



## Introduction to



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*Blake Henry  
President & CEO  
Bitwise Systems*

# Bitwise Systems

- Makers of QuickUSB®
- Design Services
  - QuickUSB Design Services
  - Turnkey hardware, FPGA,
  - Embedded systems and software solutions
- Affiliations
  - Altera ACAP Partner
  - Altera DevKit Partner
- Bitwise Systems Corporate Offices & Design Center
  - Santa Barbara, CA



# The *Quick*USB<sup>®</sup> Advantage



- Add USB to your product without any prior knowledge of USB
  - Connect your circuits to QuickUSB
  - Write your software using the included QuickUSB Library
  - You're done!
- Shorten your time to market
  - No USB driver development
  - No USB firmware development
  - No USB debugging
- Works right out of the box
  - Many applications can be prototyped by simply wiring up the module to the target system
  - Use the diagnostic control panel

**DRIVER**

**FIRMWARE**

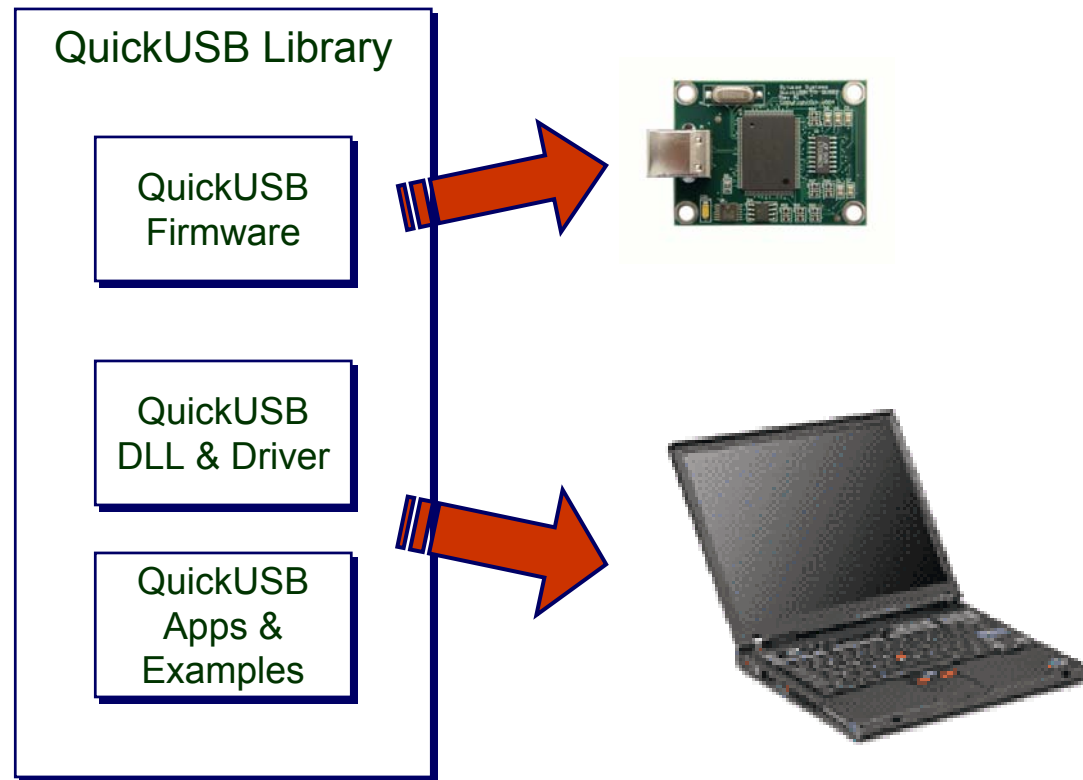
**USB DEBUG**

# QuickUSB<sup>®</sup> is Scalable

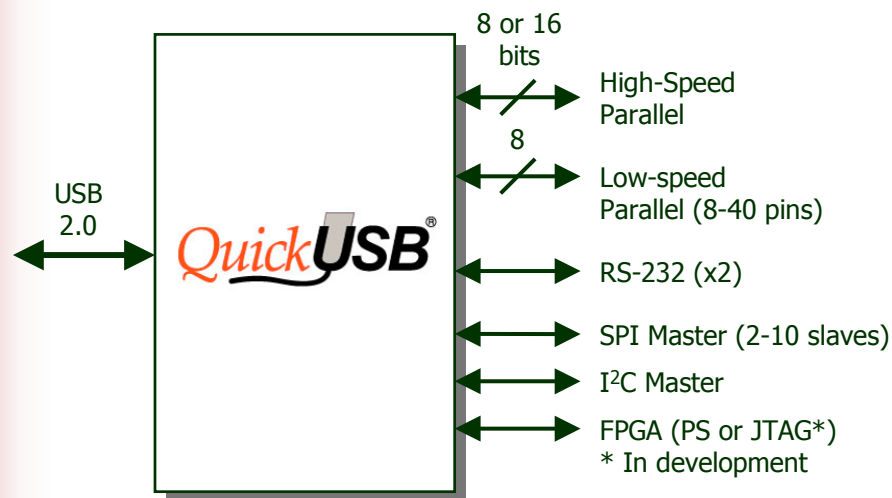
- Prototype
  - Module + adapter board
- Pre-production
  - Module on custom board
- Production
  - QuickUSB IP-only on custom board



# The QuickUSB<sup>®</sup> Library



# The QuickUSB<sup>®</sup> Module Block Diagram

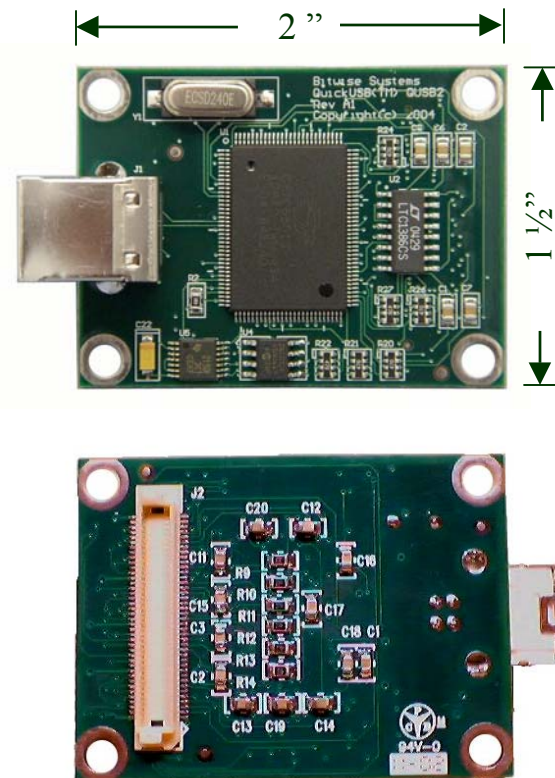


- Based on the Cypress EZ USB FX2 Single-Chip High-Speed USB 2.0 Microcontroller
  - CY7C68013A-128AXC
- QuickUSB has many ports
  - One high-speed 8 or 16 bit parallel port (up to 20 megabytes/sec)
  - Up to three low speed 8-bit parallel ports
  - Two RS-232 ports
  - One SPI master port for up to 10 devices
  - One I<sup>2</sup>C master port
  - One FPGA configuration port
  - Up to 3 8051 timers
- Each port is controlled directly from the QuickUSB Library DLL
- Pin functions are shared to provide the greatest flexibility
- Backward compatible with USB 1.1

# QuickUSB Target Applications

- FPGA/DSP/Microcontroller Interface
- Legacy Interface Upgrades
  - RS-232 port
  - PC Parallel port
  - PCI Card
- General-Purpose Static I/O
  - Buttons and lights
- Direct Chip Control for Prototyping
  - SPI & I<sup>2</sup>C
  - Many DAC, ADC, MUX and other IC devices use these interfaces

# The *Quick*USB<sup>®</sup> Module Pictorial Views

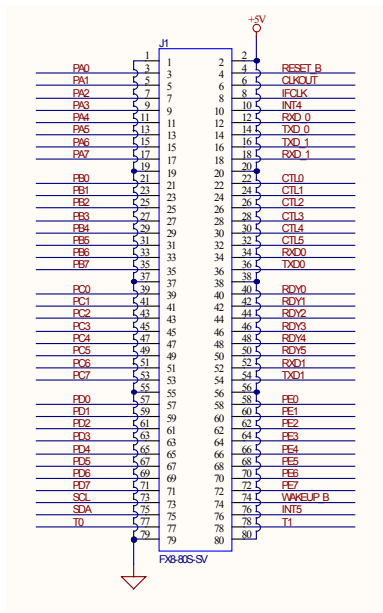


- Uses four 3mm nylon standoffs (Keystone 8843) for mechanical mounting
- Available with a standard type B USB connector
- Uses a high-density 80-pin 0.8mm pitch connector (Hirose FX8-80P-SV on board mates with FX8-80S-SV)

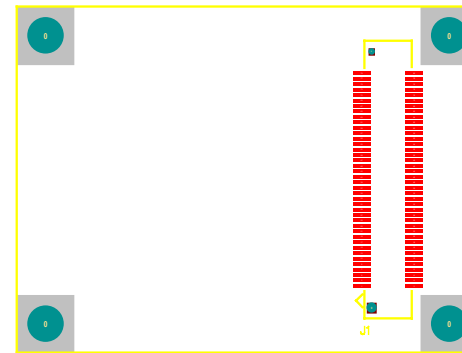


# QuickUSB<sup>®</sup> Module Symbols and Footprints

- Available for Altium Designer (Protel) and Orcad

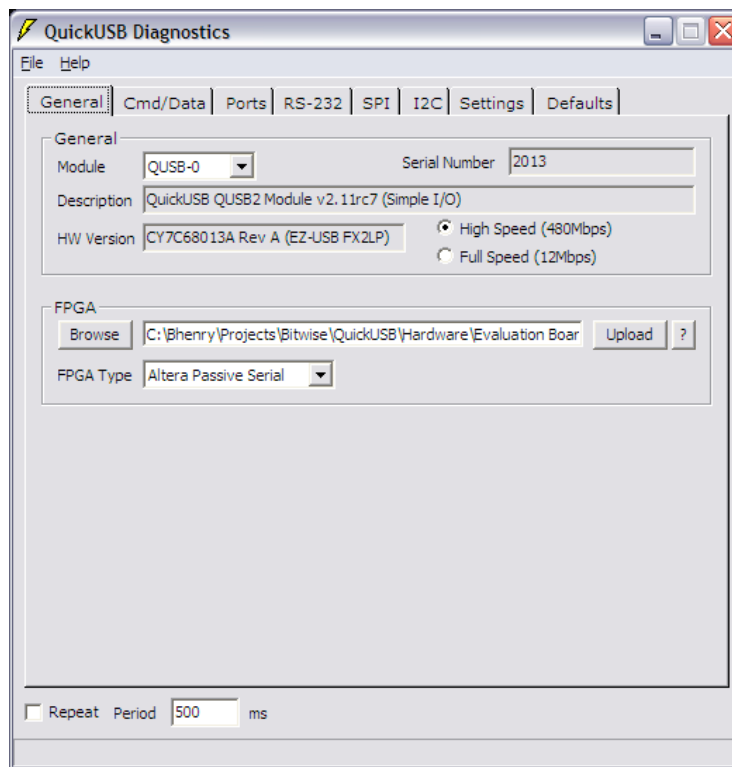


*Schematic Symbol*



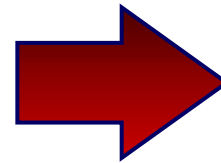
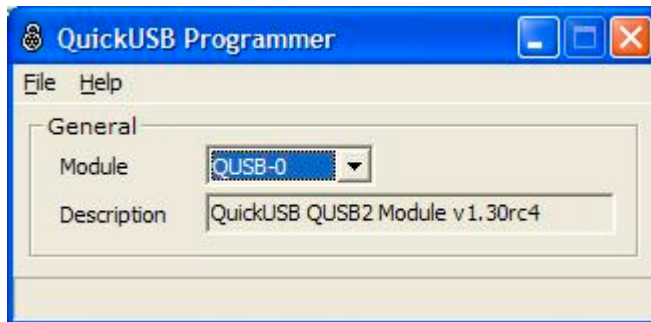
*PCB Footprint*

# QuickUSB<sup>®</sup> Software Support



- Win32 Platform
  - Microsoft Visual Basic 6.0
  - Microsoft Visual C++ 6.0
  - Microsoft .NET Component
  - Borland C++ Builder
  - Borland Delphi
  - LabView
  - HP VEE
- Linux Platform
  - Qt Designer

# QuickUSB<sup>®</sup> is Field Upgradeable



# QuickUSB<sup>®</sup> Software Is Easy

- Software Interfaces
  - QuickUSB DLL
  - QuickUSB C++ Class
  - QuickUSB VB Component
  
- All I/O Calls consist of the following steps
  - QuickUsbFindModules
  - QuickUsbOpen
  - I/O call – QuickUsbReadData, QuickUsbWriteData
  - QuickUsbClose

# QuickUSB<sup>®</sup> Settings and Defaults

- You can modify the behavior of the FX2 chip using QuickUSB settings and defaults
  
- QuickUSB Settings let you change the FX2 registers interactively
  - QuickUsbReadSetting
  - QuickUsbWriteSetting
  
- QuickUSB Defaults let you change the boot up value of FX2 registers
  - QuickUsbReadDefault
  - QuickUsbWriteDefault

# QuickUSB® Settings/Defaults Detail

Addr	Setting/Default Name
0	SETTING_EP26CONFIG
1	SETTING_WORDWIDE
2	SETTING_DATAADDRESS
3	SETTING_FIFO_CONFIG
4	SETTING_FPGATYPE
5	SETTING_CPUCONFIG
6	SETTING_SPICONFIG
7	SETTING_SLAVEFIFOFLAGS
8	SETTING_I2CTL
9	SETTING_PORTA
10	SETTING_PORTB
11	SETTING_PORTC
12	SETTING_PORTD
13	SETTING_PORTE
14	SETTING_PORTACCFG
15	SETTING_PINFLAGS
17	SETTING_VERSIONSPEED

- Settings and defaults are modeled as 16-bit registers
- Most settings and defaults modify FX2 registers
- Some change the operation of the QuickUSB firmware

# QuickUSB<sup>®</sup> I/O Models

- GPIF Master Mode Models
  - Uses the FX2's built-in GPIF (General Purpose InterFace) DMA engine
  
- Slave FIFO Modes
  - Uses the Simple I/O Model firmware
  - Implemented by setting IFCONFIG[1:0] to '11'
  - Exposes the FX2 endpoint FIFOs for external control

# QuickUSB<sup>®</sup> GPIF Master I/O Models

- GPIF Master Mode I/O Models
  - Simple I/O model
    - No handshaking or holdoff
  - FIFO Handshake I/O model
    - Interfaces with FIFO chips or FPGA FIFOs
  - Full Handshake I/O model
    - Each transfer is transferred with a full handshake
  - Block Handshake I/O model
    - Like FIFO I/O but flags are only checked at the beginning of each block
  - Pipeline I/O model
    - Like simple I/O but pipeline delayed 1 clock cycle



# QuickUSB<sup>®</sup> Slave FIFO I/O Modes

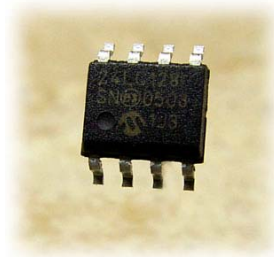
- Slave FIFO Modes
  - Synchronous Slave FIFO mode
  - Asynchronous Slave FIFO mode
  - Slave245 Mode

Pin Name	Alternate Name	Description	Dir	Default Config
IFCLK	IFCLK	Clock for synchronous I/O	In/Out	Rising edge
FD[15:0]	PD[7:0], PB[7:0]	Bi-directional FIFO data bus	Bidir	N/A
CTL0	FLAGA	Programmable level flag (Half-full)	Out	Indexed mode
CTL1	FLAGB	FIFO Full Status Flag	Out	Indexed mode
CTL2	FLAGC	FIFO Empty Status Flag	Out	Indexed Mode
PA2	nSLOE	Enables the FD outputs for the selected OUT FIFO	In	Synchronous, Active low
RDY0	nSLRD	FIFO read enable/clock	In	Synchronous, Active low
RDY1	nSLWR	FIFO write enable/clock	In	Synchronous, Active low
PA6	nPKTEND	Indicates the end of a short IN packet	In	Synchronous, Active low
PA7	nSLCS	FIFO Chip Select	In	Synchronous, Active low
PA5:PA4	FIFOADR[1:0]	Selects the active FIFO for FD and flags. 00=EP2, 01=EP4, 10=EP6, 11=EP8	In	N/A

# The *QuickUSB*<sup>®</sup> Family of Products



QuickUSB Module



Chip Pack and  
iChipPack



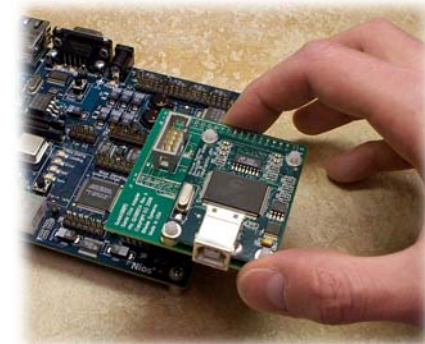
QuickUSB Adapter



Cyclone II Dev Kit



CMOS Image Sensor Dev Kit



Santa Cruz Adapter

# QuickUSB<sup>®</sup> Supports SOPC Builder

The screenshot displays the Altera SOPC Builder interface for a project named 'low\_cost\_2C35'. The main window shows a system tree on the left with components like IDT71V416 SRAM, On-Chip Memory, SDRAM Controller, and various microcontrollers. The central pane shows a list of modules and their connections. The 'quickusb\_avalon\_interface\_0' module is highlighted, and its configuration window is open on the right.

**QuickUSB Avalon Interface - quickusb\_avalon\_interface\_0**

**QuickUSB Avalon Interface 1.0 Settings**

Built on: 2006.05.15.11:48:24  
 Class name: quickusb\_avalon\_interface  
 Class version: 1.0  
 Component name: QuickUSB Avalon Interface  
 Component Group: USB

**Parameters**

infifo_depth:	512
outfifo_depth:	512
datawidth:	16
avalon_address_width:	16
reg_depth:	8

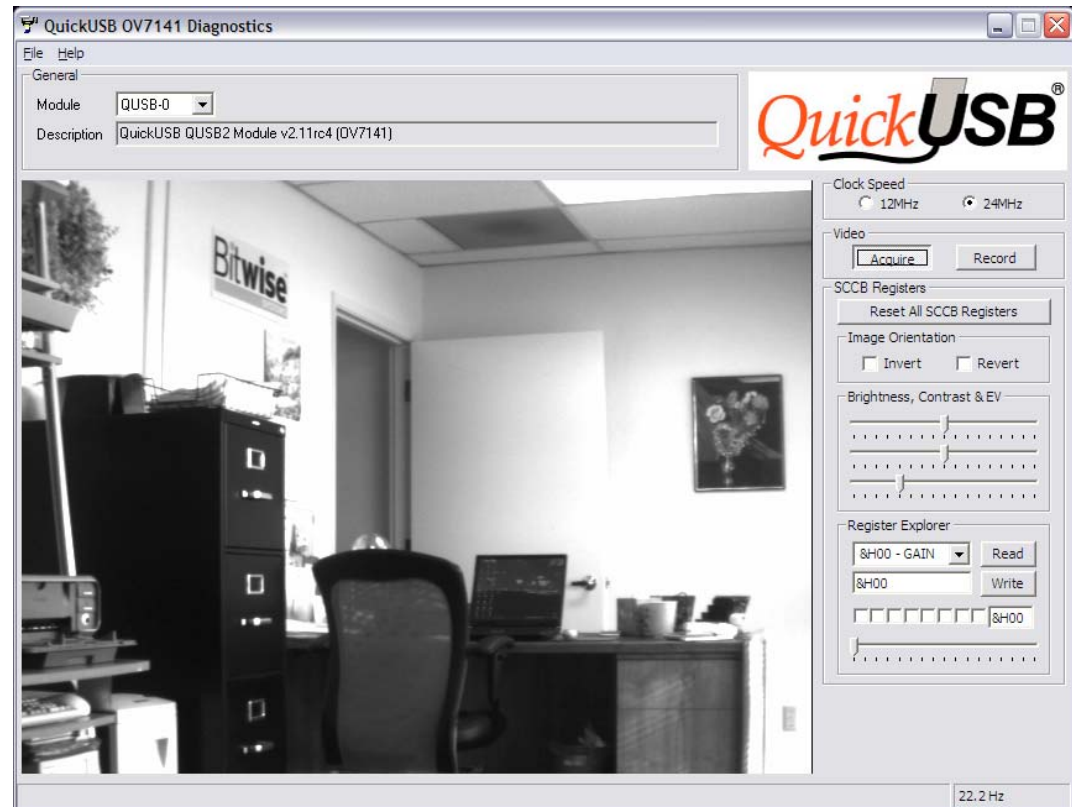
**Parameterized Signal Widths**

quickusb_fd[(((datawidth - 1)) - (0) + 1):	16
avalon_data_address[(((avalon_address_width - 1)) - (0) + 1):	16
avalon_data_writedata[(((datawidth - 1)) - (0) + 1):	16
avalon_data_readdata[(((datawidth - 1)) - (0) + 1):	16
avalon_command_address[(((avalon_address_width - 1)) - (0) + 1):	16
avalon_command_writedata[(((datawidth - 1)) - (0) + 1):	16
avalon_command_readdata[(((datawidth - 1)) - (0) + 1):	16

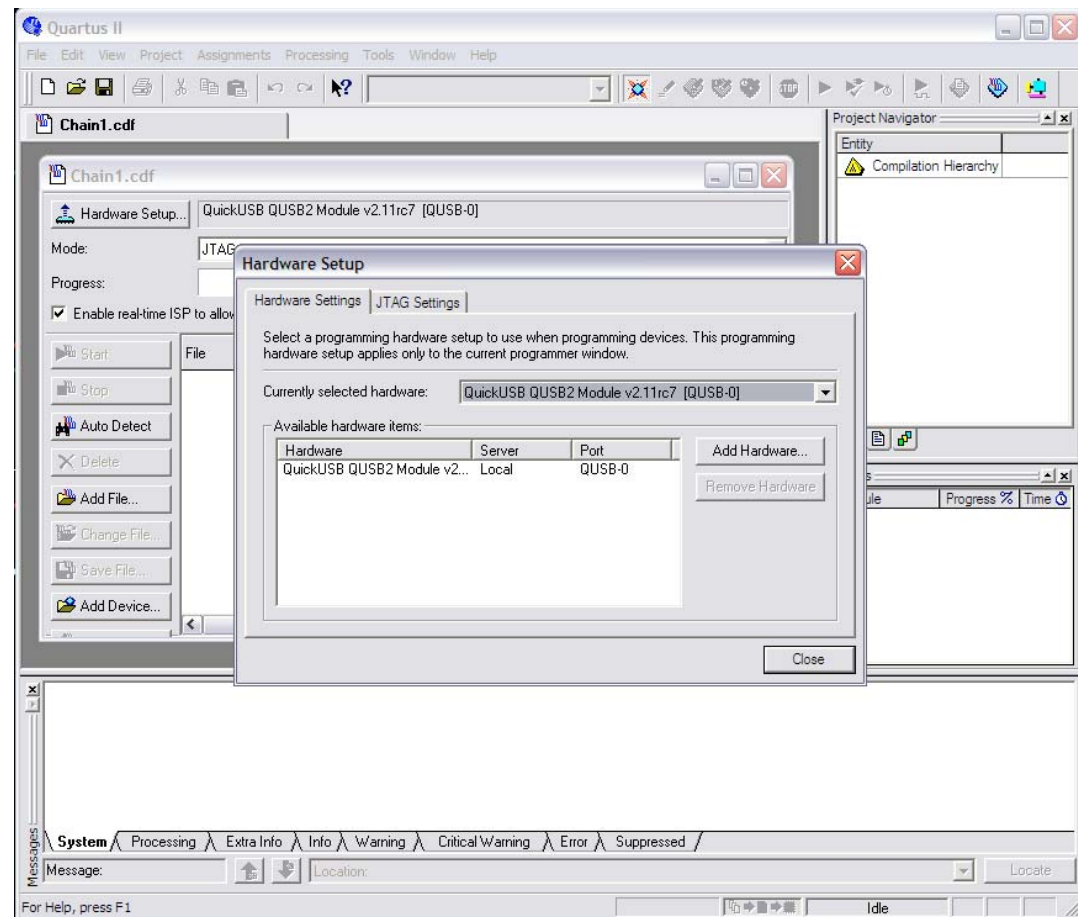
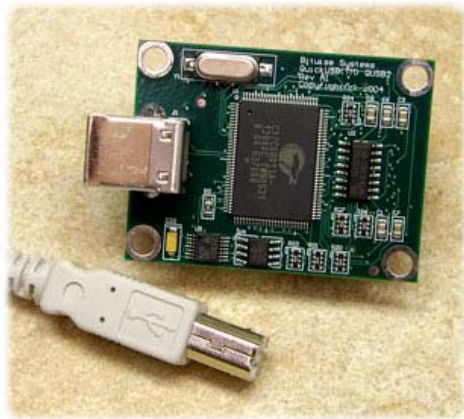
The configuration window also shows a table of connections for the 'quickusb\_avalon\_interface\_0' module:

Use	Module Name	Description	Input C
<input checked="" type="checkbox"/>	cpu	Nios II Processor - Altera Corporation	sys_clk
<input checked="" type="checkbox"/>	instruction_master	Master port	
<input checked="" type="checkbox"/>	data_master	Master port	
<input checked="" type="checkbox"/>	jtag_debug_module	Slave port	
<input checked="" type="checkbox"/>	epcs_controller	EPCS Serial Flash Controller	sys_clk
<input checked="" type="checkbox"/>	onchip_ram_4k	On-Chip Memory (RAM or ROM)	sys_clk
<input checked="" type="checkbox"/>	sys_clk_timer	Interval timer	sys_clk
<input checked="" type="checkbox"/>	jtag_uart	JTAG UART	sys_clk
<input checked="" type="checkbox"/>	button_pio	PIO (Parallel I/O)	sys_clk
<input checked="" type="checkbox"/>	led_pio	PIO (Parallel I/O)	sys_clk
<input checked="" type="checkbox"/>	seven_seg_pio	PIO (Parallel I/O)	sys_clk
<input checked="" type="checkbox"/>	sysid	System ID Peripheral	sys_clk
<input checked="" type="checkbox"/>	ddr_sdram	DDR SDRAM Controller MegaCore Fu...	sys_clk
<input checked="" type="checkbox"/>	ddr_pll_cycloneii	PLL (Phase-Locked Loop)	clk_in
<input checked="" type="checkbox"/>	quickusb_avalon_interface_0	QuickUSB Avalon Interface	
<input checked="" type="checkbox"/>	avalon_data	Slave port	sys_clk
<input checked="" type="checkbox"/>	avalon_command	Slave port	sys_clk
<input checked="" type="checkbox"/>	qusb_dma	DMA	sys_clk
<input checked="" type="checkbox"/>	read_master	Master port	

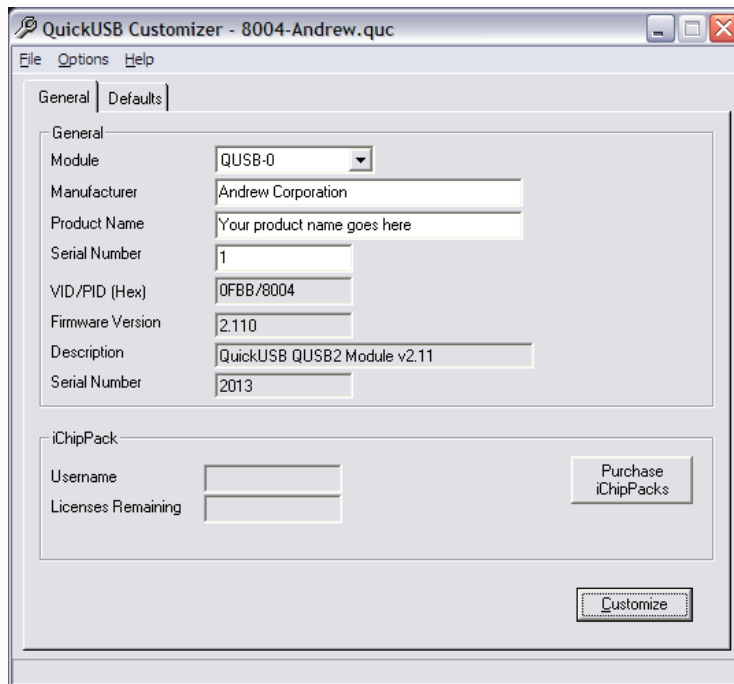
# QuickUSB<sup>®</sup> Interfaces with Imager Sensors



# QuickUSB<sup>®</sup> Interfaces with Quartus



# The QuickUSB Customizer



- Each customer gets a unique PID stored in a QUC template file
- The QuickUSB Customizer lets you change the following items
  - PID
  - Manufacturer Name String
  - Product Name String
  - Serial Number
- Automatically increments the serial number for each unit programmed
- Save all items to the QUC template file

# Partial List of QuickUSB Design Wins

- Laser Engraver
- Miniature IR camera digital interface
- Ultrasound
- Accelerometer interface for medical imaging
- CT Scanner
- Ganged anemometer system
- DSP-based motion control
- Lab test equipment
- Fiber-optic interferometer w/digital imager
- Satellite digital downlink
- Direct to digital television receiver
- Compton camera for positron emission tomography (CERN)

# QuickUSB® Sales Information

- Distributors

- UK/EU

- Israel

The logo for Kanda.com, featuring the text "Kanda.com" in white on a dark purple rectangular background.The logo for BZ-OM, featuring the text "BZ-OM" in white on a blue background with a red and white circular graphic element. Below it, the text "COMMUNICATION & EMBEDDED SOLUTIONS" is written in a smaller font.

- Learn more and buy QuickUSB products online at

- [www.quickusb.com](http://www.quickusb.com) in USA or

- [www.kanda.com](http://www.kanda.com) for rest of the world

P.O. Box 200

Aberystwyth

SY23 4AY

UK

Phone: +44 (0)8707 446 807

Fax: +44 (0)8707 446 807

Email: [sales@kanda.com](mailto:sales@kanda.com)

Web: [www.kanda.com](http://www.kanda.com)