W65C816SXB
Single Board Computer
Datasheet

DOCUMENT REVISION HISTORY

Version	Date	Author	Description
0.1	1-Jun-13	David Gray	Initial Document Entry
0.2	06-Jun-14	David Gray	Updated Quick Reference Guide and Added Ordering section.
0.3	06-Aug-15	David Gray	Updated ACIA Pinout
0.4	09-Oct-19	David Gray	Updated Title, Header, Footer, Copyright,
0.5	14-04-20	Bill Mensch / David Gray	Added clarity about de-multiplexed address bus. Added Mechanical Drawing.

Contents

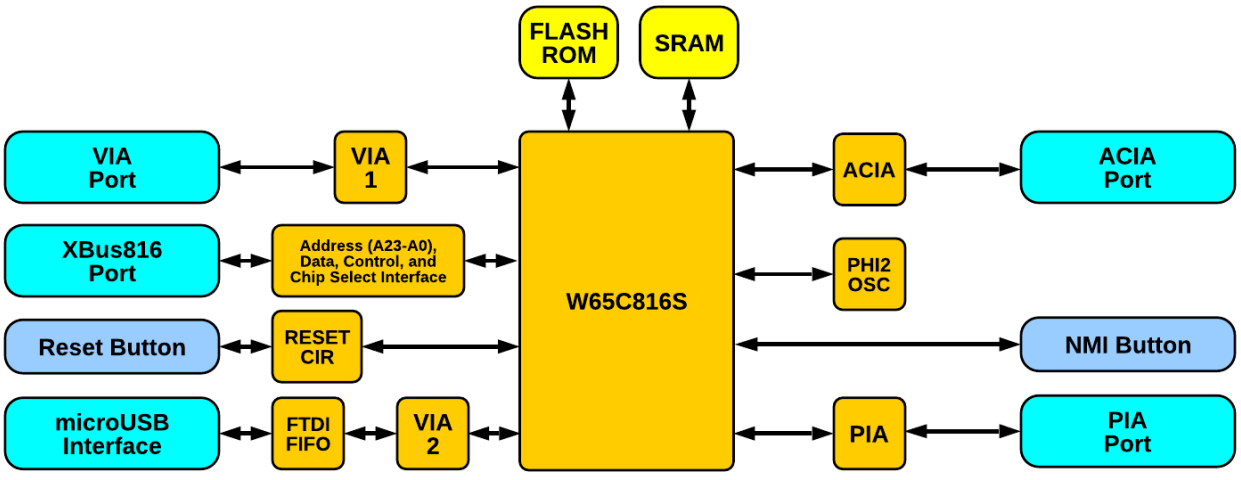
1. Introduction and Features

The W65C816SXB is an educational and industrial strength Engineering Development System based around the world renowned W65C816S 8-bit microprocessor. With its vast I/O provided by the on board W65C22 VIA, W65C21 PIA, and W65C51 ACIA peripheral ports the 816SXB provides the user with easy access to the vast flexibility in design possibilities using our Addressable Register Architecture (ARA). The addition of the XBus816 allows for expansion beyond the standard on board peripherals by providing full Data Bus, Address Bus (24-bit) and Control Signal access.

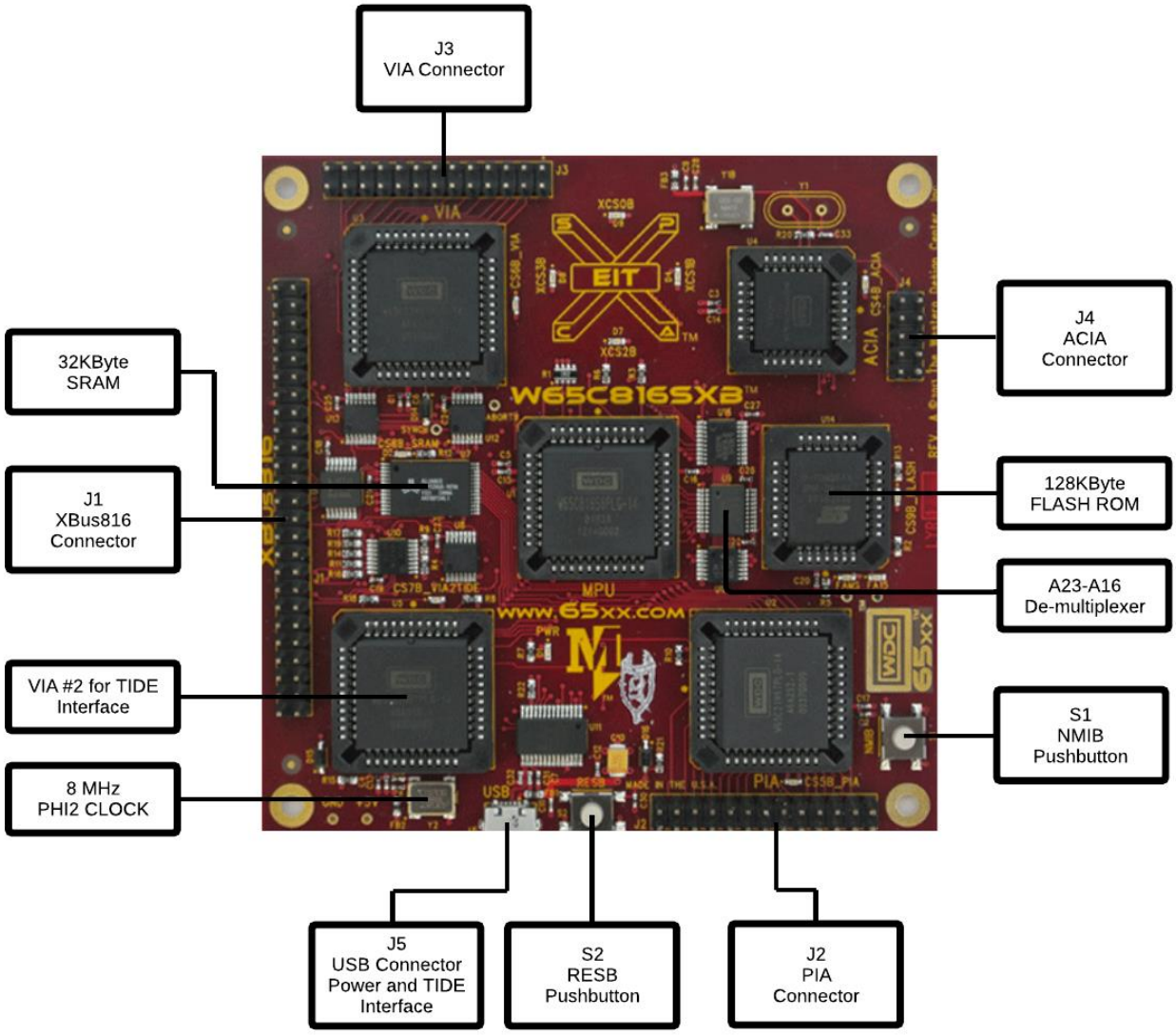
1.1 Feature List

- W65C816S MPU running at 8MHz. Refer to the W65C816S Datasheet for details on the processor.
- 2 x W65C22N VIA(1/2) - One for USB FIFO Interface and one VIA Expansion Port
- 1 x W65C21 PIA with PIA Expansion Port
- 1 x W65C51N ACIA with ACIA Expansion Port
- 1 x XBus816 Connector with full address (A23-A0, de-multiplexed), data, processor control lines and 3 external chip selects
- 1 x 128Kbytes FLASH ROM (32PLCC Socket) mapped as upper 32KB of Memory Map with overlays off of 2 IO pins from W65C22 (VIA2) Port
- 1 x 32Kbytes SRAM
- Programming/Debug Interface – FTDI245 FIFO connected to VIA2 (W65C22N) using the onboard ROM Monitor.
- Micro USB Connector – USB Power and Debugging Interface

1.2 Functional Block Diagram

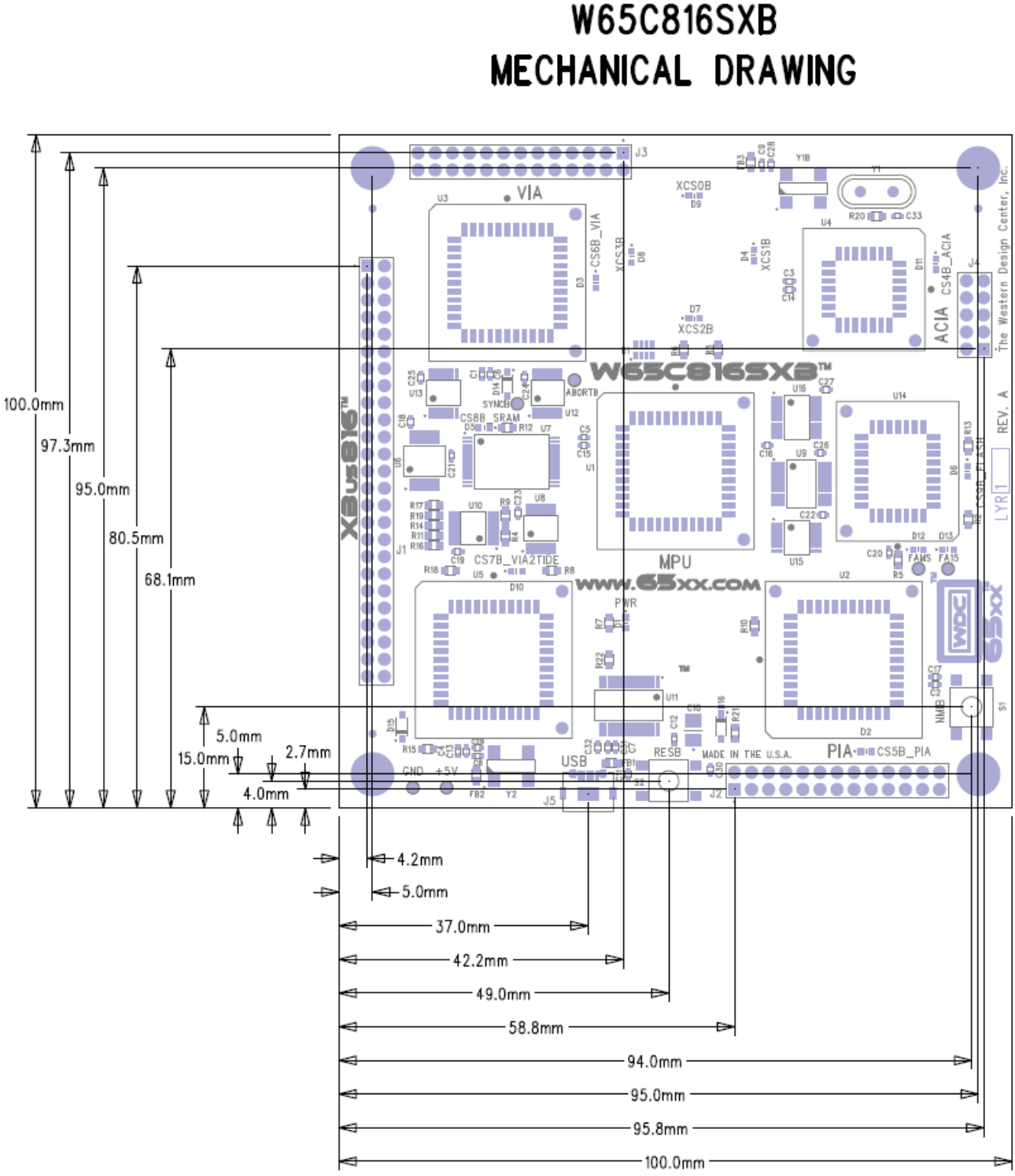


1.3 Board Diagram



100mm x 100mm PCB

1.4 Mechanical Drawing



1.5 Quick Reference Guide – Memory Map

W65C816SXB Memory Map				
Start	***End***	***Size***	***Chip Select***	***Description***
0x8000	0xFFFF	32 KB	CS9B	FLASH ROM (x4, 128KB used with 2 IO pins for overlays)
0x0000	0x7FFF	32 KB	CS8B	SRAM (7FFF-7F00 is Decoded for expansion)
0x7FE0	0x7FFF	32 B	CS7B	VIA-USB
0x7FC0	0x7FDF	32 B	CS6B	VIA Port
0x7FA0	0x7FBF	32 B	CS5B	PIA Port
0x7F80	0x7F9F	32 B	CS4B	ACIA Port
0x7F60	0x7F7F	32 B	XCS3B	XBus Chip Select 3
0x7F40	0x7F5F	32 B	XCS2B	XBus Chip Select 2
0x7F20	0x7F3F	32 B	XCS1B	XBus Chip Select 1
0x7F00	0x7F1F	32 B	XCS0B	XBus Chip Select 0

1.6 Quick Reference Guide – Expansion Connectors

J1 – XBus816 Connector			
Pin	Signal Name	Pin	Signal Name
1	VDD	2	VSS
3	D0	4	D1
5	D2	6	D3
7	D4	8	D5
9	D6	10	D7
11	A0	12	A1
13	A2	14	A3
15	A4	16	A5
17	A6	18	A7
19	A8	20	A9
21	A10	22	A11
23	A12	24	A13
25	A14	26	A15
27	A16	28	A17
29	A18	30	A19
31	A20	32	A21
33	A22	34	A23
35	XCS0B	36	XCS1B
37	XCS2B	38	XCS3B
39	VPB	40	IRQB
41	NMIB	42	RESB
43	MLB	44	VDA
45	VPA	46	BE
47	RWB	48	PHI2
49	VSS	50	VDD

J2 – PIA Connector			
Pin	Signal Name	Pin	Signal Name
1	VDD	2	VSS
3	CA1	4	CA2
5	PA0	6	PA1
7	PA2	8	PA3
9	PA4	10	PA5
11	PA6	12	PA7
13	NO CONNECT	14	NO CONNECT
15	CB1	16	CB2
17	PB0	18	PB1
19	PB2	20	PB3
21	PB4	22	PB5
23	PB6	24	PB7
25	VSS	26	VDD

J3 – VIA Connector			
Pin	Signal Name	Pin	Signal Name
1	VDD	2	VSS
3	CA1	4	CA2
5	PA0	6	PA1
7	PA2	8	PA3
9	PA4	10	PA5
11	PA6	12	PA7
13	NO CONNECT	14	NO CONNECT
15	CB1	16	CB2
17	PB0	18	PB1
19	PB2	20	PB3
21	PB4	22	PB5
23	PB6	24	PB7
25	VSS	26	VDD

J4 – ACIA Connector			
Pin	Signal Name	Pin	Signal Name
1	VDD	2	VSS
3	RTSB	4	DTRB
5	RXD	6	DSRB
7	TXD	8	DCDB
9	CTSB	10	RXC

2. Connector Descriptions

Following are descriptions of main board connectors.

2.1 XBus Port (J1)

The "XBus816" is a 50-pin male connector with the following signals:

- 8 Data Bus lines (D0-D7)
- 24 Address Bus lines (A0-A23; 16 Mbyte space)
- 3 External Chip Select Lines for expansion (XCS0B-XCS2B)
- 9 Control lines (PHI2, RWB, BE, VDA, VPA, MLB, RESB, NMIB, IRQB, VPB)
- 4 Power and Ground - 2x VSS (Pins 2 and 49) and 2x VDD (Pins 1 and 50)

2.2 PIA Port (J2)

The PIA Port Connector is an asynchronous parallel expansion port connected to the W65C21S/N. It is a 26 Pin (2 x 13; .100" spacing) male connector that provides access to the 20 I/Os (8x PA, 8x PB, CA1/2, CB1/2) of the PIA. The remaining pins serve as Power (x2) and Ground pins (x4). See section 1.4 – Quick Reference Guide for a full pin listing. Refer to the W65C21 Datasheet for detailed information for that chip.

2.3 VIA Port (J3)

The VIA Port Connector is an asynchronous parallel expansion port connected to the W65C22N. It is a 26 Pin (2 x 13; .100" spacing) male connector that provides access to the 20 I/Os (8x PA, 8x PB, CA1/2, CB1/2) of the VIA. The remaining pins serve as Power (Pins 1 and 26) and Ground pins (Pins 2, 13, 14, 35). See section 1.4 – Quick Reference Guide for a full pin listing. Refer to the W65C22 Datasheet for detailed information for that chip.

2.4 ACIA Port (J4)

The ACIA Port Connector is an asynchronous serial expansion port connected to the W65C51N. It is a 10 Pin (2 x 5; .100" spacing) connector that provides access to the 8 communication signals of the ACIA. Pin 1 is VDD and Pin 2 is VSS. See section 1.4 – Quick Reference Guide for a full pin listing. Refer to the W65C51 Datasheet for detailed information for that chip.

2.5 Micro USB Port (J5)

The Micro USB connector is dual purpose. It is the power connector that powers the board. The FTDI chip that interfaces to the connector has been pre-programmed so that when the board is power from a USB power on a computer, the chip will request 500mA of current from the host machine. The board can also be powered by any USB port that supplies 5V DC. Note that the board does not have a voltage regulator. 5V DC must be supplied. In addition to the power, the USB port serves as an interface to WDC's tool suite for debugging and loading programs into the onboard SRAM.

3 Notices and Ordering Information

3.1 FCC Compliance

The Western Design Center, Inc. (WDC) provides the enclosed product under the following conditions: This board is intended for use for Engineering Development or Evaluation Purposes ONLY and is not considered by WDC to be a finished consumer product. This board should be handled with caution using good electronics handling practices. This board is compliant per RoHS/Green directives. It does not fall within the scope of directives such as FCC, CE, and UL. It generates uses and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC rules.

3.2 Ordering Information

The W65C816SXB will be available through various distributors. For information about WDC's distribution channels, please visit: https://WDC65xx.com/where-to-buy/