to the X19 connector and XBee module socket.

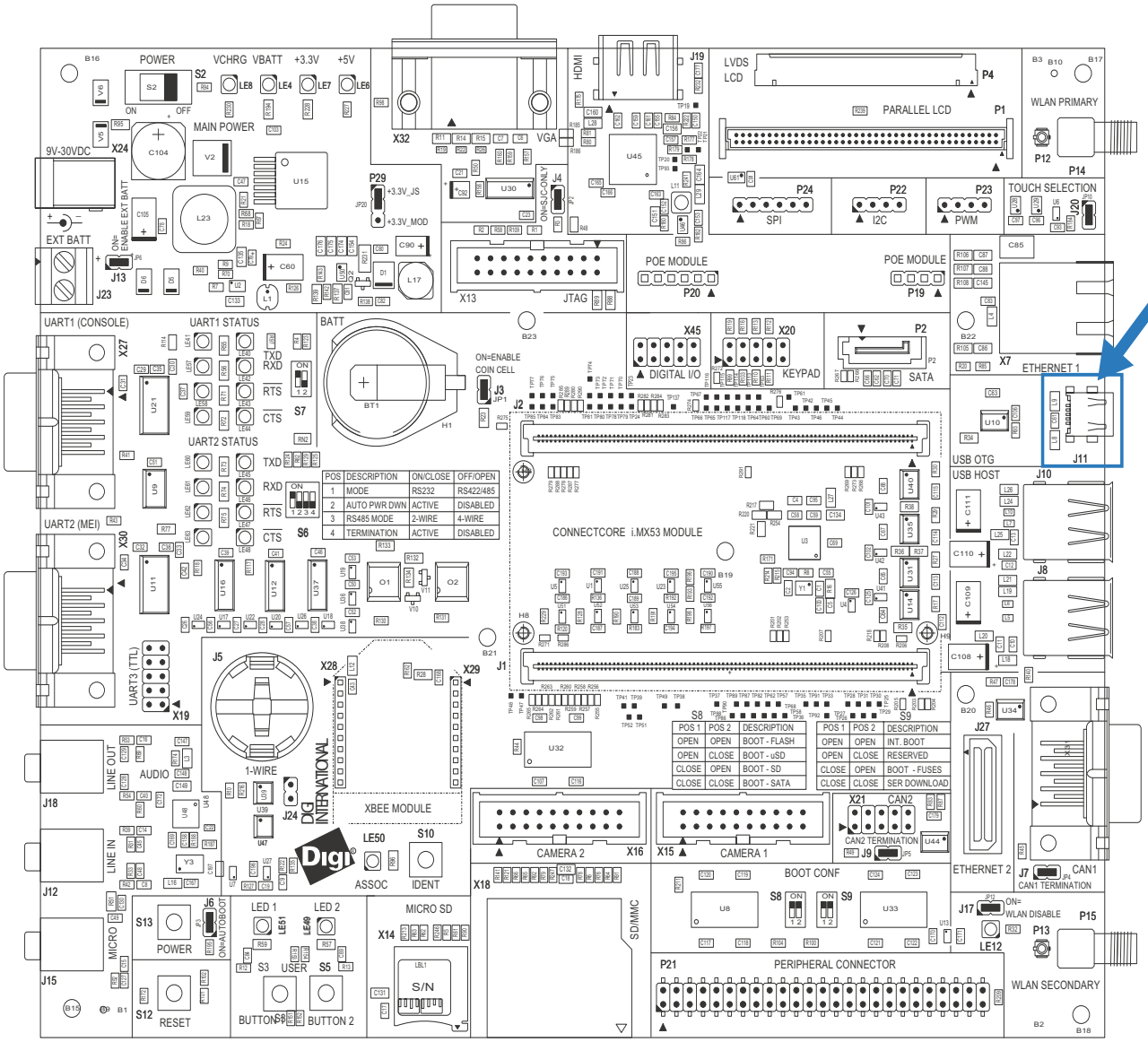
USB Host Interface



USB Host Connectors, J8 and J10

The development board provides four standard type A receptacles for a USB host connection. A 4-Port USB hub is used in the development board to convert the USB host port of the module into four USB host ports. The USB interfaces support low, full and high speed USB2.0 connectivity.

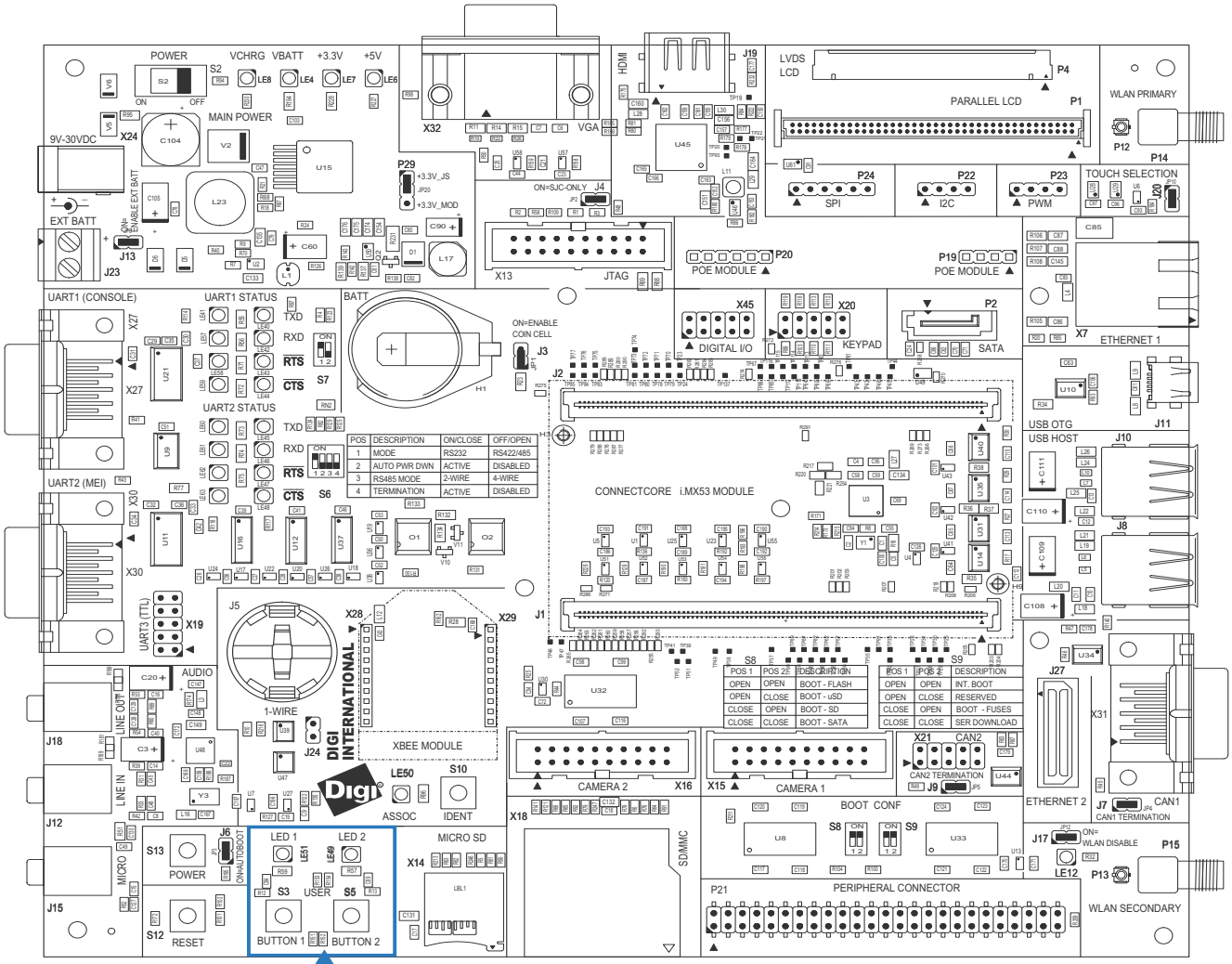
USB OTG Interface



USB OTG Connector, J11

The development board provides a standard mini-AB type receptacle for a USB OTG connection. The module supports full and high speed USB2.0 connectivity.

User Interface

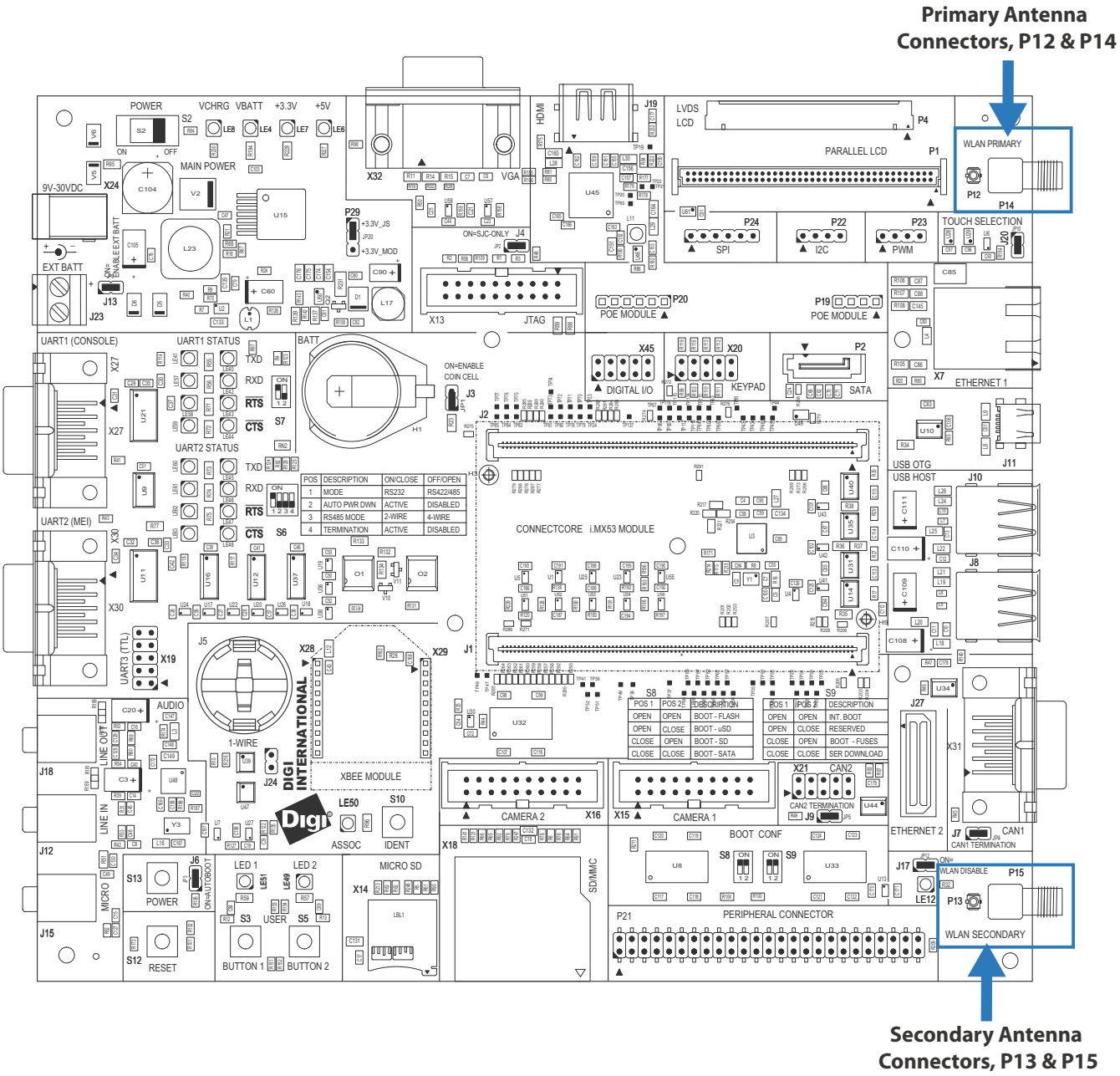


The development board provides two user buttons and two user LEDs connected to GPIO signals of the ConnectCore for i.MX53.

The table below shows the GPIO signal assigned to the user interface:

Signal	GPIO
USER_BUTTON1	GPIO4_0
USER_LED1#	GPIO5_20
USER_BUTTON2	GPIO4_1
USER_LED2#	GPIO7_12

WLAN Interface

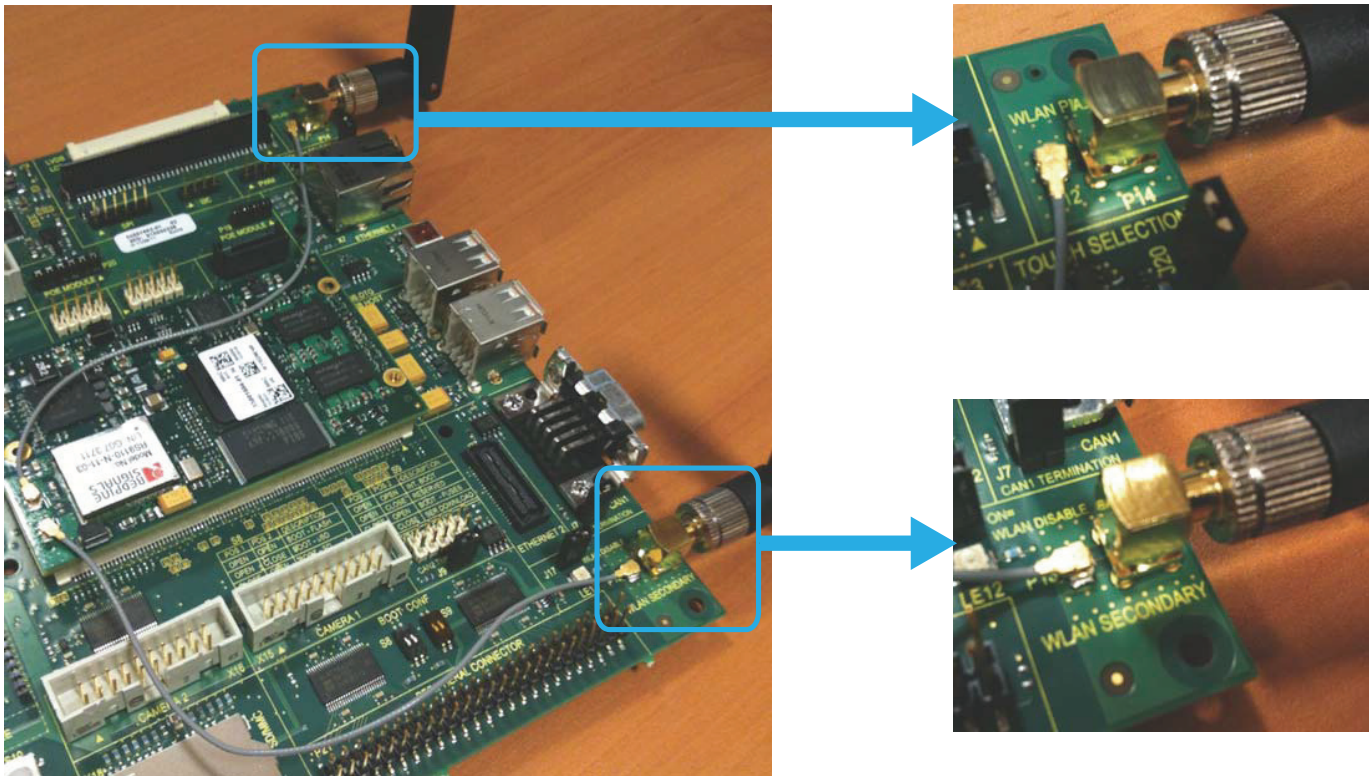


Antenna Connectors (WLAN)

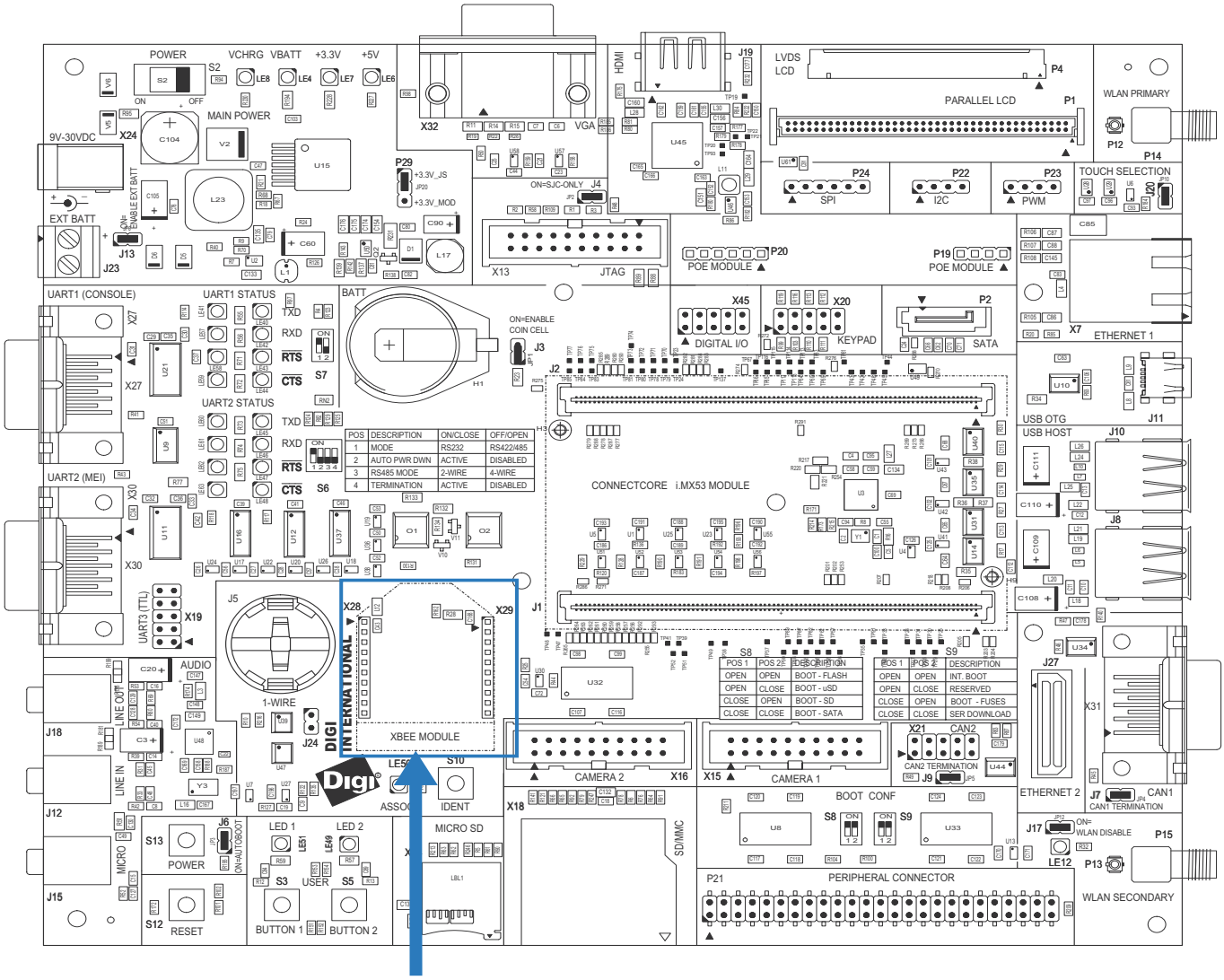
The development board provides the following connectors for the WLAN interface:

- P12 and P13: these two UFL connectors are used to connect the WLAN interface of the ConnectCore for i.MX53 to the development board. Two coaxial cables are used for this connection.
- P14 and P15: these two RP-SMA connectors are used to connect two (primary and secondary) WLAN antennas

The following picture shows the WLAN antenna connections.



Digi XBee Interface



Digi XBee Module Connectors, X28 and X29

The development board provides two 10-pin, 2.0mm connectors, X28 and X29, supporting a Digi XBee module.

The XBee serial port is shared with UART port 3 on the development board.

The table below shows the pinout of the XBee module connectors.

Pin	Signal	Pin	Signal
X28-1	+3.3V	X29-1	IDENT_BUTTON
X28-2	UART3_RXD / XBEE_DOUT	X29-2	-
X28-3	UART3_TXD / XBEE_DIN	X29-3	-
X28-4	-	X29-4	-
X28-5	GPIO6_15 / XBEE_RESET#	X29-5	UART3_CTS / XBEE_RTS#
X28-6	-	X29-6	ASSOC_LED
X28-7	-	X29-7	-
X28-8	-	X29-8	GPIO6_16 / XBEE_ON_SLEEP#
X28-9	GPIO7_6 / XBEE_SLEEP_RQ	X29-9	UART3_RTS / XBEE_CTS#
X28-10	GND	X29-10	-

Module Specifications

APPENDIX A

This appendix provides ConnectCore for i.MX53 module specifications.

Mechanical Specifications

- Length: 82 mm (3.228 inches)
- Width: 50 mm (1.968 inches)
- Height :
  - PCB: 1.60 mm (0.063 inches)
  - Top side part: 3.60 mm (0.142 inches)
  - Bottom side part: 2.20 mm (0.087 inches)

Fasteners and Appropriate Torque

Digi's recommendation is to use a M2x8mm PCB standoff with a slotted cheese head screw, DIN 84, M2x04, 6MM in combination with a flat washer, DIN 125, M2, Nylon 6. Additionally, the use of a torque key with 10 cNm is recommended.

Warning: Do not use a standard metal M2 washer.

Environmental Specifications

- Operating temperature: -20ºC to +85ºC (-4ºF to +185ºF)
- Storage temperature: -40ºC to +125ºC (-40ºF to +257ºF)

Network Interface

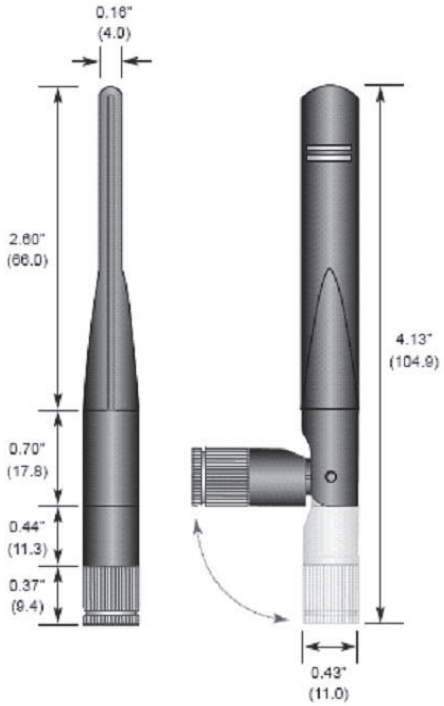
Antenna specifications: 802.11 a/b/g antenna

Attributes

Attribute	Band 1	Band 2
Frequency	2.4 ~ 2.4835 GHz	5.15 ~ 6 GHz
Bandwidth	120MHz	875MHz
Wavelength	1/4 Wave	1/4 Wave
Impedance	50 Ohm	50 Ohm
VSWR	< 19 typ. Center	< 19 typ. Center
Connector	RP-SMA	RP-SMA
Gain	2.3dBi	3.6dBi
Dimension	See measurements in the drawing after this table	
Part Number	ANT-DB1-RAF-RPS	

Dimensions

Note: Dimensions are provided for reference purposes only. The actual antenna may vary.



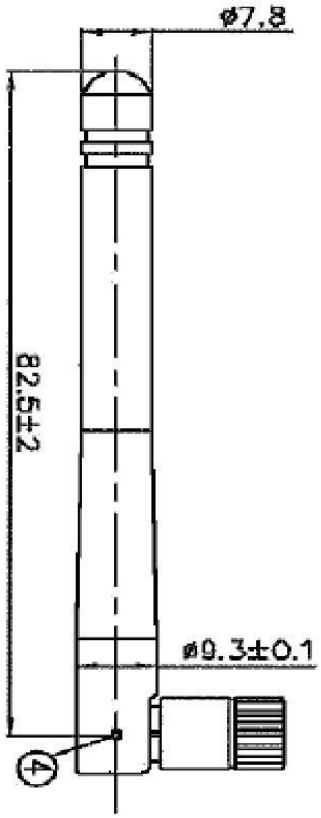
Antenna Specifications: 802.11b/g antenna

Attributes

Attribute	Property
Frequency	2.4 ~ 2.5GHz
Power Output	2W
DB Gain	2dBi
VSWR	< or = 2.0
Dimension	108.5 mm % 10.0mm
Weight	10.5g
Temperature Rating	-40° to +80° C
Part Number	DG-ANT-20DP-BG

Dimensions

Note: Dimensions are provided for reference purposes only. The actual antenna may vary.



Ethernet 1

- Standard: IEEE 802.3/802.3u
- Physical layer: 10/100Base
- Data rate: 10/100 Mbps
- Mode: Full or half duplex

Ethernet 2

- Standard: IEEE 802.3/802.3u
- Physical layer: 10/100Base
- Data rate: 10/100 Mbps
- Mode: Full or half duplex

WLAN

Standard

- IEEE 802.11a/b/g/e/i/h/j standards
- Single-stream draft IEEE 802.11n

Frequency Band

- 2.40 - 2.50 GHz (Low Band)
- 4.90 - 5.85 GHz (High Band)

Data Rates

- 802.11n: 6.5, 13, 19.5, 26, 39, 52, 58.5, 65 Mbps
- 802.11a/g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps
- 802.11b: 1, 2, 5.5, 11 Mbps

Media Access Control

- Dynamic selection of fragment threshold, data rate and antenna depending on the channel statistics
- WPA, WPA2 and WMM support

Wireless Medium

- 802.11b/g: Direct Sequence-Spread Spectrum (DSSS) and Orthogonal Frequency Divisional Multiplexing (OFDM)
- 802.11a/n: OFDM

DFS Client

- This module supports the DFS Client only between 5.25 - 5.35GHz and 5.50 - 5.70GHz bands. It does not support being DFS Master, or can it be connected to an Ad hoc network in these bands.
- This device cannot act as an access point on the non-DFS legacy frequency in the 5.15 and 5.25GHz bands.

Modulation DSSS

- Differential Binary Shift Keying (DBPSK) @ 1 Mbps
- Differential Quadrature Phase Shift Keying (DQPSK) @2 Mbps
- Complementary Code Keying (CCK) @ 5.5 Mbps and 11 Mbps
- BPSK @ 6 and 9 Mbps
- QPSK @ 12 and 18 Mbps
- 16-Quadrature Amplitude Modulation (QAM) @24 and 36 Mbps
- 64-QAM @ 48 and 54 Mbps

Frequency Bands

- 2.412 to 2.472 GHz (ETSI)
- 2.412 to 2.462 GHz (FCC)
- 5.150 to 5.250 GHz (ETSI) ISM Band 1
- 5.250 to 5.350 GHz (ETSI) ISM Band 2 excluding TPC and DFS Client
- 5.470 to 5.725 GHz (ETSI) ISM Band 3 excluding TPC and DFS Client
- 5.150 to 5.250 GHz (U-NII-1)
- 5.250 to 5.350 GHz (U-NII-2) excluding TPC and DFS Client
- 5.470 to 5.725 GHz (U-NII Worldwide) excluding TPC and DFS Client
- 5.725 to 5.825 GHz (U-NII-3)

Available Transmit Power Settings (Typical +- (2 dBm)@25°C)

(Maximum power settings will vary according to individual country regulations)

- IEEE 802.11b (~12 dBm ETSI) (~15.7 dBm FCC 15.247)
  @ 1, 2, 5.5 and 11 Mbps
- IEEE 802.11g (~ 10 dBm ETSI) (~18.6 dBm FCC 15.247)
  @ 6, 12, 18, 24, 36 and 54Mbps
- IEEE 802.11n 2.4GHz Band (~11 dBm ETSI) (~19.2 dBm FCC 15.247)
- IEEE 802.11a & IEEE 802.11n
  (~11.8 dBm ETSI)
  (5.150 to 5.250 GHz ~12.3 dBm FCC 15.407)
  (5.250 to 5.350 GHz ~12.3 dBm FCC 15.407)
  (5.470 to 5.725 GHz ~13.4 dBm FCC 15.407)
  (5.725 to 5.850 GHz ~14.5 dBm FCC 15.247)
  @ 6, 12, 18, 24, 36 and 54Mbps and
  @ 6.5, 13, 19.5, 26, 39,52 , 58.5, 65 Mbps

Receive Sensitivity

Data Rate (2.4 GHz 802.11bg)	Typical Sensitivity (+ / - 1.5 dBm)
1 Mbps	-94.0 dBm (< 8% PER)
2 Mbps	-89.0 dBm (< 8% PER)
11 Mbps	-86.0 dBm (< 8% PER)
6 Mbps	-89.0 dBm (< 10% PER)
54 Mbps	-74.0 dBm (< 10% PER)
645Mbps	-71.0 dBm (< 10% PER)

Data Rate (5 GHz 802.1a)	Typical Sensitivity (+ / - 1.5 dBm)
6 Mbps	-88.0 dBm (< 10% PER)
54 Mbps	-72.0 dBm (< 10% PER)

Data Rate (5 GHz 802.11n)	Typical Sensitivity (+ / - 1.5 dBm)
65 Mbps	-69.0 dBm (< 10% PER)

Electrical Characteristics

Supply Voltages

Parameter	Symbol	Min	Typ	Max	Unit
Battery Input	VLIO	3.4	3.7	4.4	V
Charger Input	VCHRG	3.4	5	5.5	V
Coincell Input for RTC	VCC_COINCELL	2.5	3	3.6	V

Supply Current

The following table provides current draw guidance utilizing the power management capabilities of the module. The module variant used for the measurements works at 800MHz, with 512 MB NAND flash, 512 MB DDR2, dual Ethernet, WLAN and accelerometer. A Windows Embedded CE kernel with power management capabilities has been used to make the current consumption measurements. A different kernel (Linux or Windows CE) with different driver configuration will show different current consumption values.

The ConnectCore for i.MX53 module can be powered from an external battery (VLIO) or from a battery charger (VCHRG). Current drawn by the module is different depending on the supply voltage used. The following tables show the current drawn by the module from the two power supplies.

The current drawn by the module is highly dependent on the number and type of interfaces used. To make some current measurements three different interface configurations have been defined:

Interface Configuration	Interfaces Used
Minimum	Console
Typical	Console, Ethernet 1, LVDS, USB Host (mouse connected), SD card, Wi-Fi
Maximum	Console, Ethernet 1, LVDS, USB Host (mouse connected), SD card, Ethernet 2, USB OTG (keyboard connected), microSD card, Wi-Fi

The ConnectCore for i.MX53 supports several power modes. The current drawn by the module is highly dependent on the power modes. To make some current measurements five different power modes have been defined:

Interface Configuration	Interfaces Used
Full Load	System running at 100% CPU load.
Normal	Normal operating state. User interacting with the device.
User Idle	After a long period of user inactivity some devices are turned off.

Interface Configuration	Interfaces Used
Suspend	This is the sleep state, no threads are running, the CPU is idle, the peripherals are turned off, and the system can wake up only by means of a hardware wake-source interrupt.
Halt	This is the power off mode. In this state the PMIC is switched off and only the RTC and the battery charger circuit are enabled. The system is powered again when the power button is pressed.

The tables below show the current drawn by the module for the different power modes and the different interface configurations.

Current measurement in Minimum configuration

Power Mode	Power Supply	Current Draw	Comments
Full load	+3.7V Battery	875mA	
	+5V supply to charger	775mA	
ON	+3.7V Battery	525mA	
	+5V supply to charger	425mA	
User Idle	+3.7V Battery	525mA	
	+5V supply to charger	425mA	
Suspend	+3.7V Battery	110mA	
	+5V supply to charger	100mA	
Halt	+3.7V Battery	33mA	
	+5V supply to charger	27mA	

Current measurement in Typical configuration

Power Mode	Power Supply	Current Draw	Comments
Full load	+3.7V Battery	1300mA	
	+5V supply to charger	1200mA	
ON	+3.7V Battery	900mA	
	+5V supply to charger	800mA	
User Idle	+3.7V Battery	900mA	
	+5V supply to charger	800mA	
Suspend	+3.7V Battery	135mA	
	+5V supply to charger	125mA	
Halt	+3.7V Battery	33mA	
	+5V supply to charger	27mA	

Current measurement in Maximum configuration

Power Mode	Power Supply	Current Draw	Comments
Full load	+3.7V Battery	1400mA	
	+5V supply to charger	1300mA	
ON	+3.7V Battery	950mA	
	+5V supply to charger	850mA	
User Idle	+3.7V Battery	950mA	
	+5V supply to charger	850mA	
Suspend	+3.7V Battery	135mA	
	+5V supply to charger	125mA	
Halt	+3.7V Battery	33mA	
	+5V supply to charger	27mA	

On-Module Power Supplies

The following table provides the on-module power supplies available through the module connectors, which can be used to supply the components integrated on a customer baseboard.

Supply	Source	Output Voltage	Load Current	Off-module Available Current	Comments
+2.775V	PMIC VLDO9	+2.8V	100mA max	100mA max	-
+1.8V	PMIC VLDO8	+1.8V	200mA max	100mA max	Used on module to power EIM, JTAG, Reset, Touch, Ethernet controller and bootstrap.
+3.3V	DC/DC Converter	+3.3V	1A max	400mA max (*)	Used on module to power WLAN, USB OTG PHY, USB Host PHY, and Ethernet PHY.
+3.15V	PMIC VLDO10	+3.15V	250mA max	250mA max	-

(*)The off-module available current for the wired variant modules is 800mA. The +3.3 V is disabled in low power mode.

I/O DC Parameters

This section includes the DC parameters of the following I/O types:

- General Purpose I/O (GPIO)
- Low Voltage I/O (LVIO)
- Ultra High Voltage I/O (UHVIO)
- LVDS
- WLAN
- VDDCORE, PMIC_IO1, PMIC_IO2, PMIC_ADC, PMIC_TOUCH
- Ethernet (ETH)
- Analog RGB (AN_RGB)
- ADC subsystem (ADIN)
- Digital and analog USB (DIG_USB, AN_USB)

The I/O type associated to each I/O signal of the module is shown in the “Module Pinout” section on page 17.

General Purpose I/O (GPIOxx) DC Electrical Parameters

Note: The “xx” reference signifies the supply voltage level.

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD				
	xx = 18	1.65	1.8	1.95	V
	xx = 27	2.5	2.775	3.1	
High-level output voltage	Voh	0.8 x VDD	-	-	V
Low-level output voltage	Vol	-	-	0.2 x VDD	V
High-level output current	Ioh				
	- Low drive	-2.1	-	-	mA
	- Medium drive	-4.2			
	- High drive	-6.3			
	- Max drive	-8.4			
Low-level output current	Iol				
	- Low drive	2.1	-	-	mA
	- Medium drive	4.2			
	- High drive	6.3			
	- Max drive	8.4			
High-level input voltage	VIH	0.7 x VDD	-	VDD	V
Low-level input voltage	VIL	0	-	0.3 x VDD	V

Parameter	Symbol	Min	Typ	Max	Unit
Input Hysteresis	VHYS xx = 18 xx = 27	 0.38 0.95	 0.43 1.33	-	V
Input Current (no pull-up/down)	Iin	-	-	250	nA
Input Current (22kΩ/pull-up)	Iin	-	-	161	µA
Input Current (47kΩ/pull-up)	Iin	-	-	76	µA
Input Current (100kΩ/pull-up)	Iin	-	-	36	µA
Input Current (100kΩ/pull-down)	Iin	-	-	36	µA
Keeper circuit resistance	-	-	125	-	kΩ

Low Voltage I/O (LVIO) DC Electrical Parameters

The LVIO pads operate only as inputs.

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	1.65	1.8	1.95	V
High-level input voltage	VIH	0.7 x VDD	-	VDD	V
Low-level input voltage	VIL	0	-	0.3 x VDD	V
Input Hysteresis	VHYS	0.35	0.62	-	V
Input Current (no pull-up/down)	Iin	-	-	250	nA
Input Current (22kΩ/pull-up)	Iin	-	-	161	µA
Input Current (47kΩ/pull-up)	Iin	-	-	76	µA
Input Current (100kΩ/pull-up)	Iin	-	-	36	µA
Input Current (100kΩ/pull-down)	Iin	-	-	36	µA
Keeper circuit resistance	-	-	125	-	kΩ

Ultra High Voltage I/O (UHVIOxx) DC Electrical Parameters

Note: The "xx" reference signifies the supply voltage level.

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD				
	xx = 18	1.65	1.8	1.95	V
	xx = 27	2.5	2.775	3.1	
	xx = 31	3.0	3.15	3.6	
High-level output voltage	Voh	0.8 x VDD	-	-	V
Low-level output voltage	Vol	-	-	0.2 x VDD	V
High-level output current	Ioh				
	- Low drive	-5.1	-	-	mA
	- Medium drive	-10.2			
	- High drive	-15.3			
Low-level output current	Iol				
	- Low drive	5.1	-	-	mA
	- Medium drive	10.2			
	- High drive	15.3			
High-level input voltage	VIH	0.7 x VDD	-	VDD	V
Low-level input voltage	VIL	0	-	0.3 x VDD	V
Input Hysteresis	VHYS				
	xx = 18	0.38	0.43	-	V
	xx = 27	0.95	1.33		
	xx = 31	0.95	1.33		
Input Current (no pull-up/down)	Iin	-	-	300	nA
Input Current (22kΩ/pull-up)	Iin	-	-	202	µA
Input Current (75kΩ/pull-up)	Iin	-	-	61	µA
Input Current (100kΩ/pull-up)	Iin	-	-	47	µA
Input Current (360kΩ/pull-down)	Iin	-	-	5.7	µA
Keeper circuit resistance	-	-	125	-	kΩ

LVDS I/O DC Electrical Parameters

The LVDS interface complies with TIA/EIA 644-A standard.

Parameter	Symbol	Min	Typ	Max	Unit
Output Differential Voltage	Vod	250	350	450	mV
Output High Voltage	Voh	1.25	1.375	1.6	V
Output Low Voltage	Vol	0.9	1.025	1.25	V
Offset Voltage	Vos	1.125	1.2	1.375	V

WLAN DC Electrical Parameters

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	3.0	3.3	3.6	V
High-level output voltage	Voh	2.4	-	VDD	V
Low-level output voltage	Vol	-	-	0.4	V
High-level input voltage	VIH	2	-	5.5	V
Low-level input voltage	VIL	-0.3	-	0.8	V

VDDCORE DC Electrical Parameters

The VDDCORE pads operate only as inputs.

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	2.45	2.5	2.55	V
High-level input voltage	Vih	0.7 x VDD	-	VDD	V
Low-level input voltage	Vil	-0.3	-	0.4	V

PMIC_IO1 DC Electrical Parameters

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	3.2	3.3	3.4	V
High-level output voltage	Voh	0.8 x VDD	-	VDD	V
Low-level output voltage	Vol	0	-	0.3	V
High-level input voltage	Vih	0.7 x VDD	-	VDD	V
Low-level input voltage	Vil	-0.3	-	0.4	V

PMIC_IO2 DC Electrical Parameters

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	1.65	1.8	1.95	V
High-level output voltage	Voh	0.8 x VDD	-	VDD	V
Low-level output voltage	Vol	0	-	0.3	V
High-level input voltage	Vih	0.7 x VDD	-	VDD	V
Low-level input voltage	Vil	-0.3	-	0.4	V

PMIC_ADC Subsystem (ADIN) DC Electrical Parameters

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	2.45	2.5	2.55	V
Voltage Range	VI	0	-	2.5	V
ADC Resolution	Vol		10		bit
ADC non linearity			+/-2		LSB
ADC accuracy		12		15	mV
ADC conversion time			34		µS
Internal Resistance	Rint		5		kΩ

PMIC_TOUCH DC Electrical Parameters

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	1.65	1.8	1.95	V
Touch resolution			10		bit
Touch non linearity			+/-2		LSB
Touch accuracy		12		15	mV
Touch conversion time			34		µS
Internal Resistance	Rint		5		kΩ

Ethernet (ETH) DC Electrical Parameters

Parameter	Symbol	Min	Typ	Max	Unit
Differential Output Voltage High 100BASE-Tx	Vpph	950	-	1050	mV
Differential Output Voltage Low 100BASE-Tx	Vppl	-950	-	-1050	mV
Tx Differential Output Voltage 10BASE-T	Vout	2.2	2.5	2.8	V
Rx Differential Squelch Threshold 10BASE-T	Vds	300	420	585	mV

Analog RGB (RGB) DC Electrical Parameters

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	2.69	2.75	2.91	V

Digital USB (DIG_USB) DC Electrical Parameters

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	2.25	2.5	2.75	V
High-level output voltage	Voh	VDD-0-.43	-	VDD	V
Low-level output voltage	Vol	-	-	0.43	V
High-level input voltage	Vih	0.7 x VDD	-	VDD	V
Low-level input voltage	Vil	0	-	0.3 x VDD	V
Current Consumption	I	-	-	22	mA

Analog USB (AN_USB) DC Electrical Parameters

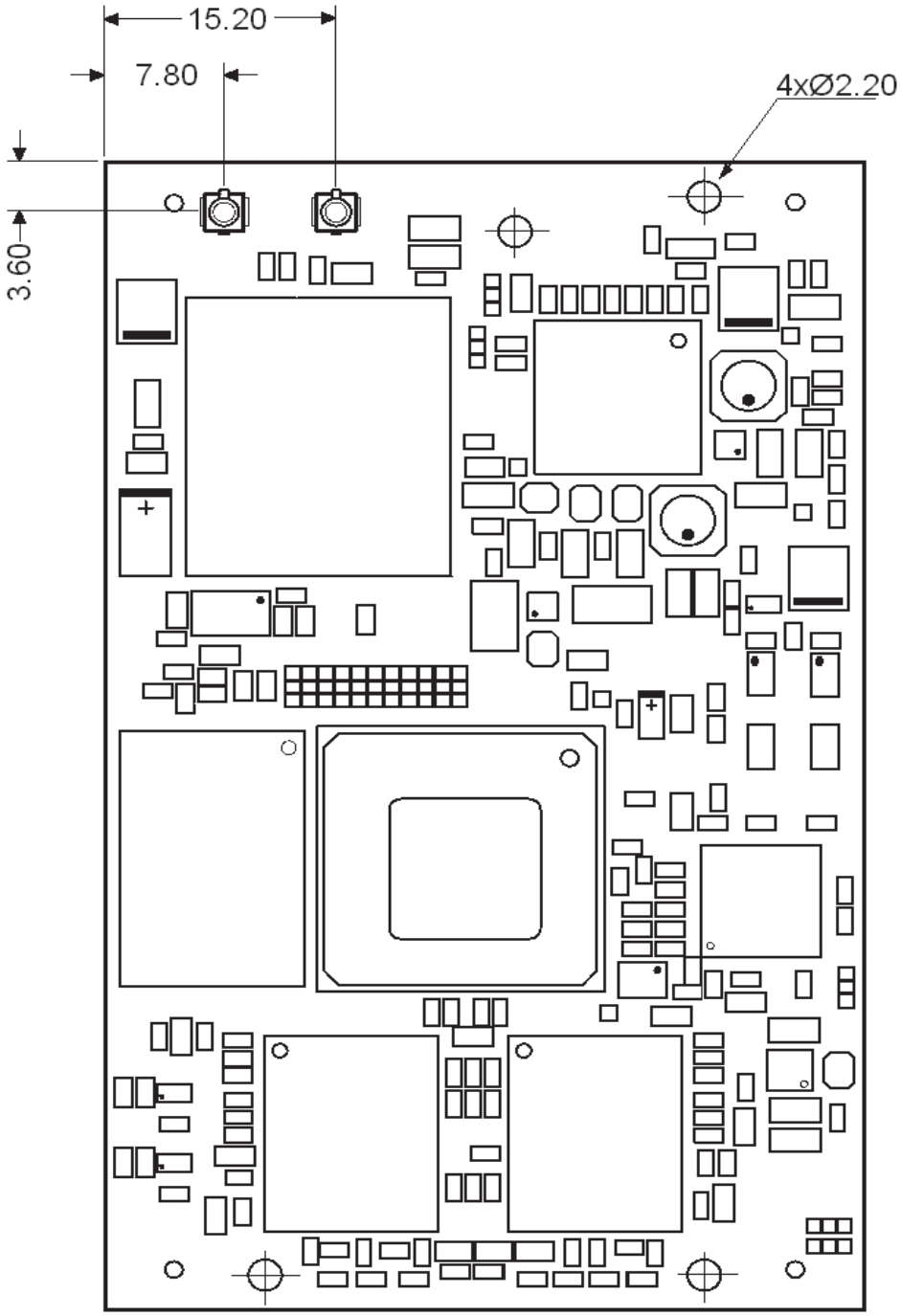
Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	3.0	3.3	3.6	V
Current Consumption	I	-	-	6	mA

Module Dimensions

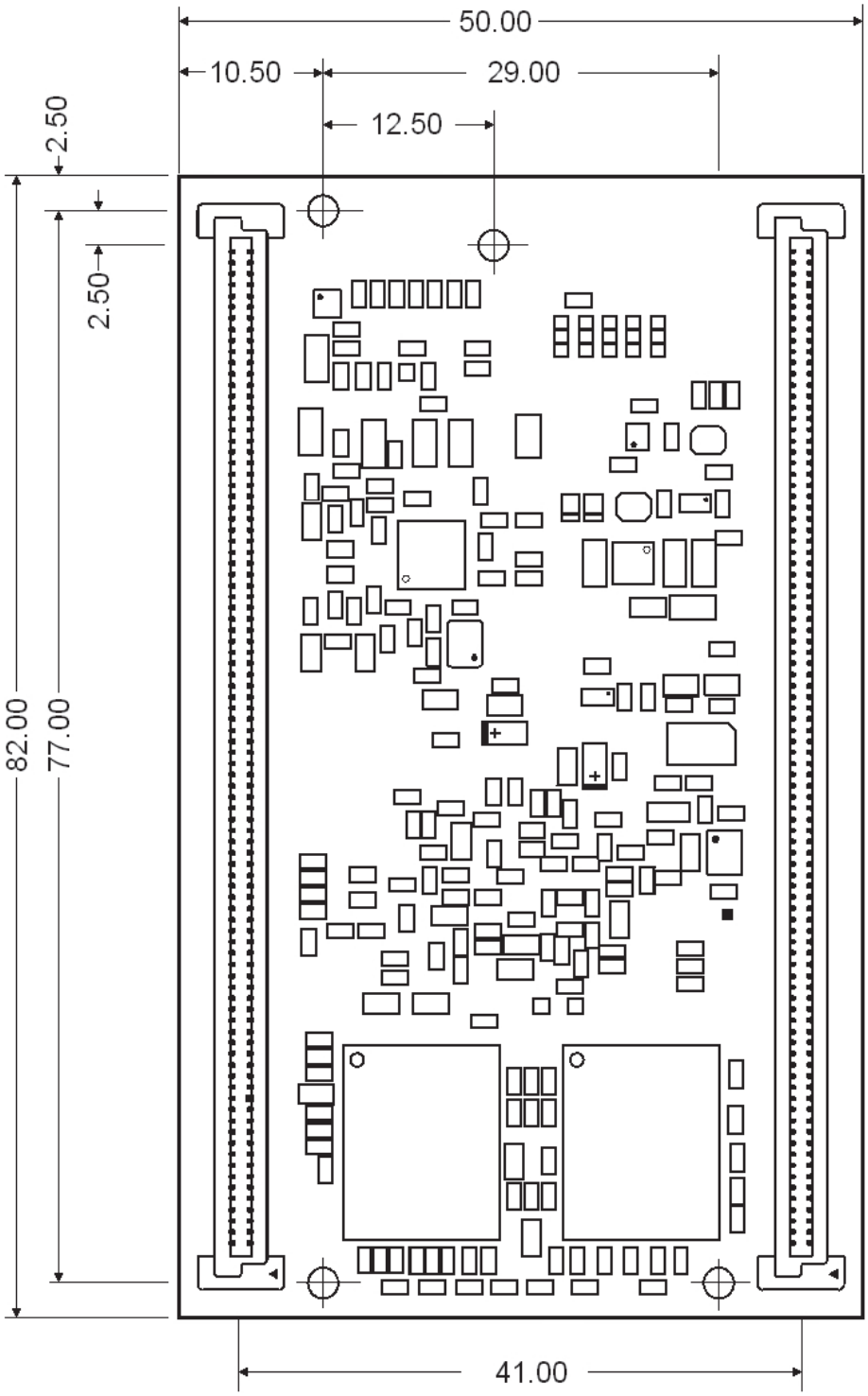
APPENDIX B

This appendix shows the dimensions of the ConnectCore for i.MX53 module, dimensions are in millimeters.

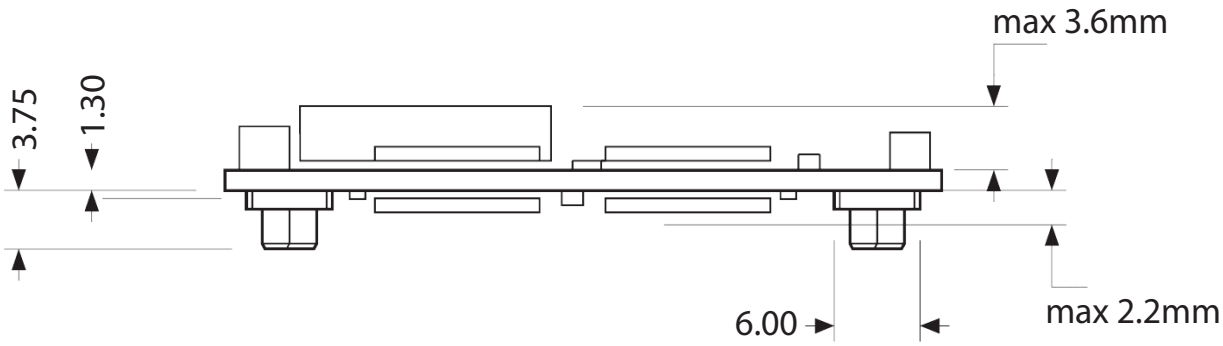
Top View



Bottom View



Side View



Connectors

The ConnectCore for i.MX53 module uses two Berg/FCI connectors. The following table shows the reference number of the connectors used in the module and the reference number of the connectors used in the development board. The mated height of the module and the development board is 5mm.

Device	Berg/FCI Connector
ConnectCore for i.MX53 module	61082-181409LF
ConnectCore for i.MX53 development board	61083-184409LF

Certifications

APPENDIX C

The ConnectCore for i.MX53 product complies with the following standards.

FCC Part 15 Class B

Radio Equipment - FCC Warning Statement

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Changes or modifications to this equipment not expressly approved by Digi may void the user's authority to operate this equipment.

Radio Equipment - Canadian Warning Statements

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada.

Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Change Log

APPENDIX D

The following changes were made to this document in the revisions listed below.

Revision A

- Initial release.

Revision B

- Added Appendix C - Certifications.
- Renamed the Change Log appendix (previously Appendix C) to Appendix D - Change Log.
- Added pinout definitions to the Module Pinout section of Chapter 1.
- Added the Known Issue with the RTC sub-section to the RTC section of Chapter 1.

Revision C

- Added the Antenna Specification: RP-SMA sub-section to the WLAN section of Chapter 1.