PRODUCT DATASHEET

SCP/DCP-122

3U cPCI Single Board Computer

Features

- Based on the IBM PowerPC 750FX processor
  - 800+ MHz
  - 1856+ DMIPS
  - 100 MHz CPU bus speed
  - 512 Kbyte of Internal L2 Cache running at core processor speed
- cPCI Bus
  - System controller and Peripheral controller
  - 3.3V or 5V signaling supported
  - 33 or 66MHz operation
  - Compliant with PICMG 2.0, Revision 3.0 CompactPCI Specification
- PMC Expansion Site
  - 64-bit, 33/66 MHz
  - Support for 3.3V or +5V PMC's
  - Full 64-bit user I/O
- Memory
  - 128 Mbyte or 256 Mbyte of SDRAM with ECC at 100 MHz
  - 64 Mbyte non-volatile Flash
  - Flash for Permanent Alternate Boot Site (PABS)
  - 32 Kbyte nonvolatile RAM
- I/O
  - 1 x 10/100BaseT Ethernet port
  - 1 x RS-232 Serial port
  - 2 x HDLC/SDLC-capable EIA 422 serial channels (2 asynchronous or 1 synchronous)
  - 1 x USB 1.1
  - 8 x general purpose DMA controllers
  - Up to 16-bit Discrete I/O
- Timers
  - One 32-bit, Three cascadable 24-bit general purpose timers
  - Avionics Watchdog Timer with programmable time-out period
  - Real-Time Clock
- Comprehensive Foundation Firmware with:
  - Debug monitor and non-volatile memory programmer
  - Suite of card support service routines
  - BIT firmware with 95%fault coverage
  - Ethernet connection option
- BSP Support
  - VxWorks Tornado 2 for PowerPC
  - INTEGRITY, Linux, LynxOS (call for availability)
- Available in both SCP and DCP versions;
  - Conduction and Convection cooled
  - Level 0 up to Level 200 - fully ruggedized

CURTISS WRIGHT Controls Embedded Computing

The CompactCore Family

CompactCore is our family of small form-factor embedded comput-ing solutions with products offered in 3U cPCI and Processor PMC (PrPMC) form-factors.

The CompactCore family is comprised of 3U cPCI single board computers (SBCs) (SCP/DCP-122 & 124), a PMC carrier card (SCP/DCP-201), and the PMC-106 Processor PMC. CompactCore products are offered in commercial, rugged air-cooled and conduc-tion-cooled versions. These small-form factor products allow sys-tems developers to take advantage of COTS solutions for a new range of space and weight constrained applications that cannot accommodate the 6U standard. While small in size, the Com-pactCore products offer processing power to handle large applica-tions.

Overview

We introduced the industry leading SCP/DCP-119, the first fully ruggedized 3U cPCI single board computer (SBC) designed for harsh environment, space constrained computing. Continuing with this role as the pioneer in rugged 3U cPCI technology, we have added the SCP/DCP-122 and 124 to our CompactCore product line.

With increased processing power, functionality, and flex-ibility, the 122 is a key component in a solutions-based approach to high den-sity processing requirements.

Designed for space and power constrained applications, the 122 offers the greatest processing/lowest power con-sumption of any ruggedized 3U cPCI single board com-puter on the market today. Based on the IBM 750FX proces-sor, it runs at a clock speed of 800 MHz while executing an impressive 1856 Dhrystone Millions of Instructions per Second (DMIPS).

The challenge of high density comput-ing is to pack the greatest functionality into the smallest stan-

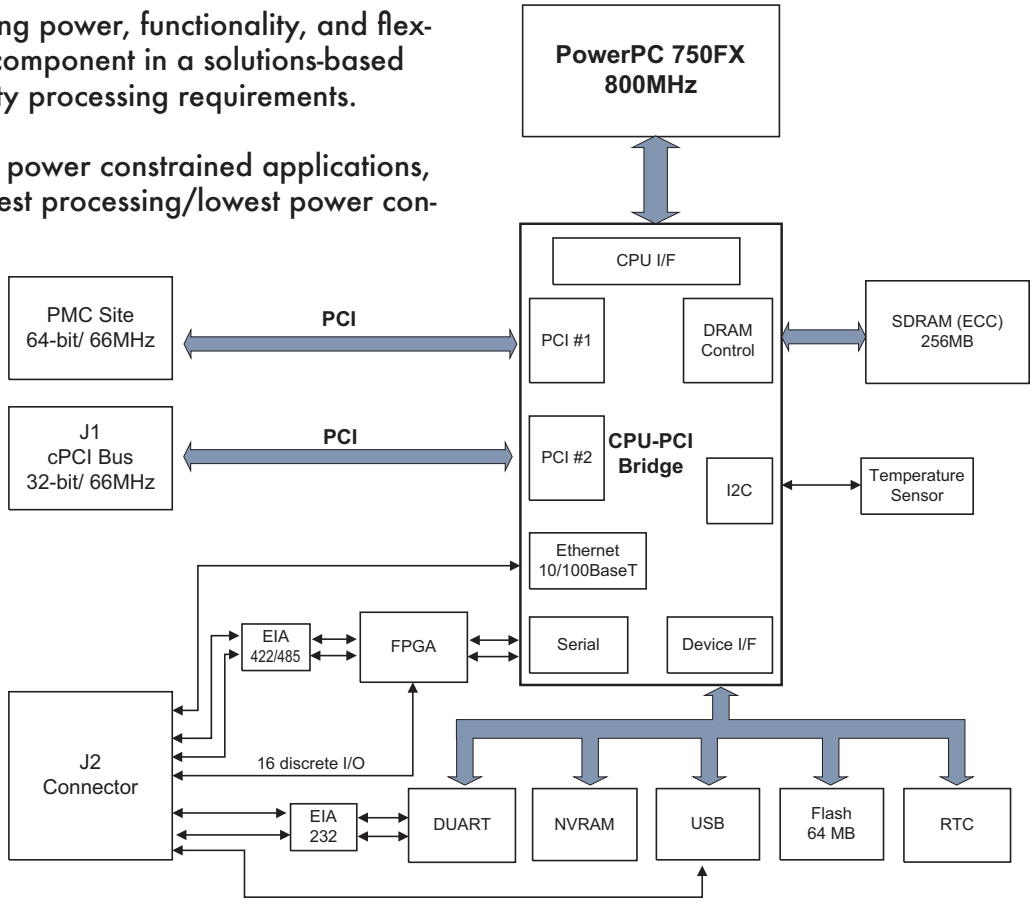

Figure 1: 122 Block Diagram

dard form factor possible while retaining as much flexibility as possible. In conjunction with its processing power, the SCP/DCP-122 meets this challenge by offering a full-speed onboard PMC site that allows developers to integrate our own or 3rd party PMCs directly onto the 122. A rich complement of I/O is also available on the 122 including Ethernet/Fast Ethernet, up to 3 serial channels (RS-232/422), up to 16-bit Dis-crete Digital I/O, and a Universal Serial Bus (USB) port.

The SCP/DCP-122 also serves as the foundation to a solutions-based approach to high density computing. To enable rapid development of 3U cPCI systems, 122 is fully interoperable with a host of our PMCs. With this in mind, the 122 has been fully tested and qualified with a complement of our PMC's to enable easy interop-erability "out-of-the-box".

Architecture

The SCP/DCP-122 embodies the spirit of high-density computing and is powered by the IBM PowerPC 750FX, which operates at a core speed of 800 MHz and executes an impressive 1856 DMIPS. Further enhancing system level performance is the 512 Kbytes of internal Level 2 cache. Because this memory is internal to the processor it operates at core speed thus improving memory access times.

The 122 uses a highly integrated system controller with PCI inter-face and communication ports for high performance embedded con-trol applications. This controller - or bridge - connects the 750FX to the SDRAM main memory and acts as the memory controller. Also connected to the controller is the PCI bus 1 and the PCI bus 0 which together provide the PMC and cPCI interfaces. PCI bus 1 connects to the J1 connector on the back panel. The bridge also includes a serial interface. Serial signals are routed through the FPGA which switches to select Discrete I/O, synchronous or asynchronous RS-422 signals. Finally, a device bus also located on the bridge connects to the USB host controller and Flash memory.

PowerPC Processor

The IBM PowerPC 750FX is a 32-bit implementation of the PowerPC (PPC) architecture. Capable of running at 800MHz core speed and executing an impressive 1856 DMIPS, it offers significant advantages in performance per watt when compared to other similar proces-sors. The 122 is also designed to be upgradeable to the next generation processor, the IBM 750GX. Level 2 cache memory (L2 cache) is contained internally within the 750FX and has been doubled to 512 Kbytes over the previous gen-eration 750C. The main advantage of an internal L2 cache is performance since it operates at core speed. In this case the core speed of the 750FX is 800 MHz with IBM specifying that availability of a 1 GHz processor is on the roadmap.

Table 1: IBM 750FX Processor Specifications

Max Core Speed	Max Bus Speed	L2 Cache (Internal)	Power (typical/Max.)	Core Voltage
800 MHz	200 MHz	512 Kbytes	5.0 to 7.5W at 800 MHz	1.45V

PMC Expansion

To enable system flexibility and to enhance system functionality through expansion, the 122 provides a full speed 64-bit 33/66 MHz PMC site directly on the basecard. Expansion can further be enhanced by combining the 122 with our conduction cooled carrier card, the SCP/DCP-201, and a complement of our PMC's that have been tested and qualified over temperature, shock and vibration to ensure interoperability in harsh environments. The SCP/DCP-122 has been tested and qualified with the following set of PMC's:

- PMC-706 graphics controller
- PMC-704 graphics controller
- PMC-702 graphics controller
- PMC-700 graphics controller
- PMC-643 dual channel, conduction cooled Fibre Channel card
- PMC-601 dual MIL-STD 1553 interface

Memory

Main Memory

Main memory on the SCP/DCP-122 consists of 128Mbyte of Synchronous Dynamic RAM (SDRAM) with Error Checking and Correction (ECC) to maintain data integrity. This is upgradeable to 256 Mbytes. SDRAM is accessed through the 122's system controller chip which also acts as the memory controller.

Flash Memory

In the event of power interruptions, flash memory banks can be used to store application code and for fast re-boot. The SCP/DCP-122 offers 64 Mbytes of high speed page mode flash memory. A Common-Flash-Interface has been incorporated into the 122 to enable using the different flash sizes.

Permanent Alternate Boot Site

As an alternate to the main software initialization code, a 8 Mbyte Permanent Alternate Boot Site (PABS) is provided as a backup boot site in the event the main Flash is corrupted. The device employed comes with the following performance specifications:

- Write protection
- 20 year data retention at 125°C

Non-Volatile Random Access Memory (nvRAM)

The Ferroelectric nvRAM is designed to provide fast, non-volatile storage of mission and other critical data and I/O that must not be lost during system power interruptions. The SCP/DCP-122 provides 32 Kbytes of non-volatile memory that allows S/W reads and writes to the nvRAM in the same way as main SDRAM. The nvRAM has a 10 year data retention.

Input/Output

Ethernet

The 122 provides a 10/100BaseT Ethernet interface compliant to IEEE 802.3 through the integrated Discovery System Controller. Ethernet access on the SCP/DCP-122 is through the backplane on all cards.

Serial Ports; RS-232, RS-422

Serial I/O on the SCP/DCP-122 is in the form of two RS-232 and two RS-422 channels, which can be configured as asynchronous or synchronous.

The RS-232 interface is implemented through an Intersil DUART. This device is capable of data rates of 115 Kbaud. RS-232 ports are acces-sible from the back panel connectors.

Up to two full duplex asynchronous or one synchronous RS-422 serial channels are available on the SCP/DCP-122. Data rates in asynchro-nous and synchronous modes are 115 Kbaud. RS-422 ports are acces-sible through the backplane. The RS-422 serial channels can be programmed as differential discrete I/O.

16 Bits of Discrete Digital I/O

The SCP/DCP-122 provides up to 16 bits of LVTTL-compatible discrete digital I/O. Each bit is individually programmable to be an input or output. In addition, each bit is capable of generating an interrupt upon a change of state, with the edge direction (high-to-low, low-to-high) also being programmable. On-board pull-up resistors are provided to allow direct connection to simple switch closure inputs. As outputs, the TTL discretes can sink 16 mA and source 12 mA. Quick switches are used to isolate the DIO circuitry when powered down.

Up to 4 Pairs of Differential Discrete Digital I/O

The 122 provides the capability to control each of the RS-422/485 driv-ers and receivers as differential-mode discrete signals via registers in the Board Controller FPGA. This allows flexibility in how the drivers and receivers are used. For instance, any Tx and Rx Clock signals that are not required on an asynchronous channel can be used as serial control signals (RTS, CTS, etc.,) for that channel or any other. Tx and Rx data signals from unused serial channels can be redeployed in the same way. In addition RS-422/485 drivers and receivers can also be used as general-purpose differential-mode control signals unrelated to serial I/O requirements. Differential discrete inputs can generate an interrupt upon a change of state, with programmable edge direction. Two differ-ential input pairs and two differential output pairs are supported.

USB

The 122 incorporates a Philips ISP1160 embedded USB Host Controller providing a single USB downstream port supporting data transfer at full speed (12 Mbit/s) and low speed (1.5 Mbit/s). The 122's USB port can be connected with any USB compliant USB device such as mice, keyboards and mass storage devices and USB hubs that have a USB upstream port. The port is connected to the backplane J2 connector and is multiplexed with PMC I/O.

Timers

In addition to the main system clock, the SCP/DCP-122 incorpo-rates both a Real Time Clock as well as an Avionics Watchdog Timer to maintain precise control and timing of system function.

Real Time Clock (RTC)

The Real Time Clock provides Time of Day and calendar readouts with a one second resolution. Indefinite standby is available thru connection of a power pin through the J2 backplane connector.

Avionics Watchdog Timer

The watchdog timer on the SCP/DCP-122 is a presettable downcounter with a resolution of 1 usec. Time periods from 1 usec to 16 seconds can be programmed. Initialization software can select whether a watchdog exception event causes an interrupt or a card reset. Once enabled to cause a reset, the watchdog cannot be disabled. A watchdog time-out log bit tells start-up code whether the last card reset was due to a watchdog exception.

Foundation Firmware and BIT

The SCP/DCP-122 SBC is equipped with a comprehensive on-board firmware package called Foundation Firmware that includes:

- General Purpose Monitor (GPM) - provides monitoring, diagnostic, and board exerciser functions to facilitate system startup and integration activities (see General Purpose Monitor data sheet for more information)
- Built-in-Test (BIT) – a library of Card Level Diagnostic (CLD) routines is provided to support Power-up BIT (PBIT), Initiated BIT (IBIT) and Continuous BIT (CBIT) (see Card Level Diagnostics data sheet for more information)
- Card Support Services (CSS) - provides a common soft-ware interface to the hardware features of the card (see Card Support Services data sheet for more information)
- Execution Sequencer (ES) - controls the invocation order of the software configuration items on the card (see Execution Sequencer data sheet for more information)
- Non Volatile Memory Programmer (NVMP) - provides for in-circuit and closed chassis reprogramming of Flash mem-ory over serial port or Ethernet (see Non-Volatile Memory Pro grammer data sheet for more information)

Our BIT firmware is designed to provide 95% fault coverage for testable functionality and supports tests in Power-up BIT (PBIT), Initiated BIT (IBIT), and Continuous BIT (CBIT) modes. PBIT con-sists of a reduced set of tests that provide confidence that the hardware is operating correctly while minimizing power-up time.

The IBIT capability allows users to initiate testing with a more comprehensive suite of tests to provide more robust testing in an offline mode. CBIT allows applications to test hardware components in the background while the mission software operates as a higher priority task. The selection of tests for PBIT, IBIT, and CBIT is configurable.

Specifications

Table 2: SCP/DCP-122 Specifications

POWER REQUIREMENTS	Maximum	Typical
+5 V	2 A	1.6 A
+12 V	0 A	Not used by the base card, only routed to the PMC sites
.-12 V	0 A	Not used by the base card, only routed to the PMC sites.
3.3 V	1.5 A	1.2 A
DIMENSIONS & WEIGHT	Dimensions	Weight
SCP card	3u cPCI 100 mm by 160 mm	250 g
DCP card	VITA 30.1-199x	295 g (includes wedgelocks)

Operating System Software

The SCP/DCP-122 supports Tornado 2.2.1 and INTEGRITY 4.09b. See the SCP/DCP-122 BSP and Driver Suite datasheet for greater detail. Please contact your local sales representative for queries.

Ruggedization Levels

The SCP/DCP-122 is available in all levels of ruggedization from L0 to L200. Please refer to Ruggedization Guidelines Datasheet.

Part Numbers

SCP/DCP-122-xyz

- I/O mode
  - 0: Full base card I/O
  - 1: Full PMC I/O
- Memory (SDRAM)
  - 0: 128MB
  - 1: 256MB
- Ruggedization level
  - 0: 0 to +50°C
  - 1: -40 to +71°C
  - 2: -40 to +85°C
- Model number:122
- Cooling method:
  - SCP: air cooled
  - DCP: conduction cooled

Contact Information

To find your appropriate sales representative, please visit:

Website: www.cwcembedded.com/sales

Email: sales@cwcembedded.com

For technical support, please visit:

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