

# Xynergy<sup>XS</sup> Motherboard Rev3 Documentation April 24, 2012

Topic	Page
Overview	1
DIMM Socket	1
Power Supply	2
I/O Voltage Selection	3
I/O Connectors	3,4
I2C/SMBUS	5
RS232	5
Testing I/Os	6
SD-Card	6
USB2.0 OTG	7
Ethernet Interface	7
CAN Interfaces	8
JTAG Interfaces	9
Connector Location (Top View Image)	10

## Overview

The Xynergy<sup>XS</sup> motherboard Rev3 is a versatile platform to start development with the Xynergy<sup>XS</sup> module and will help you to get acquainted with the Xynergy<sup>XS</sup> Hardware and its interfaces. The motherboard offers access to many typical interfaces on standard connectors as well as direct access to individual I/O ports. Please refer to the schematics and the block diagram for more information.

For information on the locations of individual connectors of the XynergyXS motherboard, please, refer to page 10.

## 200-pin DIMM Socket

The Xynergy<sup>XS</sup> module will fit into the 200pin SO-DIMM socket with the designator MOD100. For your own design, please note that the Socket is a DDR2 type socket (1.8V) not a DDR type (2.5V).

### To insert the module

- Remove power from the motherboard to prevent damage to the Xynergy<sup>XS</sup> module and the motherboard while inserting the module.  
**The Xynergy<sup>XS</sup> module is not hot plug capable!**

# Xynergy<sup>XS</sup> Motherboard Rev3 Documentation April 24, 2012

- Insert the XynergyXS module with the notch aligned to the nose of the socket at a 45° angle until you feel some resistance.  
**Do not apply excessive force during insertion!**
- Gently press down the the module, until the metal retention clips on the side of the socket will snap into place.

## To release the module from the socket

- Remove power from the motherboard to prevent damage to the Xynergy<sup>XS</sup> module and the motherboard while inserting the module.  
**Remember: The Xynergy<sup>XS</sup> module is not hot plug capable!**
- Push the retention clips of the socket away from the edges of the module sides until the module is released. Bring the module up to a 45 degree angle and remove carefully from the socket.

## Power Supply

The Xynergy XS Motherboard Rev3 needs to be powered from a stabilized 5V DC supply. The terminal block P900 offers screwing clamps for use with a wide range of power supplies. The motherboard offers a resettable fuse and a diode to protect the circuitry from damage. The fuse has a holding current of 2 amps and will trip at approx. 4 amps.

There are four basic voltage levels generated by the Xynergy<sup>XS</sup> motherboard Rev3.

- 3.3V at up to 1 amps for basic operation of the Xynergy<sup>XS</sup> module and motherboard components is generated from the input supply of 5V.
- 2.5V are generated at up to 1 amps and may be used to power VCCAUX and VCCIO for the Spartan 6 of the Xynergy<sup>XS</sup> module. Jumpers J900 and J901 are used to select either 3.3V or 2.5V for VCCAUX and VCCIO. Jumper J900 and J901 must not be left open!
- ISO-VCC5.0 is used to power the CAN transceiver. ISO-VCC5.0 and ISO-GND are isolated from the rest of the board using an isolated DC-DC converter and an isolated CAN transceiver. ISO-VCC5.0 delivers 200 milliamps max. and is used to power the transceiver with their termination resistors, only.
- The input voltage of 5V is also available via IC500 as VBUS for the USB port. IC500 is capable of sourcing 500mA but will shut down the Bus Voltage for protection, if a USB device draws significantly more than 500mA. When connected to a host, the motherboard and module will draw current from the host. While operation from USB supply without external 5V is possible, the user must pay attention to the input current to prevent damaging the USB host.

# Xynergy<sup>XS</sup> Motherboard Rev3 Documentation April 24, 2012

## Voltage Selection for the FPGA's VccAUX and VccIO:

As mentioned in the previous chapter, the Xynergy<sup>XS</sup> module offers separate supply voltage levels for the Spartan6's auxiliary voltage and I/O voltage for bank 0 and 2.

On the motherboard, Jumper J900 is used to switch VccAUX between 3.3V or 2.5V. Jumper J901 is used to switch the VccIO for the reachable banks from 3.3V to 2.5V. If other voltage levels are needed, pin 2 of J900 and J901 may be used to supply other values. **Do not move the jumper while the power is plugged in!** This may damage the Xynergy<sup>XS</sup> module.

**Do not leave pin 2 of J900 or J901 open and unconnected.** This may damage the Xynergy<sup>XS</sup> module. Always supply a voltage within the valid range for Spartan6 devices!

## I/O Connectors

The Xynergy<sup>XS</sup> motherboard Rev3 offers all functional pins of the Xynergy<sup>XS</sup> module reachable by the user, some of them with specific functions and additional hardware e.g. CAN, USB and Ethernet, while the rest of the signals are available on 100mil headers. P101 and P102 connect to the differential signals of the Spartan6 FPGA. All differential pairs are length tuned to match 0.1mm and are placed on neighboring pins to enable high speed communication.

P103 and P104 connect to the STM32 and provide various pin functions to the user. These four connectors are placed in two groups next to a 100mil pitch, 10x20 pin prototyping area with additional GND, 3.3V and VCCIO pins to add you own circuits to the motherboard and connect it to the Xynergy<sup>XS</sup> module.

STM32 Signals							
P103 Pin #	Pin Name on STM32	P103 Pin #	Pin Name on STM32	P104 Pin #	Pin Name on STM32	P104 Pin #	Pin Name on STM32
1	PI7	2	PC3	1	V_BAT	2	(VCC3.3)
3	PC13	4	PI6	3	PI4	4	PI5
5	PF7	6	PF6	5	PB1	6	PI9
7	PF8	8	PF10	7	PB0	8	PF9
9	PA5	10	PA6	9	PH11	10	PC0
11	PG6	12	PC11	11	PC2	12	PA4
13	PH12	14	PH13	13	PH10	14	PC10
15	PH15	16	PH14	15	PB10	16	PG7

# Xynergy<sup>XS</sup> Motherboard Rev3 Documentation April 24, 2012

Spartan6 Signals							
P101 Pin #	Ball Name on Spartan6	P101 Pin #	Ball Name on Spartan6	P102 Pin #	Ball Name on Spartan6	P102 Pin #	Ball Name on Spartan6
1	B16	2	(VCCIO)	1	A15	2	(VCCIO)
3	A16	4	B14	3	C15	4	C14
5	B12	6	A14	5	E13	6	D14
7	A12	8	B11	7	F13	8	C11
9	C10	10	A11	9	C9	10	D11
11	A10	12	B9	11	D9	12	F9
13	B8	14	A9	13	C8	14	G9
15	A8	16	B6	15	D8	16	A7
17	D6	18	A6	17	A5	18	C7
19	C6	20	B4	19	C5	20	A3
21	B2	22	A4	21	V14	22	B3
23	A2	24	U13	23	T14	24	T11
25	R10	26	V13	25	T3	26	R11
27	T10	28	T4	27	R3	28	T5
29	U5	30	V4	29	V6	30	R5
31	V5	32	U7	31	T6	32	T7
33	U8	34	V7	33	T8	34	R7
35	V8	36	T9	35	R8	36	V11
37	(NC)	38	V9	37	(NC)	38	U11
39	(GND)	40	(GND)	39	(GND)	40	(GND)

# Xynergy<sup>XS</sup> Motherboard Rev3 Documentation April 24, 2012

## I2C/SMBUS Interfaces

The Xynergy<sup>XS</sup> motherboard Rev3 provides two separate connectors to I2C/SMBUS signals of the STM32 controller. P100 is connected to the I2C2 controller peripherals and P105 gives access to I2C3. Both connectors provide 3.3V and Ground (GND) rails, SDA and SCL for I2C operation with 4,7kOhm pullup resistors to 3.3V and the SMBA signal for SMBUS operation.

I2C/SMBUS on P100		
Signal	P100 Pin #	Pin Name on STM32
VCC3.3	1	
I2C2_SDA	2	PH5
I2C2_SMB	3	PH6
I2C2_SCL	4	PH4
GND	5,6	

I2C/SMBUS on P105		
Signal	P105 Pin #	Pin Name on STM32
VCC3.3	1	
I2C3_SDA	2	PH8
I2C3_SMB	3	PH6
I2C3_SCL	4	PH7
GND	5,6	

## RS232 Interface

The female Sub-D9 connector P201 can be used for serial communication via RS232 between the motherboard and another device. The common UART of the STM32 (USART6) and Spartan6 ( Ball J16 for TX, J18 for RX) is connected to a RS232 transceiver and also available on P200. RTS and CTS are not supported and flow control should be managed by software.

RS232 Interface					
Signal Name	P201 Pin #	P200 Pin #	SO-DIMM Pin #	Pin Name on STM32	Ball Name on Spartan6
RS232_DTE_TX	3				
RS232_DTE_RX	2				
USART6_TX		2	71	PC6	J16
USART6_RX		1	69	PC7	J18

# Xynergy<sup>XS</sup> Motherboard Rev3 Documentation April 24, 2012

## Test Pins (User Interface)

For testing and easy user control, four push buttons and LEDs are located on the motherboard, marked as Test0 (SW300 and D300) to Test3 (SW303 and D303). While Test0 and Test1 are connected to the STM32, Test2 and Test3 are connected to the Spartan6. All buttons and LEDs are low active.

On Xynergy<sup>XS</sup> modules with Spartan6 LX9 FPGAs, Test\_LED3 and Test\_SW3 are unavailable, since the package does not support the connected pins, however, LX45 equipped modules do support Test3 functions.

Test I/Os for STM32		
Signal Name	SO-DIMM Pin #	Pin Name on STM32
Test_SW0	16	PI11
Test_LED0	14	PI10
Test_SW1	28	PA0
Test_LED1	30	PC3

Test I/Os for Spartan6		
Signal Name	SO-DIMM Pin #	Ball Name on Spartan6
Test_SW2	96	U10
Test_LED2	94	P12
Test_SW3	95	N7
Test_LED3	93	P7

## SD-Card Interface

The Xynergy<sup>XS</sup> motherboard Rev3 features a Micro-SDCard slot with card detection and SPI interface. The connections to the STM32 can be found in the following table:

SD-Card Interface		
Signal Name	SO-DIMM Pin #	Pin Name on STM32
SDIO_D0	49	PC8
SDIO_CLK	53	PC12
SDIO_CMD	51	PD2
SDIO_DET (card detect)	47	PG8

## USB2.0 OTG Interface

The micro USB connector P500 offers access to the STM32's USB2.0 Fullspeed On The Go USB PHY, has a TVS array for protection from ESD and an intelligent power switch to power USB devices when in host mode. The power switch can be enabled by the STM32 (OTG\_SW\_ON on high level) to supply USB devices and will protect the motherboard from sourcing more than 500mA to the device. If a fault condition on VBUS is detected, LED D500 will light up and the OTG\_ALARM signal will be held low. Presence of 5V on the USB Bus will be indicated by LED D501.

USB2.0 OTG Interface		
Signal Name	SO-DIMM Pin #	Pin Name on STM32
OTG_D_N	70	PA11
OTG_D_P	72	PA12
OTG_ID	68	PA10
OTG_VBUS	66	PA9
OTG_ALARM	62	PA3
OTG_SW_ON	64	PB2

## Ethernet Interface

The RJ45 socket P700 with integrated magnetics will provide Ethernet connectivity to the Xynergy<sup>XS</sup> module. In addition, the Ethernet signals are protected by a TVS array and both LEDs of the socket may be programmed for displaying different states by the Xynergy<sup>XS</sup> module's Ethernet PHY.

Ethernet Interface				
Signal Name	SO-DIMM Pin #		Signal Name	SO-DIMM Pin #
ETH_TX_P	15		ETH_LED0	23
ETH_TX_N	13		ETH_LED1	21
ETH_RX_P	19			
ETH_RX_N	17			

## CAN Interfaces

The CAN2.0(a/b) peripherals of the STM32 are connected to two isolation CAN transceivers and operate from a isolated 5V supply at the bus side. Each of the transceiver has a 120Ohm termination resistor between CANL and CANH, which can be used by closing jumper P601 or P604 or can be left open. Two male Sub-D9 connectors P600 and P603 provide the CAN signals. In addition, the signals of both CAN interfaces are also available on P602, if another connector or pinout is needed.

<b>CAN Interfaces</b>				
<b>Signal Name</b>	<b>P600 Pin #</b>	<b>P603 Pin #</b>	<b>P602 Pin #</b>	<b>Pin Name on STM32</b>
CAN1_H	7		1	
CAN1_L	2		2	
CAN2_H		7	9	
CAN2_L		2	10	
CAN_SHIELD	5	5		
ISO_VCC5.0			6	
ISO_GND	3	3	5	
NC	1,4,6,8,9	1,4,6,8,9		
CAN1_RX				PB8
CAN1_TX				PB9
CAN2_RX				PB5
CAN2_TX				PB6

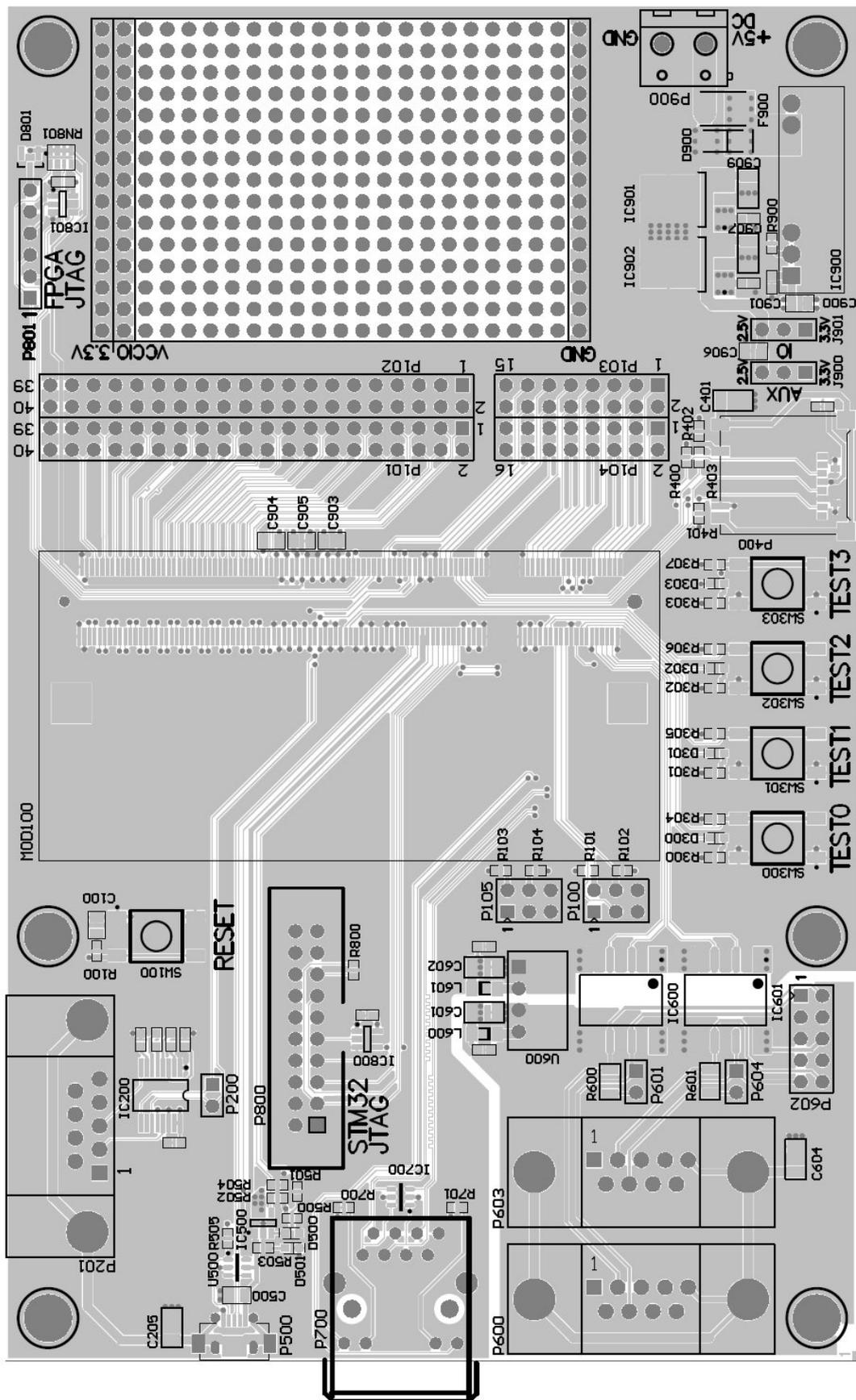
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## JTAG Interfaces

The Xynergy<sup>XS</sup> Motherboard Rev3 offers a JTAG interface on a shrouded 20pin header (P800) for the STM32, which is compatible with STM's STLink JTAG Programmer/Debugger, and a 6pin header (P801) for the Spartan6's JTAG interface, compatible with different brands of programming cables. However, the user should check the pinout before attempting to connect a programmer/debugger. Both JTAG interfaces have a clock buffers to reduce effects of long cable lengths.

<b>STM32 JTAG on P800</b>	
<b>Signal</b>	<b>Pin</b>
VCC3.3	1,2
JTRST#	3
JTDI	5
JTMS	7
JTCK	9
JTDO	13
SYS_RESET#	15
GND	4,6,8,19,12,14,18,20
Not connected	11,16,17,19

<b>Spartan6 JTAG on P801</b>	
<b>Signal</b>	<b>Pin</b>
TMS	1
TDI	2
TDO	3
TCK	4
GND	5
VCCAUX	6



Top View of the Xynergy<sup>XS</sup> Motherboard