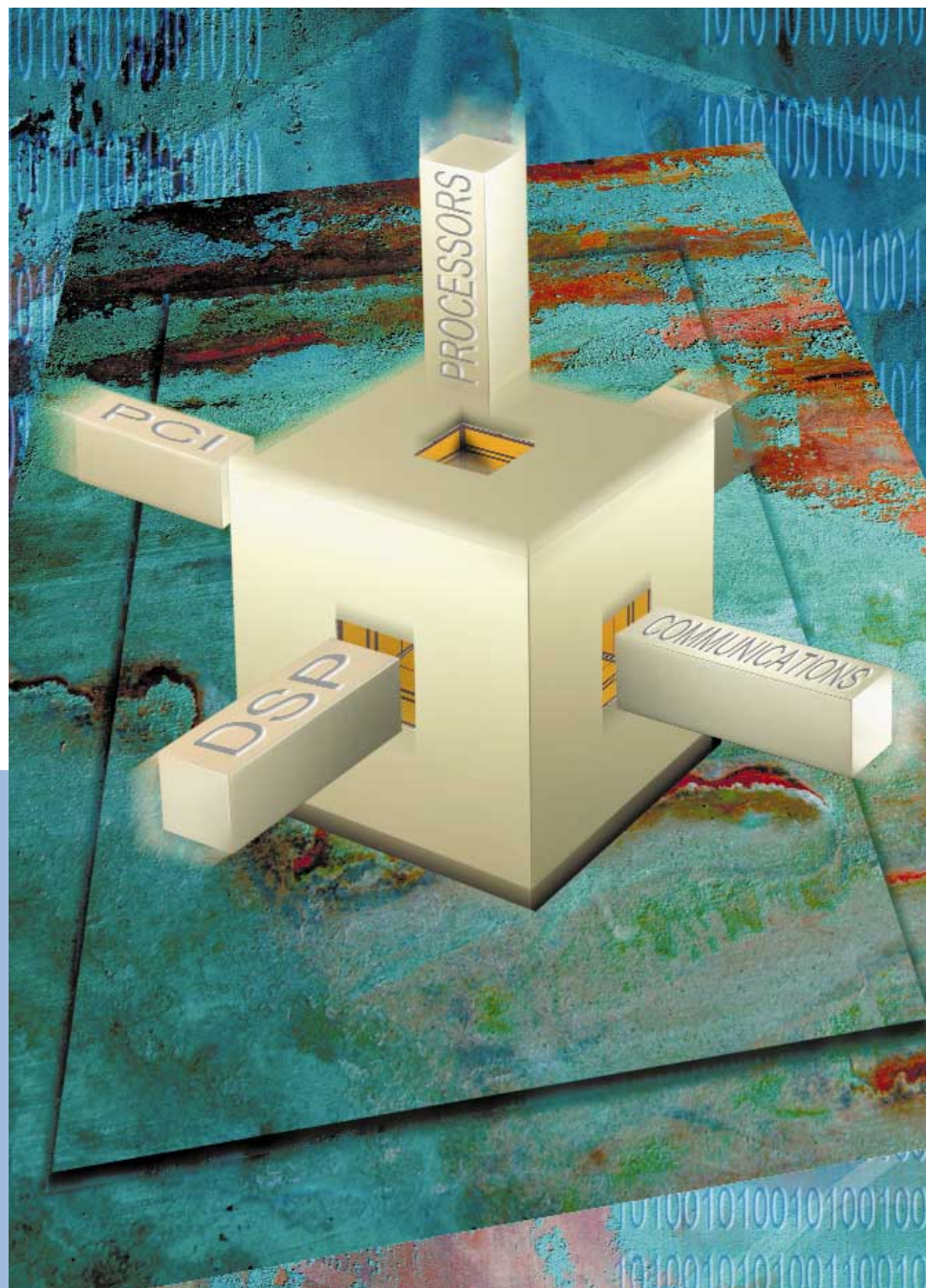


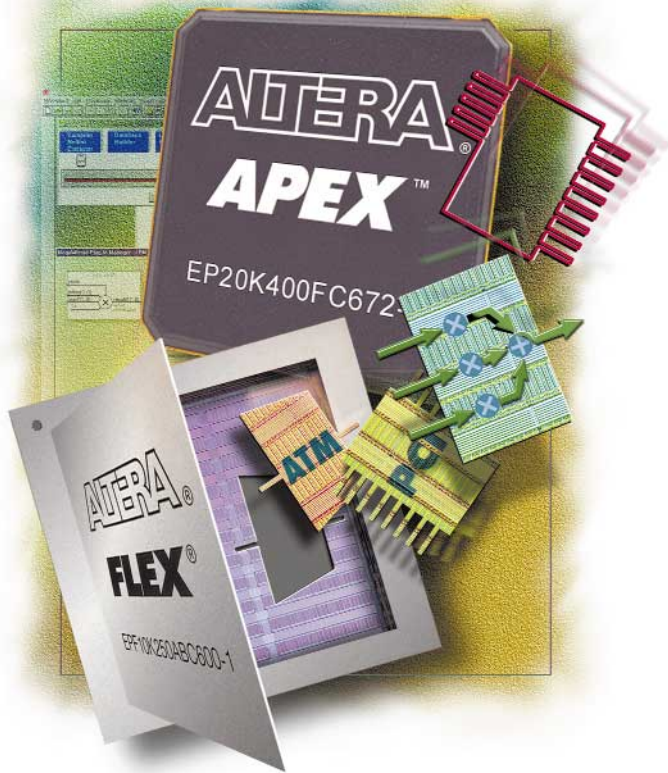


# Megafunctions Selector Guide

*System-on-a-Programmable-Chip Solutions*



**June 1999**



## Contents

- 2 Introduction to Altera Megafunctions
- 4 Digital Signal Processing Megafunctions
- 7 Communications Megafunctions
- 8 PCI & Other Bus Interface Megafunctions
- 10 Processor & Peripheral Megafunctions
- 11 AMPP Partners Directory
- 12 Megafunctions Applications Matrix

## Introduction to Altera Megafunctions

### Altera Megafunctions Provide Total Solutions for All Your Design Needs

With programmable logic device (PLD) densities reaching up to 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 a multitude of system-level intellectual property (IP) blocks called megafunctions, and integration with system-level tools.

The combination of Altera's megafunctions, PLDs, and software has resulted in lower development costs, 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<sup>SM</sup>) and with Altera-created MegaCore™ functions.

## Altera Megafunction Partners Program

The Altera Megafunction Partners Program (AMPP), an alliance between Altera and megafunction 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.



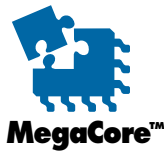
## Premier AMPP Program

The Premier AMPP<sup>SM</sup> Program recognizes the top performing participants in the regular AMPP program based on feedback from customers. The two current Premier AMPP partners are Hammer Cores and PLD Applications.



## 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.



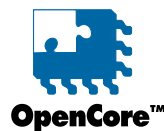
## MegaWizard Plug-Ins

Altera MegaWizard<sup>TM</sup> 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.

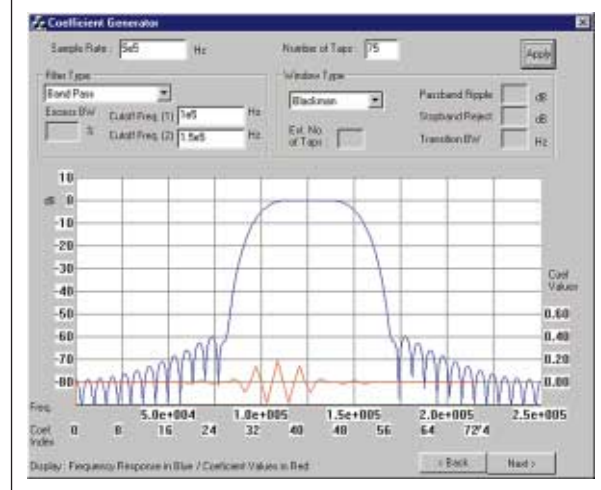


## Risk-Free OpenCore Evaluation

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



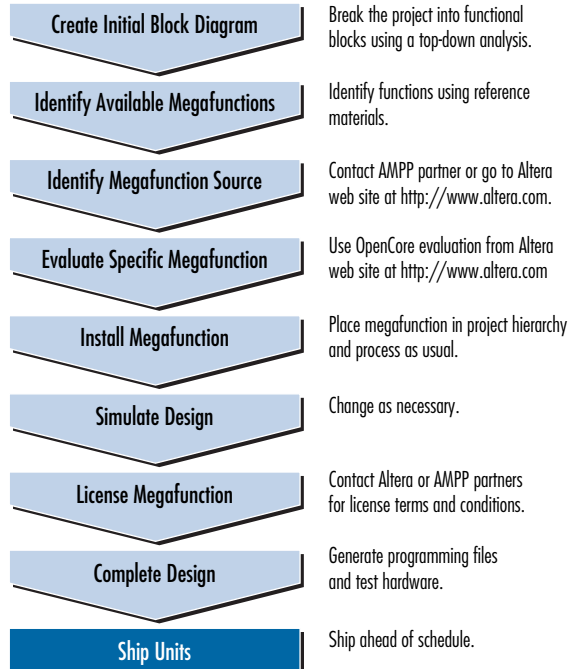
## MegaWizard Plug-In Feature



## Designing from the Top-Down

Having a smooth project flow is critical for design success. The development process for megafunctions, shown in the diagram below, helps guarantee success.

## Top-Down Design Flow





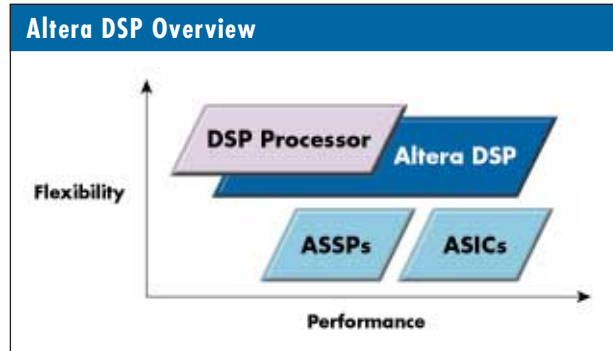
# Digital Signal Processing (DSP) Megafunctions

## 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 tradeoff, 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 error control coding solutions such as Reed-Solomon and Viterbi decoders
- DSP communication functions for wireless and broadband applications



## DSP Building Blocks

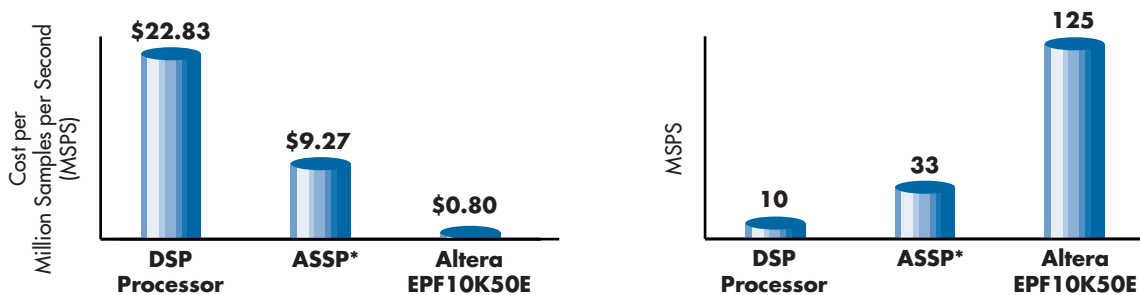
Altera’s DSP building blocks include functions such as high-speed multipliers, floating-point arithmetic functions, IIR filters, and round/saturate functions. These parameterized functions are optimized for both performance and flexibility in Altera’s FLEX® and APEX™ architectures, and can be combined 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 Error Control Coding (ECC) Solutions

ECC is a technology that detects—and in some cases corrects—errors induced in digital data during transmission over a noisy channel (digital video/audio broadcast) or during storage on an unreliable medium (e.g., compact disc, digital tape). Coding types—including Reed-Solomon, Viterbi, and Turbo—detect and correct these errors.



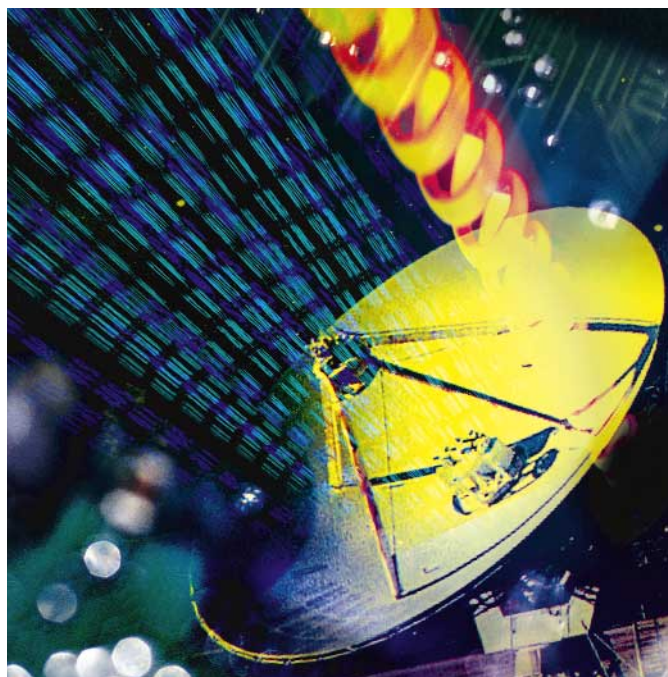
DSP Building Blocks		
FUNCTION DESCRIPTION	SOURCE	PRODUCT FAMILY
FIR Compiler	Altera MegaCore Function	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
Floating-Point Operator Library	Integrated Silicon Systems	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
FIR Filter Library	Integrated Silicon Systems	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
Fast Fourier Transform (FFT/IFFT)	Altera MegaCore Function	APEX 20K, FLEX 10K
Fast Fourier Transform (FFT/IFFT)	Hammer Cores	APEX 20K, FLEX 10K
Fast Fourier Transform (FFT/IFFT), High Performance	Integrated Silicon Systems	APEX 20K, FLEX 10K
Fast Fourier Transform (FFT/IFFT), Low Latency	Integrated Silicon Systems	APEX 20K, FLEX 10K
IIR Filter Library	Integrated Silicon Systems	APEX 20K, FLEX 10K
Rank Order Filter Library	Integrated Silicon Systems	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000

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

DSP Error Control Coding Megafunctions		
FUNCTION DESCRIPTION	SOURCE	PRODUCT FAMILY
CRC Checker/Generator	Altera MegaCore Function	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
DES Core	SICAN Microelectronics	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
DES Cryptoprocessor	Hammer Cores	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
Intermediate Data Rate (IDR) Framing/ Deframer	Integrated Silicon Systems	APEX 20K, FLEX 10K
Reed-Solomon Decoder	Altera MegaCore Function	APEX 20K, FLEX 10K
Reed-Solomon Decoder	Hammer Cores	APEX 20K, FLEX 10K
Reed-Solomon Decoder	Integrated Silicon Systems	APEX 20K, FLEX 10K
Reed-Solomon Encoder	Altera MegaCore Function	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
Reed-Solomon Encoder	Hammer Cores	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
Reed-Solomon Encoder	Integrated Silicon Systems	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
Symbol Interleaver/Deinterleaver	Altera MegaCore Function	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
Viterbi Decoder	CAST, Inc.	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
Viterbi Decoder	Integrated Silicon Systems	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
Viterbi Decoder	Nova Engineering	APEX 20K, FLEX 10K
X_DES	CAST, Inc.	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000

## 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 demands of the end users. 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. The functions are integrated to complete system-level solutions. Target applications for these solutions include cellular basestations, PCS, ADSL, and cable modems.

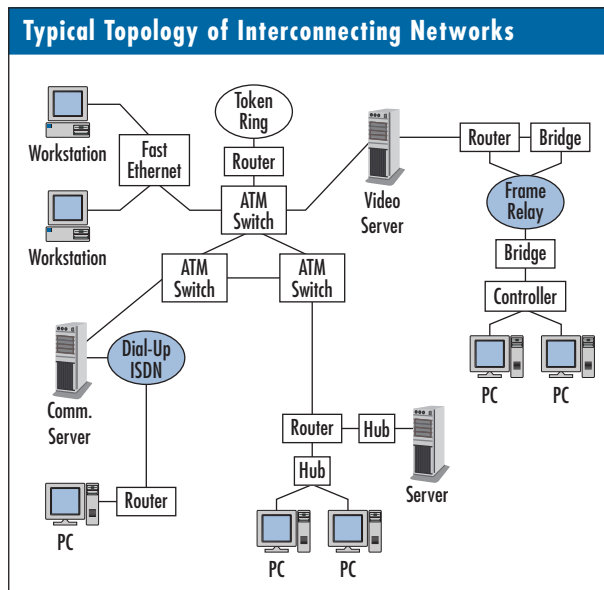


DSP Wireless & Broadband Communications Megafunctions		
FUNCTION DESCRIPTION	SOURCE	PRODUCT FAMILY
Adaptive Equalizer	Hammer Cores	APEX 20K, FLEX 10K
Adaptive Equalizer	Integrated Silicon Systems	APEX 20K, FLEX 10K
Adaptive Filter	Integrated Silicon Systems	APEX 20K, FLEX 10K
Binary Pattern Correlator	Nova Engineering	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
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
Complex Mixer/Multiplier	Nova Engineering	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
Cordpol Function	Hammer Cores	APEX 20K, FLEX 10K
Digital Modulator	Nova Engineering	APEX 20K, FLEX 10K
DVB_CODEC	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 Function	APEX 20K, FLEX 10K
FIR Compiler	Altera MegaCore Function	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
Linear Feedback Shift Register	Nova Engineering	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
LMS & Zero-Forcing Equalizers	Hammer Cores	APEX 20K, FLEX 10K
Numerically Controlled Oscillator/Cordic	Altera MegaCore Function	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
Numerically Controlled Oscillator (NCO)	Nova Engineering	APEX 20K, FLEX 10K
Numerically Controlled Oscillator (NCO)	Hammer Cores	APEX 20K, FLEX 10K
QPSK Equalizer	Integrated Silicon Systems	APEX 20K, FLEX 10K
Telephony Tone Generation Megafunction	NComm	APEX 20K, FLEX 10K

# 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
10/100 Ethernet Media Access Controller (MAC)	Stargate Solutions	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	APEX 20K, FLEX 10K
CRC-32	CoreEl Microsystems	APEX 20K, FLEX 10K
CRC Checker/Generator	Altera MegaCore Function	APEX 20K, FLEX 10K
Cell Delineation A (CC200A)	CoreEl MicroSystems	APEX 20K, FLEX 10K
Fast Ethernet Media Access Controller (MAC) Transmitter	CoreEl MicroSystems	APEX 20K, FLEX 10K
Fast Ethernet Media Access Controller (MAC) Receiver	CoreEl MicroSystems	APEX 20K, FLEX 10K
High-Level Data Link Controller (HDLC)	CAST, Inc.	APEX 20K, FLEX 10K
High-Level Data Link Controller (HDLC)	CoreEl Microsystems	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) Controller	Wipro Infotech	APEX 20K, FLEX 10K
NRZ/NRZI Data Encoder-Decoder	Innocor Ltd.	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
Packet Over SONET Controller (INL03994-01)	Innocor Ltd.	APEX 20K, FLEX 10K
PPP8	CoreEl Microsystems	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	APEX 20K, FLEX 10K
Universal Digital Data Acquisition	PLD Applications	APEX 20K, FLEX 10K
UTOPIA Level II Master	Applied Microelectronics	APEX 20K, FLEX 10K
UTOPIA Level II Slave	Applied Microelectronics	APEX 20K, FLEX 10K
UTOPIA Level II Master Receiver	CoreEl MicroSystems	APEX 20K, FLEX 10K
UTOPIA Level II Slave Receiver	CoreEl MicroSystems	APEX 20K, FLEX 10K
UTOPIA Level II Master Transmitter	CoreEl MicroSystems	APEX 20K, FLEX 10K
UTOPIA Level II Slave Transmitter	CoreEl MicroSystems	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.

### 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 and 32-bit, 33-MHz master/target functions.

The figure at the right 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 efforts.

Altera PCI Development Board

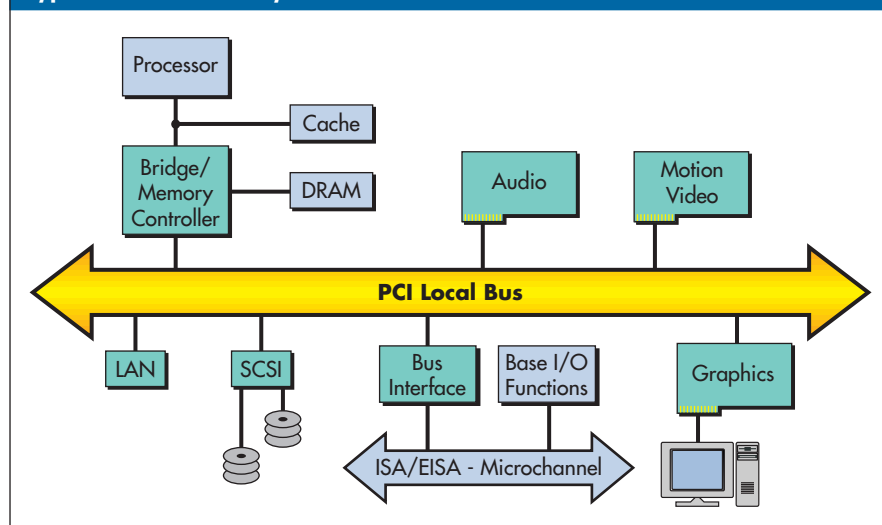


### PCI Development Board

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

Altera provides a complete PCI solution that lowers development cost and improves time-to-market.

Typical PCI Local Bus System





## Peripheral Component Interconnect (PCI) Megafunctions

FUNCTION DESCRIPTION	SOURCE	PRODUCT FAMILY
64-Bit PCI Master/Target	Altera MegaCore Function	APEX 20K, FLEX 10K
64-Bit PCI Master/Target	PLD Applications	APEX 20K, FLEX 10K
64-Bit PCI Bus Master/Target	Eureka Technology	APEX 20K, 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 Function	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 Function	APEX 20K, FLEX 10K
32-Bit PCI Master/Target with Customizable Back-End	Altera MegaCore Function	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
PCI Hostbridge	Eureka Technology	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000

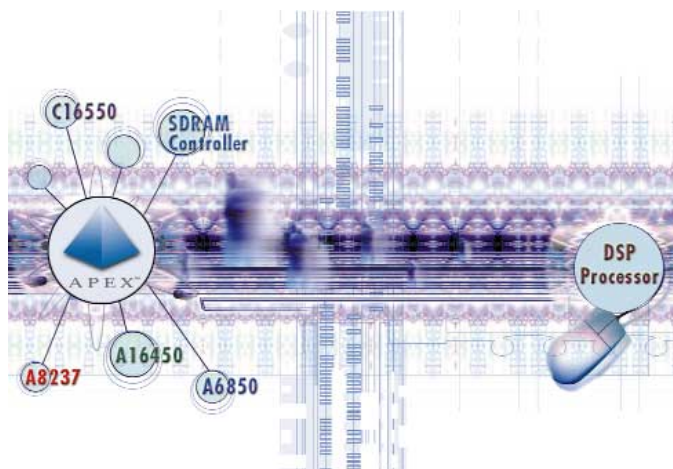
## Other Bus Interface Megafunctions

FUNCTION DESCRIPTION	SOURCE	PRODUCT FAMILY
1394A Link Layer Controller Core	Phoenix Technologies	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
IEEE 1284 Parallel Slave Interface	SIS Microelectronics	APEX 20K, FLEX 10K
IEEE 1394 Link Layer Controller (FireFox)	SIS Microelectronics	APEX 20K, FLEX 10K
CAN Bus	SICAN Microelectronics	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
IEEE1394 Link Layer Controller: Si-Link	Simple Silicon, Inc.	APEX 20K, FLEX 10K
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
SDRAM Controller	Eureka Technology	APEX 20K, FLEX 10K
SDRAM Controller	Northwest Logic Design	APEX 20K, FLEX 10K
SDRAM Controller	Stargate Solutions	APEX 20K, FLEX 10K
USB Host Controller	Sapient Design	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
USB Host Controller: Si-EnableUSP-86	Simple Silicon, Inc.	APEX 20K, FLEX 10K
USB Function Controller	Sapient Design	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
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	APEX 20K, FLEX 10K

## Processor and Peripheral Megafunctions

### 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
C29116A 16-Bit Microprocessor	CAST, Inc.	APEX 20K, FLEX 10K, FLEX 8000
CISC Processor	Hammer Cores	APEX 20K, FLEX 10K
LX4080P 32-Bit Microprocessor	Lexra	APEX 20K, FLEX 10K
RISC Processor	Hammer Cores	APEX 20K, FLEX 10K
V6502 Microprocessor	VAutomation	APEX 20K, FLEX 10K
V8- $\mu$ RISC Microprocessor	VAutomation	APEX 20K, FLEX 10K
VZ80 Microprocessor	VAutomation	APEX 20K, FLEX 10K
XTensa 32-Bit Configurable Microprocessor	Tensilica, Inc.	APEX 20K, FLEX 10K

### Peripheral Megafunctions

FUNCTION DESCRIPTION	SOURCE	PRODUCT FAMILY
8259 Programmable Interrupt Controller	Innoco Ltd.	APEX 20K, FLEX 10K, FLEX 8000, FLEX 6000
a16450 UART	Altera MegaCore Function	APEX 20K, FLEX 10K
a6402 UART	Altera MegaCore Function	APEX 20K, FLEX 10K
a6850 ACIA	Altera MegaCore Function	APEX 20K, FLEX 10K
a8237 DMA Controller	Altera MegaCore Function	APEX 20K, FLEX 10K
a8251A Communication Interface	Altera MegaCore Function	APEX 20K, FLEX 10K
a8255A Programmable Peripheral Adapter	Altera MegaCore Function	APEX 20K, FLEX 10K
a8259 Programmable Interrupt Controller	Altera MegaCore Function	APEX 20K, FLEX 10K
C-UART	CAST, Inc.	APEX 20K, 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
DMA Controller	Eureka Technology	APEX 20K, FLEX 10K, FLEX 6000
RAW8051 Microcontroller	Richard Watts Associates	APEX 20K, FLEX 10K
RAW8052 Microcontroller	Richard Watts Associates	APEX 20K, FLEX 10K
SDRAM Controller	Northwest Logic Design	APEX 20K, FLEX 10K
SDRAM Controller	Stargate Solutions	APEX 20K, FLEX 10K
Timer-Counter	Innoco Ltd.	APEX 20K, FLEX 10K

## AMPP Partners Directory

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



Premier AMPP Partners				
Partner	Address	Phone	Email	Internet URL
Hammer Cores	405 Britannia Road, 206, Mississauga, Ontario L4Z 3E6, Canada	(905) 507-6400	—	<a href="http://www.hammercores.com">www.hammercores.com</a>
PLD Applications	14 Rue Soleillet, 75971 Paris Cedex 20	(33) 1-40-33-79-98	<a href="mailto:plda@worldnet.fr">plda@worldnet.fr</a>	<a href="http://www.plda.com">www.plda.com</a>

AMPP Partners				
Partner	Address	Phone	Email	Internet URL
Applied Microelectronics	1046 Barrington Street, Halifax, Nova Scotia B3H 2R1, Canada	(902) 421-1250	<a href="mailto:info@appliedmicro.ns.ca">info@appliedmicro.ns.ca</a>	<a href="http://www.appliedmicro.ns.ca">www.appliedmicro.ns.ca</a>
CAST, Inc.	24 White Birch Drive, Pomona, NY 10970	(914) 354-4945	<a href="mailto:opencore@cast-inc.com">opencore@cast-inc.com</a>	<a href="http://www.cast-inc.com">www.cast-inc.com</a>
CoreEl Microsystems, Inc.	46750 Fremont Blvd., Suite 208, Fremont, CA 94538	(510) 770-2277	<a href="mailto:altera.sales@coreel.com">altera.sales@coreel.com</a>	<a href="http://www.coreel.com">www.coreel.com</a>
Digital Design & Development	18A Godshuis Street, 1861, Meise, Belgium	(32) 2-270-2797	73261.530@compuserve.com	<a href="http://ourworld.compuserve.com/homepages/eric_lukac_kuruc/ddd.htm">ourworld.compuserve.com/homepages/eric_lukac_kuruc/ddd.htm</a>
Eureka Technology	4962 El Camino Real, Suite 108, Los Altos, CA 94022	(415) 960-3800	<a href="mailto:info@eurekatech.com">info@eurekatech.com</a>	<a href="http://www.eurekatech.com">www.eurekatech.com</a>
Hantro Products	Teknolgiantie 14, 90570 Oulu, Finland	358-400-688-263	<a href="mailto:info@hantro.com">info@hantro.com</a>	<a href="http://www.hantro.com">www.hantro.com</a>
Innocor Ltd.	7 Mill Street, Suite 300, Almonte, Ontario KOA 1A0, Canada	(613) 256-5339	<a href="mailto:info@innocor.com">info@innocor.com</a>	<a href="http://www.innocor.com">www.innocor.com</a>
Integrated Silicon Systems	50 Malone Road, Belfast, BT9 5BS, Northern Ireland	(44) 1232-664-664	<a href="mailto:info@iss-dsp.com">info@iss-dsp.com</a>	<a href="http://www.iss-dsp.com">www.iss-dsp.com</a>
KTech Telecommunications	15501 SF Mission Blvd., Suite 100, Mission Hills, CA 91345	(818) 361-2248	<a href="mailto:skuh@ktechtelecom.com">skuh@ktechtelecom.com</a>	<a href="http://www.ktechtelecom.com">www.ktechtelecom.com</a>
Lexra, Inc.	51 Sawyer Road, Suite 110, 2 University Park Waltham, MA 02154	(781) 899-5799	—	<a href="http://www.lexra.com">www.lexra.com</a>
Northwest Logic Design	1905 NW 169th Place, Suite 121, Beaverton, OR 97006	(503) 533-5800	<a href="mailto:ip@nwlogic.com">ip@nwlogic.com</a>	<a href="http://www.nwlogic.com">www.nwlogic.com</a>
NComm, Inc.	401 Main Street, Suite 204, Salem, NH 03079	(603) 893-6186	<a href="mailto:info@ncomm.com">info@ncomm.com</a>	<a href="http://www.ncomm.com">www.ncomm.com</a>
Nova Engineering	5 Circle Freeway Drive, Cincinnati, OH 45246-1105	(513) 860-3456	<a href="mailto:info@nova-eng.com">info@nova-eng.com</a>	<a href="http://www.nova-eng.com">www.nova-eng.com</a>
Phoenix Technologies	411 E. Plumeria Drive, San Jose, CA 95134	(408) 570-1000	<a href="mailto:sales@vchips.com">sales@vchips.com</a>	<a href="http://www.phoenix.com">www.phoenix.com</a>
Richard Watts Associates, Ltd.	8 Church Square, Leighton Buzzard, Bedfordshire LU7 7AE England, UK	(44) 1525-372621	<a href="mailto:coreinfo@evolution.co.uk">coreinfo@evolution.co.uk</a>	<a href="http://www.evolution-uk.com/rwa/">www.evolution-uk.com/rwa/</a>
Sapien Design	45335 Potawatami Drive, Fremont, CA 94539	(510) 668-0200	<a href="mailto:sapien@pacbell.net">sapien@pacbell.net</a>	<a href="http://www.sapiendesign.com">www.sapiendesign.com</a>
SICAN Microelectronics Corp.	400 Oyster Point Blvd., Suite 512, S. San Francisco, CA 94080	(650) 871-1494	<a href="mailto:ampp@SICAN-micro.com">ampp@SICAN-micro.com</a>	<a href="http://www.SICAN-micro.com">www.SICAN-micro.com</a>
Simple Silicon, Inc.	10430 S. De Anza Blvd., Suite 195, Cupertino, CA 95014	(408) 873-2260	<a href="mailto:info@simplesi.com">info@simplesi.com</a>	<a href="http://www.simplesi.com">www.simplesi.com</a>
SIS Microelectronics, Inc.	1831 LeftHand Circle, Suite E, P.O. Box 1432 Longmont, CO 80501	(303) 776-1667 Ext. 223	<a href="mailto:info@sismicro.com">info@sismicro.com</a>	<a href="http://www.sismicro.com">www.sismicro.com</a>
Stargate Solutions, Inc.	2355 Oakland Road, #33, San Jose, CA 95131	(408) 954-8302	<a href="mailto:info@sgates.com">info@sgates.com</a>	<a href="http://www.sgates.com">www.sgates.com</a>
Tensilica, Inc.	3255-6 Scott Blvd., Santa Clara, CA 95054	(408) 873-1000 Ext. 302	<a href="mailto:sales@hq.tensilica.com">sales@hq.tensilica.com</a>	<a href="http://www.tensilica.com">www.tensilica.com</a>
VAutomation, Inc.	20 Trafalgar Square, Suite 443, Nashua, NH 03063	(603) 882-2282	<a href="mailto:ampp@VAutomation.com">ampp@VAutomation.com</a>	<a href="http://www.vautomation.com">www.vautomation.com</a>
Wipro Infotech Technology Solutions Division	1995 El Camino Real, #200, Santa Clara, CA 95050	(408) 557-4414	—	<a href="http://www.wipro.com">www.wipro.com</a>

### Additional Documentation Available on the Altera Web Site

Altera provides additional reference documentation including an *AMPP Catalog* (M-CAT-AMPP-03), a *Microperipheral MegaCore Library Data Book* (A-DB-MEGA-02), 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>.

# 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	●	●	●	●

## Altera Offices

**Corporate Headquarters**  
Altera Corporation  
101 Innovation Drive  
San Jose, CA 95134  
USA  
Telephone: (408) 544-7000  
<http://www.altera.com>

**Altera European Headquarters**  
Altera U.K. Limited  
Holmers Farm Way  
High Wycombe  
Buckinghamshire  
HP12 4XF  
United Kingdom  
Telephone: (44) 1 494 602 000

**Altera Japan Limited**  
Shinjuku Mitsui Building 36F  
1-1, Nishi-Shinjuku, 2 Chome  
Shinjuku-ku, Tokyo 163-0436  
Japan  
Telephone: (81) 3 3340 9480  
<http://www.altera.com/japan>

**Altera International Limited**  
Suite 908-920, Tower 1  
Metroplaza  
223 Hing Fong Road  
Kwai Fong, New Territories  
Hong Kong  
Telephone: (852) 2487 2030