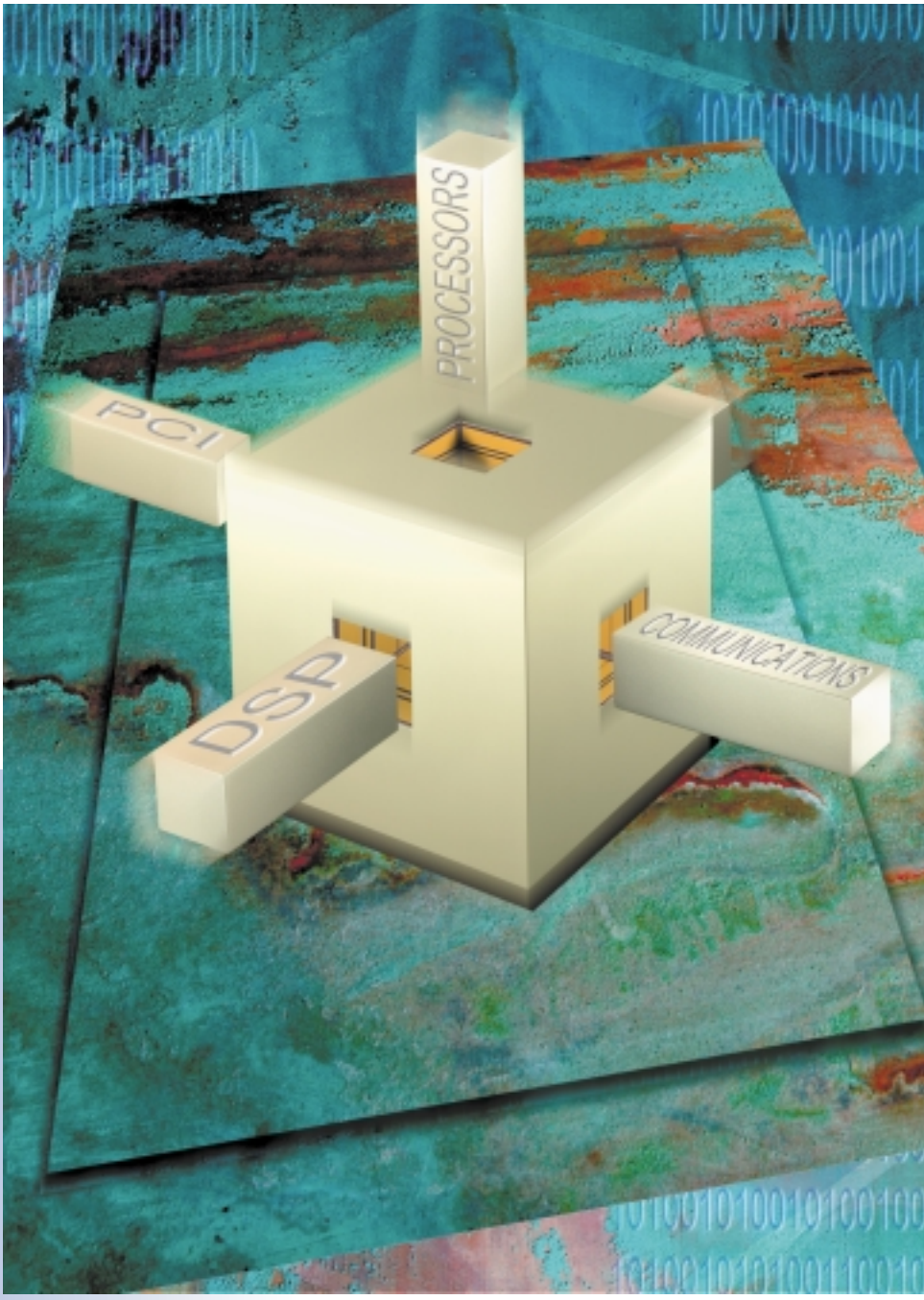
Intellectual Property Selector Guide

IP Building Blocks for System-on-a-Programmable-Chip Solutions



June 2000

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Introduction to Altera Megafunctions

Altera Megafunctions Provide Total Solutions for All Your Design Needs

With programmable logic device (PLD) densities exceeding one million gates, it is now possible to implement entire digital subsystems within a single PLD. This new level in density creates greater opportunity for designers who are required to develop systems with higher integration, complexity, and functionality. Altera is the leading provider of complete solutions, including system-level tool integration and numerous megafunctions — system-level intellectual property (IP) blocks.

The combination of Altera's megafunctions, PLDs, and software has resulted in lower development costs, and faster time-to-market for designers, and make system-on-a-programmable-chip solutions possible. With cost-effective and high-performance PLDs, designers have significant advantages over application-specific standard products (ASSPs) and application-specific integrated circuits (ASICs), such as design flexibility and system integration.

Megafunctions provide total solutions by targeting specific application areas, providing optimized performance and system reusability, and significantly reducing a design's time-to-market.

Dramatically Reduce Your Time-to-Market

Altera recommends the use of ready-made, pre-tested functional megafunctions to augment existing hardware description language (HDL) design methodology. When implementing complex system architectures, these megafunctions significantly reduce design tasks, dramatically shorten design cycles, and leverage existing IP.

Using megafunctions allows designers to focus more time and energy on improving and differentiating their system-level product, rather than redesigning common off-the-shelf functions. Altera addresses this design need with megafunctions developed through the Altera® Megafunction Partners Program (AMPP℠) and with Altera-created MegaCore™ functions.

Altera Megafunction Partners Program

The Altera Megafunction Partners Program (AMPP), an alliance between Altera and IP developers, brings the advantages of design reuse to users of Altera PLDs. Through this alliance, AMPP vendors develop megafunctions that are optimized for Altera devices.

Premier AMPP Program

The Premier AMPP℠ Program recognizes the top performing participants in the regular AMPP program, based on customer feedback. The current Premier AMPP partners are PLD Applications, Innocor Ltd., and Nova Engineering.

MegaCore Functions

MegaCore functions are developed, pre-tested, documented, and licensed directly by Altera. These functions are optimized for a specific Altera device architecture, allowing user-specified performance utilization goals to be met. Altera MegaCore functions aid in critical design implementation and help reduce design tasks and development cycles.

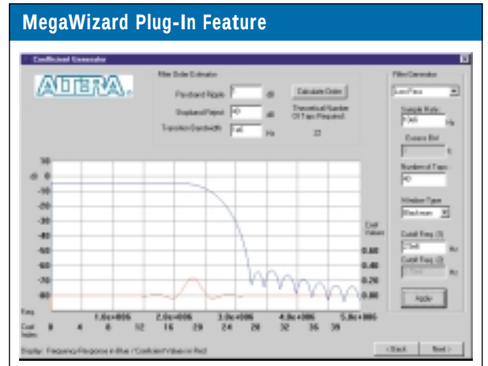
MegaWizard Plug-Ins

Altera MegaWizard™ Plug-Ins allow designers to customize associated megafunctions with minimal effort and then integrate them into any design flow with any EDA tool. Both Altera and its AMPP partners offer parameterized functions that users control by linking MegaWizard Plug-Ins to their functions. Designers using megafunctions powered by a MegaWizard Plug-In save time and money because they are able to handle customization efficiently in their own design environment.

Risk-Free OpenCore Evaluation

The MAX+PLUS® II and Quartus™ software from Altera provide the OpenCore™ evaluation feature, which allows designers to instantiate, compile, and simulate a function to verify its size and performance before making a purchase decision.

MegaWizard Plug-In Feature



SignalTap Logic Analysis

Altera's SignalTap™ Embedded Logic Analyzer (ELA) brings a new level of debug and verification tools to programmable logic designs. Integrated within the Quartus development software, SignalTap allows the designer to capture signals from internal PLD nodes while the system is running in-system and at-speed. SignalTap eliminates the problem of probing fine pitch and BGA devices, to accelerate design debug and reduce time to market.

SignalTap Plus System Analysis

The SignalTap Plus system analyzer is a powerful system-level debug tool from Altera that enhances the on-chip debug capabilities of the SignalTap embedded logic analyzer (ELA) by adding 32 channels of external logic analysis capability. The SignalTap Plus analyzer enables you to capture signals from internal PLD nodes and external board-level nodes simultaneously, and view them all in a single, time-correlated display. The new SignalTap Front Panel software provides stand-alone debugging capabilities. SignalTap Front Panel software runs separately or from within the Quartus software to control APEX device configuration, the SignalTap ELA, and the SignalTap Plus System Analyzer.

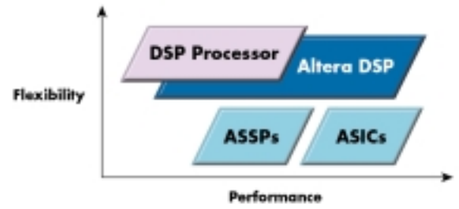
Increase Performance and Add Flexibility with Altera DSP Megafunctions

Designers traditionally have been faced with a tradeoff between the flexibility of DSP processors and the performance of DSP ASIC and ASSP solutions. Altera PLDs—when combined with DSP megafunctions—eliminate this disparity, providing both exceptional performance and the flexibility inherent to PLDs. This programmable DSP solution offers a new alternative to multiple, high-end DSP processors: it costs less, uses less resources, and requires fewer devices.

The Altera DSP solution provides optimized performance that is ideal for real-time, high-performance applications such as satellite communications, digital image processing, and spread-spectrum systems. The Altera DSP solution includes:

- DSP building blocks such as adders and high-speed multipliers
- DSP imaging functions for convolution, filtering, and compression
- DSP forward error correction solutions such as Reed-Solomon, Viterbi, and Turbo encoders and decoders
- DSP communication functions for wireless and broadband applications

Altera DSP Overview



DSP Building Blocks

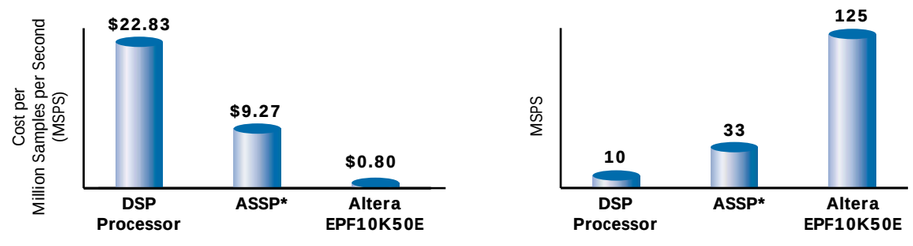
Altera's DSP building blocks include functions such as high-speed multipliers, floating-point arithmetic functions, IIR filters, and round/saturate functions. These parameterized functions are optimized for both performance and flexibility in Altera's FLEX® and APEX™, and ACEX™ architectures, and can be combined to implement efficient DSP systems.

DSP Imaging Solutions for Complex Applications

DSP imaging solutions from Altera provide functional blocks for convolution, compression, and filtering applications. Compression support includes discrete cosine transform and JPEG megafunctions that are optimized for the memory structure of the FLEX 10K and APEX device families.

Altera DSP Solution vs. DSP Processors and ASSPs

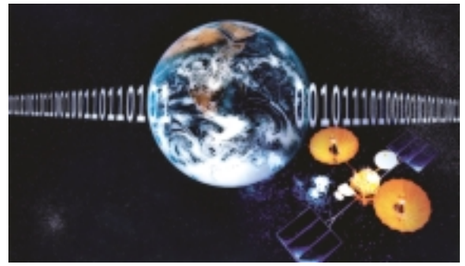
Altera offers a higher performance and lower cost DSP solution than DSP processors and ASSPs.



* 101-Tap, 12-Bit Coefficient FIR Filter

DSP Forward Error Correction (FEC) Solutions

FEC is a technology that corrects errors induced in digital data during transmission over a noisy channel (e.g., digital video/audio broadcast) or during storage on an unreliable medium (e.g., compact disc, digital tape). Altera provides several different FEC products such as Reed-Solomon, Viterbi, and Turbo that detect and correct these errors.



DSP Building Blocks

FUNCTION DESCRIPTION	SOURCE	PRODUCT FAMILY
Echo Canceller	Altera MegaCore	APEX 20K, ACEX 1K, FLEX 10K
FIR Compiler	Altera MegaCore	APEX 20K, ACEX 1K, FLEX 10K, FLEX 8000, FLEX 6000
Floating-Point Operator Library	Integrated Silicon Systems	APEX 20K, ACEX 1K, FLEX 10K, FLEX 8000, FLEX 6000
FIR Filter Library	Integrated Silicon Systems	APEX 20K, ACEX 1K, FLEX 10K, FLEX 8000, FLEX 6000
Fast Fourier Transform (FFT/IFFT)	Altera MegaCore	APEX 20K, ACEX 1K, FLEX 10K
Fast Fourier Transform (FFT/IFFT)	HammerCores by Altera	APEX 20K, ACEX 1K, FLEX 10K
Fast Fourier Transform (FFT/IFFT), High Performance	Integrated Silicon Systems	APEX 20K, ACEX 1K, FLEX 10K
Fast Fourier Transform (FFT/IFFT), Low Latency	Integrated Silicon Systems	APEX 20K, ACEX 1K, FLEX 10K
IIR Filter Library	Integrated Silicon Systems	APEX 20K, ACEX 1K, FLEX 10K
NCO Complier	Altera MegaCore	APEX 20K, ACEX 1K, FLEX 10K
Rank Order Filter Library	Integrated Silicon Systems	APEX 20K, ACEX 1K, FLEX 10K, FLEX 8000, FLEX 6000

DSP Imaging Megafunctions

FUNCTION DESCRIPTION	SOURCE	PRODUCT FAMILY
Image Processing Library	Integrated Silicon Systems	APEX 20K, ACEX 1K, FLEX 10K
JPEG Decoder/Encoder	Integrated Silicon Systems	APEX 20K, ACEX 1K, FLEX 10K
Laplacian Edge Detector	Integrated Silicon Systems	APEX 20K, ACEX 1K, FLEX 10K
Parameterized Discrete Cosine Transform	Integrated Silicon Systems	APEX 20K, ACEX 1K, FLEX 10K
RGB2YCrCb/YCrCb2RGB Color Space Converters	Altera MegaCore	APEX 20K, ACEX 1K, FLEX 10K, FLEX 8000, FLEX 6000

DSP Forward Error Correction Megafunctions

FUNCTION DESCRIPTION	SOURCE	PRODUCT FAMILY
Block and Convolutional Interleaver/Deinterleaver	Integrated Silicon Systems	APEX 20K, FLEX 10K
Convolutional Encoder	Integrated Silicon Systems	APEX 20K, FLEX 10K
Convolutional Interleaver	KTech Telecommunications	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000, MAX 9000
CRC Checker/Generator	Altera MegaCore	APEX 20K, ACEX 1K, FLEX 10K
DVB CODEC	Integrated Silicon Systems	APEX 20K, FLEX 10K
Reed-Solomon Compiler	Altera MegaCore	APEX 20K, ACEX 1K, FLEX 10K, FLEX 8000, FLEX 6000
Reed-Solomon Decoder	Integrated Silicon Systems	APEX 20K, ACEX 1K, FLEX 10K
Reed-Solomon Encoder	Integrated Silicon Systems	APEX 20K, ACEX 1K, FLEX 10K, FLEX 8000, FLEX 6000
Symbol Interleaver/Deinterleaver	Altera MegaCore	APEX 20K, ACEX 1K, FLEX 10K, FLEX 8000, FLEX 6000
Parallel Viterbi Decoder	HammerCores by Altera	APEX 20K, ACEX 1K, FLEX 10K, FLEX 8000, FLEX 6000
Serial Viterbi Decoder	HammerCores by Altera	APEX 20K, ACEX 1K, FLEX 10K, FLEX 8000, FLEX 6000
Turbo Decoder	Altera MegaCore	APEX 20K
Turbo Encoder	Altera MegaCore	APEX 20K
Viterbi Decoder	Integrated Silicon Systems	APEX 20K, ACEX 1K, FLEX 10K, FLEX 8000, FLEX 6000
Viterbi Decoder	Nova Engineering	APEX 20K, ACEX 1K, FLEX 10K

Wireless and Broadband Communications

The DSP communications solution supports wireless and broadband applications. The unique combination of high-performance and reprogrammability makes Altera PLDs ideal for emerging software radio applications. Wireless basestations and handsets can change their protocol in real time, matching the end users demands. The building blocks for these applications include functions ranging from numerically controlled oscillators (NCOs) and complex mixers to linear feedback shift registers (LFSRs), digital modulators, and FFT functions. Target applications for these solutions include cellular basestations, PCS, ADSL, and cable modems.

DSP Wireless & Broadband Communications Megafunctions

FUNCTION DESCRIPTION	SOURCE	PRODUCT FAMILY
Adaptive Equalizer	HammerCores by Altera	APEX 20K, ACEX 1K, FLEX 10K
Adaptive Equalizer	Integrated Silicon Systems	APEX 20K, FLEX 10K
Adaptive Filter	Integrated Silicon Systems	APEX 20K, FLEX 10K
Binary Pattern Correlator	Nova Engineering	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
Complex Mixer/Multiplier	Nova Engineering	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
Cordpol Function	HammerCores by Altera	APEX 20K, ACEX 1K, FLEX 10K
CRC Checker/Generator	Altera MegaCore	APEX 20K, ACEX 1K, FLEX 10K
Digital Modulator	Nova Engineering	APEX 20K, FLEX 10K
DES Core	Sican Microelectronics	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
DES Core	HammerCores by Altera	APEX 20K, ACEX 1K, FLEX 10K, FLEX 8000, FLEX 6000
X DES	CAST, Inc.	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
Intermediate Data Rate (IDR) Framer/Deframer	Integrated Silicon Systems	APEX 20K, FLEX 10K
Early/Late Gate Symbol Synchronizer	Nova Engineering	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
Fast Fourier Transform (FFT/IFFT)	Altera MegaCore	APEX 20K, ACEX 1K, FLEX 10K
FIR Compiler	Altera MegaCore	APEX 20K, ACEX 1K, FLEX 10K, FLEX 8000, FLEX 6000
Linear Feedback Shift Register	Nova Engineering	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
LMS and Zero-Forcing Equalizers	HammerCores by Altera	APEX 20K, ACEX 1K, FLEX 10K
Logarithm Function	HammerCores by Altera	APEX 20K, ACEX 1K, FLEX 10K
Numerically Controlled Oscillator Compiler	Altera MegaCore	APEX 20K, ACEX 1K, FLEX 10K, FLEX 8000, FLEX 6000
Numerically Controlled Oscillator	Nova Engineering	APEX 20K, FLEX 10K
QPSK Equalizer	Integrated Silicon Systems	APEX 20K, FLEX 10K
Square Root Function	HammerCores by Altera	APEX 20K, ACEX 1K, FLEX 10K
Telephony Tone Generation Megafunction	NComm, Inc.	APEX 20K, FLEX 10K
µ-Law and A-Law Compander	HammerCores by Altera	APEX 20K, ACEX 1K, FLEX 10K, FLEX 8000, FLEX 6000

Communications Megafunctions

Altera Megafunctions Provide System-Level Solutions for Emerging Communications Technologies

Communications (telecom and datacom) megafunctions provide networking building blocks to improve system performance. The Altera communications portfolio consists of functions such as the UTOPIA II Master/Slave, HDLC, and ethernet MAC controller. These megafunctions are ideal for a wide variety of networking applications, ranging from switches and routers to bridges and integrated services digital network (ISDN) terminal adapters. Typically, networking systems require high performance and the flexibility to scale a design to fit different speed rates. Using Altera PLDs and these megafunctions, designers can meet the speed, density, and flexibility demands of their networking applications.

Communications Megafunctions

FUNCTION DESCRIPTION	SOURCE	PRODUCT FAMILY
8b/10b Encoder/Decoder	HammerCores by Altera	APEX 20K, ACEX 1K, FLEX 10K, FLEX 6000
10/100 Ethernet Media Access Controller (MAC)	Stargate Solutions, Inc.	APEX 20K, FLEX 10K
ADPCM Transcoder, Multi-Standard	Integrated Silicon Systems	APEX 20K, FLEX 10K
ATM Controller	Innocor Ltd.	APEX 20K, FLEX 10K
ATM POS FIFO	Innocor Ltd.	APEX 20K, FLEX 10K
Bit Error Rate Tester (BERT)	Innocor Ltd.	APEX 20K, FLEX 10K
CRC-10	CoreEl MicroSystems, Inc.	APEX 20K, FLEX 10K
CRC-32	CoreEl MicroSystems, Inc.	APEX 20K, FLEX 10K
CRC Checker/Generator	Altera MegaCore	APEX 20K, ACEX 1K, FLEX 10K
Cell Delineation A (CC200A)	CoreEl MicroSystems, Inc.	APEX 20K, FLEX 10K
E1 Framer	CoreEl MicroSystems, Inc.	APEX 20K
Fast Ethernet Media Access Controller (MAC) Transmitter	CoreEl MicroSystems, Inc.	APEX 20K, FLEX 10K
Fast Ethernet Media Access Controller (MAC) Receiver	CoreEl MicroSystems, Inc.	APEX 20K, FLEX 10K
High-Level Data Link Controller (HDLC)	CAST, Inc.	APEX 20K, FLEX 10K
High-Level Data Link Controller (HDLC)	CoreEl MicroSystems, Inc.	APEX 20K, FLEX 10K
High-Level Data Link Controller (HDLC)	Integrated Silicon Systems	APEX 20K, FLEX 10K
High-Level Data Link Controller (HDLC), Bit-Oriented	Innocor Ltd.	APEX 20K, FLEX 10K
Intermediate Data Rate (IDR) Framer/Deframer	Integrated Silicon Systems	APEX 20K, FLEX 10K
Inverse Multiplexing for ATM (IMA) 1.1	ModelWare	APEX 20K
NRZ/NRZI Data Encoder-Decoder	Innocor Ltd.	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
Packet Over SONET Controller	Innocor Ltd.	APEX 20K, FLEX 10K
POS-PHY Level III (Link and PHY)	Altera MegaCore	APEX 20K
PPP8	CoreEl MicroSystems, Inc.	APEX 20K, FLEX 10K
SONET Byte Bus Interface	Innocor Ltd.	APEX 20K, FLEX 10K
Sony/Philips Digital Audio Interface	Sican Microelectronics	APEX 20K, FLEX 10K
Speedbridge Speed-Matching FIFO	SIS Microelectronics	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
Telephony Tone Generation	NComm, Inc.	APEX 20K, FLEX 10K
Universal Digital Data Acquisition	PLD Applications	APEX 20K, FLEX 10K
UTOPIA Level II Slave	Altera MegaCore	APEX 20K, FLEX 10K
UTOPIA Level II Master	Altera MegaCore	APEX 20K, FLEX 10K
UTOPIA Level II Master	AMIRIX	APEX 20K, FLEX 10K
UTOPIA Level II Slave	AMIRIX	APEX 20K, FLEX 10K
UTOPIA Level III Slave	AMIRIX	APEX 20K
UTOPIA Level II Master Receiver	CoreEl MicroSystems, Inc.	APEX 20K, FLEX 10K
UTOPIA Level II Slave Receiver	CoreEl MicroSystems, Inc.	APEX 20K, FLEX 10K
UTOPIA Level II Master Transmitter	CoreEl MicroSystems, Inc.	APEX 20K, FLEX 10K
UTOPIA Level II Slave Transmitter	CoreEl MicroSystems, Inc.	APEX 20K, FLEX 10K

PCI & Other Bus Interface Megafunctions

Bus Interfaces: Megafunctions Create Easy-to-Use Peripherals

Bus interface solutions include several megafunctions, such as peripheral component interconnect (PCI), universal serial bus (USB), controller area network (CAN) bus, SDRAM controller, and the IEEE 1394 serial bus. These solutions enable designers to focus on differentiating elements of the design, typically the local bus interface and the custom configurable logic.

Altera PCI Development Board

Custom Interconnecting with PCI

The peripheral component interconnect (PCI) bus serves as a device-level interconnect for peripherals on a circuit board, and as a bus for high-performance expansion cards. The PCI bus architecture is ideal for applications such as network adapters, storage and embedded controllers, graphic accelerator boards, and audio-video products. Altera APEX and FLEX devices provide a programmable logic solution for a variety of PCI applications. PCI megafunctions include 64-bit, 66-MHz master/target, 32-bit, 33-MHz master/target functions and 64-bit PCI-X.

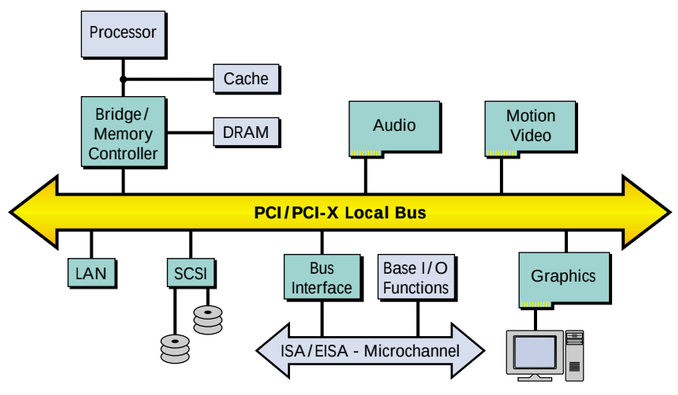
The figure titled "Typical PCI Local Bus System" shows a typical PCI local bus system architecture and does not imply any specific architectural limits. In this example, the processor/cache/memory subsystem is connected to a PCI bus through a PCI bridge. The Altera PCI solution provides critical advantages for the system designer. Altera's high-density APEX and FLEX devices enable a designer to create a single-device solution that includes both the PCI interface and the application-specific logic for a custom solution. Altera's PCI megafunctions deliver compliance and optimization, and significantly reduce design time.

PCI Development Board

In addition to several PCI megafunctions, Altera also provides a PCI development board. This board contains an Altera FLEX 10K device and supports 32- or 64-bit, 33- or 66-MHz PCI operations. Designers can use the PCI development board for quick prototyping or for debugging their designs.

Altera's complete PCI solution lowers development costs and improves time-to-market.

Typical PCI Local Bus System



Peripheral Component Interconnect (PCI) Megafunctions

FUNCTION DESCRIPTION	SOURCE	PRODUCT FAMILY
PCI-X Master/Target	Altera MegaCore	APEX 20KE
PCI-X Master/Target	DCM Technologies	APEX 20K
64-Bit PCI Master/Target	Altera MegaCore	APEX 20K, FLEX 10K
64-Bit PCI Master/Target	PLD Applications	APEX 20K, FLEX 10K
64-Bit PCI Master/Target	Eureka Technology	APEX 20K, FLEX 10K
64-Bit PCI Target Only	Altera MegaCore	APEX 20K, APEX 20KE, FLEX 10K
64-Bit PCI Target Only	PLD Applications	APEX 20K, FLEX 10K
32-Bit PCI Master/Target with Burst	Eureka Technology	APEX 20K, FLEX 10K
32-Bit PCI Master/Target with Burst	PLD Applications	APEX 20K, FLEX 10K, FLEX 6000
32-Bit PCI Target Only Interface	PLD Applications	APEX 20K, FLEX 10K, FLEX 8000
32-Bit PCI Target Only with Burst	Altera MegaCore	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
32-Bit PCI Target Only with Burst	Eureka Technology	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
32-Bit PCI Master/Target with DMA Controller	Altera MegaCore	FLEX 10K
32-Bit PCI Master/Target	Altera MegaCore	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
PCI Hostbridge	Eureka Technology	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000

Other Bus Interface Megafunctions

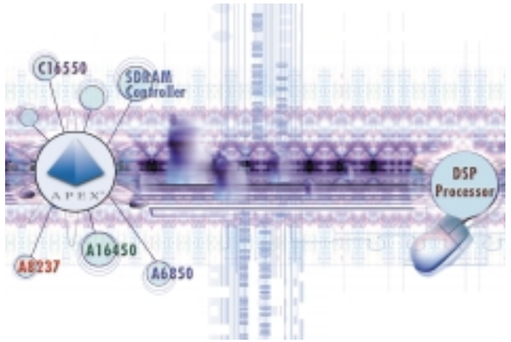
FUNCTION DESCRIPTION	SOURCE	PRODUCT FAMILY
1394A Link Layer Controller Core	inSilicon Inc.	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
1394A Link Layer Controller (FireFox)	SIS Microelectronics	APEX 20K, FLEX 10K
IEEE 1284 Parallel Slave Interface	SIS Microelectronics	APEX 20K, FLEX 10K
1394 Link Layer Controller	Simple Silicon, Inc.	APEX 20K, FLEX 10K
CAN Bus	Sican Microelectronics	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
IIC Master	Sican Microelectronics	APEX 20K, FLEX 10K, FLEX 6000, MAX 9000, MAX 7000
IIC Slave	Sican Microelectronics	APEX 20K, FLEX 10K, FLEX 6000, MAX 9000, MAX 7000
Multi-Function Memory Controller	Eureka Technology	APEX 20K, FLEX 10K
PowerPC Bus Arbiter	Eureka Technology	APEX 20K, FLEX 10K, FLEX 8000, MAX 9000, MAX 7000
PowerPC Bus Master	Eureka Technology	APEX 20K, FLEX 10K, FLEX 8000, MAX 9000, MAX 7000
PowerPC Bus Slave	Eureka Technology	APEX 20K, FLEX 10K, FLEX 8000, MAX 9000, MAX 7000
PowerPC to Hostbridge	Eureka Technology	APEX 20K, FLEX 10K
USB Device Controller	ARASAN Chips	APEX 20K
USB Host Controller	ARASAN Chips	APEX 20K
USB Function Controller: Si-Function	Simple Silicon, Inc.	APEX 20K, FLEX 10K
USB Hub Controller: Si-Function	Simple Silicon, Inc.	APEX 20K, FLEX 10K
VUSB Device Controller	VAutomation, Inc.	APEX 20K, FLEX 10K

Development Boards

DESCRIPTION	SOURCE	PRODUCT FAMILY
System-on-a-Programmable-Chip (SOPC)	Altera	APEX 20KE
FLEX 10KE PCI	Altera	FLEX 10K
PROC10K	Gid'el Limited	FLEX 10K
PROC20K	Gid'el Limited	APEX 20K
Constellation	Nova Engineering	FLEX 10K
CPCI GEN10K	PLD Applications	FLEX 10K
PCI GEN10K	PLD Applications	FLEX 10K
PCI GEN6K	PLD Applications	FLEX 6000
Megalogic System 100	Princeton Technology Group	FLEX 10K
XT1000	Tensilica, Inc.	APEX 20K
DIGILAB 10K10	El Camino GmbH	FLEX 10K
DIGILAB 20Kx240	El Camino GmbH	APEX 20K
DIGILAB 10Kx240	El Camino GmbH	FLEX 10K
DIGILAB picoMAX	El Camino GmbH	MAX 3000A, MAX 7000A, MAX 7000B, MAX 7000S

Megafunctions Enable Flexible System Design

Processor and peripheral megafunctions provide solutions for embedded processors, microcontrollers, CPU cores, and peripheral functions such as UARTs and interrupt controllers. These solutions enable designers to focus on differentiating elements of the design and use their existing building blocks to build systems ranging from interface line cards to communication systems.



Processor Megafunctions

FUNCTION DESCRIPTION	SOURCE	PRODUCT FAMILY
2901 Four-Bit Microprocessor Slice	CAST, Inc.	APEX 20K, FLEX 10K
32-Bit ARC Processor	ARC Cores, Ltd.	APEX 20K
C29116A 16-Bit Microprocessor	CAST, Inc.	APEX 20K, FLEX 10K, FLEX 8000
LX4180P 32-Bit Microprocessor	Lexra, Inc.	APEX 20K, FLEX 10K
V6502 Microprocessor	VAutomation, Inc.	APEX 20K, FLEX 10K
V8-µRISC Microprocessor	VAutomation, Inc.	APEX 20K, FLEX 10K
VZ80 Microprocessor	VAutomation, Inc.	APEX 20K, FLEX 10K
XTensa 32-Bit Configurable Microprocessor	Tensilica, Inc.	APEX 20K

Peripheral Megafunctions

FUNCTION DESCRIPTION	SOURCE	PRODUCT FAMILY
8259 Programmable Interrupt Controller	Innocor Ltd.	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
a16450 UART	Altera MegaCore	APEX 20K, ACEX 1K, FLEX 10K
a6402 UART	Altera MegaCore	APEX 20K, ACEX 1K, FLEX 10K
a6850 ACIA	Altera MegaCore	APEX 20K, ACEX 1K, FLEX 10K
a8237 DMA Controller	Altera MegaCore	APEX 20K, ACEX 1K, FLEX 10K
a8251A Communication Interface	Altera MegaCore	APEX 20K, ACEX 1K, FLEX 10K
a8255A Programmable Peripheral Adapter	Altera MegaCore	APEX 20K, ACEX 1K, FLEX 10K
a8259 Programmable Interrupt Controller	Altera MegaCore	APEX 20K, ACEX 1K, FLEX 10K
C16450 UART	CAST, Inc.	APEX 20K, FLEX 10K
C16550 UART	CAST, Inc.	APEX 20K, FLEX 10K
C2910/C2910A Microprogram Controller	CAST, Inc.	APEX 20K, FLEX 10K
C49410 Microprogram Controller	CAST, Inc.	APEX 20K, FLEX 10K
C6850 ACIA	CAST, Inc.	APEX 20K, FLEX 10K
C8051 Microcontroller	CAST, Inc.	APEX 20K, FLEX 10K
C8251 Communications Interface	CAST, Inc.	APEX 20K, FLEX 10K
C8254 Interval Timer/Counter	CAST, Inc.	APEX 20K, FLEX 10K
C8259 Programmable Interrupt Controller	CAST, Inc.	APEX 20K, FLEX 10K
DDR SDRAM Controller, 266MHz	Northwest Logic Design	APEX 20K
DMA Controller	Eureka Technology	APEX 20K, FLEX 10K, FLEX 6000
SDRAM Controller	Eureka Technology	APEX 20K, FLEX 10K
SDRAM Controller, 133 MHz	Northwest Logic Design	APEX 20K, FLEX 10K
SDRAM Controller, 66 MHz	Stargate Solutions, Inc.	APEX 20K, FLEX 10K
Timer-Counter	Innocor Ltd.	APEX 20K, FLEX 10K

For a complete list of Premier AMPP and AMPP partners, consult the Altera *IP Catalog* or the Altera web site at http://www.altera.com/IPmegastore.

Premier AMPP Partners

Partner	Address	Phone	Email	Internet URL
Innocor Ltd.	7 Mill Street, Suite 300, Almonte, Ontario, Canada KOA 1A0	(613) 256-5339	info@innocor.com	www.innocor.com
Nova Engineering	5 Circle Freeway Drive, Cincinnati, OH 45246-1105	(513) 860-3456	info@nova-eng.com	www.nova-eng.com
PLD Applications	32 ZAC de Bonepertius-Avenu d'armenie	+(33) 442-654-388	plda@worldnet.fr	www.plda.com

AMPP Partners

Partner	Address	Phone	Email	Internet URL
AMIRIX	77 Chain Lake Drive, Halifax, Nova Scotia, Canada B3S 1E1	(902) 450-1788	info@amirix.com	www.amirix.com
ARASAN Chips Systems	4340 Stevens Creek Blvd., San Jose, CA 95129	(408)985-9495	info@arasan.com	www.arasan.com
ARC Cores, Ltd.	6862 Santa Teresa Blvd., San Jose, CA 95119	(408) 360-2120	info@arccores.com	www.arccores.com
CAST, Inc.	24 White Birch Drive, Pomona, NY 10970	(914) 354-4945	opencore@cast-inc.com	www.cast-inc.com
CoreEl Microsystems, Inc.	46750 Fremont Blvd., Suite 208, Fremont, CA 94538	(510) 770-2277	altera.sales@coreel.com	www.coreel.com
DCM Technologies	39675 Cedar Boulevard, Suite #220	(510) 710-7686	info@dcmtech.com	www.dcmtech.com
Dolphin Integration	B.P.65-ZIRST, F38242 Meylan Cedex, France	33 (0)4 7641 1096	flip@dolphin.fr	www.dolphin.fr
Eureka Technology	4962 El Camino Real, Suite 108, Los Altos, CA 94022	(415) 960-3800	info@eurekatech.com	www.eurekatech.com
Fluence Technologies	8700 Creekside Place Beaverton, OR 97008	503-672-8800	mark_olen@fluence.com	www.fluence.com
Hantro Products	Teknolgiantie 14, 90570 Oulu, Finland	358-400-688-263	info@hantro.com	www.hantro.com
inSilicon, Inc.	411 E. Plumeria Drive, San Jose, CA 95134	(408) 570-1000	sales@vchips.com	www.phoenix.com
Integrated Silicon Systems	50 Malone Road, Belfast, BT9 5BS, Northern Ireland	(44) 1232-664-664	info@iss-dsp.com	www.iss-dsp.com
KTech Telecommunications	15501 SF Mission Blvd., Suite 100, Mission Hills, CA 91345	(818) 361-2248	skuh@ktechtelecom.com	www.ktechtelecom.com
Lexra, Inc.	51 Sawyer Road, Suite 110, 2 University Park Waltham, MA 02154	(781) 899-5799	info@lexra.com	www.lexra.com
ModelWare	10 West Bergen Place, #105, Red Bank, NJ 07701	(732) 936-1808	info@modelware.com	www.modelware.com
Northwest Logic Design	1905 NW 169th Place, Suite 121, Beaverton, OR 97006	(503) 533-5800	ip@nwlogic.com	www.nwlogic.com
NComm, Inc.	401 Main Street, Suite 204, Salem, NH 03079	(603) 893-6186	info@ncomm.com	www.ncomm.com
Palmchip Corporation	2055 Gateway Place, Suite 240, San Jose, CA 95110	(408) 487-9651	ampp@palmchip.com	www.palmchip.com
Sican Microelectronics Corp.	400 Oyster Point Blvd., Suite 512, S. San Francisco, CA 94080	(650) 625-1888	ampp@sican.com	www.sican.com
Simple Silicon, Inc.	10430 S. De Anza Blvd., Suite 195, Cupertino, CA 95014	(408) 873-2260	info@simplesi.com	www.simplesi.com
SIS Microelectronics, Inc.	1831 LeftHand Circle, Suite E, P.O. Box 1432 Longmont, CO 80501	(303) 776-1667 Ext. 223	info@sismicro.com	www.sismicro.com
SOC Magic	Shekou Cuiweiyuan, 1-203 Shenzhen, 51807, China	86-755-686-1129	jerry@socmagic.com	www.socmagic.com
Stargate Solutions, Inc.	2160 Lundy Ln., #240, San Jose, CA 95131	(408) 954-8302	info@sgates.com	www.sgates.com
Tensilica, Inc.	3255-6 Scott Blvd., Santa Clara, CA 95054	(408) 873-1000 Ext. 302	sales@hq.tensilica.com	www.tensilica.com
VAutomation, Inc.	20 Trafalgar Square, Suite 443, Nashua, NH 03063	(603) 882-2282	ampp@VAutomation.com	www.vautomation.com

Additional Documentation Available on the Altera Web Site

Altera provides additional reference documentation such as data sheets, application notes, and solution briefs. For the latest literature, information about Altera, and megafunction updates, go to the Altera web site at http://www.altera.com/IPmegastore.

Megafunctions Applications Matrix

Altera megafunctions provide a wide range of solutions to fulfill your application needs, as summarized in the following table.

Altera Megafunction Application Matrix

End Application	Functional Groups			
	Digital Signal Processing (DSP)	Communications	PCI & Other Bus Interfaces	Processors & Peripherals
ATM Switch		●	●	
Biometrics	●		●	
Bridges and Routers		●	●	●
Cable Modem	●	●		●
Cellular Basestations	●	●	●	●
Consumer Electronics	●	●	●	●
Data Acquisition	●	●	●	
Data Storage Systems			●	●
Digital Audio and Video Broadcast	●	●	●	
Disk Drive Arrays		●	●	●
DVD	●			●
Embedded Controller/Processor	●		●	●
Frame Relay		●	●	
Gigabit Ethernet Systems		●	●	
HDTV, SDTV, MPEG-2, MPEG-4, H.26X	●		●	●
High-End Printers	●		●	●
High-Speed Telecommunications Equipment		●	●	
Instrumentation	●		●	●
Internet Connectivity Device	●	●	●	●
LAN/WAN		●	●	●
Medical Imaging	●		●	●
PC Peripherals			●	●
PCS (GSM, CDMA, TDMA)	●	●		
Satellite (GPS, DBS, LEOS)	●	●		
Set-Top Boxes	●	●	●	●
SONET		●		
Spread Spectrum Communication	●	●		
T1/T3 and E1/E3 Line Cards		●	●	●
Token Ring		●	●	●
Voice and Multimedia Over IP	●	●		●
xDSL	●	●	●	●

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