Extending startKIT using the PCIe slot and sliceCARDs

1 Introduction

The flexibility of the GPIO pins on xCORE multicore microcontrollers allows developers to reconfigure the capabilities of the devices to support many different applications. The PCIe slot on the startKIT board can be used to extend the hardware capabilities and interfaces by plugging in expansion boards that we call sliceCARDs.

XMOS already has a set of sliceCARDs that you can buy. Alternatively it is easy to design your own slices to extend the platform as the PCIe connectors are simply contacts to the sliceCARD.
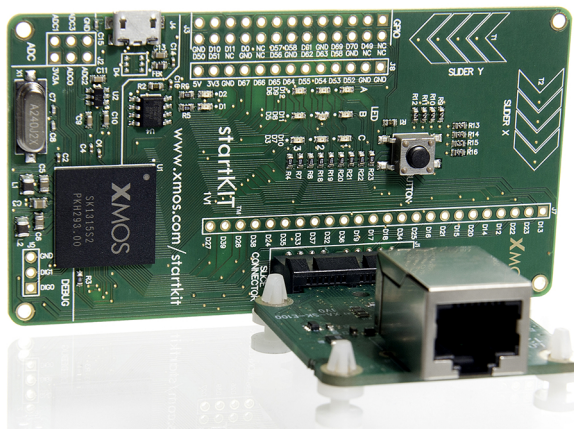

Figure 1:
startKIT with
Ethernet
sliceCARD

Further information on sliceCARDs is available in the *sliceKIT Modular Development Kit Product Brief*[1] and *sliceKIT Selector Guide*[2].

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[1] http://www.xmos.com/published/slicekit-modular-development-system-product-brief?version=latest
[2] http://www.xmos.com/published/slicekit-selector-guide?version=latest

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2   startKIT compatible sliceCARDs

The sliceCARDs listed below are compatible with the PCIe connector on startKIT:

sliceCARD	Features
Audio	4 analog I/O channels via two 3.5mm jack MIDI I/O S/PDIF output via coax On board audio clocks
Ethernet	10/100Mb Ethernet PHY RJ45 connector MII interface to xCORE
GPIO	4 LEDs 2 buttons One RS232 serial cable with DB9 connector 4 channel A/D via I2C interface Thermistor input via A/D
IS-BUS	Any serial protocol up to 60MHz pin speed, higher speeds with external SERDES Fully tested softIP, including: UART, RS485, USB, SPI, CAN, I2C, PWM, IEEE 802. Ethernet, ModBus Ample headroom for other real-time tasks
LCD	480 x 272 full color display 40-pin ZIF connector with ribbon cable to the display Resistive touch screen with 2 wire interface to xCORE
MUART	8 full duplex RS232 UARTs via I/O headers DB9 connector allowing RS232 serial cable to connect to one of the UARTs Up to 115.2 Kbaud Configurable parity, stop bits, bits per character
SDRAM	8 MByte SDRAM Clock speed up to 50MHz Data rate up to 80MBytes/second
WiFi	High performance 2.4GHz WLAN module 802.11b/g wireless connectivity Throughput of up to 7Mbps

Figure 2:
startKIT compatible sliceCARDs

3   Designing a sliceCARD

This section provides guidelines for creating sliceCARDs to use with startKIT.

3.1   Signal I/O

A sliceCARD connector has 36 contacts that are connected to the xCORE I/Os as shown in the table below:

Port	Pin	PCIe (top)	PCIe (bottom)	Pin	Port
	NC	B1	A1	NC	
P1F0	X0D13	B2	A2	5V	
	GND	B3	A3	X0D12	P1E
P1G0	X0D22	B4	A4	X0D23	P1H
	3V3	B5	A5	GND	
P4C0	X0D14	B6	A6	X0D20	P4C2
P4C1	X0D15	B7	A7	X0D21	P4C3
	GND	B8	A8	X0D25	P1J0
P4C1	X0D16	B9	A9	X0D18	P4D2
P1J0	X0D34	B10	A10	GND	
P4D2	X0D17	B11	A11	X0D19	P4D3
P4D0	X0D36	B12	A12	X0D32	P4E2
P1N0	X0D37	B13	A13	X0D33	P4E3
P4D3	CLK	B14	A14	GND	
P1I0	X0D24	B15	A15	X0D35	P1L0
	GND	B16	A16	RST_N	
P1O0	X0D38	B17	A17	X0D26	P4E0
P1P0	X0D39	B18	A18	X0D27	P4E1

Figure 3:
PCIe
connector

NOTES:

▶ PCIe connector uses a 25MHz CLK signal generated by the debugger on startKIT.

▶ The system reset input, generated by the debugger is active low; push-pull drive.

▶ 5V and 3V3 power supplies are provided by the debugger.

If you want to design a sliceCARD that is compatible with startKIT and sliceKIT please refer to the sliceKIT Hardware Manual for further details on pin compatibility.

3.2   Power

sliceCARDs have two power supplies available to them:

▶ 5V supply can range from 4.75V to 5.25V (5%) at a current of up to 0.25A per slice

▶ 3V3 supply can range from 3.13V to 3.47V (5%) at a current of up to 0.25A per slice

sliceCARDs can take their power from either 5V or 3V3 or both, but they should draw no more than 250mA from each supply.

At system power-on, the 5V supply will power up first, followed by the 3V3 supply. The system reset signal will de-assert a short time after this.
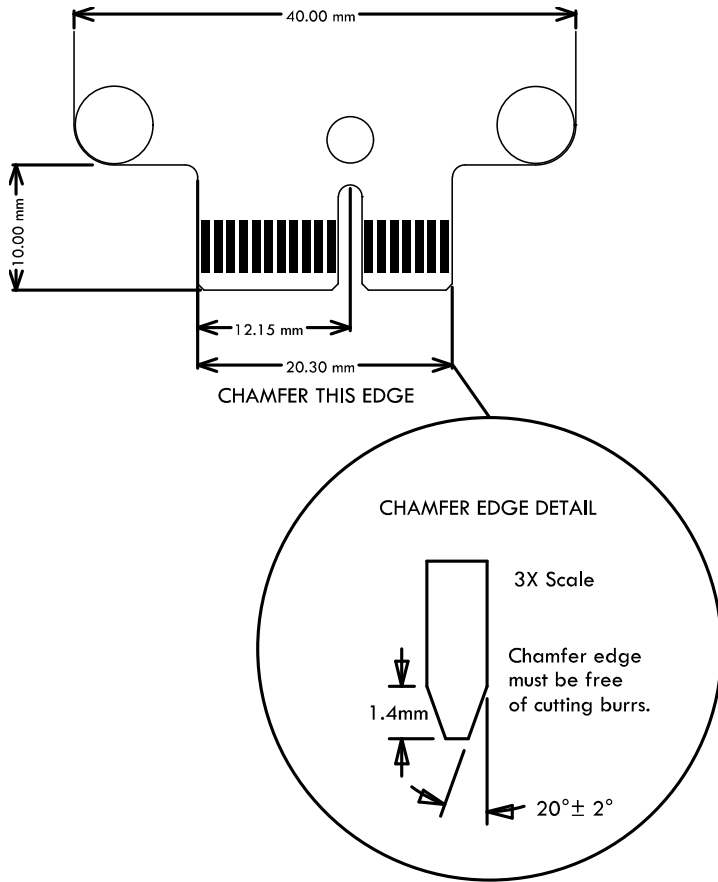
3.3   sliceCARD form factors

The sliceCARDs use a standard PCIe x1 edge finger to connect to the sliceKIT core board. Because of this, all sliceCARD PCBs must be 1.6mm thick.

There is no hard specification as to the length of sliceCARDs as this poses no mechanical clashing hazard, however to avoid clashing with other sliceCARDs or the power input connector, sliceCARDs should be limited to 40mm wide.

Four mounting holes are specified in the corners of the slice for mechanical stability. These should be used with 6mm standoffs, example part Toby Electronics DCB-6.

An optional retention hole is specified for use in securing the sliceCARD to the sliceKIT core board. This is useful to ensure the sliceCARDs is not accidentally unplugged when using the system. Typical usage uses a 2.54mm cable tie between this hole and the associated hole in the sliceKIT core board ensuring the sliceCARD cannot be unplugged.

40.00 mm

10.00 mm

12.15 mm

20.30 mm

CHAMFER THIS EDGE

CHAMFER EDGE DETAIL

3X Scale

Chamfer edge
must be free
of cutting burrs.

1.4mm

20°± 2°

Note that for quick, low cost boards using low cost PCB manufacturing, the chamfer is not required and can be generated by hand using a file or similar.

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