



*ConnectCore™ for i.MX51™
Hardware Reference*

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Contents

Chapter 1: About the Module	9
Features and Functionality	10
Module Variant	11
Block Diagram	12
CPU	12
Module	13
Module Pinout	14
Pinout Legend	14
J1 Pinout	14
J2 Pinout	22
Power	31
Module Power Supplies	31
Supply Inputs	31
Supply Outputs	32
MC13892 Power Management	33
Memory	34
DDR2 SDRAM Memory	34
NAND Flash Memory	34
Chip selects.....	34
Chip Select Memory Map	34
Multiplexed GPIO	35
GPIO Multiplexing Table	35
Interfaces	40
1-Wire	40
Accelerometer	40
ADC and Touch Screen	40
Synchronous Serial Interface (SSI)	41
External Memory Interface (EMI)	42
Ethernet 1	42
Ethernet 2	42
I ² C	43
Video Subsystem	44
Video Processing Unit (VPU)	44
Image Processing Unit (IPU)	46
Keypad	48
Memory Cards	48
PWM	49
RTC	50
SPDIF	50
SPI	51

Contents

Watchdog Timer	51
UART	52
USB Host and USB OTG	52
WLAN	53
WLAN	53
Cable Specification: U.FL/W.FL to RP-SMA	54

Chapter 2: About the Development Board 55

What's on the Development Board?	55
The Development Board	57
Switches and Push-buttons	58
Power Switch, S2	58
Reset Button, S4	59
Power Button, S11	59
User Buttons, S3 and S5	59
Ident Button, S10	59
Legend for Multi-Position Switches	59
UART 1 Switch, S6	60
UART 2 Switch, S7	60
Boot Configuration Switches, S8 and S9	61
Jumpers	62
Battery Enable, J5	62
Module Power Source, P29	63
LED 1, J16	63
LED 2, J9	63
Button 1, J28	63
Button 2, J29	63
UART3 / XBee Selection, J30 and J31	63
WLAN Disable, J17	63
Touch Selection, J20	63
Coincell Enable, J3	64
JTAG Mod., J4	64
LEDs.....	65
WLAN, LE12	65
WLAN, LE12	66
Power LEDs, LE3, LE4, LE6 and LE7.....	66
User LEDs, LE49 and LE51	66
Serial Status LEDs	66
UART 1 Status LEDs	67
UART 2 Status LEDs	67

Contents

XBee Assoc., LE50	67
Audio Interface	68
Line-out Connector Pinout, J18	69
Line-in Connector Pinout, J12	69
Microphone Connector Pinout, J15	69
Coin Cell Battery.....	70
Camera Interfaces	71
X15 Pinout	72
X17 Pinout	72
Digital IO Interface	73
Digital I/O Connector, X45	74
Ethernet 1 Interface	75
Ethernet 1, RJ-45 Connector X7	76
Ethernet 2 Interface	77
Ethernet 2, Connector J17	78
HDMI Interface	79
HDMI Connector, J19	80
I ² C Interface	81
I ² C Header, P22	82
JTAG Interface	83
Standard JTAG ARM Connector, X13	84
LCD Interfaces.....	85
LCD 1 Connector, P1	86
P1 Pinout	86
LCD 2 Connector, P2	88
P2 Pinout	88
MicroSD™ Card Interface.....	90
MicroSD™ Connector, X14	91
Module Connectors and Signal Rails	92
Module Connectors	93
Signal Rails, J25 and J26	93
J25 Pinout	93
J26 Pinout	96
Peripheral Application Header	99
Peripheral Application Header, P21	100
Power-Over-Ethernet (PoE) - IEEE802.3af	102
The PoE Module	103
PoE Connector (power in), P17	103
PoE Connector (power out), P18	104
Main Power Connector	105
SD-Card Interface.....	106

Contents

SD/MMC Connector, X18	107
SPI Interface	108
SPI Header, P24	109
UART Interface	110
Serial Port 2, RS232, X27	110
Serial Port 1, MEI Interface, X30	111
Serial Port 3, TTL Interface, X19	112
USB Host Interface	113
USB Host Connectors, J8 and J10	113
USB OTG Interface.....	114
USB OTG Connector, J11	114
User Interface	115
Analog Video Interface	117
Analog Video Connector, X32	118
WLAN Interface	119
Antenna Connectors (WLAN)	120
Digi XBee™ Interface	121
Digi XBee™ Module Connectors, X28 and X29	122

Appendix A: Module Specifications 123

Mechanical Specifications	124
Fasteners and Appropriate Torque	124
Environmental Specifications	124
Network Interface	125
Antenna specifications: 802.11 a/b/g antenna	125
Antenna Specification: 802.11b/g antenna	126
Ethernet 1	127
Ethernet 2	127
WLAN	128
Electrical Characteristics.....	131
Charger vs. Battery	131
Supply Voltages	131
Supply Current	131
On-Module Power Supplies	134
I/O DC Parameters	135

Appendix B: Module Dimensions 142

Top View	143
Bottom View	144
Side View	145

Contents

Connectors	145
Appendix C: Certifications	146
FCC Part 15 Class B	146
Radio Frequency Interface (RFI) (FCC 15.105)	146
Labeling Requirements (FCC 15.19)	146
RF Exposure	147
Modifications (FCC 15.21)	147
Industry Canada	147
Indoor/Outdoor	148
Japan Certification	148
Declaration of Conformity	148
International EMC Standards	149
Appendix D: Change Log	150
Revision A	150
Revision B	150
Revision C	150
Revision D	150
Revision E	151
Revision F	151

Using this Guide

This guide provides information about the Digi ConnectCore for i.MX51 embedded core module family.

Conventions used in this guide

This table describes the typographic conventions used in this guide:

This convention	Is used for
<i>italic type</i>	Emphasis, new terms, variables, and document titles.
monospaced type	Filenames, pathnames, and code examples.

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To contact Digi International by	Use
Mail	Digi International 1101 Bren Road East Minnetonka, MN 55343 U.S.A.
World Wide Web	http://www.digiembedded.com/support/
Telephone (U.S.)	(952) 912-3444 or (877) 912-3444
Telephone (other locations)	+1 (952) 912-3444 or (877) 912-3444

Additional Resources

Please also refer to the most recent Freescale i.MX51 processor reference manual and related documentation for additional information.

About the Module

C H A P T E R 1

The network-enabled ConnectCore for i.MX51 is a highly integrated and future-proof System-on-Module (SOM) solution based on the new Freescale® i.MX51X application processor with a high-performance ARM® Cortex-A8® core, powerful multimedia options, and a complete set of peripherals.

The module combines the fast integration, reliability and design flexibility of an off-the-shelf SOM with complete out-of-the-box software development support for platforms such as Microsoft® Windows® Embedded CE 6.0, Digi® Embedded Linux® and Timesys® LinuxLink®.

With industry-leading performance and key features like a dual-display interface and a hardware encryption engine, the module is the ideal choice for a broad range of target markets including medical, digital signage, security/access control, retail, industrial/building automation, transportation and more.

Complete and cost-efficient Digi JumpStart Kits™ for Microsoft Windows Embedded CE 6.0 and Linux allow immediate and professional embedded product development with dramatically reduced design risk and time-to-market.

Features and Functionality

The ConnectCore for i.MX51 module is based on the i.MX51 processor from Freescale. This processor offers a high number of interfaces. Most of these interfaces are multiplexed and are not available simultaneously. The module has the following features:

- High-end, low-power 32-bit System-on-Module
- 600/800 MHz ARM Cortex-A8 core
 - 32Kbyte L1 instruction and 32Kbyte L1 data cache
 - 256Kbyte L2 cache
 - NEON coprocessor
 - Vector Floating Point (VFP) unit
- SLC and MLC NAND flash support on module
- Up to 512MB 32-bit/200Mhz DDR2-400 memory
- Debug interfaces
 - JTAG
 - ETM/ETB
- RTC
- Security co-processor
 - Encryption (AES, DES, 3DES and RC4)
 - Hashing algorithms (MD5, SHA-1, SHA-224 and SHA-256)
- Timer
- Watchdog
- Up to 3 UART ports, up to 4Mbps each
- Up to 3 SPI, (two of them up to 54Mbps each)
- Two I²C (up to 400Kbps)
- 3 memory card interfaces (2 for the wireless version of the module)
 - SD/SDIO - 1 and 4-bits (up to 200Mbps)
 - MMC - 1, 4 and 8-bits (up to 416Mbps)
- USB
 - Up to 3x USB 2.0 High-Speed USB Host ports
 - 1 USB 2.0 On-The-Go USB port (with integrated PHY on module)
- 1-wire
- Keypad 6x4
- Two independent PWM interfaces
- 8, 16-bit External Memory interface

- GPIO with interrupt capabilities
- Up to 3x 10-bit ADC channels
- Multimedia
 - 2x Camera ports
 - 2x Display ports
 - 4-bit touch screen
- SPDIF output
- Three I²C/AC97/SSI, up to 1.4Mbps each
- On-module three axis accelerometer (optional)
- On-module 10/100 Ethernet controller (optional)
- Second on-module 10/100Mbit Ethernet interface (optional)
- 2.4GHz & 5GHz IEEE 802.11a/b/g/n wireless LAN interface (optional)
- Complete Microsoft Windows Embedded CE 6.0 and Linux platform support with full source code

Module Variant

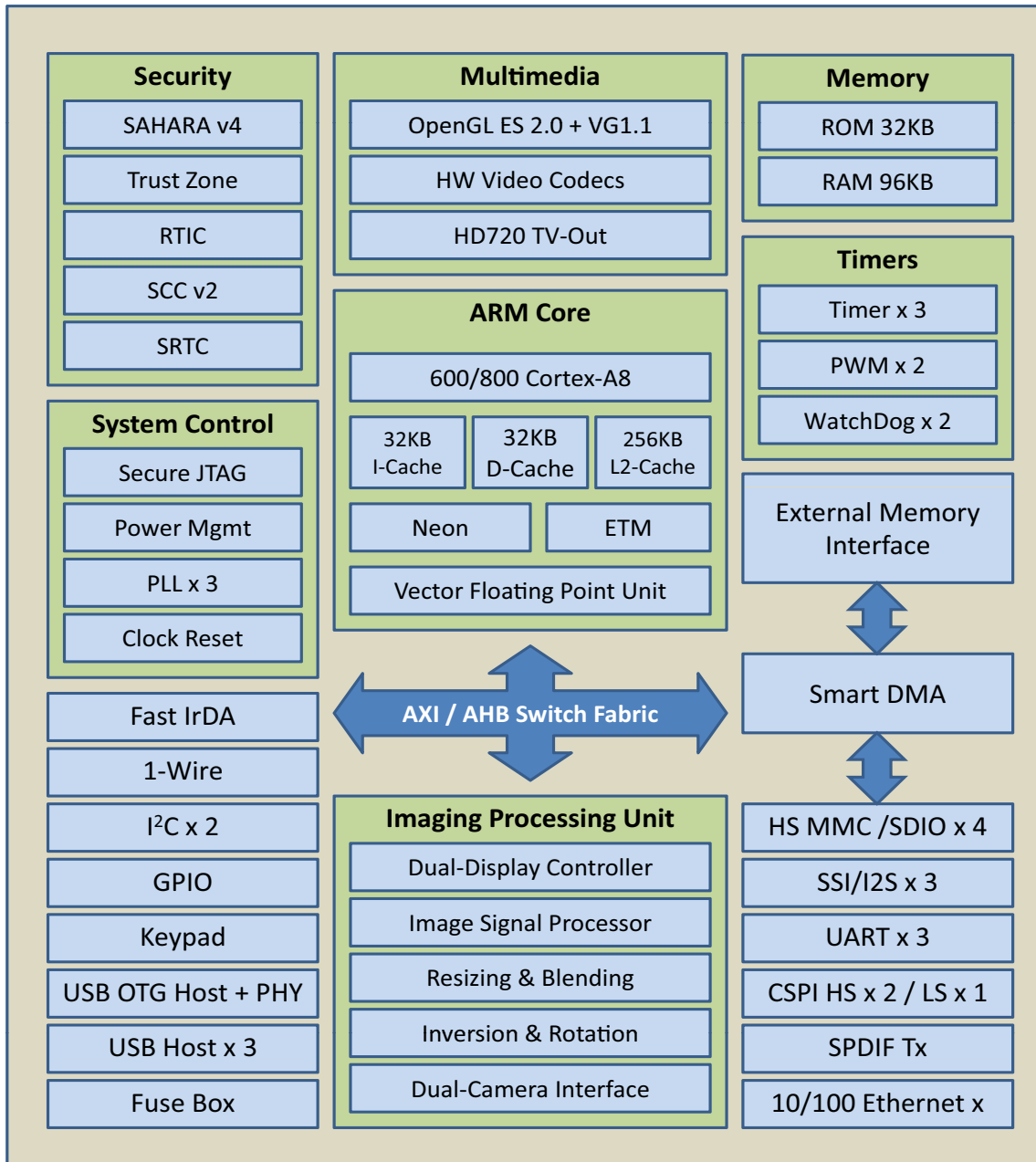
The ConnectCore for i.MX51 module is available with various population options such as network interfaces (Ethernet, WLAN), memory (flash, RAM), processor (speed grade/ operating temperature) and others.

Block Diagram

The next figures show the block diagram of the Freescale i.MX515 CPU and the block diagram of the ConnectCore for i.MX51 module.

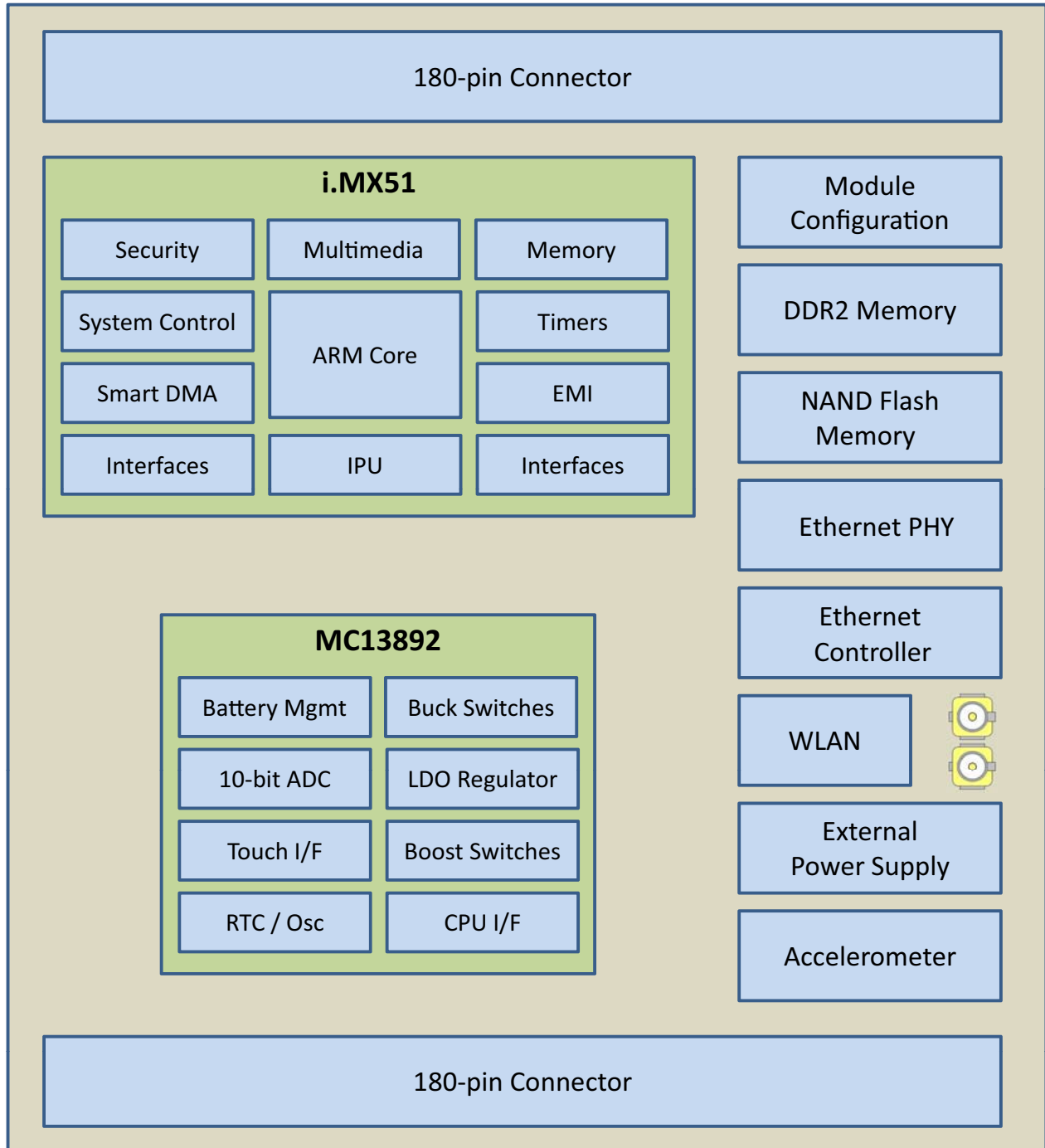
CPU

Freescale i.MX515



Module

ConnectCore i.MX51



Module Pinout

The module has two 180-pin connectors, J1 and J2. The next tables describe each pin, its properties, and its use on the module and development board. The DC parameters for each I/O type are defined in the “I/O DC Parameters” section of Appendix A - Specifications.

The “Use on module” column shows the connection of the signals on the module. The format of this column is “component: pad_name,” where “component” is the chip where the signals are connected, and “pad_name” is the name of the pad where the signals are connected as they are defined in the component’s datasheet.

Pinout Legend

I	Input
O	Output
I/O	Input or output
P	Power
#	Low level active signal

J1 Pinout

Pin	I/O Type	Signal name	Use on module	Use on development board	Comments
1	GPIO27	CSI1_D8/GPIO3_12	i.MX51: CSI1_D8	Not used	
2	GPIO27	CSI1_D9/GPIO3_13	i.MX51: CSI1_D9	Camera 1 Reset	
3	HSGPIO27	CSI1_D10	i.MX51: CSI1_D10	Camera 1 data	
4	HSGPIO27	CSI1_D11	i.MX51: CSI1_D11	Camera 1 data	
5	HSGPIO27	CSI1_D12	i.MX51: CSI1_D12	Camera 1 data	
6	HSGPIO27	CSI1_D13	i.MX51: CSI1_D13	Camera 1 data	
7	HSGPIO27	CSI1_D14	i.MX51: CSI1_D14	Camera 1 data	
8	HSGPIO27	CSI1_D15	i.MX51: CSI1_D15	Camera 1 data	
9	HSGPIO27	CSI1_D16	i.MX51: CSI1_D16	Camera 1 data	
10	HSGPIO27	CSI1_D17	i.MX51: CSI1_D17	Camera 1 data	
11	HSGPIO27	CSI1_D18	i.MX51: CSI1_D18	Camera 1 data	
12	HSGPIO27	CSI1_D19	i.MX51: CSI1_D19	Camera 1 data	
13	GPIO27	CSI1_VSYNC/GPIO3_14	i.MX51: CSI1_VSYNC	Camera 1 vertical synchronization	
14	GPIO27	CSI1_HSYNC/GPIO3_15	i.MX51: CSI1_HSYNC	Camera 1 horizontal synchronization	
15	GPIO27	CSI1_PIXCLK	i.MX51: CSI1_PIXCLK	Camera 1 pixel clock	
16	GPIO27	CSI1_MCLK	i.MX51: CSI1_MCLK	Camera 1 & 2 Master clock	
17	-	GND	-	-	

Pin	I/O Type	Signal name	Use on module	Use on development board	Comments
18	-	GND	-	-	
19	WLAN	WLAN_TDO	WLAN: TDO	Not Used	
20	WLAN	WLAN_TCK	WLAN: TCK	Not Used	
21	WLAN	WLAN_TDI	WLAN: TDI	Not Used	
22	WLAN	WLAN_TMS	WLAN: TMS	Not Used	
23	WLAN	WLAN_LED	WLAN: LED_ON	WLAN LED	
24	WLAN	RS_BT_PRIORITY	WLAN: BT_PRIORITY	Not Used	
25	WLAN	RS_WLAN_ACTIVE	WLAN: WLAN_ACTIVE	Not Used	
26	WLAN	RS_BT_ACTIVE	WLAN: BT_ACTIVE	Not Used	
27	LVIO	BOOT_MODE0	i.MX51: BOOT_MODE0	Boot Mode selection	Boot configuration not available in EA Kit
28	GPIO33	WLAN_DISABLE#	WLAN Power Supply Switch	WLAN Disable Jumper (J17)	This signal switch ON/OFF the supply of WLAN
29	LVIO	BOOT_MODE1	i.MX51: BOOT_MODE1	Boot Mode selection	Boot configuration not available in EA Kit
30	-	VLIO	MC13892: BATT	Battery supply	
31	-	VLIO	MC13892: BATT	Battery supply	
32	-	VCHRG	MC13892: CHRGRW	Charger supply	
33	-	+2.775V	-	-	
34	-	VCHRG	MC13892: CHRGRW	Charger supply	
35	-	+2.775V	-	-	
36	-	+2.775V	-	-	
37	PMIC_GPO	MC13892_GPO1	MC13892: GPO1	Reserved	
38	-	+2.775V	-	-	
39	PMIC_PWRON	PMIC_PWRON1	MC13892: PWRON1	Connected to Power Button (S11)	Suspend / Wake-up button
40	PMIC_STDBY	PMIC_STDBY_REQ	i.MX51: PMIC_STBY_REQ MC13892: STANDBY	Reserved	Output from i.MX51 to put MC13892 in low power mode
41	PMIC_INT	PMIC_INT_REQ	i.MX51: PMIC_INT_REQ	Reserved	This high-priority interrupt input on i.MX51 is not used. The output interrupt from PMIC is connected to standard interrupt GPIO_5 on i.MX51.
42	PMIC_PWGTDRV	PWRGTDRV1	MC13892: PWRGTDRV1	Not used	
43	PMIC_LED	CHRGLED	MC13892: CHRGLED	Battery Charging LED	

Pin	I/O Type	Signal name	Use on module	Use on development board	Comments
44	PMIC_PWGTDRV	PWRGTDRV2	MC13892: PWRGTDRV2 +3.3V_REG: ENABLE	Not used	Used on module to enable / disable the +3.3V supply
45	PMIC_SE	CHRGSE1#	MC13892: CHRGSE1#	Charger detection circuit	This circuit is needed to boot from charger
46	-	VCC_COINCELL	MC13892: LICELL	Coincell voltage	
47	-	VLIO	MC13892: BATT	Battery supply	
48	-	VCHRG	MC13892: CHRGRW	Charger supply	
49	-	VLIO	MC13892: BATT	Battery supply	
50	-	VCHRG	MC13892:CHRGRW	Charger supply	
51	-	VLIO	MC13892: BATT	Battery supply	
52	-	VCHRG	MC13892:CHRGRW	Charger supply	
53	ETH	ETH1_TX+	ETH_PHY: TXP	Ethernet 1 Tx+	
54	ETH	ETH1_RX+	ETH_PHY: RXP	Ethernet 1 Rx+	
55	ETH	ETH1_TX-	ETH_PHY: TXN	Ethernet 1 Tx-	
56	ETH	ETH1_RX-	ETH_PHY: RXN	Ethernet 1 Rx-	
57	-	GND	-	-	
58	GPIO33	ETH1_LINK	ETH_PHY: LED1	Ethernet 1 Link LED	
59	GPIO27	DISPB2_SER_DIN/ GPIO3_5	i.MX51: DISPB_2_SER_DIN	GPIO1 signal to LCD connectors	
60	GPIO33	ETH1_ACTIVITY	ETH_PHY: LED2	Ethernet 1 Activity LED	
61	GPIO27	DISPB2_SER_RS/ GPIO3_8	i.MX51: DISPB2_SER_RS	USB Host Reset	In Early Availability Kit USB host and Digital IO interface cannot be used at the same time.
62	GPIO27	DISPB2_SER_DIO/ GPIO3_6	i.MX51: DISPB2_SER_DIO	User button 1 & Digital IO 7	
63	GPIO27	DISP2_DATA0/ MII_RXD3/USBH3_CLK	i.MX51: DISP2_DATA0 ETH_PHY: RXD3	LCD2 Data	Ethernet 1 and LCD2 cannot be used at the same time.
64	GPIO27	DISPB2_SER_CLK_ GPIO3_7	i.MX51: DISPB2_SER_CLK	Camera 2 Reset	
65	HSGPIO27	DISP2_DATA2	i.MX51: DISP2_DATA2	LCD2 Data	
66	GPIO27	DISP2_DATA1/ MII_RX_ER/USBH3_DIR	i.MX51: DISP2_DATA1 ETH_PHY: RXD4	LCD2 Data	Ethernet 1 and LCD2 cannot be used at the same time.
67	HSGPIO27	DISP2_DATA4	i.MX51: DISP2_DATA4	LCD2 Data	
68	HSGPIO27	DISP2_DATA3	i.MX51: DISP2_DATA3	LCD2 Data	
69	GPIO27	DISP2_DATA6/ MII_TXD1/USBH3_STP	i.MX51: DISP2_DATA6 ETH_PHY: TXD1	LCD2 Data	Ethernet 1 and LCD2 cannot be used at the same time.

Pin	I/O Type	Signal name	Use on module	Use on development board	Comments
70	HSGPIO27	DISP2_DATA5	i.MX51: DISP2_DATA5	LCD2 Data	Ethernet 1 and LCD2 cannot be used at the same time.
71	GPIO27	DISP2_DATA8/ MII_TXD3/ USBH3_DATA0	i.MX51: DISP2_DATA8 ETH_PHY: TDX3	LCD2 Data	Ethernet 1 and LCD2 cannot be used at the same time.
72	GPIO27	DISP2_DATA7/ MII_TXD2/UBH3_NXT	i.MX51: DISP2_DATA7 ETH_PHY: TDX2	LCD2 Data	Ethernet 1 and LCD2 cannot be used at the same time.
73	GPIO27	DISP2_DATA10/ MII_COL/ USBH3_DATA2	i.MX51: DISP2_DATA10 ETH_PHY: COL	LCD2 Data	Ethernet 1 and LCD2 cannot be used at the same time.
74	GPIO27	DISP2_DATA9/ MII_TXEN/ USBH3_DATA1	i.MX51: DISP2_DATA9 ETH_PHY: TXEN	LCD2 Data	Ethernet 1 and LCD2 cannot be used at the same time.
75	GPIO27	DISP2_DATA12/ MII_RX_DV/ USBH3_DATA4	i.MX51: DISP2_DATA12 ETH_PHY: RXDV	LCD2 Data	Ethernet 1 and LCD2 cannot be used at the same time.
76	GPIO27	DISP2_DATA11/ MII_RX_CLK/ USBH3_DATA3	i.MX51: DISP2_DATA11 ETH_PHY: RXCLK	LCD2 Data	Ethernet 1 and LCD2 cannot be used at the same time.
77	GPIO27	DISP2_DATA14/ MII_RXD0/ USBH3_DATA6	i.MX51: DISP2_DATA14 ETH_PHY: RXD0	LCD2 Data	Ethernet 1 and LCD2 cannot be used at the same time.
78	GPIO27	DISP2_DATA13/ MII_TX_CLK/ USBH3_DATA5	i.MX51: DISP2_DATA13 ETH_PHY: TXCLK	LCD2 Data	Ethernet 1 and LCD2 cannot be used at the same time.
79	GPIO27	DI2_PIN2/MII_MDC	i.MX51: DI2_PIN2 ETH_PHY: MDC	LCD2 Data	Ethernet 1 and LCD2 cannot be used at the same time.
80	GPIO27	DISP2_DATA15/ MII_TXD0/ USBH3_DATA7	i.MX51: DISP2_DATA15 ETH_PHY: TXD0	LCD2 Data	Ethernet 1 and LCD2 cannot be used at the same time.
81	GPIO27	DI2_PIN4/MII_CRS	i.MX51: DI2_PIN4 ETH_PHY: CRS	LCD2 Data	Ethernet 1 and LCD2 cannot be used at the same time.
82	-	GND	-	-	
83	RGB	IOR	i.MX51: IOR	Not used	
84	GPIO27	DI2_DISP_CLK/ MII_RXD1	i.MX51: DI2_DISP_CLK ETH_PHY: RXD1	LCD2 Data	Ethernet 1 and LCD2 cannot be used at the same time.
85	RGB	IOR_BACK	i.MX51: IOR_BACK	Not used	
86	GPIO27	DI2_PIN3/MII_MDIO	i.MX51: DI2_PIN3 ETH_PHY: MDIO	LCD2 Data	Ethernet 1 and LCD2 cannot be used at the same time.
87	RGB	IOB	i.MX51: IOB	Not used	
88	IOG	IOG	i.MX51: IOG	Not used	
89	RGB	IOB_BACK	i.MX51: IOB_BACK	Not used	

Pin	I/O Type	Signal name	Use on module	Use on development board	Comments
90	RGB	IOG_BACK	i.MX51: IOG_BACK	Not used	
91	GPIO18	JTAG_TCK	i.MX51: JTAG_TCK	JTAG Connector	
92	GPIO18	JTAG_TRST#	i.MX51: JTAG_TRST#	JTAG Connector	
93	GPIO18	JTAG_TMS	i.MX51: JTAG_TMS	JTAG Connector	
94	GPIO18	JTAG_MOD#	i.MX51: JTAG_MOD#	JTAG Mod Selection	
95	GPIO18	JTAG_TDI	i.MX51: JTAG_TDI	JTAG Connector	
96	GPIO18	JTAG_DE#	i.MX51: JTAG_DE_B	JTAG Connector	
97	GPIO18	JTAG_TDO	i.MX51: JTAG_TDO	JTAG Connector	
98	LVIO	RESET_IN#	i.MX51: RESET_IN_B MC13892: RESETB	Not used	Warm reset input to i.MX51.
99	LVIO	POR#	i.MX51: POR_B MC13892: RESETBMCU	LCD 1 & 2 Reset, JTAG Connector and Reset Button (S4)	Cold reset input to i.MX51. Used to reset the module and peripherals on the Dev. Kit.
100	-	+1.8V		-	
101	-	GND		-	
102	-	GND		-	
103	ETH	ETH2_TX+/ETH2_DA+	ETH_CTRL: TPO+	Ethernet 1 Tx+	
104	ETH	ETH2_RX+/ETH2_DB+	ETH_CTRL: TPI+	Ethernet 1 Rx+	
105	ETH	ETH2_TX-/ETH2_DA-	ETH_CTRL: TPO-	Ethernet 1 Tx-	
106	ETH	ETH2_RX-/ETH2_DB-	ETH_CTRL: TPI-	Ethernet 1 Rx-	
107	-	-	-	-	-
108	-	-	-	-	-
109	-	-	-	-	-
110	-	-	-	-	-
111	GPIO33	ETH2_ACTIVITY#	ETH_CTRL: GPIO1/LED2#	Ethernet 2 Activity LED	
112	GPIO33	ETH2_LINK#	ETH_CTRL: GPIO0/LED1#	Ethernet 2 Link LED	
113	GPOIO18	EIM_CS0/GPIO2_25	i.MX51: EIM_CS0	Peripheral Application Chip Select	
114	GPOIO18	EIM_CS1/GPIO2_26	i.MX51: EIM_CS1	Not used	
115	GPOIO18	EIM_CS2/GPIO2_27/ FEC_RDATA2/SISG5/ CSI1_D4/AUD5_TXD	i.MX51: EIM_CS2	Not used	
116	GPOIO18	EIM_CS3/GPIO2_28/ FEC_RDATA3/ SSI_EXT2_CLK/ CSI1_D5/AUD5_RXD	i.MX51: EIM_CS3	Not used	

Pin	I/O Type	Signal name	Use on module	Use on development board	Comments
117	GPOIO18	EIM_CS4/GPIO2_29/ FEC_RX_ER/ SSI_EXT1_CLK/ CSII_D6/AUD5_TXC	i.MX51: EIM_CS4	Not used	
118	GPOIO18	EIM_CS5/GPIO2_30/ FEC_CRS/ DI1_EXT_CLK/CSII_D7/ AUD5_TXFS	i.MX51: EIM_CS4 EHT_CTRL: CS#	Reserved	
119	GPOIO18	EIM_DTACK/GPIO2_31	i.MX51: EIM_DTACK	Not used	
120	GPOIO18	EIM_LBA/GPIO3_1	i.MX51: EIM_LBA	Not used	
121	GPOIO18	EIM_DA0/TRACE16	i.MX51: EIM_DA0 ETH_CTRL: A1	Peripheral Application Data / Address	
122	GPOIO18	EIM_DA1/TRACE17	i.MX51: EIM_DA1 ETH_CTRL: A2	Peripheral Application Data / Address	
123	GPOIO18	EIM_DA2/TRACE18	i.MX51: EIM_DA2 ETH_CTRL: A3	Peripheral Application Data / Address	
124	GPOIO18	EIM_DA3/TRACE19	i.MX51: EIM_DA3 ETH_CTRL: A4	Peripheral Application Data / Address	
125	-	GND	-	-	
126	GPOIO18	EIM_DA5/TRACE21	i.MX51: EIM_DA5 ETH_CTRL: A6	Peripheral Application Data / Address	
127	GPOIO18	EIM_DA4/TRACE20	i.MX51: EIM_DA4 ETH_CTRL: A5	Peripheral Application Data / Address	
128	GPOIO18	EIM_DA7/TRACE23	i.MX51: EIM_DA7 ETH_CTRL: FIFO_SEL	Peripheral Application Data / Address	
129	GPOIO18	EIM_DA6/TRACE22	i.MX51: EIM_DA6 ETH_CTRL: A7	Peripheral Application Data / Address	
130	-	GND	-	-	
131	GPOIO18	EIM_DA8/TRACE24	i.MX51: EIM_DA8	Peripheral Application Data / Address	
132	GPOIO18	EIM_DA9/TRACE25	i.MX51: EIM_DA9	Peripheral Application Data / Address	
133	GPOIO18	EIM_DA10/TRACE26	i.MX51: EIM_DA10	Not used	
134	GPOIO18	EIM_DA11/TRACE27	i.MX51: EIM_DA11	Not used	
135	-	GND	-	-	
136	GPOIO18	EIM_DA13/TRACE29	i.MX51: EIM_DA13	Not used	
137	GPOIO18	EIM_DA12/TRACE28	i.MX51: EIM_DA12	Not used	
138	GPOIO18	EIM_DA15/TRACE31	i.MX51: EIM_DA15	Not used	
139	GPOIO18	EIM_DA14/TRACE30	i.MX51: EIM_DA14	Not used	

Pin	I/O Type	Signal name	Use on module	Use on development board	Comments
140	-	GND	-	-	
141	GPOIO18	EIM_D16/GPIO2_0/ USBH2_DATA0/ UART2_CTS#/ I2C1_SDA/AUD4_RXFS/ TRACE0/AUD5_TXD	i.MX51: EIM_D16 ETH_CTRL: D0	Peripheral Application Data	
142	GPOIO18	EIM_D17/GPIO2_1/ USBH2_DATA1/ UART2_RXD/ UART3_CTS#/SIG4/ TRACE1/AUD5_RXD	i.MX51: EIM_D17 ETH_CTRL: D1	Peripheral Application Data	
143	GPOIO18	EIM_D18/GPIO2_2/ USBH2_DATA2/ UART2_TXD/ UART3_RTS#/SIG5/ TRACE2/AUD5_TXC	i.MX51: EIM_D18 ETH_CTRL: D2	Peripheral Application Data	
144	GPOIO18	EIM_D19/GPIO2_3/ USBH2_DATA3/ UART2_RTS#/I2C1_SCL/ AUD4_RXC/TRACE3/ AUD5_TXFS	i.MX51: EIM_D19 ETH_CTRL: D3	Peripheral Application Data	
145	-	+3.15V	-	-	
146	GPOIO18	EIM_D21/GPIO2_5/ USBH2_DATA5/ AUD4_RXD/TRACE5	i.MX51: EIM_D21 ETH_CTRL: D5	Peripheral Application Data	
147	GPOIO18	EIM_D20/GPIO2_4/ USBH2_DATA4/ AUD4_TXD/TRACE4	i.MX51: EIM_D20 ETH_CTRL: D4	Peripheral Application Data	
148	GPOIO18	EIM_D23/GPIO2_7/ USBH2_DATA7/ SPDIF_OUT1/ AUD4_TXFS/TRACE7	i.MX51: EIM_D23 ETH_CTRL: D7	Peripheral Application Data	
149	GPOIO18	EIM_D22/GPIO2_6/ USBH2_DATA6/ AUD4_TXC/TRACE6	i.MX51: EIM_D22 ETH_CTRL: D8	Peripheral Application Data	
150	-	GND	-	-	
151	GPOIO18	EIM_D24/GPIO2_8/ UART3_CTS#/ I2C2_SDA/AUD6_RXFS/ TRACE8	i.MX51: EIM_D24 ETH_CTRL: D8	Peripheral Application Data	
152	GPOIO18	EIM_D25/KEY_COL6/ UART3_RXD/ UART2_CTS#/ CMPOUT1/TRACE9	i.MX51: EIM_D25 ETH_CTRL: D9	Peripheral Application Data	

Pin	I/O Type	Signal name	Use on module	Use on development board	Comments
153	GPOIO18	EIM_D26/KEY_COL7/ UART3_TXD/ UART2_RTS#/ CMPOUT2/TRACE10	i.MX51: EIM_D26 ETH_CTRL: D10	Peripheral Application Data	
154	GPOIO18	EIM_D27/GPIO2_9/ UART3_RTS#/I2C2_SCL/ AUD6_RXC/TRACE11	i.MX51: EIM_D27 ETH_CTRL: D11	Peripheral Application Data	
155	-	GND	-	-	
156	GPOIO18	EIM_D29/KEY_ROW5/ SISG1/AUD6_RXD/ TRACE13	i.MX51: EIM_D29 ETH_CTRL: D13	Peripheral Application Data	
157	GPOIO18	EIM_D28/KEY_ROW4/ SISG0/AUD6_TXD/ TRACE12	i.MX51: EIM_D28 ETH_CTRL: D12	Peripheral Application Data	
158	GPOIO18	EIM_D31/KEY_ROW7/ SISG03/AUD6_TXFS/ TRACE15	i.MX51: EIM_D31 ETH_CTRL: D15	Peripheral Application Data	
159	GPOIO18	EIM_D30/KEY_ROW6/ SISG2/AUD6_TXC/ TRACE14	i.MX51: EIM_D30 ETH_CTRL: D14	Peripheral Application Data	
160	GPOIO18	EIM_A17/GPIO2_11	i.MX51: EIM_A17	Not used	
161	GPOIO18	EIM_A16/GPIO2_10	i.MX51: EIM_A16	Not used	
162	GPOIO18	EIM_A19/GPIO2_13	i.MX51: EIM_A19	Not used	
163	GPOIO18	EIM_A18/GPIO2_12	i.MX51: EIM_A18	Not used	
164	GPOIO18	EIM_A21/GPIO2_15	i.MX51: EIM_A21	Boot Configuration Switch	
165	GPOIO18	EIM_A20/GPIO2_14	i.MX51: EIM_A20	Boot Configuration Switch	
166	GPOIO18	EIM_A23/GPIO2_17	i.MX51: EIM_A23	Not used	
167	GPOIO18	EIM_A22/GPIO2_16	i.MX51: EIM_A22	Not used	
168	GPOIO18	EIM_A25/GPIO2_19/ USBH2_DIR/DI1_PIN4	i.MX51: EIM_A25	Not used	
169	GPOIO18	EIM_A24/GPIO2_18/ USBH2_CLK	i.MX51: EIM_A24	Not used	
170	GPOIO18	EIM_A27/GPIO2_21/ USBH2_NXT/SISG1/ CSI2_DATA_EN/ DI1_PIN1	i.MX51: EIM_A27	XBEE_SLEEP_RQ	
171	GPOIO18	EIM_A26/GPIO2_20/ USBH2_STP/SISG0/ CSI1_DATA_EN/ DI2_EXT_CLK	i.MX51: EIM_A26	Not used	
172	GPOIO18	EIM_OE#/GPIO2_24	i.MX51: EIM_OE ETH_CTRL: RD#	Peripheral Application Output Enable	

Pin	I/O Type	Signal name	Use on module	Use on development board	Comments
173	GPOIO18	EIM_EB0	i.MX51: EIM_EB0	Not used	
174	GPOIO18	EIM_RW#	i.MX51: EIM_RW ETH_CTRL: WR#	Peripheral Application Read / Write	
175	GPOIO18	EIM_EB1	i.MX51: EIM_EB1	Not used	
176	GPOIO18	EIM_CRE/GPIO3_2	i.MX51: EIM_CRE	Peripheral Application Interrupt input	
177	GPOIO18	EIM_EB2/GPIO2_22/ TRCTL/FEC_MDIO/ SISG2/CSI1_D2/ AUD5_RXFS/CMPOUT1	i.MX51: EIM_EB2	Peripheral Application Byte Enable 2	
178	GPOIO18	EIM_WAIT	i.MX51: EIM_WAIT	Not used	
179	GPOIO18	EIM_EB3/GPIO2_23/ TRCLK/FEC_RDATA1/ SISG3/CSI1_D3/ AUD5_RXC/CMPOUT2	i.MX51: EIM_EB3	Peripheral Application Byte Enable 3	
180	GPOIO18	EIM_BCLK	i.MX51: EIM_BCLK	Peripheral Application Clock Burst	By default not connected on Development Board.

J2 Pinout

Pin	Type	Signal name	Use on module	Use on development board	Comments
1	HSGPIO27	DISP1_DAT0	i.MX51: DISP1_DAT0	HDMI, VGA and LCD1 Data	
2	HSGPIO27	DISP1_DAT1	i.MX51: DISP1_DAT1	HDMI, VGA and LCD1 Data	
3	HSGPIO27	DISP1_DAT2	i.MX51: DISP1_DAT2	HDMI, VGA and LCD1 Data	
4	HSGPIO27	DISP1_DAT3	i.MX51: DISP1_DAT3	HDMI, VGA and LCD1 Data	
5	HSGPIO27	DISP1_DAT4	i.MX51: DISP1_DAT4	HDMI, VGA and LCD1 Data	
6	HSGPIO27	DISP1_DAT5	i.MX51: DISP1_DAT5	HDMI, VGA and LCD1 Data	
7	GPIO27	DISP1_DAT6	i.MX51: DISP1_DAT6	HDMI, VGA and LCD1 Data, Boot Configuration	
8	GPIO27	DISP1_DAT7	i.MX51: DISP1_DAT7	HDMI, VGA and LCD1 Data, Boot Configuration	

Pin	Type	Signal name	Use on module	Use on development board	Comments
9	GPIO27	DISP1_DAT8	i.MX51: DISP1_DAT8	HDMI, VGA and LCD1 Data, Boot Configuration	On Development Kit DISP1 and DISP2 are configured at 18-bit, and connected to 24-bit LCDs.
10	GPIO27	DISP1_DAT9	i.MX51: DISP1_DAT9	HDMI, VGA and LCD1 Data, Boot Configuration	
11	GPIO27	DISP1_DAT10	i.MX51: DISP1_DAT10	HDMI, VGA and LCD1 Data, Boot Configuration	On Development Kit some DISP1 signals are used to configure the boot process.
12	GPIO27	DISP1_DAT11	i.MX51: DISP1_DAT11	HDMI, VGA and LCD1 Data, Boot Configuration	
13	GPIO27	DISP1_DAT12	i.MX51: DISP1_DAT12	HDMI, VGA and LCD1 Data, Boot Configuration	On Early Availability Kit DISP1 and DISP2 are configured at 24-bit, and connected to 24-bit LCDs.
14	GPIO27	DISP1_DAT13	i.MX51: DISP1_DAT13	HDMI, VGA and LCD1 Data, Boot Configuration	
15	GPIO27	DISP1_DAT14	i.MX51: DISP1_DAT14	HDMI, VGA and LCD1 Data, Boot Configuration	
16	GPIO27	DISP1_DAT15	i.MX51: DISP1_DAT15	HDMI, VGA and LCD1 Data, Boot Configuration	
17	GPIO27	DISP1_DAT16	i.MX51: DISP1_DAT16	HDMI, VGA and LCD1 Data, Boot Configuration	
18	GPIO27	DISP1_DAT17	i.MX51: DISP1_DAT17	HDMI, VGA and LCD1 Data, Boot Configuration	
19	GPIO27	DISP1_DAT18	i.MX51: DISP1_DAT18	Not used	
20	GPIO27	DISP1_DAT19	i.MX51: DISP1_DAT19	Not used	
21	GPIO27	DISP1_DAT20	i.MX51: DISP1_DAT20	Boot Configuration	
22	GPIO27	DISP1_DAT21	i.MX51: DISP1_DAT21	Boot Configuration	
23	GPIO27	DISP1_DAT22	i.MX51: DISP1_DAT22	LCD2 Data	
24	GPIO27	DISP1_DAT23	i.MX51: DISP1_DAT23	LCD2 Data	
25	GPIO27	DI1_PIN2	i.MX51: DI1_PIN2	HDMI, VGA and LCD1 HSYNC	
26	-	GND	-	-	
27	GPIO27	DI1_PIN11/GPIO3_0	i.MX51: DI1_PIN11	LCD1 PWREN#	
28	GPIO27	DI1_DISP_CLK	i.MX51: DI1_DISP_CLK	HDMI, VGA and LCD1 Clock	
29	GPIO27	DI1_PIN13/GPIO3_2	i.MX51: DI1_PIN13	LCD1 and LCD2 GPIO2	
30	GPIO27	DI1_PIN3	i.MX51: DI1_PIN3	HDMI, VGA and LCD1 VSYNC	
31	GPIO27	DI1_PIN15	i.MX51: DI1_PIN15	HDMI, VGA and LCD1 DRDY	
32	GPIO27	DI1_PIN12/GPIO3_1	i.MX51: DI1_PIN12	LCD2 PWREN#	
33	GPIO27	DI_GP2	i.MX51: DI_GP2	Not used	
34	GPIO27	DI_GP1	i.MX51: DI_GP1	Not used	

Pin	Type	Signal name	Use on module	Use on development board	Comments
35	GPIO27	DI_GP4/MII_RXD2	i.MX51: DI_GP4 LAN8710: RXD2	LCD2 DRDY	
36	GPIO27	DI_GP3/MII_TX_ER	i.MX51: DI_GP3 LAN8710: INT#/TXER/ TXD4	Not used	
37	GPIO27	DI1_D1_CS/GPIO3_4	i.MX51: DI_D1_CS	LCD1 and LCD2 Touch selection input	
38	GPIO27	DI1_D0_CS/GPIO3_3	i.MX51: DI_D0_CS	LCD1 and LCD2 Touch selection input	
39	ADIN	TOUCH_X1	MC13892: TSX1	LCD1 and LCD2 Touch X1	Analog input from Touch Screen
40	ADIN	ADIN5	MC13892: ADIN5	Reserved	
41	ADIN	TOUCH_X2	MC13892: TSX2	LCD1 and LCD2 Touch X2	Analog input from Touch Screen
42	ADIN	ADIN6	MC13892: ADIN6	Not used	Analog input
43	ADIN	TOUCH_Y1	MC13892: TSY1	LCD1 and LCD2 Touch Y1	Analog input from Touch Screen
44	ADIN	ADIN7	MC13892: ADIN7	Not used	Analog input
45	ADIN	TOUCH_Y2	MC13892: TSY2	LCD1 and LCD2 Touch Y2	Analog input from Touch Screen
46	-	ADC_GND	-	-	
47	-	GND	-	-	
48	PMIC_STDBY	ADTRIG	MC13892: ADTRIG	Not used	
49	-	SWBST	MC13892: SWBST MC13892: VINUSB	-	Used on the module to power USB PHY
50	-	LEDKP	MC13892: LEDKP	Reserved	
51	PMIC_LED	LEDR	MC13892: LEDR	Not used	
52	-	LEDAD	MC13892: LEDAD	Reserved	
53	PMIC_LED	LEDG	MC13892: LEDG	Not used	
54	-	LEDMD	MC13892: LEDMD	Reserved	
55	PMIC_LED	LEDB	MC13892: LEDB	Not used	
56	-	VSWLED	-	-	
57	GPIO27	CSI2_D12/GPIO4_9	i.MX51: CSI2_D12	Camera 2 Data	
58	GPIO27	CSI2_D13/GPIO4_10	i.MX51: CSI2_D13	Camera 2 Data	
59	HSGPIO27	CSI2_D14	i.MX51: CSI2_D14	Camera 2 Data	
60	HSGPIO27	CSI2_D15	i.MX51: CSI2_D15	Camera 2 Data	
61	HSGPIO27	CSI2_D16	i.MX51: CSI2_D16	Camera 2 Data	

Pin	Type	Signal name	Use on module	Use on development board	Comments
62	HSGPIO27	CSI2_D17	i.MX51: CSI2_D17	Camera 2 Data	
63	GPIO27	CSI2_D18/GPIO4_11	i.MX51: CSI2_D18	Camera 2 Data	
64	GPIO27	CSI2_D19/GPIO4_12	i.MX51: CSI2_D19	Camera 2 Data	
65	GPIO27	CSI1_VSYNC/GPIO4_13	i.MX51: CSI2_VSYNC	Camera 2 VSYNC	
66	GPIO27	CSI2_HSYNC/GPIO4_14	i.MX51: CSI2_HSYNC	Camera 2 HSYNC	
67	GPIO27	CSI2_PIXCLK_GPIO4_15	i.MX51: CSI2_PIXCLK	Camera 2 PIXCLK	
68	-	GND		-	
69	-	GND		-	
70	DIG_USB	USB_OTG_ID	i.MX51: ID	USB OTG ID	
71	AN_USB	USB_OTG_DP	i.MX51: DP	USB OTG DP	
72	-	USB_OTG_VBUS	i.MX51: VBUS	USB OTG VBUS	
73	AN_USB	USB_OTG_DN	i.MX51: DN	USB OTG DN	
74	GPIO27	GPIO1_8/USB_PWR	i.MX51: GPIO_8	Not used	
75	-	GND	-	-	
76	GPIO27	GPIO1_2/PWM1/ I2C2_SCL	i.MX51: GPIO1_2 MMA7455LR1:SCL	I ² C Bus Clock	
77	GPIO27	GPIO1_7/ MMA7455LR_INT1	i.MX51: GPIO1_7 MMA7455LR1:INT1	Reserved	Accelerometer Interrupt
78	GPIO27	GPIO1_3/PWM2/ I2C2_SDA	i.MX51: GPIO1_3 MMA7455LR1:SD	I ² C Bus Clock	
79	GPIO27	GPIO1_6/ MMA7455LR_INT2	i.MX51: GPIO1_6 MMA7455LR1:INT2	Reserved	Accelerometer Interrupt
80	PMIC_INT	CLK32K_PER	MC13892: CLK32K	Not used	
81	-	GND	-	-	
82	-	GND	-	-	
83	-	CKIH1	i.MX51: CKIH1	Not used	
84	-	CKIH2	i.MX51: CKIH2	Not used	
85	UHVIO33	SD2_DATA0/ SD1_DATA1/SPI_MOSI	i.MX51: GPIO1_6 WLAN: SDIO_DATA0	Reserved	SD bus 2 connected to WLAN.
86	UHVIO33	SD2_CLK/I2C1_SDA/ SPI_SCLK	i.MX51: SD2_CLK WLAN: SDIO_CLK	Reserved	In modules without WLAN this SD bus can be used in the development boards.
87	UHVIO33	SD2_DATA1/ SD1_DATA5	i.MX51: SD2_DATA1 WLAN: SDIO_DATA1	Reserved	
88	UHVIO33	SD2_CMD/I2C1_SCL/ SPI_MOSI	i.MX51: SD2_CMD WLAN: SDIO_CMD	Reserved	

Pin	Type	Signal name	Use on module	Use on development board	Comments
89	UHVIO03	SD2_DATA2/ SD1_DATA6	i.MX51: SD2_DATA2 WLAN: SDIO_DATA2	Reserved	
90	GPIO27	KEY_COL0	i.MX51: KEY_COL0	XBee Reset#	
91	UHVIO33	SD2_DATA3/ SD1_DATA7/SPI_SS2	i.MX51: SD2_DATA3 WLAN: SDIO_DATA3	Reserved	
92	GPIO27	KEY_COL1	i.MX51: KEY_COL1	Not used	
93	GPIO27	KEY_ROW0	i.MX51: ROW0	Not used	
94	GPIO27	KEY_COL2	i.MX51: KEY_COL2	Not used	
95	GPIO27	KEY_ROW1	i.MX51: ROW1	Not used	
96	GPIO27	KEY_COL3	i.MX51: KEY_COL3	Not used	
97	GPIO27	KEY_ROW2	i.MX51: ROW2	Not used	
98	GPIO27	KEY_COL5/ UART3_CTS#/I2C1_SDA	i.MX51: KEY_COL5	XBee RTS#	
99	GPIO27	KEY_ROW3	i.MX51: KEY_ROW3	Not used	
100	GPIO27	GPIO1_0/SD1_CD#/ SPI_SS2	i.MX51: GPIO1_0	HDMI Interrupt	
101	GPIO27	KEY_COL4/ UART3_RTS#/I2C2_SCL	i.MX51: KEY_COL4	XBee/UART3 RTS selection	
102	GPIO27	GPIO1_1/SD1_WP#/ SPI_MISO	i.MX51: GPIO1_1	User Button 2	
103	GPIO27	OWIRE_LINE/GPIO1_24	i.MX51: OWIRE_LINE	One-Wire, HDMI SPDIF	
104	UHVIO31	SD1_DATA0/ AUD5_TXD/SPI_MOSI	i.MX51: SD1_DATA0	MicroSD™ Data	
105	UHVIO31	SD1_CMD/AUD5_RXFS/ SPI_MOSI	i.MX51: SD1_CMD	MicroSD™ Command	
106	UHVIO31	SD1_DATA1/ AUD5_RXD	i.MX51: SD1_DATA1	MicroSD™ Data	
107	UHVIO31	SD1_CLK/AUD5_RXC/ SPI_SCLK	i.MX51: SD1_CLK	MicroSD™ Clock	
108	UHVIO31	SD1_DATA2/AUD5_TXC	i.MX51: SD1_DATA2	MicroSD™ Data	
109	GPIO27	WDOG1#	i.MX51: GPIO1_4	Reserved	HDMI Interrupt and PMIC Watchdog input cannot be used at the same time.
110	UHVIO31	SD1_DATA3/ AUD5_TXFS/SPI_SS1	i.MX51: SD1_DATA3	MicroSD™ Data	
111	GPIO27	CSPI1_MOSI/I2C1_SDA/ GPIO4_22	i.MX51: CSPI1_MOSI MC13892: MOSI	SPI_MOSI	
112	GPIO27	CSPI1_SS0/PMIC/ AUD4_TXC/GPIO4_24	i.MX51: CSPI1_SS0 MC13892: CS	Reserved	

Pin	Type	Signal name	Use on module	Use on development board	Comments
113	GPIO27	CSPI1_MISO/ AUD4_RXD/GPIO4_23	i.MX51: CSPI1_MISO MC13892: MISO	SPI_MISO	
114	GPIO27	CSPI1_SS1/AUD4_TXD/ GPIO4_25	i.MX51: CSPI1_SS1	SPI_SS1	
115	GPIO27	CSPI1_SCLK/I2C1_SDA/ GPIO4_27	i.MX51: CSPI1_SCLK MC13892: CLK	SPI_SCLK	
116	GPIO27	CSPI1_RDY/ AUD4_TXFS/GPIO4_26	i.MX51: CSPI1_RDY	LCD1 and LCD2 SPI Chip Select	
117	GPIO27	UART1_RXD/GPIO4_28	i.MX51: UART1_RXD	UART1 MEI	
118	GPIO27	UART1_RTS#/GPIO4_30	i.MX51: UART1_RTS	UART1 MEI	
119	GPIO27	UART1_TXD/PWM2/ GPIO4_29	i.MX51: UART1_TXD	UART1 MEI	
120	GPIO27	UART1_CTS#/GPIO4_31	i.MX51: UART1_CTS	UART1 MEI	
121	GPIO27	UART2_RXD/GPIO1_20	i.MX51: UART2_RXD	UART2 Console	
122	GPIO27	UART3_RXD/ UART1_DTR#/GPIO1_22	i.MX51: UART3_RXD	UART3/XBee	
123	GPIO27	UART2_TXD/GPIO1_21	i.MX51: UART2_TXD	UART2 Console	
124	GPIO27	UART3_TXD/ UART1_DSR#/GPIO1_23	i.MX51: UART3_TXD	UART3/XBee	
125	GPIO27	USBH1_DATA2/ UART2_TXD_GPIO1_13	i.MX51: USBH1_DATA2	USB Host	
126	-	GND	-	-	
127	GPIO27	USBH1_DATA4/ CSPI_SS0/GPIO1_15	i.MX51: USBH1_DATA4	USB Host	
128	GPIO27	USBH1_DATA0/ UART2_CTS#/GPIO1_11	i.MX51: USBH1_DATA0	USB Host (default) and UART2 Console	
129	GPIO27	USBH1_DATA6/ CSPI_SS2/GPIO1_17	i.MX51: USBH1_DATA6	USB Host	
130	GPIO27	USBH1_DATA1/ UART2_RXD/GPIO1_12	i.MX51: USBH1_DATA1	USB Host	
131	GPIO27	USBH1_DIR/SPI_MOSI/ GPIO1_26/I2C2_SDA	i.MX51: USBH1_DIR	USB Host	
132	GPIO27	USBH1_DATA3/ UART2_RTS#/GPIO1_14	i.MX51: USBH1_DATA3	USB Host (default) and UART2 Console	
133	GPIO27	USBH1_STP/SPI_RDY/ GPIO1_27	i.MX51: USBH1_STP	USB Host	
134	GPIO27	USBH1_DATA5/ UART2_RTS#/GPIO1_14	i.MX51: USBH1_DATA5	USB Host	
135	GPIO27	USBH1_NXT/SPI_MISO/ GPIO1_28	i.MX51: USBH1_NXT	USB Host	

Pin	Type	Signal name	Use on module	Use on development board	Comments
136	GPIO27	USBH1_DATA7/ SPI_SS3/SPI2_SS3/ GPIO1-18	i.MX51: USBH1_DATA7	USB Host	
137	GPIO27	AUD3_BB_TXD/ GPIO4_18	i.MX51: AUD3_BB_TXD	Audio CODEC and HDMI Audio	
138	GPIO27	USBH1_CLK/SPI_SCLK/ GPIO1_25/I2C2_SCL/	i.MX51: USBH1_CLK	USB Host	
139	GPIO27	AUD3_BB_RXD/ UART3_RXD/GPIO4_19	i.MX51: AUD_BB_RXD	Audio CODEC	
140	-	HS_I2C_SCL/GPIO4_16	i.MX51: I2C_SCL	Not used	The HS_I2C interface is not working in i.MX51.
141	GPIO27	AUD3_BB_CK/GPIO4_20	i.MX51: AUD_BB_CK	Audio CODEC and HDMI Audio	
142	-	HS_I2C_SDA/GPIO4_17	i.MX51: I2C_SDA	Not used	The HS_I2C interface is not working in i.MX51.
143	-	+3.3V	-	-	
144	GPIO27	AUD3_BB_FS/ UART3_TXD/GPIO4_21	i.MX51: AUD_BB_FS	Audio CODEC and HDMI Audio	
145	UHVIO31	NANDF_D0/PATA_D0/ SD4_DATA7/GPIO4_8	i.MX51: NANDF_D0 NAND_FLASH: I/O0	Reserved	
146	-	+3.3V	-	-	
147	UHVIO31	NANDF_D2/PATA_D2/ SD4_DATA5/GPIO4_6	i.MX51: NANDF_D2 NAND_FLASH: I/O2	Reserved	
148	UHVIO31	NANDF_D1/PATA_D1/ SD4_DATA6/GPIO4_7	i.MX51: NANDF_D1 NAND_FLASH: I/O1	Reserved	
149	UHVIO31	NANDF_D4/PATA_D4/ SD4_CD/GPIO4_4	i.MX51: NANDF_D4 NAND_FLASH: I/O4	Reserved	
150	UHVIO31	NANDF_D3/PATA_D3/ SD4_DATA4/GPIO4_5	i.MX51: NANDF_D3 NAND_FLASH: I/O3	Reserved	
151	UHVIO31	NANDF_D6/PATA_D6/ SD4_LCTL/GPIO4_2	i.MX51: NANDF_D6 NAND_FLASH: I/O6	Reserved	
152	UHVIO31	NANDF_D5/PATA_D5/ SD4_WP/GPIO4_3	i.MX51: NANDF_D5 NAND_FLASH: I/O5	Reserved	
153	UHVIO31	NANDF_D8/PATA_D8/ GPIO4_0/SD3_DATA0	i.MX51: NANDF_D8	SD/MMC Data	
154	UHVIO31	NANDF_D7/PATA_D7/ GPIO4_1	i.MX51: NANDF_D7 NAND_FLASH: I/O7	Reserved	
155	UHVIO31	NANDF_D10/ PATA_D10/GPIO3_30/ SD3_D2	i.MX51: NANDF_D10	SD/MMC Data	

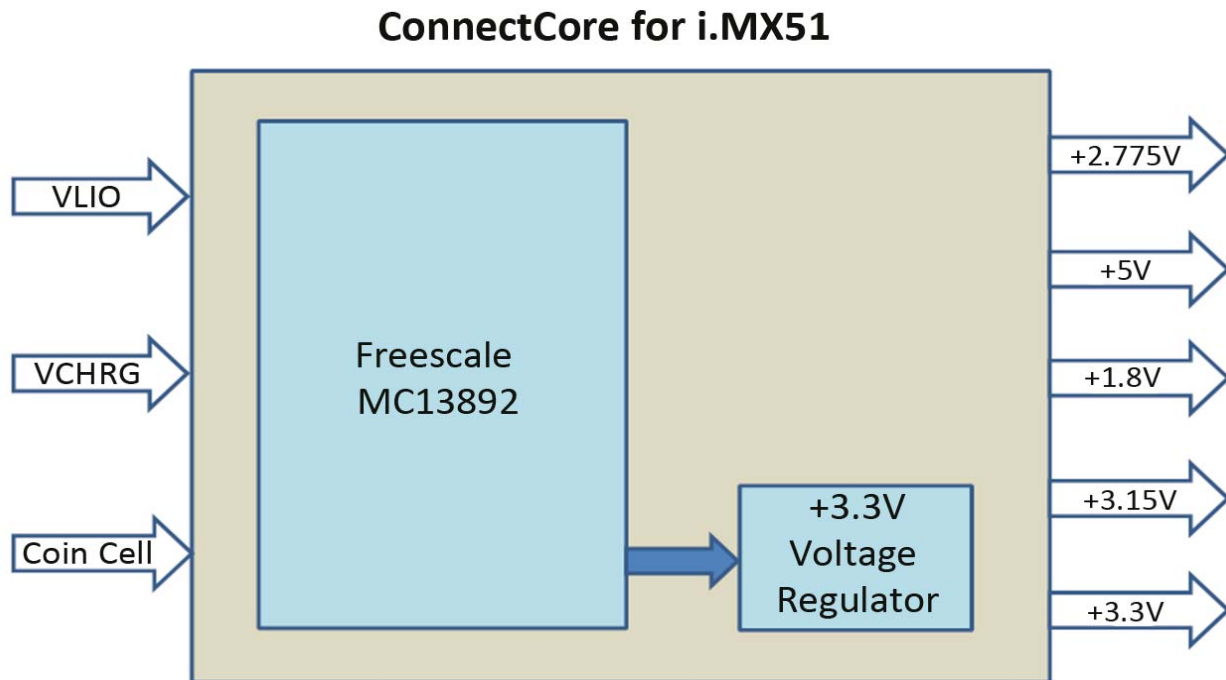
Pin	Type	Signal name	Use on module	Use on development board	Comments
156	UHVIO31	NANDF_D9/PATA_D9/ GPIO3_31/SD3_D1	i.MX51: NANDF_D9	SD/MMC Data	
157	UHVIO31	NANDF_D12/ PATA_D12/GPIO3_28/ SD3_D4	i.MX51: NANDF_D12	SD/MMC Data	
158	UHVIO31	NANDF_D11/ PATA_D11/GPIO3_29/ SD3_D3	i.MX51: NANDF_D11	SD/MMC Data	
159	UHVIO31	NANDF_D14/ PATA_D14/GPIO3_26/ SD3_D6	i.MX51: NANDF_D14	SD/MMC Data	
160	UHVIO31	NANDF_D13/ PATA_D13/GPIO3_27/ SD3_D5	i.MX51: NANDF_D13	SD/MMC Data	
161	UHVIO31	NANDF_CS0#/GPIO3_16	i.MX51: NANDF_CS0 NAND_FLASH: CE#	Reserved	
162	UHVIO31	NANDF_D15/ PATA_D15/GPIO3_25/ SD3_D7	i.MX51: NANDF_D15	SD/MMC Data	
163	UHVIO31	NANDF_CS2#/ PATA_CS0#/GPIO3_18	i.MX51: NANDF_CS2 NAND_FLASH: NC	Digital I/O Connector	
164	UHVIO31	NANDF_CS1#/GPIO3_17	i.MX51: NANDF_CS1 NAND_FLASH: NC	SD/MMC Write Protect	
165	UHVIO31	NANDF_CS4#/ PATA_DA0/GPIO3_20	i.MX51: NANDF_CS4	Digital I/O Connector	
166	UHVIO31	NANDF_CS3#/ PATA_CS1#/GPIO3_19	i.MX51: NANDF_CS3 NAND_FLASH: NC	HDMI audio clock enable	
167	UHVIO31	NANDF_CS6#/ PATA_DA2/GPIO3_22	i.MX51: NANDF_CS6	Digital I/O Connector	
168	UHVIO31	NANDF_CS5#/ PATA_DA1/GPIO3_21	i.MX51: NANDF_CS5	Digital I/O Connector	
169	UHVIO31	NANDF_RDY_INT/ GPIO3_24	i.MX51: NANDF_RDY_INT	SD/MMC Command	
170	UHVIO31	NANDF_CS7#/GPIO3_23	i.MX51: NANDF_CS7	SD/MMC Clock	SD clock and Digital IO cannot be used at the same time.
171	UHVIO31	NANDF_WE#/ PATA_DIOW/GPIO3_3	i.MX51: NANDF_WE_B NAND_FLASH: WE#	Reserved	
172	UHVIO31	GPIO_NAND/ PATA_INTRQ/GPIO3_12	i.MX51: GPIO_NAND	SD/MMC Card Detect	
173	UHVIO31	NANDF_ALE/ PATA_BUFFER_EN/ GPIO3_5	i.MX51: NANDF_ALE NAND_FLASH: ALE	Reserved	

Pin	Type	Signal name	Use on module	Use on development board	Comments
174	UHVIO31	NANDF_RE#/ PATA_DIOR/GPIO3_4	i.MX51: NANDF_RE_B NAND_FLASH: RE#	Reserved	
175	UHVIO31	NANDF_WP#/ PATA_DMACK/GPIO3_7	i.MX51: NANDF_WP_B NAND_FLASH: WP#	Reserved	
176	UHVIO31	NANDF_CLE/ PATA_RESET/GPIO3_6	i.MX51: NANDF_CLE NAND_FLASH: CLE	Reserved	
177	UHVIO31	NANDF_RB1/ PATA_IORDY/GPIO3_9	i.MX51: NANDF_RB1 NAND_FLASH: NC	User LED2 and Digital I/O Connector	
178	UHVIO31	NANDF_RB0/ PATA_DMARQ/GPIO3_8	i.MX51: NANDF_RB0 NAND_FLASH: R/B#	Reserved	
179	UHVIO31	NANDF_RB3/GPIO3_11	i.MX51: NANDF_RB3 NAND_FLASH: NC	Digital I/O Connector	
180	UHVIO31	NANDF_RB2/GPIO3_10	i.MX51: NANDF_RB2 NAND_FLASH: NC	User LED1 and Digital I/O Connector	

Power

Module Power Supplies

The following figure shows the power supply scheme of the ConnectCore for i.MX51 module.



Supply Inputs

The ConnectCore for i.MX51 module has the following supply inputs:

- Battery input (VLIO)
- Charger input (VCHRG)
- Coin Cell input (VCC_COINCELL)

Battery input (VLIO)

The VLIO supply is used to generate all the voltage supplies needed by the i.MX51 CPU and the peripherals. The minimum voltage of VLIO (to allow the module to turn on) is +3.4V. The maximum voltage of VLIO is +4.8V.

Charger input (VCHRG)

The battery charger supply is used to charge rechargeable batteries, as well as to power up the module when there is no battery or the battery is discharged. The minimum voltage of the battery charger is +3.4V. The maximum voltage of the battery charger is +20V.

Coin Cell input (VCC_COINCELL)

A connection for a coin cell or supercap is provided at VCC_COINCELL. From the coin cell the RTC remains supplied in case of absence of the main battery. A low current 60uA charger is included which will charge the coin cell to a programmable voltage of +2.5V to +3.3V. In case the module is turned off, it is ensured that the coin cell charge is maintained as long as a valid main battery is in place. The behavior of the coin cell charger is programmable.

The following table shows the current draw from the coin cell when there is no main battery attached:

Mode	Description	Typ	Max	Unit
RTC	All blocks disabled, no main battery attached, coin cell is attached.	3	7	uA

The maximum voltage of the coin cell supply is +2V. The maximum voltage of the coin cell supply is +3.6V.

Supply Outputs

The ConnectCore for i.MX51 module provides the following supply outputs:

- +3.3V
- +2.775V
- SWBT (+5V)
- +1.8V
- +3.15V

+3.3V

The ConnectCore for i.MX51 module has a DC/DC converter to generate a +3.3V supply. This supply is used on the module to power the WLAN interface, the Ethernet PHY and the Ethernet Controller.

This power regulator can be enabled/disabled by the software to save power when the module is in the low power modes. The maximum current provided by this regulator is 1.2A.

The current available to supply off-module components is 400mA for the wireless variants of the ConnectCore for i.MX51, and 800mA for the wired variant of the ConnectCore for i.MX51.

+2.775V

This supply is used on the module to power the i.MX51 peripherals, the accelerometer and the i.MX51 image processing unit. The maximum current provided by this supply is 100mA.

The current available to supply off-module components is 50mA.

SWBT (+5V)

The voltage level of the SWBT supply is +5V. The maximum current provided by this supply is 300mA.

+1.8V

This supply is generated on the internal regulator of the PMIC. The maximum current provided by this supply is 250mA.

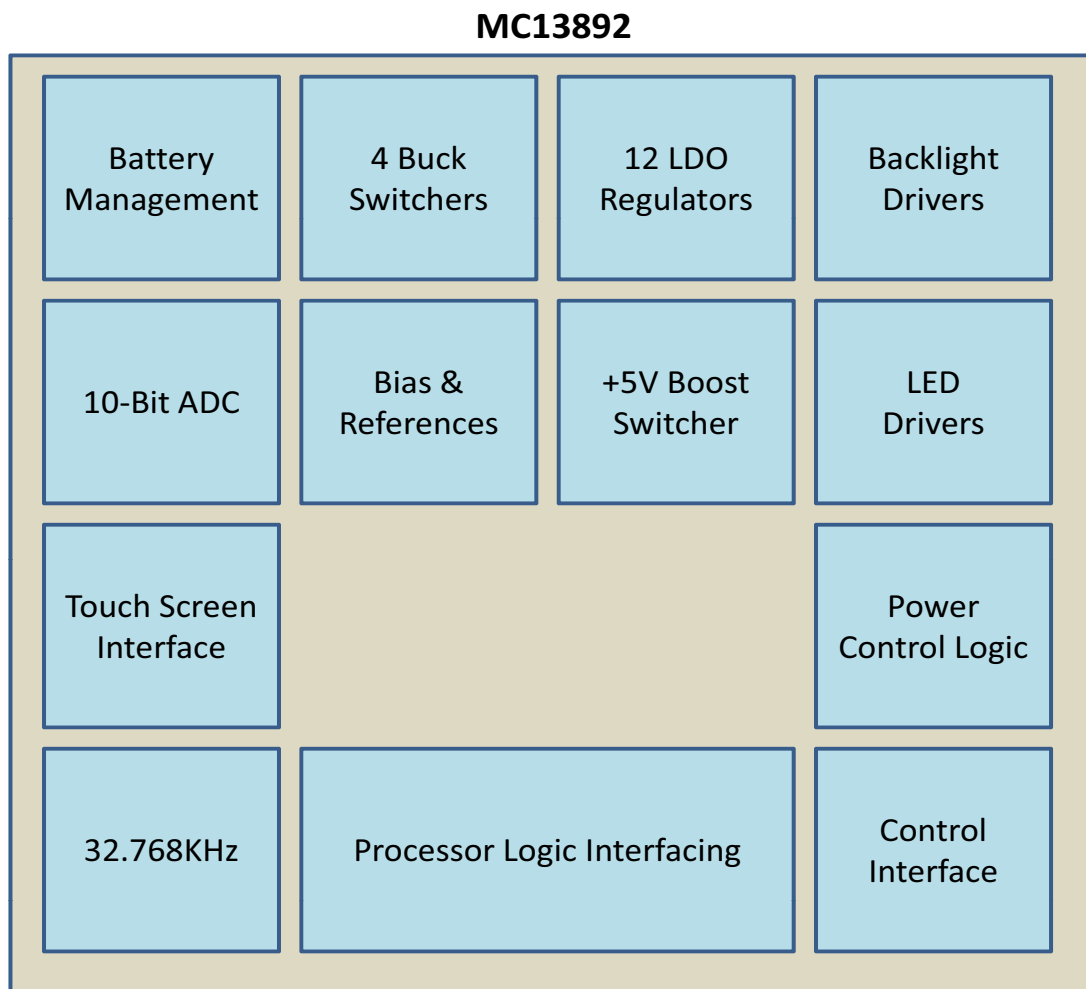
+3.15V

This supply is used on the module to power the NAND Flash interface and the SD-card 1 interface. The maximum current provided by this supply is 350mA.

The current available to supply off-module components is 300mA.

MC13892 Power Management

The ConnectCore for i.MX51 module is designed with Freescale MC13892 Power Management chip. This chip provides reference and supply voltages for the i.MX51 as well as for the peripheral devices. The MC13892 has four buck switchers, one +5V boost switcher and twelve low dropout regulators as well as other user interfaces. The following figure shows the block diagram of the MC13892.



Memory

DDR2 SDRAM Memory

The ConnectCore for i.MX51 module provides up to 512 MBytes of DDR2-400 SDRAM memory.

The module can support up to four 16-bit, 128Mbit, DDR2-400 chips, configured as two banks of 32-bits of 128Mbits DDR2-400 memory.

NAND Flash Memory

The ConnectCore for i.MX51 module provides 512Mbytes of NAND-Flash memory. On the module a 512MByte, 2Kbyte page, NAND-Flash chip is used.

Options for other densities NAND Flash devices are available depending on the module variant.

Chip selects

Chip Select Memory Map

The ConnectCore for i.MX51 has eight chip select signals, two for dynamic memory and six for static memory. The table below shows the memory map of these chip select signals.

Name	Pin	Address range	Size [Mb]	Usage	Comments
DRAM_CS0#	Y4	0x9000_000-0x9FFF_FFFF	256M	DDR2 bank 0	First bank on module
DRAM_CS1#	Y3	0xA000_0000-0xAFFF_FFFF	256M	DDR2 bank 1	Second bank on module
EIM_CS0	W6	0xB000_000-0xB7FF_FFFF	128M	External CS0#	
EIM_CS1	Y6	0xB800_000-0xBFFF_FFFF	128M	External CS1#	
EIM_CS2	Y7	0xC000_000-0xC7FF_FFFF	128M	External CS2#	
EIM_CS3	AC3	0xC800_000-0xCBFF_FFFF	64M	External CS3#	
EIM_CS4	AA6	0xCC00_000-0xCDFE_FFFF	32M	External CS4#	
EIM_CS5	AA5	0xCE00_000-0xCFFE_FFFF	32M (minus 64K)	External CS5#	Used for Ethernet Controller on module

Multiplexed GPIO

GPIO Multiplexing Table

The ConnectCore for i.MX51 has four GPIO banks. Each bank provides 32 bidirectional general purpose input and output signals.

The GPIO pins are multiplexed with other functions on the module. For each pin there are up to 8 muxing options (called ALT modes). By default all GPIO pins are configured to their respective GPIO signals. Since different modules require different pin settings (like pull up, keeper, etc) the i.MX51 has an IOMUX controller to configure the pin settings.

The table below shows the ALT mode for each GPIO signal, the name of the Pad and the default use on the module. For a detailed description of all the muxing options for each pin, refer to the i.MX51 Hardware Reference Manual.

GPIO	Mode	Pad	On module default as
GPIO1_0	ALT1	GPIO1_0	HDMI Interrupt
GPIO1_1	ALT1	GPIO1_1	User Button 2
GPIO1_2	ALT0	GPIO1_2	I2C2_SCL
GPIO1_3	ALT0	GPIO1_3	I2C2_SDA
GPIO1_4	ALT0	GPIO1_4	Watchdog reset
GPIO1_5	ALT0	GPIO1_5	MC13892 Interrupt
GPIO1_6	ALT0	GPIO1_6	Accelerometer Interrupt 2
GPIO1_7	ALT0	GPIO1_7	Accelerometer Interrupt 1
GPIO1_8	ALT0	GPIO1_8	USB Power enable
GPIO1_9	ALT0	GPIO1_9	Ethernet 2 Interrupt
GPIO1_10	ALT7	DISP2_DAT11	Ethernet 1
GPIO1_11	ALT2	USBH1_DATA0	USB Host
GPIO1_12	ALT2	USBH1_DATA1	USB Host
GPIO1_13	ALT2	USBH1_DATA2	USB Host
GPIO1_14	ALT2	USBH1_DATA3	USB Host
GPIO1_15	ALT2	USBH1_DATA4	USB Host
GPIO1_16	ALT2	USBH1_DATA5	USB Host
GPIO1_17	ALT2	USBH1_DATA6	USB Host
GPIO1_18	ALT2	USBH1_DATA7	USB Host
GPIO1_19	ALT5	DISP2_DAT6	Ethernet 1
GPIO1_20	ALT3	UART2_RXD	UART2_RXD
GPIO1_21	ALT3	UART2_TXD	UART2_TXD

GPIO	Mode	Pad	On module default as
GPIO1_22	ALT3	UART3_RXD	UART3_RXD
GPIO1_23	ALT3	UART3_TXD	UART3_TXD
GPIO1_24	ALT3	OWIRE_LINE	S/PDIF Output
GPIO1_25	ALT2	USBH1_CLK	USB Host
GPIO1_26	ALT2	USBH1_DIR	USB Host
GPIO1_27	ALT2	USBH1_STP	USB Host
GPIO1_28	ALT2	USBH1_NXT	USB Host
GPIO1_29	ALT5	DISP2_DAT7	Ethernet 1
GPIO1_30	ALT5	DISP2_DAT8	Ethernet 1
GPIO1_31	ALT5	DISP2_DAT9	Ethernet 1
GPIO2_0	ALT1	EIM_D16	EIM_D16
GPIO2_1	ALT1	EIM_D17	EIM_D17
GPIO2_2	ALT1	EIM_D18	EIM_D18
GPIO2_3	ALT1	EIM_D19	EIM_D19
GPIO2_4	ALT1	EIM_D20	EIM_D20
GPIO2_5	ALT1	EIM_D21	EIM_D21
GPIO2_6	ALT1	EIM_D22	EIM_D22
GPIO2_7	ALT1	EIM_D23	EIM_D23
GPIO2_8	ALT1	EIM_D24	EIM_D24
GPIO2_9	ALT1	EIM_D27	EIM_D27
GPIO2_10	ALT1	EIM_A16	GPIO
GPIO2_11	ALT1	EIM_A17	GPIO
GPIO2_12	ALT1	EIM_A18	GPIO
GPIO2_13	ALT1	EIM_A19	GPIO
GPIO2_14	ALT1	EIM_A20	GPIO
GPIO2_15	ALT1	EIM_A21	GPIO
GPIO2_16	ALT1	EIM_A22	GPIO
GPIO2_17	ALT1	EIM_A23	GPIO
GPIO2_18	ALT1	EIM_A24	GPIO
GPIO2_19	ALT1	EIM_A25	GPIO
GPIO2_20	ALT1	EIM_A26	GPIO
GPIO2_21	ALT1	EIM_A27	XBEE_SLEEP_RQ
GPIO2_22	ALT1	EIM_EB2	EIM_EB2

GPIO	Mode	Pad	On module default as
GPIO2_23	ALT1	EIM_EB3	EIM_EB3
GPIO2_24	ALT1	EIM_OE	EIM_OE
GPIO2_25	ALT1	EIM_CS0	EIM_CS0
GPIO2_26	ALT1	EIM_CS1	GPIO
GPIO2_27	ALT1	EIM_CS2	GPIO
GPIO2_28	ALT1	EIM_CS3	GPIO
GPIO2_29	ALT1	EIM_CS4	GPIO
GPIO2_30	ALT1	EIM_CS5	Ethernet 2 Controller chip select
GPIO2_31	ALT1	EIM_DTACK	GPIO
GPIO3_0	ALT4	DI1_PIN11	LCD1 PWREN
GPIO3_1	ALT4	DI1_PIN12	LCD2 PWREN
	ALT1	EIM_LBA	GPIO
GPIO3_2	ALT4	DI1_PIN13	GPIO
	ALT1	EIM_CRE	GPIO
GPIO3_3	ALT4	DI1_D0_CS	LCD Touch Screen interrupt
	ALT3	NANDF_WE_B	NANDF_WE_B
GPIO3_4	ALT4	DI1_D1_CS	LCD1_TCH_INT/TCH_EXT#
	ALT3	NANDF_RE_B	NANDF_RE_B
GPIO3_5	ALT4	DISPB2_SER_DIN	GPIO
	ALT3	NANDF_ALE	NANDF_ALE
GPIO3_6	ALT4	DISPB2_SER_DIO	User Button 1 / GPIO
	ALT3	NANDF_CLE	NANDF_CLE
GPIO3_7	ALT4	DISPB2_SER_CLK	Camera 2 Reset
	ALT3	NANDF_WP_B	NANDF_WP_B
GPIO3_8	ALT4	DISPB2_SER_RS	USB Host Reset signal
	ALT3	NANDF_RB0	NANDF_RB0
GPIO3_9	ALT3	NANDF_RB1	GPIO / User LED2
GPIO3_10	ALT3	NANDF_RB2	GPIO / User LED1
GPIO3_11	ALT3	NANDF_RB3	GPIO
GPIO3_12	ALT3	CS11_D8	Not used
	ALT0	GPIO_NAND	Card Detect input SD Card
GPIO3_13	ALT3	CS11_D9	Camera 1 Reset
GPIO3_14	ALT3	CS11_VSYNC	CS11_VSYNC

GPIO	Mode	Pad	On module default as
GPIO3_15	ALT3	CSI1_HSYNC	CSI1_HSYNC
GPIO3_16	ALT3	NANDF_CS0	NANDF_CS0
GPIO3_17	ALT3	NANDF_CS1	SD Card write protect
GPIO3_18	ALT3	NANDF_CS2	GPIO
GPIO3_19	ALT3	NANDF_CS3	Not used
GPIO3_20	ALT3	NANDF_CS4	GPIO
GPIO3_21	ALT3	NANDF_CS5	GPIO
GPIO3_22	ALT3	NANDF_CS6	GPIO
GPIO3_23	ALT3	NANDF_CS7	SD3_CLK
GPIO3_24	ALT3	NANDF_RDY_INT	SD3_CMD#
GPIO3_25	ALT3	NANDF_D15	SD3_DATA7
GPIO3_26	ALT3	NANDF_D14	SD3_DATA6
GPIO3_27	ALT3	NANDF_D13	SD3_DATA5
GPIO3_28	ALT3	NANDF_D12	SD3_DATA4
GPIO3_29	ALT3	NANDF_D11	SD3_DATA3
GPIO3_30	ALT3	NANDF_D10	SD3_DATA2
GPIO3_31	ALT3	NANDF_D9	SD3_DATA1
GPIO4_0	ALT3	NANDF_D8	SD3_DATA0
GPIO4_1	ALT3	NANDF_D7	NANDF_D7
GPIO4_2	ALT3	NANDF_D6	NANDF_D6
GPIO4_3	ALT3	NANDF_D5	NANDF_D5
GPIO4_4	ALT3	NANDF_D4	NANDF_D4
GPIO4_5	ALT3	NANDF_D3	NANDF_D3
GPIO4_6	ALT3	NANDF_D0	NANDF_D0
GPIO4_7	ALT3	NANDF_D1	NANDF_D1
GPIO4_8	ALT3	NANDF_D0	NANDF_D0
GPIO4_9	ALT3	CSI2_D12	CSI2_D12
GPIO4_10	ALT3	CSI2_D13	CSI2_D13
GPIO4_11	ALT3	CSI2_D18	CSI2_D18
GPIO4_12	ALT3	CSI2_D19	CSI2_D19
GPIO4_13	ALT3	CSI2_VSYNC	CSI2_VSYNC
GPIO4_14	ALT3	CSI2_HSYNC	CSI2_HSYNC
GPIO4_15	ALT3	CSI2_PIXCLK	CSI2_PIXCLK

GPIO	Mode	Pad	On module default as
GPIO4_16	ALT3	I2C1_CLK	GPIO
GPIO4_17	ALT3	I2C1_DAT	GPIO
GPIO4_18	ALT3	AUD3_BB_TXD	AUD3_BB_TXD
GPIO4_19	ALT3	AUD3_BB_RXD	AUD3_BB_RXD
GPIO4_20	ALT3	AUD3_BB_CK	AUD3_BB_CK
GPIO4_21	ALT3	AUD3_BB_FS	AUD3_BB_FS
GPIO4_22	ALT3	CSPI1_MOSI	CSPI1_MOSI
GPIO4_23	ALT3	CSPI1_MISO	CSPI1_MISO
GPIO4_24	ALT3	CSPI1_SS0	CSPI1_SS0 (MC13892 Chip select)
GPIO4_25	ALT3	CSPI1_SS1	CSPI1_SS1
GPIO4_26	ALT3	CSPI1_RDY	LCD SPI chip select
GPIO4_27	ALT3	CSPI1_SCLK	CSPI1_SCLK
GPIO4_28	ALT3	UART1_RXD	UART1_RXD
GPIO4_29	ALT3	UART1_TXD	UART1_TXD
GPIO4_30	ALT3	UART1_RTS	UART1_RTS
GPIO4_31	ALT3	UART1_CTS	UART1_CTS

Interfaces

1-Wire

The ConnectCore for i.MX51 provides a 1-Wire communication interface. The module sends or receives one bit at a time. The required protocol for accessing the generic 1-Wire device is defined by Maxim.

The main features of the 1-Wire interface are the following:

- Performs the 1-Wire bus protocol to communicate with an external 1-Wire device
- Provides a clock divider to generate a 1-Wire bus reference clock

Accelerometer

The module provides a three axis digital output accelerometer. This device is connected to the i.MX51 through the I²C bus. The I²C device address of the accelerometer is the following:

Interface	I ² C Address (7 bits)
Accelerometer (MMA7455L)	0 x 1D

The main features of the accelerometer device are the following:

- User assigned registers for offset calibration
- Programmable threshold interrupt output
- Level detection for motion recognition (shock, vibration, freefall)
- Pulse detection for single or double pulse recognition
- Selectable sensitivity ($\pm 2g$, $\pm 4g$, $\pm 8g$) for 8-bit mode

ADC and Touch Screen

The module provides an eight channel 10-bit ADC. The ADC/Touch interface is integrated in the MC13892 power management device. This ADC can be used as a standard ADC or as a touch screen interface.

The ADC runs at approximately 2MHz, and it has an auto calibration circuit which reduces the offset and gain errors.

The main features of the ADC are the following:

- Resolution: 10-bit
- Differential linearity error: 1 LSB
- Integral linearity error: 3 LSB
- Conversion time per channel: 10 μs
- Low power consumption (1 mA of conversion current)
- Analog input range: 0 ~ 2.4V

- Five channels pre-assigned to battery interface measurements
- Internal voltage scaling for pre-assigned measurements
- Normal conversion mode and touch screen mode

The following table shows the ADC channel assignment in ADC and touch screen modes:

Channel	ADC Mode	Touch Screen Mode
0	Battery Voltage	Touch_X1
1	Battery Current	Touch_X2
2	Application voltage (VBP)	-
3	Charger Voltage	Touch_Y1
4	Charger Current	Touch_Y2
5	General Purpose ADIN5	-
6	General Purpose ADIN6	Contact resistance
7	General Purpose ADIN7	Contact resistance

Synchronous Serial Interface (SSI)

The ConnectCore for i.MX51 module provides up to three synchronous serial interfaces (SSI) that allows communicating with a variety of serial devices as standard CODECs, audio CODECs implementing the I²S standard and Intel AC97 standard.

SSI is typically used to transfer samples in a periodic manner. The SSI consists of independent transmitter and receiver sections with independent clock generation and frame synchronization.

The main features of the SSI interface are the following:

- Independent (asynchronous) or shared (synchronous) transmit and receive sections operating in Master or Slave mode
- Normal mode operation using frame sync
- Network mode operation allowing multiple devices to share the port with as many as 32 time slots
- Two sets of four 15 x 32 bits Transmit and Receive FIFOs.
- Programmable data interface mode such like I²S, LSB, MSB aligned
- Programmable word length 8, 10, 12, 16, 18, 20, 22 or 24 bits
- Program options for frame sync and clock generation
- Programmable I²S modes (Master, Slave or Normal)
- AC97 support

External Memory Interface (EMI)

The module provides access to the external memory controller. This memory controller handles the interface to devices external to the chip, including generation of chip selects, clock and control for external peripherals and memory. It provides asynchronous access to devices with SRAM-like interface and synchronous access to devices with NOR Flash like or PSRAM like interfaces.

The following lines of the memory controller are available on the module connectors:

- Support for multiplexed address/data bus operations
 - 16-bit data/28-bit address in non-multiplexed address/data mode
 - 16-bit or 32-bit data/28-bit address in multiplexed address/data mode
- Programmable data port size of each chip select
- 28-bit address bus
- Up to 5 chip selects
- Read and write control lines
- 2 x byte enable signals
- Register/command selection line (CRE)

Note: 8-bit devices are supported by the EMI connecting to only one of the following three locations:

- EIM_DA[7:0] pads
- EIM_DA[15:8] pads
- EIM_DA[31:24] pads

Connection to the EIM_D[23:16] pads is not supported.

Ethernet 1

The ConnectCore for i.MX51 provides a Fast Ethernet Controller (FEC) designed to support both 10 and 100 Mbps Ethernet/IEEE 802.3 networks. A low power consumption 10/100 Ethernet transceiver (LAN8710A) from SMSC is used on the module to complete the interface to the media.

The module does not provide a transformer and Ethernet connector.

The PHY address on the MII bus is 0x7 (0b00111).

The module also provides two status signals for activity and link LEDs.

Ethernet 2

The ConnectCore for i.MX51 module can provide a high-performance 10/100Mbit Ethernet controller (LAN9221) with integrated MAC and PHY from SMSC as a second Ethernet port.

The main features of this Ethernet controller are the following:

- Embedded 16 Kbyte FIFO for packet buffers
- Support burst-mode read for highest performance applications
- Configurable interrupt pin with programmable hold-off timer
- Compatible with IEEE 802.3, 802.3u standards
- Integrate Fast Ethernet MAC/PHY transceiver in one chip
- 10Mbps and 100Mbps data rate
- Full and half duplex operations
- 10/100Mbps Auto-negotiation operation
- Twisted pair crossover detection and auto-correction (HP Auto-MDIX)
- IEEE 802.3x flow control for full-duplex operation
- Wake-on-LAN capabilities
- LED pins for various network activity indications

The Ethernet controller is connected to CS5#. Its programmable polarity interrupt output is connected to the signal GPIO1_9.

The module does not have a transformer and Ethernet connector.

The module provides two status signals for activity and link LEDs.

I²C

The module provides two I²C interfaces. The I²C interfaces operate up to 400Kbps, depending on pad loading and timing. The I²C system is a true multiple master bus including arbitration and collision detection.

The I²C port 2 interface is available on the development board (header P22). Two 2K2 pull-up resistors are provided on the module.

The I²C port 1 interface is available through the main module connectors (J1 and J2) as well as on the corresponding signal rail connectors (J25 and J26), multiplexed with other interface functionality. The development board does not provide a dedicated header for access to I²C port 1.

The I²C port 1 signals are available through the main module connectors as outlined below:

- I²C1_SDA:
 - J1.141 - EIM_D16 (used on the module for external Ethernet controller, if present)
 - J2.111 - SPI1_MOSI (used on the module as communication channel for Freescale PMIC)
 - J2.86 - SD2_CLK (used on the module as communication channel for Wireless LAN interface, if present)
- I²C1_SCL:
 - J1.144 - EIM_D19 (used on the module for external Ethernet controller, if present)

- J2.115 - SPI1_SCLK (used on the module as communication channel with Freescale PMIC)
- J2.88 - SD2_CMD (used on the module as communication channel for Wireless LAN interface, if present)

The I²C interface provides the following capabilities:

- Compatibility with I²C bus standard
- Multiple-master operation
- Software programmable for one of 64 different serial clock frequencies
- Software selectable acknowledge bit
- Start and stop signal generation detection
- Repeated START signal generation
- Acknowledge bit generation/detection
- Bus-busy detection

Video Subsystem

The i.MX51 processor has a video subsystem that includes the following modules:

- Video Processing Unit (VPU): a multi-standard video encoder/decoder
- Image Processing Unit (IPU): providing connectivity to displays, related processing, synchronization and control
- TV encoder (TVE) bridge: providing optional translation from the digital display interface supported by the IPU to SDTV analog and some HDTV interfaces

Video Processing Unit (VPU)

The video processing unit of the i.MX51 is a high performance, multistandard video processing unit that can perform H.264 BP/MP/HP, VC-1 SP/MP/AP, MPEG4 SP/ASP, Divx, RV8/9, and MPEG2 MP decoding up to 1920 × 1088 resolution. It supports multiple video codecs simultaneously.

The detailed features of the VPU are as follows:

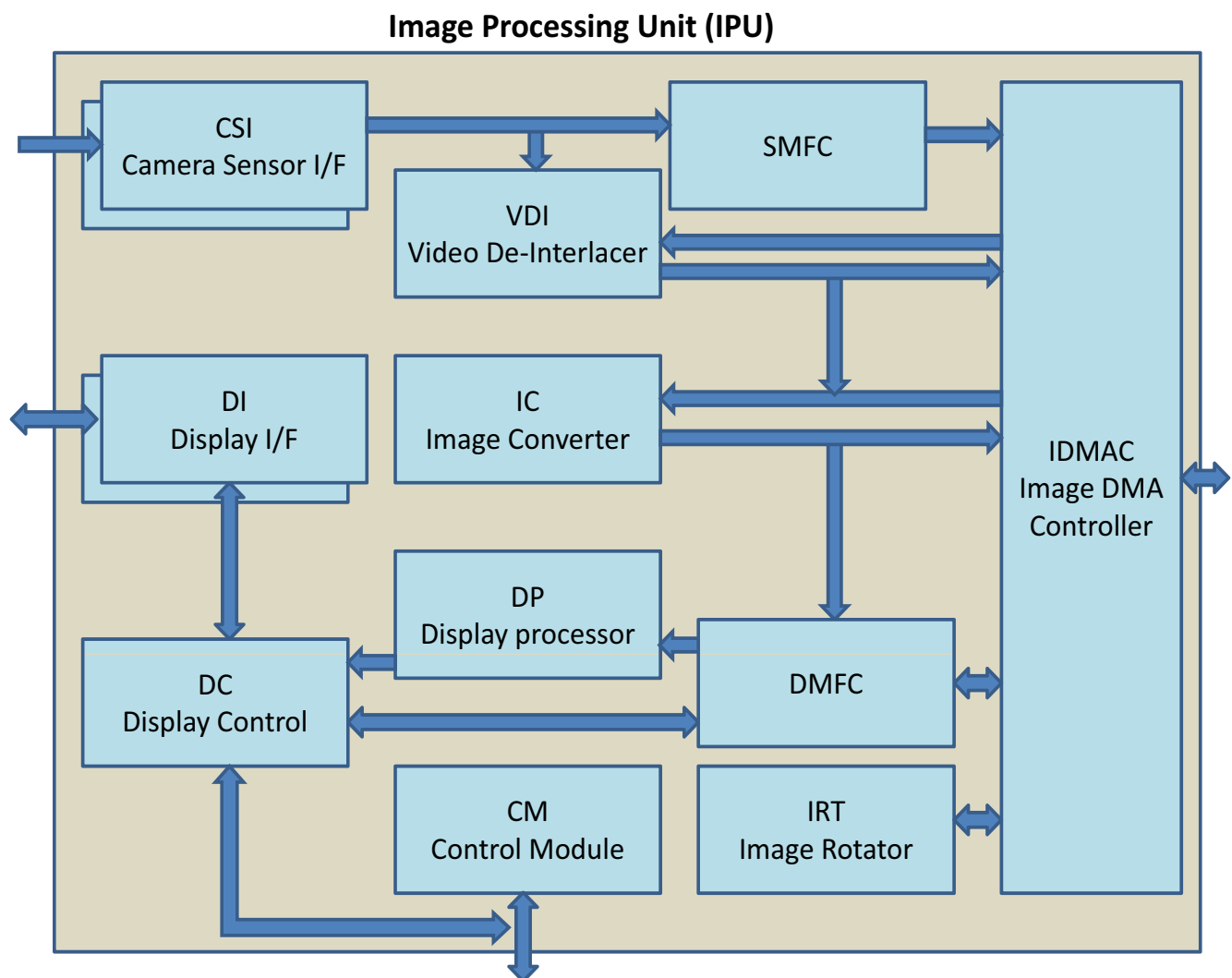
- Multi-standard video codec
 - H.264/AVC decoder for baseline profile, main profile and high profile
 - VC-1 decoder for simple profile, main profile and advanced profile
 - MPEG-4 decoder for simple profile, advanced simple profile except GMC
 - H.263 decoder for baseline profile
 - Divx Home Theater decoder for profile (version 3.x, 4.x, 5.x, 6.x) and Xvid
 - MPEG-2 decoder for main profile @ high level
 - RV decoder for profile 8/9/10

- H.264/AVC encoder for baseline profile
- MPEG-4 encoder for simple profile
- H.263 encoder for baseline profile
- MJPEG encoder for baseline profile
- Multiple codec: supports up to 4 decoding/encoding processes simultaneously, each process can have a different format
- Other features
 - Supports rotating and mirroring simultaneously.
 - Built-in de-ringing filter
 - Built-in de-blocking filter for MPEG-2/MPEG-4/Divx
 - Simultaneous multi-stream and multi-standard processing capability
 - Robust error detection

Image Processing Unit (IPU)

- Connect relevant devices - cameras, displays, graphics accelerators, TV encoders and decoders
- Related image processing and manipulation: sensor image signal processing, display processing, image conversions, etc.
- Synchronization and control capabilities (for example, to avoid tearing artifacts)

The following figure shows the simplified block diagram of the IPU:



The image processing unit has the following blocks:

- Camera Sensor Interface - CSI
 - Controls a camera port; provides interface to an image sensor or a related device. The ConnectCore for i.MX51 has two camera blocks.
- Display Interface - DI
 - Provides interface to displays, display controllers and related devices. The ConnectCore for i.MX51 has two camera blocks.
- Display Controller - DC
 - Controls the display ports
- Display Processor - DP
 - Performs the processing required for data sent to display
- Image Converter - IC
 - Performs resizing, color conversion/correction, combining with graphics, and horizontal inversion
- Video De Interlacer - VDI
 - Performs video de interlacing (interlaced -> progressive)
- Image Rotator - IRT
 - Performs rotation (90 or 180 degrees) and inversion (vertical/horizontal)
- Image DMA Controller - IDMAC
 - Controls the memory port; transfers data to/from system memory
- Sensor Multi FIFO Controller - SMFC
 - Controls FIFOs for output from the CSIs to system memory
- Display Multi FIFO Controller - DMFC
 - Controls FIFOs for IDMAC channels related to the display system
- Control Module - CM
 - Provides control and synchronization

Keypad

The module provides a keypad port that can be used as a keypad matrix interface or as general purpose input/output.

The Keypad port is designed to interface with the keypad matrix with 2-point contact or 3-point contact keys. The Keypad port is designed to simplify the software task of scanning a keypad matrix. With appropriate software support, the Keypad port is capable of detecting, debouncing, and decoding one or multiple keys pressed simultaneously on the keypad.

- Supports up to an 6 × 4 external keypad matrix
- Port pins can be used as general purpose I/O
- Open drain design
- Glitch suppression circuit design
- Multiple-key detection
- Long key-press detection
- Standby key-press detection
- Synchronizer chain clear
- Supports a 2-point and 3-point contact key matrix

Memory Cards

The ConnectCore for i.MX51 module provides up to four MMC/SD/SDIO interfaces.

- MultiMediaCard (MMC)
This is a universal low-cost data storage and communication media that is designed to cover a wide area of applications including mobile video and gaming, WLAN or other wireless networks. Old MMC cards are based on 7-pin serial bus with a single data pin, while the newer high-speed MMC communication is based on an advanced 11-pin serial bus designed to operate at lower voltage.
- Secure Digital (SD) card
This is an evolution of earlier MMC technology. It is specifically designed to meet the security, capacity, performance, and environment requirements inherent in newly emerging audio and video consumer electronic devices. The physical form factor, pin assignment and data transfer protocol are forward compatible with MMC, with some additions. Under the SD protocol, an SD card can be categorized as memory card, I/O card, or combo card (having both memory and I/O functions).

The main features of the Memory Card interfaces are the following:

- Designed to work with MMC, MMC plus, MMC RS, SD memory, miniSD memory, SDIO, and SD Combo. Compatible with the following specifications:
 - MMC System Specification Version 4.2
 - SD Host Controller Standard Specification Version 2.0

- SD Memory Card Specification Version 2.0: supports High-Capacity SD Memory Cards
- SDIO Card Specification Version 2.0
- Supports 1, 4, or 8 bit MMC modes and 1bit or 4 bit SD and SDIO modes
 - Card bus clock frequency up to 52 MHz
 - Up to 416 Mbps of data transfer for MMC cards in 8-bit mode
 - Up to 200 Mbps of data transfer for SD/SDIO cards in 4-bit mode
 - Allows cards to interrupt the host in 1-bit and 4-bit SDIO modes, also supports interrupt period

The following table shows the memory card signals available on the module connectors:

Signal	Memory Card 1	Memory Card 2	Memory Card 3	Memory Card 4
Card Detect (CD #)	√			√
CLK	√	√	√	√
CMD	√	√	√	
LCTL				√
WP#	√			√
DATA3 - DATA0	√	√	√	√
DATA7 - DATA4	√		√	√

PWM

The ConnectCore for i.MX51 module provides two PWM interfaces. These PWM interfaces share the output pad in the i.MX51 CPU with the I²C bus used on the module for the accelerometer. In order to use the PWM signals the I²C bus must be disabled.

The main features of the PWM interface are the following:

- 16-bit up-counter with clock source selection
- 4 × 16 FIFO to minimize interrupt overhead
- 12-bit prescaler for division of clock
- Sound and melody generation
- Active high or active low configured output
- Can be programmed to be active in low power and debug modes
- Interrupts at compare and rollover

RTC

The ConnectCore for i.MX51 provides a Real Time Clock and a Secure Real Time clock.

The real time clock function is provided including time and day counters as well as an alarm function. The RTC utilizes the 32.768KHz crystal oscillator for the time base and is powered by the coin cell backup supply when main supply has dropped below operational range. In configurations where the SRTC is used, the RTC can be disabled to conserve current drain. The accuracy of the 32.768KHz crystal used for the Real-Time Clock is ± 20 ppm.

- RTC accuracy ± 20 ppm
- 17-bit time of day counter
- 15-bit day counter
- Time of day alarm
- Day alarm

The secure real time clock helps to comply with issues arising out of different applications requiring secure and certifiable time, for example Digital Rights Management (DRM) schemes.

The main features of the secure RTC interface are the following:

- Secure 47-bit time counter
- Non-secure 47-bit time counter
- Use-mode protection. The SRTC cannot be configured by non-secured SW.
- Re-programming protection. The SRTC cannot be altered or disabled after SRTC locked.
- Clock source protection
- Programmable secure and non-secure alarms with interrupt

SPDIF

The ConnectCore for i.MX51 has a Sony/Philips Digital Interface Transmitter (SPDIF Tx) audio module that allows the processor to transmit digital audio over it.

For the SPDIF transmitter, the audio data is provided by the processor. Zero is always inserted in the user data. The SPDIF transmitter generates a SPDIF output bitstream in the biphas mark format (IEC958), which consists of audio data, channel status, and user data. In the SPDIF transmitter, the IEC958 biphas bit stream is generated on both edges of the SPDIF transmit clock.

- IEC 60958 format SPDIF output
- 7 transmit clock source
- Consumer channel status support
- Support for interrupt and DMA

SPI

The module provides up to three SPI interfaces that can be configured in either master or slave mode. Two of the SPI interfaces contain one 64 x 32 receive buffer (RXFIFO) and one 64 x 32 transmit buffer (TXFIFO). The other SPI interface contains one 8 x 32 receive buffer and one 8 x 32 transmit buffer.

- Full-duplex synchronous serial interface
- Master/Slave configurable
- Two SPI interfaces support SPI clocks up to 66MHz in both Master and Slave mode
- One SPI interface supports SPI clocks up to 16.5MHz in both Master and Slave mode
- Up to four chip selects (two chip select for SPI1) to support multiple peripherals
- Transfer continuation function allows unlimited length data transfers
- Polarity and phase of the chip select (SS#) and SPI Clock (SCLK) are configurable
- Data ready output signal for fast data communication with fewer software interrupts
- DMA support

Watchdog Timer

The watchdog timer module protects against system failures by providing a method of escaping from unexpected events or programming errors. Once the watchdog module is activated, it must be serviced by the software on a periodic basis. If servicing does not take place, the timer times out. Upon a time-out, the watchdog timer module asserts the internal system reset signal.

- A time-out counter with time-out periods from 0.5 to 128 seconds
- Time resolution of 0.5 seconds
- Configurable time-out counter that can be programmed to run or stop during low-power and debug modes
- Programmable interrupt generation prior to time-out
- Programmable time duration between interrupt and timeout events, from 0 to 128 seconds in steps of 0.5 seconds
- Power down counter enabled out of any reset by default

UART

The module provides up to three UART ports. The UART 1 is a full-modem UART port with all the handshake signals available. The UART 2 and UART 3 ports are 4-wire UART ports with data lines RXD/TXD and the handshake lines RTS#/CTS#.

The main features of these UART ports are the following:

- 7 or 8 data bits
- 1 or 2 stop bits
- Programmable parity (even, odd, and no parity)
- Hardware flow control support for RTS# and CTS# signals (signals direction according to DEC mode)
- Interrupt-based or DMA-based mode
- Serial IR interface low-speed, IrDA-compatible (up to 115.2 Kbps)
- Auto baud rate detection (up to 115.2 Kbps)
- Programmable baud rate (up to 4Mbps)
- Two independent 32-byte FIFOs for receive and transmit

USB Host and USB OTG

The ConnectCore for i.MX51 provides three USB Host interfaces and one USB On-The-Go (OTG) interface. These interfaces conform to the USB 2.0 specification, the OTG supplement, and the ULPI specification.

In addition to the normal USB functionality, the module also supports direct connections to on-board USB peripherals using serial or ULPI protocol. It also has serial/ULPI bypass mode connection and support for multiple interface types of ULPI and serial transceivers.

Main features of the USB Host interfaces:

- High-speed/full-speed/low-speed host
- HS/FS ULPI compliant interface
- Software configurable for full-speed/low-speed interface for serial transceivers
- Full-speed transceiverless link logic (FS-TLL) for on board connection to a FS/LS USB peripheral
- High-speed ULPI transceiverless link logic (HS-TLL) for onboard connection to a high-speed ULPI interface USB peripheral

Main features of the USB OTG interface:

- High-speed OTG
- HS/FS ULPI compliant interface
- Software configurable for ULPI or serial transceiver interface

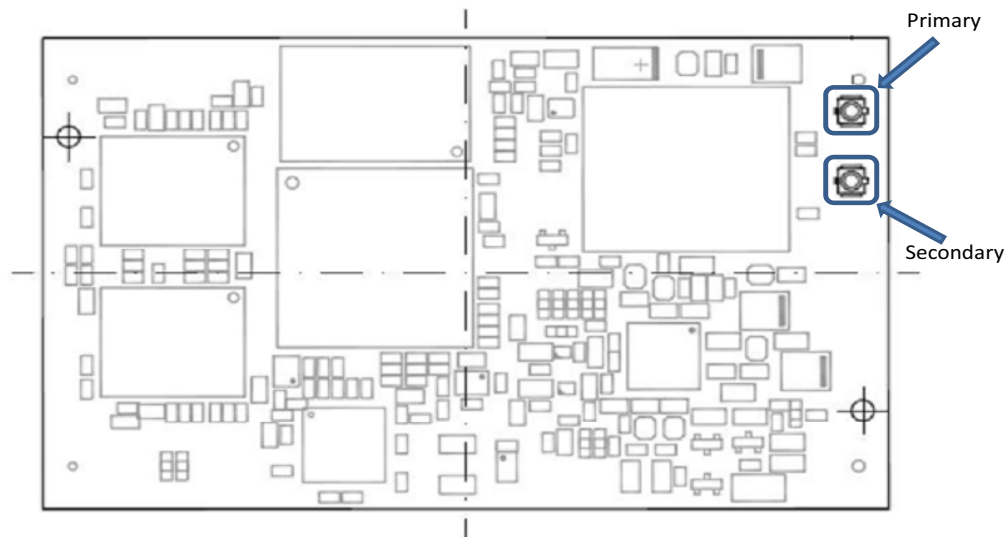
- High-speed (with ULPI transceiver), full-speed, and low-speed operation in host mode
- High-speed (with ULPI transceiver), and full-speed operation in peripheral mode
- Hardware support for OTG signaling, session request protocol, and host negotiation protocol
- Up to 8 bidirectional endpoints

WLAN

WLAN

In addition to the on-module Ethernet interface, the ConnectCore for i.MX51 module can also provide an optional 802.11a/b/g/n WLAN interface with data rates up to 54 Mbps on the a/b/g band and up to 65 Mbps on the n band.

Two U.FL antenna connectors are provided on the module.



On the ConnectCore Wi-i.MX51 module variant, attach the antennas with the U.FL-RP-SMA female cable to the primary connector and secondary connector on the module.

Note: When disconnecting U.FL connectors, the use of a U.FL plug extraction tool (Hirose P/N U.FL-LP-N-2 or U.FL-LP(V)-N-2) is strongly recommended to avoid damage to the U.FL connectors on the module.

To mate U.FL connectors, the mating axes of both connectors must be aligned. The "click" will confirm mated connection. Do not attempt insertion at an extreme angle.

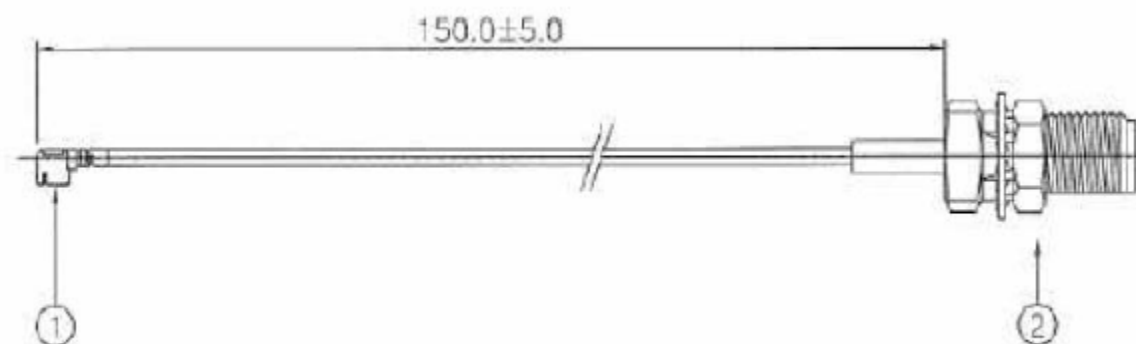
Cable Specification: U.FL/W.FL to RP-SMA

Attributes

Attribute	Property
Impedance	50 Ohm
Frequency Range	0 to 6 GHz
Length	150 mm
Temperature Range	-40° to +90° C
Loss	3.8dB/m (3 GHz) 5.6dB/m (6 GHz)

Dimensions

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



1 = U.FL

2 = RP-SMA

Note: This module obtained its complete certification by using the cable described here. End users in North America should use a cable that matches these specifications to maintain the module's certification.

About the Development Board

C H A P T E R 2

The development board supports the ConnectCore for i.MX51 module. This chapter describes the interfaces of the development board and explains how to configure the board for your requirements.

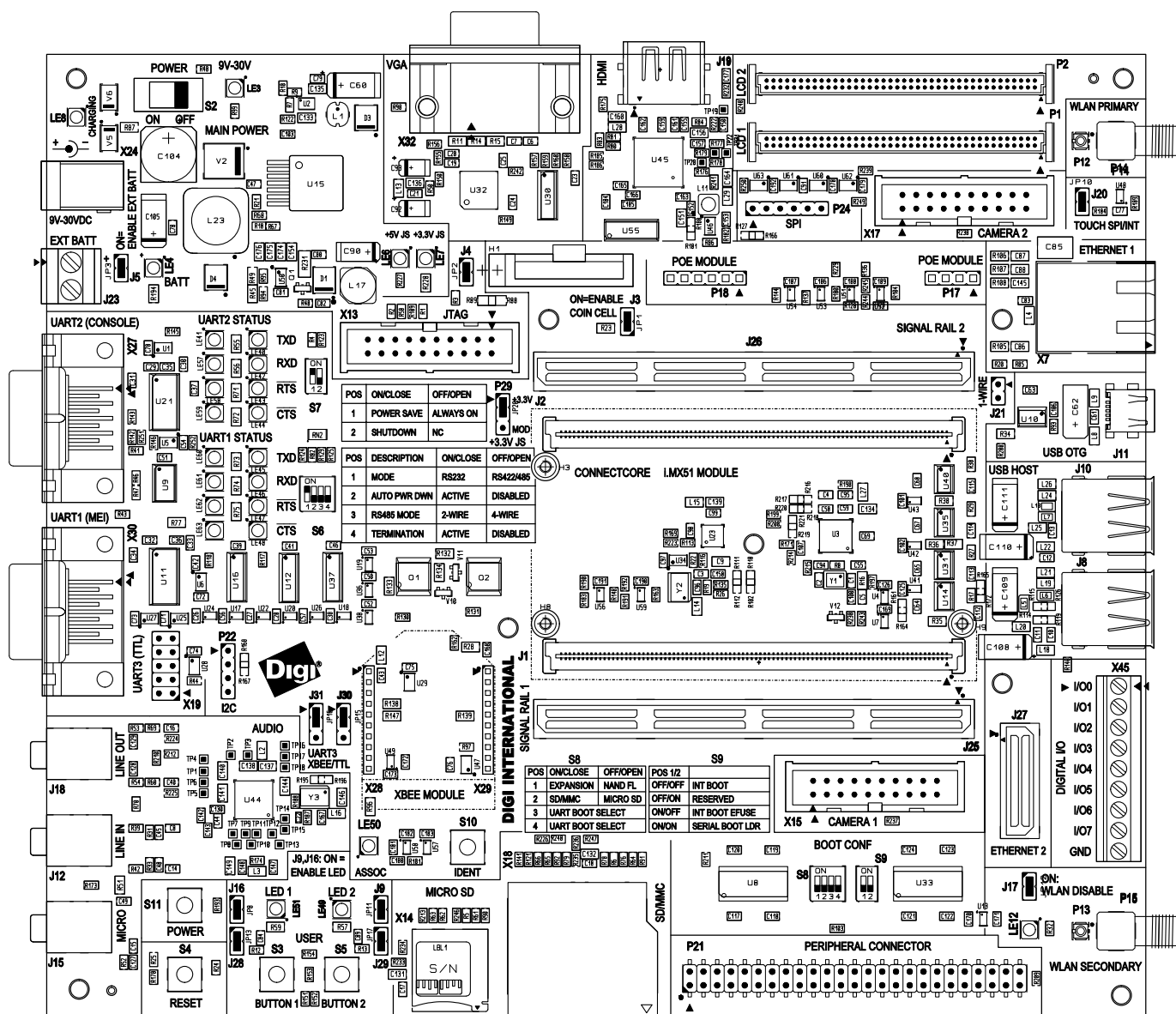
The development board has two 180-pin connectors that mate with the module connectors.

What's on the Development Board?

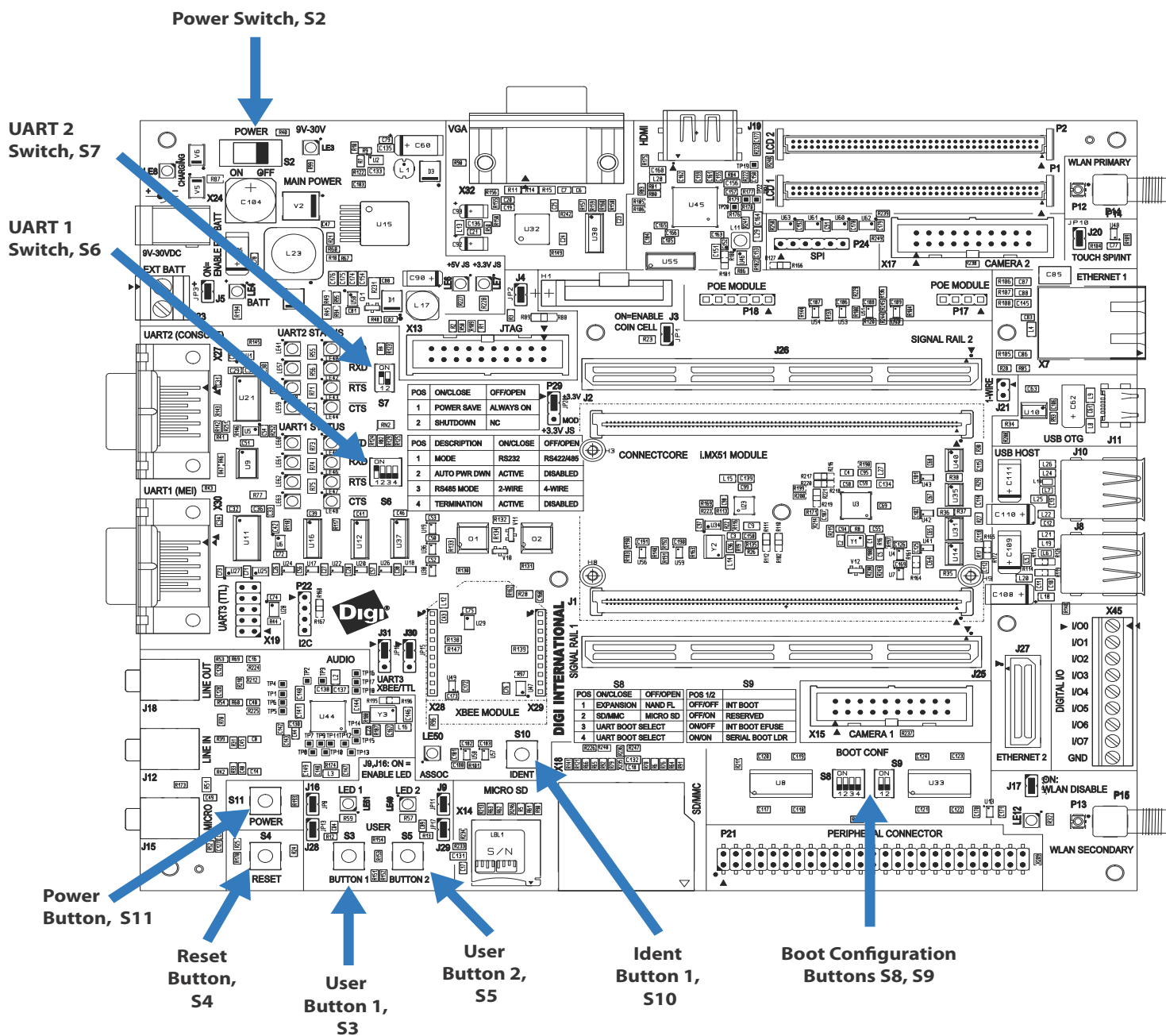
- Flexible 9-30VDC charger power supply with power-on switch
- Screw-flange Battery header with enable jumper
- 3V coin cell battery
- Connectors for Digi 802.3af PoE Application board (sold separately)
- 1 x UART RS232 with status LEDs and SUB-D 9-pin connector
- 1 x UART MEI (RS232/RS4xx) with status LEDs and SUB-D 9-pin connector
- 1 x UART with TTL levels
- 1 x USB OTG connector
- 4 x USB Host connectors
- 1 x SD/MMC card holder
- 1 x MicroSD card holder
- SPI and I²C headers
- Audio interface with Line-out, Line-In and Mic-In jacks
- VGA interface
- HDMI interface
- 2 x LCD connectors with Touch Screen interface
- 2 x Camera connectors
- RJ-45 Ethernet connector
- Connector for a Digi 100M_ETHADPT (sold separately)

- 2 x RP-SMA WLAN antenna connectors
- Screw-flange connector for GPIO
- XBee interface (XBee module sold separately)
- Peripheral application header
- Module Expansion connectors
- JTAG interface
- 2 x User LEDs (green)
- 2 x User Push-buttons
- 1 x Power down Push-button
- 1 x Reset Push-button

57



Switches and Push-buttons



Power Switch, S2

The development board has an ON/OFF switch, S2. The power switch S2 can switch both 9V-30VDC input power supply and 12VDC coming out of the optional PoE module. However, if a power plug is connected to the DC power jack, the PoE is disabled.

Reset Button, S4

The reset push-button S4, resets the module and the peripherals on the development board. A push-button allows manual reset by connecting POR# or optionally RSTIN# to ground.

Power Button, S11

The power button S11, generates a Turn On/Turn Off interrupt to the MC13892 power management device on the module.

The Turn Off event does not directly power off the module. The module is powered off by the processor's response to this interrupt. The software can configure a user initiated power down, or a transition to a low power off mode by pressing this power button.

When in Off mode or in low power mode, the module can be powered via the Turn On event generated by pressing the Power button.

User Buttons, S3 and S5

Use the user push-buttons to interact with the applications running on the ConnectCore for i.MX51 module. Use these module signals to implement the push-buttons:

Signal Name	Button	GPIO Used
DISPB2_SER_DIO/GPIO3_6/USER_KEY1	S3	GPIO3_8
GPIO1_1/SD1_WP#/SPI_MISO/USER_KEY2	S5	GPIO1_1

GPIO3_6 is used in User Button S3 and also in the Digital I/O connector for Digital I/O7.

Ident Button, S10

The Ident push-button S10 is associated to the commissioning input of the Digi XBee modules. This input provides a variety of simple functions to aid in deploying devices in a network. For a deeply description of this functionality please refer to the Digi XBee modules documentation.

Legend for Multi-Position Switches

Switches S6, S7, S8 and S9 are multi-pin switches. In the description tables for these switches, the position is designated as *S[switch number].[pin number]*. For example, position 1 on switch S6 is specified as S6.1.

UART 1 Switch, S6

Use S6 to configure the line interface for serial port 1 MEI:

Switch Pin	Function	Comments
S6.1	On = RS232 transceiver enabled RS4xx transceiver disabled Off = RS232 transceiver disabled RS4xx transceiver enabled	
S6.2	On = Auto Power Down enabled Off = Auto Power Down disabled	Auto Power Down is not supported on this board. This signal is only accessible to permit the user to completely disable the MEI interface for using the signals for other purposes. To disable the MEI interface, go into RS232 mode (S6.1 = ON) and activate the Auto Power Down feature (S1.2 = ON) - be sure that no cable is connected to connector X30.
S6.3	On = 2-wire interface (RS4xx) Off = 4-wire interface (RS422)	
S6.4	On = Termination ON Off = No termination	

UART 2 Switch, S7

Use S7 to configure the line interface for serial port 2 (console):

Switch Pin	Function	Comments
S7.1	On = Power save Off = Normal Operation	If there is a valid RS232 signal at receiver inputs the UART will be in normal operation mode. If there is not a valid RS232 signal at receiver inputs the UART will be in shutdown mode.
S7.2	On = Shutdown Off = Normal Operation	Shutdown is the highest priority functionality. If switch S7.2 = ON, the UART 2 will be in shutdown mode independently of the position of S7.1.

Boot Configuration Switches, S8 and S9

Use S8 to configure the source of the boot code when S9 is configured in internal boot, or to configure the source of the serial download when S9 is configured in serial downloader.

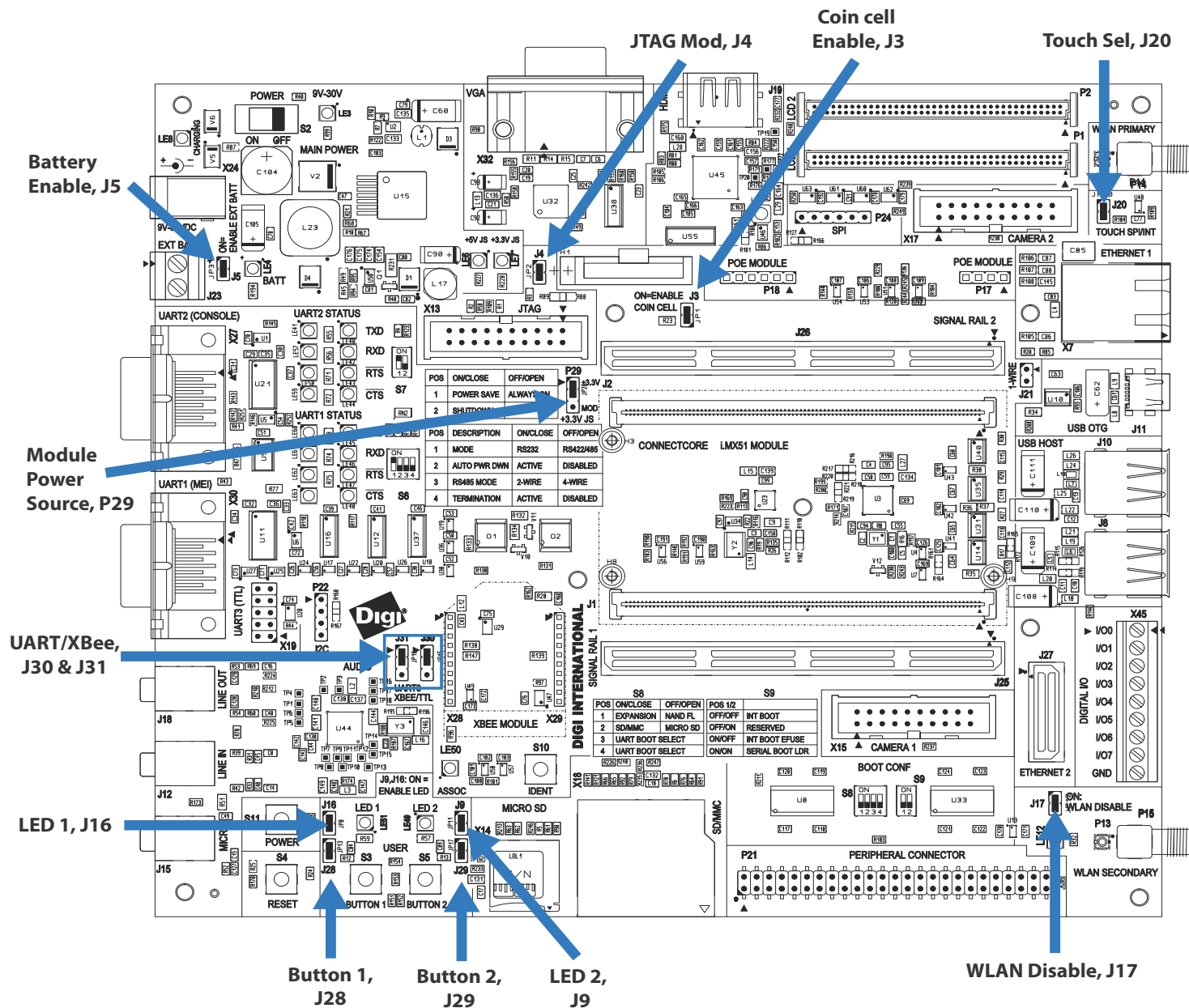
Switch Pin	Function	Comments
S8.1	On = Boot from expansion device Off = Boot from NAND Flash	Applies only if switch S9 is configured in internal boot mode
S8.2	On = Boot from SD/MMC Off = Boot from microSD™	Applies only if switch S9 is configured in internal boot mode and S8.1 is configured to boot from expansion device
S8.3 / S8.4	On / On = UART1 (MEI)	If S9 is configured in serial boot loader
S8.3 / S8.4	On / Off = UART2 (Console)	If S9 is configured in serial boot loader
S8.3 / S8.4	Off / On = UART3 (TTL)	If S9 is configured in serial boot loader
S8.3 / S8.4	Off / Off = Reserved	If S9 is configured in serial boot loader

Use S9 to configure the module boot mode:

Switch Pin	Function	Comments
S9.1 / S9.2	Off / Off	Internal Boot configured by switch S8
S9.1 / S9.2	Off / On	Reserved
S9.1 / S9.2	On / Off	Internal Boot configured by fuse block
S9.1 / S9.2	On / On	Serial downloader

For a detailed description of the ConnectCore for i.MX51 boot mode functionality please refer to the Freescale i.MX51 Processor Hardware Reference Manual.

Jumpers



Battery Enable, J5

When J5 is set, the development board can be powered by an external battery connected to J23.

Module Power Source, P29

When set on positions 1-2, the 3.3V supply of the development board is generated on the +3.3V power regulator (U50).

When set on positions 2-3, the +3.3V supply of the development board is generated on the module.

LED 1, J16

When set, enables the User LED 1 (LE51) to show the status of this signal (on if low).

LED 2, J9

When set, enables the User LED 2 (LE49) to show the status of this signal (on if low).

Button 1, J28

When set, enables the User Button 1 (S3).

Button 2, J29

When set, enables the User Button 2 (S5).

UART3 / XBee Selection, J30 and J31

The UART 3 port is shared on the development board between the XBee module socket and the UART 3 connector (X19).

When J30 and J31 are set to positions 1-2, the UART 3 on the connector (X19) can be used.

When J30 and J31 are set to positions 2-3, the XBee module socket can be used.

WLAN Disable, J17

When set, this jumper disables the WLAN interface on the module.

Touch Selection, J20

When set, an external SPI touch screen controller is configured for the LCD 1 interface and the internal analog touch screen controller (on module) is configured for the LCD 2 interface.

When removed, an internal touch screen controller is configured for the LCD 2 interface, and the internal analog touch screen controller (on module) is configured for the LCD 1 interface.

Coincell Enable, J3

When set, this jumper supplies the real time clock with +3V from the lithium coin cell battery, even if the board is switched off.

JTAG Mod., J4

When set, this jumper disables the JTAG interface for the ConnectCore for i.MX51.

When removed, the JTAG interface is enabled.

WLAN, LE12

LED indicating WLAN operational status.

Power LEDs, LE3, LE4, LE6 and LE7

All power LEDs are red. The power supplies must be present:

- LE3 ON indicates that +9VDC / +30VDC power is present
- LE4 ON indicates that battery power is present
- LE6 ON indicates that +5VDC power for the development board is present
- LE7 ON indicates that +3.3VDC power for the development board is present

User LEDs, LE49 and LE51

The user LEDs are controlled through applications running on the ConnectCore for i.MX51 module. You may use these module signals to implement the LEDs:

Signal Name	Button	GPIO Used
NANDF_RB2/MII_COL/SPI2_SCLK/GPIO3_10	LE51	GPIO3_10
NANDF_RB1/PATA_IORDY/SPI2_RDY/GPIO3_9	LE49	GPIO3_9

Serial Status LEDs

The development board has two sets of serial port LEDs - four for serial port 1 and four for serial port 2. The LEDs are connected to the TTL side of the RS232 or RS4xx transceivers.

- Green means corresponding signal high
- Red means corresponding signal low
- The intensity and color of the LED will change when the voltage is switching

UART 1 Status LEDs

LED Reference		Function
RED	GREEN	
LE60	LE45	TXD
LE61	LE46	RXD#
LE62	LE47	RTS#
LE63	LE48	CTS#

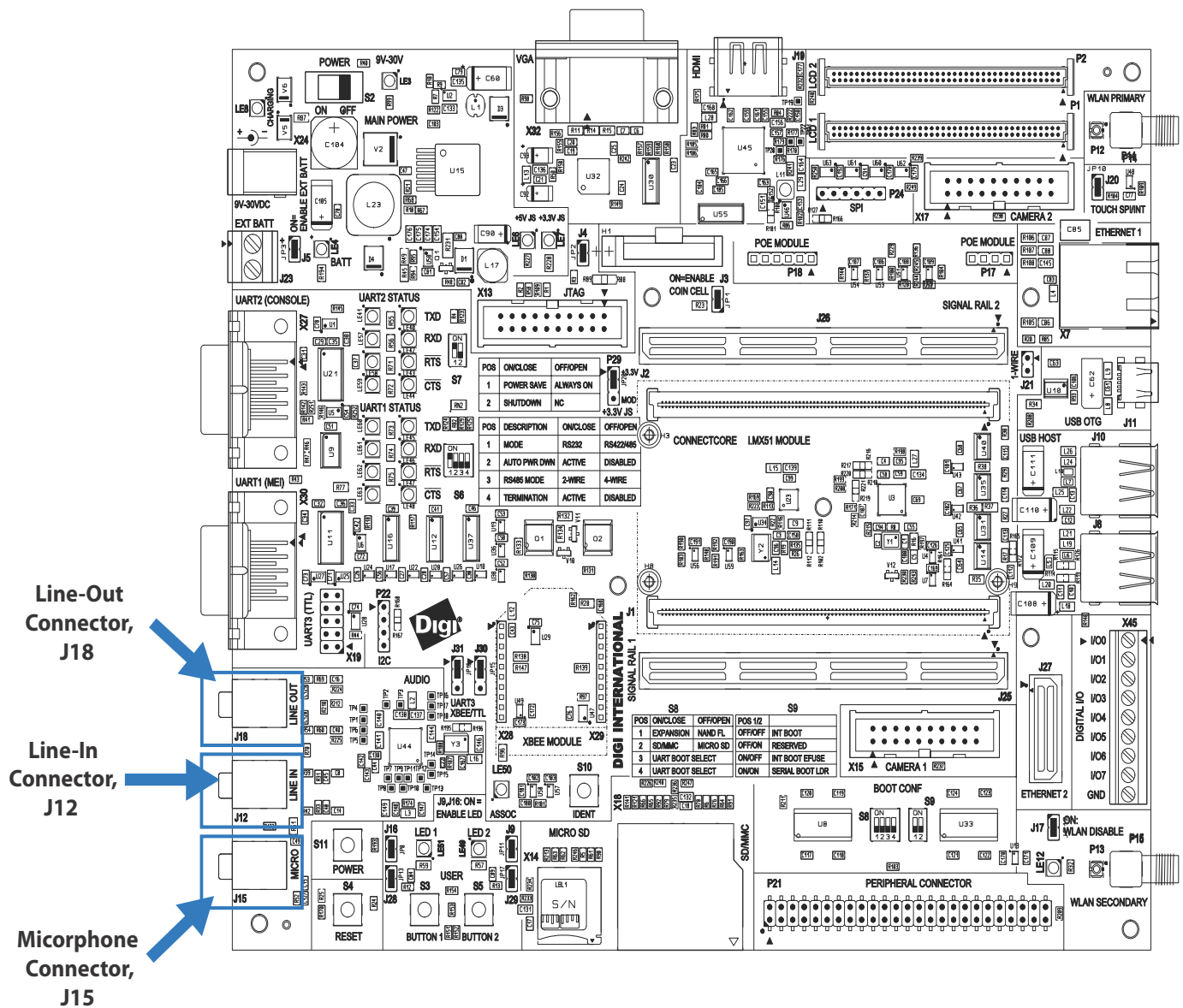
UART 2 Status LEDs

LED Reference		Function
RED	GREEN	
LE41	LE40	TXD
LE57	LE42	RXD
LE58	LE43	RTS#
LE59	LE44	CTS#

XBee Assoc., LE50

This LED is connected to the Associate output of the Digi XBee module. This LED provides information of the device's network status and diagnostics information. For a more in-depth description of this LED please refer to the Digi XBee modules documentation available at www.digi.com.

Audio Interface



The development board provides an audio interface with a line input channel, a line-output channel and a microphone input. A Wolfson WM8753L audio CODEC is used in the development board. This audio CODEC is controlled through the I²C port 2 of the ConnectCore for i.MX51. Digital audio data is sent/received between the audio CODEC and the ConnectCore for i.MX51 through an I²S interface (AUD3 channel of the i.MX51 AUDMUX).

The I²C device address of the audio CODEC is the following:

Interface	I ² C Address (7 bits)
Audio CODEC (WM8753L)	0 x 1A

Three stereo audio jacks are provided on the development board:

- J18 connector for LINE+OUT
- J12 connector for LINE+IN
- J15 connector for microphone

Line-out Connector Pinout, J18

Pin	Signal
1	GND
2	LINE-OUT-RIGHT
3	LINE-OUT-LEFT
4	HEADPHONE-DETECT
5	-

Line-in Connector Pinout, J12

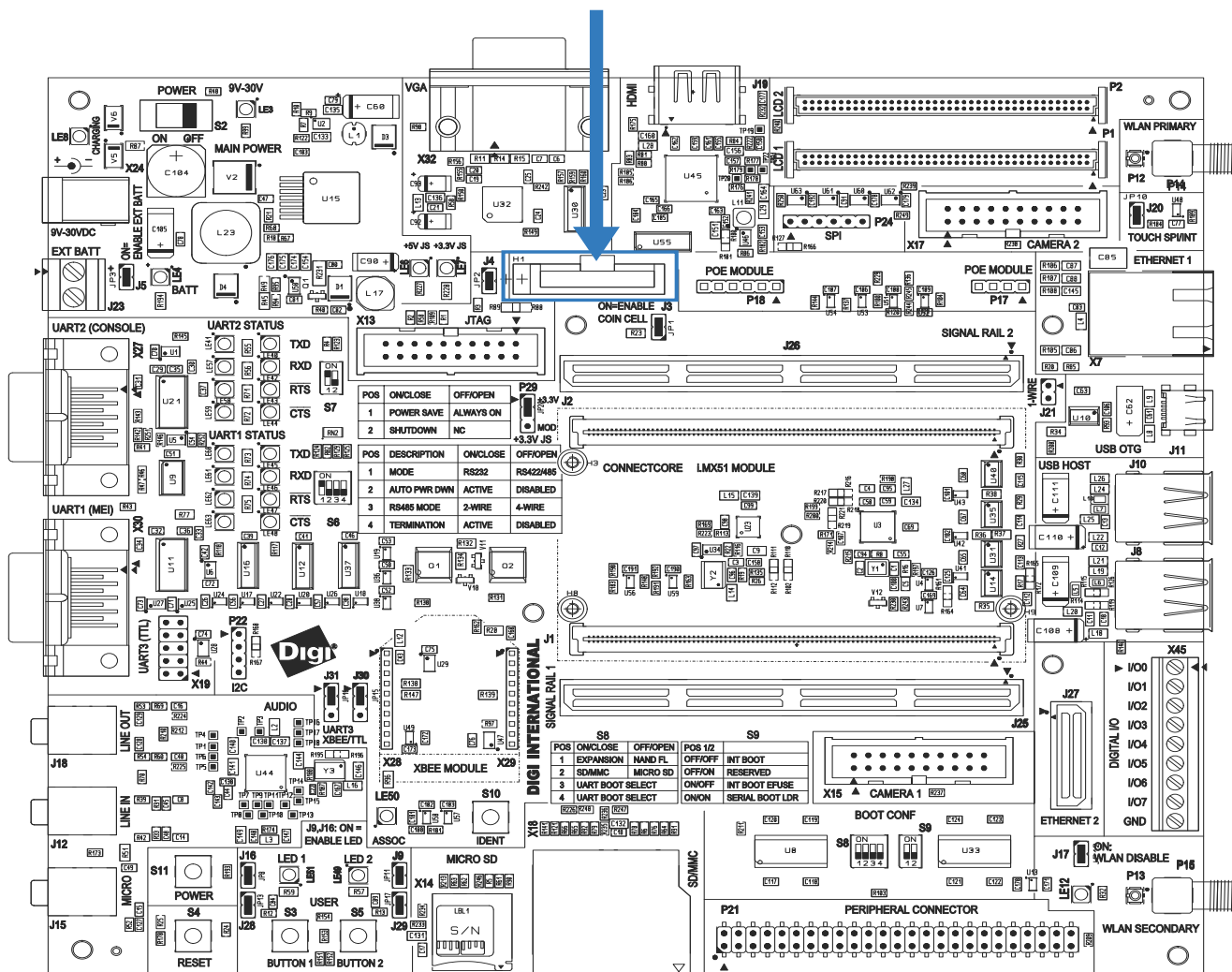
Pin	Signal
1	GND
2	LINE-IN-RIGHT
3	LINE-IN-LEFT
4	GND
5	GND

Microphone Connector Pinou, J15

Pin	Signal
1	GND
2	MIC-IN
3	MICBIAS
4	GND
5	GND

Coin Cell Battery

Coin Cell Battery
Holder, H1



Battery Holder

Vertical Coin-Cell Holder for CR2032 Battery

Keystone 1065

Ettinger 15.61.602

Battery

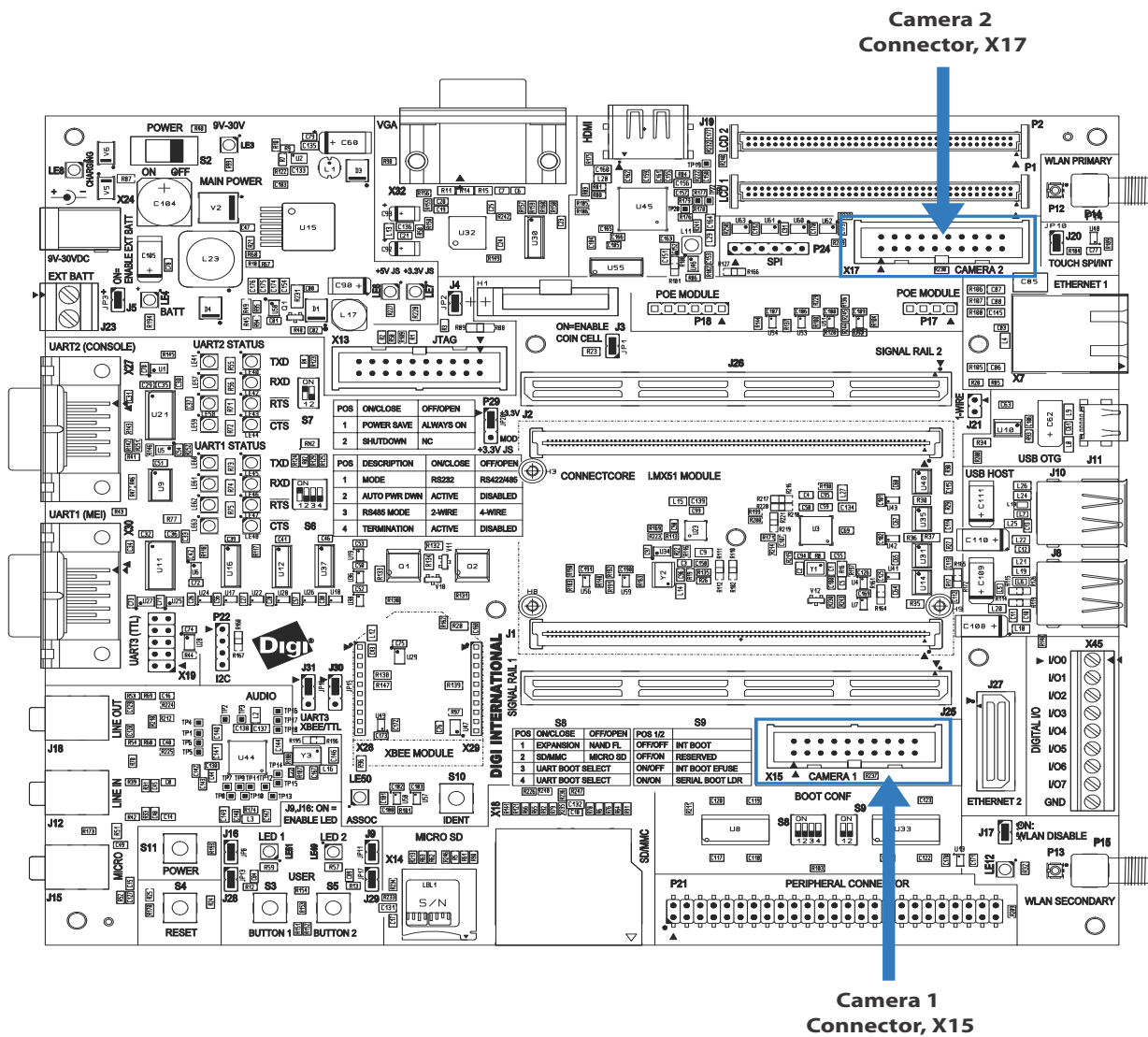
Lithium coin cell, CR2032, 200mAh

Renata CR2032N

Panasonic CR2032N

The development board provides a coin cell battery to back up the module's integrated RTC while main power is disconnected. Jumper J3 controls if the coin cell battery power is available.

Camera Interfaces



The development board provides two camera interfaces connected to the camera sensor interfaces of the ConnectCore for i.MX51 CPU. The I²C bus of the ConnectCore for i.MX51CPU is used to configure and control the two cameras.

The I²C device addresses of the Digi camera application kits (CC-ACC0MT9V111) are the following:

Interface	I ² C Address (7 bits)
Camera 1	0 x 5C
Camera 2	0 x 48

Two 2 x 10 pin headers, X15 and X17, are provided on the development board for connecting two Digi camera application kits (optional) or customer specific hardware.

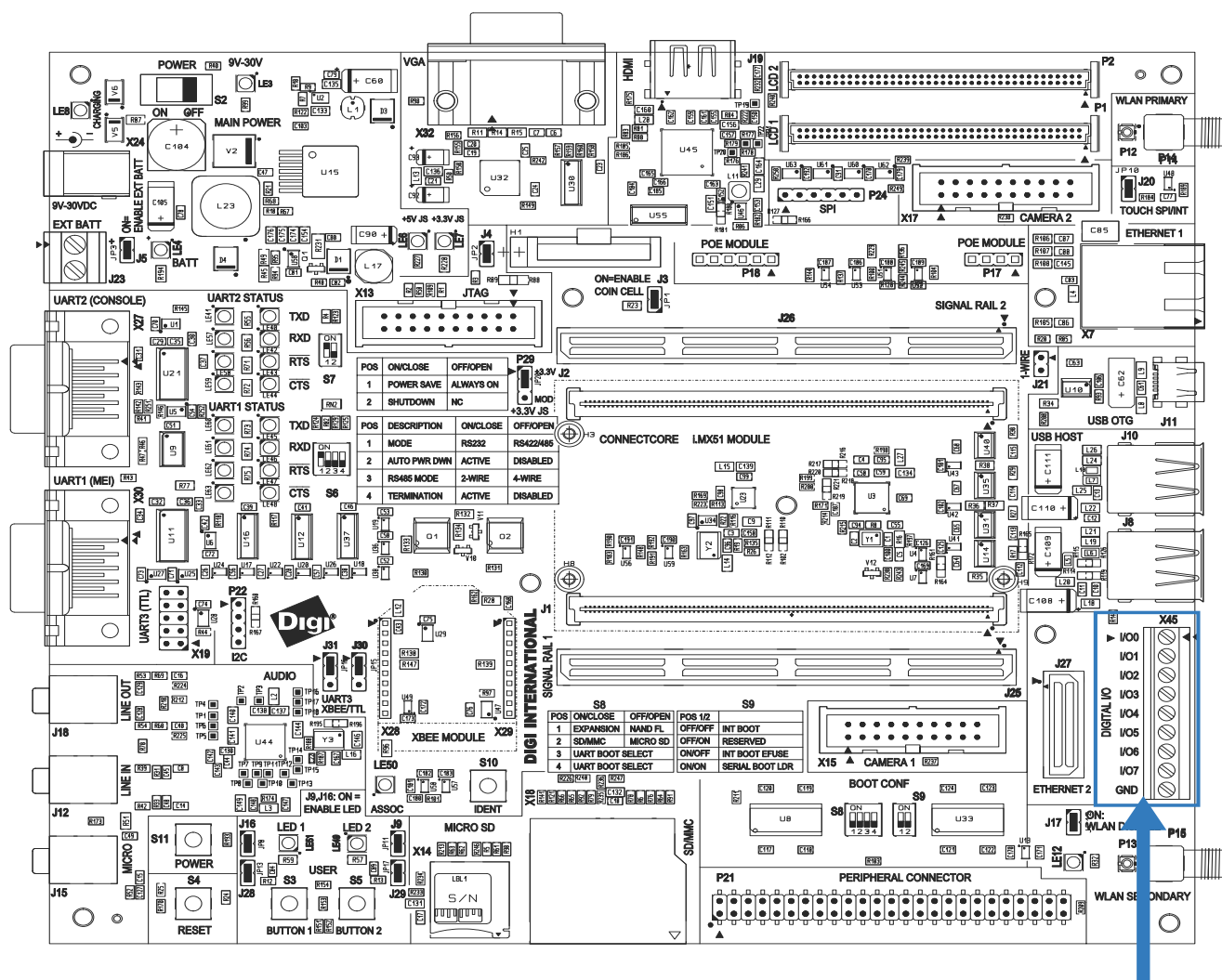
- X15 connector for camera 1
- X17 connector for camera 2

X15 Pinout

Pin	Signal	Pin	Signal
1	+2.775V	2	GND
3	CSI1_D12	4	CSI1_D13
5	CSI1_D14	6	CSI1_D15
7	CSI1_D16	8	CSI1_D17
9	CSI1_D18	10	CSI1_D19
11	CSI1_MCLK	12	CSI1_PIXCLK
13	CSI1_HSYNC/GPIO3_15	14	CSI1_VSYNC/GPIO3_14
15	GPIO1_2/I2C2_SCL	16	GPIO1_3/I2C2_SDA
17	CSI1_D10	18	CAMRESET1#/GPIO3_13/CSI1_D19
19	GND	20	CSI1_D11

X17 Pinout

Pin	Signal	Pin	Signal
1	+2.775V	2	GND
3	CSI2_D12/GPIO4_9	4	CSI2_D13/GPIO4_10
5	CSI2_D14	6	CSI2_D15
7	CSI2_D16	8	CSI2_D17
9	CSI2_D18/GPIO4_11	10	CSI2_D19/GPIO4_12
11	CSI1_MCLK	12	CSI2_PIXCLK/GPIO4_15
13	CSI2_HSYNC/GPIO4_14	14	CSI2_VSYNC/GPIO4_13
15	GPIO1_2/I2SC2_SCL	16	GPIO1_3/I2C2_SDA
17	-	18	CAMRESET2#/GPIO3_7
19	GND	20	-



Digital I/O Connector, X45

Digital I/O Connector, X45

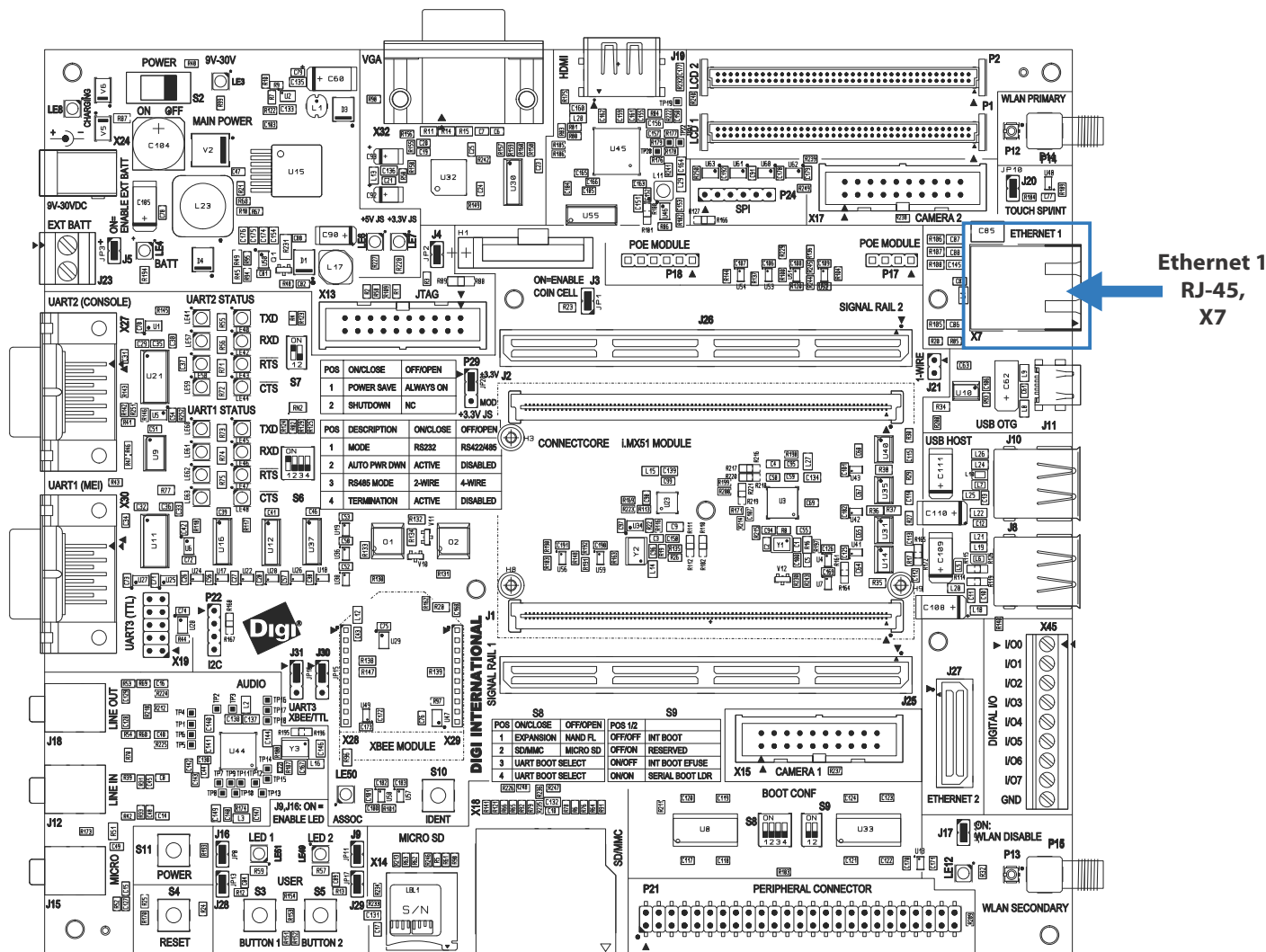
The development board provides a 3.81mm green terminal block, X45, for accessing eight on chip digital GPIOs of the i.MX51 CPU.

Pin	Signal	Voltage Level
1	GPIO3_11/SPI2_MISO/NANDF_RB3	+3.15V
2	GPIO3_18/NANDF_CS2#	+3.15V
3	GPIO3_9/SPI2_RDY/USER_LED2/NANDF_RB1	+3.15V
4	GPIO3_10/SPI2_SCLK/USER_LED1/NANDF_RB2	+3.15V
5	GPIO3_20/NANDF_CS4#	+3.15V
6	GPIO3_21/NANDF_CS5#	+3.15V
7	GPIO3_22/NANDF_CS6#	+3.15V
8	GPIO3_6/DISP2_SER_DIO/USER_KEY1	+2.775
9	GND	0V

On the development board, GPIO3_6 is connected to USER_KEY1. When using this signal as digital I/O, the USER_KEY1 should not be used.

Note: The digital I/O interface is not protected against ESD, over voltage or inverse polarity. Care must be taken when using these signals.

Ethernet 1 Interface



The development board provides one 8-wire RJ-45 jack with integrated 1:1 transformers and link/activity LEDs for the Ethernet 1 interface. This interface is attached to the Fast Ethernet controller (FEC) of the i.MX51. The ConnectCore for i.MX51 module provides a 10/100 Ethernet PHY chip for this interface.

The Ethernet 1 RJ-45 connector also supports 802.3af (PoE).

Ethernet 1, RJ-45 Connector X7

The table below shows the pinout of the Ethernet 1 RJ-45 connector.

Pin	Signal	802.3af End-Span (mode A)	802.3ad Mid-Span (mode B)	Description
1	TXD+	Negative V_{Port}		Transmit data+
2	TXD-	Negative V_{Port}		Transmit data-
3	RXD+	Positive V_{Port}		Receive data+
4	EPWR+		Positive V_{Port}	Power from switch+
5	EPWR+		Positive V_{Port}	Power from switch+
6	RXD-	Positive V_{Port}		Receive data-
7	EPWR-		Negative V_{Port}	Power from switch-
8	EPWR-		Negative V_{PortP}	Power from switch-

The table below shows the description of the Ethernet 1 LEDs.

LED	Description
Yellow	Network activity (speed): - Flashing - indicates network traffic - Off - no network traffic
Green	Network link: - On - indicates an active network link - Off - no network link present

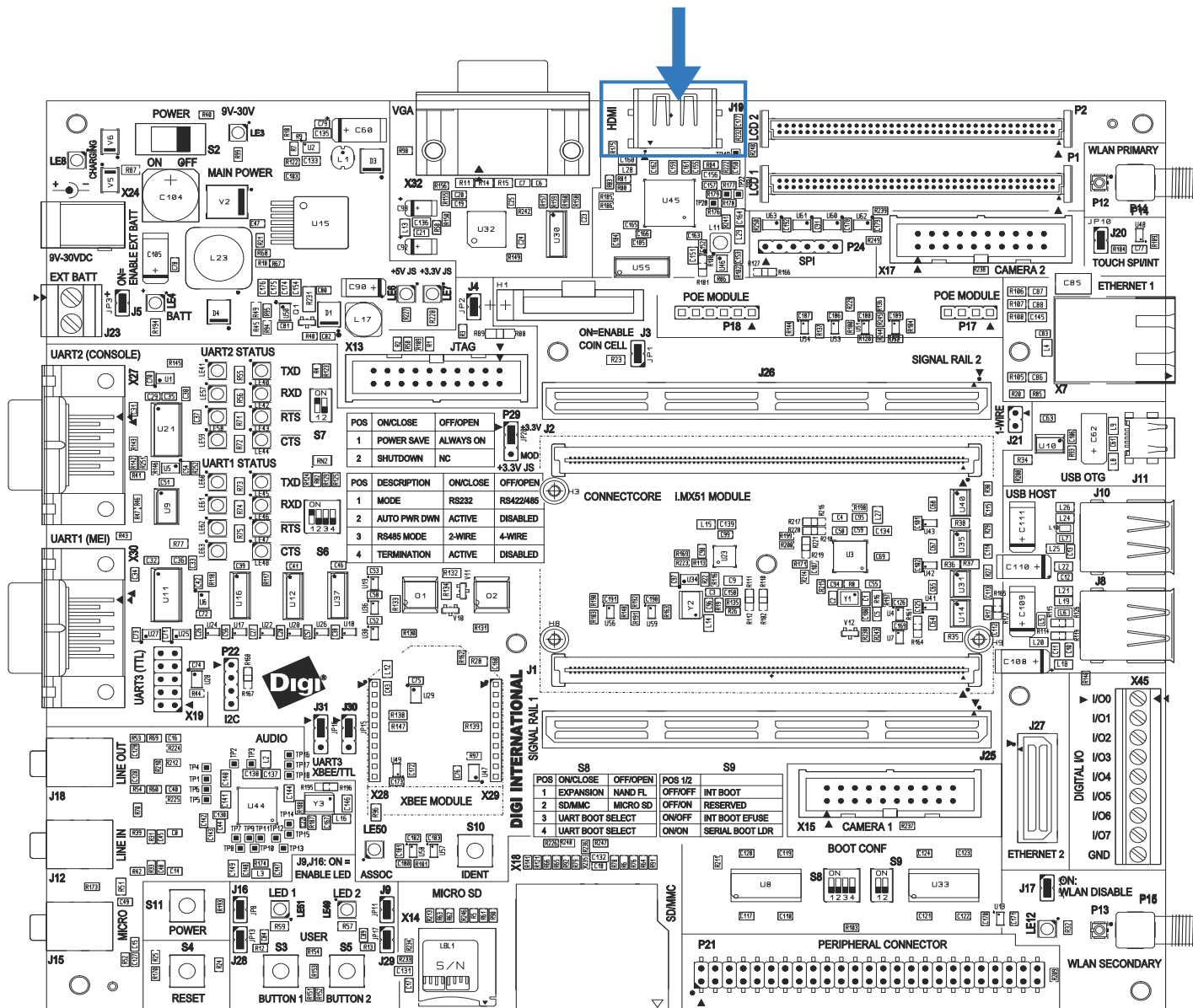
Ethernet 2, Connector J17

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	Reserved (ETH2_DC+)	10	Reserved (ETH2_DD+)
11	Reserved (ETH2_DC-)	12	Reserved (ETH2_DD-)
13	GND	14	GND
15	ETH2_ACTIVITY#	16	ETH2_LINK#
17	-	18	-
19	-	20	-
21	-	22	-
23	-	24	-
25	-	26	-
27	-	28	-
29	-	30	-
31	-	32	-
33	-	34	-
35	-	36	-
37	-	38	-
39	-	40	-

HDMI Interface

HDMI Connector, J19



The development board provides an HDMI interface connected to the display interface 1 of the ConnectCore for i.MX51 CPU. An Analog Devices AD9389 HDMI transmitter is used in the development board. This HDMI transmitter is controlled through the I²C port 2 of the ConnectCore for i.MX51.

The I²C device address of the HDMI transmitter is the following:

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

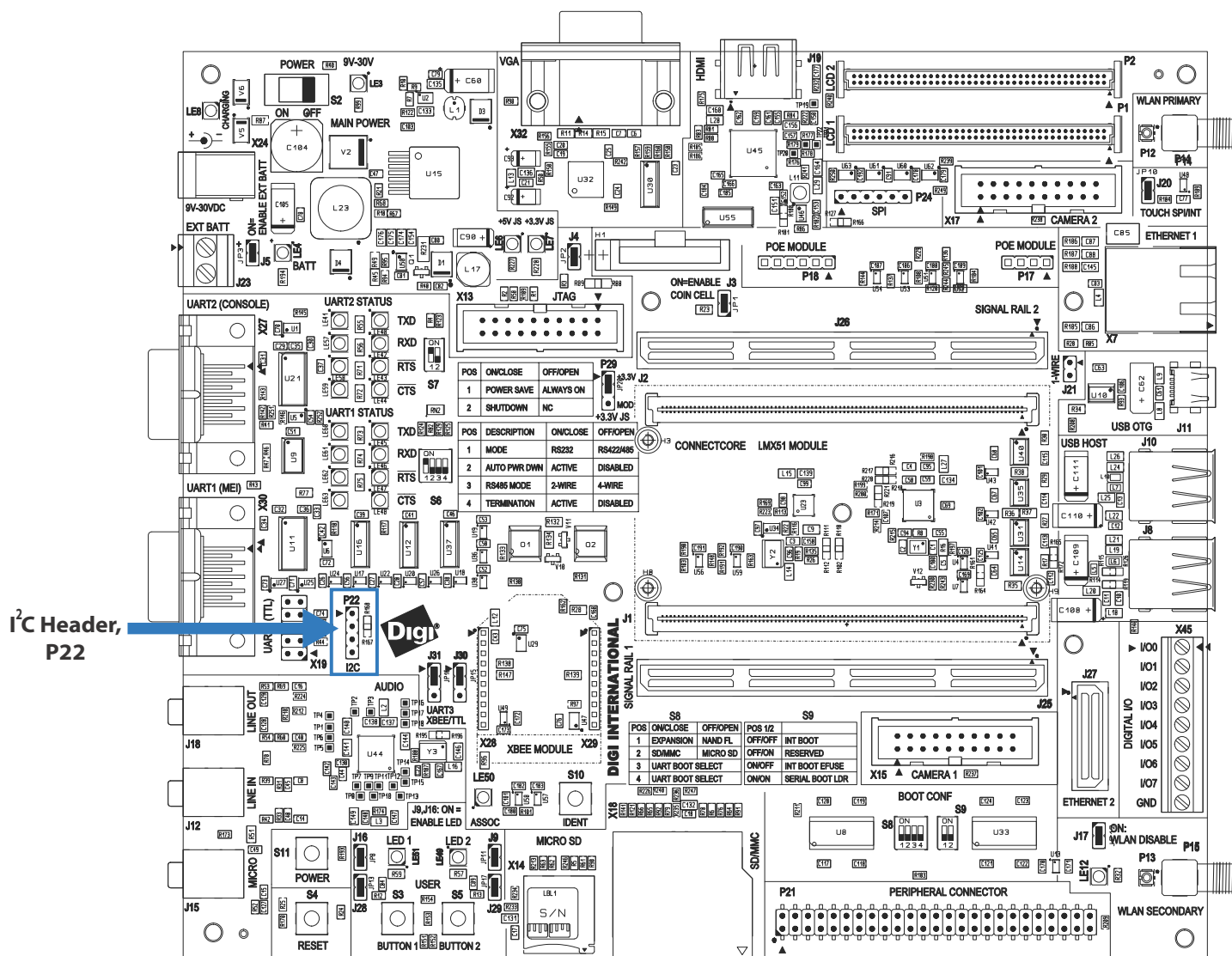
HDMI Connector, J19

The development board provides an HDMI connector, J19. The HDMI interface is connected to the Display 1 interface of the ConnectCore for i.MX51 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



I² C Header, P22

Pin header P22 provides access to the i.MX51 I²C port 2 interface.

The I²C port 2 is connected to the following headers/interfaces on the development board.

Interface	I ² C Address (7 bits)
I ² C Header	-
Camera 1	0 x 5 C (Digi CC-ACC-MT9V111)
Camera 2	0 x 4 8 (Digi CC-ACC-MT9V111)
HDMI Transmitter	0 x 39
LCD 1	-
LCD 2	-
Audio CODEC	0 x 1A
Peripheral connector	-

I²C port 2 is connected to the following interfaces of the ConnectCore for i.MX51 module:

Interface	I ² C Address (7 bits)
Accelerometer (MMA7455L)	0 x 31D

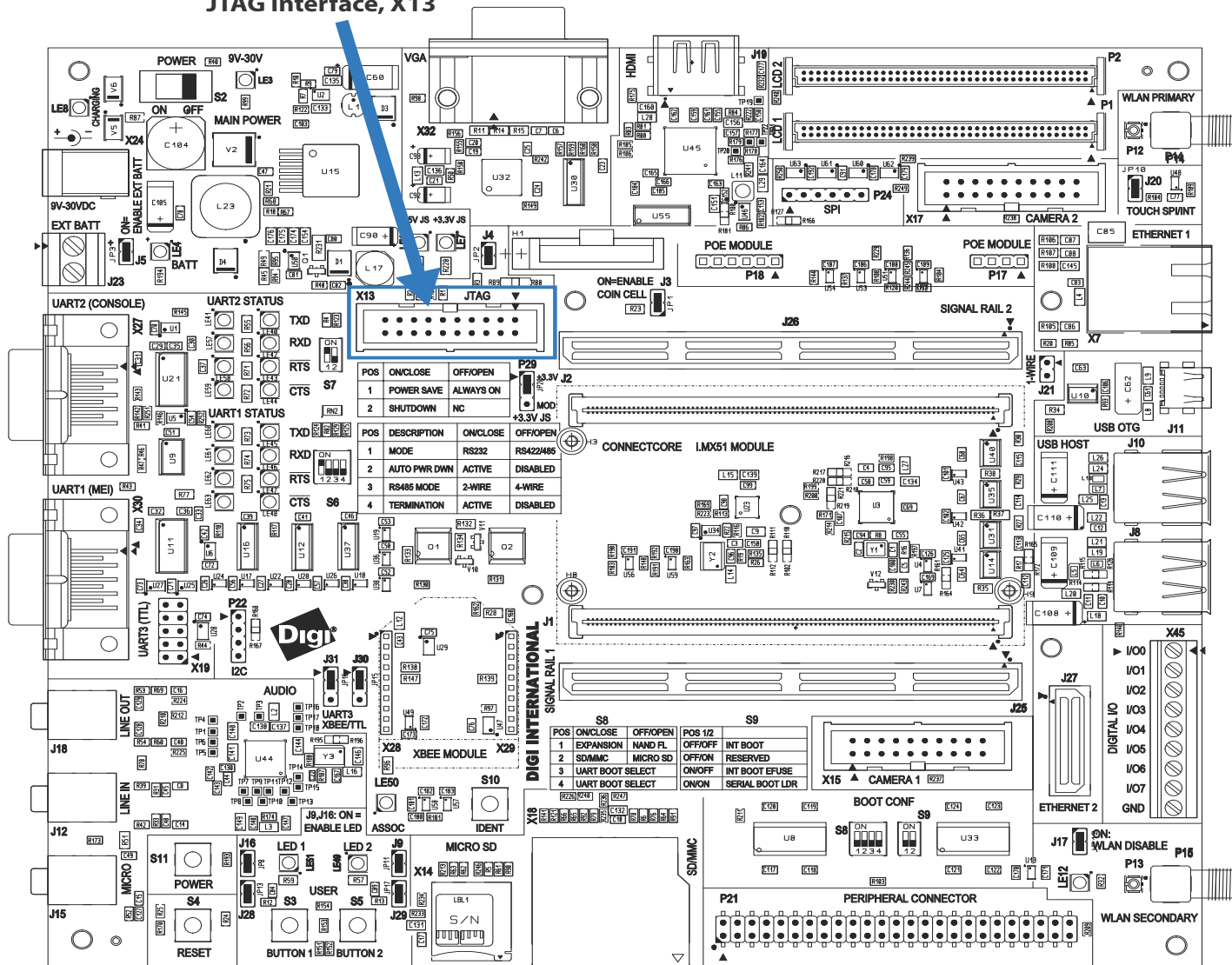
The table below provides the pinout of connector P22:

Pin	Function	Defaults to
1	I ² C_SDA	GPIO1_3
2	+2.775V	
3	I ² _SCL	GPIO1_2
4	GND	

By default, this interface is configured to operate in GPIO mode.

JTAG Interface

JTAG Interface, X13



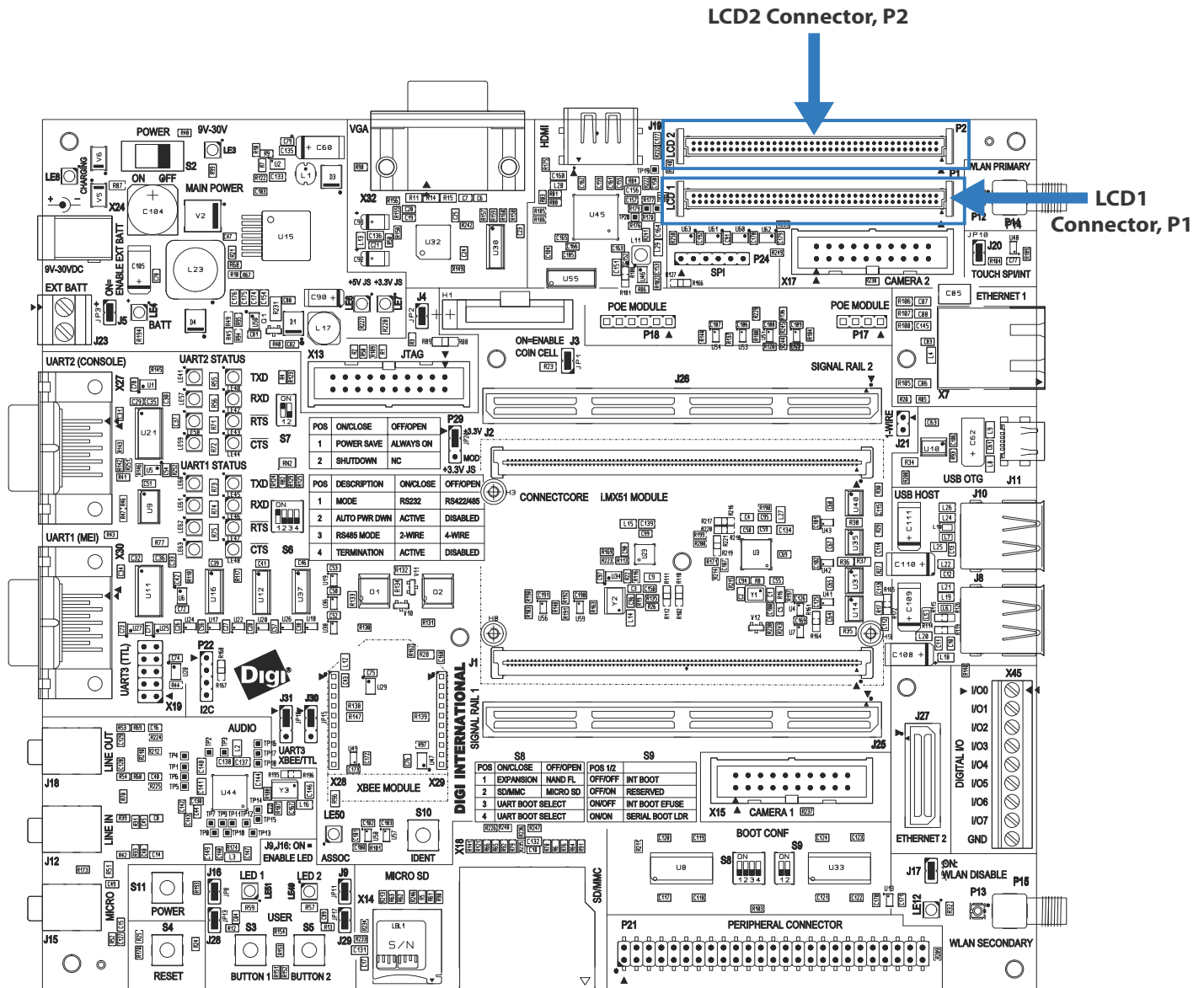
Standard JTAG ARM Connector, X13

The standard JTAG ARM connector is a 20-pin header and can be used to connect development tools (ICS) such as Ronetix PEEDI or other.

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). Please contact us.

LCD Interfaces



The development board provides two 2x40 pin, 1.27mm connectors for accessing a Digi-provided LCD application boards (CC-ACC0LCDW-70) or a user defined LCD application board.

- P1 : corresponds to i.MX51 display interface 1
- P2 : corresponds to i.MX51 display interface 2

LCD 1 Connector, P1

This connector provides access to the following capabilities:

- 18-bit (RGB x 8bit) LCD
- SPI bus for a touch screen controller
- Touch screen (on-module, shared with LCD2)
- Interrupt input for touch screen
- I²C bus
- 2 x GPIO
- +3.3VDC supply and a 9-30VDC supply

P1 Pinout

The table below shows the pinout of the LCD1 connector, P1:

Pin	Function	Pin	Function
1	LCD1_DATA16 (R0)	2	LCD1_DATA17 (R1)
3	LCD1_DATA12 (R2)	4	LCD1_DATA13 (R3)
5	LCD1_DATA14 (R4)	6	LCD1_DATA215(R5)
7	LCD1_DATA16 (R6)	8	LCD1_DATA17 (R7)
9	-	10	-
11	-	12	-
13	GND	14	GND
15	LCD1_DATA10 (G0)	16	LCD1_DATA11 (G1)
17	LCD1_DATA6 (G2)	18	LCD1_DATA7 (G3)
19	LCD1_DATA8 (G4)	20	LCD1_DATA9 (G5)
21	LCD1_DATA10 (G6)	22	LCD1_DATA11 (G7)
23	-	24	-
25	-	26	-
27	GND	28	GND
29	LCD1_DATA4 (B0)	30	LCD1_DATA5 (B1)
31	LCD1_DATA0 (B2)	32	LCD1_DATA1 (B3)
33	LCD1_DATA2 (B4)	34	LCD1_DATA3 (B5)
35	LCD1_DATA4 (B6)	36	LCD1_DATA75 (B7)
37	-	38	-

Pin	Function	Pin	Function
39	-	40	-
41	GND	42	GND
43	LCD1_BIAS	44	LCD1_PCLK
45	LCD1_PWREN#	46	GND
47	LCD1_VSYNC	48	LCD1_HSYNC
49	-	50	-
51	-	52	-
53	-	54	-
55	GND	56	GND
57	TOUCH_X1	58	TOUCH_Y1
59	TOUCH_X2	60	TOUCH_Y2
61	I ² C ² _SDA	62	I ² C ² _SCL
63	LCD_SPI_SS#	64	SPI1_CLK
65	SPI1_MOSI	66	SPI1_MISO
67	RESET#	68	LCD1_TOUCH_INT/EXT#
69	LCD1_GPIO1	70	LCD1_GPIO2
71	LCD_PENIRQ	72	GND
73	+3.3V	74	+3.3V
75	+9-30V	76	+9-30V
77	+9-30V	78	+9-30V
79	-	80	-

LCD 2 Connector, P2

This connector provides access to the following capabilities:

- 18-bit (RGB x 8bit) LCD
- SPI bus for a touch screen controller
- Touch screen (on-module, shared with LCD1)
- Interrupt input for touch screen
- I²C bus
- 2 x GPIO
- +3.3VDC supply and a 9-30VDC supply

P2 Pinout

The table below shows the pinout of the LCD2 connector, P2:

Pin	Function	Pin	Function
1	LCD2_DATA16 (R0)	2	LCD2_DATA17 (R1)
3	LCD2_DATA12 (R2)	4	LCD2_DATA13 (R3)
5	LCD2_DATA14 (R4)	6	LCD2_DATA15 (R5)
7	LCD2_DATA16 (R6)	8	LCD2_DATA17 (R7)
9	-	10	-
11	-	12	-
13	GND	14	GND
15	LCD2_DATA10 (G0)	16	LCD2_DATA11 (G1)
17	LCD2_DATA6 (G2)	18	LCD2_DATA7 (G3)
19	LCD2_DATA8 (G4)	20	LCD2_DATA9 (G5)
21	LCD2_DATA10 (G6)	22	LCD2_DATA11 (G7)
23	-	24	-
25	-	26	-
27	GND	28	GND
29	LCD2_DATA4 (B0)	30	LCD2_DATA5 (B1)
31	LCD2_DATA0 (B2)	32	LCD2_DATA1 (B3)
33	LCD2_DATA2 (B4)	34	LCD2_DATA3 (B5)
35	LCD2_DATA4 (B6)	36	LCD2_DATA5 (B7)
37	-	38	-

Pin	Function	Pin	Function
39	-	40	-
41	GND	42	GND
43	LCD2_BIAS	44	LCD2_PCLK
45	LCD2_PWREN#	46	GND
47	LCD2_VSYNC	48	LCD2_HSYNC
49	-	50	-
51	-	52	-
53	-	54	-
55	GND	56	GND
57	TOUCH_X1	58	TOUCH_Y1
59	TOUCH_X2	60	TOUCH_Y2
61	I ² C ² _SDA	62	I ² C ² _SCL
63	LCD_SPI_SS#	64	SPI1_CLK
65	SPI1_MOSI	66	SPI1_MISO
67	RESET#	68	LCD2_TOUCH_INT/EXT#
69	LCD2_GPIO1	70	LCD2_GPIO2
71	LCD_PENIRQ	72	GND
73	+3.3V	74	+3.3V
75	+9-30V	76	+9-30V
77	+9-30V	78	+9-30V
79	LED_BCK+	80	LED_BCK-

MicroSD™ Connector, X14

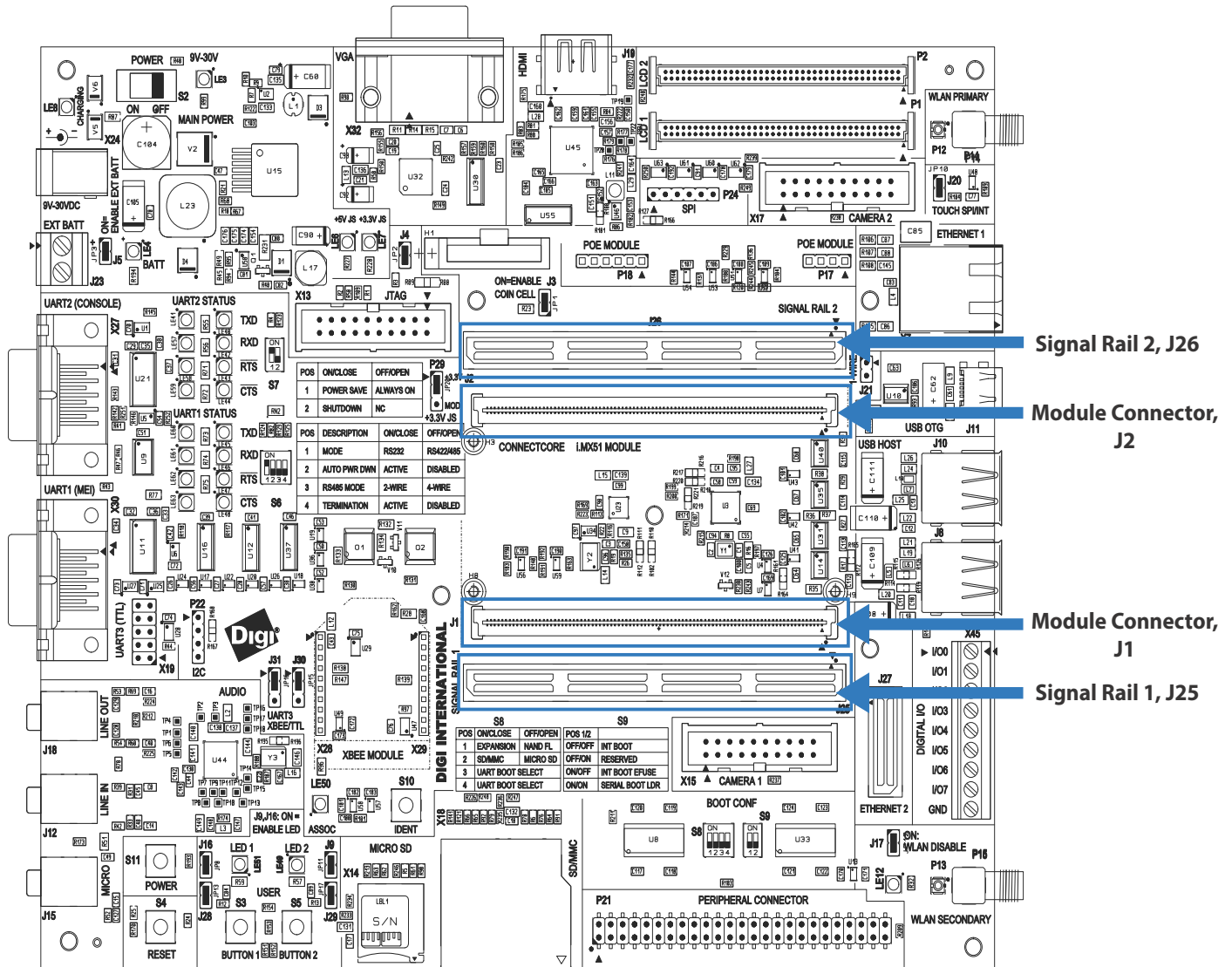
The development board provides one MicroSD™ card connector, X14. This interface is connected to the enhanced Secured Digital Host controller 1 (eSDHC1) of the i.MX51 CPU.

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

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

Pin	Signal
1	SD_SATA2
2	SD_DATA3
3	SD_CMD
4	+3.3V
5	SD_CLK
6	GND
7	SD_DATA0
8	SD_DATA1
9	SD_CD (Connected to chassis)
10	SD_CD (Connected to chassis)

Module Connectors and Signal Rails



Module Connectors

See the "Module Pinout" chapter on page 14 for related information.

Signal Rails, J25 and J26

The development board provides two 2x80 pin signal rails, J25 and J26. These connectors provide most of the signals available on the module connectors and can be used for measurement or development purposes.

- J25 corresponds to module connector J1
- J26 corresponds to module connector J2

J25 Pinout

Pin	Signal	Pin	Signal
1	CSI1_D8	2	CSI1_D9
3	CSI1_D10	4	CSI1_D11
5	CSI1_D12	6	CSI1_D13
7	CSI1_D14	8	CSI1_D15
9	CSI1_D16	10	CSI1_D17
11	CSI1_D18	12	CSI1_D19
13	CSI1_VSYNC/GPIO3_14	14	CSI1_HSYNC/GPIO3_15
15	CSI1_PIXCLK	16	CSI1_MCLK
17	WLAN_TDO	18	WLAN_TCK
19	WLAN_TDI	20	WLAN_TMS
21	WLAN_LED	22	RS_BT_PRIORITY
23	RS_WLAN_ACTIVE	24	RS_BT_ACTIVE
25	+2.775V	26	WLAN_DISABLE#
27	+2.775V	28	+2.775V
29	MC13892_GPO1	30	+2.775V
31	PMIC_PWRON1	32	PMIC_STDBY_REQ
33	PMIC_INT_REQ	34	PWRGTDRV1
35	CHRGLED	36	PWRGTDRV2
37	CHRGSE1#	38	VCC_COINCELL
39	VLIO	40	+5V_IN

Pin	Signal	Pin	Signal
41	VLIO	42	+5V_IN
43	VLIO	44	+5V_IN
45	DISP2_SER_DIN/GPIO3_5	46	DISPB2_SER_DIO/GPIO3_6
47	DISPB2_SER_RS/GPIO3_8	48	DISPB2_SER_CLK/GPIO3_7
49	DISP2_DATA0/MII_RXD3/USBH3_CLK	50	DISP2_DATA1/MII_RX_ER/USBH3_DIR
51	DISP2_DATA2	52	DISP2_DATA3
53	DISP2_DATA4	54	DISP2_DATA5
55	DISP2_DATA6/MII_TXD1/USBH3_STP	56	DISP2_DATA7/MII_TXD2/USBH3_NXT
57	DISP2_DATA8/MII_TXD3/USBH3_DATA0	58	DISP2_DATA9/MII_TXEN/USBH3_DATA1
59	DISP2_DATA10/MII_COL/USBH3_DATA2	60	DISP2_DATA11/MII_RX_CLK/USBH3_DATA3
61	DISP2_DATA12/MII_RX_DV/USBH3_DATA4	62	DISP2_DATA13/MII_TX_CLK/USBH3_DATA5
63	DISP2_DATA14/MII_RXD0/USBH3_DATA6	64	DISP2_DATA15/MII_TXD0/USBH3_DATA7
65	D12_PIN2/MII_MDC	66	D12_DISP_CLK/MII_RXD1
67	D12_PIN4/MII_CRS	68	D12_PIN3/MII_MDIO
69	IOR	70	IOG
71	IOR_BACK	72	IOG_BACK
73	IOB	74	JTAG_TRST#
75	IOB_BACK	76	JTAG_MOD#
77	JTAG_TCK	78	JTAG_DE#
79	JTAG_TMS	80	RESET_IN#
81	JTAG_TDI	82	+1.8V
83	JTAG_TDO	84	EIM_CS1/GPIO2_26
85	POR#	86	EIM_CS3/GPIO2_28
87	EIM_CS0/GPIO2_25	88	EIM_CS5_LAN9221_CS#/GPIO2_30
89	EIM_CS2/GPIO2_27	90	EIM_LBA/GPIO3_1
91	EIM_CS4/GPIO2_29	92	EIM_DA1/TRACE17
93	EIM_DTACK/GPIO2_31	94	EIM_DA3/TRACE19
95	EIM_DA0/TRACE16	96	EIM_DA5/TRACE21
97	EIM_DA2/TRACE18	98	EIM_DA7/TRACE23
99	EIM_DA4/TRACE20	100	EIM_DA9/TRACE25
101	EIM_DA6/TRACE22	102	EIM_DA11/TRACE27
103	EIM_DA8/TRACE 24	104	EIM_DA13/TRACE29
105	EIM_DA10/TRACE26	106	EIM_DA15/TRACE31

Pin	Signal	Pin	Signal
107	EIM_DA12/TRACE28	108	EIM_DA17/TRACE1
109	EIM_DA14/TRACE30	110	EIM_DA19/TRACE3
111	EIM_DA16/TRACE0	112	EIM_DA21/TRACE5
113	EIM_DA18/TRACE2	114	EIM_DA23/TRACE7
115	+3.15V	116	EIM_DA25/TRACE9
117	EIM_DA20/TRACE4	118	EIM_DA27/TRACE11
119	EIM_DA22/TRACE6	120	EIM_DA29/TRACE13
121	EIM_DA24/TRACE8	122	EIM_DA31/TRACE15
123	EIM_DA26/TRACE10	124	EIM_A17/GPIO2_11
125	EIM_DA28/TRACE12	126	EIM_A19/GPIO2_13
127	EIM_DA30/TRACE14	128	EIM_A21/GPIO2_15
129	EIM_A16/GPIO2_10	130	EIM_A23/GPIO2_17
131	EIM_A18/GPIO2_12	132	EIM_A25/GPIO2_19
133	EIM_A20/GPIO2_14	134	EIM_A27/GPIO2_21
135	EIM_A22/GPIO2_16	136	EIM_OE#/GPIO2_24
137	EIM_A24/GPIO2_18	138	EIM_RW#
139	EIM_A26.GPIO2_20	140	EIM_CRE/GPIO3_2
141	EIM_EB0	142	EIM_WAIT
143	EIM_EB1	144	GND
145	EIM_EB2/GPIO2_22/TRCTL	146	EIM_BCLK
147	EIM_EB3/GPIO2_23/TRCLK	148	GND
149	NANDF_ALE/GPIO3_5	150	NAND_RE#/SD3_DATA1/GPIO3_4
151	NANDF_WP#/SD3_DATA2/GPIO3_7	152	NANDF_CLE/GPIO3_6
153	NANDF_RB1_SP12_RDY/GPIO3_9	154	NANDF_RB0/SD3_DATA3/GPIO3_8
155	NANDF_RB3/SP12_MISO/GPIO3_11	156	NANDF_R2/SP12_SCLK/GPIO3_10
157	-	158	-
159	-	160	-

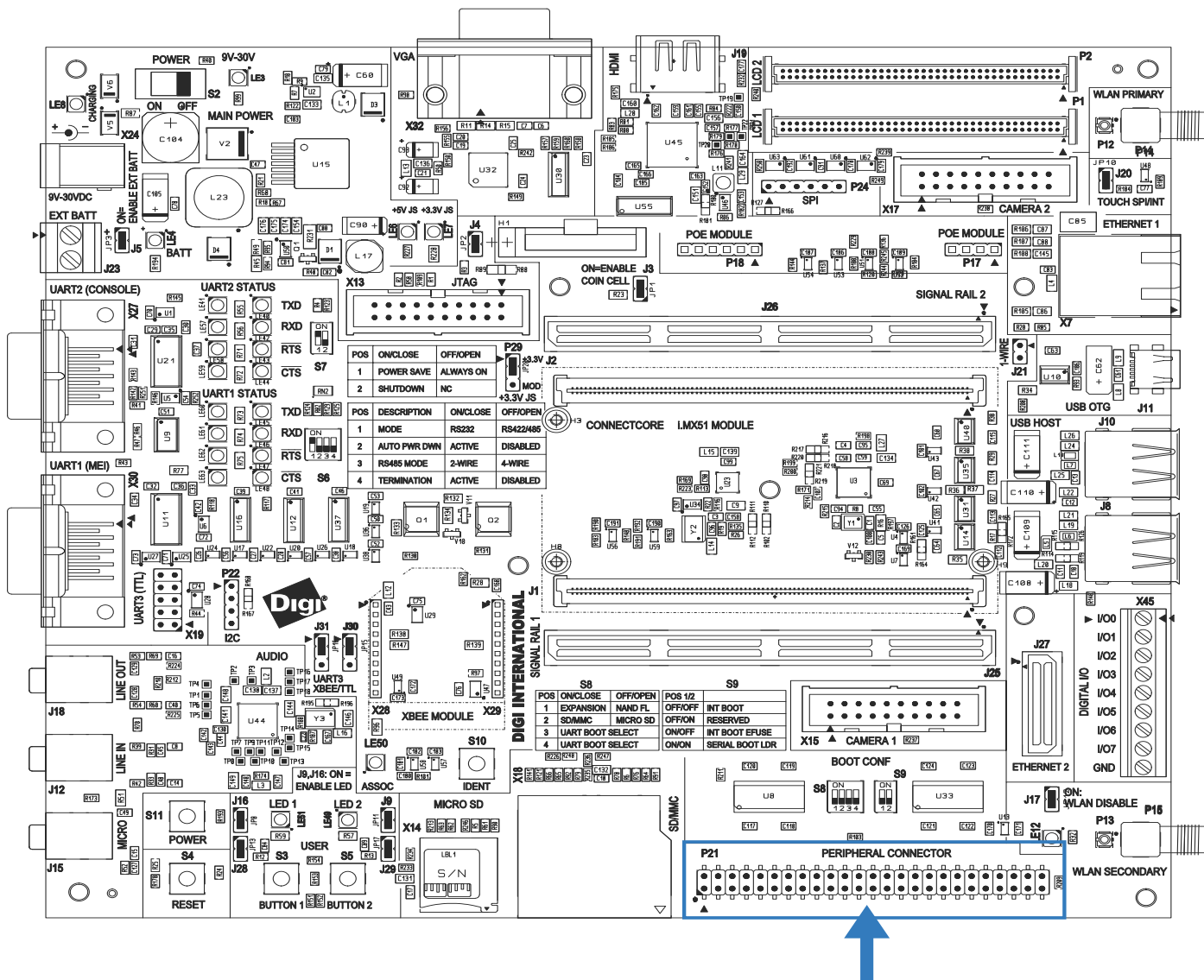
J26 Pinout

Pin	Signal	Pin	Signal
1	DISP1_DAT0	2	DISP1_DAT1
3	DISP1_DAT2	4	DISP1_DAT3
5	DISP1_DAT4	6	DISP1_DAT5
7	DISP1_DAT6	8	DISP1_DAT7
9	DISP1_DAT8	10	DISP1_DAT9
11	DISP1_DAT10	12	DISP1_DAT11
13	DISP1_DAT12	14	DISP1_DAT13
15	DISP1_DAT14	16	DISP1_DAT15
17	DISP1_DAT16	18	DISP1_DAT17
19	DISP1_DAT18	20	DISP1_DAT19
21	DISP1_DAT20	22	DISP1_DAT21
23	DISP1_DAT22	24	DISP1_DAT23
25	DI1_PIN2	26	DI1_DISP_CLK
27	DI1_PIN11/GPIO3_0	28	DI1_PIN3
29	DI1_PIN13/GPIO3_2	30	DI1_PIN12/GPIO3_1
31	DI1_PIN15	32	DI_GP1
33	DI_GP2	34	DI_GP3/MII_TX_ER
35	DI_GP4/MII_RXD2	36	DI1_D0_CS/GPIO3_3
37	DI1_D1_CS/GPIO3_4	38	ADIN5
39	TOUCH_X1	40	ADIN6
41	TOUCH_X2	42	ADIN7
43	TOUCH_Y1	44	ADC_GND
45	TOUCH_Y2	46	ADTRIG
47	SWBST	48	-
49	LEDR	50	-
51	LEDG	52	-
53	LEDB	54	-
55	CSI2_D12/GPIO4_9	56	CSI2_D13/GPIO4_10
57	CSI2_D14	58	CSI2_D15
59	CSI2_D16	60	CSI2_D17

Pin	Signal	Pin	Signal
61	CSI2_D18/GPIO4_11	62	CSI2_D19/GPIO4_12
63	CSI2_VSYNC/GPIO4_13	64	CSI2_HSYNC/GPIO4_14
65	CSI2_PIXCLK/GPIO4_15	66	GPIO1_8/USB_PWR
67	GPIO1_7/MMA7455LR_INT1	68	GPIO1_2/PWM1/I2C2_SCL
69	GPIO1_6/MMA7455LR_INT2	70	GPIO1_3/PWM2/I2C2_SDA
71	CKIH1	72	CLK32K_PER
73	SD2_DATA0/SD1_DATA4/SPI_MOSI	74	CKIH2
75	SD2_DATA1/SD1_DATA5	76	SD2_CLK/I2C1_SDA/SPI_SCLK
77	SD2_DATA2/SD1_DATA6	78	SD2_CMD/I2C1_SCL/SPI_MOSI
79	SD2_DATA3/SD1_DATA7/SPI_SS2	80	KEY_COL0
81	ROW0	82	KEY_COL1
83	ROW1	84	KEY_COL2
85	ROW2	86	KEY_COL3
87	ROW3	88	KEY_COL5/UART3_CTS#/I2C2_SDA
89	KEY_COL4/UART3_RTS#/I2C2_SCL	90	GPIO1_0/SD1_CD#/SPI_SS2
91	OWIRE_LINE/GPIO1_24	92	GPIO1_1/SD1_WP#/SPI_MISO
93	SC1_CMD/AUD5_RXFS/SPI_MOSI	94	SD1_DAT0/AUD5_TXD/SPI_MOSI
95	SD1_CLK/AUD5_RXC/SPI_SCLK	96	SD1_DATA1/AUD5_RXD
97	WDOG1#/GPIO1_4	98	SD1_DATA2/AUD5_TXC
99	CSPI1_MOSI/I2C1_SDA/GPIO4_22	100	SD1_DATA3/AUD5_TXFS/SPI_SS1
101	CSPI1_MISO/AUD4_RXD/GPIO4_23	102	CSPI1_SS0_PMIC/AUD4_TXC/GPIO4_24
103	CSPI1_SCLK/I2C1_SDA/GPIO4_27	104	CSPI1_SS1/AUD4_TXD/GPIO4_25
105	UART1_RXD/GPIO4_28	106	CSPI1_RDY/AUD4_TXFS/GPIO4_26
107	UART1_TXD/PWM2/GPIO4_29	108	UART1_RTS#/GPIO4_30
109	UART2_RXD/GPIO1_20	110	UART1_CTS#/GPIO4_31
111	UART2_TXD/GPIO1_21	112	UART3_RXD/UART1_DTR#/GPIO1_22
113	USBH1_DATA2/UART2_TXD/GPIO1_13	114	UART3_TXD/UART1_DSR#/GPIO_23
115	USBH1_DATA4/SPI_SS0/GPIO1_15	116	USBH1_DATA0/UART2_CTS#/GPIO1_11
117	USBH1_DATA6/SPI_SS2/GPIO1_17	118	USBH1_DATA1/UART2_RXD/GPIO1_12
119	USBH1_DIR/SPI_MOSI/GPIO1_26/ I2C2_SDA	120	USBH1_DATA3/UART2_RTS#/GPIO1_14
121	USBH1_STP/SPI_RDY/GPIO1_27	122	USBH1_DATA5/SPI_SS1/GPIO1_16

Pin	Signal	Pin	Signal
123	USBH1_NXT/SPI_MISO/GPIO1_28	124	USBH1_DATA7/SPI_SS3/SPI2_SS3/ GPIO1_18
125	AUD3_BB_TXD/GPIO4_18	126	USBH1_CLK/SPI_SCLK/GPIO1_25/ I2C2_SCL
127	AUD3_BB_RXD/UART3_RXD/ GPIO4_19	128	HS_I2C_SCL/GPIO4_16
129	AUD3_BB_CK/GPIO4_20	130	HS_I2C_SDA/GPIO4_17
131	+3.3V MOD	132	AUD3_BB_FS/UART3_TXD/GPIO4_21
133	NANDF_D0/PATA_D0/SD4_DATA7/ GPIO4_8	134	+3.3V
135	NANDF_D2/PATA_D2/SD4_DATA5/ GPIO4_6	136	NANDF_D1/PATA_D1/SD4_DATA6/ GPIO4_7
137	NANDF_D4/PATA_D4/SD4_CD/ GPIO4_4	138	NANDF_D3/PATA_D3/SD4_DATA4/ GPIO4_5
139	NANDF_D6/PATA_D6/SD4_LCTL/ GPIO4_2	140	NANDF_D5/PATA_D5/SD4_WP#/GPIO4_3
141	NANDF_D8/PATA_D8/GPIO4_0/ SD3_DATA0	142	NANDF_D7/PATA_D7/GPIO4_1
143	NANDF_D10/PATA_D10/GPIO3_30/ SD3_D2	144	NANDF_D9/PATA_D9/GPIO3_31/SD3_D1
145	NANDF_D12/PATA_D12/GPIO3_28/ SD3_D4	146	NANDF_D11/PATA_D11/GPIO3_29/ SD3_D3
147	NANDF_D14/PATA_D14/GPIO3_26/ SD3_D6	148	NANDF_D13/PATA_D13/GPIO3_27/ SD3_D5
149	NANDF_CS0#/GPIO3_16	150	NANDF_D15/PATA_D15/GPIO3_25/ SD3_D7
151	NANDF_CS2#/PATA_CS0#/GPIO3_18	152	NANDF_CS1#/GPIO3_17
153	NANDF_CS4#/PATA_DA0/GPIO3_20	154	NANDF_CS3#/PATA_CS1#/GPIO3_19
155	NANDF_CS6#/PATA_DA2/GPIO3_22	156	NANDF_CS5#/PATA_DA1/GPIO3_21
157	NANDF_RDY_INT/GPIO3_24	158	NANDF_CS7#/GPIO3_23
159	NANDF_WE#/PATA_DIOW/GPIO3_3	160	GPIO_NAND/PATA_INTRQ/GPIO3_12

Peripheral Application Header



Peripheral Application Header, P21

The development board provides one, 2x25-pin, 2.54mm pitch header for applications-specific daughter cards/expansion boards:

- P21, Peripheral application header. Provides access to a 16-bit data bus, 10-bit address bus and control signals (such as CS#, OE#, WE#), as well as I²C and power (+3.3V). Using these signals you can connect Digi-specific extension modules or your own custom daughter card to the module's address/data bus and other interfaces.

Peripheral Application Header, P21

Pin	Signal	Pin	Signal
1	GND	2	D0
3	D1	4	D2
5	D3	6	GND
7	D4	8	D5
9	D6	10	D7
11	GND	12	D8
13	D9	14	D10
15	D11	16	GND
17	D12	18	D13
19	D14	20	D15
21	GND	22	8-bit / 16-bit (default)
23	GND	24	+3.3V
25	+3.3V	26	A0
27	A1	28	A2
29	A3	30	GND
31	A4	32	A5
33	A6	34	A7
35	GND	36	A8
37	A9	38	GND
39	CS0#	40	I ² C ² _SDA/GPIO1_3
41	WE#	42	OE#
43	I ² C ² _SCL/GPIO1_2	44	GPIO3_2
45	+3.3V	46	+3.3V
47	BE2#	48	BE3#
49	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 most peripheral application signals on this header to +3.3V.

The Data bus signals D0 - D15 are connected to the i.MX51 data bus signals D16 - D31.

The Address bus signals A0 - A9 are connected to the i.MX51 data/address bus signals DA0 - DA9.

The BE2# signal is connected to the i.MX51 byte enable 2 (D16 - D23).

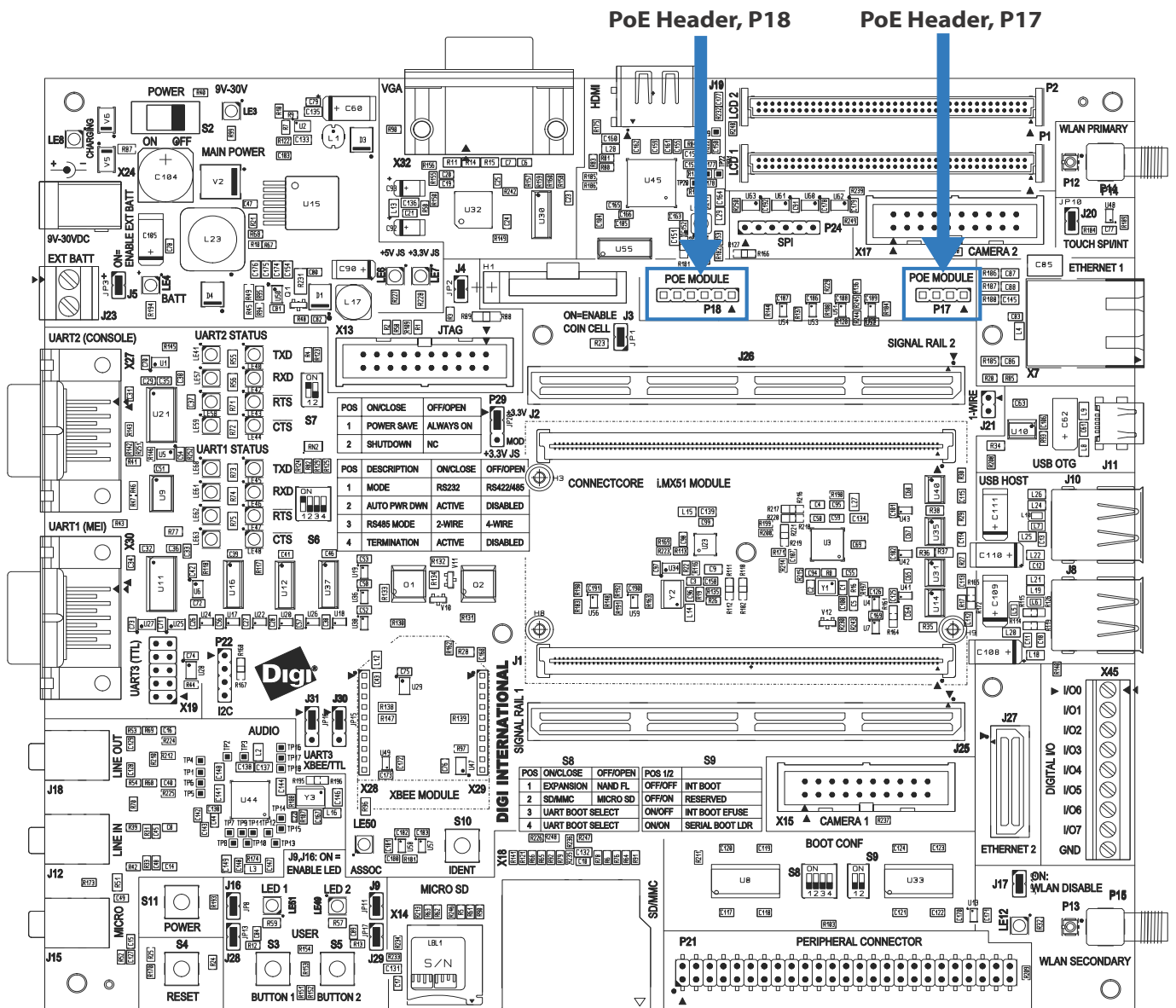
The BE3# signal is connected to the i.MX51 byte enable 3 (D24 - D31).

The BCLK signal corresponds to the i.MX51 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 I²C interface corresponds to i.MX51 I²C port 2. For more information, refer to the I²C chapter in this document.

The signal GPIO3_2 can only be used as an input signal to the i.MX51. This signal is intended to be used as interrupt line in the peripheral boards.

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



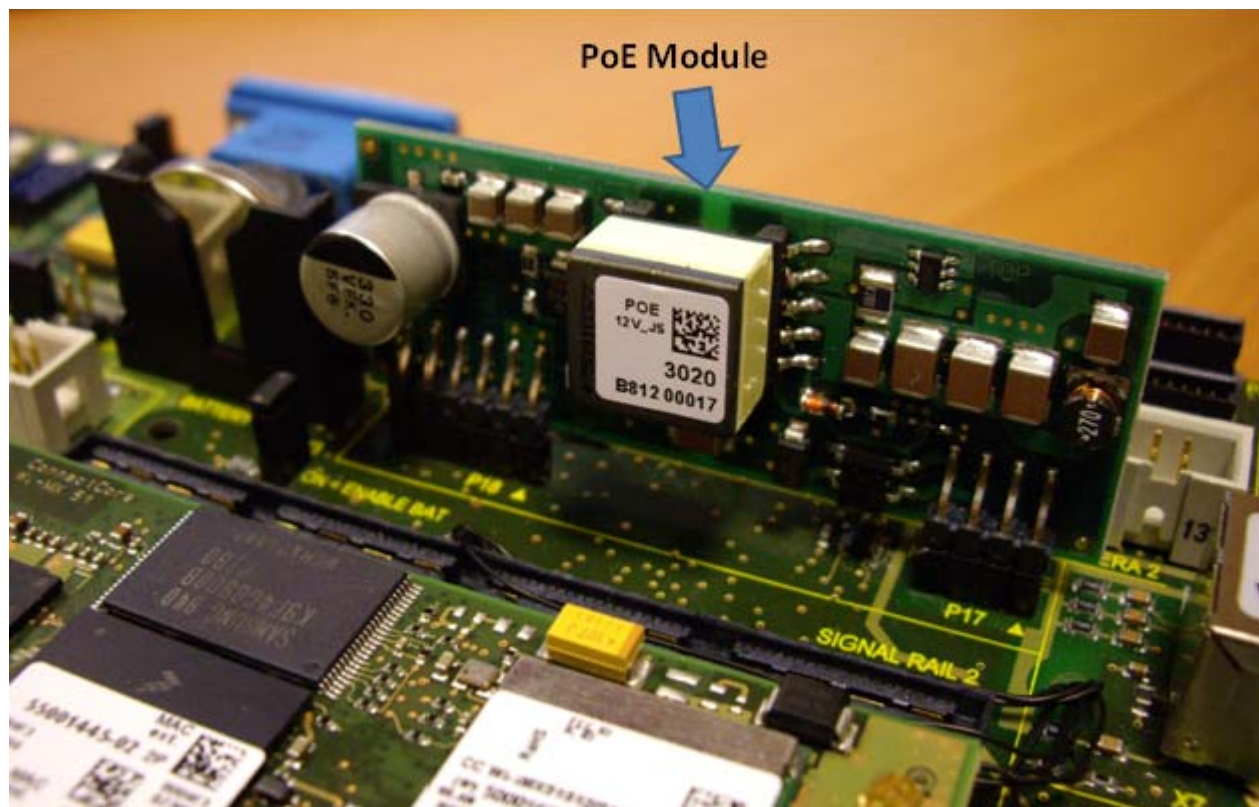
The development board provides two PoE module connectors, P17 and P18, to plug a Digi PoE module (DG-ACC-POE). The PoE module is an optional accessory item that can be plugged on the development board through the two connectors.

- P17, input connector: provides access to the PoE signals from the Ethernet connector
- P18, 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), P17

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

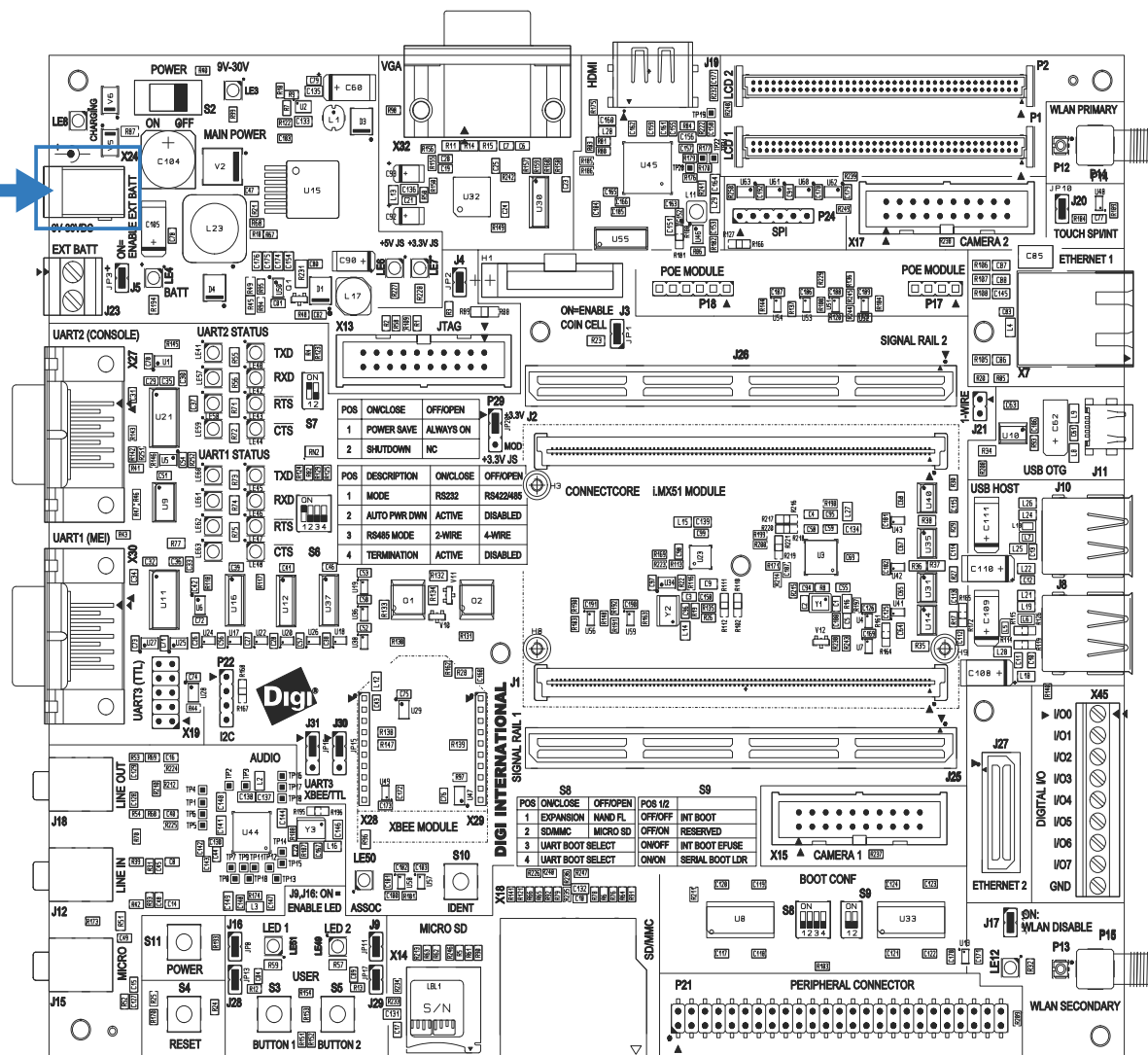
PoE Connector (power out), P18

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

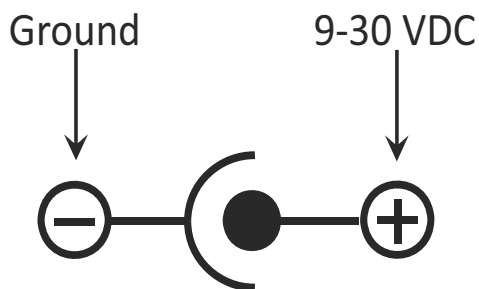
Pin	Signal
1	+12V_PoE
2	+12V_PoE
3	GND
4	GND
5	PoE_GND
6	PoE_GND

Main Power Connector

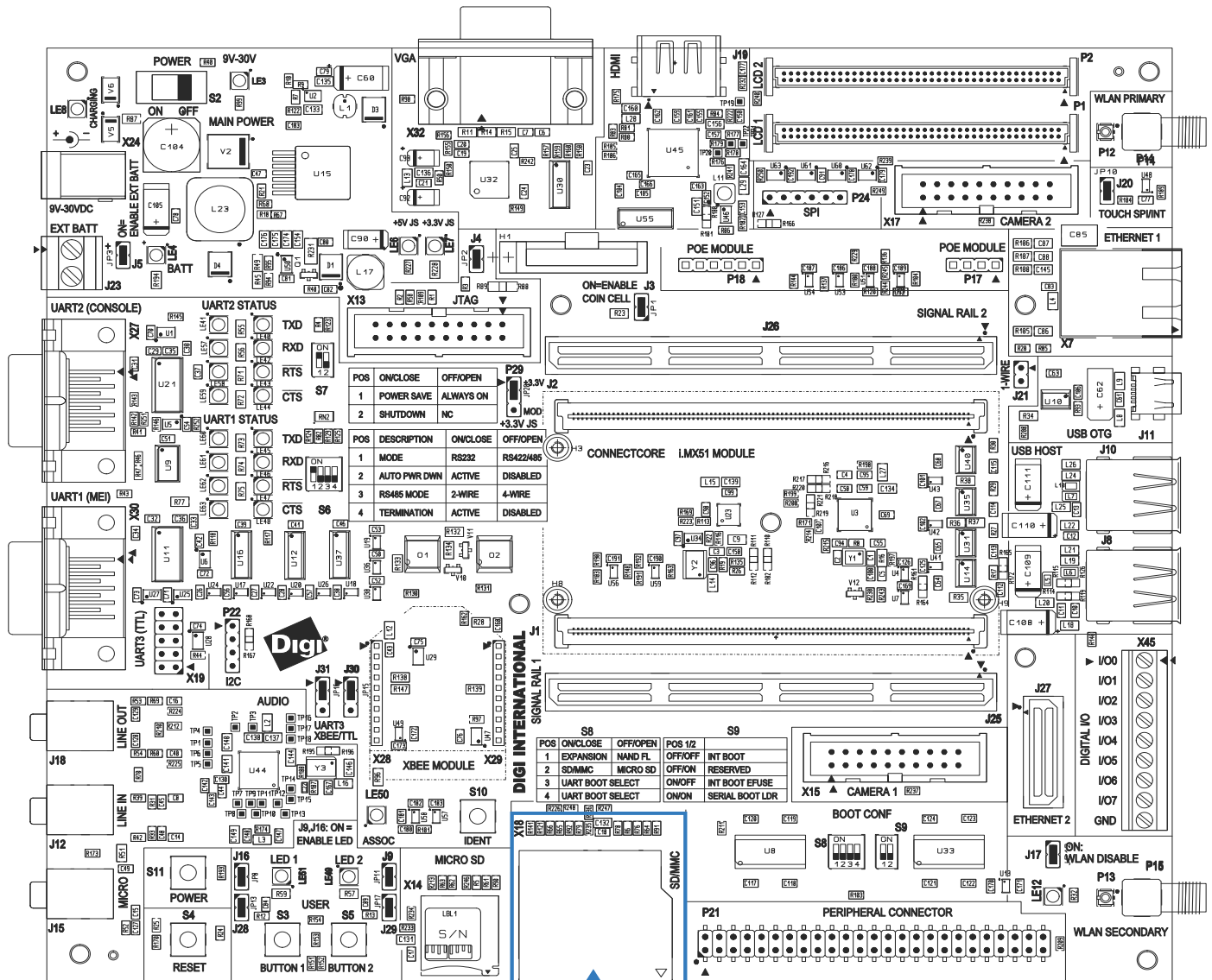
Power Connector,
X24



The main power connector (X24) is a barrel connector for the development board's 9-30VDC power supply. The figure below shows the polarity.



SD-Card Interface



SD/MMC Connector, X18

SD/MMC Connector, X18

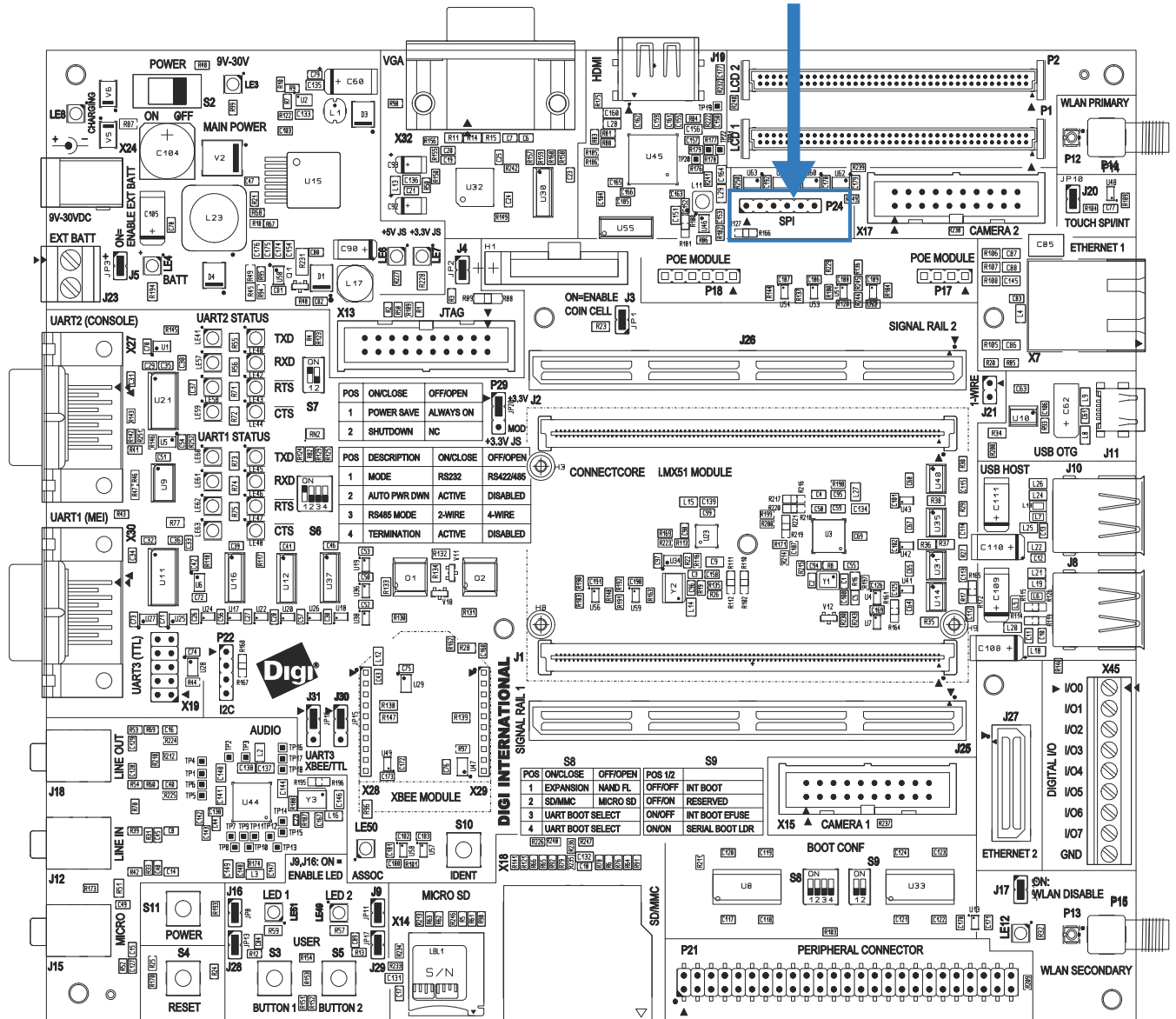
The development board provides one SD/MMC card connector, X18. This interface is connected to the enhanced Secured Digital Host controller 3 (eSDHC3) of the i.MX51 CPU.

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

Pin	Function
1	SD_DATA3
2	SD_CMD#
3	GND
4	+3.3V
5	SD_CLK
6	GND
7	SD_DATA0
8	SD_DATA1
9	SD_DATA2
10	SD_DATA4
11	SD_DATA5
12	SD_DATA6
13	SD_DATA7
14	SD_CD#
15	SD_WP#

SPI Interface

SPI Header, P24



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 i.MX51 ECSP1 port.

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

Interface	Chip Select
SPI Header	CSPI1_SS1/GPIO4_25
LCD1	GPIO4_26 (*)
LCD2	GPIO4_26 (*)

(*) the SPI chip select signal for the two LCD interfaces is generated with a logic combination of GPIO4_26 and the touch selection jumper (J20).

The SPI bus is connected to the following interfaces of the ConnectCore for i.MX51 module.

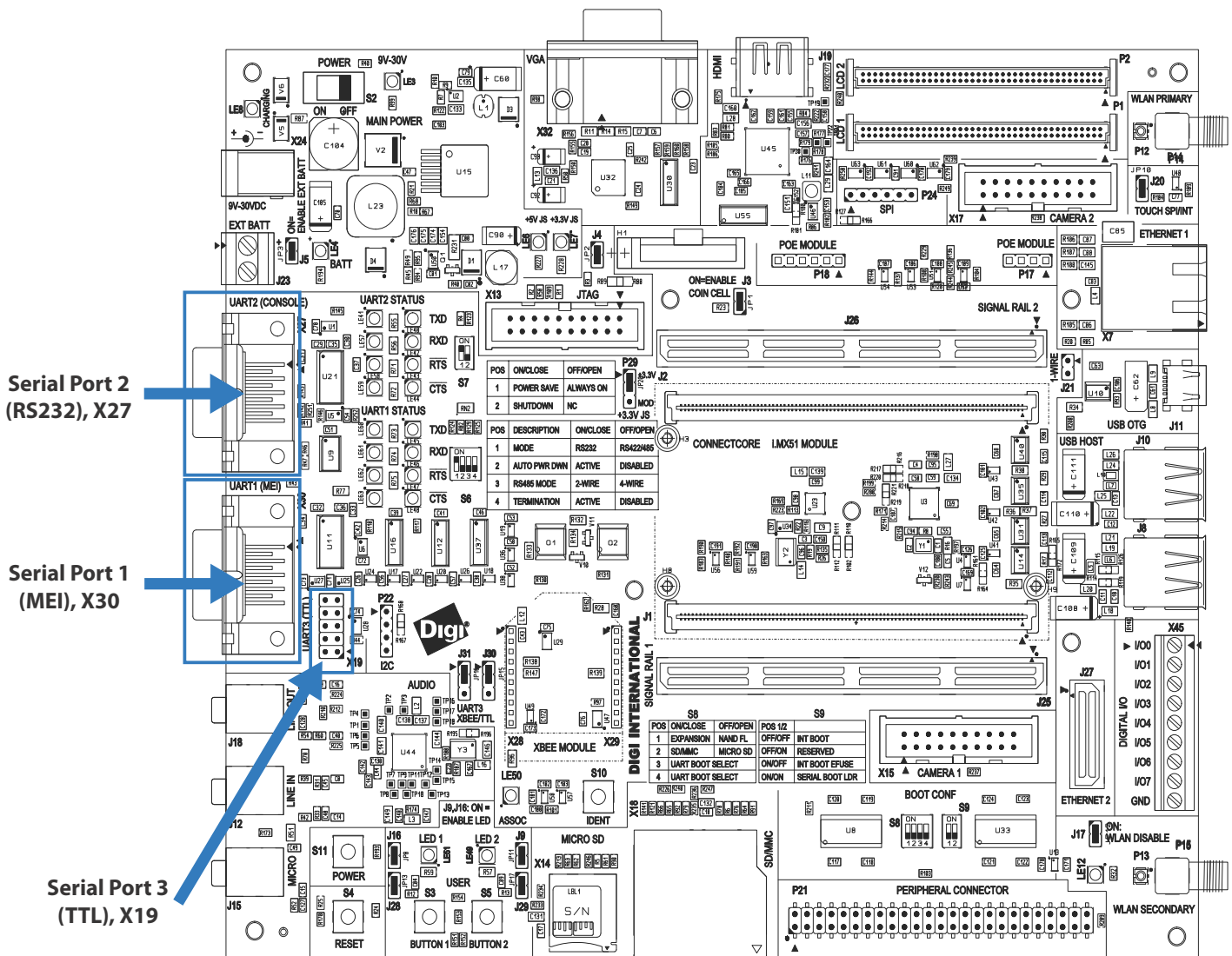
Interface	Chip Select
MC13892 Power Management	CSPI1_SS0/GPIO4_24

The table below provides the pinout of the SPI header:

Pin	Function	Defaults to
1	+2.775V	
2	SPI_MOSI/GPIO4_22	GPIO4_22
3	SPI_MISO/GPIO4_23	GPIO4_23
4	SPI_SCLK/GPIO4_27	GPIO4_27
5	SPI_SS1/GPIO4_25	GPIO4_25
6	GND	

By default, SPI pins are configured as GPIO signals.

UART Interface



Serial Port 2, RS232, X27

The serial (UART) port 2 connector, X27, is a DB-9 male connector, which is also used as the standard console port. This asynchronous serial port is operating in DTE mode and requires a null-modem cable to connect to a computer serial port.

The serial port 2 interface is connected to i.MX51 UART port 2. The corresponding line driver on the development board can be enabled or disabled using switch S7. Refer to paragraph "Switches and Push-buttons" in this document for more information.

Serial port 2 pins are allocated as shown:

Pin	Function	Defaults to
1	NC	-
2	RXD	GPIO1_20
3	TXD	GPIO1_21
4	NC	-
5	GND	-
6	NC	-
7	RTS#	GPIO1_14
8	CTS#	GPIO1_11
9	NC	-

By default, serial port 2 signals are configured as GPIO signals.

Serial Port 1, MEI Interface, X30

The serial (UART) port 1 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 serial port 1 MEI (multiple electrical interface) interface corresponds to i.MX51 UART port 1. The line drivers are configured using the switch S6. Refer to the "Switches and Push-buttons" section of this document for more information.

Serial port 1 pins are allocated as shown:

Pin	RS232 Function	RS232 Default	RS485 Function	RS485 Default
1	-	-	CTS-	-
2	RXD	GPIO4_28	RX+	GPIO4_28
3	TXD	GPIO4_29	TX+	GPIO4_29
4	-	-	RTS-	-
5	GND	-	GND	-
6	-	-	RX-	-
7	RTS#	GPIO4_30	RTS+	GPIO4_30
8	CTS#	GPIO4_31	CTS+	GPIO4_31
9	-	-	TX-	-

By default, serial port 1 signals are configured as GPIO signals.

Serial Port 3, TTL Interface, X19

The serial (UART) port 3 interface is a TTL interface connected to a 2x5 pin, 2.54mm connector, X19. The connector supports only TTL level signals.

The serial port 3 interface is connected to i.MX51 UART port 3.

Serial port 3 pins are allocated as shown:

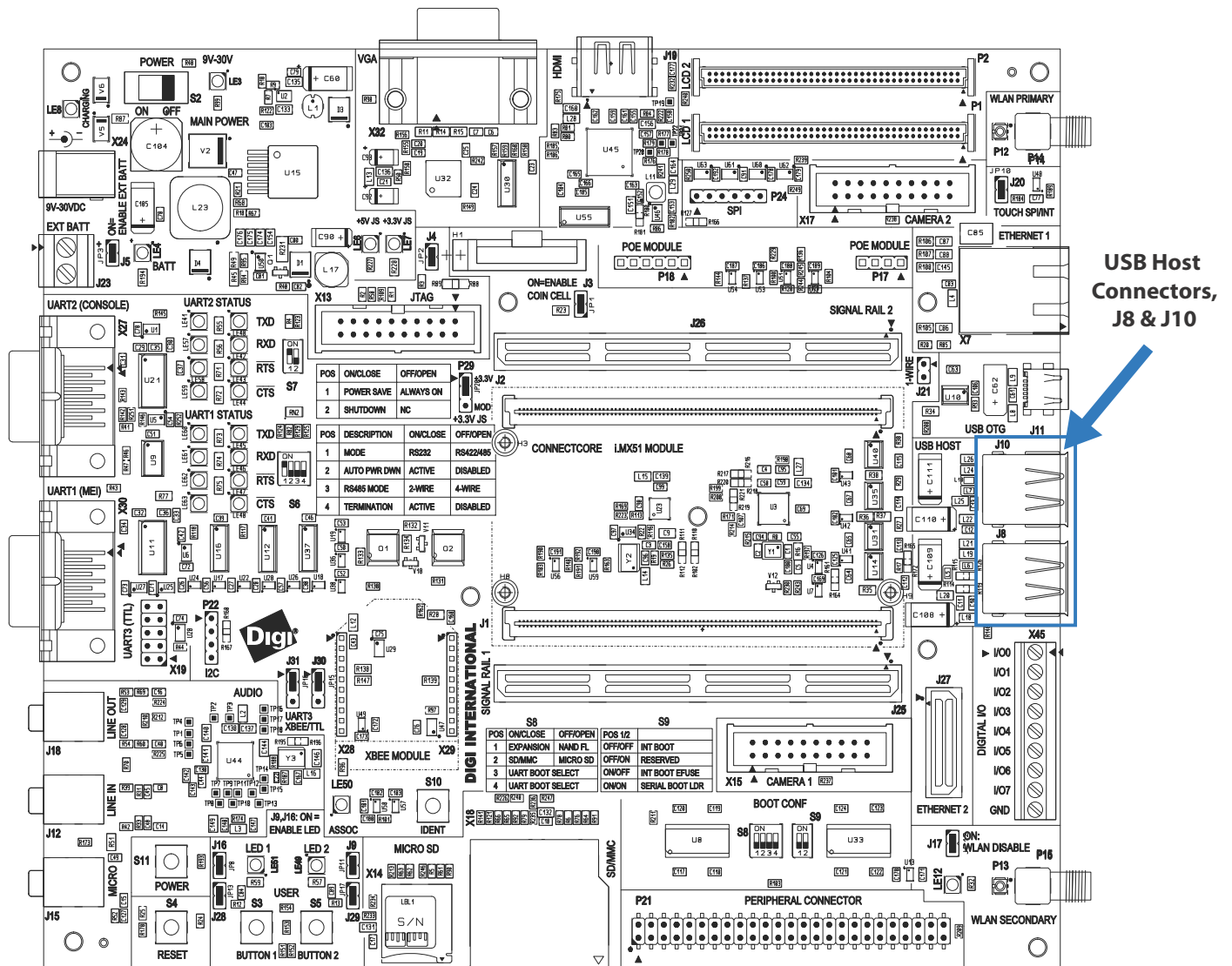
Pin	Function	Defaults to
1	NC	-
2	NC	-
3	RXD	GPIO1_22
4	RTS#	KEY_COL4
5	TXD	GPIO1_23
6	CTS#	KEY_COL5
7	NC	-
8	NC	-
9	GND	-
10	+3.3V	-

By default, serial port 3 signals are configured to their respective GPIO or KEY_COL signals.

Serial port 3 is connected to the X19 connector and to the XBee module socket. Two jumpers (J30 and J31) are used in the development board to select the connector where serial port 3 will be available. Refer to the “Jumpers” section of this document for more information.

By default serial port 3 CTS# signal is not connected to X19. A 0 Ω resistor, R44, must be manually populated to connect this signal to the X19 connector.

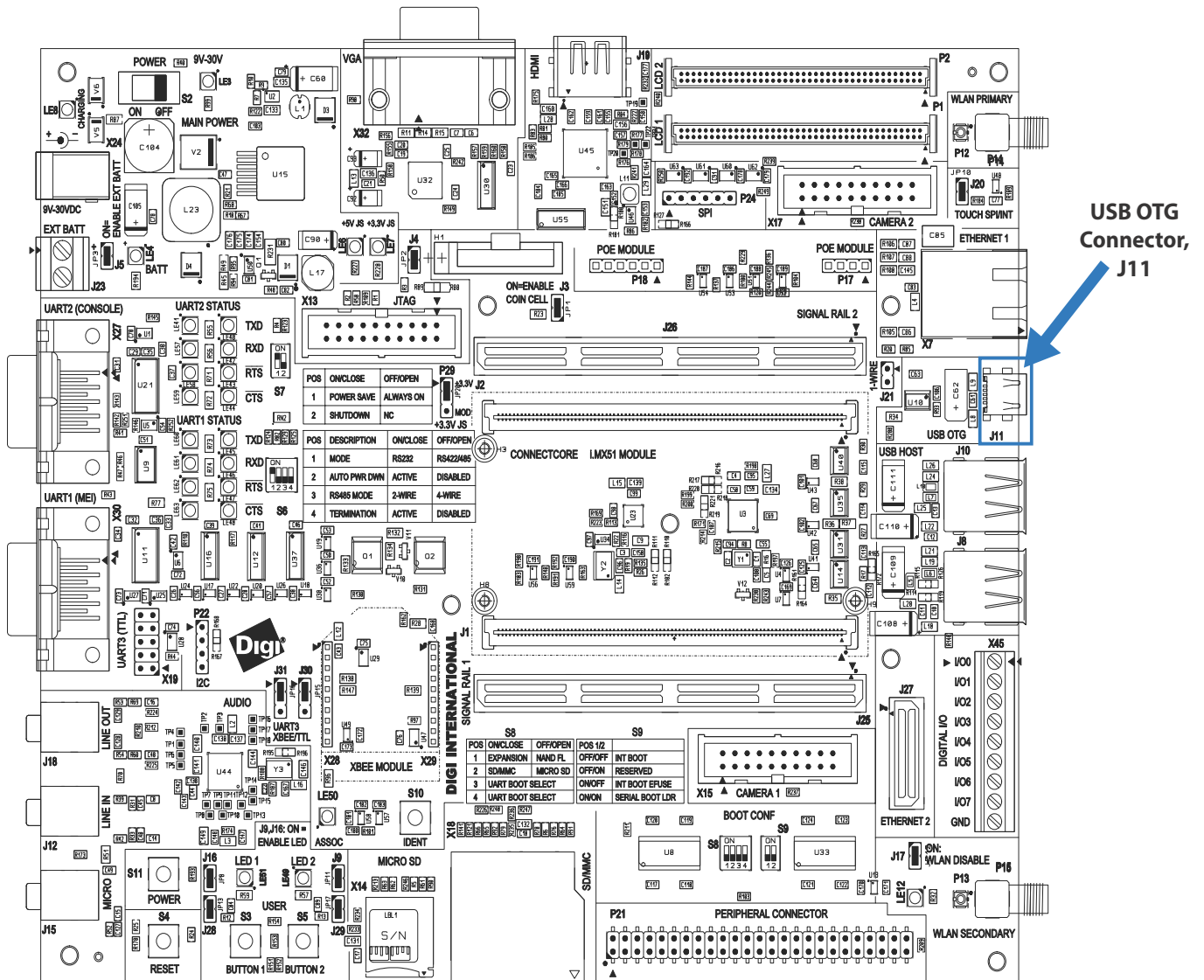
USB Host Interface



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 1 of the module into four USB host ports. The module supports low, full and high speed USB 2.0 connectivity.

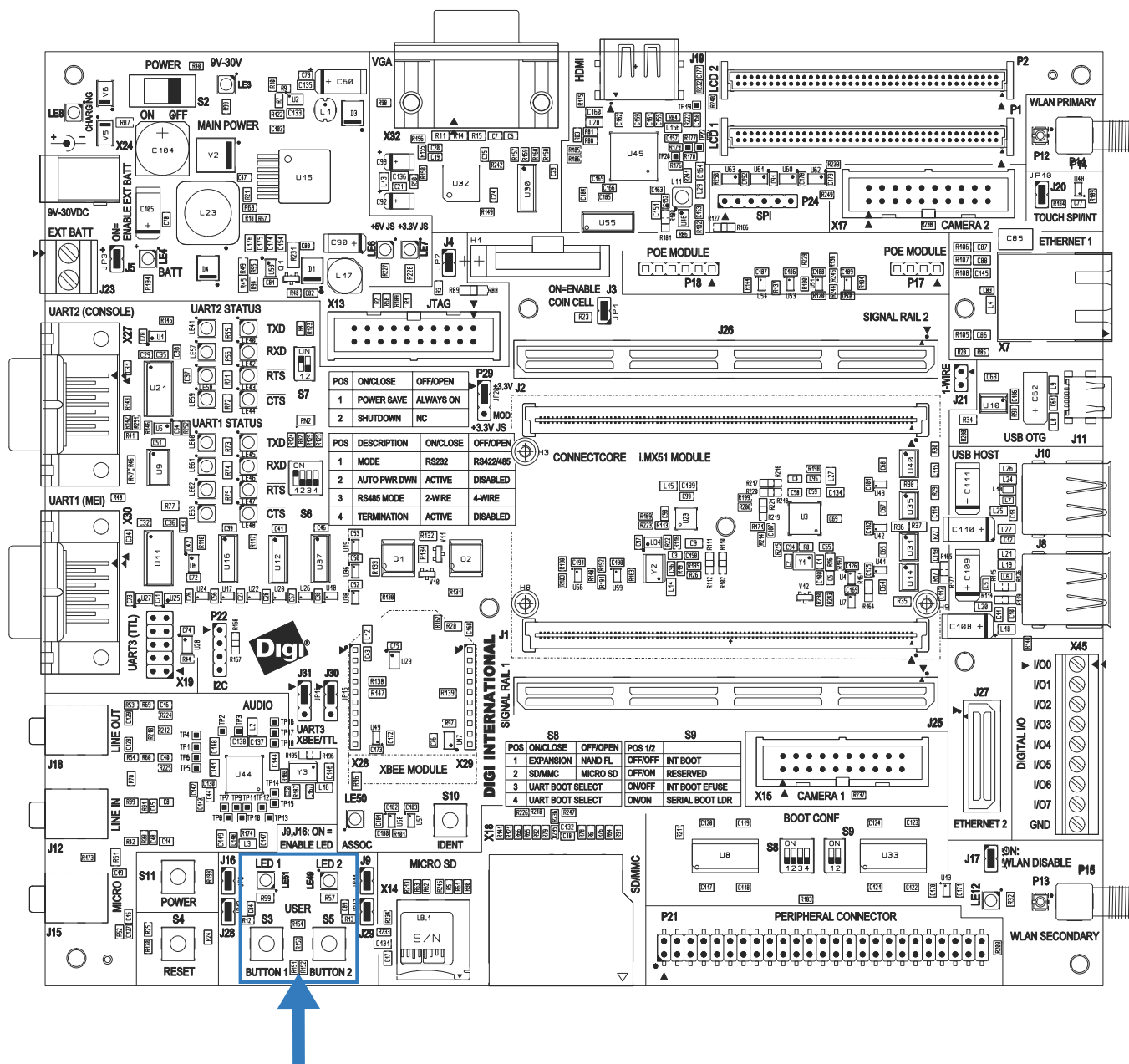
USB OTG Interface



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



User Interface

The development board provides two user buttons and two user LEDs connected to GPIO signals of the i.MX51.

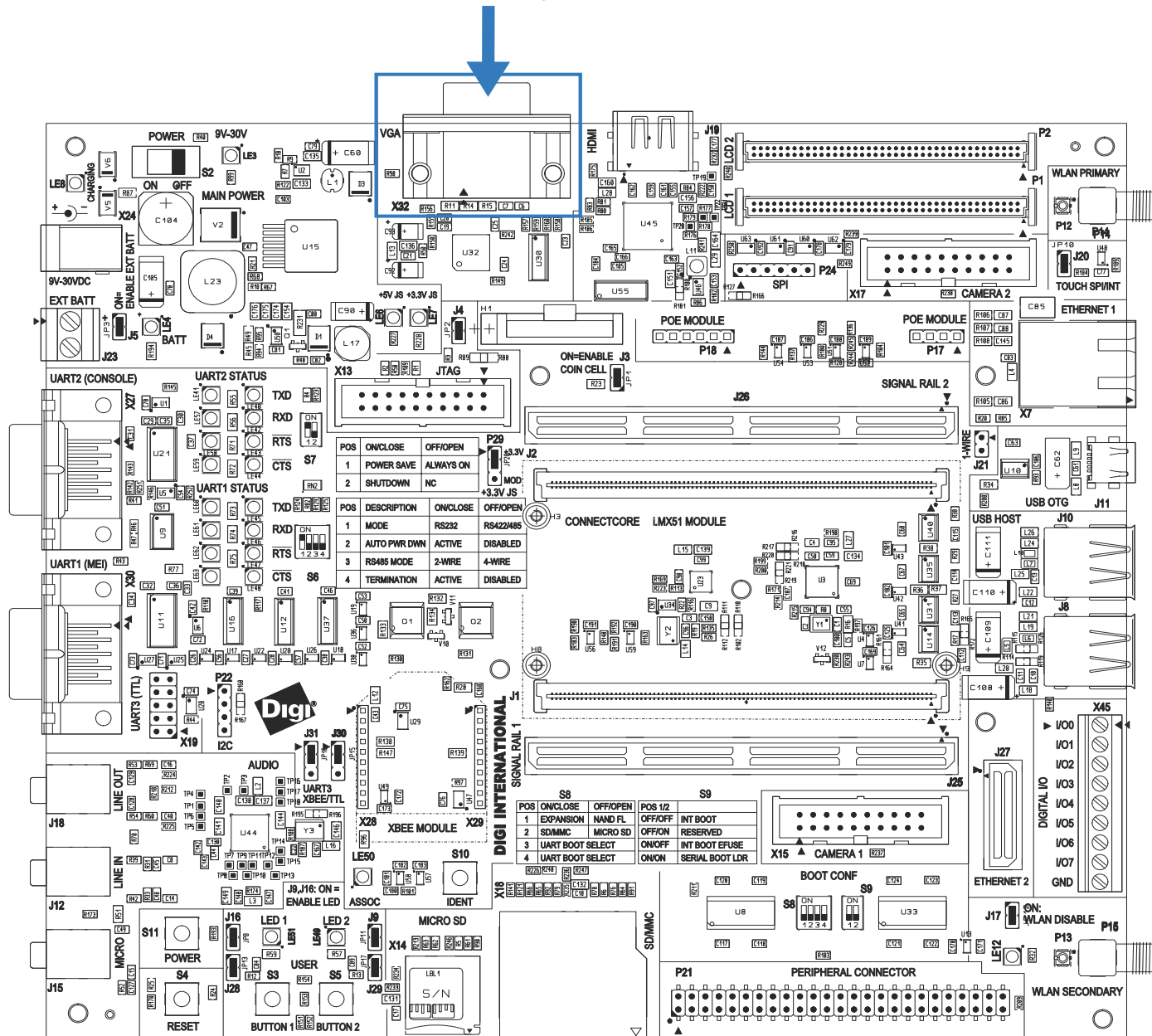
The user buttons and the user LEDs can be enabled or disabled by correctly setting the corresponding jumpers.

The table below shows the GPIO signal assigned to the user interface, and the jumpers used to enable/disable the buttons and LEDs:

Signal	GPIO	Jumper	Comment
USER_BUTTON1	GPIO3_6	J28	10K pull-up to +2.775V on the development board
USER_LED1#	GPIO3_10	J16	
USER_BUTTON2	GPIO1_1	J29	10K pull-up to +2.775V on the development board
USER_LED2#	GPIO3_9	J9	

Analog Video Interface

VGA Connector, X32



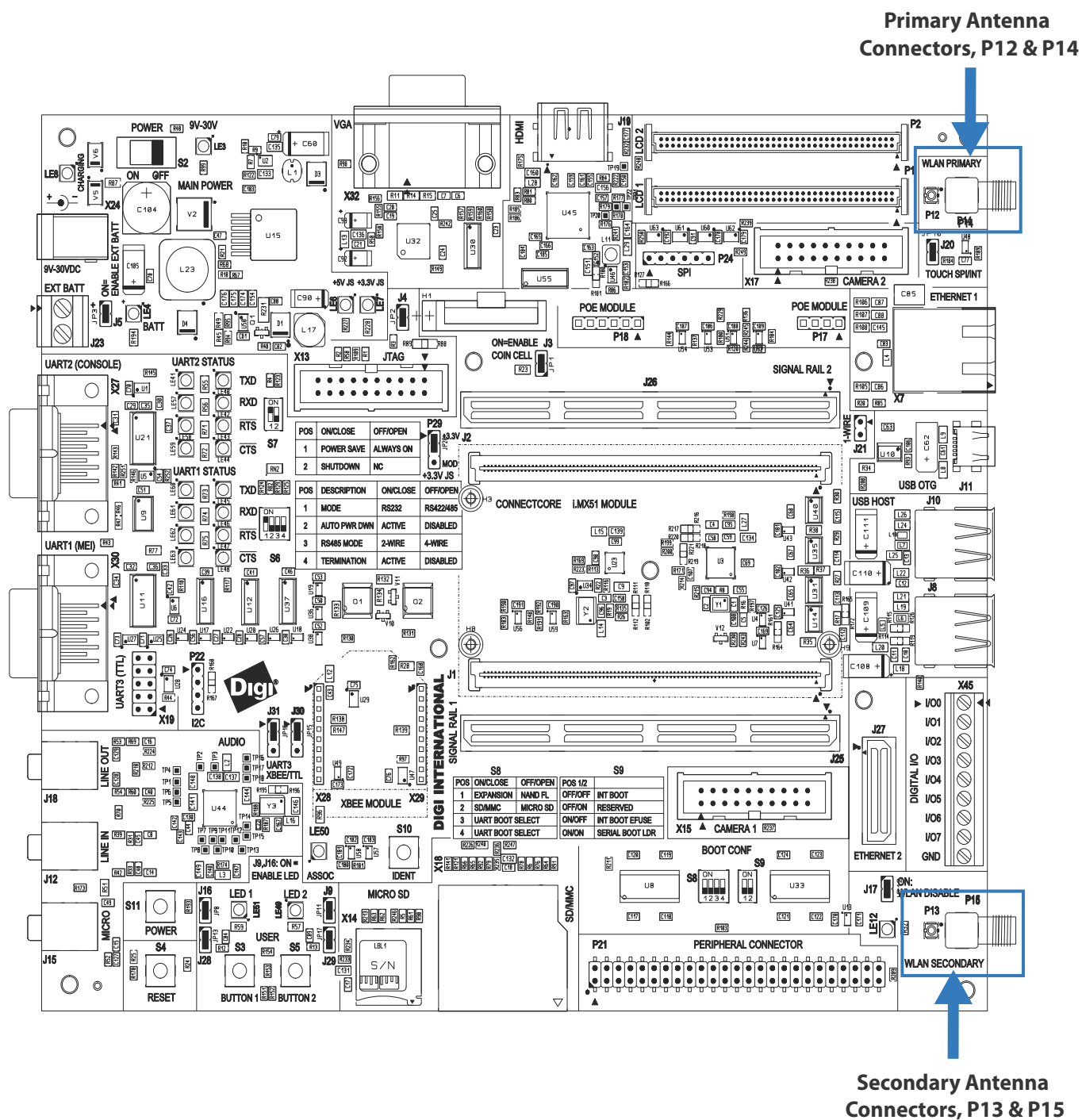
Analog Video Connector, X32

The development board provides an Analog Video connector. This connector is a 15-pin female connector, labeled X32. The Analog Video interface is connected to the Display 1 interface of the i.MX51 CPU.

The table below shows the pinout of the Analog Video connector.

Pin	Signal
1	VGA_RED
2	VGA_GREEN
3	VGA_BLUE
4	NC
5	GND
6	RED_RETURN
7	GREEN_RETURN
8	BLUE_RETURN
9	NC
10	GND
11	NC
12	NC
13	HSYNC#
14	VSYNC#
15	NC

WLAN Interface

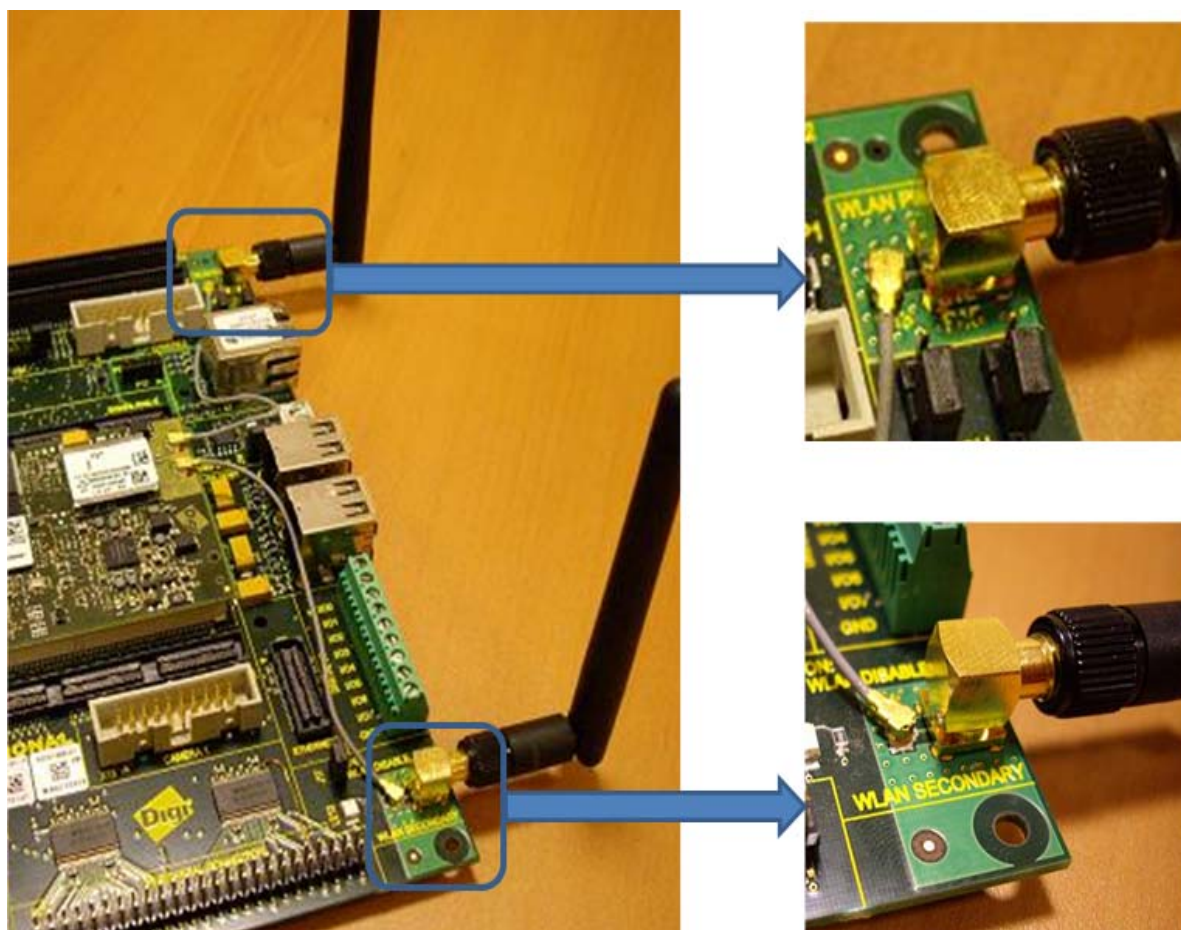


Antenna Connectors (WLAN)

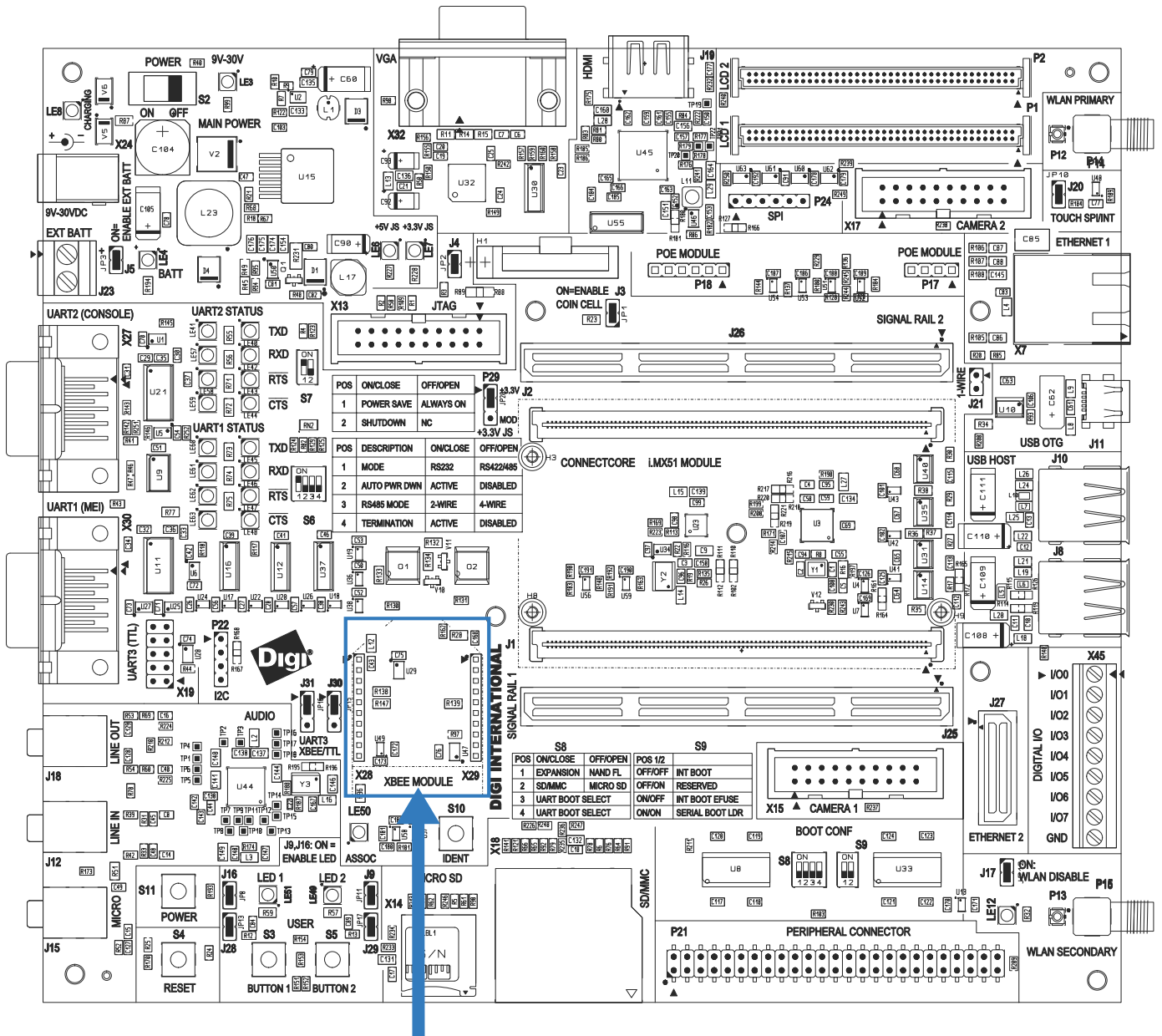
The development board provides the following connectors for the WLAN interface:

- P12 and P13: these two UFL connectors are used to connect the WLAN interface of the ConnectCore for i.MX51 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
Connectors, X28 & X29**

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. Two jumpers (J30 and J31) are used in the development board to select the connector where serial port 3 will be available. Refer to the “Jumpers” section of this document for more information.

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

Pin	Signal	Pin	Signal
X28-1	+3.3V	X29-1	IDENT
X28-2	XBEE_DOUT	X29-2	
X28-3	XBEE_DIN	X29-3	
X28-4	NC	X29-4	
X28-5	XBEE_RESET#	X29-5	XBEE_RTS#
X28-6	-	X29-6	ASSOC
X28-7	-	X29-7	
X28-8	-	X29-8	ON/SLEEP#
X28-9	XBEE_SLEEP_RQ	X29-9	XBEE_CTS#
X28-10	GND	X29-10	

Module Specifications

A P P E N D I X A

This appendix provides ConnectCore for i.MX51 module specifications.

Mechanical Specifications

- Length: 82 mm (3.228 inches)
- Width: 50 mm (1.968 inches)
- Height :
 - PCB: 1.40 mm (0.055 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 (Digi P/N MA00898) in combination with a flat washer, DIN 125, M2, Nylon 6 (Digi P/N MA01617). 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:
 - 600MHz variant:
-40°C to +85°C (-40°F to +185°F)
 - 800MHz variant:
-20°C to +70°C (-4°F to +158°F)
- Storage temperature: -40°C to +125°C (-40°F to +257°F)

Network Interface

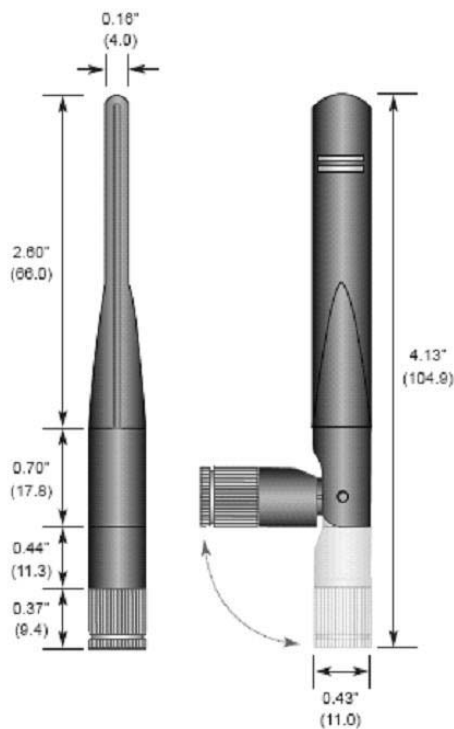
Antenna specifications: 802.11 a/b/g antenna

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 might vary.



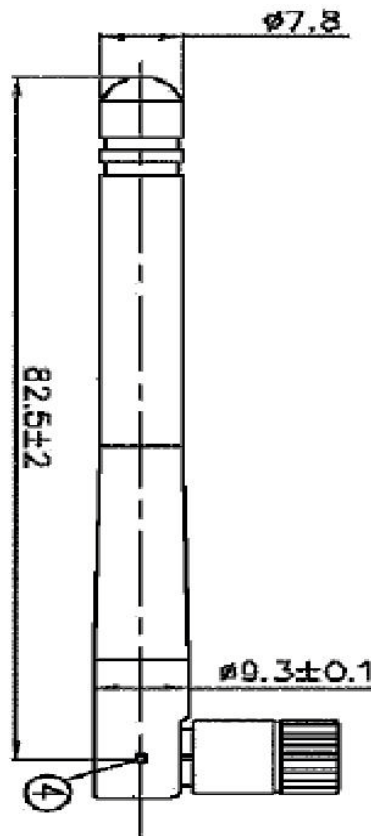
Antenna Specification: 802.11b/g antenna

Attributes

Attribute	Property
Frequency	2.4 ~ 2.5GHz
Power Output	2W
DB Gain	2dBi
VSWR	< or = 2.0
Dimension	108.5 mm $\pm$ 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 might 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 IEEE 802.11n

Frequency Band

- 2.400 - 2.500 GHz (Low Band)
- 4.900 - 5.850 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 (~16mW ETSI) (~37mW FCC 15.247)
@ 1, 2, 5.5 and 11 Mbps
- IEEE 802.11g (~ 10mW ETSI) (~72mW FCC 15.247)
@ 6, 12, 18, 24, 36 and 54Mbps
- IEEE 802.11n 2.4GHz Band (~12.5mW ETSI) (~83mW FCC 15.247)
- IEEE 802.11a & IEEE 802.11n
(~15mW ETSI)
(5.150 to 5.250 GHz ~17mW FCC 15.407)

(5.250 to 5.350 GHz ~17mW FCC 15.407)

(5.470 to 5.725 GHz ~22mW FCC 15.407)

(5.725 to 5.850 GHz ~28mW 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

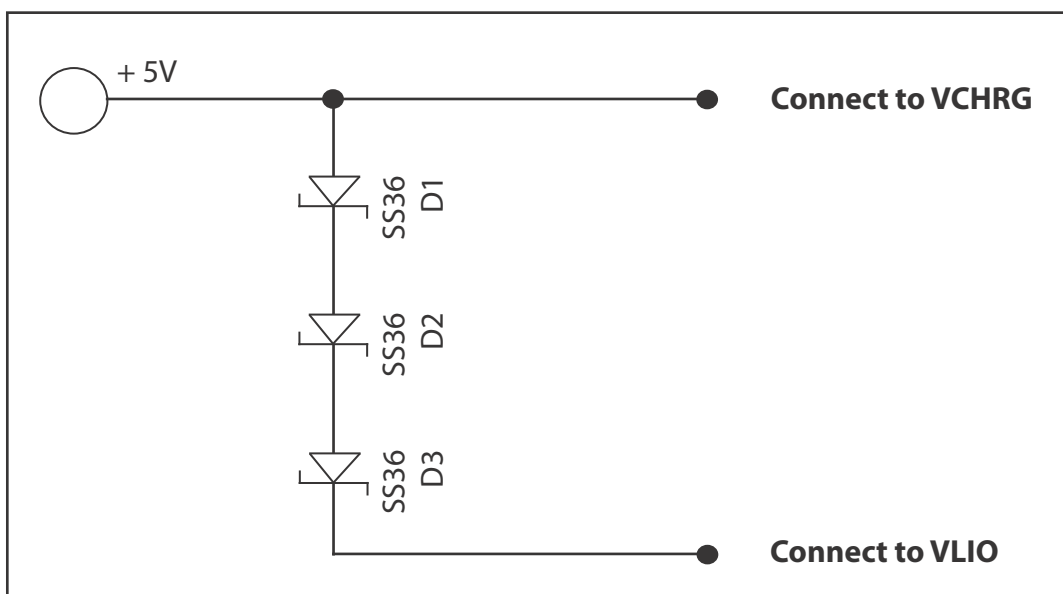
Data Rate (bg Mode)	Typical Sensitivity (+ / - 1.5 dBm)
1 Mbps	-94.0 dBm (< 8% PER)
2 Mbps	-89.0 dBm (< 8% PER)
11 Mbps	-86.0 dBm (< 8% PER)
6 Mbps	-89.0 dBm (< 10% PER)
54 Mbps	-74.0 dBm (< 10% PER)
645Mbps	-71.0 dBm (< 10% PER)
Data Rate (a Mode)	Typical Sensitivity (+ / - 1.5 dBm)
6 Mbps	-88.0 dBm (< 10% PER)
54 Mbps	-72.0 dBm (< 10% PER)
Data Rate (bg Mode)	Typical Sensitivity (+ / - 1.5 dBm)
65 Mbps	-69.0 dBm (< 10% PER)

Electrical Characteristics

Charger vs. Battery

The ConnectCore for i.MX51 can be supplied solely either through the battery input or also through the charger input. When using solely the charger input, and when no battery is connected to VLIO, the ConnectCore for i.MX51 won't be functional at temperatures below -20° C. This is due to the internal state machine of the on-module PMIC (Power Management IC).

To override this limitation, a battery voltage must be generated on the carrier board. Different options are available for simulating a battery voltage - below is one example, based on three Schottky diodes in series.



Supply Voltages

Parameter	Symbol	Min	Typ	Max	Unit
Battery Input	VLIO	3.4	3.7	4.8	V
Charger Input	VCHRG	3.4	5	20	V
Coin cell 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 a different driver configuration will show different current consumption values.

The ConnectCore for i.MX51 module can be powered from an external battery (VLIO) or from a battery charger (VCHRG). Current drawn by the modules 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, Ethernet. +3.3V of development board drawn from external power supply.
Typical	VGA, USB Host (two devices connected), Audio, Ethernet, Console. +3.3V of development board drawn from module.
Maximum	Display1, Display2, Camera1, Camera2, USB OTG, USB Host (four devices connected), Audio, Ethernet, Console, WLAN, SD Card, microSD™ Card. +3.3V of development board drawn from module.

The ConnectCore for i.MX51 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.
System Idle	In this state the user is not using the system, even passively, and devices that are not actively doing work are turned off.
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 hardware wake-source interrupt.

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	700mA	
	+5V supply to charger	680mA	
ON	+3.7V Battery	420mA	
	+5V supply to charger	410mA	
User Idle	+3.7V Battery	420mA	
	+5V supply to charger	410mA	
System Idle	+3.7V Battery	380mA	
	+5V supply to charger	390mA	
Suspend	+3.7V Battery	145mA	
	+5V supply to charger	170mA	

Current measurement in Typical configuration

Power Mode	Power Supply	Current Draw	Comments
Full load	+3.7V Battery	1450mA	
	+5V supply to charger	1250mA	
ON	+3.7V Battery	1150mA	
	+5V supply to charger	950mA	
User Idle	+3.7V Battery	1075mA	
	+5V supply to charger	890mA	
System Idle	+3.7V Battery	350mA	
	+5V supply to charger	350mA	
Suspend	+3.7V Battery	145mA	
	+5V supply to charger	170mA	

Current measurement in Maximum configuration

Power Mode	Power Supply	Current Draw	Comments
Full load	+3.7V Battery	2100mA	
	+5V supply to charger	1850mA	
ON	+3.7V Battery	1900mA	
	+5V supply to charger	1700mA	
User Idle	+3.7V Battery	1800mA	
	+5V supply to charger	1650mA	
System Idle	+3.7V Battery	1600mA	
	+5V supply to charger	1250mA	
Suspend	+3.7V Battery	420mA	
	+5V supply to charger	490mA	

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 Capacity	Off-module Available Current	Comments
+2.775V	PMIC VIOHI LDO	+2.775V	100mA max	50mA max	Used on module to power IPU, Peripheral interfaces, Accelerometer, I ² C, Ethernet PHY, and bootstraps
+1.8V	PMIC VGEN3 LDO	+1.8V	250mA max	250mA max	
+3.3V	DC/DC Converter	+3.3V	1.2A max	400mA max (*)	Used on module to power WLAN, Ethernet Controller and Ethernet PHY
+3.15V	PMIC VGEN2 LDO	+3.15V	350mA max	300mA max	Used on module to power NAND Flash SD1 and fuse interface
SWBST	PMIC +5V Boost Switcher	+5V	300mA max	300mA max	

(*)The off-module available current for the wired variant modules is 800mA.

I/O DC Parameters

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

- General Purpose I/O and High-Speed General Purpose I/O (GPIOxx/HSGPIOxx)
- Low Voltage I/O (LVIO)
- Ultra High Voltage I/O (UHVIOxx)
- WLAN
- PMIC_GPO, PMIC_PWRON, PMIC_STDBY, PMIC_INT, PMIC_PWDRV, PMIC_SE, PMIC_CHRGLED, and PMIC_LED
- Ethernet (ETH)
- Analog 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 paragraph “Module Pinout” of Chapter 1.

The following table shows the General Purpose I/O and High-Speed General Purpose I/O (GPIOxx/HSGPIOxx) DC parameters. 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 = 33	3.0	3.3	3.6	
High-level output voltage	Voh	VDD-0.15	-	VDD+0.3	V
	(Vol USB)	VDD-0.43	-	VDD+0.3	
Low-level output voltage	Vol	-		0.15	V
	(Vol USB)	-	--	0.43	
High-level output current	Ioh		-	-	mA
	- Low drive	-1.9			
	- Medium drive	-3.7			
	- High drive	-5.2			
	- Max drive	-5.6			
Low-level output current	Iol		-	-	mA
	- Low drive	1.9			
	- Medium drive	3.7			
	- High drive	5.2			
	- Max drive	5.6			
High-level input voltage	VIH	0.7 x VDD	-	VDD	V

Parameter	Symbol	Min	Typ	Max	Unit
Low-level input voltage	VIL	0	-	0.3 x VDD	V
Input Current (no/pull)	Iin	-	-	2	μA
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	-	-	17	-	kΩ
Output driver impedance	Rout				
	- Low drive	80	104	250	Ω
	- Medium drive	40	52	125	
	- High drive	27	35	83	
	- Max drive	20	26	62	

The following table shows the LVIO DC parameters.

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	1.65	1.8	1.95	V
High-level output voltage	Voh	VDD-0.15	-	-	V
Low-level output voltage	Vol	-	-	0.15	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
Input Current (no/pull)	Iin	-	-	1	μA
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	-	-	17	-	kΩ
Output driver impedance	Rout				
	- Low drive	80	150	250	Ω
	- Medium drive	40	75	125	
	- High drive	27	51	83	
	- Max drive	20	38	62	

The following table shows the Ultra-High Voltage I/O (UHVIOxx) DC parameters. The “xx” reference signifies the supply voltage level.

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD				
	xx = 31	3.0	3.15	3.6	V
	xx = 33	3.0	3.3	3.6	
High-level output voltage	Voh	VDD-0.15	-	VDD-0.15	V
	(USB, WLAN)	VDD-0.43	-	VDD-0.43	
Low-level output voltage	Vol	-		0.15	V
	(USB, WLAN)	-	--	0.43	
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 Current (no/pull)	Iin	-	-	10	μA
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	-	-	17	-	kΩ
Output driver impedance	Rout				
	- Low drive	114	135	206	Ω
	- Medium drive	57	67	103	
	- High drive	38	45	69	

The following table shows the WLAN DC 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
Input Leakage Current	I _{IK}	-	-	10	μA

The following table shows the PMIC_GPO DC parameters.

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	2.5	2.775	3.1	V
High-level output voltage	Voh	VDD-0.2	-	VDD	V
Low-level output voltage	Vol	-	-	0.2	V
Output driver impedance	R _{out}	200	-	500	Ω

The following table shows the PMIC_PWRON DC parameters.

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	-	1.5	3.1	V
High-level input voltage	V _{ih}	1	-	VDD	V
Low-level input voltage	V _{il}	-	-	0.3	V
Input pull-up impedance	R _{up}	-	200	-	kΩ

The following table shows the PMIC_STDBY DC parameters.

Parameter	Symbol	Min	Typ	Max	Unit
High-level output voltage	Voh	1	-	3.6	V
Low-level output voltage	Vol	-	-	0.3	V
Input pull-down impedance	R _{dw}	-	36	-	MΩ

The following table shows the PMIC_INT DC parameters.

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	2.5	2.775	3.1	V
High-level output voltage	Voh	VDD-0.2	-	VDD	V
Low-level output voltage	Vol	-	-	0.2	V
Output driver impedance	Rout	200	-	500	Ω

The following table shows the PMIC_PWGTDRV DC parameters.

Parameter	Symbol	Min	Typ	Max	Unit
High-level output voltage	Voh	5	5.4	5.4	V
Low-level output voltage	Vol	-	-	0.1	V
Load Current	Iout	-	-	100	nA

The following table shows the PMIC_LED DC parameters.

Parameter	Symbol	Min	Typ	Max	Unit
Input current	Iled	0	-	21	mA

The following table shows the PMIC_SE DC parameters.

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	2.5	2.775	3.1	V
High-level output voltage	Voh	1	-	VDD	V
Low-level output voltage	Vol	-	-	0.3	V
Input pull-up impedance	Rup	-	100	-	k Ω

The following table shows the Ethernet DC 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

Parameter	Symbol	Min	Typ	Max	Unit
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

The following table shows the Analog RGB DC parameters.

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

The following table shows the DC parameter of the ADC subsystem. The ADC subsystem is used by the touch interface and by the three analog input signals (ADIN).

Parameter	Symbol	Min	Typ	Max	Unit
Input Voltage range	VI	0	-	2.4	V
Input Buffer offset	Voff	-5	-	5	mV
Conversion Current	Iin	-	1	-	mA
Source Impedance	Rin	-	-	5	kΩ

The following table shows the DC parameter of the digital USB.

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

The following table shows the DC parameter of the Analog USB.

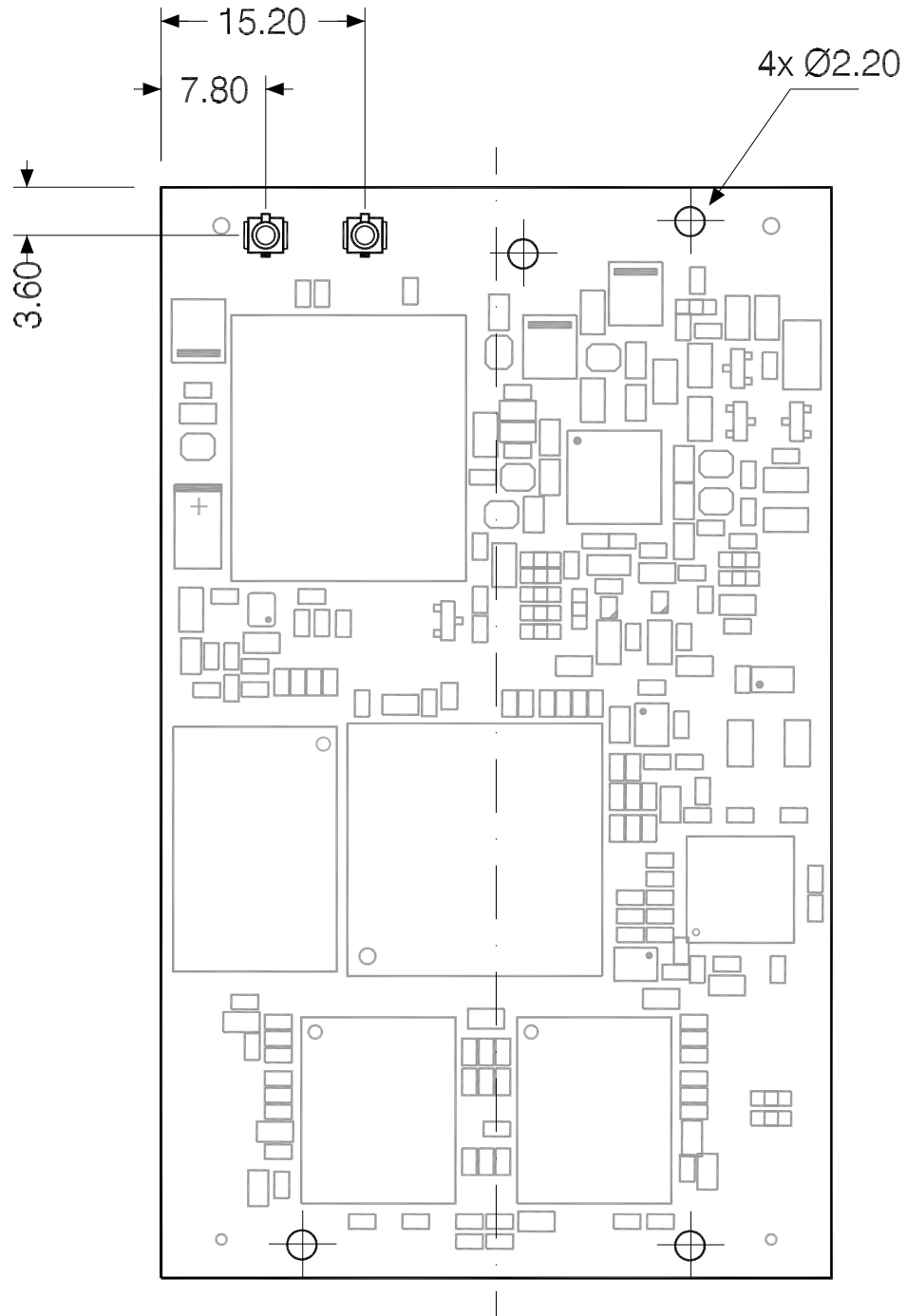
Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	3.0	3.3	3.6	V
Current consumption	I	-	-	6	mA

Module Dimensions

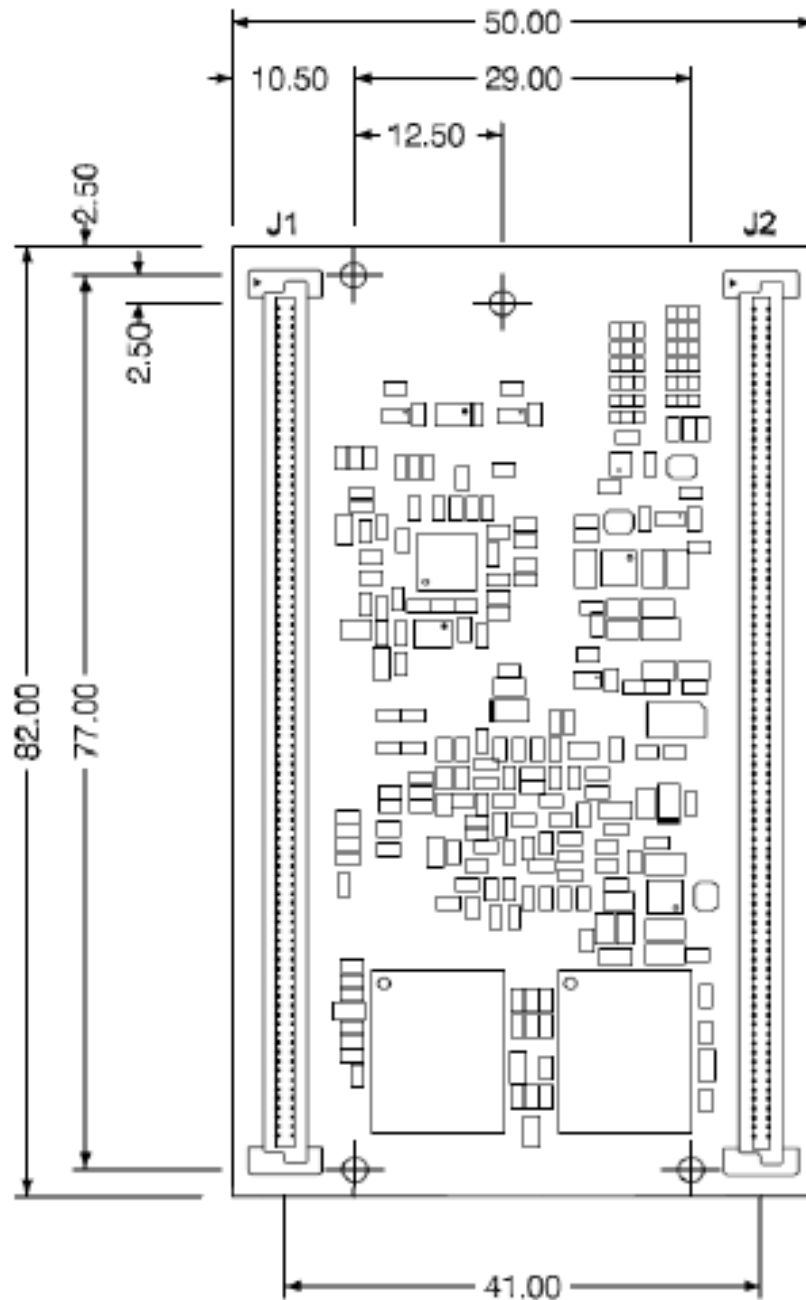
A P P E N D I X B

This appendix shows the dimensions of the ConnectCore for i.MX51 module, dimensions are in millimeters.

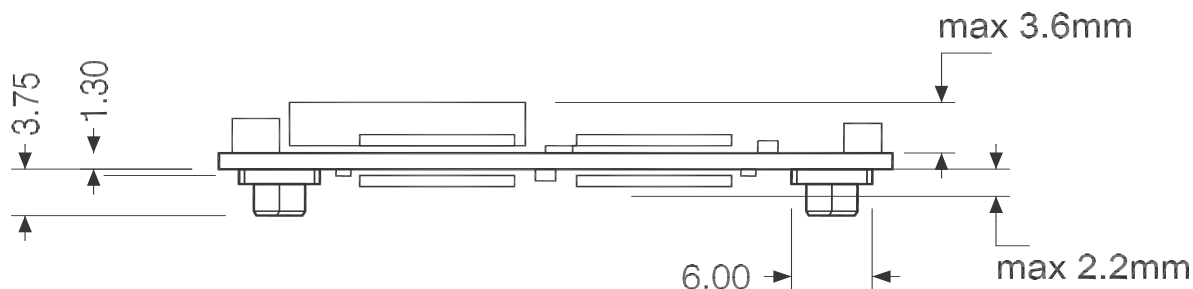
Top View



Bottom View



Side View



Connectors

The ConnectCore for i.MX51 module uses two Berg/FCI connectors. The following table shows the reference number of the connectors used on 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.MX51 module	61082-181409LF
ConnectCore for i.MX51 development board	61083-184409LF

Certifications

A P P E N D I X C

The ConnectCore for i.MX51 product complies with the following standards.

FCC Part 15 Class B

Radio Frequency Interface (RFI) (FCC 15.105)

The ConnectCore for i.MX51 module has been tested and found to comply with the limits for Class B digital devices pursuant to Part 15 Subpart B, of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Labeling Requirements (FCC 15.19)

This device complies with Part 15 of 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.

If the FCC ID is not visible when installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed

module FCC ID. This exterior label can use wording such as the following: “Contains Transmitter Module FCC ID: MCQ-50M1699/ IC: 1846A-50M1699”.

RF Exposure

RF Exposure considerations require that a 20cm separation distance between users and the installed antenna location shall be maintained at all times when the module is energized. OEM installers must consider suitable module and antenna installation locations in order to assure this in 20cm separation, and end users be also be advised to the requirement.

Modifications (FCC 15.21)

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

Industry Canada

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numeriques de la class B prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

The maximum antenna gain permitted in the bands 5250-5350 MHz and 5470-5725 MHz to comply with the e.i.r.p limit is, according to RSS-210 section A9.2(2)

- 250mW conducted power
- 1.0W max EIRP

This limit is met with the highest gain antenna listed, antennafactor ANT-DB1-RAF-RPS.

The maximum antenna gain permitted in the band 5725-5825 MHz to comply with the e.i.r.p limit specified for non point-to-point operation is, according to RSS-210 section A9.2(3):

- 1W conducted power
- 4.0W max EIRP

This limit is met with the highest gain antenna listed, antennafactor ANT-DB1-RAF-RPS.

OEM installers and users are cautioned to take note that high-power radars are allocated as primary users (meaning they have priority) of the bands 5250-5330 MHz and 5650-5850 MHz and these radars could cause interference and /or damage to devices operating in these frequency bands.

Indoor/Outdoor

When the ConnectCore for i.MX51 module is installed in devices that can be used outdoors, the channels in the band 5150-5250 MHz must be disabled to comply with US and Canadian regulatory requirements. The OEM users are encouraged to inform end users of this restriction as well.

Japan Certification

この製品は、周波数帯域 5.15 ~ 5.35 GHz で動作しているときは、屋内においてのみ使用可能です。

This device has been granted a designation number by Ministry of Internal Affairs and Communications according to:
Ordinance concerning Technical Regulations Conformity Certification etc. of Specified Radio Equipment (特定無線設備の技術基準適合証明等に関する規)

Article 2 clause 1 item 19
Approval n°: 202WW09115541
Article 2 clause 1 item 19 (2)
Approval n°: 202GZ09115541
Article 2 clause 1 item 19 (3)
Approval n°: 202XW09115541
Article 2 clause 1 item 19 (3) (2)
Approval n°: 202YW09115541

This device should not be modified (otherwise the granted designation number will be invalid).

Declaration of Conformity

(In accordance with FCC Dockets 96-208 and 95-19)

Manufacturer's Name:	Digi International
Corporate Headquarters:	11001 Bren Road East Minnetonka MN 55343
Manufacturing Headquarters:	10000 West 76th Street Eden Prairie MN 55344

Digi International declares that the product:

Product Name ConnectCore for i.MX51
Model Number: 50001699-xx

to which this declaration relates, meets the requirements specified by the Federal Communications Commission as detailed in the following specifications:

- Part 15, Subpart B, for Class B equipment
- FCC Docket 96-208 as it applies to Class B personal
- Personal computers and peripherals

The product listed above has been tested at an External Test Laboratory certified per FCC rules and has been found to meet the FCC, Part 15, Class B, Emission Limits. Documentation is on file and available from the Digi International Homologation Department.

International EMC Standards

The ConnectCore for i.MX51 meets the following standards:

Standards	ConnectCore for i.MX51
Emissions	FCC Part 15 Subpart B IS-003
Immunity	EN 55022 EN 55024
Safety	UL 60950-1 CSA C22.2, No. 60950-1 EN 60950-1

Change Log

A P P E N D I X D

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

Revision A

- Initial release.

Revision B

- Updated mechanical drawings (additional mounting holes, increased height of WLAN variant).

Revision C

- Updated document structure.
- Updated "About the module" chapter.
- Updated "About the Development board" chapter.
- Updated "module specifications" appendix.
- Updated mechanical drawings.

Revision D

- Updated module pinout tables.
- Updated "power" section.
- Updated GPIO table.
- Updated development board figures.
- Updated "Switches and push-buttons," "Jumper," and "LEDs" sections.
- Updated development board interfaces.
- Updated several sub-sections to Appendix A.
- Added electrical characteristics.
- Updated the figures in Appendix B.

- Renamed “Appendix C: Change Log” to “Appendix D: Change Log.”
- Added Appendix C: Certifications.
- Added the Cable Specification: U.FL/W.FL to Chapter 2.
- Added the Antenna specifications: 802.11 a/b/g antenna and Antenna specifications: 802.11 b/g antenna sections to Appendix A.
- Added several sub-sections to the WLAN section of Appendix A.

Revision E

- Corrected a typo in pin 113's “Use on Module” column in Chapter 1 (changed MC13892:CS to MC13892:MISO).
- Added the Fasteners and Appropriate Torque section to Appendix A.
- Added the Charger vs. Battery section to Appendix A.
- Added the “Off-module Available Current” column and information to the On-Module Power Supplies table in Appendix A.
- Updated the Power section of Chapter 1 and its accompanying sub-sections.
- Added pin descriptions for the USBH2 interface signals in the J1 Pinout table of Chapter 1.

Revision F

- Corrected naming inconsistencies throughout the guide.
- Added the “Japan Certification” section to Appendix C.