

HELIX PC/104
SBC with
Vortex86DX3 1GHz
CPU and Data
Acquisition



DIAMON
S Y S T E M



Helix "A" model with integrated data acquisition

FEATURES

CPU Features

- Vortex86DX3 SoC dual core CPU running at 1GHz
- Up to 2GB of DDR3 SDRAM soldered on board
- 3 or 6 USB 2.0 ports (model dependent)
- 2 RS-232/422/485 serial ports & 2 RS-232 ports
- 1 10/100Mbps Ethernet port
- 1 Gigabit Ethernet port
- 1 SATA port for disk-on-module or external drive
- 1 mSATA socket shared with PCIe MiniCard
- 24-bit dual channel LVDS LCD display
- VGA CRT
- HD audio
- PCIe MiniCard socket shared with mSATA
- 16 16-bit analog inputs
- 100KHz maximum sample rate
- 4 16-bit analog outputs
- Up to 27 digital I/O lines with programmable direction
- 8 counter/timers
- 4 pulse width modulators
- PC/104 stackable I/O expansion capability
- PC/104 extended form factor (4.0" x 4.0")
- 40°C to +85°C operation

◆ Description

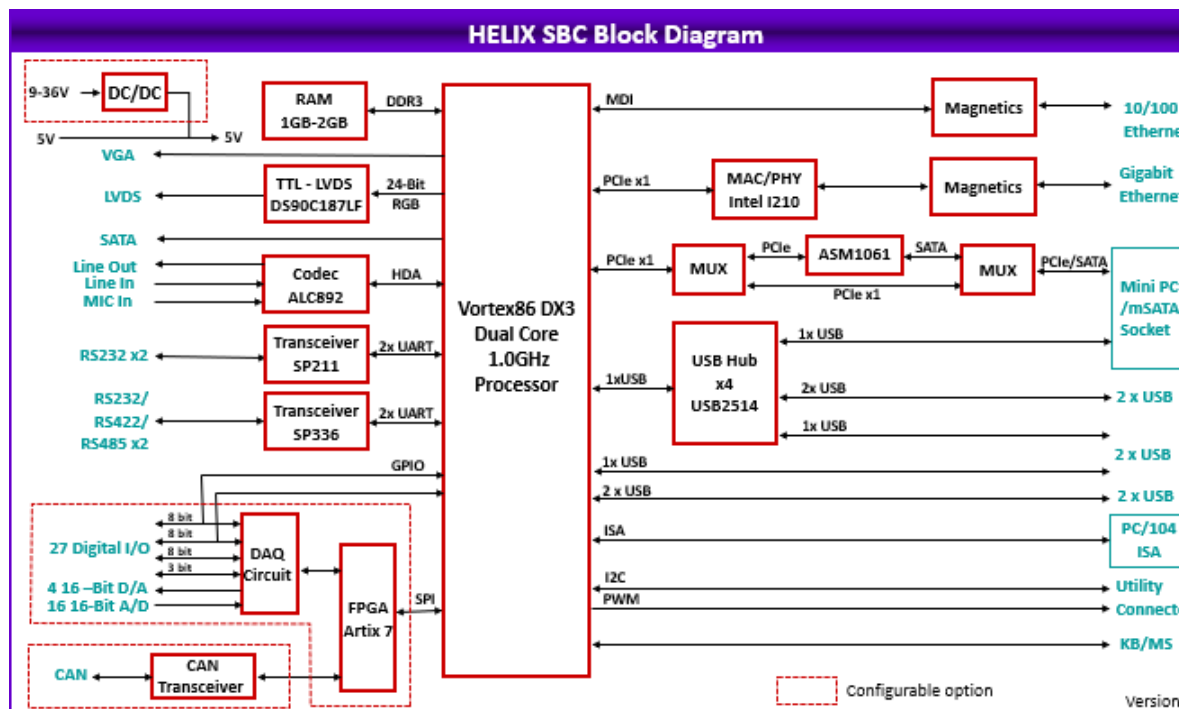
The HELIX family of PC/104 SBCs combines mid-range CPU performance, standard PC I/O, and on-board data acquisition circuitry in a compact size and at a competitive price. Available PC I/O includes 3 or 6 USB 2.0 (model dependent), 4 serial ports (2 RS-232/422/485 and 2 RS-232), 1 10/100Mbps Ethernet, 1 Gigabit Ethernet, and a SATA port. The optional data acquisition circuit includes 16 16-bit analog inputs, 4 16-bit analog outputs and 27 digital I/O lines configurable as counter/timers and pulse width modulators.

Helix supports stackable I/O expansion with PC/104 I/O modules, and it also has a combination mSATA/PCIe MiniCard socket for additional I/O expansion and mass storage. I/O modules featuring WiFi, Ethernet, analog I/O, digital I/O, and CAN are available in the PCIe MiniCard form factor, providing compact expandability without increasing the total height of the system.

Helix runs Linux and Windows Embedded Standard 7. Both Linux and Windows Embedded 7 Software Development Kits are available with bootable images and drivers to get you started on your design project right out of the box. Note: Board does not support booting from mSATA port.

The Helix SBC was designed with rugged applications in mind. With an operating temperature of -40°C to +85°C, soldered on-board memory, and thicker PCB, Helix is an excellent choice for vehicle and other harsh environment applications. A 9-36VDC power supply option is also available for easier integration into industrial or military systems.

◆ Block Diagram



◆ Development Kits

Complete Development Kits with a bootable operating system are available with all the components you need to get started on your embedded design project. The kit contains a Helix SBC, 32GB MLC SATA-DOM flashdisk with your choice of Windows Embedded 7 or Linux pre-loaded, cable kit, and software CD.

◆ Cable Kit

The Helix cable kit includes cables for Helix input and output. Many cables are also available individually.

CK-HLX-01 includes the following cables:

No.	Qty	Cable	Description	Drawing
1	1	6980511	Battery cable	Show
2	1	6980512	Power input cable, discrete wires	Show
3	2	6980515	Digital I/O and Analog I/O cables	Show
4	2	6981075	Dual serial port DB9M	Show
5	1	6981076	Audio	Show
6	1	6981080	Gigabit Ethernet cable, RJ-45 socket, 10 pin board connector	Show
7	2	6981082	Dual USB 2.0 type A	Show
8	1	6981083	Keyboard/Mouse, 2mm 2x4 crimp to 2x Mini-DIN-6	Show
9	1	6981084	VGA	Show
10	1	6981161	RJ45PNL-CRIMP2x5 2mm, 12"	Show
11	1	6981169	Ribbon cable for GPIO, A/D, and misc	Show
12	1	6989101	SATA Cable, 7-Pin Data, Straight to Right Angle, 500mm	Show

◆ Helix Data Acquisition Circuit

Helix is available with two different data acquisition circuits, denoted by either A or D in the model number.

All digital and analog I/O features are supported by Diamond's industry-leading Universal Driver software, which provides a C language programming library that supports all features in an easy-to-use, high-level fashion. Demo programs with source code and executables are included to demonstrate the use of each library function. A graphical monitor and control program provides easy access to all the I/O features and lets you prototype your application quickly as well as debug problems. Universal Driver is available as a free download from our website upon acceptance of our software license agreement.

◆ "A" Model Full Data Acquisition

Helix "A" models include a complete data acquisition circuit with a combination of analog and digital I/O features. The circuit controller is an FPGA that interfaces to the DX3 processor via the SPI bus for data I/O and via the ISA bus for interrupt operation.

A/D Features

- 16 analog voltage inputs
- 16-bit resolution (1 part in 65536)
- Programmable input ranges: 0-5V, 0-10V, +/-5v, +/-10V
- Single-ended and differential input configuration options
- Precision, low-drift 2.5V reference voltage

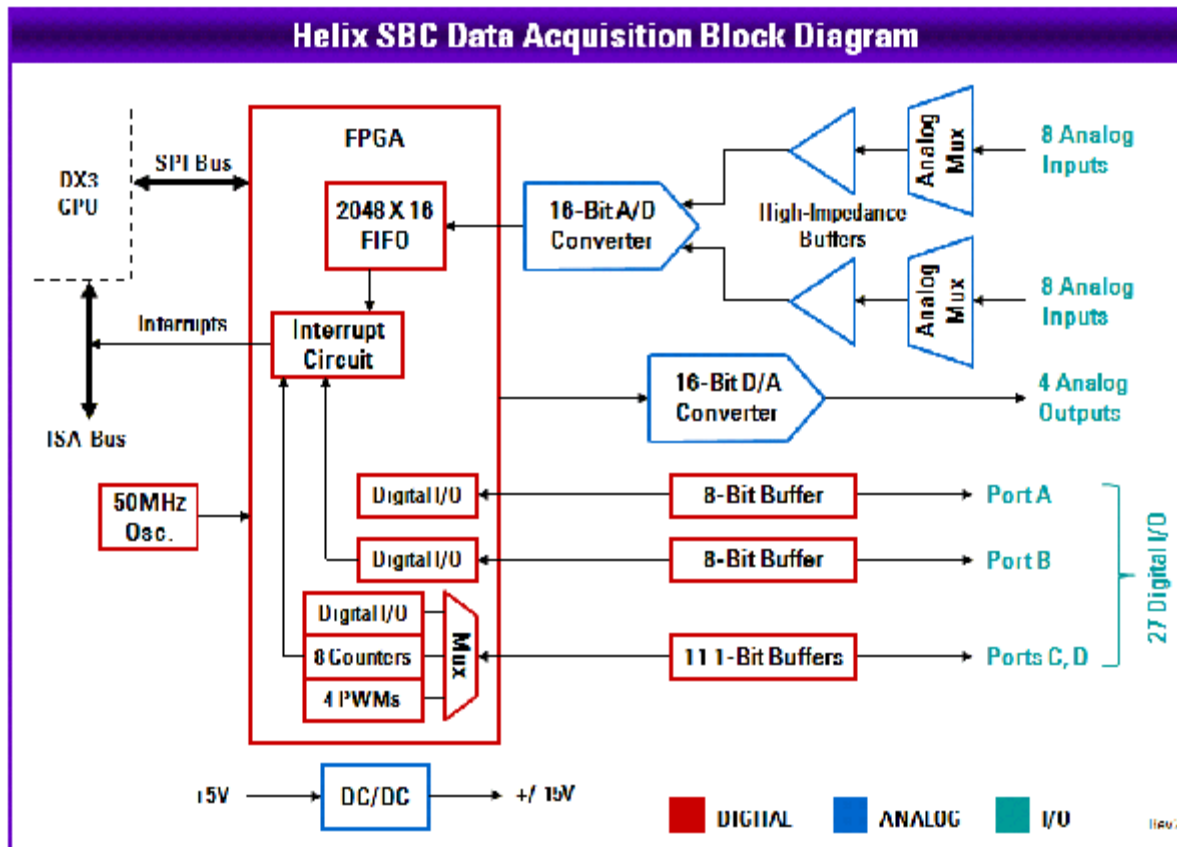
- 100KHz maximum total A/D sample rate (all active channels combined)
- Integrated 2048-sample FIFO and interrupt service for efficient high-speed sampling

D/A Features

- 4 analog voltage outputs
- 16-bit resolution (1 part in 65536)
- Single-channel and multi-channel simultaneous update modes
- Programmable output range: 0-5V, 0-2.5V
- 330KHz update rate capability
- Waveform generator on 1 to 4 outputs with user-defined waveforms and 2048-sample waveform buffer

Digital I/O features

- 27 digital I/O lines
- User-selectable 3.3V / 5V logic levels
- User-selectable 10K pull-up / pull-down resistors
- Programmable direction in 8-bit and 1-bit groups
- 8-bit programmable edge detection circuit
- Buffers for protection and higher current drive
- 8 32-bit counter/timers with up counting, down counting, pulse output, and interrupt features
- 4 24-bit pulse-width modulators with programmable duty cycle and output polarity
- Interrupt support on ISA bus for A/D, digital I/O, and counter/timer circuits

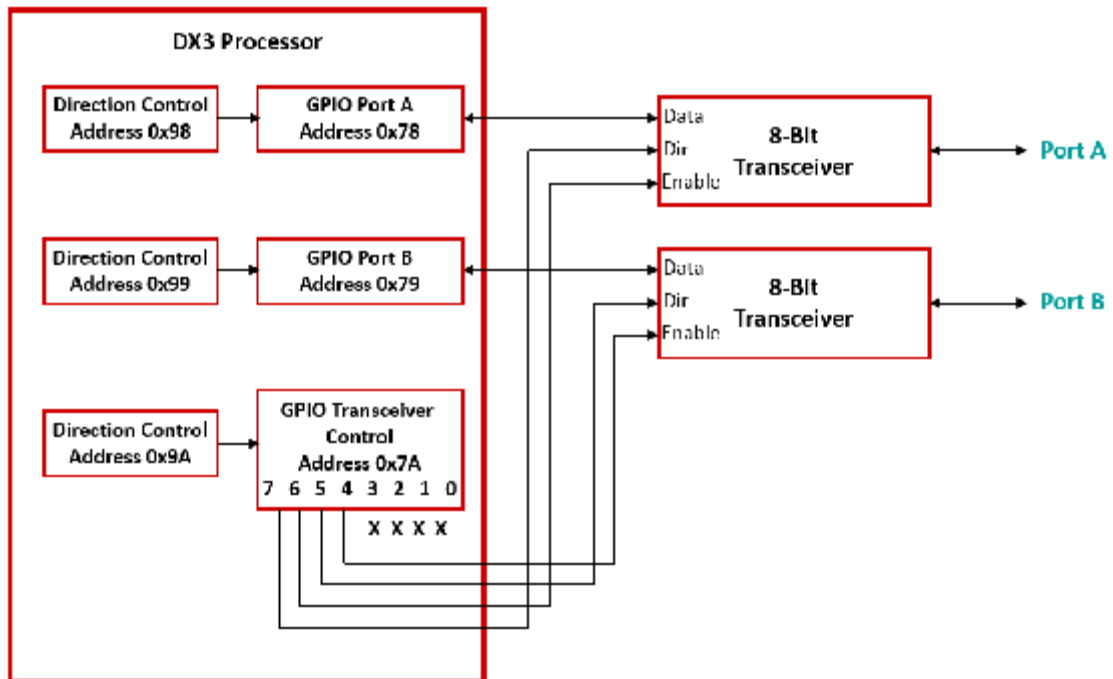


◆ "D" Model Digital I/O

Helix "D" models include a digital I/O (GPIO) circuit coming from the DX3 processor with the following features:

- 16 digital I/O lines
- User-selectable 3.3V / 5V logic levels
- User-selectable 10K pull-up / pull-down resistors
- Programmable direction in 8-bit groups
- Buffers for protection and higher current drive

Helix SBC Processor Digital I/O Block Diagram



Rev

◆ Specifications

CPU	
Processor	1GHz dual core DMP Vortex86DX3
Memory	Up to 2GB of on-board 64-bit DDR3 SDRAM
Bus Interface	PC/104 (ISA)
Display Type	24-bit LVDS LCD and VGA CRT
Display Resolution	LVDS: 1920 x 1080 maximum VGA: 1920 x 1080 maximum 1280 x 1024 maximum in dual display mode
USB Ports	3 or 6 USB 2.0 ports (model dependent)
Serial Ports	2 RS-232/422/485 ports 2 RS-232 ports
Networking	1 10/100Base-T Ethernet ports 1 Gigabit Ethernet port
Mass Storage	1 SATA 1.5Gbps port for external hard drive or SATA DOM 1 mSATA socket shared with PCIe MiniCard
Keyboard / Mouse	PS/2
Audio	HD audio ALC892 CODEC with stereo line out, line in and microphone
Analog inputs	16 16-bit
Input ranges	±10V, ±5V, 0-10V, 0-5V programmable
Sample rate	100KHz maximum
On board FIFO	2048 samples, programmable threshold
DAQ calibration	Autocalibration values stored in EEPROM
Analog outputs	4 16-bit

Output ranges	0-5V, 0-2.5V programmable
Digital I/O	27 lines independently programmable (A model) 16 lines independently programmable (D model)
PWM	4 24-bit pulse width modulators
Counter/timers	8 32-bit counter/timers
Watchdog Timer	Programmable watchdog timer 0-255 seconds
Expansion socket	PCIe MiniCard socket shared with mSATA
Expansion bus	PC/104 (ISA) stackable I/O expansion
Input power	+5VDC ±5%
Power Consumption	7.5W
Cooling	Heat sink, no fan
Operating Temperature	-40°C to +85°C (-40°F to +185°F)
Shock	MIL-STD-202G compatible
Vibration	MIL-STD-202G compatible
Dimensions	4.0" x 4.0" (101.5mm x 101.5mm)
Weight	2.5 oz / 70.8g with heat sink
MTBF	HLX1000-2GA: tbd hours
RoHS	Compliant

◆ Models and Accessories

Helix		
available models:		
HLX1000-1GA	Helix SBC, 1 GHz VortexDX3 CPU, 1GB DDR3 SDRAM, analog I/O (Data Acquisition), digital I/O, extended temperature.	Min Order Quantity
HLX1000-2GA	Helix SBC, 1GHz Vortex 86DX3 CPU, 2GB DDR3 SDRAM, analog I/O, digital I/O, extended temperature	Available
HLX1000-1GD	Helix SBC, 1GHz Vortex 86DX3 CPU, 1GB DDR3 SDRAM, digital I/O, extended temperature	Available
HLX1000-2GD	Helix SBC, 1GHz Vortex 86DX3 CPU, 2GB DDR3 SDRAM, digital I/O, extended temperature (minimum order quantities apply)	Min Order Quantity
DK-HLXA-WE7	Helix Development Kit with HLX1000-2GA SBC, cables, and Windows Embedded 7 OS	Available
DK-HLXA-LNX	Helix Development Kit with HLX1000-2GA SBC, cables, and Linux OS	Available
DK-HLXD-WE7	Helix Development Kit with HLX1000-1GD SBC, cables, and Windows Embedded 7 OS	Available
DK-HLXD-LNX	Helix Development Kit with HLX1000-1GD SBC, cables, and Linux OS	Available
SDK-HLX-WE7	Helix Windows Embedded 7 Software Development Kit	Available
SDK-HLX-LNX	Helix Linux Software Development Kit	Available

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Cables and accessories	
available models:	
FDSM-64G-XT	SATADOM Flashdisk, MLC, 64GB, Pin 7 VCC, -40/+85C
FDSM-32G-XT	SATADOM Flashdisk, MLC, 32GB, Pin 7 VCC, -40/+85C
FDMM-64G-XT	mSATA MLC Flashdisk, 64GB, extended temperature

FDMM-32G-XT	mSATA MLC Flashdisk, 32GB, extended temperature
FDMM-16G-XT	mSATA MLC Flashdisk, 16GB, extended temperature
6980511	Battery cable
6980512	Power input cable, discrete wires
6980515	Digital I/O and Analog I/O cables
6981075	Dual serial port DB9M
6981076	Audio
6981080	Gigabit Ethernet cable, RJ45 socket, 10 pin board connector
6981082	Dual USB 2.0 type A
6981083	Keyboard/Mouse, 2mm 2x4 crimp to 2x Mini-DIN-6
6981084	VGA
6981161	RJ45PNL-CRIMP2x5 2mm, 12"
6981169	Ribbon cable for GPIO, A/D, and misc
6989101	SATA Cable, 7-Pin Data, Straight to Right Angle, 500mm

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