

ZC706 Evaluation Board for the Zynq-7000 XC7Z045 All Programmable SoC

User Guide

UG954 (v1.3) July 31, 2013



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Revision History

The following table shows the revision history for this document.

Date	Version	Revision
10/08/2012	1.0	Initial Xilinx release.
11/21/2012	1.1	Added additional user LED in ZC706 Evaluation Board Features section, Table 1-1 , User I/O section, Figure 1-25 , and Table 1-28 . In Table 1-1 , added fan sink information and updated notes for 10/100/1000 Ethernet PHY, user pushbuttons, user DIP switch, and FPGA PROG pushbutton. Added Encryption Key Backup Circuit section. Updated second paragraph in DDR3 SODIMM Memory (PL) section. Updated second paragraph in SD Card Interface section. Updated Table 1-11 . Added U53 information to first paragraph in HDMI Video Output section. Added fourth bullet to Real Time Clock (RTC) section. Updated Figure 1-23 . Added pin A17 to Table 1-28 . Updated Figure 1-32 . Replaced UCF in Appendix C . Added additional reference to References in Appendix F .

Date	Version	Revision
04/24/2013	1.2	<p>Chapter 1, ZC706 Evaluation Board Features: Table 1-1 feature descriptions are now linked to their respective sections in the book. Figure 1-2, Figure 1-33, and Figure 1-34 were replaced. Table 1-2 was removed because it was a duplicate of Table 1-11. Table 1-2: Switch SW11 Configuration Option Settings was added. FMC Connector JTAG Bypass, page 33 was updated. Default lane size information below Figure 1-17 was changed. Figure 1-18 PCI Express Lane Size Select Jumper J19 was added. The names of pins 18 and 19 changed in Table 1-17. The address of I²C bus PMBUS_DATA/CLOCK changed in Table 1-25. Reference designator DS35 was added to Table 1-27. Callout numbers in the User I/O, page 57 section are now linked to Table 1-1. SW13 information was added to the section User Pushbuttons, page 59. In Table 1-33, J5 pin H22 changed to XC7Z045 (U1) pin AH26 and H23 changed to AH27. The section ZC706 Board Power System, page 72 was added. Voltage levels were changed in VADJ Voltage Control, page 79. Table 1-37 was modified and Table 1-38 was added.</p> <p>Appendix A, Default Switch and Jumper Settings: The SW11 selection in Table A-1 changed.</p> <p>Appendix G, Regulatory and Compliance Information: A link to the master answer record was added.</p>
07/31/2013	1.3	<p>Updated Table 1-22. Replaced the master User Constraints File (UCF) list in Appendix C, Master Constraints File Listing with the master Xilinx Design Constraints (XDC) list. Updated references throughout the document.</p>

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ZC706 Evaluation Board Features

Overview

The ZC706 evaluation board for the XC7Z045 All Programmable SoC (AP SoC) provides a hardware environment for developing and evaluating designs targeting the Zynq®-7000 XC7Z045-2FFG900C AP SoC. The ZC706 evaluation board provides features common to many embedded processing systems, including DDR3 SODIMM and component memory, a four-lane PCI Express® interface, an Ethernet PHY, general purpose I/O, and two UART interfaces. Other features can be supported using VITA-57 FPGA mezzanine cards (FMC) attached to the low pin count (LPC) FMC and high pin count (HPC) FMC connectors.

ZC706 Evaluation Board Features

The ZC706 evaluation board features are listed in here. Detailed information for each feature is provided in [Feature Descriptions](#) starting on [page 14](#).

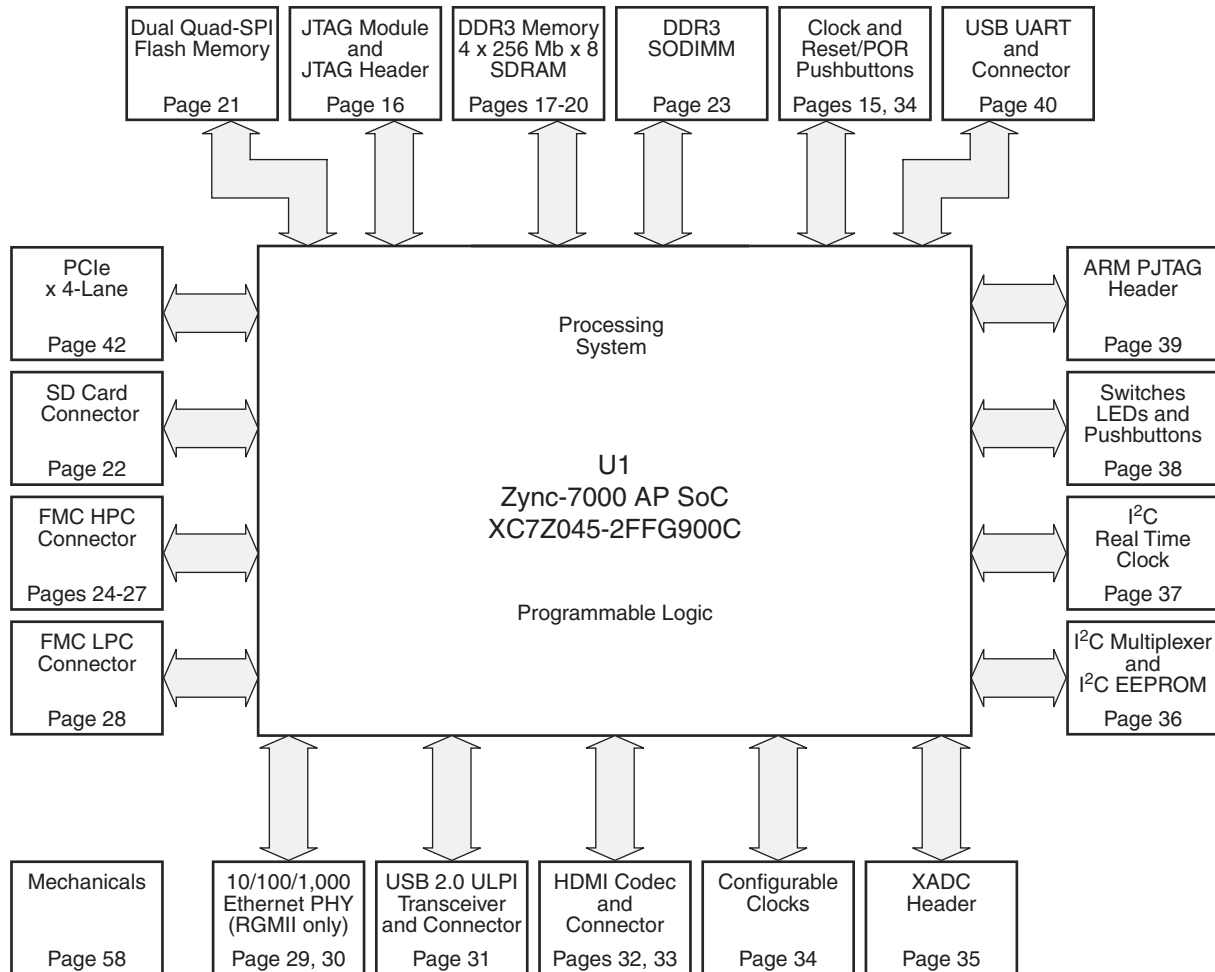
- Zynq-7000 XC7Z045-2FFG900C AP SoC
- 1 GB DDR3 memory SODIMM on the programmable logic (PL) side
- 1 GB DDR3 component memory (four [256 Mb x 8] devices) on the processing system (PS) side
- Two 128 Mb Quad-SPI (QSPI) flash memory (Dual Quad-SPI)
- USB 2.0 ULPI (UTMI+ low pin interface) transceiver with micro-B USB connector
- Secure Digital (SD) connector
- USB JTAG interface via Digilent module with micro-B USB connector
- Clock sources:
 - Fixed 200 MHz LVDS oscillator (differential)
 - I²C programmable LVDS oscillator (differential)
 - Fixed 33.33 MHz LVCMOS oscillator (single-ended)
 - Subminiature version A (SMA) connectors (differential)
 - SMA connectors for GTX transceiver clocking (differential)

- GTX transceivers
 - FMC HPC connector (eight GTX transceivers)
 - FMC LPC connector (one GTX transceiver)
 - SMA connectors (one pair each for TX, RX and REFCLK)
 - PCI Express (four lanes)
 - Small form-factor pluggable plus (SFP+) connector
 - Ethernet PHY RGMII interface
- PCI Express endpoint connectivity
 - Gen1 4-lane (x4)
 - Gen2 4-lane (x4)
- SFP+ Connector
- Ethernet PHY RGMII interface with RJ-45 connector
- USB-to-UART bridge with mini-B USB connector
- HDMI codec with HDMI connector
- I²C bus
- I²C bus multiplexed to:
 - Si570 user clock
 - ADV7511 HDMI codec
 - M24C08 EEPROM (1 kB)
 - 1-to-16 TCA6416APWR port expander
 - DDR3 SODIMM
 - RTC-8564JE real time clock
 - FMC HPC connector
 - FMC LPC connector
 - PMBUS data/clock
- Status LEDs:
 - Ethernet status
 - TI Power Good
 - Linear Power Good
 - PS DDR3 Component V_{tt} Good
 - PL DDR3 SODIMM V_{tt} Good

- FMC Power Good
- 12V Input Power On
- FPGA INIT
- FPGA DONE
- User I/O:
 - Four (PL) user LEDs
 - Three (PL) user pushbuttons
 - One (PL) user DIP switch (4-pole)
 - Two Dual row Pmod GPIO headers
- AP SoC PS Reset Pushbuttons:
 - SRST_B PS reset button
 - POR_B PS reset button
- VITA 57.1 FMC HPC connector
- VITA 57.1 FMC LPC connector
- Power on/off slide switch
- Program_B pushbutton
- Power management with PMBus voltage and current monitoring through TI power controller
- Dual 12-bit 1 MSPS XADC analog-to-digital front end
- Configuration options:
 - Dual Quad-SPI flash memory
 - USB JTAG configuration port (Digilent module)
 - Platform cable header JTAG configuration port
 - 20-pin PL PJTAG header

Block Diagram

The ZC706 evaluation board block diagram is shown in [Figure 1-1](#).



Note: Page numbers reference the page number of schematic 0381513.

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Figure 1-1: ZC706 Evaluation Board Block Diagram

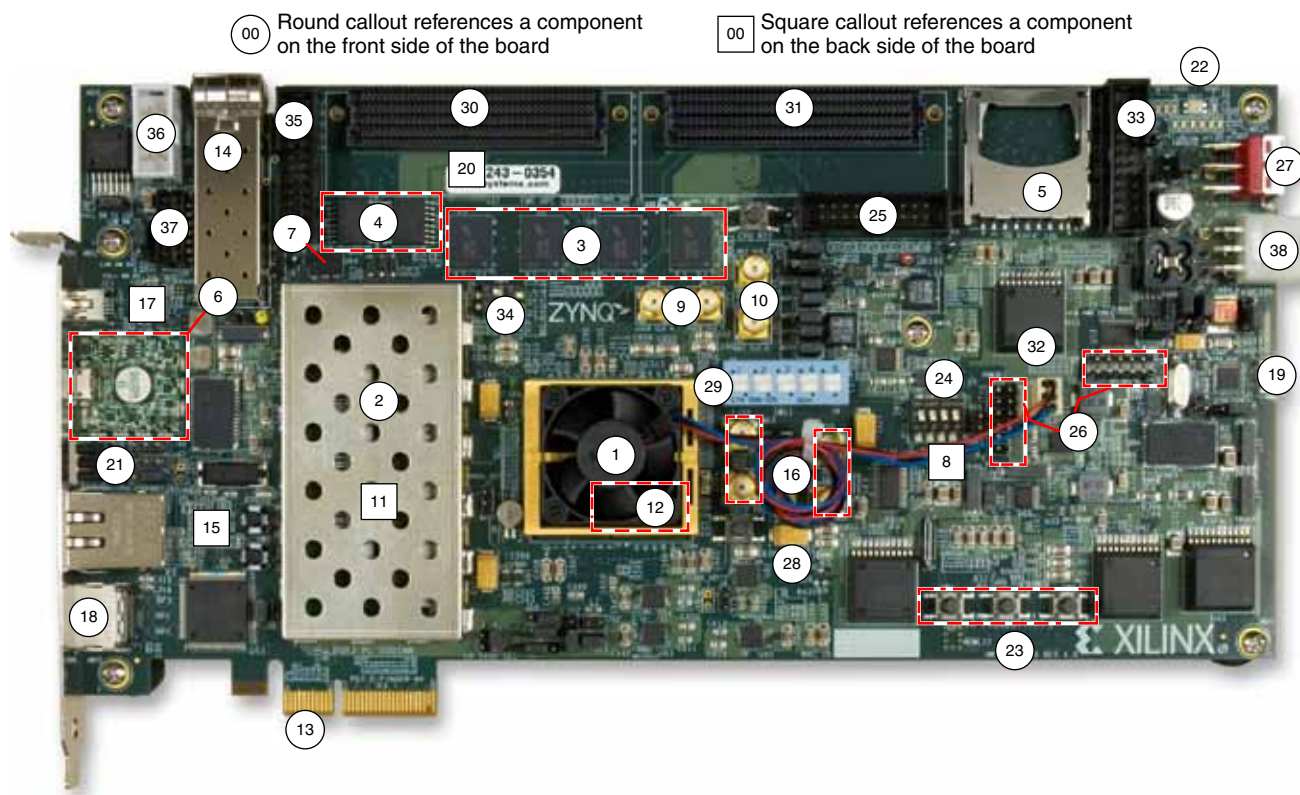
Board Layout

[Figure 1-2](#) shows the ZC706 evaluation board. Each numbered feature that is referenced in [Figure 1-2](#) is described in [Table 1-1](#) with a link to detailed information provided under [Feature Descriptions](#) starting on [page 14](#).

Note: The image in [Figure 1-2](#) is for reference only and might not reflect the current revision of the board.



CAUTION! The ZC706 evaluation board can be damaged by electrostatic discharge (ESD). Follow ESD prevention measures when handling the board.



UG954_c1_02_041113

Figure 1-2: ZC706 Evaluation Board Component Locations

Table 1-1: ZC706 Evaluation Board Component Descriptions

Callout	Feature	Notes	Schematic 0381513 Page Number
1	Zynq-7000 XC7Z045 AP SoC, page 14 Zynq-7000 All Programmable SoC with fan sink	XC7Z045T-2FFG900C with Radian INC3001-7_1.5BU_LI98 fan sink	
2	DDR3 SODIMM Memory (PL), page 18 DDR3 SODIMM Memory Socket (J1)	Micron MT8JTF12864HZ-1G6G1	23
3	DDR3 Component Memory (PS), page 22 DDR3 Memory 1GB (4x256M U2-U5)	Micron MT41J256M8HX-15E	17-20
4	Quad-SPI Flash Memory, page 25 Dual Quad-SPI Flash (128Mb) (U58-U59)	Spansion S25FL128SAGMFIR01	21
5	SD Card Interface, page 29 SD Card Interface Connector (J30)	Molex 67840-8001	22
6	USB 2.0 ULPI Transceiver, page 27 USB JTAG Interface w/Micro-B Connector (U30)	Digilent USB JTAG Module	16
7	System Clock, page 34 System Clock, 2.5V LVDS (U64)	SiTime SIT9102-243N25E200.0000	34

Table 1-1: ZC706 Evaluation Board Component Descriptions (Cont'd)

Callout	Feature	Notes	Schematic 0381513 Page Number
8	Programmable User Clock, page 35 I ² C Prog. User Clock 3.3V LVDS (U37, bottom of board)	Silicon Labs SI570BAB0000544DG, default 156.250 MHz	34
9	User SMA Clock Source, page 36 User Differential SMA Clock P/N (J67/J68)	Rosenberger 32K10K-400L5	44
10	GTX SMA Clock (SMA_MGT_REFCLK_P and SMA_MGT_REFCLK_N), page 37 GTX Differential SMA Clock P/N (J36/J31)	Rosenberger 32K10K-400L5	44
11	Jitter Attenuated Clock, page 38 Jitter Attenuated Clock (U60, bottom of board)	Silicon Labs SI5324C-C-GM	43
12	GTX Transceivers, page 39 GTX Transceivers	Embedded within AP SoC U1	8
13	PCI Express Endpoint Connectivity, page 44 PCI Express Connector (P4)	4-lane card edge connector	42
14	SFP/SFP+ Module Connector, page 46 SFP/SFP+ Module Connector (P2)	Molex 74441-0010	41
15	10/100/1,000 Mb/s Tri-Speed Ethernet PHY (PL), page 47 RGMII only 10/100/1000 Mb/s Ethernet PHY w/RJ45 (U51, P3)	Marvell 88E1116RA0-NNC1C000	29
16	GTX Differential SMA TX and RX P/N (J35/J34 and J32/J33)	Rosenberger 32K10K-400L5	44
17	USB-to-UART Bridge, page 49 USB-to-UART Bridge with Mini-B Connector (U52, J21)	Silicon Labs CP2103GM bridge	40
18	HDMI Video Output, page 50 HDMI Controller (U53), HDMI Video Connector (P1)	Analog Devices ADV7511KSTZ-P, Molex 500254-1927,	32, 33
19	USB 2.0 ULPI Transceiver, page 27 USB 2.0 ULPI Controller w/ Micro-B Connector (U12, J2)	SMSC USB3320C-EZK	31
20	I2C Bus, page 53 I ² C Bus MUX (U65, bottom of board)	TI PCA9548ARGER	36
21	Ethernet PHY User LEDs, page 57 Ethernet PHY Status LEDs (DS28-DS30)	EPHY status LED, GREEN single-stack	29
22	User LEDs, page 58 User LEDs (DS8-DS10, DS35)	GPIO LEDs, GREEN 0603	38
23	User Pushbuttons, page 59 User pushbuttons, active-High (SW7, 9, 8)	E-Switch TL3301EF100QG in Left, Center, Right pattern	38

Table 1-1: ZC706 Evaluation Board Component Descriptions (Cont'd)

Callout	Feature	Notes	Schematic 0381513 Page Number
24	GPIO DIP Switch, page 60 GPIO DIP Switch (SW12)	4-pole C&K SDA04H1SBD	38
25	ARM® core PJTAG Header (J64)	2x10 0.1inch male header, Samtec TST-110-01-G-D	39
26	User PMOD GPIO Headers, page 60 PMOD Headers (J57, J58)	2x6 0.1 inch male header	37, 39
27	Power On/Off Slide Switch, page 62 Power On/Off Switch (SW1)	C&K 1201M2S3AQE2	48
28	Program_B Pushbutton, page 63 FPGA PROG pushbutton (SW10)	E-Switch TL3301EF100QG	38
29	AP SoC MIO Config. DIP Switch (SW11)	5-pole DPDT CTS 206-125	15
30	HPC Connector J37, page 65 FMC HPC connector (J37)	Samtec ASP_134486_01	24-27
31	LPC Connector J5, page 70 FMC LPC connector (J5)	Samtec ASP_134603_01	28
32	Power Management, page 77 Power Management System (top and bottom of board)	TI UCD90120ARGC in conjunction w/various regulators	48-57
33	XADC Analog-to-Digital Converter, page 83 XADC Connector (J63)	2x10 0.1inch male header, Samtec TST-110-01-G-D	35
34	Programmable Logic JTAG Select Switch, page 31 JTAG Configuration DIP Switch (SW4)	2-pole C&K SDA02H1SBD	16
35	JTAG Flying Lead Header (J62)	2x10 0.1inch male header, Samtec TST-110-01-G-D	16
36	2x5 shrouded PMBus connector J4	ASSMAN HW10G-0202	48
37	2x7 2mm shrouded JTAG cable connector J3	MOLEX 87832-1420	16
38	12V power input 2x6 connector J22	MOLEX-39-30-1060	48

Feature Descriptions

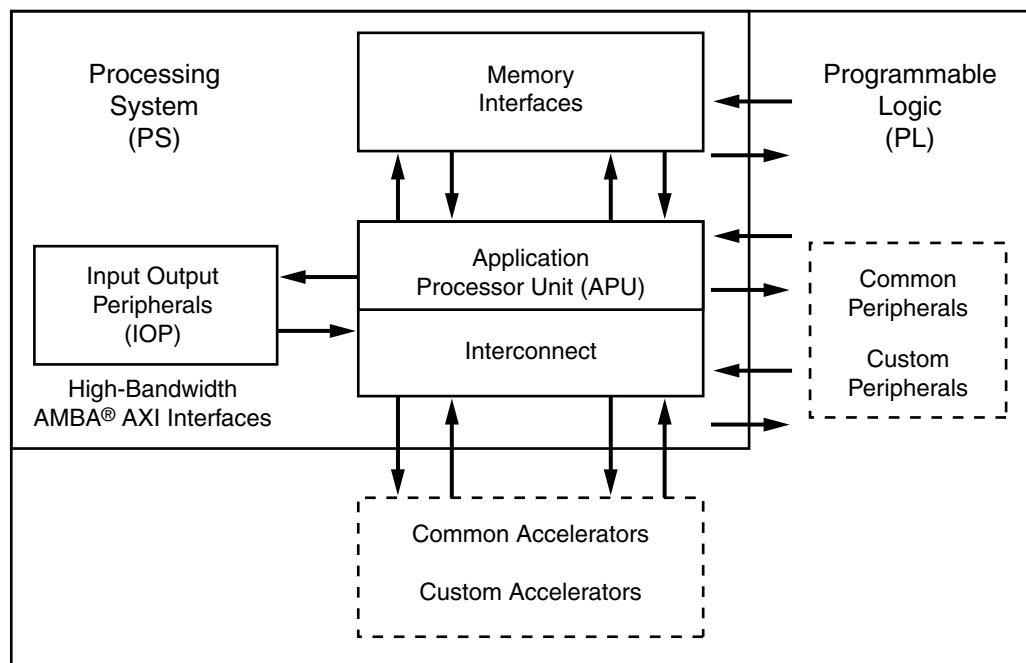
Detailed information for each feature shown in [Figure 1-2](#) and listed in [Table 1-1](#) is provided in this section.

Zynq-7000 XC7Z045 AP SoC

[[Figure 1-2](#), callout 1]

The ZC706 evaluation board is populated with the Zynq-7000 XC7Z045-2FFG900C AP SoC.

The XC7Z045 AP SoC consists of an integrated processing system (PS) and programmable logic (PL), on a single die. The high-level block diagram is shown in [Figure 1-3](#).

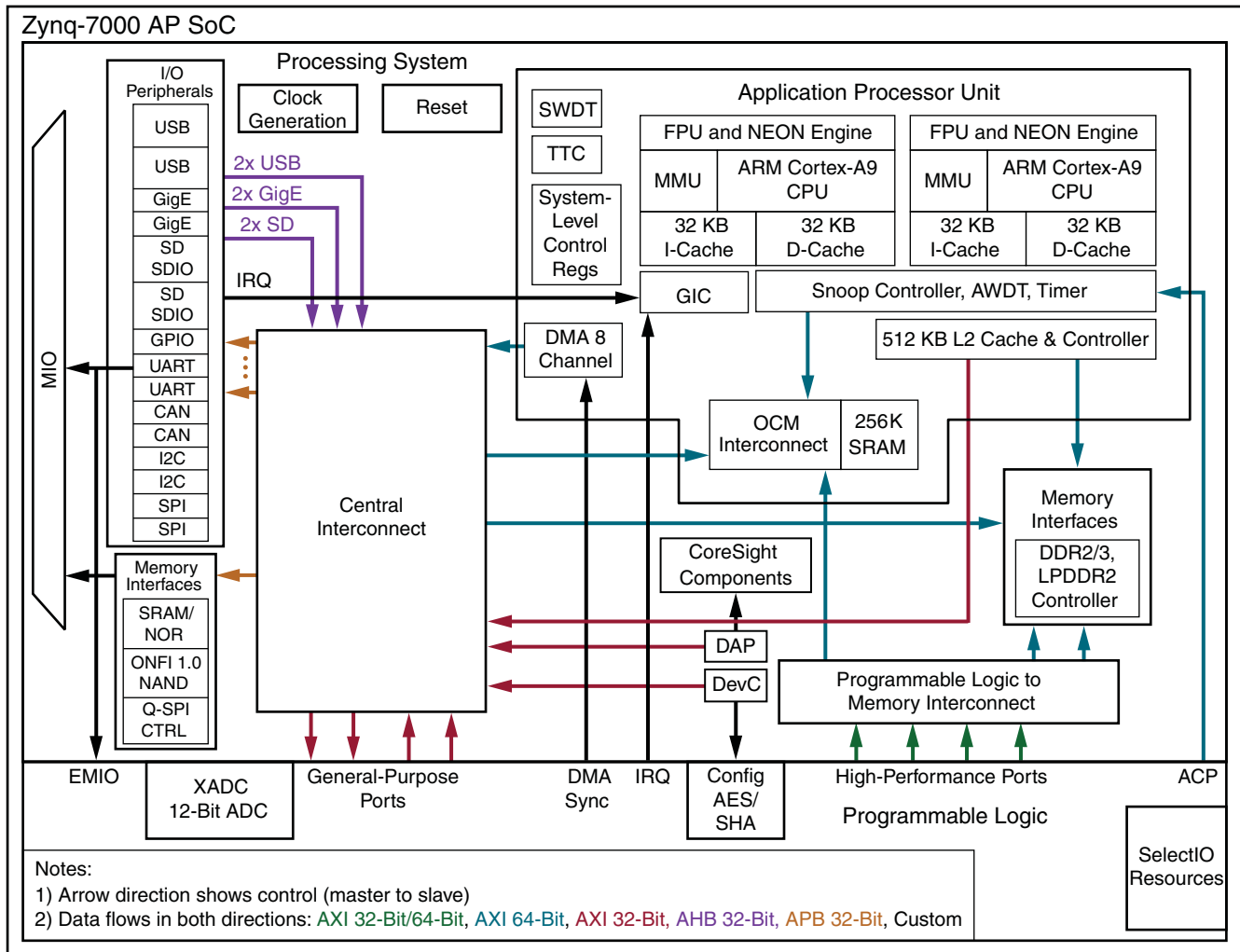


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Figure 1-3: High-Level Block Diagram

The PS integrates two ARM® Cortex™-A9 MPCore™ application processors, AMBA® interconnect, internal memories, external memory interfaces, and peripherals including USB, Ethernet, SPI, SD/SDIO, I²C, CAN, UART, and GPIO. The PS runs independently of the PL and boots at power-up or reset.

A system level block diagram is shown in [Figure 1-4](#).



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Figure 1-4: Zynq-7000 Block Diagram

For additional information on Zynq-7000 SoC devices, see *Zynq-7000 All Programmable SoC Overview* ([DS190](#)) and *Zynq-7000 All Programmable SoC Technical Reference Manual* ([UG585](#)).

Device Configuration

the Zynq-7000 XC7Z045 AP SoC uses a multi-stage boot process that supports both a non-secure and a secure boot. The PS is the master of the boot and configuration process. For a secure boot, the PL must be powered on to enable the use of the security block located within the PL, which provides 256-bit AES and SHA decryption/authentication.

The ZC706 evaluation board supports these configuration options:

- PS Configuration: Quad-SPI flash memory
- PS Configuration: Processor System Boot from SD Card (J30)

- PL Configuration: USB JTAG configuration port (Digilent module U30)
- PL Configuration: Platform cable header J3 and flying lead header J62 JTAG configuration ports



TIP: Designs using serial configuration based on Quad-SPI flash memory can take advantage of low-cost commodity SPI flash memory.

The JTAG configuration option is selected by setting SW11 (PS) as shown in [Table 1-2](#) and SW4 (PL) as described in [Programmable Logic JTAG Programming Options, page 31](#). SW11 is callout 29 in [Figure 1-2](#).

Table 1-2: Switch SW11 Configuration Option Settings

Boot Mode	SW11.1	SW11.2	SW11.3	SW11.4	SW11.5
JTAG mode ⁽¹⁾	0	0	0	0	0
Independent JTAG mode	1	0	0	0	0
QSPI mode	0	0	0	1	0
SD mode	0	0	1	1	0
MIO configuration pin	MIO2	MIO3	MIO4	MIO5	MIO6

Notes:

1. Default switch setting

For more information about Zynq-7000 AP SoC configuration settings, see *Zynq-7000 All Programmable SoC Technical Reference Manual* ([UG585](#)).

Encryption Key Backup Circuit

The XC7Z045 AP SoC U1 implements bitstream encryption key technology. The ZC706 board provides the encryption key backup battery circuit shown in [Figure 1-5](#). The Seiko TS518FE rechargeable 1.5V lithium button-type battery B2 is soldered to the board with the positive output connected to the XC7Z045 AP SoC U1 VCCBATT pin P9. The battery supply current IBATT specification is 150 nA max when board power is off. B2 is charged from the VCCAUX 1.8V rail through a series diode with a typical forward voltage drop of 0.38V and 4.7 K Ω current limit resistor. The nominal charging voltage is 1.42V.

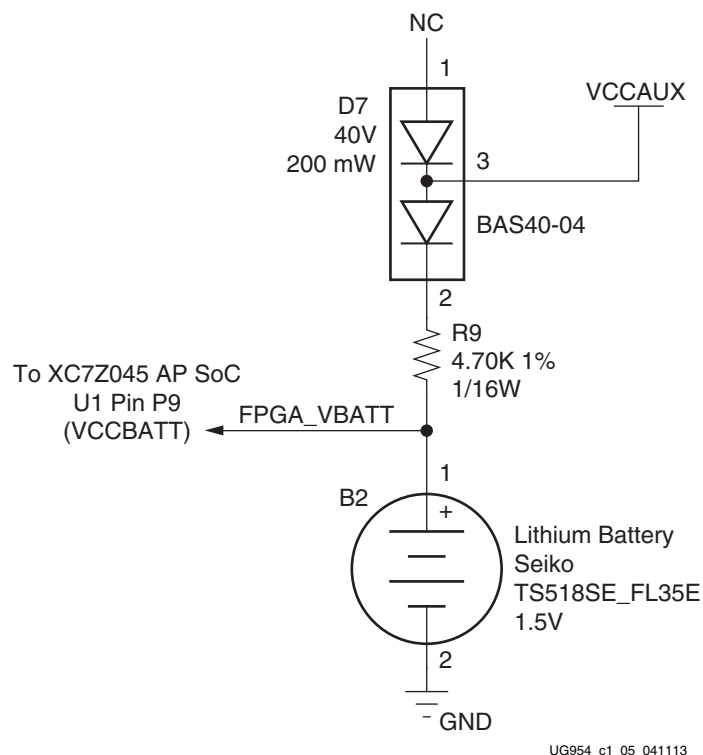


Figure 1-5: Encryption Key Backup Circuit

I/O Voltage Rails

There are eleven I/O banks available on the XC7Z045 AP SoC. The voltages applied to the XC7Z045 AP SoC I/O banks used by the ZC706 evaluation board are listed in [Table 1-3](#).

Table 1-3: I/O Voltage Rails

XC7Z045 (U1) Bank	Net Name	Voltage	Connected To
PL Bank 0	VCC3V3_FPGA	3.3V	AP SoC Configuration Bank 0
PL Bank 9	VADJ_FPGA	2.5V	PMOD, USER_SMA_CLOCK, SM_FAN, REC_CLOCK, SFP_TX_DISABLE
PL Bank 10			FMC_LPC, PL_JTAG, GPIO
PL Bank 11			FMC_HPC, GPIO_LED, HDMI
PL Bank 12			FMC_LPC, HDMI
PL Bank 13			FMC_HPC, HDMI
PL Bank 33	VCC1V5_PL	1.5V	PL_DDR3_D[31:0]
PL Bank 34			PL_DDR3_A, SYSCLK
PL Bank 35			PL_DDR3_D[63:32], XADC

Table 1-3: I/O Voltage Rails (Cont'd)

XC7Z045 (U1) Bank	Net Name	Voltage	Connected To
PS Bank 500	VCCP1V8	1.8V	QSPIO,QSPI1
PS Bank 501			PHY_IF,SDIO_IF,USB_IF
PS Bank 502			PS_DDR3_IF

Notes:

1. The ZC706 evaluation board is shipped with V_{ADJ} set to 2.5V.

DDR3 SODIMM Memory (PL)

[Figure 1-2, callout 2]

The memory module at J1 is a 1 GB DDR3 small outline dual-inline memory module (SODIMM). It provides volatile synchronous dynamic random access memory (SDRAM) for storing user code and data.

- Part number: MT8JTF12864HZ-1G6G1 (Micron Technology)
- Supply voltage: 1.5V
- Datapath width: 64 bits
- Data rate: Up to 1,600 MT/s

The DDR3 interface is implemented across the PL-side I/O banks. Bank 33 and bank 35 have a dedicated DCI VRP/N resistor connection. An external 0.75V reference VTTREF_SODIMM is provided for data interface banks. Any interface connected to these banks that requires the VTTREF voltage must use this FPGA voltage reference. The connections between the DDR3 memory and the AP SoC are listed in Table 1-4.

Table 1-4: DDR3 SODIMM Socket J1 Connections to the XC7Z045 AP SoC

XC7Z045 (U1) Pin	Net Name	SODIMM Memory	
		Pin Number	Pin Name
E10	PL_DDR3_A0	98	A0
B9	PL_DDR3_A1	97	A1
E11	PL_DDR3_A2	96	A2
A9	PL_DDR3_A3	95	A3
D11	PL_DDR3_A4	92	A4
B6	PL_DDR3_A5	91	A5
F9	PL_DDR3_A6	90	A6
E8	PL_DDR3_A7	86	A7
B10	PL_DDR3_A8	89	A8
J8	PL_DDR3_A9	85	A9

Table 1-4: DDR3 SODIMM Socket J1 Connections to the XC7Z045 AP SoC (Cont'd)

XC7Z045 (U1) Pin	Net Name	SODIMM Memory	
		Pin Number	Pin Name
D6	PL_DDR3_A10	107	A10/AP
B7	PL_DDR3_A11	84	A11
H12	PL_DDR3_A12	83	A12_BC_N
A10	PL_DDR3_A13	119	A13
G11	PL_DDR3_A14	80	A14
C6	PL_DDR3_A15	78	A15
F8	PL_DDR3_BA0	109	BA0
H7	PL_DDR3_BA1	108	BA1
A7	PL_DDR3_BA2	79	BA2
L1	PL_DDR3_D0	5	DQ0
L2	PL_DDR3_D1	7	DQ1
K5	PL_DDR3_D2	15	DQ2
J4	PL_DDR3_D3	17	DQ3
K1	PL_DDR3_D4	4	DQ4
L3	PL_DDR3_D5	6	DQ5
J5	PL_DDR3_D6	16	DQ6
K6	PL_DDR3_D7	18	DQ7
G6	PL_DDR3_D8	21	DQ8
H4	PL_DDR3_D9	23	DQ9
H6	PL_DDR3_D10	33	DQ10
H3	PL_DDR3_D11	35	DQ11
G1	PL_DDR3_D12	22	DQ12
H2	PL_DDR3_D13	24	DQ13
G5	PL_DDR3_D14	34	DQ14
G4	PL_DDR3_D15	36	DQ15
E2	PL_DDR3_D16	39	DQ16
E3	PL_DDR3_D17	41	DQ17
D4	PL_DDR3_D18	51	DQ18
E5	PL_DDR3_D19	53	DQ19
F4	PL_DDR3_D20	40	DQ20
F3	PL_DDR3_D21	42	DQ21
D1	PL_DDR3_D22	50	DQ22
D3	PL_DDR3_D23	52	DQ23
A2	PL_DDR3_D24	57	DQ24
B2	PL_DDR3_D25	59	DQ25

Table 1-4: DDR3 SODIMM Socket J1 Connections to the XC7Z045 AP SoC (Cont'd)

XC7Z045 (U1) Pin	Net Name	SODIMM Memory	
		Pin Number	Pin Name
B4	PL_DDR3_D26	67	DQ26
B5	PL_DDR3_D27	69	DQ27
A3	PL_DDR3_D28	56	DQ28
B1	PL_DDR3_D29	58	DQ29
C1	PL_DDR3_D30	68	DQ30
C4	PL_DDR3_D31	70	DQ31
K10	PL_DDR3_D32	129	DQ32
L9	PL_DDR3_D33	131	DQ33
K12	PL_DDR3_D34	141	DQ34
J9	PL_DDR3_D35	143	DQ35
K11	PL_DDR3_D36	130	DQ36
L10	PL_DDR3_D37	132	DQ37
J10	PL_DDR3_D38	140	DQ38
L7	PL_DDR3_D39	142	DQ39
F14	PL_DDR3_D40	147	DQ40
F15	PL_DDR3_D41	149	DQ41
F13	PL_DDR3_D42	157	DQ42
G16	PL_DDR3_D43	159	DQ43
G15	PL_DDR3_D44	146	DQ44
E12	PL_DDR3_D45	148	DQ45
D13	PL_DDR3_D46	158	DQ46
E13	PL_DDR3_D47	160	DQ47
D15	PL_DDR3_D48	163	DQ48
E15	PL_DDR3_D49	165	DQ49
D16	PL_DDR3_D50	175	DQ50
E16	PL_DDR3_D51	177	DQ51
C17	PL_DDR3_D52	164	DQ52
B16	PL_DDR3_D53	166	DQ53
D14	PL_DDR3_D54	174	DQ54
B17	PL_DDR3_D55	176	DQ55
B12	PL_DDR3_D56	181	DQ56
C12	PL_DDR3_D57	183	DQ57
A12	PL_DDR3_D58	191	DQ58
A14	PL_DDR3_D59	193	DQ59
A13	PL_DDR3_D60	180	DQ60

Table 1-4: DDR3 SODIMM Socket J1 Connections to the XC7Z045 AP SoC (Cont'd)

XC7Z045 (U1) Pin	Net Name	SODIMM Memory	
		Pin Number	Pin Name
B11	PL_DDR3_D61	182	DQ61
C14	PL_DDR3_D62	192	DQ62
B14	PL_DDR3_D63	194	DQ63
J3	PL_DDR3_DM0	11	DM0
F2	PL_DDR3_DM1	28	DM1
E1	PL_DDR3_DM2	46	DM2
C2	PL_DDR3_DM3	63	DM3
L12	PL_DDR3_DM4	136	DM4
G14	PL_DDR3_DM5	153	DM5
C16	PL_DDR3_DM6	170	DM6
C11	PL_DDR3_DM7	187	DM7
K2	PL_DDR3_DQS0_N	10	DQS0_N
K3	PL_DDR3_DQS0_P	12	DQS0_P
H1	PL_DDR3_DQS1_N	27	DQS1_N
J1	PL_DDR3_DQS1_P	29	DQS1_P
D5	PL_DDR3_DQS2_N	45	DQS2_N
E6	PL_DDR3_DQS2_P	47	DQS2_P
A4	PL_DDR3_DQS3_N	62	DQS3_N
A5	PL_DDR3_DQS3_P	64	DQS3_P
K8	PL_DDR3_DQS4_N	135	DQS4_N
L8	PL_DDR3_DQS4_P	137	DQS4_P
F12	PL_DDR3_DQS5_N	152	DQS5_N
G12	PL_DDR3_DQS5_P	154	DQS5_P
E17	PL_DDR3_DQS6_N	169	DQS6_N
F17	PL_DDR3_DQS6_P	171	DQS6_P
A15	PL_DDR3_DQS7_N	186	DQS7_N
B15	PL_DDR3_DQS7_P	188	DQS7_P
G7	PL_DDR3_ODT0	116	ODT0
C9	PL_DDR3_ODT1	120	ODT1
G17	PL_DDR3_RESET_B	30	RESET_B
J11	PL_DDR3_S0_B	114	S0_B
H8	PL_DDR3_S1_B	121	S1_B
M10	PL_DDR3_TEMP_EVENT	198	98 EVENT_B
F7	PL_DDR3_WE_B	113	WE_B
E7	PL_DDR3_CAS_B	115	CAS_B

Table 1-4: DDR3 SODIMM Socket J1 Connections to the XC7Z045 AP SoC (Cont'd)

XC7Z045 (U1) Pin	Net Name	SODIMM Memory	
		Pin Number	Pin Name
H11	PL_DDR3_RAS_B	110	RAS_B
D10	PL_DDR3_CKE0	73	CKE0
C7	PL_DDR3_CKE1	74	CKE1
F10	PL_DDR3_CLK0_N	103	CK0_N
G10	PL_DDR3_CLK0_P	101	CK0_P
D8	PL_DDR3_CLK1_N	104	CK1_N
D9	PL_DDR3_CLK1_P	102	CK1_P

The ZC706 DDR3 SODIMM interface adheres to the constraints guidelines documented in the “Dynamic Memory” section of the *Zynq-7000 All Programmable SoC PCB Design and Pin Planning Guide* ([UG933](#)). The ZC706 DDR3 SODIMM interface is a 40Ω impedance implementation.

DDR3 Component Memory (PS)

[Figure 1-2, callout 3]

The 1 GB, 32-bit wide DDR3 component memory system is comprised of four 256 Mb x 8 SDRAMs (Micron MT41J256M8HX-15E) at U2-U5. This memory system is connected to the XC7Z045 AP SoC Processing System (PS) memory interface bank 502. The DDR3 0.75V VTT termination voltage is sourced from linear regulator U27. The connections between the DDR3 component memory and XC7Z045 AP SoC bank 502 are listed in [Table 1-5](#).

Table 1-5: DDR3 Component Memory Connections to the XC7Z045 AP SoC

XC7Z045 (U1) Pin	Net Name	Component Memory		
		Pin Number	Pin Name	Ref. Des.
E26	PS_DDR3_DQ0	B3	DQ0	U2
A25	PS_DDR3_DQ1	C7	DQ1	U2
E27	PS_DDR3_DQ2	C2	DQ2	U2
E25	PS_DDR3_DQ3	C8	DQ3	U2
D26	PS_DDR3_DQ4	E3	DQ4	U2
B25	PS_DDR3_DQ5	E8	DQ5	U2
D25	PS_DDR3_DQ6	D2	DQ6	U2
B27	PS_DDR3_DQ7	E7	DQ7	U2
A27	PS_DDR3_DQ8	B3	DQ8	U3
A28	PS_DDR3_DQ9	C7	DQ9	U3
A29	PS_DDR3_DQ10	C2	DQ10	U3
C28	PS_DDR3_DQ11	C8	DQ11	U3

Table 1-5: DDR3 Component Memory Connections to the XC7Z045 AP SoC (Cont'd)

XC7Z045 (U1) Pin	Net Name	Component Memory		
		Pin Number	Pin Name	Ref. Des.
D30	PS_DDR3_DQ12	E3	DQ12	U3
A30	PS_DDR3_DQ13	E8	DQ13	U3
D29	PS_DDR3_DQ14	D2	DQ14	U3
D28	PS_DDR3_DQ15	E7	DQ15	U3
H27	PS_DDR3_DQ16	B3	DQ16	U4
G27	PS_DDR3_DQ17	C7	DQ17	U4
H28	PS_DDR3_DQ18	C2	DQ18	U4
E28	PS_DDR3_DQ19	C8	DQ19	U4
E30	PS_DDR3_DQ20	E3	DQ20	U4
F28	PS_DDR3_DQ21	E8	DQ21	U4
G30	PS_DDR3_DQ22	D2	DQ22	U4
F30	PS_DDR3_DQ23	E7	DQ23	U4
K27	PS_DDR3_DQ24	B3	DQ24	U5
J30	PS_DDR3_DQ25	C7	DQ25	U5
J28	PS_DDR3_DQ26	C2	DQ26	U5
J29	PS_DDR3_DQ27	C8	DQ27	U5
K30	PS_DDR3_DQ28	E3	DQ28	U5
M29	PS_DDR3_DQ29	E8	DQ29	U5
L30	PS_DDR3_DQ30	D2	DQ30	U5
M30	PS_DDR3_DQ31	E7	DQ31	U5
C27	PS_DDR3_DM0	B7	DM0	U2
C26	PS_DDR3_DQS0_P	C3	DQS0_P	U2
B26	PS_DDR3_DQS0_N	D3	DQS0_N	U2
B30	PS_DDR3_DM1	B7	DM1	U3
C29	PS_DDR3_DQS1_P	C3	DQS1_P	U3
B29	PS_DDR3_DQS1_N	D3	DQS1_N	U3
H29	PS_DDR3_DM2	B7	DM2	U4
G29	PS_DDR3_DQS2_P	C3	DQS2_P	U4
F29	PS_DDR3_DQS2_N	D3	DQS2_N	U4
K28	PS_DDR3_DM3	B7	DM3	U5
L28	PS_DDR3_DQS3_P	C3	DQS3_P	U5
L29	PS_DDR3_DQS3_N	D3	DQS3_N	U5
L25	PS_DDR3_A0	K3	A0	U2, U3, U4, U5
K26	PS_DDR3_A1	L7	A1	U2, U3, U4, U5
L27	PS_DDR3_A2	L3	A2	U2, U3, U4, U5

Table 1-5: DDR3 Component Memory Connections to the XC7Z045 AP SoC (Cont'd)

XC7Z045 (U1) Pin	Net Name	Component Memory		
		Pin Number	Pin Name	Ref. Des.
G25	PS_DDR3_A3	K2	A3	U2, U3, U4, U5
J26	PS_DDR3_A4	L8	A4	U2, U3, U4, U5
G24	PS_DDR3_A5	L2	A5	U2, U3, U4, U5
H26	PS_DDR3_A6	M8	A6	U2, U3, U4, U5
K22	PS_DDR3_A7	M2	A7	U2, U3, U4, U5
F27	PS_DDR3_A8	N8	A8	U2, U3, U4, U5
J23	PS_DDR3_A9	M3	A9	U2, U3, U4, U5
G26	PS_DDR3_A10	H7	A10	U2, U3, U4, U5
H24	PS_DDR3_A11	M7	A11	U2, U3, U4, U5
K23	PS_DDR3_A12	K7	A12	U2, U3, U4, U5
H23	PS_DDR3_A13	N3	A13	U2, U3, U4, U5
J24	PS_DDR3_A14	N7	A14	U2, U3, U4, U5
M27	PS_DDR3_BA0	J2	BA0	U2, U3, U4, U5
M26	PS_DDR3_BA1	K8	BA1	U2, U3, U4, U5
M25	PS_DDR3_BA2	J3	BA2	U2, U3, U4, U5
K25	PS_DDR3_CLK_P	F7	CK	U2, U3, U4, U5
J25	PS_DDR3_CLK_N	G7	CK_B	U2, U3, U4, U5
M22	PS_DDR3_CKE	G9	CKE	U2, U3, U4, U5
N23	PS_DDR3_WE_B	H3	WE_B	U2, U3, U4, U5
M24	PS_DDR3_CAS_B	G3	CAS_B	U2, U3, U4, U5
N24	PS_DDR3_RAS_B	F3	RAS_B	U2, U3, U4, U5
F25	PS_DDR3_RESET_B	N2	RESET_B	U2, U3, U4, U5
N22	PS_DDR3_CS_B	H2	CS_B	U2, U3, U4, U5
L23	PS_DDR3_ODT	G1	ODT	U2, U3, U4, U5
N21	PS_VRN			
M21	PS_VRP			
L22	VTTVREF_PS			
L24	VTTVREF_PS			

The ZC706 DDR3 component interface adheres to the constraints guidelines documented in the *DDR3 Design Guidelines* section of *Zynq-7000 All Programmable SoC PCB Design and Pin Planning Guide* ([UG933](#)). The ZC706 DDR3 component interface is a 40Ω impedance implementation.

Quad-SPI Flash Memory

[Figure 1-2, callout 4]

The Quad-SPI flash memory located at U58 and U59 provides 2 x 128 Mb of nonvolatile storage that can be used for configuration and data storage.

- Part number: S25FL128SAGMFIR01 (Spansion)
- Supply voltage: 1.8V
- Datapath width: 4 bits
- Data rate: Various depending on Single/Dual/Quad mode

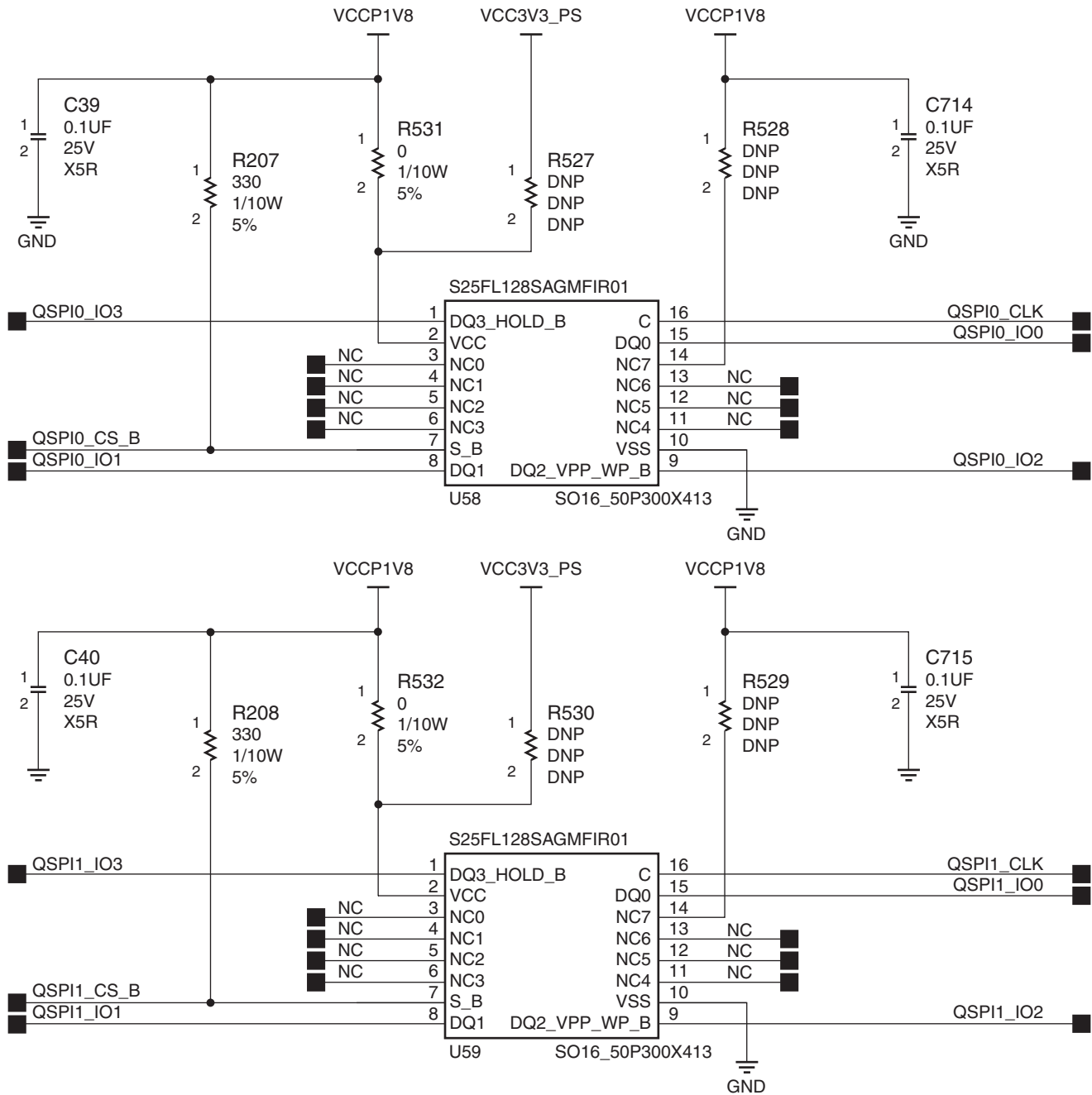
The connections between the SPI flash memory and the XC7Z045 AP SoC are listed in Table 1-6.

Table 1-6: Quad-SPI Flash Memory Connections to the XC7Z045 AP SoC

XC7Z045 (U1)			Schematic Net Name	Quad-SPI Flash Memory		QSPI Device	MIO Select Header
Pin Name	Bank	Pin Number		Pin Number	Pin Name	Ref. Des.	
PS_MIO6	500	D24	QSPI0_CLK	16	C	U58	J74.2
PS_MIO5	500	C24	QSPI0_IO3	1	DQ3_HOLD_B	U58	J73.2
PS_MIO4	500	E23	QSPI0_IO2	9	WP_B	U58	J72.2
PS_MIO3	500	C23	QSPI0_IO1	8	DQ1	U58	J71.2
PS_MIO2	500	F23	QSPI0_IO0	15	DQ0	U58	J70.2
PS_MIO1	500	D23	QSPI0_CS_B	7	S_B	U58	N/A
PS_MIO9	500	A24	QSPI1_CLK	16	C	U59	N/A
PS_MIO13	500	F22	QSPI1_IO3	1	DQ3_HOLD_B	U59	N/A
PS_MIO12	500	E21	QSPI1_IO2	9	WP_B	U59	N/A
PS_MIO11	500	A23	QSPI1_IO1	8	DQ1	U59	N/A
PS_MIO10	500	E22	QSPI1_IO0	15	DQ0	U59	N/A
PS_MIO0	500	F24	QSPI1_CS_B	7	S_B	U59	N/A

The configuration section of [UG585](#), *Zynq-7000 All Programmable SoC Technical Reference Manual* provides details on using the Quad-SPI flash memory.

Figure 1-6 shows the connections of the linear Quad-SPI flash memory on the ZC706 evaluation board. For more details, see the Spansion S25FL128SAGMFIR01 data sheet [Ref 1].



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Figure 1-6: 128 Mb Quad-SPI Flash Memory

USB 2.0 ULPI Transceiver

[Figure 1-2, callout 19]

The ZC706 evaluation board uses a Standard Microsystems Corporation USB3320 USB 2.0 ULPI Transceiver at U12 to support a USB connection to the host computer. A USB cable is supplied in the ZC706 evaluation kit (Standard-A connector to host computer, Micro-B connector to ZC706 evaluation board connector J2). The USB3320 is a high-speed USB 2.0 PHY supporting the UTMI+ low pin interface (ULPI) interface standard. The ULPI standard defines the interface between the USB controller IP and the PHY device which drives the physical USB bus. Use of the ULPI standard reduces the interface pin count between the USB controller IP and the PHY device.

The USB3320 is clocked by a 24 MHz crystal. Consult the SMSC USB3320 data sheet for clocking mode details [Ref 2].

The interface to the USB3320 transceiver is implemented through the IP in the XC7Z045 AP SoC Processor System.

Table 1-7 describes the jumper settings for the USB 2.0 circuit.

Table 1-7: USB Jumper Settings

Header	Function	Shunt Position
J11	USB PHY reset	Shunt ON = USB PHY reset Shunt OFF ⁽¹⁾ = USB PHY normal operation
J10	Host/OTG or device	Shunt ON ⁽¹⁾ = Host or OTG mode Shunt OFF = Device mode
J48	RVBUS select	Position 1-2 = Device mode (10 K Ω) Position 2-3 ⁽¹⁾ = Host or OTG mode (1 K Ω)
J50	CVBUS select	Position 1-2 = 1 μ F to GND Position 2-3 ⁽¹⁾ = 120 μ F to GND
J49	Cable ID select	Position 1-2 ⁽¹⁾ = A/B cable detect Position 2-3 = ID not used
J51	USB Micro-B	Position 1-2 ⁽¹⁾ = Shield connected to GND Position 2-3 = Shield floating

Notes:

1. Default shunt position

The connections between the USB Micro-B connector at J2 and the PHY at U12 are listed in [Table 1-8](#).

Table 1-8: USB Connector Pin Assignments and Signal Definitions Between J2 and U12

USB Connector J1		Net Name	Description	USB3320 (U12) Pin
Pin	Name			
1	VBUS	USB_VBUS_SEL	+5V from host system	22
2	D_N	USB_D_N	Bidirectional differential serial data (N-side)	19
3	D_P	USB_D_P	Bidirectional differential serial data (P-side)	18
5	GND	GND	Signal ground	33

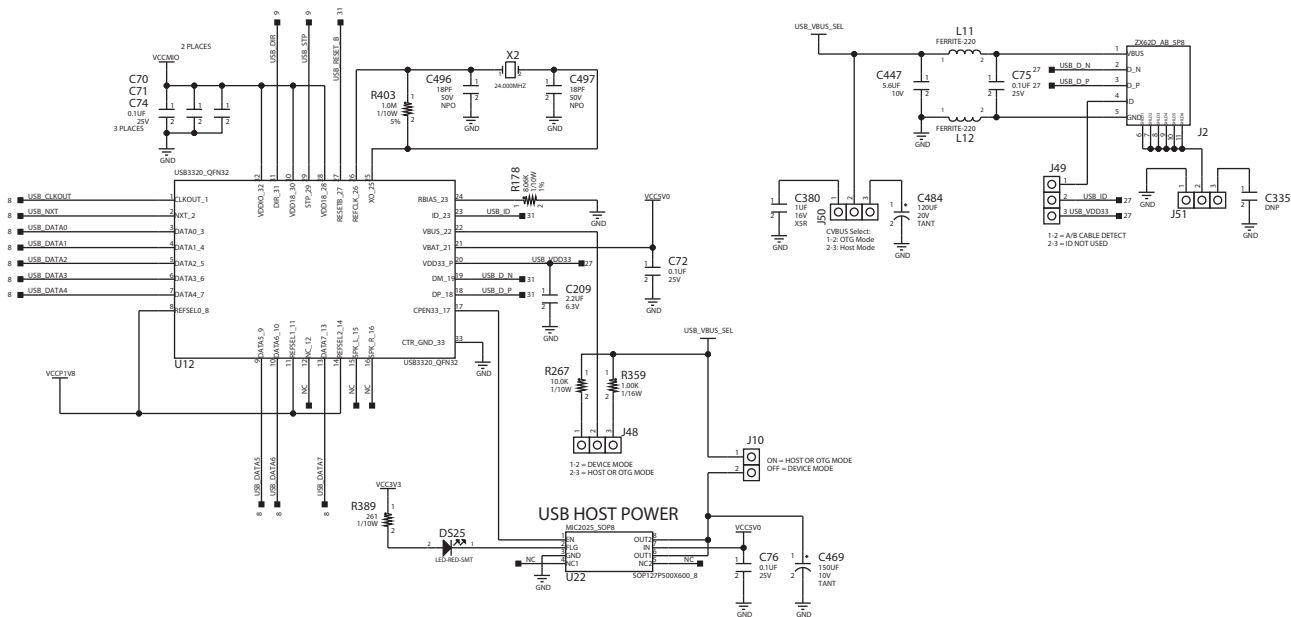
The connections between the USB 2.0 PHY at U12 and the XC7Z045 AP SoC are listed in [Table 1-9](#).

Table 1-9: USB 2.0 ULPI Transceiver Connections to the XC7Z045 AP SoC

XC7Z045 (U1)			Schematic Net Name	USB3320 (U12) Pin
Pin Name	Bank	Pin Number		
PS_MIO36	501	H17	USB_CLKOUT	1
PS_MIO31	501	H21	USB_NXT	2
PS_MIO32	501	K17	USB_DATA0	3
PS_MIO33	501	G22	USB_DATA1	4
PS_MIO34	501	K18	USB_DATA2	5
PS_MIO35	501	G21	USB_DATA3	6
PS_MIO28	501	L17	USB_DATA4	7
PS_MIO37	501	B21	USB_DATA5	9
PS_MIO38	501	A20	USB_DATA6	10
PS_MIO39	501	F18	USB_DATA7	13
PS_MIO30	501	L18	USB_STP	29
PS_MIO29	501	E8	USB_DIR	31
PS_MIO7	500	D5	USB_RESET_B_AND	27 (via AND gate U13)

For additional information on the Zynq-7000 AP SoC device USB controllers, see *Zynq-7000 All Programmable SoC Overview* ([DS190](#)) and *Zynq-7000 All Programmable SoC Technical Reference Manual* ([UG585](#)).

Figure 1-7 shows the USB 2.0 ULPI transceiver circuitry. Note that the shield for the USB Micro-B connector (J2) can be tied to GND by a jumper on header J51 pins 1–2 (default). The USB shield can optionally be connected through a capacitor to GND by installing a capacitor (body size 0402) at location C335 and jumping pins 2-3 on header J51.



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Figure 1-7: USB 2.0 ULPI Transceiver

SD Card Interface

[Figure 1-2, callout 5]

The ZC706 evaluation board includes a secure digital input/output (SDIO) interface to provide user-logic access to general purpose nonvolatile SDIO memory cards and peripherals. Information for the SD I/O card specification can be found at the SanDisk and SD card websites [Ref 3], [Ref 4].

The SDIO signals are connected to XC7Z045 AP SoC PS bank 501 which has its VCCMIO set to 1.8V. A MAX13035E high-speed logic-level translator (U11) is used between XC7Z045 AP SoC 1.8V PS bank 501 and the 3.3V SD card connector (J30).

Figure 1-8 shows the connections of the SD card interface on the ZC706 evaluation board.

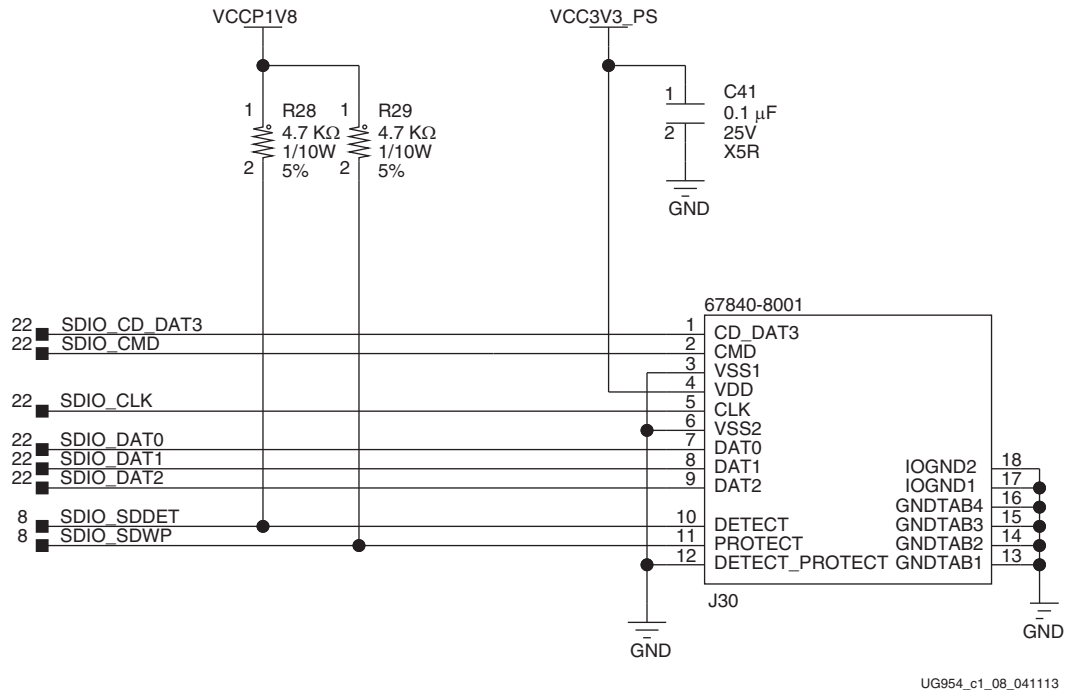


Figure 1-8: SD Card Interface

Table 1-10 lists the SD card interface connections to the XC7Z045 AP SoC

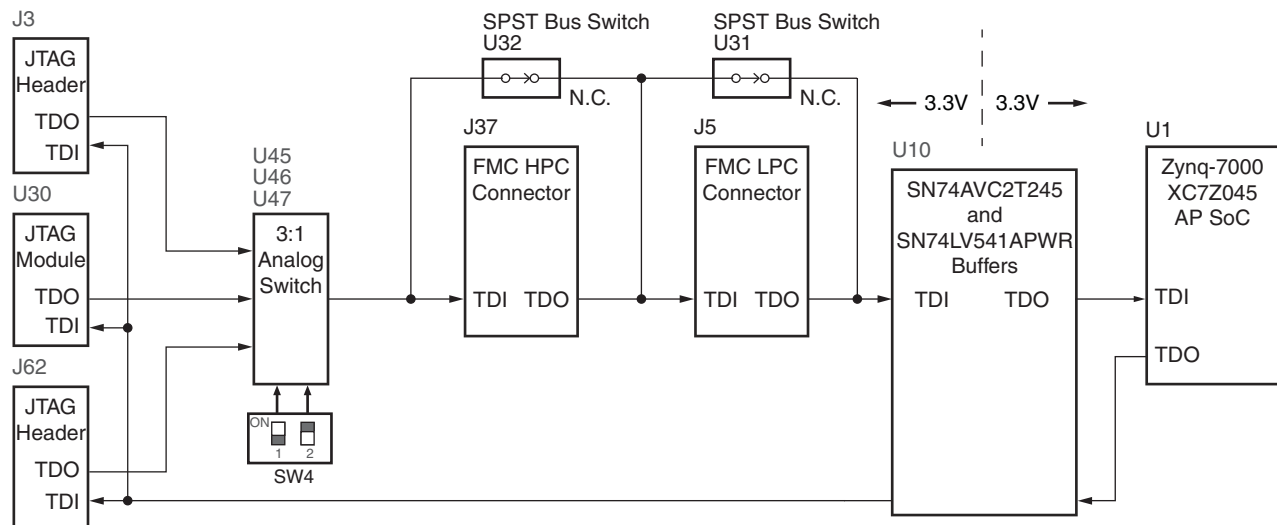
Table 1-10: SDIO Connections to the XC7Z045 AP SoC

XC7Z045 (U1) Pin			Schematic Net Name	Level Shifter (U11)		SDIO Connector (J30)	
Pin Name	Bank	Pin Number		1.8V Side Pin	3.3V Side Pin	Pin Number	Pin Name
PS_MIO15	500	C22	SDIO_SDWP	N/A	N/A	11	PROTECT
PS_MIO14	500	B22	SDIO_SDDDET	N/A	N/A	10	DETECT
PS_MIO41	501	J18	SDIO_CMD_LS	4	20	2	CMD
PS_MIO40	501	B20	SDIO_CLK_LS	9	19	5	CLK
PS_MIO44	501	E20	SDIO_DAT2_LS	1	23	9	DAT2
PS_MIO43	501	E18	SDIO_DAT1_LS	7	16	8	DAT1
PS_MIO42	501	D20	SDIO_DAT0_LS	6	18	7	DAT0
PS_MIO45	501	H18	SDIO_CD_DAT3_LS	3	22	1	CD_DAT3

Programmable Logic JTAG Programming Options

[Figure 1-2, callout 6]

The ZC706 evaluation board JTAG chain is shown in Figure 1-9.



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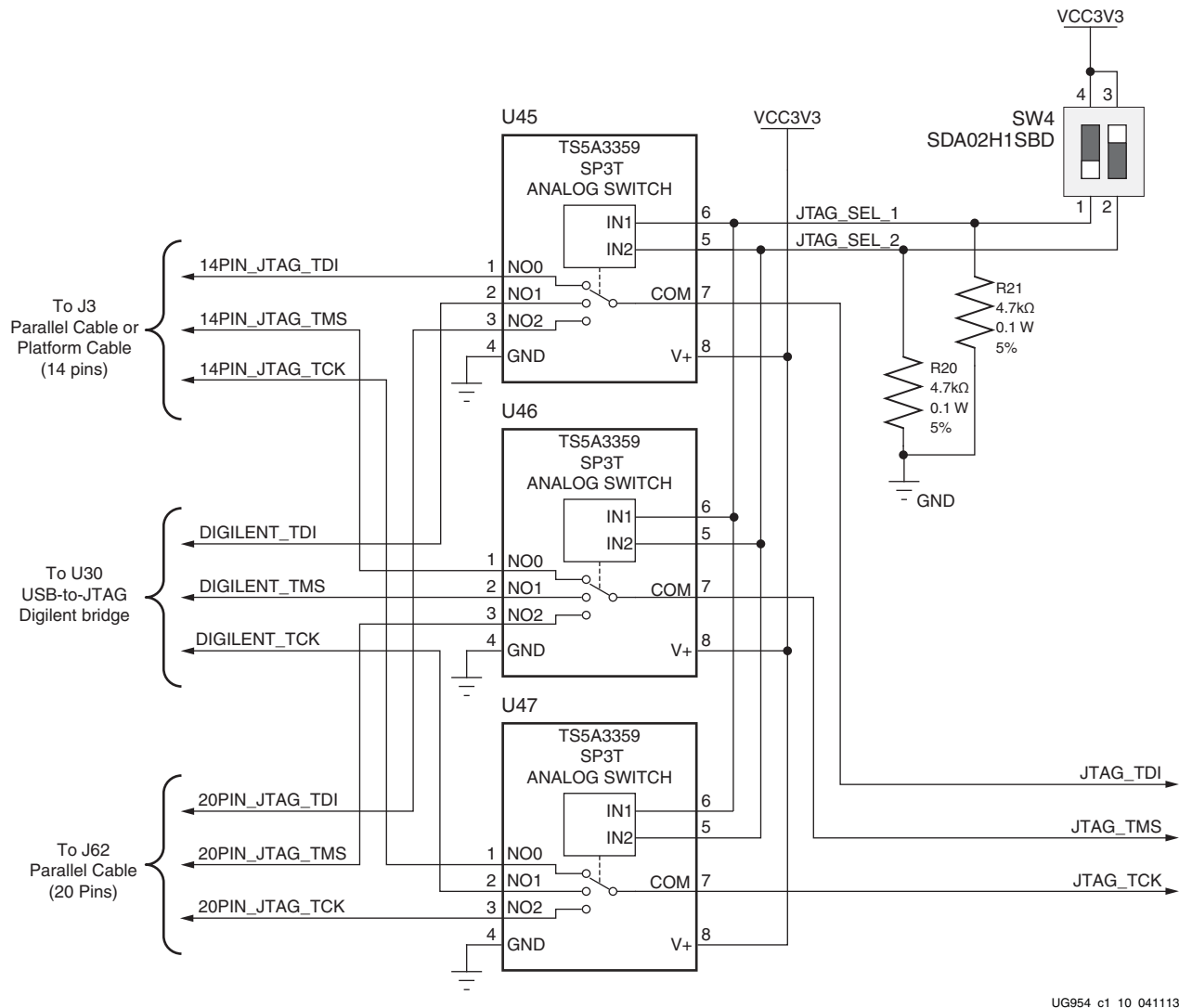
Figure 1-9: JTAG Chain Block Diagram

Programmable Logic JTAG Select Switch

[Figure 1-2, callout 35]

The PL JTAG chain can be programmed by three different methods made available through a 3-to-1 analog switch (U45, U46, and U47) controlled by a 2-position DIP switch at SW4.

Figure 1-10 shows the JTAG analog switches and DIP switch SW4.



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Figure 1-10: PL JTAG Programming Source Analog Switch

DIP switch SW4[1:2] setting 10 selects the 14-pin header J3 for configuration using either a Parallel Cable IV (PC4) or Platform Cable USB II. DIP switch SW4 setting 01 selects the USB-to-JTAG Digilent bridge U30 for configuration over a Standard-A to Micro-B USB cable. DIP switch SW4 setting 11 selects the JTAG 20-pin header at J62. The four JTAG signals TDI, TDO, TCK, and TMS would be connected to J62 through flying leads from a JTAG cable. The 3-to-1 analog switch settings are shown in [Table 1-11](#).

Table 1-11: Switch SW4 Configuration Option Settings

Configuration Source	DIP Switch SW4	
	Switch 1 ⁽¹⁾ JTAG_SEL_1	Switch 2 ⁽¹⁾ JTAG_SEL_2
None	0	0
Cable Connector J3 ⁽²⁾	1	0
Digilent USB-to-JTAG interface U30	0	1
JTAG (flying lead) Header J62	1	1

Notes:

1. 0 = open, 1 = closed
2. Default switch setting

FMC Connector JTAG Bypass

When an FPGA mezzanine card (FMC) is attached to HPC J37 or LPC J5 it is automatically added to the JTAG chain through electronically controlled single-pole single-throw (SPST) switches U32 and U31 respectively. The SPST switches are normally closed and transition to an open state when an FMC is attached. Switch U32 adds an attached FMC to the JTAG chain as determined by the FMC_HPC_PRSENT_M2C_B signal. Switch U31 adds an attached FMC to the JTAG chain as determined by the FMC_LPC_PRSENT_M2C_B signal. The attached FMC card must implement a TDI-to-TDO connection through a device or bypass jumper for the JTAG chain to be completed to the AP SoC U1.

The JTAG connectivity on the ZC706 board allows a host computer to download bitstreams to the AP SoC using the Xilinx® iMPACT software. In addition, the JTAG connector allows debug tools such as the Vivado serial I/O analyzer or a software debugger to access the SoC. The iMPACT software tool can also indirectly program the linear QSPI flash memory. To accomplish this, the iMPACT software configures the SoC with a temporary design to access and program the QSPI memory device.

Clock Generation

[Figure 1-2, callouts 7, 8, and 9]

The ZC706 evaluation board provides four clock sources for the XC7Z045 AP SoC.

Table 1-12 lists the source devices for each clock.

Table 1-12: ZC706 Evaluation Board Clock Sources

Clock Name	Clock Source	Description
System Clock	U64	SiT9102 2.5V LVDS 200 MHz fixed-frequency oscillator (SiTime). See System Clock , page 34.
User Clock	U37	Si570 3.3V LVDS I ² C programmable oscillator, 156.250 MHz default (Silicon Labs). See Programmable User Clock , page 35.
User SMA Clock	J67(P), J68(N)	User clock input SMAs, limit input swing voltage to VADJ_FPGA setting (1.8V, 2.5V, 3.3V). See User SMA Clock Source , page 36.
PS Clock	U24	SIT8103 1.8V single-ended CMOS 33.3333 MHz fixed frequency oscillator (SiTime). See Processing System Clock Source , page 37.
GTX SMA REF Clock	J36(P), J31(N)	User clock input SMAs. See GTX SMA Clock (SMA_MGT_REFCLK_P and SMA_MGT_REFCLK_N) , page 37.
Jitter Attenuated Clock	U60	Si5324C LVDS precision clock multiplier/jitter attenuator (Silicon Labs). See Jitter Attenuated Clock , page 38.

Table 1-13 lists the pin-to-pin connections from each clock source to the XC7Z045 AP SoC.

Table 1-13: Clock Connections, Source to XC7Z045 AP SoC

Clock Source Pin	Net Name	XC7Z045 (U1) Pin
U64.5	SYSCLK_N	G9
U64.4	SYSCLK_P	H9
U37.5	USRCLK_N	AG14
U37.4	USRCLK_P	AF14
J67.1	USER_SMA_CLOCK_P	AD18
J68.1	USER_SMA_CLOCK_N	AD19
J24.3	PS_CLK	A22 (Bank 500)
J36.1	SMA_MGT_REFCLK_P	W8
J31.1	SMA_MGT_REFCLK_N	W7
U60.28	SI5324_OUT_C_P	AC8
U60.29	SI5324_OUT_C_N	AC7

System Clock

[Figure 1-2, callout 7]

The system clock source is an LVDS 200 MHz oscillator at U64. It is wired to a multi-region clock capable (MRCC) input on programmable logic (PL) bank 34. The signal pair is named SYSCLK_P and SYSCLK_N and each signal is connected to U1 (pins H9 and G9, respectively) on the XC7Z045 AP SoC.

- Oscillator: SiTime SiT9102AI-243N25E200.00000 (200 MHz)
- Frequency jitter: 50 ppm

- LVDS Differential Output

The system clock circuit is shown in [Figure 1-11](#).

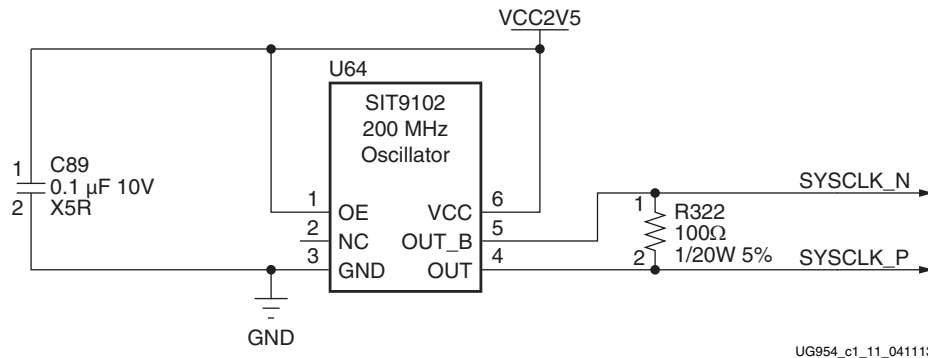


Figure 1-11: System Clock Source

For more details, see the SiTime SiT9102 data sheet [\[Ref 5\]](#).

Programmable User Clock

[\[Figure 1-2, callout 8\]](#)

The ZC706 evaluation board has a programmable low-jitter 3.3V LVDS differential oscillator (U37) connected to the MRCC inputs of bank 10. This USRCLK_P and USRCLK_N clock signal pair is connected to XC7Z045 AP SoC U1 pins AF14 and AG14, respectively. On power-up the user clock defaults to an output frequency of 156.250 MHz. User applications can change the output frequency within the range of 10 MHz to 810 MHz through an I²C interface. Power cycling the ZC706 evaluation board reverts the user clock to the default frequency of 156.250 MHz.

- Programmable Oscillator: Silicon Labs Si570BAB0000544DG (10 MHz–810 MHz)
- Frequency jitter: 50 ppm
- LVDS Differential Output

The user clock circuit is shown in [Figure 1-12](#).

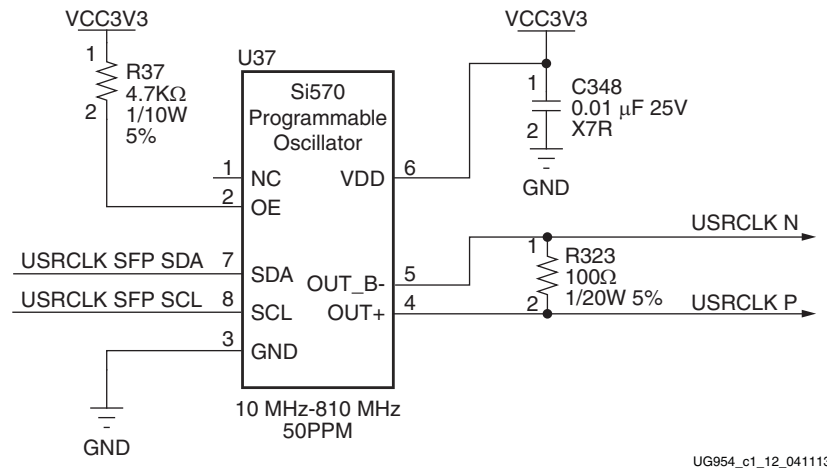


Figure 1-12: User Clock Source

See the Silicon Labs Si570 data sheet [\[Ref 6\]](#).

User SMA Clock Source

The ZC706 board provides a pair of SMAs for differential user clock input into PL Bank 9 (see [Figure 1-13](#)). The P-side SMA J67 signal USER_SMA_CLOCK_P is connected to U1 pin AD18, with the N-side SMA J68 signal USER_SMA_CLOCK_N connected to U1 pin AD19. Bank 9 Vcco is VADJ_FPGA, a variable voltage (1.8V, 2.5V, 3.3V) depending on the ZC706 FMC interface banks voltage. The USER_SMA_CLOCK input voltage swing should not exceed the board VADJ_FPGA voltage setting.

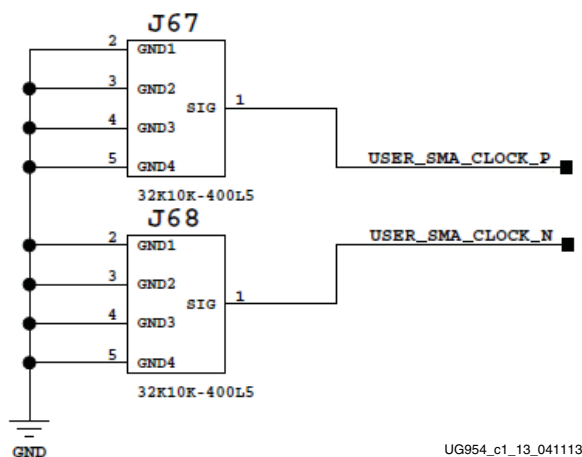


Figure 1-13: User SMA Clock

Processing System Clock Source

The Processing System (PS) clock source is a 1.8V LVCMOS single-ended fixed 33.33333 MHz oscillator at U24. It is wired to PS bank 500, pin A22 (PS_CLK), on the XC7Z045 AP SoC.

- Oscillator: SiTime SiT8103AC-23-18E-33.33333 (33.3 MHz)
- Frequency jitter: 50 ppm
- Single-ended output

The system clock circuit is shown in [Figure 1-14](#).

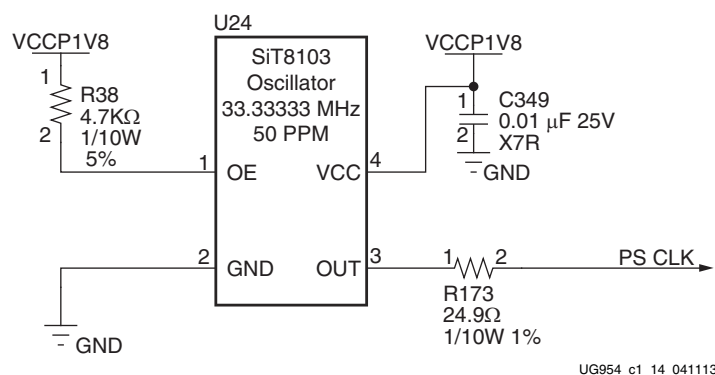


Figure 1-14: Processing System Clock Source

For more details, see the SiTime SiT8103 data sheet [\[Ref 5\]](#).

GTX SMA Clock (SMA_MGT_REFCLK_P and SMA_MGT_REFCLK_N)

[\[Figure 1-2, callout 10\]](#)

The ZC706 board includes a pair of SMA connectors for a GTX clock wired to GTX Quad bank 111. This differential clock has signal names SMA_MGT_REFCLK_P and SMA_REFCLK_N, which are connected to AP SoC U1 pins W8 and W7 respectively.

- External user-provided GTX reference clock on SMA input connectors
- Differential Input

Figure 1-15 shows this AC-coupled clock circuit.

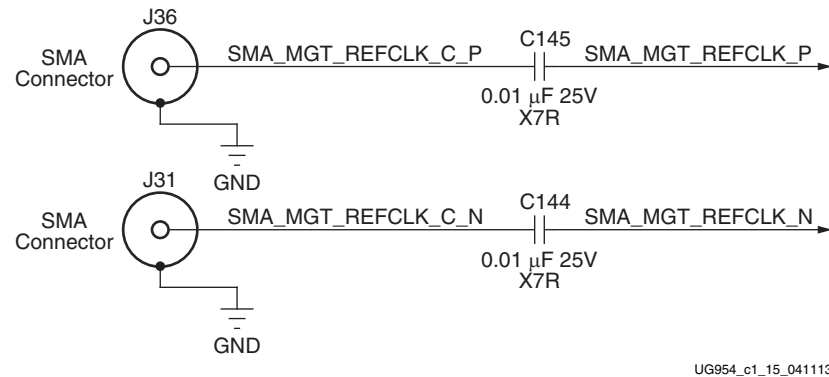


Figure 1-15: GTX SMA Clock Source

Jitter Attenuated Clock

[Figure 1-2, callout 11]

The ZC706 board includes a Silicon Labs Si5324 jitter attenuator U60 on the back side of the board. AP SoC user logic can implement a clock recovery circuit and then output this clock to a differential I/O pair on I/O bank 9 (REC_CLOCK_C_P, AP SoC U1 pin AD20 and REC_CLOCK_C_N, AP SoC U1 pin AE20) for jitter attenuation. The jitter attenuated clock (Si5324_OUT_C_P, Si5324_OUT_C_N) is then routed as a reference clock to GTX Quad 110 inputs MGTREFCLK1P (AP SoC U1 pin AC8) and MGTREFCLK1N (AP SoC U1 pin AC7).

The primary purpose of this clock is to support CPRI/OBSAI applications that perform clock recovery from a user-supplied SFP/SFP+ module and use the jitter attenuated recovered clock to drive the reference clock inputs of a GTX transceiver. The jitter attenuated clock circuit is shown in Figure 1-16.

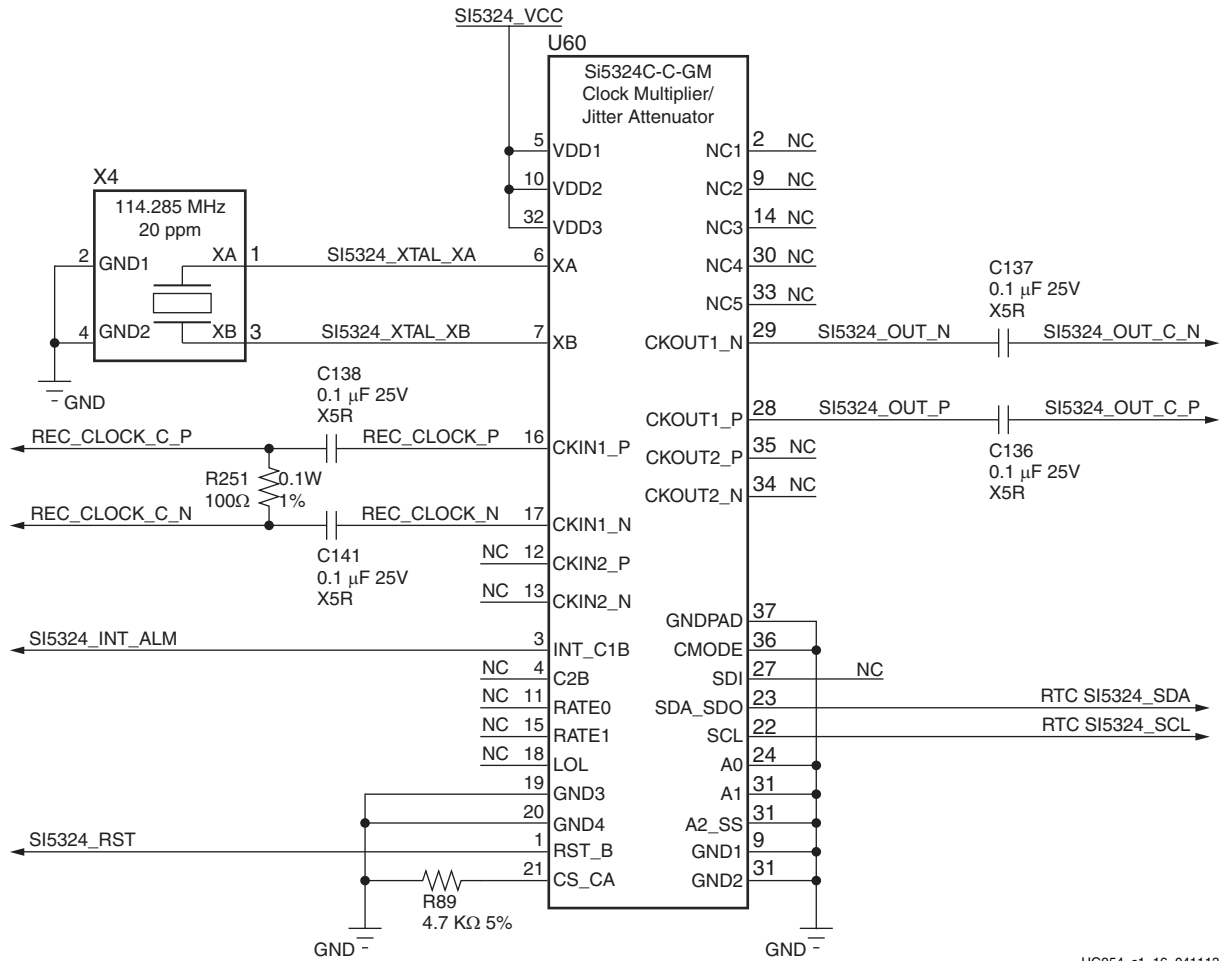


Figure 1-16: Jitter Attenuated Clock

See the Silicon Labs Si5324 data sheet [Ref 6].

GTX Transceivers

[Figure 1-2, callout 12]

The ZC706 board provides access to 16 GTX transceivers:

- Four of the GTX transceivers are wired to the PCI Express x4 endpoint edge connector (P4) fingers
- Eight of the GTX transceivers are wired to the FMC HPC connector (J37)
- One GTX transceiver is wired to the FMC LPC connector (J5)
- One GTX transceiver is wired to SMA connectors (RX: J32, J33 TX: J35, J34)
- One GTX transceiver is wired to the SFP/SFP+ Module connector (P2)

- One GTX transceiver is unused and is wired in a capacitively coupled TX-to-RX loopback configuration

The GTX transceivers in Zynq-7000 series AP SoCs are grouped into four channels described as Quads. The reference clock for a Quad can be sourced from the Quad above or Quad below the GTX Quad of interest. There are four GTX Quads on the ZC706 board with connectivity as shown here:

- Quad 109:
 - MGTREFCLK0 - FMC_HPC_GBTCLK0_M2C clock
 - MGTREFCLK1 - not connected
 - Contains 4 GTX transceivers allocated to FMC_HPC_DP[3:0]_C2M_P/N
- Quad 110:
 - MGTREFCLK0 - FMC_HPC_GBTCLK1_M2C clock
 - MGTREFCLK1 - SI5324_OUT_C_P/N jitter attenuator clock
 - Contains 4 GTX transceivers allocated to FMC_HPC_DP[7:4]_C2M_P/N
- Quad 111:
 - MGTREFCLK0 - FMC_LPC_GBTCLK0_M2C_C_P/N
 - MGTREFCLK1 - SMA_MGT_REFCLK_P/N SMA GTX clock input
 - Contains 1 GTX transceiver allocated to FMC_LPC_DP0_C2M_P/N
 - Contains 1 GTX transceiver allocated to SMA_MGT_TX_P/N and RX_P/N SMA connectors
 - Contains 1 GTX transceiver allocated to SFP_TX and _RX_P/N SFP/SFP+ connector
 - Contains 1 GTX transceiver which is unused and is wired in TX-to-RX loopback configuration
- Quad 112:
 - MGTREFCLK0 - PCIE_CLK_Q0_P/N PCIe edge connector clock
 - MGTREFCLK1 - not connected
 - Contains 4 GTX transceivers allocated to PCIe lanes 0-3

Table 1-14 lists the GTX Banks 109 and 110 interface connections between the AP SoC U1 and FMC HPC connector J37.

Table 1-14: AP SoC GTX Banks 109 and 110 Interface Connections to FMC HPC J37

Transceiver Bank	AP SoC U1 Pin Number	AP SoC U1 Pin Name	Schematic Net Name	Connected Pin	Connected Device
GTX_BANK_109	AK10	MGTPTXP0_109	FMC_HPC_DP0_C2M_P	C2	FMC HPC J37
	AK9	MGTPTXN0_109	FMC_HPC_DP0_C2M_N	C3	
	AH10	MGTPRXP0_109	FMC_HPC_DP0_M2C_P	C6	
	AH9	MGTPRXN0_109	FMC_HPC_DP0_M2C_N	C7	
	AK6	MGTPTXP1_109	FMC_HPC_DP1_C2M_P	A22	
	AK5	MGTPTXN1_109	FMC_HPC_DP1_C2M_N	A23	
	AJ8	MGTPRXP1_109	FMC_HPC_DP1_M2C_P	A2	
	AJ7	MGTPRXN1_109	FMC_HPC_DP1_M2C_N	A3	
	AJ4	MGTPTXP2_109	FMC_HPC_DP2_C2M_P	A26	
	AJ3	MGTPTXN2_109	FMC_HPC_DP2_C2M_N	A27	
	AG8	MGTPRXP2_109	FMC_HPC_DP2_M2C_P	A6	
	AG7	MGTPRXN2_109	FMC_HPC_DP2_M2C_N	A7	
	AK2	MGTPTXP3_109	FMC_HPC_DP3_C2M_P	A30	
	AK1	MGTPTXN3_109	FMC_HPC_DP3_C2M_N	A31	
	AE8	MGTPRXP3_109	FMC_HPC_DP3_M2C_P	A10	
	AE7	MGTPRXN3_109	FMC_HPC_DP3_M2C_N	A11	
	AD10	MGTREFCLK0P_109	FMC_HPC_GBTCLK0_M2C_C_P ⁽¹⁾	D4	
	AD9	MGTREFCLK0N_109	FMC_HPC_GBTCLK0_M2C_C_N ⁽¹⁾	D5	
	AF10	MGTREFCLK1P_109	NC	NA	NA
	AF9	MGTREFCLK1N_109	NC	NA	NA

Table 1-14: AP SoC GTX Banks 109 and 110 Interface Connections to FMC HPC J37 (Cont'd)

Transceiver Bank	AP SoC U1 Pin Number	AP SoC U1 Pin Name	Schematic Net Name	Connected Pin	Connected Device
GTX_BANK_110	AH2	MGTPTXP0_110	FMC_HPC_DP4_C2M_P	A34	FMC HPC J37
	AH1	MGTPTXN0_110	FMC_HPC_DP4_C2M_N	A35	
	AH6	MGTPRXP0_110	FMC_HPC_DP4_M2C_P	A14	
	AH5	MGTPRXN0_110	FMC_HPC_DP4_M2C_N	A15	
	AF2	MGTPTXP1_110	FMC_HPC_DP5_C2M_P	A38	
	AF1	MGTPTXN1_110	FMC_HPC_DP5_C2M_N	A39	
	AG4	MGTPRXP1_110	FMC_HPC_DP5_M2C_P	A18	
	AG3	MGTPRXN1_110	FMC_HPC_DP5_M2C_N	A19	
	AE4	MGTPTXP2_110	FMC_HPC_DP6_C2M_P	B36	
	AE3	MGTPTXN2_110	FMC_HPC_DP6_C2M_N	B37	
	AF6	MGTPRXP2_110	FMC_HPC_DP6_M2C_P	B16	
	AF5	MGTPRXN2_110	FMC_HPC_DP6_M2C_N	B17	
	AD2	MGTPTXP3_110	FMC_HPC_DP7_C2M_P	B32	
	AD1	MGTPTXN3_110	FMC_HPC_DP7_C2M_N	B33	
	AD6	MGTPRXP3_110	FMC_HPC_DP7_M2C_P	B12	
	AD5	MGTPRXN3_110	FMC_HPC_DP7_M2C_N	B13	
	AA8	MGTREFCLK0P_110	FMC_HPC_GBTCLK1_M2C_P ⁽¹⁾	B20	
	AA7	MGTREFCLK0N_110	FMC_HPC_GBTCLK1_M2C_N ⁽¹⁾	B21	
	AC8	MGTREFCLK1P_110	SI5324_OUT_C_P ⁽²⁾	28	SI5324C U60
	AC7	MGTREFCLK1N_110	SI5324_OUT_C_N ⁽²⁾	29	

Notes:

1. AP SoC U1 GTX input clock nets are capacitively coupled to the FMC HPC J37 pins.
2. AP SoC U1 GTX input clock nets are capacitively coupled to the SI5324C Recovery Clock U60 output pins.

Table 1-15 lists the GTX Bank interface connections between the AP SoC U1 and FMC LPC connector J5.

Table 1-15: AP SoC GTX Bank 111 Interface Connections to FMC LPC J5

Transceiver Bank	AP SoC U1 Pin Number	AP SoC U1 Pin Name	Schematic Net Name	Connected Pin	Connected Device
GTX_BANK_111	AB2	MGTPTXP0_111	FMC_LPC_DP0_C2M_P	C2	FMC LPC J5
	AB1	MGTPTXN0_111	FMC_LPC_DP0_C2M_N	C3	
	AC4	MGTPRXP0_111	FMC_LPC_DP0_M2C_P	C6	
	AC3	MGTPRXN0_111	FMC_LPC_DP0_M2C_N	C7	
	Y2	MGTPTXP1_111	SMA_MGT_TX_P	J35.1	GTX TX/RX SMA
	Y1	MGTPTXN1_111	SMA_MGT_TX_N	J34.1	
	AB6	MGTPRXP1_111	SMA_MGT_RX_P ⁽²⁾	J32.1	
	AB5	MGTPRXN1_111	SMA_MGT_RX_N ⁽²⁾	J33.1	
	W4	MGTPTXP2_111	SFP_TX_P	18	SFP+ Conn. P2
	W3	MGTPTXN2_111	SFP_TX_N	19	
	Y6	MGTPRXP2_111	SFP_RX_P	13	
	Y5	MGTPRXN2_111	SFP_RX_N	12	
	V2	MGTPTXP3_111	(capacitively coupled to AA4)	U1.AA4	AP SoC U1 GTX Loopback
	V1	MGTPTXN3_111	(Cooperatively coupled to AA3)	U1.AA3	
	AA4	MGTPRXP3_111	See Pin V2 loopback	U1.V2	
	AA3	MGTPRXN3_111	See Pin V1 loopback	U1.V1	
	U8	MGTREFCLK0P_111	FMC_LPC_GBCLK0_M2C_C_P ⁽¹⁾	D4	FMC LPC J5
	U7	MGTREFCLK0N_111	FMC_LPC_GBCLK0_M2C_C_N ⁽¹⁾	D5	
	W8	MGTREFCLK1P_111	SMA_MGT_REFCLK_P ⁽²⁾	J36.1	GTX REFCLK SMA
	W7	MGTREFCLK1N_111	SMA_MGT_REFCLK_N ⁽²⁾	J31.1	

Notes:

1. AP SoC U1 GTX input clock nets are capacitively coupled to the FMC LPC J5 pins.
2. AP SoC U1 GTX input nets are capacitively coupled to the RX and MGT_REFCLK SMA pins.

For additional information on Zynq-7000 GTX transceivers, see *7 Series FPGAs GTX/GTH Transceivers User Guide* ([UG476](#)).

PCI Express Endpoint Connectivity

[Figure 1-2, callout 13]

The 4-lane PCI Express edge connector performs data transfers at the rate of 2.5 GT/s for a Gen1 application and 5.0 GT/s for a Gen2 application. The PCIe transmit and receive signal data paths have a characteristic impedance of $85\Omega \pm 10\%$. The PCIe clock is routed as a 100Ω differential pair.

The XC7Z045-2FFG900C AP SoC (-2 speed grade) included with the ZC706 board supports up to Gen2 x4.

The PCIe clock is input from the edge connector. It is AC coupled to the AP SoC through the MGTREFCLK0 pins of Quad 112. PCIE_CLK_Q0_P is connected to AP SoC U1 pin N8, and the _N net is connected to pin N7. The PCI Express clock circuit is shown in Figure 1-17.

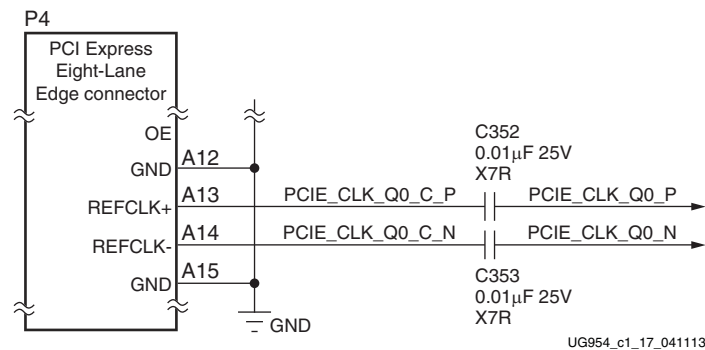


Figure 1-17: PCI Express Clock

PCIe lane width/size is selected by jumper J19 (Figure 1-17). The default lane size selection is 4-lane (J19 pins 3 and 4 jumpered).

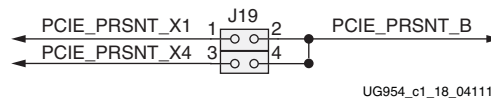


Figure 1-18: PCI Express Lane Size Select Jumper J19

Table 1-17 lists the GTX Bank 112 interface connections between the AP SoC U1 and PCIe 4-lane connector P4.

Table 1-16: AP SoC GTX Bank 112 Interface Connections to PCIe 4-Lane Connector P4

Transceiver Bank	AP SoC U1 Pin Number	AP SoC U1 Pin Name	Schematic Net Name	PCIe 4-Lane Conn. P4 Pin Number
GTX_BANK_112	T2	MGTPTXP0_112	PCIE_TX3_P	A29 (1)
	T1	MGTPTXN0_112	PCIE_TX3_N	A30 (1)
	V6	MGTPRXP0_112	PCIE_RX3_P	B27
	V5	MGTPRXN0_112	PCIE_RX3_N	B28
	R4	MGTPTXP1_112	PCIE_TX2_P	A25 (1)
	R3	MGTPTXN1_112	PCIE_TX2_N	A26 (1)
	U4	MGTPRXP1_112	PCIE_RX2_P	B23
	U3	MGTPRXN1_112	PCIE_RX2_N	B24
	P2	MGTPTXP2_112	PCIE_TX1_P	A21 (1)
	P1	MGTPTXN2_112	PCIE_TX1_N	A22 (1)
	T6	MGTPRXP2_112	PCIE_RX1_P	B19
	T5	MGTPRXN2_112	PCIE_RX1_N	B20
	N4	MGTPTXP3_112	PCIE_TX0_P	A16 (1)
	N3	MGTPTXN3_112	PCIE_TX0_N	A17 (1)
	P6	MGTPRXP3_112	PCIE_RX0_P	B14
	P5	MGTPRXN3_112	PCIE_RX0_N	B15
	N8	MGTREFCLK0P_112	PCIE_CLK_QO_P	A13 (1)
	N7	MGTREFCLK0N_112	PCIE_CLK_QO_N	A14 (1)
	R8	MGTREFCLK1P_112	NC	NA
	R7	MGTREFCLK1N_112	NC	NA

Notes:

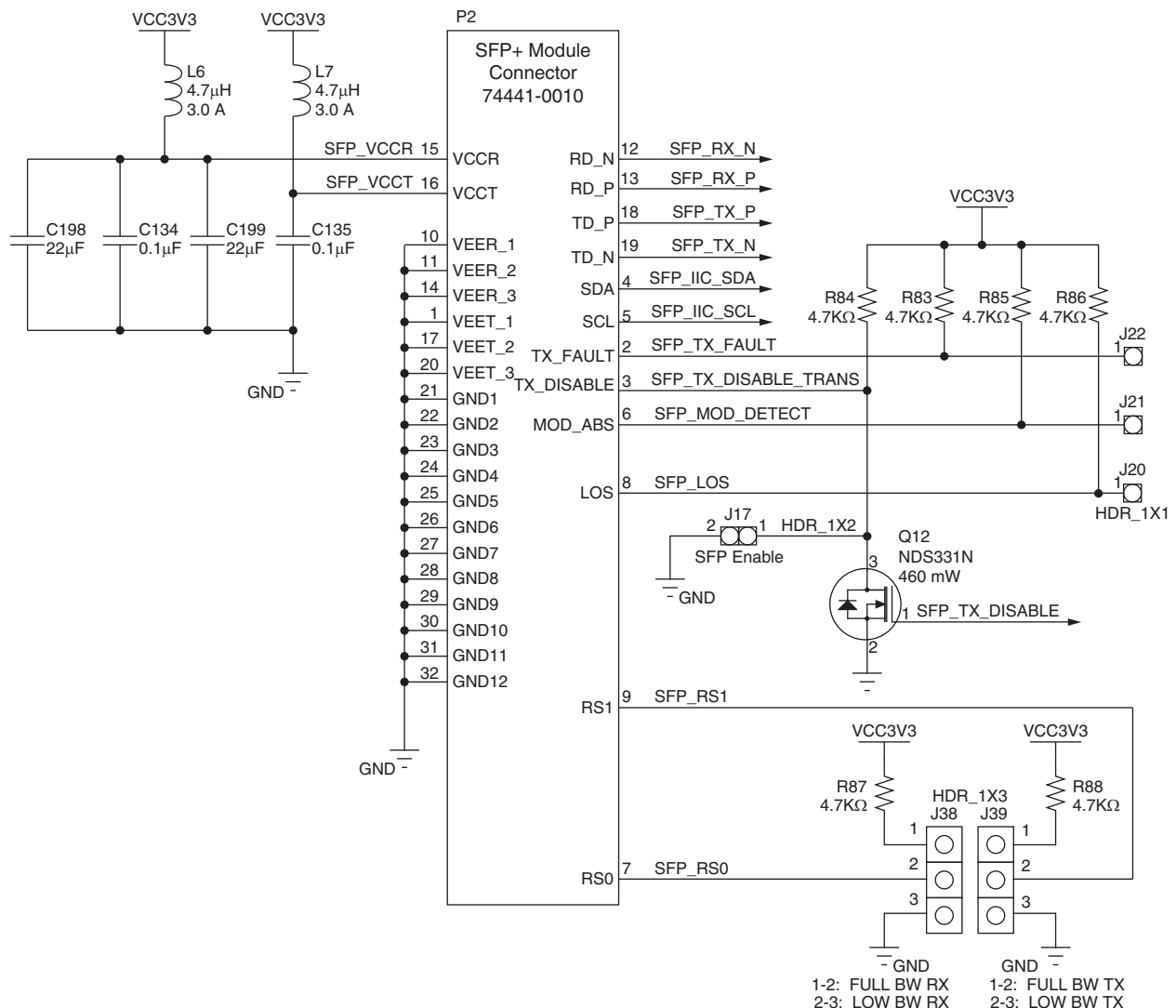
1. PCIE_TXn_P/N and PCIE_CLK_QO_P/N are capacitively coupled to the PCIe edge connector P4.

For additional information about Zynq-7000 PCIe functionality, see *7 Series FPGAs Integrated Block for PCI Express Product Guide for Vivado Design Suite* ([PG054](#)). Additional information about the PCI Express standard is available [\[Ref 7\]](#).

SFP/SFP+ Module Connector

[Figure 1-2, callout 14]

The ZC706 board contains a small form-factor pluggable (SFP/SFP+) connector and cage assembly P2 that accepts SFP or SFP+ modules. Figure 1-19 shows the SFP/SFP+ module connector circuitry.



UG954_c1_19_041113

Figure 1-19: SFP+ Module Connector

Table 1-17 lists the SFP+ module RX and TX connections to the AP SoC.

Table 1-17: AP SoC U1 to SFP+ Module Connections

AP SoC (U1) Pin	Schematic Net name	SFP+ Module (P2)	
		Pin	Name
Y5	SFP_RX_N	12	RD_N
Y6	SFP_RX_P	13	RD_P
W4	SFP_TX_P	18	TD_P
W3	SFP_TX_N	19	TD_N
AA18	SFP_TX_DISABLE_TRANS	3	TX_DISABLE

Table 1-18 lists the SFP+ module control and status connections to the AP SoC.

Table 1-18: SFP+ Module Control and Status Connections

SFP Control/ Status Signal	Board Connection	
SFP_TX_FAULT	Test Point J23	High = Fault
		Low = Normal operation
SFP_TX_DISABLE	Jumper 17	Off = SFP Disabled
		On = SFP enabled
SFP_MOD_DETECT	Test Point J24	High = Module not present
		Low = Module present
SFP_RS0	Jumper 56	Jumper pins 1-2 = Full RX bandwidth
		Jumper pins 2-3 = Reduced RX bandwidth
SFP_RS1	Jumper 55	Jumper pins 1-2 = Full TX bandwidth
		Jumper pins 2-3 = Reduced TX bandwidth
SFP_LOS	Test Point J25	High = Loss of receiver signal
		Low = Normal operation

For additional information about the enhanced Small Form Factor Pluggable (SFP+) module, see the SFF-8431 specification [Ref 8].

10/100/1,000 Mb/s Tri-Speed Ethernet PHY (PL)

[Figure 1-2, callout 15]

The ZC706 evaluation board uses the Marvell Alaska PHY device (88E1116R) at U51 for Ethernet communications at 10 Mb/s, 100 Mb/s, or 1,000 Mb/s. The board supports RGMII mode only. The PHY connection to a user-provided Ethernet cable is through a Halo HFJ11-1G01E RJ-45 connector (P3) with built-in magnetics.

On power-up, or on reset, the PHY is configured to operate in RGMII mode with PHY address 0b00111 using the settings shown in Table 1-19. These settings can be overwritten via software commands passed over the MDIO interface.

Table 1-19: Board Connections for PHY Configuration Pins

U51 Pin	Setting	Configuration	
CONFIG (64)	VCCP1V8	PHYAD[1]=1	PHYAD[0]=1
CONFIG1 (1)	PHY_LED0	PHYAD[3]=0	PHYAD[2]=1
CONFIG2 (2)	GND	ENA_XC=0	PHYAD[4]=0
	PHY_LED0	ENA_XC=0	PHYAD[4]=1
	VCCP1V8	ENA_XC=1	PHYAD[4]=1
CONFIG3 (3)	GND	RGMII_TX=0	RGMII_RX=0
	PHY_LED0	RGMII_TX=0	RGMII_RX=1
	PHY_LED1	RGMII_TX=1	RGMII_RX=0
	VCCP1V8	RGMII_TX=1	RGMII_RX=1

The Ethernet connections from the XC7Z045 AP SoC at U1 to the 88E1116R PHY device at U51 are listed in [Table 1-20](#).

Table 1-20: Ethernet Connections, XC7Z045 AP SoC to the PHY Device

XC7Z045 (U1) Pin			Schematic Net Name	M88E1116R PHY U51	
Pin Name	Bank	Pin Number		Pin	Name
PS_MIO53	501	C18	PHY_MDIO	45	MDIO
PS_MIO52	501	D19	PHY_MDC	48	MDC
PS_MIO16	501	L19	PHY_TX_CLK	60	TX_CLK
PS_MIO21	501	J19	PHY_TX_CTRL	63	TX_CTRL
PS_MIO20	501	M20	PHY_TXD3	62	TXD3
PS_MIO19	501	J20	PHY_TXD2	61	TXD2
PS_MIO18	501	K20	PHY_TXD1	59	TXD1
PS_MIO17	501	K21	PHY_TXD0	58	TXD0
PS_MIO22	501	L20	PHY_RX_CLK	53	RX_CLK
PS_MIO27	501	G20	PHY_RX_CTRL	49	RX_CTRL
PS_MIO26	501	M17	PHY_RXD3	55	RXD3
PS_MIO25	501	G19	PHY_RXD2	54	RXD2
PS_MIO24	501	M19	PHY_RXD1	51	RXD1
PS_MIO23	501	J21	PHY_RXD0	50	RXD0

Ethernet PHY Clock Source

A 25.00 MHz 50 ppm crystal at X1 is the clock source for the 881116R PHY at U51. [Figure 1-20](#) shows the clock source.

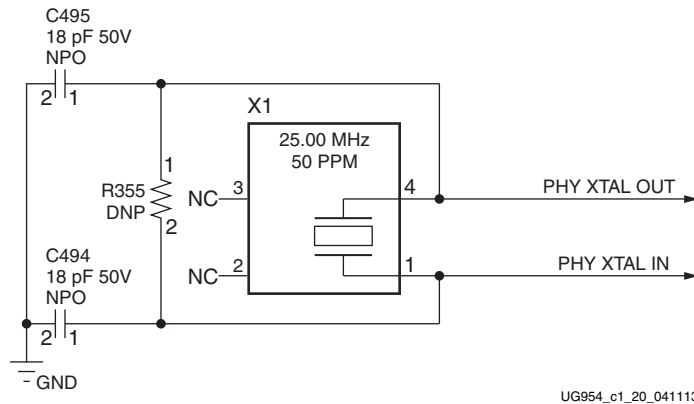


Figure 1-20: Ethernet PHY Clock Source

The data sheet can be obtained under NDA with Marvell. Contact information can be found at their website [\[Ref 9\]](#).

For additional information on the Zynq-7000 AP SoC device gigabit Ethernet controller, see *Zynq-7000 All Programmable SoC Overview* ([DS190](#)) and *Zynq-7000 All Programmable SoC Technical Reference Manual* ([UG585](#)).

USB-to-UART Bridge

[[Figure 1-2](#), callout 17]

The ZC706 evaluation board contains a Silicon Labs CP2103GM USB-to-UART bridge device (U52) which allows a connection to a host computer with a USB port. The USB cable is supplied in the ZC706 evaluation kit (Standard-A end to host computer, Type Mini-B end to ZC706 evaluation board connector J21). The CP2103GM is powered by the USB 5V provided by the host PC when the USB cable is plugged into the USB port on the ZC706 evaluation board.

The CP2103GM TX and RX pins are wired to the UART_1 IP block within the XC7Z045 AP SoC PS I/O Peripherals set. The XC7Z045 AP SoC supports the USB-to-UART bridge using two signal pins: Transmit (TX) and Receive (RX).

Silicon Labs provides royalty-free Virtual COM Port (VCP) drivers for the host computer. These drivers permit the CP2103GM USB-to-UART bridge to appear as a COM port to communications application software (for example, TeraTerm or HyperTerm) that runs on the host computer. The VCP device drivers must be installed on the host PC prior to establishing communications with the ZC706 evaluation board.

The USB Connector pin assignments and signal definitions between J21 and U52 are listed in [Table 1-21](#).

Table 1-21: USB Connector J21 Pin Assignments and Signal Definitions

USB Connector (J21)		Net Name	Description	CP2103GM (U52)	
Pin	Name			Pin	Name
1	VBUS	USB_UART_VBUS	+5V VBUS Powered	7	REGIN
				8	VBUS
2	D_N	USB_UART_D_N	Bidirectional differential serial data (N-side)	4	D –
3	D_P	USB_UART_D_P	Bidirectional differential serial data (P-side)	3	D +
5	GND	USB_UART_GND	Signal ground	2	GND1
				29	CNR_GND

Table 1-22 lists the USB connections between the XC7Z045 AP SoC PS Bank 501 and the CP2103 UART bridge.

Table 1-22: XC7Z045 AP SoC to CP2103 Connections

XC7045 AP SoC (U1)						Schematic Net Name	CP2103GM Device (U52)		
Pin Name	Bank	PIN	Function	Direction	IOSTANDARD		PIN	Function	Direction
PS_MIO48	501	C19	TX	Output	LVC MOS18	USB_UART_RX	24	RXD	Input
PS_MIO49	501	D18	RX	Input	LVC MOS18	USB_UART_TX	25	TXD	Output

Refer to the Silicon Labs website for technical information on the CP2103GM and the VCP drivers [\[Ref 6\]](#).

For additional information on the Zynq-7000 AP SoC device UART controller, see *Zynq-7000 All Programmable SoC Overview* ([DS190](#)) and *Zynq-7000 All Programmable SoC Technical Reference Manual* ([UG585](#)).

HDMI Video Output

[\[Figure 1-2, callout 18\]](#)

The ZC706 evaluation board provides a high-definition multimedia interface (HDMI®) video output using an Analog Devices ADV7511KSTZ-P HDMI transmitter at U53. The HDMI transmitter U53 is connected to the XC7Z045 AP SoC PL-side banks 12 and 13 and its output is provided on a Molex 500254-1927 HDMI type-A receptacle at P1. The ADV7511 supports 1080P 60Hz, YCbCr 4:4:4 encoding via 24-bit input data mapping.

The ZC706 evaluation board supports the following HDMI device interfaces:

- 24 data lines
- Independent VSYNC, HSYNC
- Single-ended input CLK
- Interrupt Out pin to XC7Z045 AP SoC

- I²C
- SPDIF

Figure 1-21 shows the HDMI codec circuit.

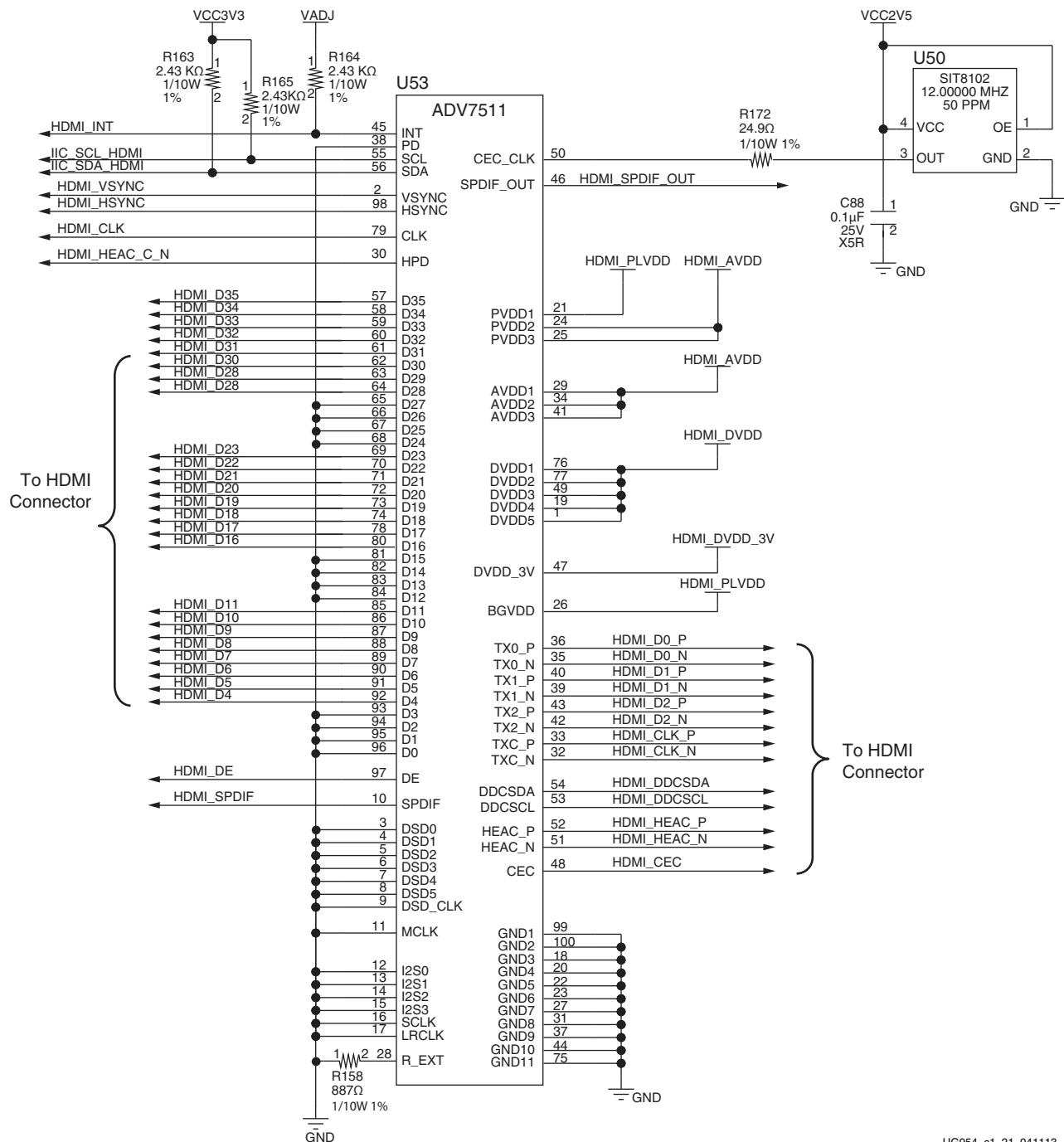


Figure 1-21: HDMI Codec Circuit

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Table 1-23 lists the connections between the codec and the XC7Z045 AP SoC.

Table 1-23: XC7Z045 AP SoC U1 to HDMI Codec Connections (ADV7511)

XC7Z045 (U1) Pin	Net Name	ADV7511 (U53)	
		Pin	Name
U24	HDMI_R_D4	92	D4
T22	HDMI_R_D5	91	D5
R23	HDMI_R_D6	90	D6
AA25	HDMI_R_D7	89	D7
AE28	HDMI_R_D8	88	D8
T23	HDMI_R_D9	87	D9
AB25	HDMI_R_D10	86	D10
T27	HDMI_R_D11	85	D11
AD26	HDMI_R_D16	80	D16
AB26	HDMI_R_D17	78	D17
AA28	HDMI_R_D18	74	D18
AC26	HDMI_R_D19	73	D19
AE30	HDMI_R_D20	72	D20
Y25	HDMI_R_D21	71	D21
AA29	HDMI_R_D22	70	D22
AD30	HDMI_R_D23	69	D23
Y28	HDMI_R_D28	64	D28
AF28	HDMI_R_D29	63	D29
V22	HDMI_R_D30	62	D30
AA27	HDMI_R_D31	61	D31
U22	HDMI_R_D32	60	D32
N28	HDMI_R_D33	59	D33
V21	HDMI_R_D34	58	D34
AC22	HDMI_R_D35	57	D35
V24	HDMI_R_DE	97	DE
R22	HDMI_R_HSYNC	98	HSYNC
U21	HDMI_R_VSYNC	2	VSYNC
P28	HDMI_R_CLK	79	CLK
AC23	HDMI_INT	45	INT
AC21	HDMI_R_SPDIF	10	SPDIF
AB22	HDMI_SPDIF_OUT_LS	46	SPDIF_OUT

Table 1-24 lists the connections between the codec and the HDMI receptacle P1.

Table 1-24: ADV7511 to HDMI Receptacle Connections

ADV7511 (U53)	Net Name	HDMI Receptacle P1 Pin
36	HDMI_D0_P	7
35	HDMI_D0_N	9
40	HDMI_D1_P	4
39	HDMI_D1_N	6
43	HDMI_D2_P	1
42	HDMI_D2_N	3
33	HDMI_CLK_P	10
32	HDMI_CLK_N	12
54	HDMI_DDCSDA	16
53	HDMI_DDCSCL	15
52	HDMI_HEAC_P	14
51	HDMI_HEAC_N	19
48	HDMI_CEC	13

Information about the ADV7511KSTZ-P is available on the Analog Devices website [\[Ref 10\]](#).

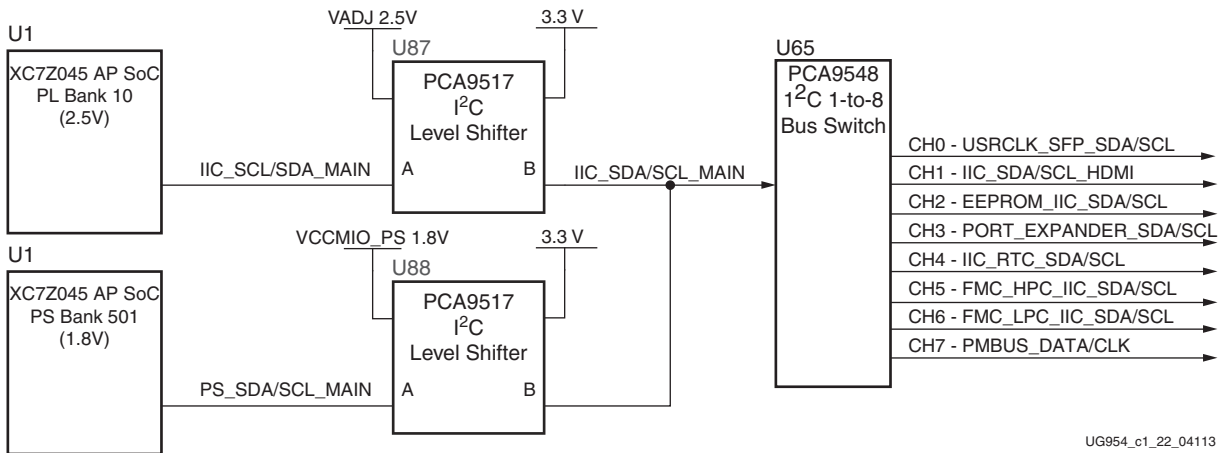
For additional information about HDMI IP options, see the *LogiCORE IP DisplayPort Product Guide for Vivado Design Suite* ([PG064](#)).

I2C Bus

[Figure 1-2, callout 20]

The ZC706 evaluation board implements two I²C ports on the XC7Z045 AP SoC. The PL-side I²C port (IIC_SDA and _SCL_MAIN) is routed to level shifter U87. The PS-side I²C port (PS_SDA and _SCL_MAIN) is routed to level shifter U88. The "output" side of the two level shifters are wired to the common I²C bus IIC_SDA and _SCL_MAIN which is connected to TI Semiconductor PCA9548 1-to-8 channel I²C bus switch (U65). The bus switch can operate at speeds up to 400 kHz.

The ZC706 evaluation board I²C bus topology is shown in [Figure 1-22](#).



UG954_c1_22_04113

Figure 1-22: I²C Bus Topology

User applications that communicate with devices on one of the downstream I²C buses must first set up a path to the desired bus through the U65 bus switch at I²C address 0x74 (0b01110100). [Table 1-25](#) lists the address for each bus.

Table 1-25: I²C Bus Addresses

I ² C Bus	I ² C Switch Position	I ² C Address	Device
PCA9548 8-Channel bus switch	NA	0b1110100	PCA9548 U65
USRCLK_SDA/SCL	0	0b1011101	Si570 U37
		0b1010000	SFP+ Conn. P2
IIC_SDA_HDMI	1	0b0111001	ADV7511 U53
IIC_EEPROM_SDA/SCL	2	0b1010100	M24C08 U9
IIC_PORT_EXPANDER_SDA/SCL	3	0b0100001	Port Expander U16
		0b1010000	DDR3 SODIMM J1
		0b0011000	
IIC_RTC_SDA/SCL	4	0b1010001	RTC8564JE U26
		0b1101000	SI5324 U60
FMC_HPC_IIC_SDA/SCL	5	0bxxxxx00	FMC HPC J37
FMC_LPC_IIC_SDA/SCL	6	0bxxxxx00	FMC LPC J5
PMBUS_DATA/CLOCK	7	0b1100101	UCD90120A U48

Information about the PCA9548 is available on the TI Semiconductor website at [\[Ref 11\]](#).

For additional information on the Zynq-7000 AP SoC device I²C controller, see *Zynq-7000 All Programmable SoC Overview* ([DS190](#)) and *Zynq-7000 All Programmable SoC Technical Reference Manual* ([UG585](#)).

Real Time Clock (RTC)

The Epson RTC-8564JE (U26) is an I²C bus interface real-time clock that has a built-in 32.768 KHz oscillator with these features:

- Frequency output options: 32.768 KHz, 1,024 Hz, 32 Hz or 1 Hz
- Calendar output functions: Year, month, day, weekday, hour, minute and second
- Clock counter, alarm and fixed-cycle timer interrupt functions
- Back-up battery B3 Panasonic ML621S/DN, 3.0V rechargeable cell

Programming information for the RTC-8564JE is available in the *RTC-8564JE/NB Application Manual* [Ref 14].

Figure 1-23 shows the real time clock circuit.

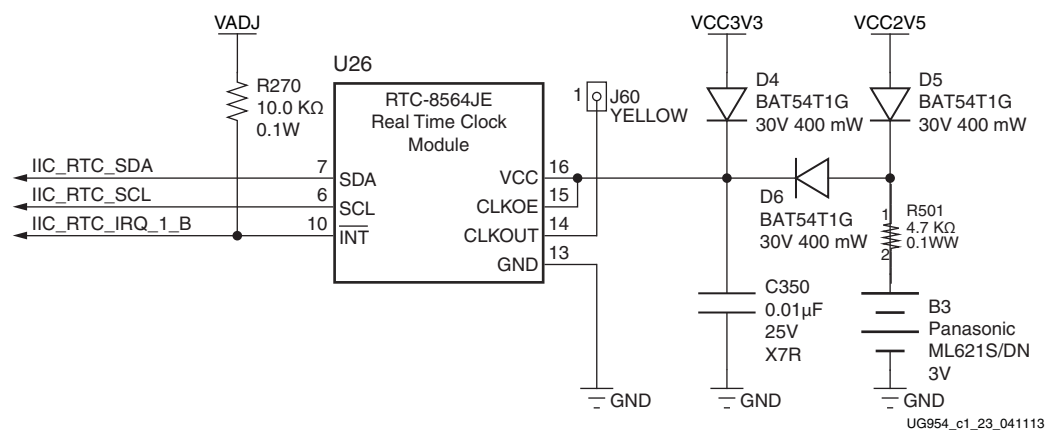


Figure 1-23: Real Time Clock Circuit

Real time clock connections to the XC7Z045 AP SoC and the PCA9548 8-Channel bus switch are listed in Table 1-26. Refer to Table 1-25 for the RTC I²C address.

Table 1-26: Real Time Clock Connections

RTC-8564JE (U16) Pin	Net Name	Connects To
6	IIC_RTC_SCL	U65.11 (PCA9548 SC4)
7	IIC_RTC_SDA	U65.10 (PCA9548 SD4)
10	IIC_RTC_IRQ_1_B	U1.AA17 (XC7Z045 AP SoC PL BANK 10)

Information about the RTC-8564JE is available at the Epson Electronics America website [Ref 15].

Status and User LEDs

Table 1-27 defines the status and user LEDs.

Table 1-27: Status LEDs

Reference Designator	Net Name	LED Color	Description
DS1	POR	RED	Processor System Power-ON reset is active
DS2	FPGA_INIT_B	GRN/RED	Green: FPGA initialization was successful Red: FPGA initialization is in progress
DS3	DONE	GRN	FPGA bit file download is complete
DS8	GPIO_LED_LEFT	GRN	Geographically LEFT located user LED
DS9	GPIO_LED_CENTER	GRN	Geographically CENTER located user LED
DS10	GPIO_LED_RIGHT	GRN	Geographically RIGHT located user LED
DS11	VCCINT	GRN	VCCINT voltage on indicator
DS13	VCC1V5_PL	GRN	VCC1V5_PL voltage on indicator
DS15	VADJ_FPGA	GRN	VADJ_FPGA voltage on indicator
DS16	VCC3V3_FPGA	GRN	VCC3V3 voltage on indicator
DS20	PS_DDR_LINEAR_PG	GRN	VTTDDR_PS voltage on indicator
DS21	SODIMM_DDR_LINEAR_PG	GRN	VTTDDR_SODIMM voltage on indicator
DS22	VCC12_P	GRN	VCC12_P voltage on indicator
DS23	PWRCTL1_FMC_PG_C2M	GRN	FMC power good INDICATOR
DS24	CTRL1_PWRGOOD	GRN	Power Controller controlled voltage regulator outputs are all \geq their minimum "good" threshold
DS25	U22_FLG	RED	USB 2.0 MOSFET power switch fault
DS26	LINEAR_POWER_GOOD	GRN	MGTAVCC, MGTAVTT, MGTVCCAUX voltage regulator outputs are all \geq their minimum "good" threshold
DS27	VCCAUX	GRN	VCCAUX voltage on indicator
DS28	PHY_LED0	GRN	Ethernet PHY LED0
DS29	PHY_LED1	GRN	Ethernet PHY LED1
DS30	PHY_LED2	GRN	Ethernet PHY LED2
DS35	GPIO_LED_0	GRN	General Purpose user LED

Ethernet PHY User LEDs

[Figure 1-2, callout 21]

The three Ethernet PHY user LEDs shown in Figure 1-24 are located near the RJ45 Ethernet jack P3. The on/off state for each LED is software dependent and has no specific meaning at Ethernet PHY power on.

Refer to the Marvell 881116R Alaska Gigabit Ethernet transceiver data sheet for details concerning the use of the Ethernet PHY user LEDs. They are referred to in the data sheet as LED0, LED1, and LED2. See the data sheet and other product information for the Marvell 881116R Alaska Gigabit Ethernet Transceiver [Ref 9].

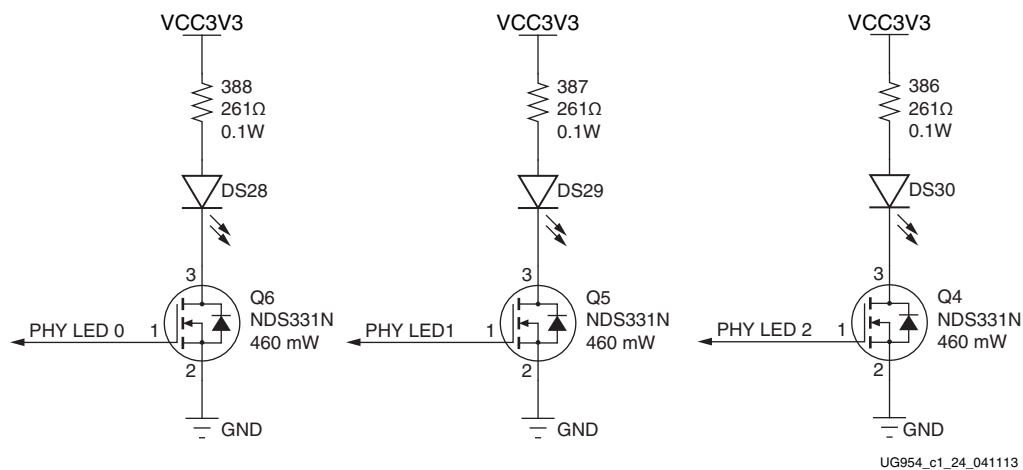


Figure 1-24: Ethernet PHY User LEDs

User I/O

[Figure 1-2, callout 22–24]

The ZC706 evaluation board provides the following user and general purpose I/O capabilities:

- Four user LEDs (callout 22)
 - GPIO_LED_LEFT DS8, GPIO_LED_CENTER DS9, GPIO_LED_RIGHT DS10, GPIO_LED_0 DS35
- Three user pushbuttons (callout 23)
 - GPIO_SW_LEFT SW7, GPIO_SW_CENTER SW9, GPIO_SW_RIGHT SW8
- PL CPU reset pushbutton
 - PL_CPU_RESET SW13
- 4-position user DIP Switch (callout 24)

- GPIO_DIP_SW[3:0] SW12
- Two user GPIO male pin headers (callout 26)
- 2 x 6 0.1 in. pitch PMOD1 J57
- 2 x 6 0.1 in. pitch PMOD2 J58

User LEDs

[Figure 1-2, callout 22]

The ZC706 evaluation board supports four user LEDs connected to XC7Z045 AP SoC Banks 11, 33, and 35. Figure 1-25 shows the user LED circuits.

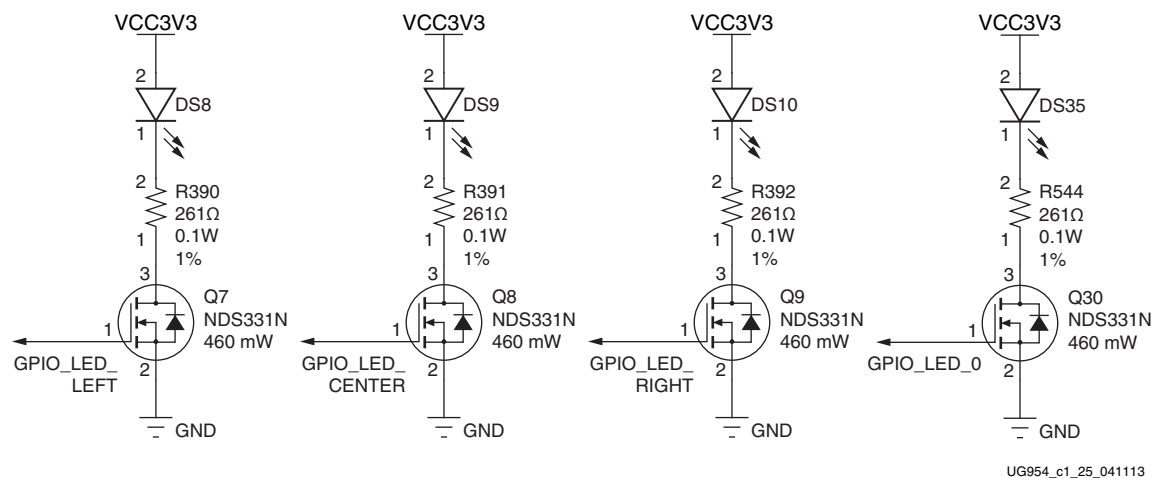


Figure 1-25: User LEDs

Table 1-28 lists the user LED connections to XC7Z045 AP SoC U1.

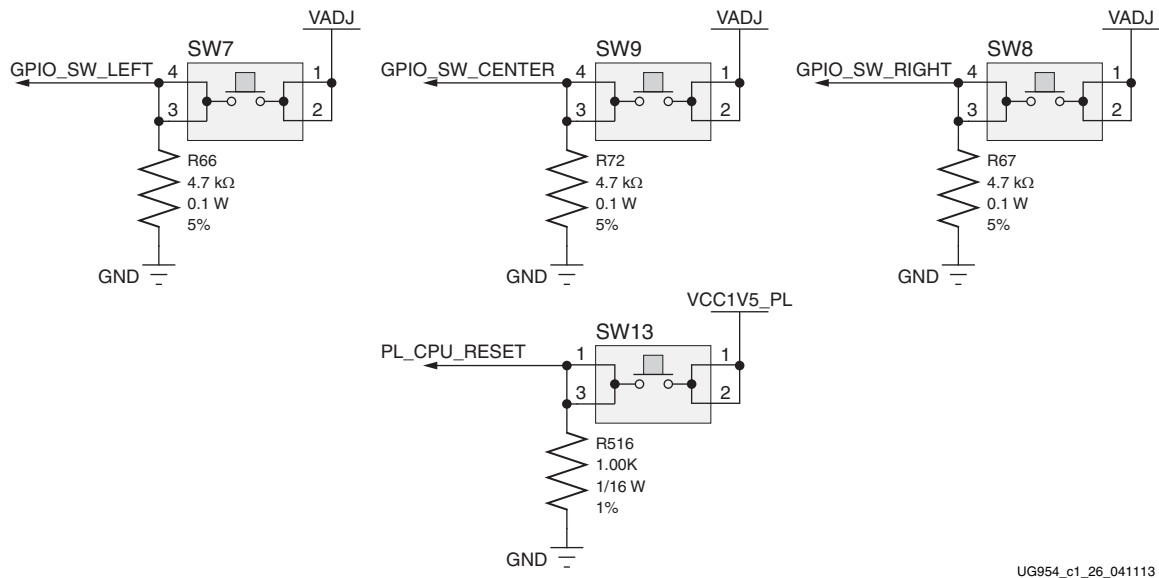
Table 1-28: User LED Connections to XC7Z045 AP SoC U1

XC7Z045 AP SoC (U1) Pin	Net Name	LED Reference
Y21	GPIO_LED_LEFT	DS8
G2	GPIO_LED_CENTER	DS9
W21	GPIO_LED_RIGHT	DS10
A17	GPIO_LED_0	DS35

User Pushbuttons

[Figure 1-2, callout 23]

Figure 1-26 shows the user pushbutton circuits.



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Figure 1-26: User Pushbuttons

Table 1-29 lists the user pushbutton connections to XC7Z045 AP SoC U1.

Table 1-29: User Pushbutton Connections to XC7Z045 AP SoC U1

XC7Z045 AP SoC (U1) Pin	Net Name	Pushbutton Reference
AK25	GPIO_SW_LEFT	SW7
K15	GPIO_SW_CENTER	SW9
R27	GPIO_SW_RIGHT	SW8
A8	PL_CPU_RESET	SW13

GPIO DIP Switch

Figure 1-27 shows the GPIO DIP switch circuit.

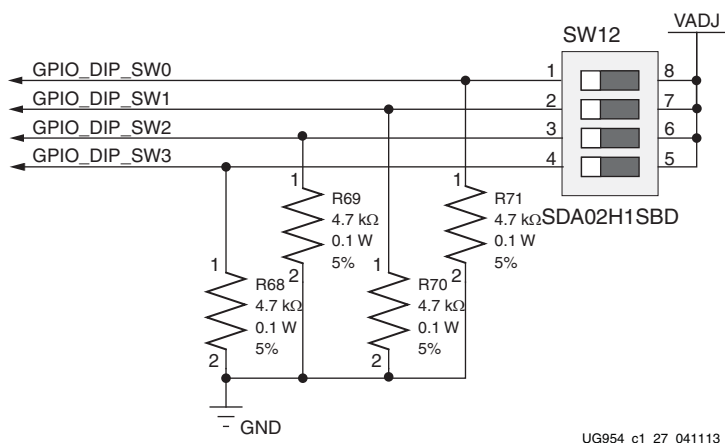


Figure 1-27: GPIO DIP Switch

Table 1-30 lists the GPIO DIP switch connections to XC7Z045 AP SoC U1.

Table 1-30: GPIO DIP Switch Connections to XC7Z045 AP SoC at U1

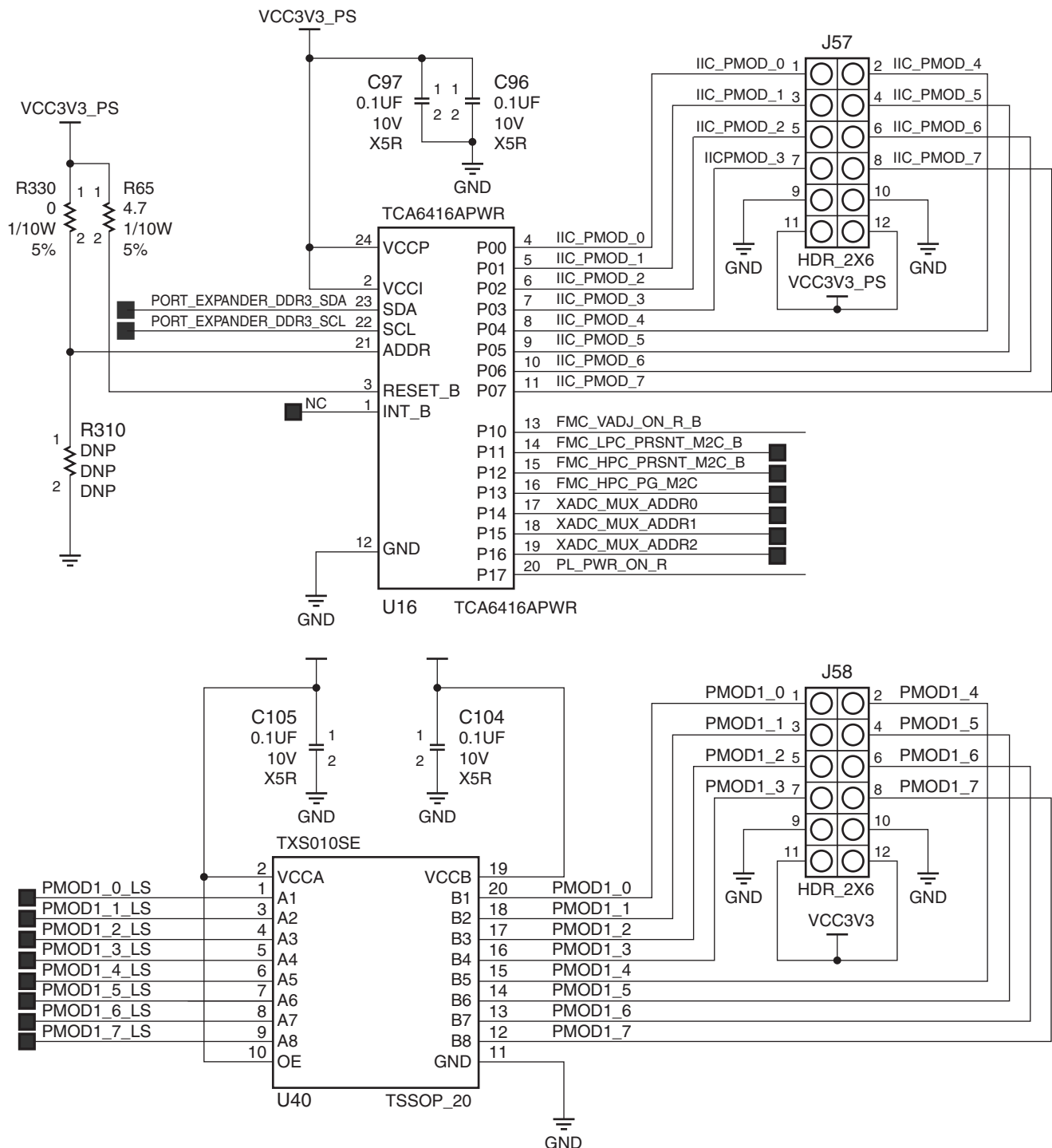
XC7Z045 AP SOC (U1) Pin	Net Name	DIP Switch SW12 Pin
AB17	GPIO_DIP_SW0	1
AC16	GPIO_DIP_SW1	2
AC17	GPIO_DIP_SW2	3
AJ13	GPIO_DIP_SW3	4

User PMOD GPIO Headers

[Figure 1-2, callout 26]

The ZC706 evaluation board supports two GPIO headers J57 and J58. The PMOD nets connected to these headers are accessed via I²C bus expander U16 (PMOD0 J57) and level-shifter U40 (PMOD1 J58).

Figure 1-28 shows the user GPIO male pin header circuits.



UG954_c1_28_073013

Figure 1-28: User GPIO Headers

Table 1-31 lists the GPIO Header connections to XC7Z045 AP SoC U1.

Table 1-31: GPIO Header Connections to XC7Z045 AP SoC at U1

TCA6416APWR (U16) PORT: Pin	Net Name	GPIO Header J57 Pin
P00:4	IIC_PMOD_0	J57.1
P01:5	IIC_PMOD_1	J57.3
P02:6	IIC_PMOD_2	J57.5
P03:7	IIC_PMOD_3	J57.7
P04:8	IIC_PMOD_4	J57.2
P05:9	IIC_PMOD_5	J57.4
P06:10	IIC_PMOD_6	J57.6
P07:11	IIC_PMOD_7	J57.8
XC7Z045 AP SoC (U1) Pin	Net Name	GPIO Header J58 Pin
AJ21	PMOD1_0	J58.1
AK21	PMOD1_1	J58.3
AB21	PMOD1_2	J58.5
AB16	PMOD1_3	J58.7
Y20	PMOD1_4	J58.2
AA20	PMOD1_5	J58.4
AC18	PMOD1_6	J58.6
AC19	PMOD1_7	J58.8

See *Zynq-7000 All Programmable SoC Technical Reference Manual* ([UG585](#)) for information about the PS PJTAG functionality.

Switches

The ZC706 evaluation board includes a power and a configuration (PL PROG_B) switch:

- Power On/Off slide switch SW1 (callout [27](#))
- SW10 (FPGA_PROG_B), active-Low pushbutton (callout [28](#))
- PS System Reset Pushbuttons

Power On/Off Slide Switch

[[Figure 1-2](#), callout 27]

The ZC706 evaluation board power switch is SW1. Sliding the switch actuator from the Off to On position applies 12V power from J22 a 6-pin mini-fit connector. Green LED DS22 illuminates when the ZC706 evaluation board power is on. See [Power Management](#) for details on the onboard power system.



CAUTION! Do NOT plug a PC ATX power supply 6-pin connector into J22 on the ZC706 Evaluation Board. The ATX 6-pin connector has a different pinout than J22. Connecting an ATX 6-pin connector into J22 will damage the ZC706 Evaluation Board and void the board warranty.

The ZC706 evaluation kit provides the adapter cable shown in [Figure 1-29](#) for powering the ZC706 board from the ATX power supply 4-pin peripheral connector. The Xilinx part number for this cable is 2600304, and is equivalent to Sourcegate Technologies part number AZCBL-WH-1109-RA4.



Figure 1-29: ATX Power Supply Adapter Cable

Figure 1-30 shows the power connector J22, power switch SW1 and indicator LED DS22.

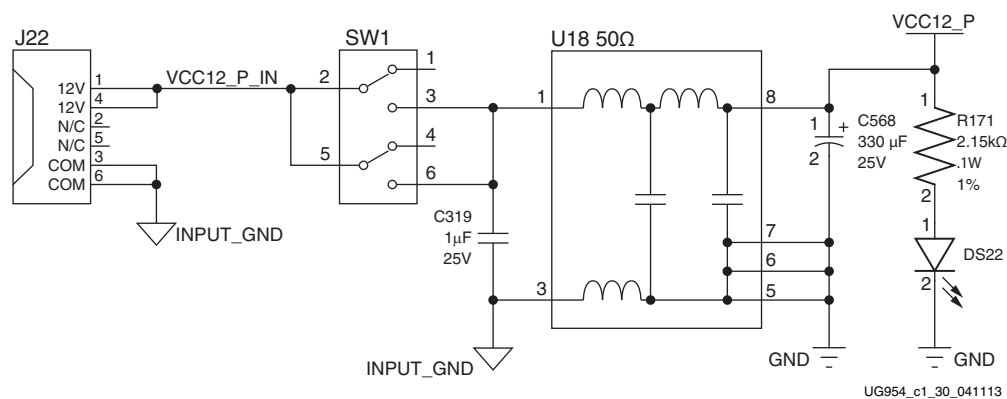


Figure 1-30: Power On/Off Switch SW1

Program_B Pushbutton

[Figure 1-2, callout 28]

Switch SW10 grounds the XC7Z045 AP SoC PROG_B pin when pressed. This action clears the programmable logic configuration. The FPGA_PROG_B signal is connected to XC7Z045 AP SoC U1 pin Y9.

See *7 Series FPGAs Configuration User Guide* for further details on configuring the 7 series FPGAs ([UG470](#)).

Figure 1-31 shows SW10.

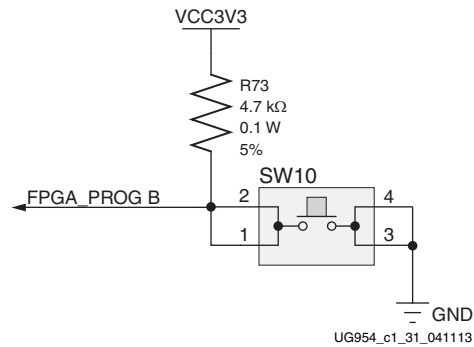


Figure 1-31: PROG_B Pushbutton SW10

PS Power-On and System Reset Pushbuttons

Figure 1-32 shows the reset circuitry for the processing system.

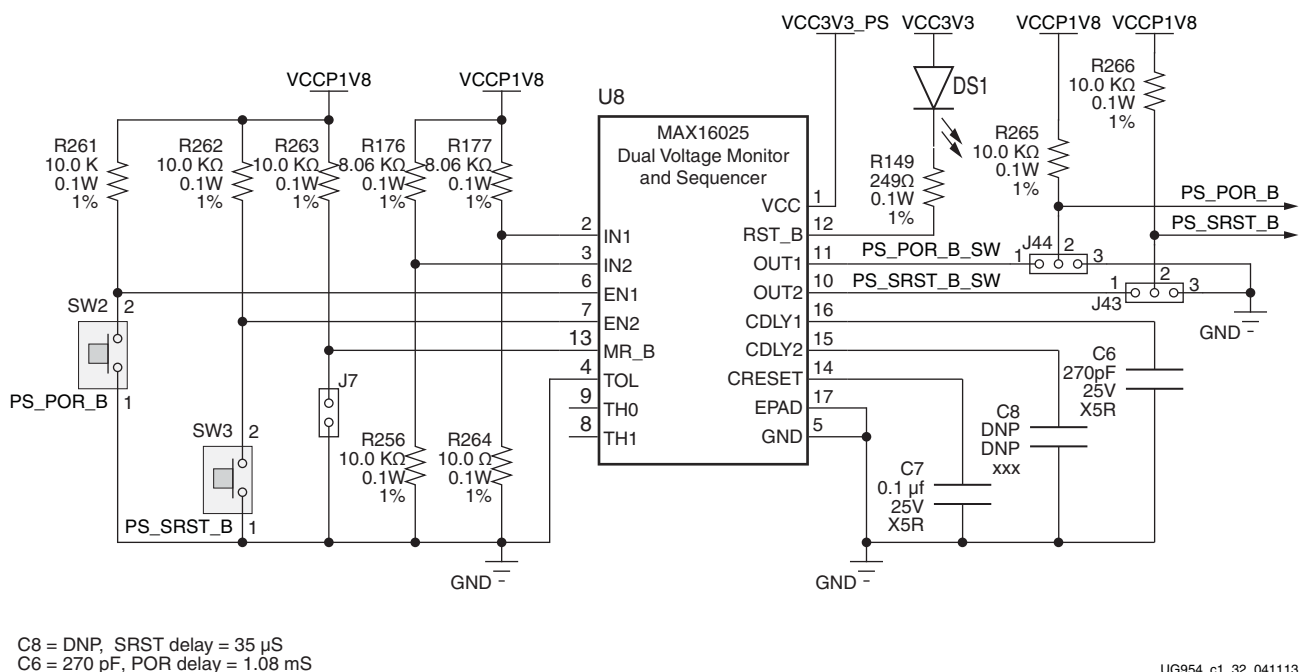


Figure 1-32: PS Power On and System Reset Circuitry

Depressing and then releasing pushbutton SW1 causes PS_POR_B_SW to strobe low.

PS_POR_B: This reset is used to hold the PS in reset until all PS power supplies are at the required voltage levels. It must be held Low through PS power-up. PS_POR_B should be generated by the power supply *power-good* signal.

Depressing and then releasing pushbutton SW3 causes PS_SRST_B_SW (connected to the XC7Z045 AP SoC U1 dedicated PS Bank 500 pin D21) to strobe low.

PS_SRST_B: This reset is used to force a system reset. It can be tied or pulled High, and can be High during the PS supply power ramps.

See *Zynq-7000 All Programmable SoC Technical Reference Manual* ([UG585](#)) for information concerning the resets.

FPGA Mezzanine (FMC) Card Interface

[[Figure 1-2](#), callout 30 and 31]

The ZC706 evaluation board supports the VITA 57.1 FPGA Mezzanine Card (FMC) specification by providing subset implementations of the high pin count (HPC) connector at J37 and low pin count (LPC) version at J5. Both connectors use a 10 x 40 form factor. The HPC connector is populated with 400 pins, while the LPC connector is partially populated with 160 pins. The connectors are keyed so that a mezzanine card, when installed in either of these FMC connectors on the ZC706 evaluation board, faces away from the ZC706 board.

Signaling Speed Ratings:

- Single-ended: 9 GHz (18 Gb/s)
- Differential Optimal Vertical: 9 GHz (18 Gb/s)
- Differential Optimal Horizontal: 16 GHz (32 Gb/s)
- High Density Vertical: 7 GHz (15 Gb/s)

The Samtec connector system is rated for signaling speeds up to 9 GHz (18 Gb/s) based on a –3 dB insertion loss point within a two-level signaling environment.

Connector Type:

- Samtec SEAF Series, 1.27 mm (0.050 in) pitch. Mates with SEAM series connector

More information about SEAF series connectors is available at the Samtec website [[Ref 16](#)].

HPC Connector J37

[[Figure 1-2](#), callout 30]

The 400-pin HPC connector defined by the FMC specification ([Figure B-1, page 88](#)) provides connectivity for up to:

- 160 single-ended or 80 differential user-defined signals
- 10 GTX transceivers
- 2 GTX clocks

- 4 differential clocks
- 159 ground and 15 power connections

The connections between the HPC connector at J37 and AP SoC U1 (Table 1-32) implements a subset of this connectivity:

- 34 differential user-defined pairs (34 LA pairs, LA00–LA33)
- 8 GTX transceivers
- 2 GTX clocks
- 2 differential clocks
- 159 ground and 15 power connections

The ZC706 board V_{ADJ} voltage for the J37 and J5 connectors is determined by the FMC V_{ADJ} power sequencing logic described in the [Power Management, page 77](#).

Table 1-32 shows the J37 HPC FMC to AP SoC U1 connections.

Table 1-32: J37 HPC FMC Connections to XC7Z045 AP SoC U1

J37 Pin	Net Name	XC7Z045 (U1) Pin	J37 Pin	Net Name	XC7Z045 (U1) Pin
A2	FMC_HPC_DP1_M2C_P	AJ8	B1	NC	
A3	FMC_HPC_DP1_M2C_N	AJ7	B4	NC	
A6	FMC_HPC_DP2_M2C_P	AG8	B5	NC	
A7	FMC_HPC_DP2_M2C_N	AG7	B8	NC	
A10	FMC_HPC_DP3_M2C_P	AE8	B9	NC	
A11	FMC_HPC_DP3_M2C_N	AE7	B12	FMC_HPC_DP7_M2C_P	AD6
A14	FMC_HPC_DP4_M2C_P	AH6	B13	FMC_HPC_DP7_M2C_N	AD5
A15	FMC_HPC_DP4_M2C_N	AH5	B16	FMC_HPC_DP6_M2C_P	AF6
A18	FMC_HPC_DP5_M2C_P	AG4	B17	FMC_HPC_DP6_M2C_N	AF5
A19	FMC_HPC_DP5_M2C_N	AG3	B20	FMC_HPC_GBTCLK1_M2C_P	AA8
A22	FMC_HPC_DP1_C2M_P	AK6	B21	FMC_HPC_GBTCLK1_M2C_N	AA7
A23	FMC_HPC_DP1_C2M_N	AK5	B24	NC	
A26	FMC_HPC_DP2_C2M_P	AJ4	B25	NC	
A27	FMC_HPC_DP2_C2M_N	AJ3	B28	NC	
A30	FMC_HPC_DP3_C2M_P	AK2	B29	NC	
A31	FMC_HPC_DP3_C2M_N	AK1	B32	FMC_HPC_DP7_C2M_P	AD2
A34	FMC_HPC_DP4_C2M_P	AH2	B33	FMC_HPC_DP7_C2M_N	AD1
A35	FMC_HPC_DP4_C2M_N	AH1	B36	FMC_HPC_DP6_C2M_P	AE4
A38	FMC_HPC_DP5_C2M_P	AF2	B37	FMC_HPC_DP6_C2M_N	AE3

Table 1-32: J37 HPC FMC Connections to XC7Z045 AP SoC U1 (Cont'd)

J37 Pin	Net Name	XC7Z045 (U1) Pin	J37 Pin	Net Name	XC7Z045 (U1) Pin
A39	FMC_HPC_DP5_C2M_N	AF1	B40	NC	
C2	FMC_HPC_DP0_C2M_P	AK10	D1	PWRCTL1_FMC_PG_C2M	AB20
C3	FMC_HPC_DP0_C2M_N	AK9	D4	FMC_HPC_GBTCLK0_M2C_P	AD10
C6	FMC_HPC_DP0_M2C_P	AH10	D5	FMC_HPC_GBTCLK0_M2C_N	AD9
C7	FMC_HPC_DP0_M2C_N	AH9	D8	FMC_HPC_LA01_CC_P	AG21
C10	FMC_HPC_LA06_P	AG22	D9	FMC_HPC_LA01_CC_N	AH21
C11	FMC_HPC_LA06_N	AH22	D11	FMC_HPC_LA05_P	AH23
C14	FMC_HPC_LA10_P	AG24	D12	FMC_HPC_LA05_N	AH24
C15	FMC_HPC_LA10_N	AG25	D14	FMC_HPC_LA09_P	AD21
C18	FMC_HPC_LA14_P	AC24	D15	FMC_HPC_LA09_N	AE21
C19	FMC_HPC_LA14_N	AD24	D17	FMC_HPC_LA13_P	AA22
C22	FMC_HPC_LA18_CC_P	W25	D18	FMC_HPC_LA13_N	AA23
C23	FMC_HPC_LA18_CC_N	W26	D20	FMC_HPC_LA17_CC_P	V23
C26	FMC_HPC_LA27_P	V28	D21	FMC_HPC_LA17_CC_N	W24
C27	FMC_HPC_LA27_N	V29	D23	FMC_HPC_LA23_P	P25
C30	FMC_HPC_IIC_SCL	U65.13	D24	FMC_HPC_LA23_N	P26
C31	FMC_HPC_IIC_SDA	U65.12	D26	FMC_HPC_LA26_P	R28
C34	GND		D27	FMC_HPC_LA26_N	T28
C35	VCC12_P		D29	FMC_HPC_TCK_BUF	U23.15
C37	VCC12_P		D30	FMC_TDI_BUF	U23.18
C39	VCC3V3		D31	FMC_HPC_TDO_FMC_LPC_TDI	U32.2
			D32	VCC3V3	
			D33	FMC_HPC_TMS_BUF	U23.17
			D34	NC	
			D35	GND	
			D36	VCC3V3	
			D38	VCC3V3	
			D40	VCC3V3	
E2	NC		F1	FMC_HPC_PG_M2C	U16.16
E3	NC		F4	NC	
E6	NC		F5	NC	
E7	NC		F7	NC	

Table 1-32: J37 HPC FMC Connections to XC7Z045 AP SoC U1 (Cont'd)

J37 Pin	Net Name	XC7Z045 (U1) Pin	J37 Pin	Net Name	XC7Z045 (U1) Pin
E9	NC		F8	NC	
E10	NC		F10	NC	
E12	NC		F11	NC	
E13	NC		F13	NC	
E15	NC		F14	NC	
E16	NC		F16	NC	
E18	NC		F17	NC	
E19	NC		F19	NC	
E21	NC		F20	NC	
E22	NC		F22	NC	
E24	NC		F23	NC	
E25	NC		F25	NC	
E27	NC		F26	NC	
E28	NC		F28	NC	
E30	NC		F29	NC	
E31	NC		F31	NC	
E33	NC		F32	NC	
E34	NC		F34	NC	
E36	NC		F35	NC	
E37	NC		F37	NC	
E39	VADJ		F38	NC	
			F40	VADJ	
G2	FMC_HPC_CLK1_M2C_P	U26	H1	NC	
G3	FMC_HPC_CLK1_M2C_N	U27	H2	FMC_HPC_PRSNT_M2C_B	U16.15
G6	FMC_HPC_LA00_CC_P	AF20	H4	FMC_HPC_CLK0_M2C_P	AE22
G7	FMC_HPC_LA00_CC_N	AG20	H5	FMC_HPC_CLK0_M2C_N	AF22
G9	FMC_HPC_LA03_P	AH19	H7	FMC_HPC_LA02_P	AK17
G10	FMC_HPC_LA03_N	AJ19	H8	FMC_HPC_LA02_N	AK18
G12	FMC_HPC_LA08_P	AF19	H10	FMC_HPC_LA04_P	AJ20
G13	FMC_HPC_LA08_N	AG19	H11	FMC_HPC_LA04_N	AK20
G15	FMC_HPC_LA12_P	AF23	H13	FMC_HPC_LA07_P	AJ23
G16	FMC_HPC_LA12_N	AF24	H14	FMC_HPC_LA07_N	AJ24
G18	FMC_HPC_LA16_P	AA24	H16	FMC_HPC_LA11_P	AD23

Table 1-32: J37 HPC FMC Connections to XC7Z045 AP SoC U1 (Cont'd)

J37 Pin	Net Name	XC7Z045 (U1) Pin	J37 Pin	Net Name	XC7Z045 (U1) Pin
G19	FMC_HPC_LA16_N	AB24	H17	FMC_HPC_LA11_N	AE23
G21	FMC_HPC_LA20_P	U25	H19	FMC_HPC_LA15_P	Y22
G22	FMC_HPC_LA20_N	V26	H20	FMC_HPC_LA15_N	Y23
G24	FMC_HPC_LA22_P	V27	H22	FMC_HPC_LA19_P	T24
G25	FMC_HPC_LA22_N	W28	H23	FMC_HPC_LA19_N	T25
G27	FMC_HPC_LA25_P	T29	H25	FMC_HPC_LA21_P	W29
G28	FMC_HPC_LA25_N	U29	H26	FMC_HPC_LA21_N	W30
G30	FMC_HPC_LA29_P	R25	H28	FMC_HPC_LA24_P	T30
G31	FMC_HPC_LA29_N	R26	H29	FMC_HPC_LA24_N	U30
G33	FMC_HPC_LA31_P	N29	H31	FMC_HPC_LA28_P	P30
G34	FMC_HPC_LA31_N	P29	H32	FMC_HPC_LA28_N	R30
G36	FMC_HPC_LA33_P	N26	H34	FMC_HPC_LA30_P	P23
G37	FMC_HPC_LA33_N	N27	H35	FMC_HPC_LA30_N	P24
G39	VADJ		H37	FMC_HPC_LA32_P	P21
			H38	FMC_HPC_LA32_N	R21
			H40	VADJ	
J2	NC		K1	NC	
J3	NC		K4	NC	
J6	NC		K5	NC	
J7	NC		K7	NC	
J9	NC		K8	NC	
J10	NC		K10	NC	
J12	NC		K11	NC	
J13	NC		K13	NC	
J15	NC		K14	NC	
J16	NC		K16	NC	
J18	NC		K17	NC	
J19	NC		K19	NC	
J21	NC		K20	NC	
J22	NC		K22	NC	
J24	NC		K23	NC	
J25	NC		K25	NC	
J27	NC		K26	NC	

Table 1-32: J37 HPC FMC Connections to XC7Z045 AP SoC U1 (Cont'd)

J37 Pin	Net Name	XC7Z045 (U1) Pin	J37 Pin	Net Name	XC7Z045 (U1) Pin
J28	NC		K28	NC	
J30	NC		K29	NC	
J31	NC		K31	NC	
J33	NC		K32	NC	
J34	NC		K34	NC	
J36	NC		K35	NC	
J37	NC		K37	NC	
J39	NC		K38	NC	
			K40	NC	

LPC Connector J5

[Figure 1-2, callout 31]

The 160-pin LPC connector defined by the FMC specification (Figure B-1, page 88) provides connectivity for up to:

- 68 single-ended or 34 differential user-defined signals
- 1 GTX transceiver
- 1 GTX clock
- 2 differential clocks
- 61 ground and 10 power connections

The connections between the HPC connector at J5 and AP SoC U1 implements a subset of this connectivity:

- 34 differential user-defined pairs (34 LA pairs, LA00–LA33)
- 1 GTX transceiver
- 1 GTX clock
- 2 differential clocks
- 61 ground and 9 power connections

Table 1-33 shows the FMC LPC connections between J5 and XC7Z045 AP SoC U1.

Table 1-33: J5 LPC FMC Connections to AP SoC U1

J5 Pin	Net Name	XC7Z045 (U1) Pin	J5 Pin	Net Name	XC7Z045 (U1) Pin
C2	FMC_LPC_DP0_C2M_P	AB2	D1	PWRCTL1_FMC_PG_C2M	AB20
C3	FMC_LPC_DP0_C2M_N	AB1	D4	FMC_LPC_GBTCLK0_M2C_P	U8
C6	FMC_LPC_DP0_M2C_P	AC4	D5	FMC_LPC_GBTCLK0_M2C_N	U7
C7	FMC_LPC_DP0_M2C_N	AC3	D8	FMC_LPC_LA01_CC_P	AF15
C10	FMC_LPC_LA06_P	AB12	D9	FMC_LPC_LA01_CC_N	AG15
C11	FMC_LPC_LA06_N	AC12	D11	FMC_LPC_LA05_P	AE16
C14	FMC_LPC_LA10_P	AC14	D12	FMC_LPC_LA05_N	AE15
C15	FMC_LPC_LA10_N	AC13	D14	FMC_LPC_LA09_P	AH14
C18	FMC_LPC_LA14_P	AF18	D15	FMC_LPC_LA09_N	AH13
C19	FMC_LPC_LA14_N	AF17	D17	FMC_LPC_LA13_P	AH17
C22	FMC_LPC_LA18_CC_P	AE27	D18	FMC_LPC_LA13_N	AH16
C23	FMC_LPC_LA18_CC_N	AF27	D20	FMC_LPC_LA17_CC_P	AB27
C26	FMC_LPC_LA27_P	AJ28	D21	FMC_LPC_LA17_CC_N	AC27
C27	FMC_LPC_LA27_N	AJ29	D23	FMC_LPC_LA23_P	AJ26
C30	FMC_LPC_IIC_SCL	U65.15	D24	FMC_LPC_LA23_N	AK26
C31	FMC_LPC_IIC_SDA	U65.14	D26	FMC_LPC_LA26_P	AJ30
C34	GND		D27	FMC_LPC_LA26_N	AK30
C35	VCC12_P		D29	FMC_LPC_TCK_BUF	U23.14
C37	VCC12_P		D30	FMC_HPC_TDO_FMC_LPC_TDI	U31.1
C39	VCC3V3		D31	FMC_LPC_TDO_FPGA_TDI	U31.2
			D32	VCC3V3	
			D33	FMC_LPC_TMS_BUF	U23.16
			D34	NC	
			D35	GND	
			D36	VCC3V3	
			D38	VCC3V3	
			D40	VCC3V3	
G2	FMC_LPC_CLK1_M2C_P	AC28	H1	NC	
G3	FMC_LPC_CLK1_M2C_N	AD28	H2	FMC_LPC_PRSNT_M2C_B	U16.14
G6	FMC_LPC_LA00_CC_P	AE13	H4	FMC_LPC_CLK0_M2C_P	AG17
G7	FMC_LPC_LA00_CC_N	AF13	H5	FMC_LPC_CLK0_M2C_N	AG16

Table 1-33: J5 LPC FMC Connections to AP SoC U1 (Cont'd)

J5 Pin	Net Name	XC7Z045 (U1) Pin	J5 Pin	Net Name	XC7Z045 (U1) Pin
G9	FMC_LPC_LA03_P	AG12	H7	FMC_LPC_LA02_P	AE12
G10	FMC_LPC_LA03_N	AH12	H8	FMC_LPC_LA02_N	AF12
G12	FMC_LPC_LA08_P	AD14	H10	FMC_LPC_LA04_P	AJ15
G13	FMC_LPC_LA08_N	AD13	H11	FMC_LPC_LA04_N	AK15
G15	FMC_LPC_LA12_P	AD16	H13	FMC_LPC_LA07_P	AA15
G16	FMC_LPC_LA12_N	AD15	H14	FMC_LPC_LA07_N	AA14
G18	FMC_LPC_LA16_P	AE18	H16	FMC_LPC_LA11_P	AJ16
G19	FMC_LPC_LA16_N	AE17	H17	FMC_LPC_LA11_N	AK16
G21	FMC_LPC_LA20_P	AG26	H19	FMC_LPC_LA15_P	AB15
G22	FMC_LPC_LA20_N	AG27	H20	FMC_LPC_LA15_N	AB14
G24	FMC_LPC_LA22_P	AK27	H22	FMC_LPC_LA19_P	AH26
G25	FMC_LPC_LA22_N	AK28	H23	FMC_LPC_LA19_N	AH27
G27	FMC_LPC_LA25_P	AF29	H25	FMC_LPC_LA21_P	AH28
G28	FMC_LPC_LA25_N	AG29	H26	FMC_LPC_LA21_N	AH29
G30	FMC_LPC_LA29_P	AE25	H28	FMC_LPC_LA24_P	AF30
G31	FMC_LPC_LA29_N	AF25	H29	FMC_LPC_LA24_N	AG30
G33	FMC_LPC_LA31_P	AC29	H31	FMC_LPC_LA28_P	AD25
G34	FMC_LPC_LA31_N	AD29	H32	FMC_LPC_LA28_N	AE26
G36	FMC_LPC_LA33_P	Y30	H34	FMC_LPC_LA30_P	AB29
G37	FMC_LPC_LA33_N	AA30	H35	FMC_LPC_LA30_N	AB30
G39	VADJ		H37	FMC_LPC_LA32_P	Y26
			H38	FMC_LPC_LA32_N	Y27
			H40	VADJ	

ZC706 Board Power System

The ZC706 board hosts a power system based on the Texas Instruments (TI) UCD90120A power supply sequencer and monitor, and the TI TPS84K and LMZ22000 family voltage regulators.

UCD90120A Description

The UCD90120A is a 12-rail PMBus/I²C addressable power-supply sequencer and monitor. The device integrates a 12-bit ADC for monitoring up to 12 power-supply voltage inputs. Twenty-six GPIO pins can be used for power supply enables, power-on reset signals, external interrupts, cascading, or other system functions. Twelve of these pins offer pulse

width modulation (PWM) functionality. Using these pins, the UCD90120A offers support for margining and general purpose PWM functions.

The TI Fusion Digital Power™ designer software is provided for device configuration. This PC-based graphical user interface (GUI) offers an intuitive interface for configuring, storing, and monitoring all system operating parameters.

TPS84K Family Regulator Description

The TPS84621RUQ (6A) and TPS84320RUQ (3A) regulators are integrated synchronous buck power solutions that combine a DC-DC converter with power MOSFETs, an inductor, and passives into low profile BQFN packages. The TPS84K devices accept an input voltage rail between 4.5V and 14.5V and deliver an adjustable output voltage in the 0.6V to 5.5V range. This type of power solution allows as few as three external components and eliminates the loop compensation and magnetic parts selection process.

LMZ22000 Family Regulator Description

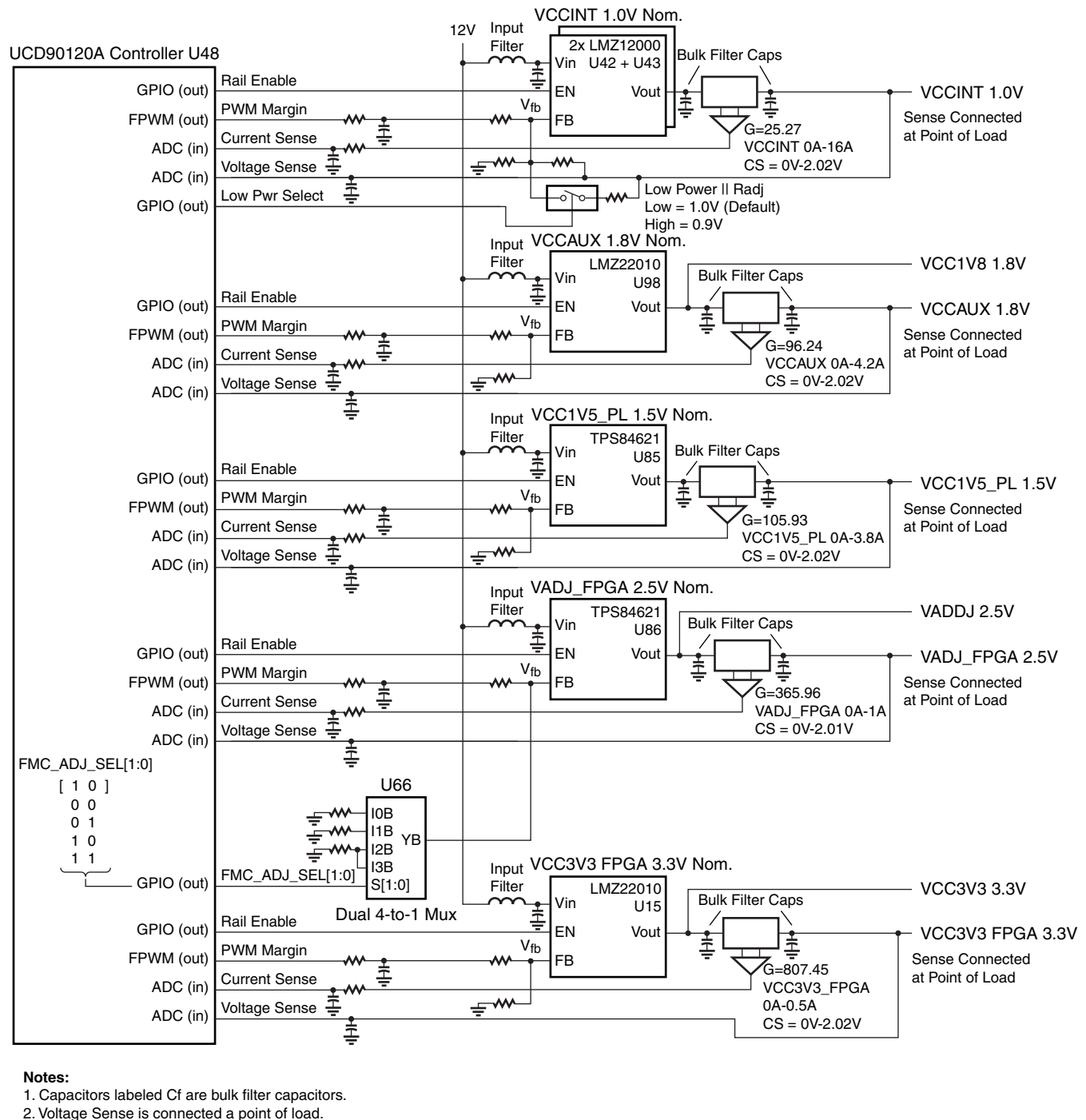
The LMZ22010 SIMPLE SWITCHER® power module is a step-down DC-DC solution capable of driving up to 10A load. The LMZ22010 module can accept an input voltage rail between 6V and 20V and deliver an adjustable and highly accurate output voltage as low as 0.8V. The LMZ22010 module only requires two external resistors and external capacitors to complete the power solution. The LMZ22010 module is a reliable and robust design with the following protection features: thermal shutdown, programmable input under-voltage lockout, output over-voltage protection, short-circuits protection, output current limit, and allows startup into a pre-biased output. The sync input allows synchronization over the 314 kHz to 600 kHz switching frequency range and up to six modules can be connected in parallel for higher load currents.

Table 1-34 shows the ZC706 board TI power system configuration for controller U48.

Table 1-34: ZC706 TI Controller U48 Power System Configuration

Sequencer	Schematic Page			Regulator Type, U#	Voltage	Current
	Page	Contents	Net Name			
U48 PMBus Addr 101 5 Rails	49	UCD90120A				
	50	Addr 101, Rail 1	VCCINT	2xLMZ22008 U42,U43	1.0V	16A
	51	Addr 101, Rail 2	VCCAUX	LMZ22010	1.8V	10A
	52	Addr 101, Rail 3	VCC1V5_PL	TPS84621 U85	1.5V	6A
	53	Addr 101, Rail 4	VADJ_FPGA,VADJ	TPS84621 U86	2.5V	6A
	54	Addr 101, Rail 5	VCC3V3_FPGA,VCC3V3	LMZ22010	3.3V	10A

Figure 1-33 shows the power system for UCD90120A U48 controller.



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Figure 1-33: ZC706 TI UCD90120A Controller U48 Power System

Both the TPS84K and LMZ22000 family adjustable voltage regulators have their output voltage set through an external resistor. The regulator topology on the ZC706 board permits the TI UCD90120A module to monitor rail voltage and current. Voltage margining at +5% and -5% is also implemented.

Each voltage regulator's external V_{OUT} setting resistor is calculated and implemented as if the regulator is stand-alone. The TI UCD90120A module has two ADC inputs allocated per voltage rail, one input for the remote voltage sense connection, the other for the current sense resistor op amp output voltage connection. The TI UCD90120A ADC full scale input is 2.5V. The remote voltage feedback is scaled to approximately 2V if it exceeds 2V, that is, the V_{CCO_VADJ} rail for the 2.5V and 3.3V modes, and the FPGA_3V3 rail also at 3.3V are resistor-attenuated to scale the remotely sensed voltage at a ratio of 0.606 to give approximately 2V at the ADC input pin for a 3.3V remote sense value. Rails below 2V are not scaled.

Each rail's current sense op amp has its gain set to provide approximately 2V maximum at the TI UCD90120A ADC input pin when the rail current is at its expected maximum current level, as can be seen in the U48 controller power system figure ([Figure 1-33](#)).

The TI UCD90120A module has an assignable group of GPIO pins with PWM capability. Each controller "channel" has a PWM GPIO pin wired to the associated voltage regulator V_{ADJ} pin. The external V_{OUT} setting resistor is also wired to this pin. The PWM GPIO pin is configured in 3-state mode. This pin is not driven unless a Margin command is executed. The Margin command is available within the TI Fusion Digital Power™ designer software.

During the margin-High or Low operation, the PWM GPIO pin drives a voltage into the voltage regulator V_{ADJ} pin, which causes a slight voltage change resulting in the regulator V_{OUT} moving to the margin +5% or -5% voltage commanded.

XADC Power System Measurement

The ZC706 board XADC interface includes power system voltage and current measuring capability. The V_{CCINT} and V_{CCAUX} rail voltages are measured using the XADC internal voltage measurement capability. Other rails are measured through an external Analog Devices ADG707BRU multiplexer U6. Each rail has a separate TI INA333 op amp strapped across its series current sense resistor Kelvin terminals. This op amp has its gain adjusted to give approximately 1V at the expected full scale current value for the rail.

Figure 1-34 shows the XADC external MUX block diagram.

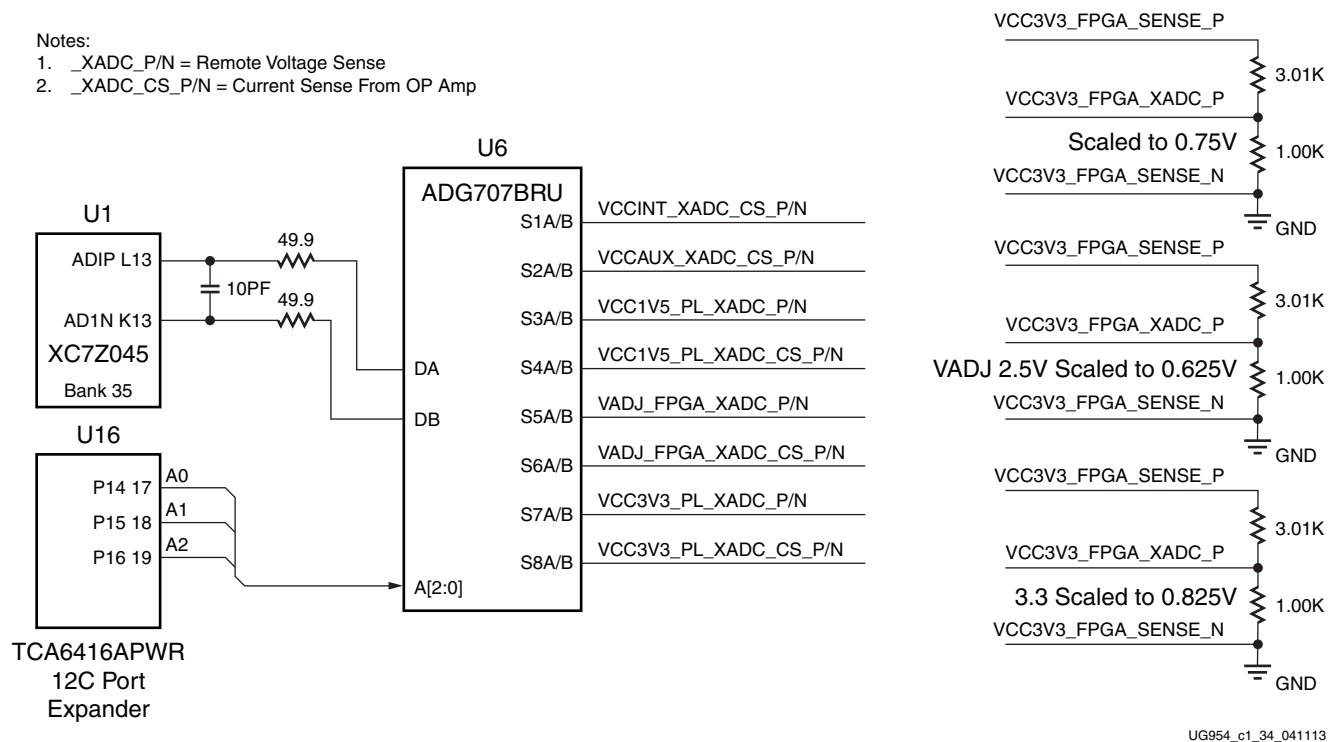


Figure 1-34: XADC External MUX Block Diagram

See [Table 1-35](#) which lists the ZC706 XADC power system voltage and current measurement details for the external MUX U6.

Table 1-35: XADC Measurements through MUX U6

Meas. Type	Rail Name	Current Range	Isense Op Amp			Schematic Net Name	8-to-1 MUX U6		MUX A[2:0]
			Reference Designator	Gain	Vo Range		Pin Num	Pin Name	
V	VCCINT	NA	NA	NA	NA	XADC INTERNAL	NA	NA	NA
I	VCCINT CS	0A-8A	U69	20	0V-0.8V	VCCINT_XADC_CS_P	19	S1A	000
						VCCINT_XADC_CS_N	11	S1B	
V	VCCAUX	NA	NA	NA	NA	XADC INTERNAL	NA	NA	NA
I	VCCAUX CS	0A-4A	U68	50	0V-1V	VCCAUX_XADC_CS_P	20	S2A	001
						VCCAUX_XADC_CS_N	10	S2B	
V	VCC1V5_PL	NA	VCC1V5_PL REMOTE SENSE DIVIDED TO DELIVER 0.75V ON VCC1V5_PL_XADC_P			VCC1V5_PL_XADC_P	21	S3A	010
						VCC1V5_PL_SENSE_N	9	S3B	
I	VCC1V5_PL CS	0A-2A	U67	100	0V-1V	VCC1V5_PL_XADC_CS_P	22	S4A	011
						VCC1V5_PL_XADC_CS_N	8	S4B	

Table 1-35: XADC Measurements through MUX U6 (Cont'd)

Meas. Type	Rail Name	Current Range	Isense Op Amp			Schematic Net Name	8-to-1 MUX U6		MUX A[2:0]
			Reference Designator	Gain	Vo Range		Pin Num	Pin Name	
V	VADJ_FPGA	NA	VADJ_FPGA 2.5V REMOTE SENSE DIVIDED TO DELIVER 0.625V ON VADJ_FPGA_XADC_P			VADJ_FPGA_XADC_P	23	S5A	100
						VADJ_FPGA_SENSE_N	7	S5B	
I	VADJ_FPGA CS	0A-2A	U70	100	0V-1V	VADJ_FPGA_XADC_CS_P	24	S6A	101
						VADJ_FPGA_XADC_CS_N	6	S6B	
V	VCC3V3_FPGA	NA	VCC3V3_FPGA REMOTE SENSE DIVIDED TO DELIVER 0.825V ON VCC3V3_FPGA_XADC_P			VCC3V3_FPGA_XADC_P	25	S7A	110
						VCC3V3_FPGA_SENSE_N	5	S7B	
I	VCC3V3_FPGA CS	0A-2A	U97	100	0V-1V	VCC3V3_FPGA_XADC_CS_P	26	S8A	111
						VCC3V3_FPGA_XADC_CS_N	4	S8B	

Power Management

[Figure 1-2, callout 32]

The ZC706 board uses power regulators and a PMBus-compliant system controller from Texas Instruments to supply core and auxiliary voltages. The Texas Instruments Fusion Digital Power graphical user interface is used to monitor the voltage and current levels of the board power modules.

The PCB layout and power system design meet the recommended criteria described in *Zynq-7000 All Programmable SoC PCB Design and Pin Planning Guide* ([UG933](#)).

The ZC706 evaluation board power distribution diagram is shown in [Figure 1-35](#).

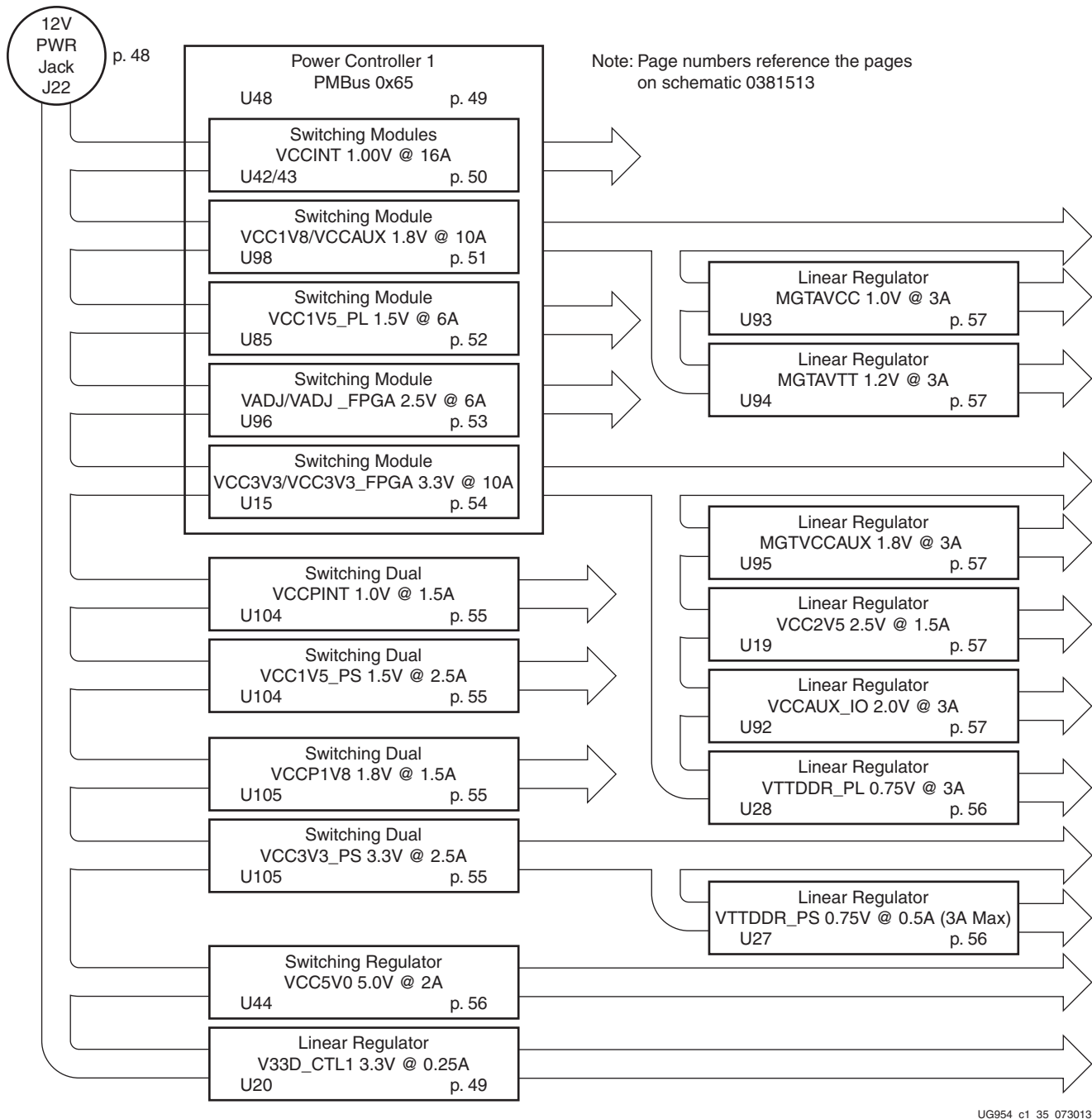


Figure 1-35: Onboard Power Regulators

The ZC706 evaluation board uses power regulators and PMBus compliant PWM system controllers from Texas Instruments to supply the core and auxiliary voltages listed in [Table 1-36](#).

Table 1-36: Onboard Power System Devices

Device Type	Reference Designator	Description	Power Rail Net Name	Power Rail Voltage	Schematic Page
UCD90120A	U48	PMBus Controller, PMBus Addr = 101			49
LMZ22008TZ ⁽¹⁾	U42	1 of 2 8A 0.8V - 6V shared Adj. Switching Regulator	VCCINT ⁽²⁾	1.00V	50
LMZ22008TZ ⁽¹⁾	U43	2 of 2 8A 0.8V - 6V shared Adj. Switching Regulator	VCCINT	1.00V	50
LMZ22010TZ	U98	10A 0.8V - 6V Adj. Switching Regulator	VCCAUX ⁽³⁾	1.80V	51
TPS84621RUQ	U85	6A 0.6V - 5.5V Adj. Switching Regulator	VCC1V5_PL	1.50V	52
TPS84621RUQ	U86	6A 0.6V - 5.5V Adj. Switching Regulator	VADJ_FPGA ⁽⁴⁾	2.50V	53
LMZ22010TZ	U15	10A 0.8V - 6V Adj. Switching Regulator	VCC3V3_FPGA ⁽⁵⁾	3.30V	54
TPS54291PWP (Dual Output)	U104	2.5A 0.8V - 10V Adj. Switching Regulator	VCCPINT	1.00V	55
		2.5A 0.8V - 10V Adj. Switching Regulator	VCC1V5_PS	1.50V	55
TPS54291PWP (Dual Output)	U105	2.5A 0.8V - 10V Adj. Switching Regulator	VCCP1V8	1.80V	55
		2.5A 0.8V - 10V Adj. Switching Regulator	VCC3V3_PS	3.30V	55
TPS51200DR	U27	3A Push/Pull Tracking Regulator	VTTDDR_PS	0.75V	56
TPS51200DR	U28	3A Push/Pull Tracking Regulator	VTTDDR_SODI MM	0.75V	56
TPS74901RGW	U92	3A 0.8V - 3.6V Adj. Linear Regulator	VCCAUX_IO	2.00V	57
TPS74901RGW	U93	3A 0.8V - 3.6V Adj. Linear Regulator	MGTAVCC	1.00V	57
TPS74901RGW	U94	3A 0.8V - 3.6V Adj. Linear Regulator	MGTAVTT	1.20V	57
TPS74901RGW	U95	3A 0.8V - 3.6V Adj. Linear Regulator	MGTVCCAUX	1.80V	57
TL1963A	U19	1.5A 1.21V - 3.3V Adj. Linear Regulator	VCC2V5	2.50V	57
TPS79433	U20	0.25A 3.3V Fixed Linear Regulator	V33D_CTL1	3.30V	49

Notes:

1. VCCINT max. current is 16A
2. VCCBRAM 1.0V is also sourced from the Vccint rail
3. VCC1V8 1.80V is also sourced from the Vccaux rail
4. VADJ (1.80V/2.50V/3.30V) for the FMC connectors is also sourced from the Vadj_fpga rail
5. VCC3V3 3.30V is also sourced from the Vcc3v3_fpga rail

VADJ Voltage Control

The V_{ADJ} rail is set to 2.5V. When the ZC706 evaluation board is powered on, the state of the FMC_VADJ_ON_B signal wired to header J18 is sampled by the TI UCD90120A controller U48. If a jumper is installed on J18 signal FMC_VADJ_ON_B is held Low, and the TI controller U48 energizes the V_{ADJ} rail at power on.

Because the rail turn on decision is made at power on time based on the presence of the J18 jumper, removing the jumper at J18 after the board is powered up does not affect the 2.5V power delivered to the V_{ADJ} rail and it remains on.

A jumper installed at J18 is the default setting.

In this mode the user can control when to turn on V_{ADJ} and to which voltage level (1.8V, 2.5V, 3.3V). With V_{ADJ} off the XC7Z045 AP SoC still configures and has access to the TI controller PMBUS along with the FMC_VADJ_ON_B signal. The combination of these allows the user to develop code to command the V_{ADJ} rail to be set to something other than the default setting of 2.5V. Once the new V_{ADJ} voltage level has been programmed into TI controller U48, the FMC_VADJ_ON_B signal can be driven low by the user logic and the V_{ADJ} rail comes up at the new V_{ADJ} voltage level. Installing a jumper at J18 after a ZC706 board powers up in the V_{ADJ} off (no jumper on J18 at ZC706 power up) mode turns on the V_{ADJ} rail.

The FMC_VADJ_ON_B signal is connected to the TCA6416APWR I²C port expander U16 pin 13 (see [Figure 1-28](#)). The XC7Z045 AP SoC is thus able to drive the FMC_VADJ_ON_B signal by writing to the I²C port expander U16.

The I²C port expander IIC_PORT_EXPANDER SDA/SCL bus is wired to the PCA9548ARGER I²C U65 bus switch (see [I2C Bus, page 53](#)).

Documentation describing PMBUS programming for the UCD90120A power controller is available at the website [\[Ref 11\]](#).

AP SoC Programmable Logic (PL) Voltage Control

All PL and PS power rails are enabled by default. When the ZC706 board is powered on, the state of the PL_PWR_ON signal wired to 2-pin header J66 is sampled by the TI UCD90120A controller U48. If a jumper is not installed on J66, signal PL_PWR_ON is held high, and the TI controller U48 energizes all the PL and PS power rails.

Because the rail turn on decision is made at power on time based on the presence of the J66 jumper, installing the jumper at J66 after the board is powered up does not affect power delivered to the any PS or PL rails, all rails remain on.

A jumper not installed at J66 is the default setting.

If a jumper is installed on J66 when the ZC706 board is powered on, signal PL_PWR_ON is held low, and the ZC706 board does not energize the PL side power rails at power on.

Monitoring Voltage and Current

Voltage and current monitoring and control are available for selected power rails through Texas Instruments' Fusion Digital Power Designer graphical user interface. The onboard TI power controller (U48 at address 101) is accessed through the PMBus connector J4, which is provided for use with the TI USB Interface Adapter PMBus pod (TI part number EVM USB-TO-GPIO), which can be ordered from the Texas Instruments website [\[Ref 12\]](#) and

associated TI Fusion Digital Power Designer GUI (downloadable from the TI site [\[Ref 13\]](#). This is the simplest and most convenient way to monitor the voltage and current values for the power rails listed in [Table 1-37](#).

In the table, the Power Good (PG) On Threshold is the setpoint at or above which the particular rail is deemed "good". The PG Off Threshold is the setpoint at or below which the particular rail is no longer deemed "good". The controller internally OR's these per rail PG conditions together and drives an output PG pin high only if all active rail PG states are "good". The On and Off Delay and parameters are relative to when the board power on-off slide switch SW12 is turned on and off.

[Table 1-37](#) Power Rail Specifications for UCD90120A PMBus controller at Address 101 defines the voltage and current values for each power rail controlled by the UCD90120A U48.



IMPORTANT: In [Table 1-37](#), the values defined in the Shutdown columns are the voltage and current thresholds that cause the regulator to shut down if the value is exceeded.

Table 1-37: Power Rail Specifications for UCD90120A PMBus Controller at Address 101

Device	Address	Rail		Nominal Voltage	Power Good On	Power Good Off	Turn On Delay (ms) ⁽²⁾	Turn Off Delay (ms)	Shutdown ⁽¹⁾	
									Over Voltage	Over Current
UCD90120A U48	101d	1	VCCINT	1.000	0.900	0.850	0.0	25.0	1.150	11.50
		2	VCCAUX	1.800	1.620	1.530	5.0	20.0	2.070	6.91
		3	VCC1V5_PL	1.500	1.350	1.275	5.0	10.0	1.725	3.50
		4	VADJ_FPGA	2.500	2.250	2.125	5.0	5.0	2.875	3.50
		5	VCC3V3_FPGA	3.300	2.970	2.805	5.0	15.0	3.795	6.91

Notes:

1. The values defined in these columns are the voltage and current thresholds that cause the regulator to shut down if the value is exceeded.
2. See [Table 1-39](#) for rail turn on dependency details.

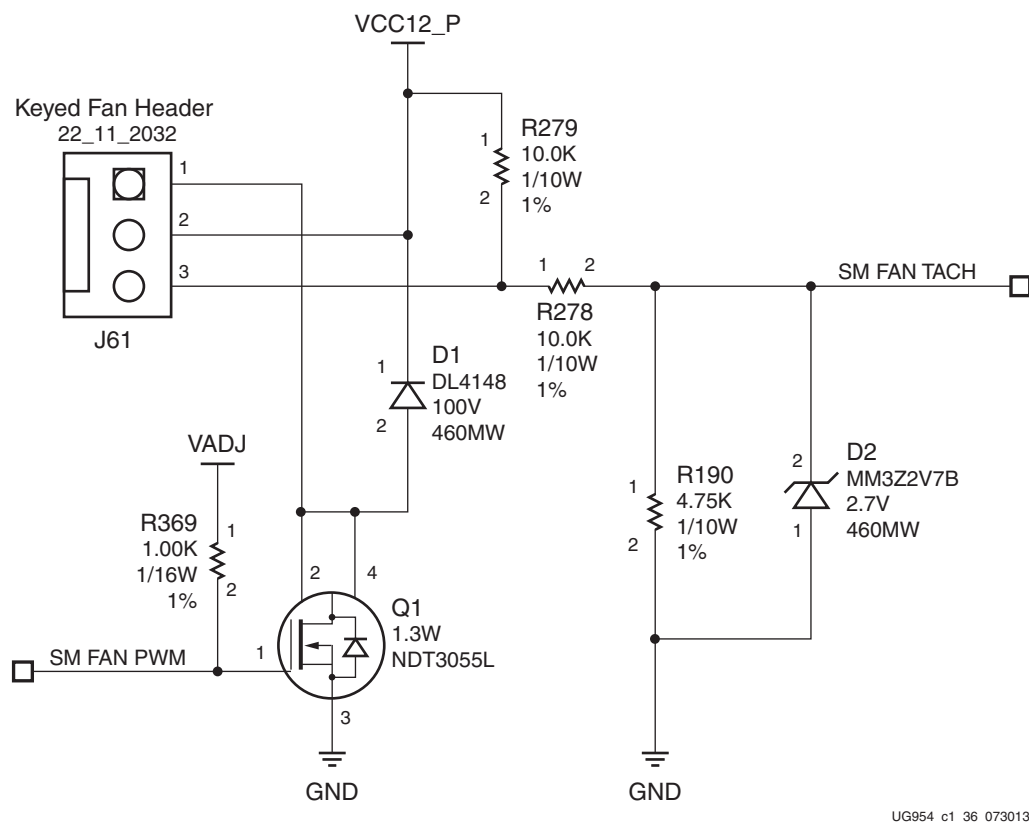
The ZC706 power system rail turn on timing is not strictly controlled through the Turn On Delay shown in [Table 1-37](#). The [Table 1-37](#) Turn On Delay delay values are applied after the preceding rail has reached 90% of its nominal voltage. See [Table 1-38](#) for rail turn on dependency details.

Table 1-38: Power Rail Sequence On Dependencies for UCD90120A PMBus Controller at Address 101

Device	Address	Rail	Nominal Voltage	Turn On Order	Turn On Timing
UCD90120A	101d	1 VCCINT	1.000	1	Turn on at board power-on
		2 VCCAUX	1.800	2	5ms after VCCINT hits 90%
		5 VCC3V3_FPGA	3.300	3	5ms after VCCAUX hits 90%
		3 VCC1V5_PL	1.500	4	5ms after VCC3V3 hits 90%
		4 VADJ_FPGA	2.500	5	5ms after VCC1V5_PL hits 90%

Cooling Fan

The XC7Z045 AP SoC cooling fan connector is shown in [Figure 1-36](#).



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Figure 1-36: Cooling Fan Circuit

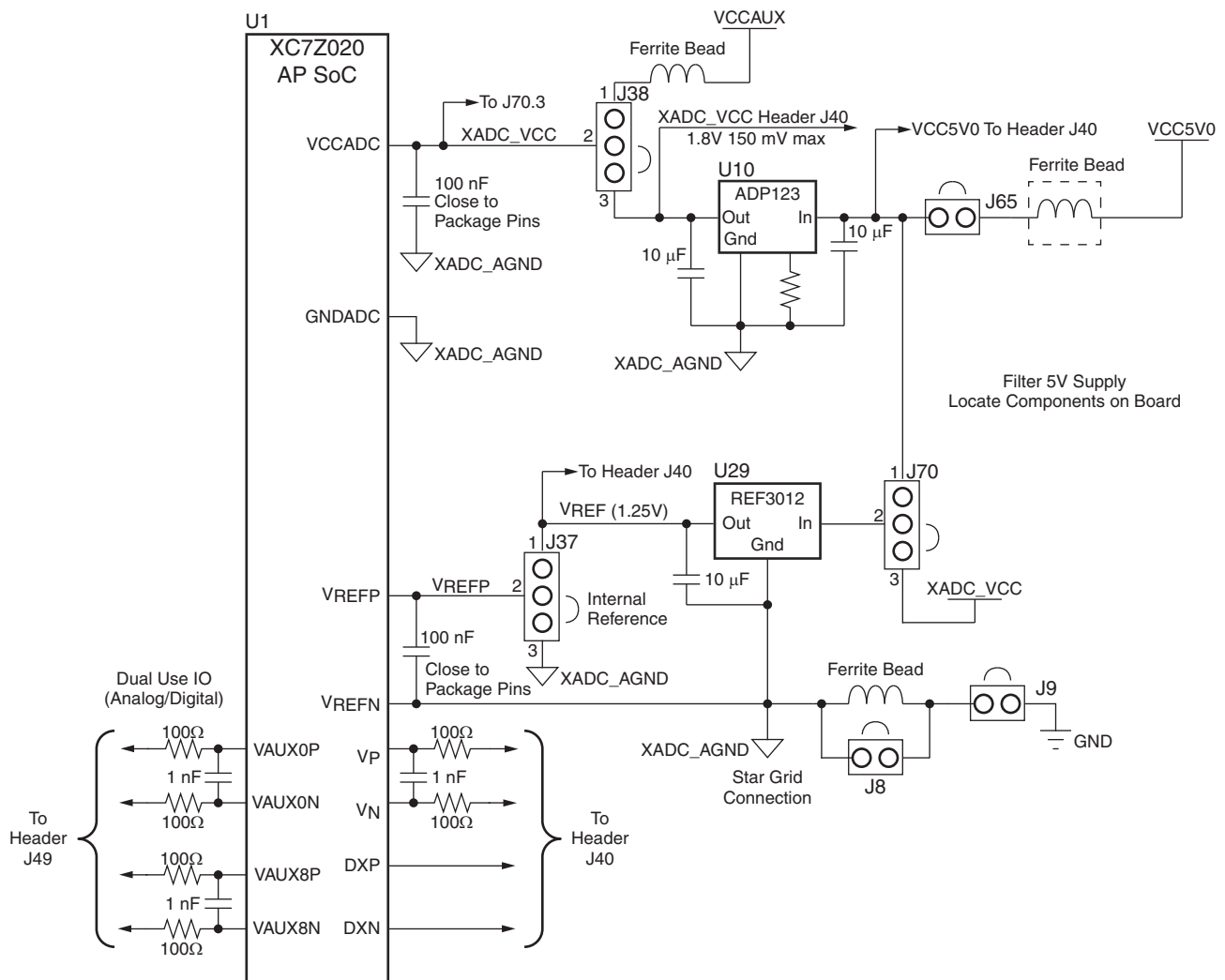
The fan turns on when the ZC706 is power up due to pull-up resistor R369. The SM_FAN_PWM and SM_FAN_TACH signals are wired to XC7Z045 AP SoC U1 pins AB19 and AA19 respectively, enabling the user to implement their own fan speed control IP in the AP SoC PL logic.

More information about the power system components used by the ZC706 evaluation board are available from the Texas Instruments digital power website [\[Ref 17\]](#).

XADC Analog-to-Digital Converter

[Figure 1-2, callout 33]

The XC7Z045 AP SoC provides an Analog Front End XADC block. The XADC block includes a dual 12-bit, 1 MSPS Analog-to-Digital Converter (ADC) and on-chip sensors. See *7 Series FPGAs and Zynq-7000 All Programmable SoC XADC Dual 12-Bit 1 MSPS Analog-to-Digital Converter User Guide* ([UG480](#)) for details on the capabilities of the analog front end. [Figure 1-37](#) shows the XADC block diagram.



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Figure 1-37: XADC Block Diagram

The ZC706 evaluation board supports both the internal XC7Z045 AP SoC sensor measurements and the external measurement capabilities of the XADC. Internal measurements of the die temperature, VCCINT, VCCAUX, and VCCBRAM are available.

Jumper J52 can be used to select either an external voltage reference (VREF) or on-chip voltage reference for the analog-to-digital converter.

For external measurements an XADC header (J63) is provided. This header can be used to provide analog inputs to the XC7Z045 AP SoC's dedicated VP/VN channel, and to the VAUXP[0]/VAUXN[0], VAUXP[8]/VAUXN[8] auxiliary analog input channels. Simultaneous sampling of Channel 0 and Channel 8 is supported.

A user-provided analog signal multiplexer card can be used to sample additional external analog inputs using the 4 GPIO pins available on the XADC header as multiplexer address lines. Figure 1-38 shows the XADC header connections.

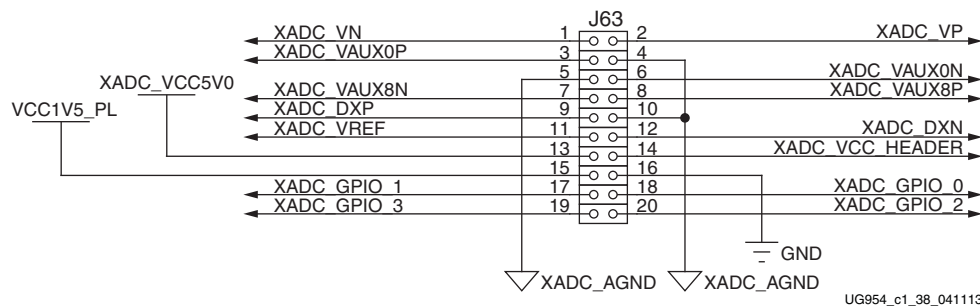


Figure 1-38: XADC Header (J63)

Table 1-39 describes the XADC header J40 pin functions.

Table 1-39: XADC Header J63 Pinout

Net Name	J63 Pin Number	Description
VN, VP	1, 2	Dedicated analog input channel for the XADC.
XADC_VAUX0P, N	3, 6	Auxiliary analog input channel 0. Also supports use as I/O inputs when anti alias capacitor is not present.
XADC_VAUX8N, P	7, 8	Auxiliary analog input channel 8. Also supports use as I/O inputs when anti alias capacitor is not present.
DXP, DXN	9, 12	Access to thermal diode.
XADC_AGND	4, 5, 10	Analog ground reference.
XADC_VREF	11	1.25V reference from the board.
XADC_VCC5V0	13	Filtered 5V supply from board.
XADC_VCC_HEADER	14	Analog 1.8V supply for XADC.
VCC1V5_PL	15	VCCO supply for bank which is the source of DIO pins.
GND	16	Digital Ground (board) Reference
XADC_GPIO_3, 2, 1, 0	19, 20, 17, 18	Digital I/O. These pins should come from the same bank. These IOs should not be shared with other functions because they are required to support three-state operation.

Default Switch and Jumper Settings

The default switch and jumper settings for the ZC706 evaluation board are provided in this appendix.

Switches

[Figure 1-2, callout 24]

Default switch settings are listed in Table A-1.

Table A-1: Default Switch Settings

Switch	Function	Default	Selects	Figure 1-2 Callout
SW1	Board main power On-Off Slide Switch	OFF	Delivered in OFF position	27
SW4	2-pole SPST DIP Switch, JTAG mode select signals JTAG_SEL_[1:2]	10	JTAG = cable connector J3	34
SW11	5-pole DPDT DIP Switch, PS Boot Mode select signals MIO[6:2]_SELECT	All Down	JTAG flat cable header J3	29
SW12	4-pole SPST DIP Switch, user signals GPIO_DIP_SW[0:3], poles [1:4]	All OFF	All = 0 (4.7K p/d to GND)	24

Jumpers

[Figure 1-2, callout 24]

Default jumper positions are listed in Table A-2.

Table A-2: Default Jumper Settings

Jumper	Function	Default Position	Selects
HDR_1 X 2			
J6	AP SoC U1 Bank 0 CFGBVS pin V9 pull-down to GND	OPEN	Not pulled down to GND

Table A-2: Default Jumper Settings (Cont'd)

Jumper	Function	Default Position	Selects
J7	U8 Power-On Reset Device MR_B pin to GND	OPEN	MR_B pin not GND
J8	JTAG Header J62 pin 2 can be connected to 3.3V	OPEN	J62.2 not conn. to 3.3V
J9	U51 Ethernet PHY CONFIG2 pin 2 1K pull-down to GND Select Header	1-2	CONFIG2 = 0 (p/d to GND)
J10	U12 USB3320 2.0 Host/OTG or Device Select Header	1-2	HOST sources VBUS power
J11	U12 USB3320 2.0 RESET Header	OPEN	U12 not held in RESET
J12	U38 REF3012 VREF XADC_AGND-to-GND L3 inductor bypass	OPEN	L3 not bypassed
J13	U38 REF3012 VREF XADC_AGND-to-GND Select Header	1-2	XADC_GND conn. to GND
J14	XADC circuit VCC5V0 sources XADC_VCC5V0 Select Header	1-2	XADC_VCC5V0 = filtered VCC5V0
J15	ARM PJTAG Header J64 pin 2 can be connected to VADJ	OPEN	J64.2 not conn. to VADJ
J17	SPF+ P2 SFP_TX_DISABLE_TRANS Header	OPEN	SFP+ P2 TX enabled
J18	FMC_VADJ_ON_B Header	1-2	VADJ rail enabled
J19	PCIe® Lane Width Select Header	3-4	PCIe = 4-Lanes
J66	PL_PWR_ON Header	OPEN	PL power enabled
J69	XADC Power System Vccint Current Sense OpAmp Gain Select Header	OPEN	Gain = 10
J70	MIO Select Header MIO2 (Note: DIP SW11 pole 1 affects this signal)	1-2	QSPIO_IO0 = MIO2_SELECT
J71	MIO Select Header MIO3 (Note: DIP SW11 pole 2 affects this signal)	1-2	QSPIO_IO1 = MIO3_SELECT
J72	MIO Select Header MIO4 (Note: DIP SW11 pole 3 affects this signal)	1-2	QSPIO_IO4 = MIO2_SELECT
J73	MIO Select Header MIO5 (Note: DIP SW11 pole 4 affects this signal)	1-2	QSPIO_IO5 = MIO2_SELECT
J74	MIO Select Header MIO6 (Note: DIP SW11 pole 5 affects this signal)	1-2	QSPIO_CLK = MIO6_SELECT
HDR_1 X 3			
J43	PS_SRST_B Select Header	1-2	Sourced by U8 POR MAX16025
J44	PS_POR_B Select Header	1-2	Sourced by U8 POR MAX16025

Table A-2: Default Jumper Settings (Cont'd)

Jumper	Function	Default Position	Selects
J45	U51 Ethernet PHY CONFIG3 pin 3 1K pull-up to 1.8V or 1K pull-down to GND Select Header	1-2	CONFIG3 = 1 (p/u to 1.8V)
J46	U51 Ethernet PHY CONFIG2 pin 2 tie to 1.8V or LED0 Select Header	OPEN	J9 sets CONFIG2 condition
J47	U51 Ethernet PHY CONFIG3 pin 3 LED1 or LED0 Select Header	OPEN	J44 sets CONFIG3 condition
J48	U12 USB3320 2.0 MODE Select Header	2-3	HOST/OTG mode
J49	USB 2.0 Micro-B connector J2 ID pin 4 function Select Header	1-2	Function = USB ID
J50	USB_VBUS_SEL capacitor to GND Select Header	2-3	120uF to GND
J51	USB 2.0 Micro-B connector J2 ID shield pins connection Select Header	1-2	J2 shield pins to GND
J52	XADC_VREFP source Select Header	1-2	XADC_VREFP = XADC_VREF
J53	XADC_VCC source Select Header	2-3	XADC_VCC = U14 ADP123
J54	U38 REF3012 VREF Vin Select Header	2-3	U38 powered by XADC_VCC
J55	SPF+ P2 SFP_RS1 BW Select Header	2-3	Low BW TX
J56	SPF+ P2 SFP_RS0 BW Select Header	2-3	Low BW RX

VITA 57.1 FMC Connector Pinouts

Figure B-1 shows the pinout of the FPGA mezzanine card (FMC) low pin count (LPC) connector defined by the VITA 57.1 FMC specification. For a description of how the ZC706 evaluation board implements the FMC specification, see [FPGA Mezzanine \(FMC\) Card Interface, page 65](#) and [LPC Connector J5, page 70](#).

	K	J	H	G	F	E	D	C	B	A
1	NC	NC	VREF_A_M2C	GND	NC	NC	PG_C2M	GND	NC	NC
2	NC	NC	PRSNT_M2C_L	CLK1_M2C_P	NC	NC	GND	DP0_C2M_P	NC	NC
3	NC	NC	GND	CLK1_M2C_N	NC	NC	GND	DP0_C2M_N	NC	NC
4	NC	NC	CLK0_M2C_P	GND	NC	NC	GBTCLK0_M2C_P	GND	NC	NC
5	NC	NC	CLK0_M2C_N	GND	NC	NC	GBTCLK0_M2C_N	GND	NC	NC
6	NC	NC	GND	LA00_P_CC	NC	NC	GND	DP0_M2C_P	NC	NC
7	NC	NC	LA02_P	LA00_N_CC	NC	NC	GND	DP0_M2C_N	NC	NC
8	NC	NC	LA02_N	GND	NC	NC	LA01_P_CC	GND	NC	NC
9	NC	NC	GND	LA03_P	NC	NC	LA01_N_CC	GND	NC	NC
10	NC	NC	LA04_P	LA03_N	NC	NC	GND	LA06_P	NC	NC
11	NC	NC	LA04_N	GND	NC	NC	LA05_P	LA06_N	NC	NC
12	NC	NC	GND	LA08_P	NC	NC	LA05_N	GND	NC	NC
13	NC	NC	LA07_P	LA08_N	NC	NC	GND	GND	NC	NC
14	NC	NC	LA07_N	GND	NC	NC	LA09_P	LA10_P	NC	NC
15	NC	NC	GND	LA12_P	NC	NC	LA09_N	LA10_N	NC	NC
16	NC	NC	LA11_P	LA12_N	NC	NC	GND	GND	NC	NC
17	NC	NC	LA11_N	GND	NC	NC	LA13_P	GND	NC	NC
18	NC	NC	GND	LA16_P	NC	NC	LA13_N	LA14_P	NC	NC
19	NC	NC	LA15_P	LA16_N	NC	NC	GND	LA14_N	NC	NC
20	NC	NC	LA15_N	GND	NC	NC	LA17_P_CC	GND	NC	NC
21	NC	NC	GND	LA20_P	NC	NC	LA17_N_CC	GND	NC	NC
22	NC	NC	LA19_P	LA20_N	NC	NC	GND	LA18_P_CC	NC	NC
23	NC	NC	LA19_N	GND	NC	NC	LA23_P	LA18_N_CC	NC	NC
24	NC	NC	GND	LA22_P	NC	NC	LA23_N	GND	NC	NC
25	NC	NC	LA21_P	LA22_N	NC	NC	GND	GND	NC	NC
26	NC	NC	LA21_N	GND	NC	NC	LA26_P	LA27_P	NC	NC
27	NC	NC	GND	LA25_P	NC	NC	LA26_N	LA27_N	NC	NC
28	NC	NC	LA24_P	LA25_N	NC	NC	GND	GND	NC	NC
29	NC	NC	LA24_N	GND	NC	NC	TCK	GND	NC	NC
30	NC	NC	GND	LA29_P	NC	NC	TDI	SCL	NC	NC
31	NC	NC	LA28_P	LA29_N	NC	NC	TDO	SDA	NC	NC
32	NC	NC	LA28_N	GND	NC	NC	3P3VAUX	GND	NC	NC
33	NC	NC	GND	LA31_P	NC	NC	TMS	GND	NC	NC
34	NC	NC	LA30_P	LA31_N	NC	NC	TRST_L	GA0	NC	NC
35	NC	NC	LA30_N	GND	NC	NC	GA1	12P0V	NC	NC
36	NC	NC	GND	LA33_P	NC	NC	3P3V	GND	NC	NC
37	NC	NC	LA32_P	LA33_N	NC	NC	GND	12P0V	NC	NC
38	NC	NC	LA32_N	GND	NC	NC	3P3V	GND	NC	NC
39	NC	NC	GND	VADJ	NC	NC	GND	3P3V	NC	NC
40	NC	NC	VADJ	GND	NC	NC	3P3V	GND	NC	NC

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Figure B-1: FMC LPC Connector Pinout

Figure B-2 shows the pinout of the FPGA mezzanine card (FMC) high pin count (HPC) connector defined by the VITA 57.1 FMC specification. For a description of how the ZC706 evaluation board implements the FMC specification, see [FPGA Mezzanine \(FMC\) Card Interface, page 65](#) and [HPC Connector J37, page 65](#).

	K	J	H	G	F	E	D	C	B	A
1	VREF_B_M2C	GND	VREF_A_M2C	GND	PG_M2C	GND	PG_C2M	GND	RES1	GND
2	GND	CLK3_M2C_P	PRSNT_M2C_L	CLK1_M2C_P	GND	HA01_P_CC	GND	DP0_C2M_P	GND	DP1_M2C_P
3	GND	CLK3_M2C_N	GND	CLK1_M2C_N	GND	HA01_N_CC	GND	DP0_C2M_N	GND	DP1_M2C_N
4	CLK2_M2C_P	GND	CLK0_M2C_P	GND	HA00_P_CC	GND	GBTCLK0_M2C_P	GND	DP9_M2C_P	GND
5	CLK2_M2C_N	GND	CLK0_M2C_N	GND	HA00_N_CC	GND	GBTCLK0_M2C_N	GND	DP9_M2C_N	GND
6	GND	HA03_P	GND	LA00_P_CC	GND	HA05_P	GND	DP0_M2C_P	GND	DP2_M2C_P
7	HA02_P	HA03_N	LA02_P	LA00_N_CC	HA04_P	HA05_N	GND	DP0_M2C_N	GND	DP2_M2C_N
8	HA02_N	GND	LA02_N	GND	HA04_N	GND	LA01_P_CC	GND	DP8_M2C_P	GND
9	GND	HA07_P	GND	LA03_P	GND	HA09_P	LA01_N_CC	GND	DP8_M2C_N	GND
10	HA06_P	HA07_N	LA04_P	LA03_N	HA08_P	HA09_N	GND	LA06_P	GND	DP3_M2C_P
11	HA06_N	GND	LA04_N	GND	HA08_N	GND	LA05_P	LA06_N	GND	DP3_M2C_N
12	GND	HA11_P	GND	LA08_P	GND	HA13_P	LA05_N	GND	DP7_M2C_P	GND
13	HA10_P	HA11_N	LA07_P	LA08_N	HA12_P	HA13_N	GND	GND	DP7_M2C_N	GND
14	HA10_N	GND	LA07_N	GND	HA12_N	GND	LA09_P	LA10_P	GND	DP4_M2C_P
15	GND	HA14_P	GND	LA12_P	GND	HA16_P	LA09_N	LA10_N	GND	DP4_M2C_N
16	HA17_P_CC	HA14_N	LA11_P	LA12_N	HA15_P	HA16_N	GND	GND	DP6_M2C_P	GND
17	HA17_N_CC	GND	LA11_N	GND	HA15_N	GND	LA13_P	GND	DP6_M2C_N	GND
18	GND	HA18_P	GND	LA16_P	GND	HA20_P	LA13_N	LA14_P	GND	DP5_M2C_P
19	HA21_P	HA18_N	LA15_P	LA16_N	HA19_P	HA20_N	GND	LA14_N	GND	DP5_M2C_N
20	HA21_N	GND	LA15_N	GND	HA19_N	GND	LA17_P_CC	GND	GBTCLK1_M2C_P	GND
21	GND	HA22_P	GND	LA20_P	GND	HB03_P	LA17_N_CC	GND	GBTCLK1_M2C_N	GND
22	HA23_P	HA22_N	LA19_P	LA20_N	HB02_P	HB03_N	GND	LA18_P_CC	GND	DP1_C2M_P
23	HA23_N	GND	LA19_N	GND	HB02_N	GND	LA23_P	LA18_N_CC	GND	DP1_C2M_N
24	GND	HB01_P	GND	LA22_P	GND	HB05_P	LA23_N	GND	DP9_C2M_P	GND
25	HB00_P_CC	HB01_N	LA21_P	LA22_N	HB04_P	HB05_N	GND	GND	DP9_C2M_N	GND
26	HB00_N_CC	GND	LA21_N	GND	HB04_N	GND	LA26_P	LA27_P	GND	DP2_C2M_P
27	GND	HB07_P	GND	LA25_P	GND	HB09_P	LA26_N	LA27_N	GND	DP2_C2M_N
28	HB06_P_CC	HB07_N	LA24_P	LA25_N	HB08_P	HB09_N	GND	GND	DP8_C2M_P	GND
29	HB06_N_CC	GND	LA24_N	GND	HB08_N	GND	TCK	GND	DP8_C2M_N	GND
30	GND	HB11_P	GND	LA29_P	GND	HB13_P	TDI	SCL	GND	DP3_C2M_P
31	HB10_P	HB11_N	LA28_P	LA29_N	HB12_P	HB13_N	TDO	SDA	GND	DP3_C2M_N
32	HB10_N	GND	LA28_N	GND	HB12_N	GND	3P3VAUX	GND	DP7_C2M_P	GND
33	GND	HB15_P	GND	LA31_P	GND	HB19_P	TMS	GND	DP7_C2M_N	GND
34	HB14_P	HB15_N	LA30_P	LA31_N	HB16_P	HB19_N	TRST_L	GA0	GND	DP4_C2M_P
35	HB14_N	GND	LA30_N	GND	HB16_N	GND	GA1	12P0V	GND	DP4_C2M_N
36	GND	HB18_P	GND	LA33_P	GND	HB21_P	3P3V	GND	DP6_C2M_P	GND
37	HB17_P_CC	HB18_N	LA32_P	LA33_N	HB20_P	HB21_N	GND	12P0V	DP6_C2M_N	GND
38	HB17_N_CC	GND	LA32_N	GND	HB20_N	GND	3P3V	GND	GND	DP5_C2M_P
39	GND	VIO_B_M2C	GND	VADJ	GND	VADJ	GND	3P3V	GND	DP5_C2M_N
40	VIO_B_M2C	GND	VADJ	GND	VADJ	GND	3P3V	GND	RES0	GND

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Figure B-2: FMC HPC Connector Pinout

Master Constraints File Listing

The master Xilinx Design Constraints (XDC) file template for the ZC706 board provides for designs targeting the ZC706 evaluation board. Net names in the constraints listed below correlate with net names on the latest ZC706 evaluation board schematic. Users must identify the appropriate pins and replace the net names with net names in the user RTL. See *Vivado Design Suite User Guide: Using Constraints* ([UG903](#)) for more information.

For detailed I/O standards information required for a particular interface, users can refer to the constraint files generated by tools like the Memory Interface Generator (MIG) and Base System Builder (BSB).

The FMC connectors J37 and J5 are connected to 2.5V V_{ADJ} banks. Because different FMC cards implement different circuitry, the FMC bank I/O standards must be uniquely defined by each customer.

Note: The constraints file listed in this appendix might not be the latest version. Always refer to the Xilinx Zynq-7000 All Programmable SoC ZC706 Evaluation Kit product page (www.xilinx.com/zc706) for the latest pins constraints file.

ZC706 Evaluation Board XDC Listing

```
set_property PACKAGE_PIN Y20 [get_ports PMOD1_4_LS]
set_property IOSTANDARD LVCMOS25 [get_ports PMOD1_4_LS]
set_property PACKAGE_PIN AA20 [get_ports PMOD1_5_LS]
set_property IOSTANDARD LVCMOS25 [get_ports PMOD1_5_LS]
set_property PACKAGE_PIN AC18 [get_ports PMOD1_6_LS]
set_property IOSTANDARD LVCMOS25 [get_ports PMOD1_6_LS]
set_property PACKAGE_PIN AC19 [get_ports PMOD1_7_LS]
set_property IOSTANDARD LVCMOS25 [get_ports PMOD1_7_LS]
set_property PACKAGE_PIN AD18 [get_ports USER_SMA_CLOCK_P]
set_property IOSTANDARD LVDS_25 [get_ports USER_SMA_CLOCK_P]
set_property PACKAGE_PIN AD19 [get_ports USER_SMA_CLOCK_N]
set_property IOSTANDARD LVDS_25 [get_ports USER_SMA_CLOCK_N]
set_property PACKAGE_PIN AA18 [get_ports SFP_TX_DISABLE]
set_property IOSTANDARD LVCMOS25 [get_ports SFP_TX_DISABLE]
set_property PACKAGE_PIN AA19 [get_ports SM_FAN_TACH]
set_property IOSTANDARD LVCMOS25 [get_ports SM_FAN_TACH]
set_property PACKAGE_PIN AB19 [get_ports SM_FAN_PWM]
set_property IOSTANDARD LVCMOS25 [get_ports SM_FAN_PWM]
set_property PACKAGE_PIN AB20 [get_ports PWRCTL1_FMC_PG_C2M_LS]
set_property IOSTANDARD LVCMOS25 [get_ports PWRCTL1_FMC_PG_C2M_LS]
set_property PACKAGE_PIN AD20 [get_ports REC_CLOCK_C_P]
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set_property IOSTANDARD LVDS_25 [get_ports REC_CLOCK_C_P]
set_property PACKAGE_PIN AE20 [get_ports REC_CLOCK_C_N]
set_property IOSTANDARD LVDS_25 [get_ports REC_CLOCK_C_N]
set_property PACKAGE_PIN AA13 [get_ports PL_PJTAG_TDO_R]
set_property IOSTANDARD LVCMOS25 [get_ports PL_PJTAG_TDO_R]
set_property PACKAGE_PIN AK13 [get_ports PL_PJTAG_TCK]
set_property IOSTANDARD LVCMOS25 [get_ports PL_PJTAG_TCK]
set_property PACKAGE_PIN AK12 [get_ports PL_PJTAG_TMS]
set_property IOSTANDARD LVCMOS25 [get_ports PL_PJTAG_TMS]
set_property PACKAGE_PIN AH18 [get_ports PL_PJTAG_TDI]
set_property IOSTANDARD LVCMOS25 [get_ports PL_PJTAG_TDI]
set_property PACKAGE_PIN AJ18 [get_ports IIC_SDA_MAIN_LS]
set_property IOSTANDARD LVCMOS25 [get_ports IIC_SDA_MAIN_LS]
set_property PACKAGE_PIN AJ14 [get_ports IIC_SCL_MAIN_LS]
set_property IOSTANDARD LVCMOS25 [get_ports IIC_SCL_MAIN_LS]
set_property PACKAGE_PIN AJ13 [get_ports GPIO_DIP_SW3]
set_property IOSTANDARD LVCMOS25 [get_ports GPIO_DIP_SW3]
set_property PACKAGE_PIN AJ16 [get_ports FMC_LPC_LA11_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA11_P]
set_property PACKAGE_PIN AK16 [get_ports FMC_LPC_LA11_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA11_N]
set_property PACKAGE_PIN AJ15 [get_ports FMC_LPC_LA04_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA04_P]
set_property PACKAGE_PIN AK15 [get_ports FMC_LPC_LA04_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA04_N]
set_property PACKAGE_PIN AH17 [get_ports FMC_LPC_LA13_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA13_P]
set_property PACKAGE_PIN AH16 [get_ports FMC_LPC_LA13_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA13_N]
set_property PACKAGE_PIN AE12 [get_ports FMC_LPC_LA02_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA02_P]
set_property PACKAGE_PIN AF12 [get_ports FMC_LPC_LA02_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA02_N]
set_property PACKAGE_PIN AH14 [get_ports FMC_LPC_LA09_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA09_P]
set_property PACKAGE_PIN AH13 [get_ports FMC_LPC_LA09_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA09_N]
set_property PACKAGE_PIN AD14 [get_ports FMC_LPC_LA08_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA08_P]
set_property PACKAGE_PIN AD13 [get_ports FMC_LPC_LA08_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA08_N]
set_property PACKAGE_PIN AG12 [get_ports FMC_LPC_LA03_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA03_P]
set_property PACKAGE_PIN AH12 [get_ports FMC_LPC_LA03_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA03_N]
set_property PACKAGE_PIN AE13 [get_ports FMC_LPC_LA00_CC_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA00_CC_P]
set_property PACKAGE_PIN AF13 [get_ports FMC_LPC_LA00_CC_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA00_CC_N]
set_property PACKAGE_PIN AF14 [get_ports USRCLK_P]
set_property IOSTANDARD LVDS_25 [get_ports USRCLK_P]
set_property PACKAGE_PIN AG14 [get_ports USRCLK_N]
set_property IOSTANDARD LVDS_25 [get_ports USRCLK_N]
set_property PACKAGE_PIN AG17 [get_ports FMC_LPC_CLK0_M2C_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_CLK0_M2C_P]
set_property PACKAGE_PIN AG16 [get_ports FMC_LPC_CLK0_M2C_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_CLK0_M2C_N]
set_property PACKAGE_PIN AF15 [get_ports FMC_LPC_LA01_CC_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA01_CC_P]

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set_property PACKAGE_PIN AG15 [get_ports FMC_LPC_LA01_CC_N]
set_property IOSTANDARD LVC MOS25 [get_ports FMC_LPC_LA01_CC_N]
set_property PACKAGE_PIN AF18 [get_ports FMC_LPC_LA14_P]
set_property IOSTANDARD LVC MOS25 [get_ports FMC_LPC_LA14_P]
set_property PACKAGE_PIN AF17 [get_ports FMC_LPC_LA14_N]
set_property IOSTANDARD LVC MOS25 [get_ports FMC_LPC_LA14_N]
set_property PACKAGE_PIN AE16 [get_ports FMC_LPC_LA05_P]
set_property IOSTANDARD LVC MOS25 [get_ports FMC_LPC_LA05_P]
set_property PACKAGE_PIN AE15 [get_ports FMC_LPC_LA05_N]
set_property IOSTANDARD LVC MOS25 [get_ports FMC_LPC_LA05_N]
set_property PACKAGE_PIN AE18 [get_ports FMC_LPC_LA16_P]
set_property IOSTANDARD LVC MOS25 [get_ports FMC_LPC_LA16_P]
set_property PACKAGE_PIN AE17 [get_ports FMC_LPC_LA16_N]
set_property IOSTANDARD LVC MOS25 [get_ports FMC_LPC_LA16_N]
set_property PACKAGE_PIN AD16 [get_ports FMC_LPC_LA12_P]
set_property IOSTANDARD LVC MOS25 [get_ports FMC_LPC_LA12_P]
set_property PACKAGE_PIN AD15 [get_ports FMC_LPC_LA12_N]
set_property IOSTANDARD LVC MOS25 [get_ports FMC_LPC_LA12_N]
set_property PACKAGE_PIN AC14 [get_ports FMC_LPC_LA10_P]
set_property IOSTANDARD LVC MOS25 [get_ports FMC_LPC_LA10_P]
set_property PACKAGE_PIN AC13 [get_ports FMC_LPC_LA10_N]
set_property IOSTANDARD LVC MOS25 [get_ports FMC_LPC_LA10_N]
set_property PACKAGE_PIN AA15 [get_ports FMC_LPC_LA07_P]
set_property IOSTANDARD LVC MOS25 [get_ports FMC_LPC_LA07_P]
set_property PACKAGE_PIN AA14 [get_ports FMC_LPC_LA07_N]
set_property IOSTANDARD LVC MOS25 [get_ports FMC_LPC_LA07_N]
set_property PACKAGE_PIN AB12 [get_ports FMC_LPC_LA06_P]
set_property IOSTANDARD LVC MOS25 [get_ports FMC_LPC_LA06_P]
set_property PACKAGE_PIN AC12 [get_ports FMC_LPC_LA06_N]
set_property IOSTANDARD LVC MOS25 [get_ports FMC_LPC_LA06_N]
set_property PACKAGE_PIN AB15 [get_ports FMC_LPC_LA15_P]
set_property IOSTANDARD LVC MOS25 [get_ports FMC_LPC_LA15_P]
set_property PACKAGE_PIN AB14 [get_ports FMC_LPC_LA15_N]
set_property IOSTANDARD LVC MOS25 [get_ports FMC_LPC_LA15_N]
set_property PACKAGE_PIN AC17 [get_ports GPIO_DIP_SW2]
set_property IOSTANDARD LVC MOS25 [get_ports GPIO_DIP_SW2]
set_property PACKAGE_PIN AC16 [get_ports GPIO_DIP_SW1]
set_property IOSTANDARD LVC MOS25 [get_ports GPIO_DIP_SW1]
set_property PACKAGE_PIN AB17 [get_ports GPIO_DIP_SW0]
set_property IOSTANDARD LVC MOS25 [get_ports GPIO_DIP_SW0]
set_property PACKAGE_PIN AB16 [get_ports PMOD1_3_LS]
set_property IOSTANDARD LVC MOS25 [get_ports PMOD1_3_LS]
set_property PACKAGE_PIN AA17 [get_ports IIC_RTC_IRQ_1_B]
set_property IOSTANDARD LVC MOS25 [get_ports IIC_RTC_IRQ_1_B]
set_property PACKAGE_PIN W23 [get_ports SI5324_RST_LS]
set_property IOSTANDARD LVC MOS25 [get_ports SI5324_RST_LS]
set_property PACKAGE_PIN AJ25 [get_ports SI5324_INT_ALM_LS]
set_property IOSTANDARD LVC MOS25 [get_ports SI5324_INT_ALM_LS]
set_property PACKAGE_PIN AK25 [get_ports GPIO_SW_LEFT]
set_property IOSTANDARD LVC MOS25 [get_ports GPIO_SW_LEFT]
set_property PACKAGE_PIN AK22 [get_ports PCIE_WAKE_B_LS]
set_property IOSTANDARD LVC MOS25 [get_ports PCIE_WAKE_B_LS]
set_property PACKAGE_PIN AK23 [get_ports PCIE_PERST_LS]
set_property IOSTANDARD LVC MOS25 [get_ports PCIE_PERST_LS]
set_property PACKAGE_PIN AJ21 [get_ports PMOD1_0_LS]
set_property IOSTANDARD LVC MOS25 [get_ports PMOD1_0_LS]
set_property PACKAGE_PIN AK21 [get_ports PMOD1_1_LS]
set_property IOSTANDARD LVC MOS25 [get_ports PMOD1_1_LS]
set_property PACKAGE_PIN AJ23 [get_ports FMC_HPC_LA07_P]

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set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA07_P]
set_property PACKAGE_PIN AJ24 [get_ports FMC_HPC_LA07_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA07_N]
set_property PACKAGE_PIN AH23 [get_ports FMC_HPC_LA05_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA05_P]
set_property PACKAGE_PIN AH24 [get_ports FMC_HPC_LA05_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA05_N]
set_property PACKAGE_PIN AG22 [get_ports FMC_HPC_LA06_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA06_P]
set_property PACKAGE_PIN AH22 [get_ports FMC_HPC_LA06_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA06_N]
set_property PACKAGE_PIN AC24 [get_ports FMC_HPC_LA14_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA14_P]
set_property PACKAGE_PIN AD24 [get_ports FMC_HPC_LA14_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA14_N]
set_property PACKAGE_PIN AG24 [get_ports FMC_HPC_LA10_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA10_P]
set_property PACKAGE_PIN AG25 [get_ports FMC_HPC_LA10_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA10_N]
set_property PACKAGE_PIN AF23 [get_ports FMC_HPC_LA12_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA12_P]
set_property PACKAGE_PIN AF24 [get_ports FMC_HPC_LA12_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA12_N]
set_property PACKAGE_PIN AD21 [get_ports FMC_HPC_LA09_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA09_P]
set_property PACKAGE_PIN AE21 [get_ports FMC_HPC_LA09_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA09_N]
set_property PACKAGE_PIN AD23 [get_ports FMC_HPC_LA11_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA11_P]
set_property PACKAGE_PIN AE23 [get_ports FMC_HPC_LA11_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA11_N]
set_property PACKAGE_PIN AE22 [get_ports FMC_HPC_CLK0_M2C_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_CLK0_M2C_P]
set_property PACKAGE_PIN AF22 [get_ports FMC_HPC_CLK0_M2C_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_CLK0_M2C_N]
set_property PACKAGE_PIN AG21 [get_ports FMC_HPC_LA01_CC_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA01_CC_P]
set_property PACKAGE_PIN AH21 [get_ports FMC_HPC_LA01_CC_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA01_CC_N]
set_property PACKAGE_PIN AF20 [get_ports FMC_HPC_LA00_CC_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA00_CC_P]
set_property PACKAGE_PIN AG20 [get_ports FMC_HPC_LA00_CC_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA00_CC_N]
set_property PACKAGE_PIN AJ20 [get_ports FMC_HPC_LA04_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA04_P]
set_property PACKAGE_PIN AK20 [get_ports FMC_HPC_LA04_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA04_N]
set_property PACKAGE_PIN AK17 [get_ports FMC_HPC_LA02_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA02_P]
set_property PACKAGE_PIN AK18 [get_ports FMC_HPC_LA02_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA02_N]
set_property PACKAGE_PIN AH19 [get_ports FMC_HPC_LA03_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA03_P]
set_property PACKAGE_PIN AJ19 [get_ports FMC_HPC_LA03_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA03_N]
set_property PACKAGE_PIN AF19 [get_ports FMC_HPC_LA08_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA08_P]
set_property PACKAGE_PIN AG19 [get_ports FMC_HPC_LA08_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA08_N]

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set_property PACKAGE_PIN AB21 [get_ports PMOD1_2_LS]
set_property IOSTANDARD LVCMOS25 [get_ports PMOD1_2_LS]
set_property PACKAGE_PIN AB22 [get_ports HDMI_SPDIF_OUT_LS]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_SPDIF_OUT_LS]
set_property PACKAGE_PIN W21 [get_ports GPIO_LED_RIGHT]
set_property IOSTANDARD LVCMOS25 [get_ports GPIO_LED_RIGHT]
set_property PACKAGE_PIN Y21 [get_ports GPIO_LED_LEFT]
set_property IOSTANDARD LVCMOS25 [get_ports GPIO_LED_LEFT]
set_property PACKAGE_PIN Y22 [get_ports FMC_HPC_LA15_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA15_P]
set_property PACKAGE_PIN Y23 [get_ports FMC_HPC_LA15_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA15_N]
set_property PACKAGE_PIN AA24 [get_ports FMC_HPC_LA16_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA16_P]
set_property PACKAGE_PIN AB24 [get_ports FMC_HPC_LA16_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA16_N]
set_property PACKAGE_PIN AA22 [get_ports FMC_HPC_LA13_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA13_P]
set_property PACKAGE_PIN AA23 [get_ports FMC_HPC_LA13_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA13_N]
set_property PACKAGE_PIN AC22 [get_ports HDMI_R_D35]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D35]
set_property PACKAGE_PIN AC23 [get_ports HDMI_INT]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_INT]
set_property PACKAGE_PIN AC21 [get_ports HDMI_R_SPDIF]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_SPDIF]
set_property PACKAGE_PIN Y25 [get_ports HDMI_R_D21]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D21]
set_property PACKAGE_PIN Y30 [get_ports FMC_LPC_LA33_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA33_P]
set_property PACKAGE_PIN AA30 [get_ports FMC_LPC_LA33_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA33_N]
set_property PACKAGE_PIN AB29 [get_ports FMC_LPC_LA30_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA30_P]
set_property PACKAGE_PIN AB30 [get_ports FMC_LPC_LA30_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA30_N]
set_property PACKAGE_PIN Y26 [get_ports FMC_LPC_LA32_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA32_P]
set_property PACKAGE_PIN Y27 [get_ports FMC_LPC_LA32_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA32_N]
set_property PACKAGE_PIN Y28 [get_ports HDMI_R_D28]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D28]
set_property PACKAGE_PIN AA29 [get_ports HDMI_R_D22]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D22]
set_property PACKAGE_PIN AA27 [get_ports HDMI_R_D31]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D31]
set_property PACKAGE_PIN AA28 [get_ports HDMI_R_D18]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D18]
set_property PACKAGE_PIN AB25 [get_ports HDMI_R_D10]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D10]
set_property PACKAGE_PIN AB26 [get_ports HDMI_R_D17]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D17]
set_property PACKAGE_PIN AC26 [get_ports HDMI_R_D19]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D19]
set_property PACKAGE_PIN AD26 [get_ports HDMI_R_D16]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D16]
set_property PACKAGE_PIN AD30 [get_ports HDMI_R_D23]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D23]
set_property PACKAGE_PIN AE30 [get_ports HDMI_R_D20]

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set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D20]
set_property PACKAGE_PIN AC29 [get_ports FMC_LPC_LA31_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA31_P]
set_property PACKAGE_PIN AD29 [get_ports FMC_LPC_LA31_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA31_N]
set_property PACKAGE_PIN AD25 [get_ports FMC_LPC_LA28_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA28_P]
set_property PACKAGE_PIN AE26 [get_ports FMC_LPC_LA28_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA28_N]
set_property PACKAGE_PIN AB27 [get_ports FMC_LPC_LA17_CC_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA17_CC_P]
set_property PACKAGE_PIN AC27 [get_ports FMC_LPC_LA17_CC_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA17_CC_N]
set_property PACKAGE_PIN AC28 [get_ports FMC_LPC_CLK1_M2C_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_CLK1_M2C_P]
set_property PACKAGE_PIN AD28 [get_ports FMC_LPC_CLK1_M2C_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_CLK1_M2C_N]
set_property PACKAGE_PIN AE28 [get_ports HDMI_R_D8]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D8]
set_property PACKAGE_PIN AF28 [get_ports HDMI_R_D29]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D29]
set_property PACKAGE_PIN AE27 [get_ports FMC_LPC_LA18_CC_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA18_CC_P]
set_property PACKAGE_PIN AF27 [get_ports FMC_LPC_LA18_CC_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA18_CC_N]
set_property PACKAGE_PIN AF29 [get_ports FMC_LPC_LA25_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA25_P]
set_property PACKAGE_PIN AG29 [get_ports FMC_LPC_LA25_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA25_N]
set_property PACKAGE_PIN AF30 [get_ports FMC_LPC_LA24_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA24_P]
set_property PACKAGE_PIN AG30 [get_ports FMC_LPC_LA24_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA24_N]
set_property PACKAGE_PIN AG26 [get_ports FMC_LPC_LA20_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA20_P]
set_property PACKAGE_PIN AG27 [get_ports FMC_LPC_LA20_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA20_N]
set_property PACKAGE_PIN AE25 [get_ports FMC_LPC_LA29_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA29_P]
set_property PACKAGE_PIN AF25 [get_ports FMC_LPC_LA29_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA29_N]
set_property PACKAGE_PIN AH28 [get_ports FMC_LPC_LA21_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA21_P]
set_property PACKAGE_PIN AH29 [get_ports FMC_LPC_LA21_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA21_N]
set_property PACKAGE_PIN AJ30 [get_ports FMC_LPC_LA26_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA26_P]
set_property PACKAGE_PIN AK30 [get_ports FMC_LPC_LA26_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA26_N]
set_property PACKAGE_PIN AJ28 [get_ports FMC_LPC_LA27_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA27_P]
set_property PACKAGE_PIN AJ29 [get_ports FMC_LPC_LA27_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA27_N]
set_property PACKAGE_PIN AK27 [get_ports FMC_LPC_LA22_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA22_P]
set_property PACKAGE_PIN AK28 [get_ports FMC_LPC_LA22_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA22_N]
set_property PACKAGE_PIN AH26 [get_ports FMC_LPC_LA19_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA19_P]

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set_property PACKAGE_PIN AH27 [get_ports FMC_LPC_LA19_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA19_N]
set_property PACKAGE_PIN AJ26 [get_ports FMC_LPC_LA23_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA23_P]
set_property PACKAGE_PIN AK26 [get_ports FMC_LPC_LA23_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_LPC_LA23_N]
set_property PACKAGE_PIN AA25 [get_ports HDMI_R_D7]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D7]
set_property PACKAGE_PIN U21 [get_ports HDMI_R_VSYNC]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_VSYNC]
set_property PACKAGE_PIN P30 [get_ports FMC_HPC_LA28_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA28_P]
set_property PACKAGE_PIN R30 [get_ports FMC_HPC_LA28_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA28_N]
set_property PACKAGE_PIN T30 [get_ports FMC_HPC_LA24_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA24_P]
set_property PACKAGE_PIN U30 [get_ports FMC_HPC_LA24_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA24_N]
set_property PACKAGE_PIN N28 [get_ports HDMI_R_D33]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D33]
set_property PACKAGE_PIN P28 [get_ports HDMI_R_CLK]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_CLK]
set_property PACKAGE_PIN N29 [get_ports FMC_HPC_LA31_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA31_P]
set_property PACKAGE_PIN P29 [get_ports FMC_HPC_LA31_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA31_N]
set_property PACKAGE_PIN T29 [get_ports FMC_HPC_LA25_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA25_P]
set_property PACKAGE_PIN U29 [get_ports FMC_HPC_LA25_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA25_N]
set_property PACKAGE_PIN R28 [get_ports FMC_HPC_LA26_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA26_P]
set_property PACKAGE_PIN T28 [get_ports FMC_HPC_LA26_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA26_N]
set_property PACKAGE_PIN V28 [get_ports FMC_HPC_LA27_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA27_P]
set_property PACKAGE_PIN V29 [get_ports FMC_HPC_LA27_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA27_N]
set_property PACKAGE_PIN W29 [get_ports FMC_HPC_LA21_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA21_P]
set_property PACKAGE_PIN W30 [get_ports FMC_HPC_LA21_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA21_N]
set_property PACKAGE_PIN V27 [get_ports FMC_HPC_LA22_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA22_P]
set_property PACKAGE_PIN W28 [get_ports FMC_HPC_LA22_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA22_N]
set_property PACKAGE_PIN W25 [get_ports FMC_HPC_LA18_CC_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA18_CC_P]
set_property PACKAGE_PIN W26 [get_ports FMC_HPC_LA18_CC_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA18_CC_N]
set_property PACKAGE_PIN U25 [get_ports FMC_HPC_LA20_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA20_P]
set_property PACKAGE_PIN V26 [get_ports FMC_HPC_LA20_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA20_N]
set_property PACKAGE_PIN U26 [get_ports FMC_HPC_CLK1_M2C_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_CLK1_M2C_P]
set_property PACKAGE_PIN U27 [get_ports FMC_HPC_CLK1_M2C_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_CLK1_M2C_N]
set_property PACKAGE_PIN R25 [get_ports FMC_HPC_LA29_P]

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set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA29_P]
set_property PACKAGE_PIN R26 [get_ports FMC_HPC_LA29_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA29_N]
set_property PACKAGE_PIN R27 [get_ports GPIO_SW_RIGHT]
set_property IOSTANDARD LVCMOS25 [get_ports GPIO_SW_RIGHT]
set_property PACKAGE_PIN T27 [get_ports HDMI_R_D11]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D11]
set_property PACKAGE_PIN N26 [get_ports FMC_HPC_LA33_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA33_P]
set_property PACKAGE_PIN N27 [get_ports FMC_HPC_LA33_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA33_N]
set_property PACKAGE_PIN P25 [get_ports FMC_HPC_LA23_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA23_P]
set_property PACKAGE_PIN P26 [get_ports FMC_HPC_LA23_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA23_N]
set_property PACKAGE_PIN T24 [get_ports FMC_HPC_LA19_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA19_P]
set_property PACKAGE_PIN T25 [get_ports FMC_HPC_LA19_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA19_N]
set_property PACKAGE_PIN P23 [get_ports FMC_HPC_LA30_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA30_P]
set_property PACKAGE_PIN P24 [get_ports FMC_HPC_LA30_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA30_N]
set_property PACKAGE_PIN P21 [get_ports FMC_HPC_LA32_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA32_P]
set_property PACKAGE_PIN R21 [get_ports FMC_HPC_LA32_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA32_N]
set_property PACKAGE_PIN T22 [get_ports HDMI_R_D5]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D5]
set_property PACKAGE_PIN T23 [get_ports HDMI_R_D9]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D9]
set_property PACKAGE_PIN R22 [get_ports HDMI_R_HSYNC]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_HSYNC]
set_property PACKAGE_PIN R23 [get_ports HDMI_R_D6]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D6]
set_property PACKAGE_PIN U22 [get_ports HDMI_R_D32]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D32]
set_property PACKAGE_PIN V22 [get_ports HDMI_R_D30]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D30]
set_property PACKAGE_PIN U24 [get_ports HDMI_R_D4]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D4]
set_property PACKAGE_PIN V24 [get_ports HDMI_R_DE]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_DE]
set_property PACKAGE_PIN V23 [get_ports FMC_HPC_LA17_CC_P]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA17_CC_P]
set_property PACKAGE_PIN W24 [get_ports FMC_HPC_LA17_CC_N]
set_property IOSTANDARD LVCMOS25 [get_ports FMC_HPC_LA17_CC_N]
set_property PACKAGE_PIN V21 [get_ports HDMI_R_D34]
set_property IOSTANDARD LVCMOS25 [get_ports HDMI_R_D34]
set_property PACKAGE_PIN J4 [get_ports PL_DDR3_D3]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D3]
set_property PACKAGE_PIN J3 [get_ports PL_DDR3_DM0]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_DM0]
set_property PACKAGE_PIN L1 [get_ports PL_DDR3_D0]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D0]
set_property PACKAGE_PIN K1 [get_ports PL_DDR3_D4]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D4]
set_property PACKAGE_PIN K3 [get_ports PL_DDR3_DQS0_P]
set_property IOSTANDARD DIFF_SSTL15 [get_ports PL_DDR3_DQS0_P]

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set_property PACKAGE_PIN K2 [get_ports PL_DDR3_DQS0_N]
set_property IOSTANDARD DIFF_SSTL15 [get_ports PL_DDR3_DQS0_N]
set_property PACKAGE_PIN L3 [get_ports PL_DDR3_D5]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D5]
set_property PACKAGE_PIN L2 [get_ports PL_DDR3_D1]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D1]
set_property PACKAGE_PIN K5 [get_ports PL_DDR3_D2]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D2]
set_property PACKAGE_PIN J5 [get_ports PL_DDR3_D6]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D6]
set_property PACKAGE_PIN K6 [get_ports PL_DDR3_D7]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D7]
set_property PACKAGE_PIN G2 [get_ports GPIO_LED_CENTER]
set_property IOSTANDARD LVCMOS15 [get_ports GPIO_LED_CENTER]
set_property PACKAGE_PIN F2 [get_ports PL_DDR3_DM1]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_DM1]
set_property PACKAGE_PIN H6 [get_ports PL_DDR3_D10]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D10]
set_property PACKAGE_PIN G6 [get_ports PL_DDR3_D8]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D8]
set_property PACKAGE_PIN J1 [get_ports PL_DDR3_DQS1_P]
set_property IOSTANDARD DIFF_SSTL15 [get_ports PL_DDR3_DQS1_P]
set_property PACKAGE_PIN H1 [get_ports PL_DDR3_DQS1_N]
set_property IOSTANDARD DIFF_SSTL15 [get_ports PL_DDR3_DQS1_N]
set_property PACKAGE_PIN H2 [get_ports PL_DDR3_D13]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D13]
set_property PACKAGE_PIN G1 [get_ports PL_DDR3_D12]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D12]
set_property PACKAGE_PIN H4 [get_ports PL_DDR3_D9]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D9]
set_property PACKAGE_PIN H3 [get_ports PL_DDR3_D11]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D11]
set_property PACKAGE_PIN G5 [get_ports PL_DDR3_D14]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D14]
set_property PACKAGE_PIN G4 [get_ports PL_DDR3_D15]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D15]
set_property PACKAGE_PIN F5 [get_ports 6N1792]
set_property IOSTANDARD SSTL15 [get_ports 6N1792]
set_property PACKAGE_PIN E5 [get_ports PL_DDR3_D19]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D19]
set_property PACKAGE_PIN F4 [get_ports PL_DDR3_D20]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D20]
set_property PACKAGE_PIN F3 [get_ports PL_DDR3_D21]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D21]
set_property PACKAGE_PIN E6 [get_ports PL_DDR3_DQS2_P]
set_property IOSTANDARD DIFF_SSTL15 [get_ports PL_DDR3_DQS2_P]
set_property PACKAGE_PIN D5 [get_ports PL_DDR3_DQS2_N]
set_property IOSTANDARD DIFF_SSTL15 [get_ports PL_DDR3_DQS2_N]
set_property PACKAGE_PIN D4 [get_ports PL_DDR3_D18]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D18]
set_property PACKAGE_PIN D3 [get_ports PL_DDR3_D23]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D23]
set_property PACKAGE_PIN E3 [get_ports PL_DDR3_D17]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D17]
set_property PACKAGE_PIN E2 [get_ports PL_DDR3_D16]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D16]
set_property PACKAGE_PIN E1 [get_ports PL_DDR3_DM2]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_DM2]
set_property PACKAGE_PIN D1 [get_ports PL_DDR3_D22]

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set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D22]
set_property PACKAGE_PIN C4 [get_ports PL_DDR3_D31]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D31]
set_property PACKAGE_PIN B5 [get_ports PL_DDR3_D27]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D27]
set_property PACKAGE_PIN B4 [get_ports PL_DDR3_D26]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D26]
set_property PACKAGE_PIN A5 [get_ports PL_DDR3_DQS3_P]
set_property IOSTANDARD DIFF_SSTL15 [get_ports PL_DDR3_DQS3_P]
set_property PACKAGE_PIN A4 [get_ports PL_DDR3_DQS3_N]
set_property IOSTANDARD DIFF_SSTL15 [get_ports PL_DDR3_DQS3_N]
set_property PACKAGE_PIN C2 [get_ports PL_DDR3_DM3]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_DM3]
set_property PACKAGE_PIN C1 [get_ports PL_DDR3_D30]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D30]
set_property PACKAGE_PIN B2 [get_ports PL_DDR3_D25]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D25]
set_property PACKAGE_PIN B1 [get_ports PL_DDR3_D29]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D29]
set_property PACKAGE_PIN A3 [get_ports PL_DDR3_D28]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D28]
set_property PACKAGE_PIN A2 [get_ports PL_DDR3_D24]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D24]
set_property PACKAGE_PIN M12 [get_ports 6N2017]
set_property IOSTANDARD LVCMOS15 [get_ports 6N2017]
set_property PACKAGE_PIN B10 [get_ports PL_DDR3_A8]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_A8]
set_property PACKAGE_PIN A10 [get_ports PL_DDR3_A13]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_A13]
set_property PACKAGE_PIN B9 [get_ports PL_DDR3_A1]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_A1]
set_property PACKAGE_PIN A9 [get_ports PL_DDR3_A3]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_A3]
set_property PACKAGE_PIN A8 [get_ports PL_CPU_RESET]
set_property IOSTANDARD LVCMOS15 [get_ports PL_CPU_RESET]
set_property PACKAGE_PIN A7 [get_ports PL_DDR3_BA2]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_BA2]
set_property PACKAGE_PIN C7 [get_ports PL_DDR3_CKE1]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_CKE1]
set_property PACKAGE_PIN B7 [get_ports PL_DDR3_A11]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_A11]
set_property PACKAGE_PIN C6 [get_ports PL_DDR3_A15]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_A15]
set_property PACKAGE_PIN B6 [get_ports PL_DDR3_A5]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_A5]
set_property PACKAGE_PIN C9 [get_ports PL_DDR3_ODT1]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_ODT1]
set_property PACKAGE_PIN J11 [get_ports PL_DDR3_S0_B]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_S0_B]
set_property PACKAGE_PIN H11 [get_ports PL_DDR3_RAS_B]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_RAS_B]
set_property PACKAGE_PIN E11 [get_ports PL_DDR3_A2]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_A2]
set_property PACKAGE_PIN D11 [get_ports PL_DDR3_A4]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_A4]
set_property PACKAGE_PIN H12 [get_ports PL_DDR3_A12]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_A12]
set_property PACKAGE_PIN G11 [get_ports PL_DDR3_A14]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_A14]

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set_property PACKAGE_PIN E10 [get_ports PL_DDR3_A0]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_A0]
set_property PACKAGE_PIN D10 [get_ports PL_DDR3_CKE0]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_CKE0]
set_property PACKAGE_PIN G10 [get_ports PL_DDR3_CLK0_P]
set_property IOSTANDARD DIFF_SSTL15 [get_ports PL_DDR3_CLK0_P]
set_property PACKAGE_PIN F10 [get_ports PL_DDR3_CLK0_N]
set_property IOSTANDARD DIFF_SSTL15 [get_ports PL_DDR3_CLK0_N]
set_property PACKAGE_PIN D9 [get_ports PL_DDR3_CLK1_P]
set_property IOSTANDARD DIFF_SSTL15 [get_ports PL_DDR3_CLK1_P]
set_property PACKAGE_PIN D8 [get_ports PL_DDR3_CLK1_N]
set_property IOSTANDARD DIFF_SSTL15 [get_ports PL_DDR3_CLK1_N]
set_property PACKAGE_PIN H9 [get_ports SYSCLK_P]
set_property IOSTANDARD LVDS [get_ports SYSCLK_P]
set_property PACKAGE_PIN G9 [get_ports SYSCLK_N]
set_property IOSTANDARD LVDS [get_ports SYSCLK_N]
set_property PACKAGE_PIN F9 [get_ports PL_DDR3_A6]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_A6]
set_property PACKAGE_PIN E8 [get_ports PL_DDR3_A7]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_A7]
set_property PACKAGE_PIN J8 [get_ports PL_DDR3_A9]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_A9]
set_property PACKAGE_PIN H8 [get_ports PL_DDR3_S1_B]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_S1_B]
set_property PACKAGE_PIN F8 [get_ports PL_DDR3_BA0]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_BA0]
set_property PACKAGE_PIN F7 [get_ports PL_DDR3_WE_B]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_WE_B]
set_property PACKAGE_PIN E7 [get_ports PL_DDR3_CAS_B]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_CAS_B]
set_property PACKAGE_PIN D6 [get_ports PL_DDR3_A10]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_A10]
set_property PACKAGE_PIN H7 [get_ports PL_DDR3_BA1]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_BA1]
set_property PACKAGE_PIN G7 [get_ports PL_DDR3_ODT0]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_ODT0]
set_property PACKAGE_PIN L7 [get_ports PL_DDR3_D39]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D39]
set_property PACKAGE_PIN J10 [get_ports PL_DDR3_D38]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D38]
set_property PACKAGE_PIN J9 [get_ports PL_DDR3_D35]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D35]
set_property PACKAGE_PIN L8 [get_ports PL_DDR3_DQS4_P]
set_property IOSTANDARD DIFF_SSTL15 [get_ports PL_DDR3_DQS4_P]
set_property PACKAGE_PIN K8 [get_ports PL_DDR3_DQS4_N]
set_property IOSTANDARD DIFF_SSTL15 [get_ports PL_DDR3_DQS4_N]
set_property PACKAGE_PIN K11 [get_ports PL_DDR3_D36]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D36]
set_property PACKAGE_PIN K10 [get_ports PL_DDR3_D32]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D32]
set_property PACKAGE_PIN L10 [get_ports PL_DDR3_D37]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D37]
set_property PACKAGE_PIN L9 [get_ports PL_DDR3_D33]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D33]
set_property PACKAGE_PIN L12 [get_ports PL_DDR3_DM4]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_DM4]
set_property PACKAGE_PIN K12 [get_ports PL_DDR3_D34]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D34]
set_property PACKAGE_PIN M10 [get_ports PL_DDR3_TEMP_EVENT]

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set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_TEMP_EVENT]
set_property PACKAGE_PIN L15 [get_ports XADC_VAUX0P_R]
set_property IOSTANDARD LVCMOS5 [get_ports XADC_VAUX0P_R]
set_property PACKAGE_PIN L14 [get_ports XADC_VAUX0N_R]
set_property IOSTANDARD LVCMOS15 [get_ports XADC_VAUX0N_R]
set_property PACKAGE_PIN J13 [get_ports XADC_VAUX8P_R]
set_property IOSTANDARD LVCMOS15 [get_ports XADC_VAUX8P_R]
set_property PACKAGE_PIN H13 [get_ports XADC_VAUX8N_R]
set_property IOSTANDARD LVCMOS15 [get_ports XADC_VAUX8N_R]
set_property PACKAGE_PIN L13 [get_ports XADC_AD1_R_P]
set_property IOSTANDARD LVCMOS15 [get_ports XADC_AD1_R_P]
set_property PACKAGE_PIN K13 [get_ports XADC_AD1_R_N]
set_property IOSTANDARD LVCMOS15 [get_ports XADC_AD1_R_N]
set_property PACKAGE_PIN J14 [get_ports XADC_GPIO_3]
set_property IOSTANDARD LVCMOS15 [get_ports XADC_GPIO_3]
set_property PACKAGE_PIN H14 [get_ports XADC_GPIO_0]
set_property IOSTANDARD LVCMOS15 [get_ports XADC_GPIO_0]
set_property PACKAGE_PIN K15 [get_ports GPIO_SW_CENTER]
set_property IOSTANDARD LVCMOS15 [get_ports GPIO_SW_CENTER]
set_property PACKAGE_PIN J15 [get_ports XADC_GPIO_1]
set_property IOSTANDARD LVCMOS15 [get_ports XADC_GPIO_1]
set_property PACKAGE_PIN J16 [get_ports XADC_GPIO_2]
set_property IOSTANDARD LVCMOS15 [get_ports XADC_GPIO_2]
set_property PACKAGE_PIN G17 [get_ports PL_DDR3_RESET_B]
set_property IOSTANDARD LVCMOS15 [get_ports PL_DDR3_RESET_B]
set_property PACKAGE_PIN G16 [get_ports PL_DDR3_D43]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D43]
set_property PACKAGE_PIN G15 [get_ports PL_DDR3_D44]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D44]
set_property PACKAGE_PIN G14 [get_ports PL_DDR3_DM5]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_DM5]
set_property PACKAGE_PIN G12 [get_ports PL_DDR3_DQS5_P]
set_property IOSTANDARD DIFF_SSTL15 [get_ports PL_DDR3_DQS5_P]
set_property PACKAGE_PIN F12 [get_ports PL_DDR3_DQS5_N]
set_property IOSTANDARD DIFF_SSTL15 [get_ports PL_DDR3_DQS5_N]
set_property PACKAGE_PIN F13 [get_ports PL_DDR3_D42]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D42]
set_property PACKAGE_PIN E12 [get_ports PL_DDR3_D45]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D45]
set_property PACKAGE_PIN E13 [get_ports PL_DDR3_D47]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D47]
set_property PACKAGE_PIN D13 [get_ports PL_DDR3_D46]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D46]
set_property PACKAGE_PIN F15 [get_ports PL_DDR3_D41]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D41]
set_property PACKAGE_PIN F14 [get_ports PL_DDR3_D40]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D40]
set_property PACKAGE_PIN E16 [get_ports PL_DDR3_D51]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D51]
set_property PACKAGE_PIN E15 [get_ports PL_DDR3_D49]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D49]
set_property PACKAGE_PIN D15 [get_ports PL_DDR3_D48]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D48]
set_property PACKAGE_PIN D14 [get_ports PL_DDR3_D54]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D54]
set_property PACKAGE_PIN F17 [get_ports PL_DDR3_DQS6_P]
set_property IOSTANDARD DIFF_SSTL15 [get_ports PL_DDR3_DQS6_P]
set_property PACKAGE_PIN E17 [get_ports PL_DDR3_DQS6_N]
set_property IOSTANDARD DIFF_SSTL15 [get_ports PL_DDR3_DQS6_N]

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set_property PACKAGE_PIN D16 [get_ports PL_DDR3_D50]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D50]
set_property PACKAGE_PIN C16 [get_ports PL_DDR3_DM6]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_DM6]
set_property PACKAGE_PIN C17 [get_ports PL_DDR3_D52]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D52]
set_property PACKAGE_PIN B16 [get_ports PL_DDR3_D53]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D53]
set_property PACKAGE_PIN B17 [get_ports PL_DDR3_D55]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D55]
set_property PACKAGE_PIN A17 [get_ports GPIO_LED_0]
set_property IOSTANDARD LVCMOS15 [get_ports GPIO_LED_0]
set_property PACKAGE_PIN C14 [get_ports PL_DDR3_D62]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D62]
set_property PACKAGE_PIN C12 [get_ports PL_DDR3_D57]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D57]
set_property PACKAGE_PIN B12 [get_ports PL_DDR3_D56]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D56]
set_property PACKAGE_PIN B15 [get_ports PL_DDR3_DQS7_P]
set_property IOSTANDARD DIFF_SSTL15 [get_ports PL_DDR3_DQS7_P]
set_property PACKAGE_PIN A15 [get_ports PL_DDR3_DQS7_N]
set_property IOSTANDARD DIFF_SSTL15 [get_ports PL_DDR3_DQS7_N]
set_property PACKAGE_PIN C11 [get_ports PL_DDR3_DM7]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_DM7]
set_property PACKAGE_PIN B11 [get_ports PL_DDR3_D61]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D61]
set_property PACKAGE_PIN B14 [get_ports PL_DDR3_D63]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D63]
set_property PACKAGE_PIN A14 [get_ports PL_DDR3_D59]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D59]
set_property PACKAGE_PIN A13 [get_ports PL_DDR3_D60]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D60]
set_property PACKAGE_PIN A12 [get_ports PL_DDR3_D58]
set_property IOSTANDARD SSTL15 [get_ports PL_DDR3_D58]
set_property PACKAGE_PIN AK2 [get_ports FMC_HPC_DP3_C2M_P]
set_property PACKAGE_PIN AE8 [get_ports FMC_HPC_DP3_M2C_P]
set_property PACKAGE_PIN AK1 [get_ports FMC_HPC_DP3_C2M_N]
set_property PACKAGE_PIN AE7 [get_ports FMC_HPC_DP3_M2C_N]
set_property PACKAGE_PIN AJ4 [get_ports FMC_HPC_DP2_C2M_P]
set_property PACKAGE_PIN AG8 [get_ports FMC_HPC_DP2_M2C_P]
set_property PACKAGE_PIN AJ3 [get_ports FMC_HPC_DP2_C2M_N]
set_property PACKAGE_PIN AD10 [get_ports FMC_HPC_GBTCLK0_M2C_C_P]
set_property PACKAGE_PIN AG7 [get_ports FMC_HPC_DP2_M2C_N]
set_property PACKAGE_PIN AD9 [get_ports FMC_HPC_GBTCLK0_M2C_C_N]
set_property PACKAGE_PIN AF9 [get_ports 8N241]
set_property PACKAGE_PIN AF10 [get_ports 8N242]
set_property PACKAGE_PIN AK6 [get_ports FMC_HPC_DP1_C2M_P]
set_property PACKAGE_PIN AJ8 [get_ports FMC_HPC_DP1_M2C_P]
set_property PACKAGE_PIN AK5 [get_ports FMC_HPC_DP1_C2M_N]
set_property PACKAGE_PIN AJ7 [get_ports FMC_HPC_DP1_M2C_N]
set_property PACKAGE_PIN AK10 [get_ports FMC_HPC_DP0_C2M_P]
set_property PACKAGE_PIN AH10 [get_ports FMC_HPC_DP0_M2C_P]
set_property PACKAGE_PIN AK9 [get_ports FMC_HPC_DP0_C2M_N]
set_property PACKAGE_PIN AH9 [get_ports FMC_HPC_DP0_M2C_N]
set_property PACKAGE_PIN AD2 [get_ports FMC_HPC_DP7_C2M_P]
set_property PACKAGE_PIN AD6 [get_ports FMC_HPC_DP7_M2C_P]
set_property PACKAGE_PIN AD1 [get_ports FMC_HPC_DP7_C2M_N]
set_property PACKAGE_PIN AD5 [get_ports FMC_HPC_DP7_M2C_N]
set_property PACKAGE_PIN AE4 [get_ports FMC_HPC_DP6_C2M_P]

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set_property PACKAGE_PIN AF6 [get_ports FMC_HPC_DP6_M2C_P]
set_property PACKAGE_PIN AE3 [get_ports FMC_HPC_DP6_C2M_N]
set_property PACKAGE_PIN AA8 [get_ports FMC_HPC_GBTCLK1_M2C_C_P]
set_property PACKAGE_PIN AF5 [get_ports FMC_HPC_DP6_M2C_N]
set_property PACKAGE_PIN AA7 [get_ports FMC_HPC_GBTCLK1_M2C_C_N]
set_property PACKAGE_PIN AC7 [get_ports SI5324_OUT_C_N]
set_property PACKAGE_PIN AC8 [get_ports SI5324_OUT_C_P]
set_property PACKAGE_PIN AF2 [get_ports FMC_HPC_DP5_C2M_P]
set_property PACKAGE_PIN AG4 [get_ports FMC_HPC_DP5_M2C_P]
set_property PACKAGE_PIN AF1 [get_ports FMC_HPC_DP5_C2M_N]
set_property PACKAGE_PIN AG3 [get_ports FMC_HPC_DP5_M2C_N]
set_property PACKAGE_PIN AH2 [get_ports FMC_HPC_DP4_C2M_P]
set_property PACKAGE_PIN AH6 [get_ports FMC_HPC_DP4_M2C_P]
set_property PACKAGE_PIN AH1 [get_ports FMC_HPC_DP4_C2M_N]
set_property PACKAGE_PIN AH5 [get_ports FMC_HPC_DP4_M2C_N]
set_property PACKAGE_PIN V2 [get_ports 8N281]
set_property PACKAGE_PIN AA4 [get_ports 8N261]
set_property PACKAGE_PIN V1 [get_ports 8N278]
set_property PACKAGE_PIN AA3 [get_ports 8N282]
set_property PACKAGE_PIN W4 [get_ports SFP_TX_P]
set_property PACKAGE_PIN Y6 [get_ports SFP_RX_P]
set_property PACKAGE_PIN W3 [get_ports SFP_TX_N]
set_property PACKAGE_PIN U8 [get_ports FMC_LPC_GBTCLK0_M2C_C_P]
set_property PACKAGE_PIN Y5 [get_ports SFP_RX_N]
set_property PACKAGE_PIN U7 [get_ports FMC_LPC_GBTCLK0_M2C_C_N]
set_property PACKAGE_PIN W7 [get_ports SMA_MGT_REFCLK_N]
set_property PACKAGE_PIN W8 [get_ports SMA_MGT_REFCLK_P]
set_property PACKAGE_PIN Y2 [get_ports SMA_MGT_TX_P]
set_property PACKAGE_PIN AB6 [get_ports SMA_MGT_RX_P]
set_property PACKAGE_PIN Y1 [get_ports SMA_MGT_TX_N]
set_property PACKAGE_PIN AB5 [get_ports SMA_MGT_RX_N]
set_property PACKAGE_PIN AB2 [get_ports FMC_LPC_DP0_C2M_P]
set_property PACKAGE_PIN AC4 [get_ports FMC_LPC_DP0_M2C_P]
set_property PACKAGE_PIN AB1 [get_ports FMC_LPC_DP0_C2M_N]
set_property PACKAGE_PIN AC3 [get_ports FMC_LPC_DP0_M2C_N]
set_property PACKAGE_PIN N4 [get_ports PCIE_TX0_P]
set_property PACKAGE_PIN P6 [get_ports PCIE_RX0_P]
set_property PACKAGE_PIN N3 [get_ports PCIE_TX0_N]
set_property PACKAGE_PIN P5 [get_ports PCIE_RX0_N]
set_property PACKAGE_PIN P2 [get_ports PCIE_TX1_P]
set_property PACKAGE_PIN T6 [get_ports PCIE_RX1_P]
set_property PACKAGE_PIN P1 [get_ports PCIE_TX1_N]
set_property PACKAGE_PIN N8 [get_ports PCIE_CLK_QO_P]
set_property PACKAGE_PIN T5 [get_ports PCIE_RX1_N]
set_property PACKAGE_PIN N7 [get_ports PCIE_CLK_QO_N]
set_property PACKAGE_PIN AB9 [get_ports 8N91]
set_property PACKAGE_PIN R7 [get_ports 8N236]
set_property PACKAGE_PIN R8 [get_ports 8N235]
set_property PACKAGE_PIN R4 [get_ports PCIE_TX2_P]
set_property PACKAGE_PIN U4 [get_ports PCIE_RX2_P]
set_property PACKAGE_PIN R3 [get_ports PCIE_TX2_N]
set_property PACKAGE_PIN U3 [get_ports PCIE_RX2_N]
set_property PACKAGE_PIN T2 [get_ports PCIE_TX3_P]
set_property PACKAGE_PIN V6 [get_ports PCIE_RX3_P]
set_property PACKAGE_PIN T1 [get_ports PCIE_TX3_N]
set_property PACKAGE_PIN V5 [get_ports PCIE_RX3_N]

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Board Setup

Installing the ZC706 Board in a PC Chassis

Installation of the ZC706 board inside a computer chassis is required when developing or testing PCI Express® functionality.

When the ZC706 board is used inside a computer chassis (that is, plugged in to the PCIe® slot), power is provided from the ATX power supply 4-pin peripheral connector through the ATX adapter cable shown in [Figure D-1](#) to J22 on the ZC706 board. The Xilinx part number for this cable is 2600304.



Figure D-1: ATX Power Supply Adapter Cable

To install the ZC706 board in a PC chassis:

1. On the ZC706 board, remove all six rubber feet and standoffs and the PCIe bracket. The standoffs and feet are affixed to the board by screws on the top side of the board. Remove all six screws.
2. Re-attach the PCIe bracket to the ZC706 board using two of the previously removed screws.
3. Power down the host computer and remove the power cord from the PC.
4. Open the PC chassis following the instructions provided with the PC.
5. Select a vacant PCIe expansion slot and remove the expansion cover (at the back of the chassis) by removing the screws on the top and bottom of the cover.
6. Plug the ZC706 board into the PCIe connector at this slot and secure its PCIe bracket to the chassis with a screw at the top of the bracket.

7. The ZC706 board is taller than standard PCIe cards. Ensure that the height of the card is free of obstructions.
8. Connect the ATX power supply to the ZC706 board using the ATX power supply adapter cable as shown in [Figure D-1](#):
 - a. Plug the 6-pin 2 x 3 Molex connector on the adapter cable into J22 on the ZC706 board.
 - b. Plug the 4-pin 1 x 4 peripheral power connector from the ATX power supply into the 4-pin adapter cable connector.
9. Slide the ZC706 board power switch SW1 to the ON position. The PC can now be powered on.

Board Specifications

Dimensions

Height 5.5 inch (14.0 cm)

Length 10.5 inch (26.7 cm)

Note: The ZC706 board height exceeds the standard 4.376 inch (11.15 cm) height of a PCI Express card.

Environmental

Temperature

Operating: 0°C to +45°C

Storage: -25°C to +60°C

Humidity

10% to 90% non-condensing

Operating Voltage

+12 V_{DC}

Additional Resources

Xilinx Resources

For support resources such as Answers, Documentation, Downloads, and Forums, see the Xilinx Support website at:

www.xilinx.com/support

For continual updates, add the Answer Record to your myAlerts:

www.xilinx.com/support/myalerts

For a glossary of technical terms used in Xilinx documentation, see:

www.xilinx.com/company/terms.htm

Solution Centers

See the [Xilinx Solution Centers](#) for support on devices, software tools, and intellectual property at all stages of the design cycle. Topics include design assistance, advisories, and troubleshooting tips.

Further Resources

The most up to date information related to the ZC706 board, its documentation, and schematics, are available on the following websites.

The Xilinx Zynq-7000 All Programmable SoC ZC706 Evaluation Kit product page:

www.xilinx.com/zc706

The Zynq-7000 AP SoC ZC706 Evaluation Kit - Known Issues and Release Notes Master Answer Record is [AR# 51899](#).

These Xilinx documents provide supplemental material useful with this guide:

[DS190](#), *Zynq-7000 All Programmable SoC Overview*

[PG064](#), *LogiCORE IP DisplayPort Product Guide for Vivado Design Suite*

[PG051](#), *LogiCORE IP Tri-Mode Ethernet MAC Product Guide for Vivado Design Suite*

[UG473](#), *7 Series FPGAs Memory Resources User Guide*

[UG470](#), *7 Series FPGAs Configuration User Guide*

[UG476](#), *7 Series FPGAs GTX/GTH Transceivers User Guide*

[PG054](#), *7 Series FPGAs Integrated Block for PCI Express Product Guide for Vivado Design Suite*

[UG480](#), *7 Series FPGAs and Zynq-7000 All Programmable SoC XADC Dual 12-Bit 1 MSPS Analog-to-Digital Converter User Guide*

[UG585](#), *Zynq-7000 All Programmable SoC Technical Reference Manual*

[UG586](#), *7 Series FPGAs Memory Interface Solutions User Guide*

[UG865](#), *Zynq-7000 All Programmable SoC Packaging and Pinout Product Specification*

[UG886](#), *AMS101 Evaluation Card User Guide*

[UG903](#), *Vivado Design Suite User Guide: Using Constraints*

[UG933](#), *Zynq-7000 All Programmable SoC PCB Design and Pin Planning Guide*

Other documents associated with Xilinx devices, design tools, intellectual property, boards, and kits are available at the Xilinx documentation website at:

www.xilinx.com/support/documentation/index

References

Documents associated with other devices used by the ZC706 evaluation board are available at these vendor websites:

1. Spansion Inc.: www.spansion.com
(S25FL128SAGMFIR01)

2. Standard Microsystems Corporation: www.smsc.com/
(USB3320)
3. SanDisk: www.sandisk.com
4. SD Association: www.sdcard.org.
5. SiTime: www.sitime.com
(SiT9102)
6. Silicon Labs: www.silabs.com
(Si570, Si5324C)
7. PCI Express® standard: www.pcisig.com/specifications
8. SFF-8431 specification: [ftp.seagate.com/sff](ftp://ftp.seagate.com/sff)
9. Marvell Semiconductor: www.marvell.com, www.marvell.com/transceivers/alaska-gbe
10. Analog Devices: www.analog.com/en/index.html
(ADP 123, ADV7511KSTZ-P)
11. Texas Instruments: www.ti.com, www.ti.com/fusiondocs
(UCD90120A, TPS84621RUQ, LMZ22010TZ, LMZ12008TZ, LMZ12002, TPS54291PWP, TPS51200DR, PCA9548)
12. Texas Instruments: www.ti.com/xilinx_usb
(to order EVM USB-TO-GPIO)
13. Texas Instruments: www.ti.com/fusion-gui
(to download FUSION_DIGITAL_POWER_DESIGNER)
14. *RTC-8564JE/NB Application Manual*:
www.epsondevice.com/docs/qd/en/DownloadServlet?id=ID000498
15. Epson Electronics America: www.eea.epson.com.
(RTC-8564JE)
16. Samtec: www.samtec.com.
(SEAF series connectors)
17. Texas Instruments digital power: www.ti.com/ww/en/analog/digital-power/index.html
18. Maxim Integrated: www.maximintegrated.com
(Maxim MAX13035E)
19. Micron Semiconductor: www.micron.com
20. Digilent: www.digilentinc.com
(Pmod Peripheral Modules)

Regulatory and Compliance Information

This product is designed and tested to conform to the European Union directives and standards described in this section.

Refer to the Zynq-7000 AP SoC ZC706 Evaluation Kit - Known Issues and Release Notes Master Answer Record concerning the CE requirements for the PC Test Environment:

www.xilinx.com/support/answers/51899

Declaration of Conformity

To view the Declaration of Conformity online, please visit:

www.xilinx.com/support/documentation/boards_and_kits/ce-declarations-of-conformity-xtp251.zip

Directives

2006/95/EC, *Low Voltage Directive (LVD)*

2004/108/EC, *Electromagnetic Compatibility (EMC) Directive*

Standards

EN standards are maintained by the European Committee for Electrotechnical Standardization (CENELEC). IEC standards are maintained by the International Electrotechnical Commission (IEC).

Electromagnetic Compatibility

EN 55022:2010, *Information Technology Equipment Radio Disturbance Characteristics – Limits and Methods of Measurement*

EN 55024:2010, *Information Technology Equipment Immunity Characteristics – Limits and Methods of Measurement*

This is a Class A product. In a domestic environment, this product can cause radio interference, in which case the user might be required to take adequate measures.

Safety

IEC 60950-1:2005, *Information technology equipment – Safety, Part 1: General requirements*

EN 60950-1:2006, *Information technology equipment – Safety, Part 1: General requirements*

Markings



This product complies with Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). The affixed product label indicates that the user must not discard this electrical or electronic product in domestic household waste.



This product complies with Directive 2002/95/EC on the restriction of hazardous substances (RoHS) in electrical and electronic equipment.



This product complies with CE Directives 2006/95/EC, *Low Voltage Directive (LVD)* and 2004/108/EC, *Electromagnetic Compatibility (EMC) Directive*.