



Plextek

Diablo

3U cPCI High Performance DSP Board with Receiver or Modem PMC

Plextek's broad knowledge of communication system design combined with skills in advanced electronic product design has enabled it to develop the Diablo Digital Receiver family, featuring a highly integrated, very high performance DSP board and a variety of PMC modules for radar, radio and modem applications.

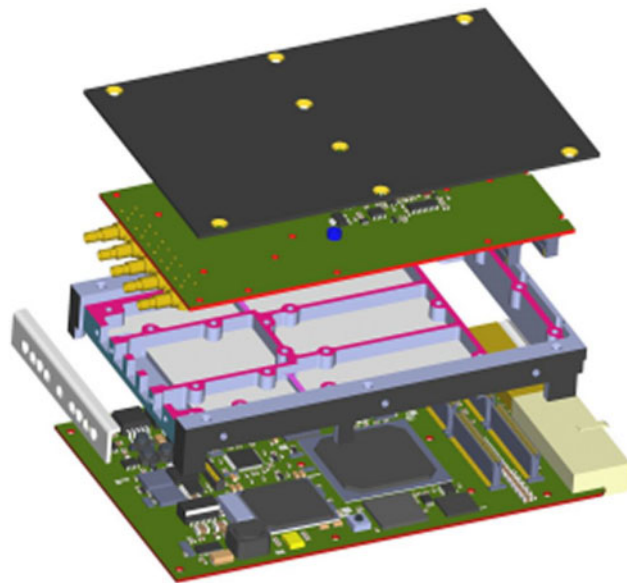
Key Features:

- 3U cPCI format
- PowerPC 7410
- 3 Million gate FPGA
- Options for ruggedisation and thermal management
- Serial, Ethernet and debug port access
- Dual channel 80MHz 14 bit ADC (Radio PMC)
- Single channel ADC/DAC Pair 80MHz 14 bit (Modem PMC)

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Plextek's **Diablo DSP board** is a ruggedised, conduction-cooled 3U cPCI unit, containing a PowerPC microprocessor, a high gate-count FPGA and numerous I/O options. It may be used in conjunction with Plextek's dual-channel **Diablo Receiver PMC** (PCI Mezzine Card) or **Diablo Modem PMC** to provide a highly adaptable and high-performance digital receiver or modem system for a diverse range of applications.

Diablo's design has been focused on key parameters necessary for Digital Radio type applications, such as DSP performance, power dissipation, and memory capability. Peripherals have been integrated to allow for ease of development and debug.

Both the DSP board and the PMC modules are available as Commercial Off The Shelf (COTS) products but, as Plextek is an electronics design house, very cost effective customisation can be applied to the basic design to include customer specific features. This could include changes in peripherals, processor or FPGA.

Plextek is willing to license the design in full or in part, depending on your requirements. This can provide you with a low risk,

rapid time to market option while still retaining design ownership.

For this specific DSP Board design, the Motorola PowerPC 7410 has been selected as a high performance, power conscious general purpose processing engine. An industrial grade 450MHz part is specified. This is supported by 2Mbytes of Level 2 Cache.

A large Xilinx Virtex II FPGA connects to the PowerPC, PCI buses and the PMC module to provide substantial DSP capability and the opportunity to implement custom interfaces and protocols. The board presently provides a common footprint for a range of devices between ¼ to 3 Million system gates. Plextek can assist you with your FPGA firmware design.

To simplify the system design yet provide the best achievable performance, the Marvell Discovery 1 System Controller has been used. This provides the PowerPC memory support, two PCI interfaces of cPCI bus and PMC interface, a high bandwidth interface to the FPGA, plus a number of additional communications interfaces.



Diablo DSP Board Features:

- **3U cPCI format -**
 - 32 bit PCI Interface 33/66MHz 3V3 / 5V compatible
 - Plextek can customise to any common format or bus standard
- **PowerPC 7410 @ 450MHz running VxWorks**
- **FPGA – Xilinx Virtex II - ¼ to 3 Million System Gates**
 - Common footprint on PCB – select cost effective device
- **Discovery 1 System Controller – 133MHz**
- **Memory – SDRAM 64Mbyte**
 - 2Mbyte Cache
 - 16Mbytes Flash for PowerPC
 - FPGA Boot PROM
 - 8kByte I2C EEPROM
- **Ruggedisation -**
 - Thermal management
 - Stiffening & heat spreader frame
 - Industrial grade components
 - Custom attachment if required
- **PMC site - 32 bit PCI interface**
 - General purpose FPGA Interface – 3V3 only
 - Designed for optimal performance with Plextek's Dual Channel PMC Radio Board
- **Power supply management –**
 - High efficiency regulators
 - Power-up sequencing
- **Peripherals – RS232 serial port**
 - 10/100 base T Ethernet
 - High speed RS422 input & output
 - Onboard thermal monitor
- **Programmable system clock -**
 - Onboard 66-133MHz clock
 - Onboard programmable clock via FPGA
 - External clock in from PMC interface



Plextek's design skills are recognised by many leading silicon vendors. We are a Xilinx Xpert and a member of the Motorola Design Alliance.



The **Diablo DSP Board** may be used stand-alone or with PMC plug-in modules. Optimum performance may be achieved by using Plextek's analogue interface PMC boards.

The **Diablo Radio board** PMC is designed for Digital Receiver type applications including radar signal processing. In general each channel would be used to sample the IF of the analogue receiver strip. The two channels can also sample Complex (I/Q) baseband signals. External frequency reference input & output, clock synch input and dual ADC channels allow IF frequencies up to around 100MHz to be digitally down-converted and processed.

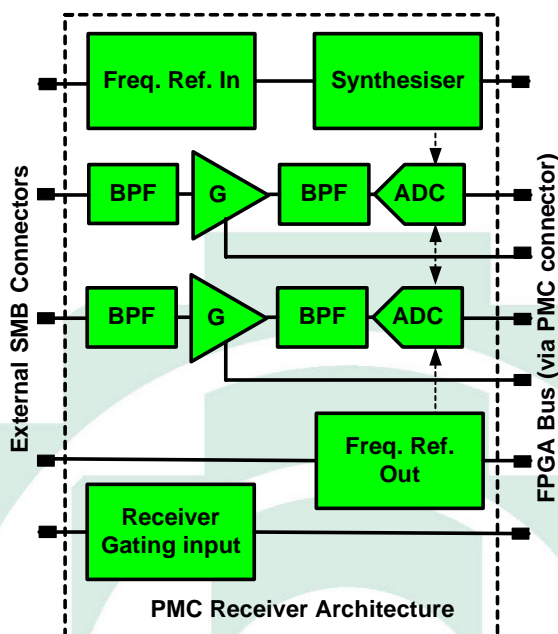
The **Diablo Modem Board** PMC provides a high speed ADC input plus a matching DAC output channel. This may be used for IF signal sampling and synthesis in Modem type applications or where coded transmission is required.

Several boards may be slaved off an external reference clock to provide multi-channel operation. Unlike other commercial "Digital Receiver" PMC products based on standard chipsets, Plextek's solution uses the FPGA on the DSP board to provide totally flexible channel filters, decimation rates and other signal processing functions.

Both the Radio and Modem PMC boards provide on-board reference clocks. An external reference clock can also be used to drive

The ± 12 Volt power supply inputs provide the principal power source. Switching regulators provide efficient voltage translation prior to precision, low-noise linear regulation and filtering.

The RF circuits have been designed to provide the best possible RF performance. Rather than designing a compromised broadband product, the components are selected for your application to provide the required IF frequency and filter characteristics.



an on-board synthesiser, producing a programmable, synchronised and stable sampling clock for the ADC and DAC converters.

For "Coherent on Receive" radar applications, an additional input provides a sample alignment input.

The ADCs are provided with stepped attenuators to provide an AGC function for applications requiring a high dynamic range. The standard design uses 32 individual 1dB steps.

In keeping with the cPCI DSP board, design features have been incorporated to improve power management

Each circuit is individually screened within a milled aluminium enclosure to minimise crosstalk between the radio channels, power supplies and synthesiser. The design can be easily customised for your application, including options for ruggedisation, connector type and circuit functionality.

The combined Digital Radio board hardware, firmware and support software was designed and commissioned by Plextek within a three month 'Rapid Prototyping' programme. If required, Plextek are able to take the same approach with your design problems.

Receiver Variant Features:

- 2 x 80MHz 14 bit ADC
- IF signal up to 100MHz
- Sub-sampling capable
- Factory configurable IF bandwidth
- Stepped Attenuators 32 x 1dB
- Power Managed $\pm 12V$ supplies

Modem Variant Features:

- 1 x 80MHz 14 bit ADC & DAC
- Stepped Attenuators 32 x 1dB
- Tx signal IF & bandwidth factory configurable

PMC Common Features:

- Clocks
 - On-board reference
 - External Reference In
 - Programmable Synthesised ADC Sampling clock
 - Clock out
 - Clock Synch in (Coherent on Receive)
- PMC PCI bus spare
- Direct interface to cPCI based FPGA for ADC, DAC, Attenuator, Synthesiser and Clocks
- Power Managed $\pm 12V$ supplies
- RF Screening



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