SI-GATE GMBH

X-1500

Reference Manual

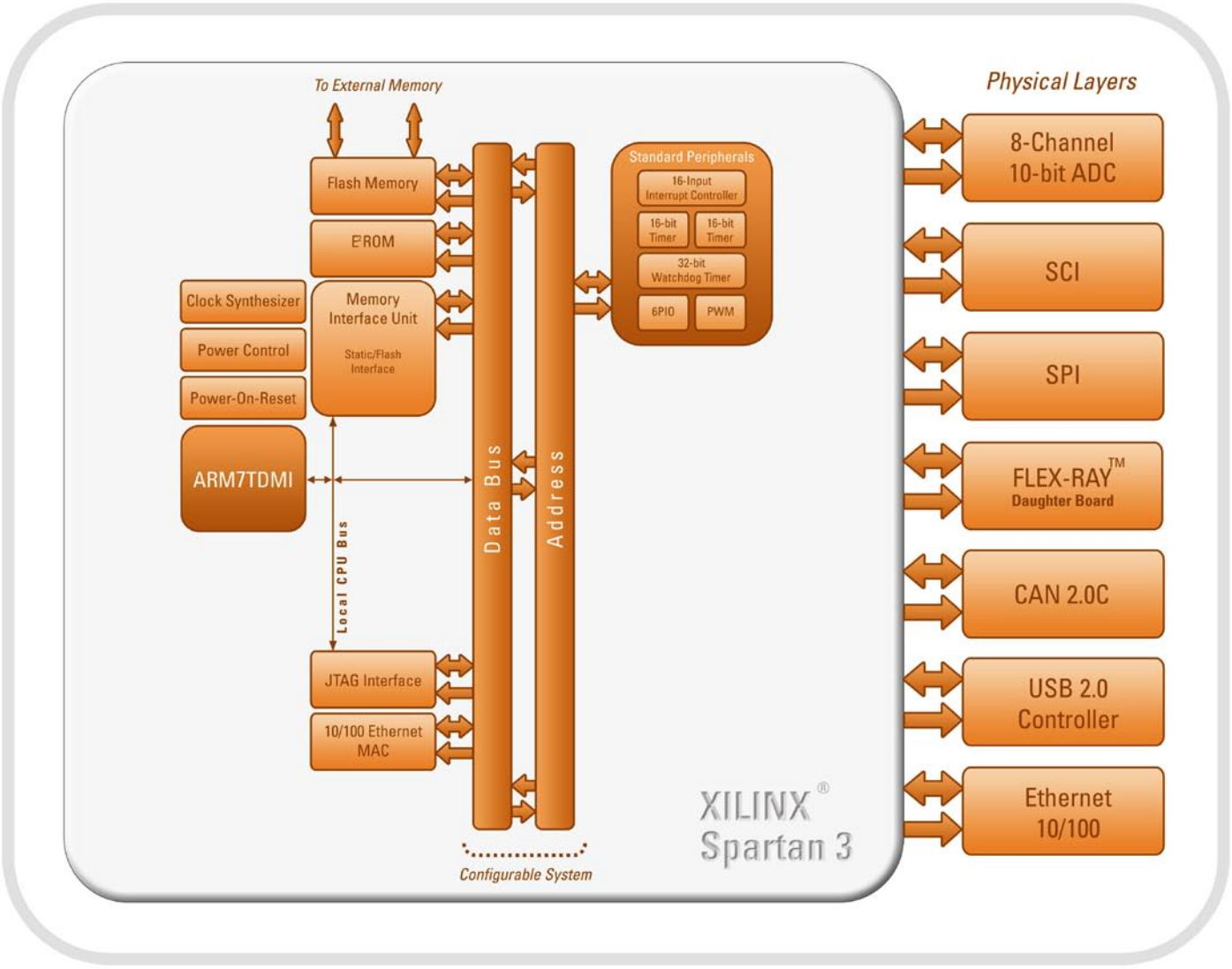
Contents

Introduction

Congratulations on your purchase of the Si-Gate X-1500 Configurable Automotive ECU Platform. The X-1500 provides designers with a configurable ECU right out of the box suitable for a wide range of Automotive and Industrial applications. Please review the following reference manual thoroughly to receive the most of your new purchase.

The X-1500 is a complete 32-bit Field Configurable ECU platform, combining the highly popular 32-bit ARM7TDMI-S™ or Xilinx MicroBlaze™ processor core with standard System-on-Chip peripherals and over 150 user programmable I/O's. It is contained within a Xilinx Spartan-3™ FPGA with programmable logic for custom driven IP applications, a robust memory subsystem, and a full suite of Automotive and Industrial peripherals. The X-1500 enables programmable System-on-Chip applications and expands traditional development platforms by including necessary physical layers on-board the ECU. The X-1500 supports physical layers for 10/100 Ethernet, JTAG, USB 2.0, 12-bit ADC, High and Low Speed CAN, FlexRay™, LIN, K-Line, UART, and SPI along with on-board Flash and SRAM memory.

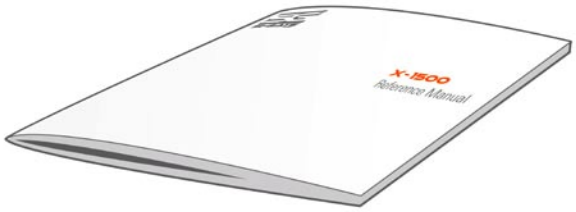
The X-1500 is ideal for projects where flexibility and expand-ability is needed for your future ECU developments.Please visit *www.si-gate.com* for additional or updated information which may not be presented in this manual.



Block diagram of the Si-Gate X-1500

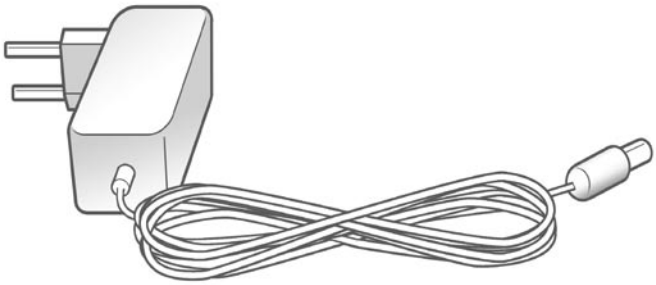
Package Contents

Your X-1500 Development kit includes the following components:

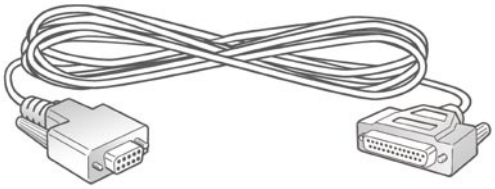


Users Manual

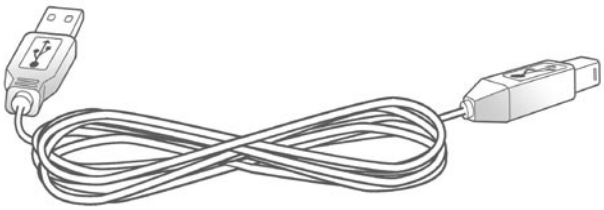
Installation CD



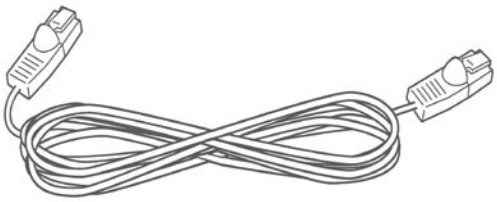
Mains Adapter



Serial Cable



USB A/B Cable



Ethernet Cable

Getting Started

The standard bit stream that is delivered with the Si-Gate X-1500 includes a Xilinx Microblaze Soft Core. This is integrated with a basic RS-232 demo application which provides the user the ability to immediately connect the X-1500 to a PC serial port and start developing. When coupled together with the Xilinx EDK tool-chain (must be purchased seperately) the X-1500 development kit provides every-thing the user needs to start writing software for Microblaze inside the Spartan-3 FPGA. If the user wants to develop new bit streams, this can be done with the purchase of the Xilinx ISE Foundation. Or the user may opt for a Si-Gate special-ist to handle this integration task leaving room for the user to concentrate on their specific applications.

Communicating with the X-1500

Because of the constant challenge in deciding which peripherals are needed in a new automotive system, several physical layers are included with the X-1500 which allow the user to add peripherals of their choice at any time without having to re-design the hardware interfaces including:

CAN 2.0C
ETHERNET 10/100 Part # LXT971 (Ethernet MAC needed inside FPGA for operation)
USB 2.0 Controller Part # CY7C68001
SPI
SCI
12 bit ADC

With the X-1500's FPGA architecture, the user has the complete flexibility to select any combinations of automotive periphals, memory, and interface features that give the best system performance at the lowest costs on a single FPGA.

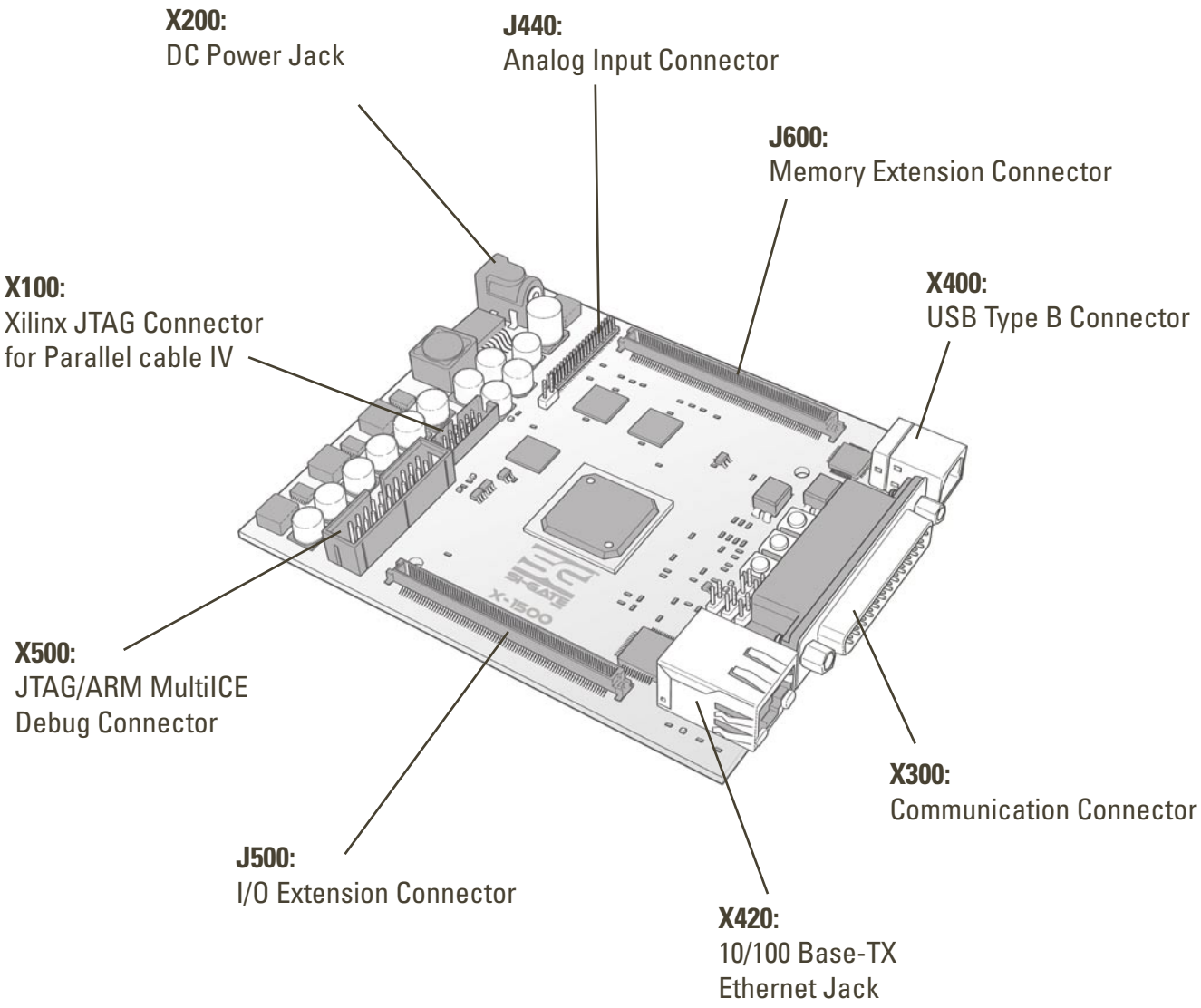
Xilinx MicroBlaze Soft Processor Core

The MicroBlaze core is a 3-stage pipeline 32-bit RISC Harvard architecture soft processor core with 32 general purpose registers, ALU, and rich instruction set optimized for embedded applications. It supports both on-chip block RAM and/or external memory.

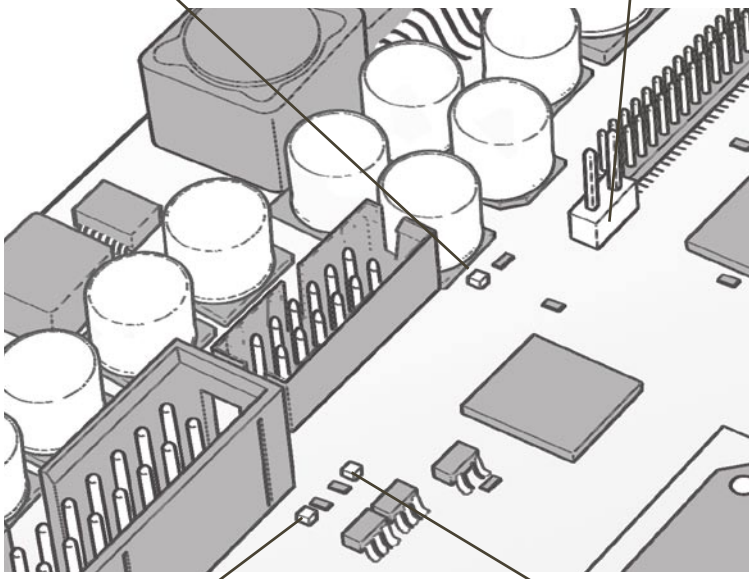
This basic design can then be configured with more advanced features such as: barrel shifter, floating-point unit (FPU), caches, exception handling, debug logic, and others. This flexibility allows the user to balance the required performance of the target application against the logic area cost of the soft processor. Additional information can be found at *www.xilinx.com*.

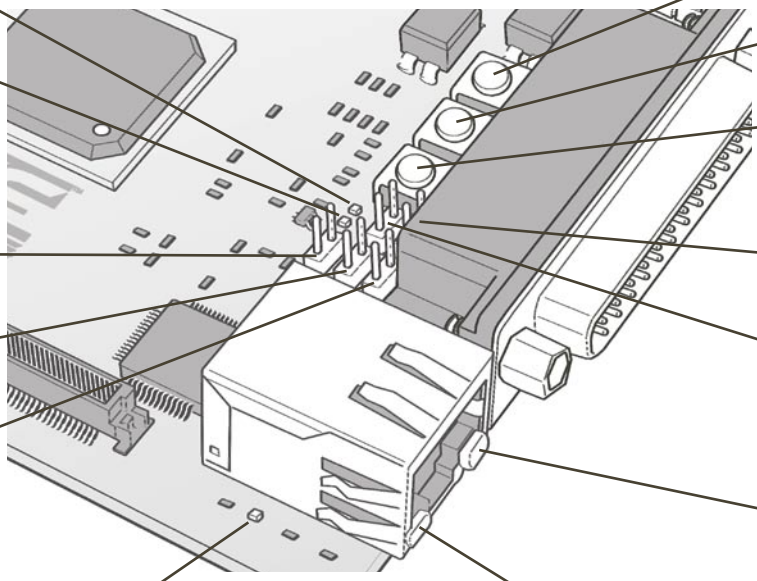
Overview

The following section will inform you on the basic components of the X-1500.



X-1500 User Interface	
X200: DC Power Jack	Connect the supplied mains adapter here
J440: Analog Input Connector	See pin out descriptions on page 13
J600: Memory Extension Connector	See pin out descriptions on page 15
X400: USB Type B Connector	
X300: Communication Connector	See pin out descriptions on page 12
X420: 10/100 Base-TX Ethernet Jack	
J-500: I/O Extension Connector	See pin out descriptions on page 14
X500: JTAG/ARM MultiICE Debug Connector	Additional information can be found at *www.arm.com*
X100: Xilinx JTAG Connector for Parallel cable IV	Additional information can be found at *www.xilinx.com*

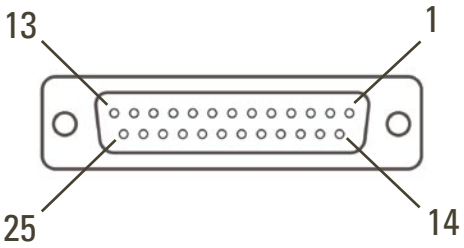

Power LED
JP600
Flash Enable/Protect
Reset LED:
User or Powerfail Reset
Configuration Done LED:
FPGA Configured


LED392:
User LED 1
LED393:
User LED 2
JP370:
K-Line Master Enable
JP341:
LIN2 Master Enable
JP340:
LIN2 Master Enable
S260:
User Reset Button
S390:
User Button 1
S391:
User Button 2
JP330:
LIN1 Master Enable
JP331:
LIN1 Wakeup Enable
Ethernet LED 1:
Indicates Activity
Ethernet LED 2:
Indicates Established Link
Ethernet LED 3

X-1500 LED's, Buttons, & Jumpers	
Power LED	Indicates power is being supplied to the X-1500
JP600: Flash Enable/Protect	Stuff to enable flash erase or programming
Reset LED: User or Power Fail Reset	Indicates power failure, power on or user reset
Config Done LED: FPGA Configured	Indicates that FPGA is configured
LED 392: User LED 1	User programmable LED 1
LED 393: User LED 2	User programmable LED 2
JP370: K-Line Master	Stuff for K-Line master mode
JP341: LIN2 Master Enable	Stuff to enable LIN2 master configuration
JP340: LIN2 Master Enable	Stuff to enable LIN2 wakeup
Ethernet LED 3	User programmable LED of ethernet PHY
S260: User Reset Button	Manual reset button
S390: User Button 1	User programmable push button 1
S391: User Button 2	User programmable push button 2
JP330: LIN1 Master Enable	Stuff to enable LIN 1 master configuration
JP331: LIN1 Wakeup Enable	Stuff to enable LIN 1 wakeup
Ethernet LED 1	User programmable LED of ethernet PHY (default shows activity)
Ethernet LED 2	User programmable LED of ethernet PHY (default shows link status)

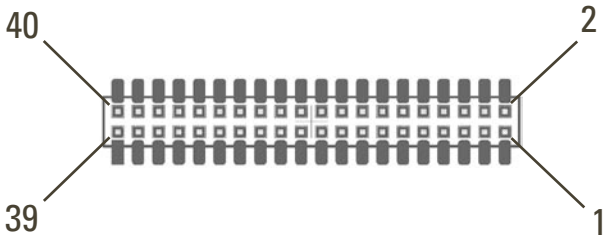
Pin Out Descriptions

X300:
Communication Connector



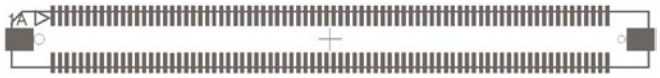
Pin	Signal
1	+12V
2	IN_J1850
3	GND
4	IN_CAN1_H
5	IN_CAN1_L
6	GND
7	IN_CAN2_H
8	IN_CAN2_L
9	GND
10	LIN1_LINE
11	GND
12	LIN2_LINE
13	GND
14	KL_LINE
15	GND
16	CANB_H
17	CANB_L
18	GND
19	RS0_TX
20	RS0_RX
21	RS1_TX
22	RS1_RX
23	RS2_TX
24	RS2_RX
25	GND

J440:
Analog Input Connector



Signal	Pin	Pin	Signal
GNDA	2	1	AN0
GNDA	4	3	AN1
GNDA	6	5	AN2
GNDA	8	7	AN3
GNDA	10	9	AN4
GNDA	12	11	AN5
GNDA	14	13	AN6
GNDA	16	15	AN7
GNDA	18	17	AN8
GNDA	20	19	AN9
GNDA	22	21	AN10
GNDA	24	23	AN11
GNDA	26	25	AN12
GNDA	28	27	AN13
GNDA	30	29	AN14
GNDA	32	31	AN15
GNDA	34	33	VDDA+5V
GNDA	36	35	VDDA+5V
GNDA	38	37	VDDA+5V
GNDA	40	39	VDDA+5V

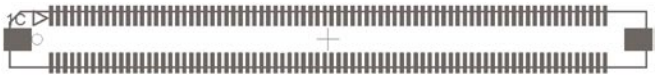
J500:
I/O Extension Connector



Signal	Pin	Pin	Signal
PA0	1A	1B	PC0
PA1	2A	2B	PC1
PA2	3A	3B	PC2
PA3	4A	4B	PC3
+3V3	5A	5B	GND
PA4	6A	6B	PC4
PA5	7A	7B	PC5
PA6	8A	8B	PC6
PA7	9A	9B	PC7
+3V3	10A	10B	GND
PA8	11A	11B	PC8
PA9	12A	12B	PC9
PA10	13A	13B	PC10
PA11	14A	14B	PC11
+3V3	15A	15B	GND
PA12	16A	16B	PC12
PA13	17A	17B	PC13
PA14	18A	18B	PC14
PA15	19A	19B	PC15
+3V3	20A	20B	GND
PA16	21A	21B	PC16
PA17	22A	22B	PC17
PA18	23A	23B	PC18
PA19	24A	24B	PC19
+3V3	25A	25B	GND
PA20	26A	26B	PC20
PA21	27A	27B	PC21
PA22	28A	28B	PC22
PA23	29A	29B	PC23
+3V3	30A	30B	GND
PA24	31A	31B	PC24
PA25	32A	32B	PC25
PA26	33A	33B	PC26
PA27	34A	34B	PC27
+3V3	35A	35B	GND
PA28	36A	36B	PC28
PA29	37A	37B	PC29
PA30	38A	38B	PC30
PA31	39A	39B	PC31
+3V3	40A	40B	GND

Signal	Pin	Pin	Signal
PB0	41A	41B	PD0
PB1	42A	42B	PD1
PB2	43A	43B	PD2
PB3	44A	44B	PD3
+1V2	45A	45B	GND
PB4	46A	46B	PD4
PB5	47A	47B	PD5
PB6	48A	48B	PD6
PB7	49A	49B	PD7
+1V2	50A	50B	GND
PB8	51A	51B	PD8
PB9	52A	52B	PD9
PB10	53A	53B	PD10
PB11	54A	54B	PD11
+1V2	55A	55B	GND
PB12	56A	56B	PD12
PB13	57A	57B	PD13
PB14	58A	58B	PD14
PB15	59A	59B	PD15
+1V2	60A	60B	GND
PB16	61A	61B	PD16
PB17	62A	62B	PD17
PB18	63A	63B	PD18
PB19	64A	64B	PD19
+1V2	65A	65B	GND
PB20	66A	66B	PD20
PB21	67A	67B	PD21
PB22	68A	68B	PD22
PB23	69A	69B	PD23
+1V2	70A	70B	GND
PB24	71A	71B	PD24
PB25	72A	72B	PD25
PB26	73A	73B	PD26
PB27	74A	74B	PD27
+1V2	75A	75B	GND
PB28	76A	76B	PD28
PB29	77A	77B	PD29
PB30	78A	78B	PD30
PB31	79A	79B	PD31
+1V2	80A	80B	GND

J600:
I/O Extension Connector



Signal	Pin	Pin	Signal
BD0	1C	1D	MEM_#RD
BD1	2C	2D	MEM_#OE
BD2	3C	3D	MEM_#WE
BD3	4C	4D	UNUSED
+5V	5C	5D	GND
BD4	6C	6D	MEM_#BE3
BD5	7C	7D	MEM_#BE2
BD6	8C	8D	MEM_#BE1
BD7	9C	9D	MEM_#BE0
+5V	10C	10D	GND
BD8	11C	11D	SRAM_#CS
BD9	12C	12D	FLASH_#CS
BD10	13C	13D	FLASH_#RP
BD11	14C	14D	FLASH_STS
+5V	15C	15D	GND
BD12	16C	16D	BD12
BD13	17C	17D	USB_#RESET
BD14	18C	18D	USB_#IFCLK
BD15	19C	19D	USB_#INT
+5V	20C	20D	GND
BD16	21C	21D	USB_WAKEUP
BD17	22C	22D	USB_READY
BD18	23C	23D	USB_FLAGA
BD19	24C	24D	USB_FLAGB
+5V	25C	25D	GND
BD20	26C	26D	USB_FLAGC
BD21	27C	27D	USB_PKTEND
BD22	28C	28D	EXT1_#CS
BD23	29C	29D	EXT2_#CS
+5V	30C	30D	GND
BD24	31C	31D	TPX1
BD25	32C	32D	TPX2
BD26	33C	33D	SPI_#CS2
BD27	34C	34D	SPI_#CS1
+5V	35C	35D	GND
BD28	36C	36D	SPI_#CS0
BD29	37C	37D	SPI_SCLK
BD30	38C	38D	SPI_MOSI
BD31	39C	39D	SPI_MISO
+5V	40C	40D	GND

Signal	Pin	Pin	Signal
BA31	41C	41D	PEXT4
BA30	42C	42D	PEXT5
BA29	43C	43D	PEXT6
BA28	44C	44D	PEXT7
+2V5	45C	45D	GND
BA27	46C	46D	PEXT8
BA26	47C	47D	PEXT9
BA25	48C	48D	PEXT10
BA24	49C	49D	PEXT11
+2V5	50C	50D	GND
BA23	51C	51D	PEXT12
BA22	52C	52D	PEXT13
BA21	53C	53D	PEXT14
BA20	54C	54D	PEXT15
+2V5	55C	55D	GND
BA19	56C	56D	PEXT16
BA18	57C	57D	PEXT17
BA17	58C	58D	PEXT18
BA16	59C	59D	PEXT19
+2V5	60C	60D	GND
BA15	61C	61D	PEXT20
BA14	62C	62D	PEXT21
BA13	63C	63D	PEXT22
BA12	64C	64D	PEXT23
+2V5	65C	65D	GND
BA11	66C	66D	PEXT24
BA10	67C	67D	PEXT25
BA9	68C	68D	PEXT26
BA8	69C	69D	PEXT27
+2V5	70C	70D	GND
BA7	71C	71D	PEXT28
BA6	72C	72D	PEXT29
BA5	73C	73D	PEXT30
BA4	74C	74D	PEXT31
+2V5	75C	75D	GND
BA3	76C	76D	VSUPPLY
BA2	77C	77D	VSUPPLY
BA1	78C	78D	VSUPPLY
BA0	79C	79D	VSUPPLY
+2V5	80C	80D	GND

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