

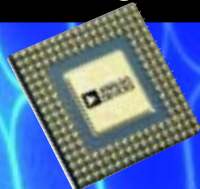


THE BROADBAND BEAT

Fall 2001

Newsletter Vol. 1

xDSL • Analog • DSP • Power Management • RF Chip Sets • MEMS • Audio • RF Synthesizers • DDS



Presented by:

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**ADSL - It's as simple
as Annex A,B,C**

**How to put the
"POP" back into
your interop**

**Traversing the
Telco Topography**

**The "X"-treme power of
the AD6x89 family of
Network Processors**



INTEGRATION ZONE



ADSL



ENTER TO WIN
See back cover for details



The ABC's of ADSL

Annex

**OVER 14 MILLION
ADSL CHIPSETS
DELIVERED TO DATE**

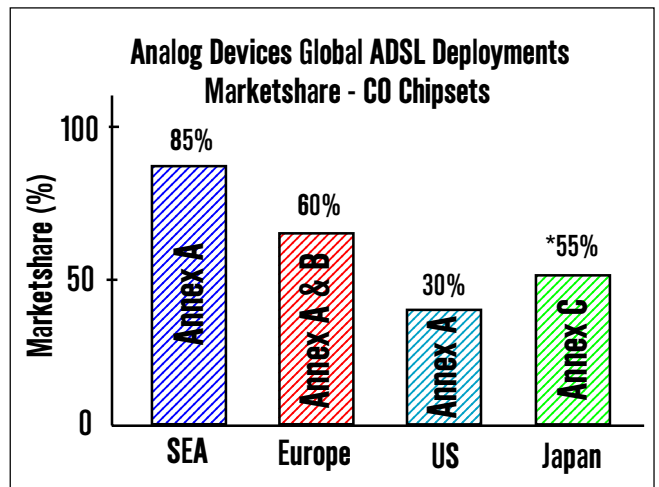


Whenever you pick up any trade rag these days there is an endless supply of bolder and bolder ADSL product performance claims ranging from data rate speed upgrades to flawless interoperability, stopping just shy of having the solution for world hunger. But we all know that most of these claims are unfounded and certainly not supported by any hard evidence. Despite all of these exaggerated claims, certain facts cannot be disputed, one of which is the current Global ADSL deployment marketshare distributions. Within the ADSL industry it is perceived that Alcatel is the marketshare leader, when in reality ADI has a dominant marketshare position in both SEA (80% - including Korea and Taiwan) and Europe (60%) with both its Annex A and B CO chipset solutions, with plans to become a major player in Japan (Annex C) to the tune of 50+% with the introduction of its Anaconda and Diamondback products (up to 12 Mb/s).

On the heels of these significant CO ADSL deployments, ADI introduced the Eagle™ 2-chip CPE solution which is offered in UTOPIA, USB, and PCI interfaces. With Eagle's unsurpassed level of integration and enhanced performance it is anticipated to be the dominant chipset for the CPE Modem OEM market for the foreseeable future.

Since ADI is currently the open marketshare leader for ADSL CO chipset deployments and is projected to have a dominant global marketshare in CPE modems with the introduction of Eagle, it only stands to reason that seamless interoperability will finally be obtainable for most domestic and international Telco providers.

Having superior CO and CPE ADSL solutions for Annex A, B, and C is the rock solid foundation that helps solidify ADI's leadership role in the global ADSL marketplace.



* - Estimated Projection

ADSL

INTEGRATION ZONE

CO Solution - Anaconda™

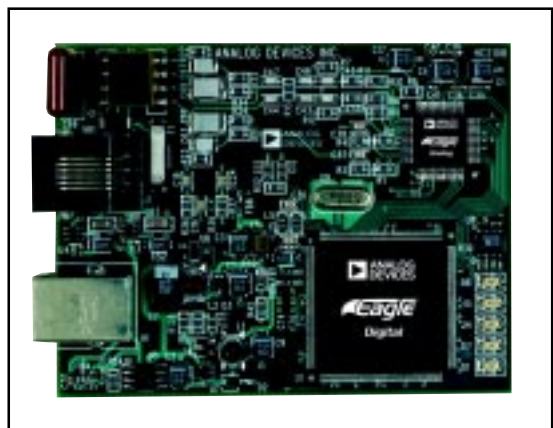
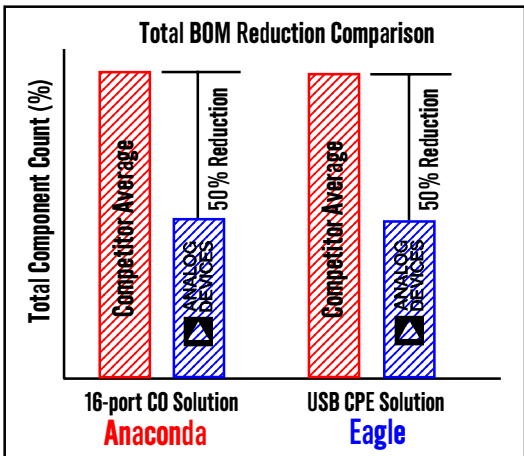


Anaconda reference design line card shown

Analog Devices, the market leader in ADSL silicon solutions, now offers a 6th generation, Central Office (CO), DMT-based ADSL chipset: the Anaconda™ 16-Port. Anaconda is a fully programmable, multimode chipset solution that enables ADSL equipment manufacturers to design high-density line cards for voice switches, DSLAMs, and digital loop carrier equipment. Incorporating higher integration levels and significantly reducing the analog circuitry and components required for the complete design, Anaconda reduces overall system operating and manufacturing costs while dramatically improving ease of manufacture. Setting new standards for CO chipset density, Anaconda allows for the complete solution, from UTOPIA bus to line, occupying a mere 1.1 inches/port and consuming only 1.1 watts/port for full-rate ADSL.

CPE Solution - Eagle™

The Eagle CPE is a highly integrated Customer Premise Equipment chipset that performs all physical layer functions needed to implement standards-compliant Category 1 and Category 2 Asymmetric Digital Subscriber Line (ADSL) modems. The analog IC integrates several passive and active components, a line driver an AFE to reduce the number of components. The digital IC integrates a DSP, DMT coprocessor, framer, and interleave RAM. The programmable DMT engine performs QAM or Trellis encoding/decoding, symmetric 512-point FFT/IFFT processing, echo cancellation, time/frequency-domain equalization, and transmit/filtering. The FFT/IFFT bin assignments are completely programmable to support ADSL over ISDN (Annex B and C). The framer provides ATM TC sublayer processing, standard and reduced overhead ADSL framing, and FEC with interleaving. Dual latency and multi-frame code words are supported. Software-based modem control and configuration allows for considerable flexibility in configuration and management. The chip supports very low-power standby and D3 cold ADSL remote wake-up through an on-board circuit to detect central office (CO) transmitted wake-up tones. On-chip digital timing recovery eliminates the need for a VCXO and allows Eagle to run from a single 12 MHz external crystal.

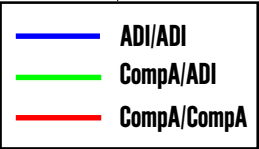


Eagle-USB reference design board shown

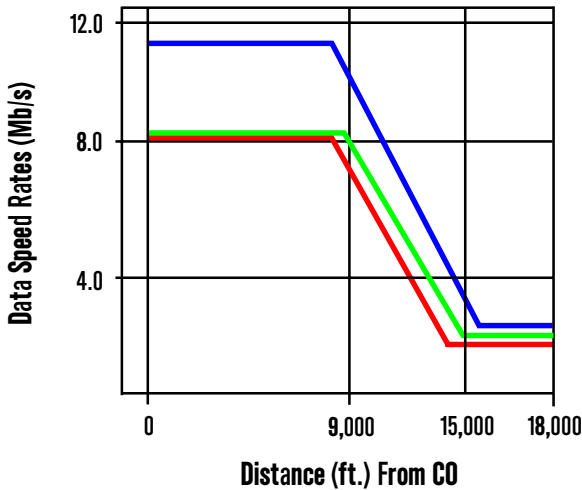
Putting the "Pop" back into your Interop

Will the Real Performance Leader Stand Up

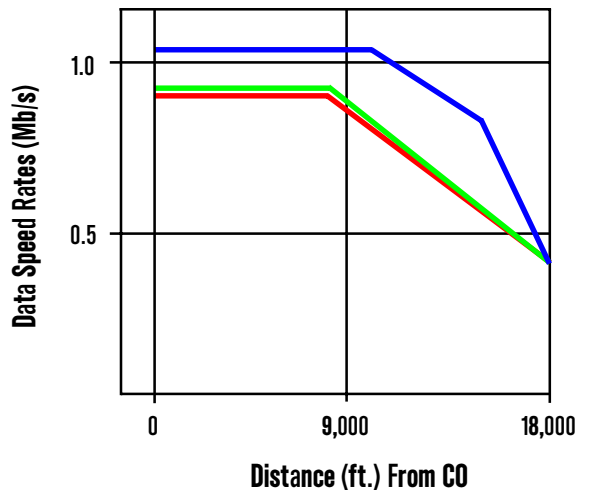
The dispute over ADSL interoperability has raged on ever since the mass deployment of ADSL technology became a reality. Since Analog Devices is a major player in that space it would make sense for ADI to insure that their respective products were compatible with other leading providers to minimize connection errors. After a comprehensive and exhaustive series of independent tests, the following results were presented as it related to Analog Devices and another major competitors (Comp A) interoperability performance.



Downstream

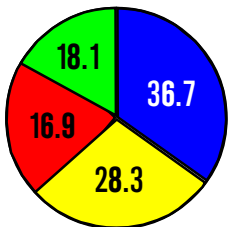


Upstream

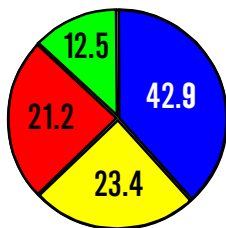


No matter how you slice it, ADI is on Top

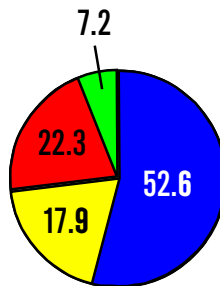
**CO ADSL
IC Port Shipments
Merchant Marketshare (%)**



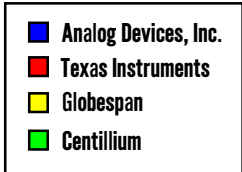
**2001
10.3M Ports**



**2002
13.8M Ports**



**2003
14M Ports**



The most recent downturn in the ADSL market further illustrates just how volatile and unpredictable this industry truly is. With variables such as performance, interoperability, delivery, tech support, install base, etc. it would be best to partner with a company that has the proven technical and financial resources to insure continued support and leadership through the good and bad times. As depicted by the "Marketshare" data, it becomes quite evident that ADI has what it takes to lead and survive the tumultuous and unforgiving landscape of the xDSL marketplace. With a dominant worldwide CO marketshare and industry leading CPE products, ADI plans on continuing to provide the best in products and services for our existing and new customers.

Traversing the "Telco" Topography

This article is the first in a series Telecommunications-related articles. Future articles will: I) explore the various telecommunications service providers, by region, in detail, II) analyze worldwide ADSL/G.SHDSL/VDSL deployments, III) explain the various broadband voice technologies such as, VoIP, VoATM and CVoDSL, IV) review PSTN, ATM and IP networks and V) describe the various termination equipment such as, IADs, Gateways, DSLAMs, DLCs and mini-DSLAMs (for MTU/MDU applications).

For the purposes of this article the market regions of interest are: 1. Asia/Pacific (China, Japan, Taiwan, S. Korea, India and Turkey), 2. Europe (UK, Germany, France, Italy and Spain) and 3. North America (US, Canada and Mexico). From 1996 to 2001 the total worldwide number of fixed-line telephones (business + residential) grew from 740 million to over 1.1 billion, this growth corresponds to a CAGR of 8.5%. The growth however was not uniform over the various market regions. As Figure 1 illustrates, the number of fixed-lines in the Asia/Pacific region grew at a CAGR of 42.3%, while North America and Europe grew at 10.3% and 5.4% respectively.

Teledensity (# of main phone lines / 100 people) helps explain the reason behind the growth in the Asia/Pacific region. Figure 2 shows the teledensities for the 3 market regions. North America and Europe have very stable teledensities; both regions had values of approximately 50 in 1996 and 56 in 2001. In these regions, the fixed-line infrastructure is very well established; any future growth in the number of fixed-lines will be strongly linked with the population growth. Excluding Japan (with a 2001 teledensity of 67.6), the Asia/Pacific fixed-line infrastructure is not well established, but it is rapidly expanding. In 1996 China's and India's teledensities were 4.4 and 1.5, respectively. By 2001, China's teledensity increased to 14.1 while India's remained low at 3.8. China's 3-fold increase is due to its aggressive infrastructure build-out. According to a recent Wall Street Journal article, by the year 2005, China's Ministry of Information Industry (MII) is planning to have between 220 to 260 million fixed-lines, representing teledensities of 16.9 and 20.0, respectively. The cost of this build-out will exceed \$150 billion.

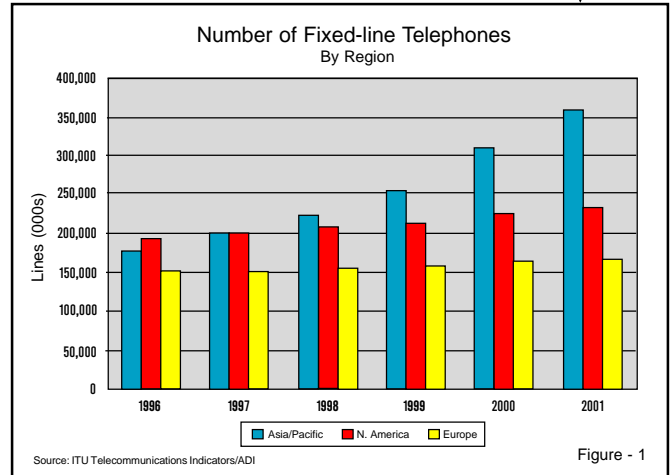


Figure - 1

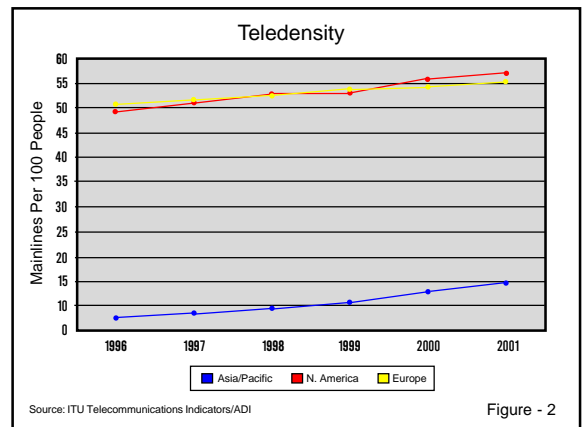


Figure - 2

Referring back to Figure 1, the growth driver in fixed-lines for the Asia/Pacific region is aggressive infrastructure build-out. For North America and Europe, infrastructure build-out will be tightly aligned with the modest population growth.

Figure 3 shows the world's top fixed-line telecommunications operators. In 2001, with nearly 180 million main fixed-lines, China Telecom occupies the number 1 position. NTT is the largest in Japan and ranks second in the world with approximately 73 million fixed-lines. The top two telcos in the US are Verizon (~72M) and SBC (~65M). Deutsche Telecom is Europe's largest telco with approximately 50 million fixed-lines. India's DOT is growing rapidly; from 1996 to 2001 the number of main fixed-lines grew from approximately 11 million to over 26 million. From an ADSL rollout perspective it is interesting to note Korea Telecom's success. KT is the world's ADSL leader even though it is only the world's 10th largest fixed-line telco. Future articles will discuss each region's telecom operators and ADSL rollout projections.

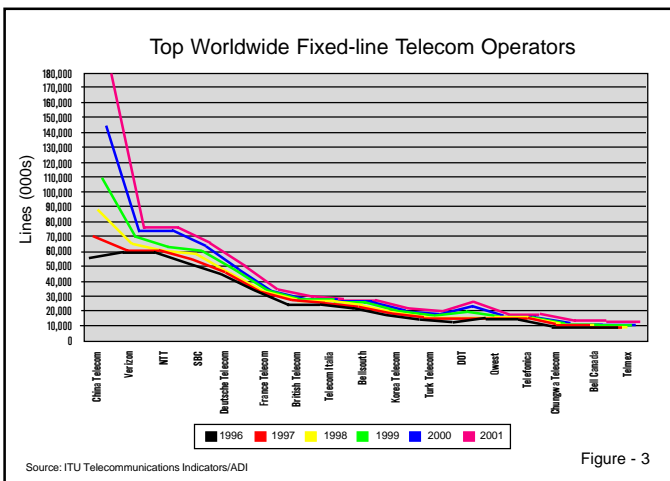


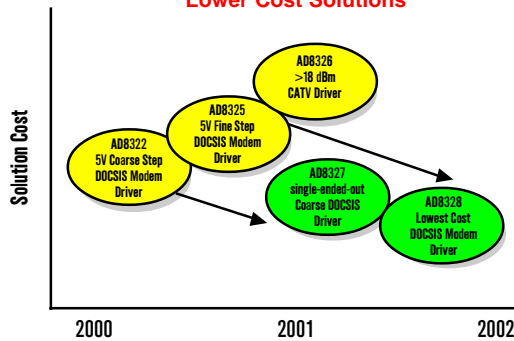
Figure - 3

How well do you know your Designated Drivers

xDSL/Cable Modem Line Drivers for any application

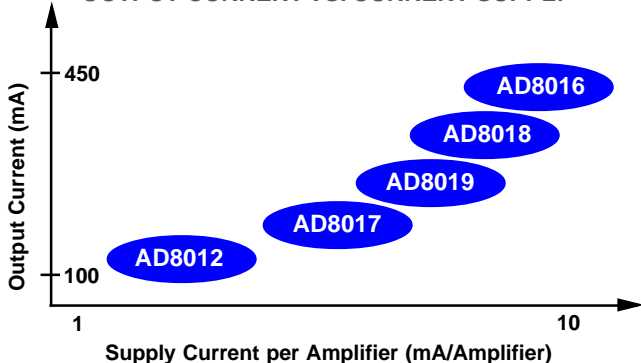
Over half of the broadband modems and linecards shipping today rely on ADI's high-performance line drivers. One look at the reference designs of the leading chipset manufacturers in the cable and ADSL markets shows you our line drivers' superior features and overall lower cost solutions are changing the industry. The first two DOCSIS-certified cable modems relied on our CATV line driver. And the dramatically reduced power dissipation of our AD8016 enables higher port density linecards required to roll out cost-effective xDSL services. In addition, ADI continues to set the benchmark for power efficiencies while delivering no-compromise ADSL bit rates. For over 30 years Analog Devices has been delivering the breakthrough technologies that enable our customers to succeed and excel. Analog Devices, the world leader in analog ICs, is committed to providing unparalleled product performance and customer satisfaction.

Driving the Cable Modem Market to Lower Cost Solutions

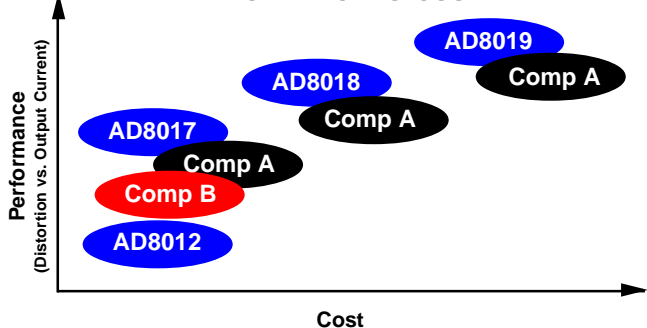


ANALOG DEVICES OFFER "BEST IN CLASS" HIGH-PERFORMANCE XDSL LINE DRIVERS.

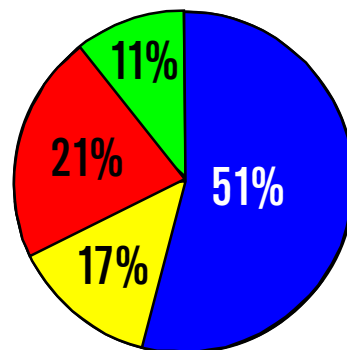
OUTPUT CURRENT VS. CURRENT SUPPLY



PERFORMANCE VS. COST



NO. 1 Market Share Leader ADSL and Cable Modem Line Drivers

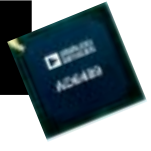


■ Analog Devices, Inc.	■ Maxim
■ Others	■ Texas Instruments

Line Drivers from ADI — "We Drive the Broadband Markets"
www.analog.com/industry/communications/modems/line_drivers.html

X-TREME

Network Processing



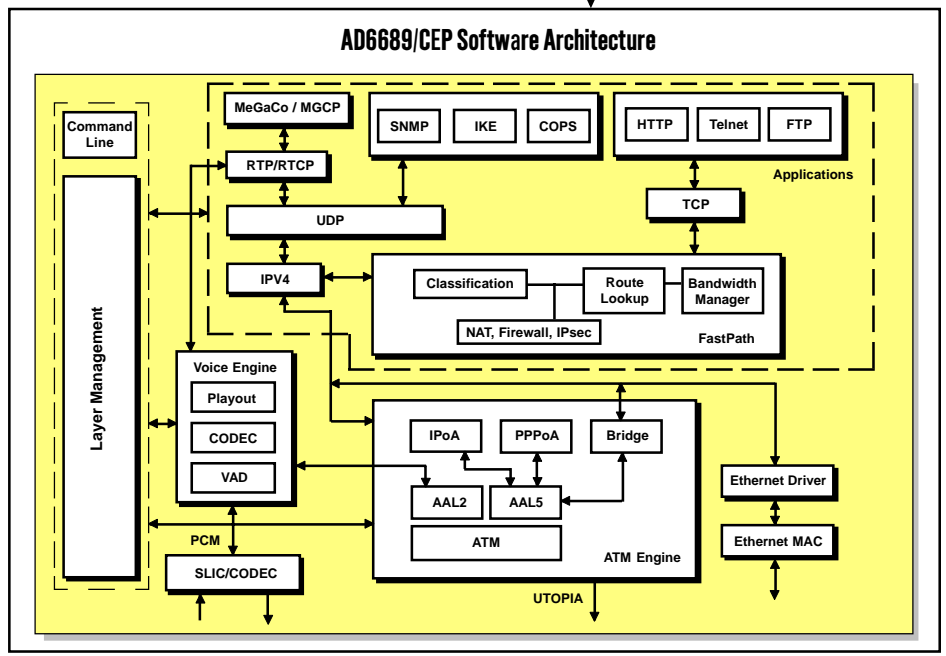
The AD6X89 Family of Network Processing Solutions

The core of the network has been moving from circuit-switching to the more efficient packet switching over the last few years. Local Exchange Carriers have been aggressively rolling out broadband services for data. We are now starting to see a revolution that will take advantage of voice packetization in the local loop (last mile) infrastructure. Applications like Voice over ATM (VoATM) and Voice over IP (VoIP) enable carriers to bundle voice and data services over the same local loop providing multiple channels of voice and high-speed data access. The AD6689 Voice over Packet processors along with the integrated software will provide the functionality needed for Layer 2 to Layer 7 applications.

The AD6689 solution provides the functionality needed for emerging broadband applications including scaleable, fast path QoS engines, policy-driven bandwidth management, and scaleable pipelined flows of security under the control of policy management including stateful firewalls. The AD6689 solution helps the system vendor go to market faster by providing a highly integrated System-On-A-Chip (SoC). The SoC comes with a reference board and complete software. A powerful Application Programming Interface (API) and plenty of processing power are available for the system vendor to provide differentiated value-addition to the system. AD6689 optimizes the split of functionality between hardware and software – this ensures high performance while providing a flexible platform suited to a wide variety of applications – IP, ATM and Frame-Relay.



The AD6489/AD6689 Evaluation Board - Convergence Exchange Platform (CEP) shown



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The Domain of DSP has a New King

Blackfin / ADSP-21535

The ADSP-21535 was formally announced to the public on Monday June, 11 2001. The ADSP-21535 is ADI's first standard product based on the high performance Micro Signal Architecture jointly developed by ADI and Intel. This announcement marks a significant milestone in the development effort and enables ADI to take the performance leadership position in the 16-bit general-purpose DSP market.

The ADSP-21535 was designed for a range of telecommunications and Internet appliance applications requiring high performance, low power consumption, and fast time to market. Operating at 300MHz, with power consumption as low as 42mW, the ADSP-21535 improves the performance of ADI's DSP portfolio by more than four fold and reduces power consumption by almost one third. The part's programmer-friendly architecture and simplified on-chip interfaces shorten hardware and software development time. Additionally, the integration of enhanced media instructions enable efficient processing of moving and still images for a wide range of emerging Internet applications.



At-A-Glance

- High-performance 300MHz 16-bit dual-MAC DSP core*
 - Flexible, software-controlled Dynamic Power Management*
 - Enhanced media instructions for audio, image, and video multimedia applications*
 - Integrated system peripherals including USB Device, PCI, serial ports, UARTs, SPI, timers*
 - VisualDSP++™ tool support*
- For more information visit www.analog.com/blackfin**

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The ADSP-21535 integrates Analog Devices' new high-performance Micro Signal Architecture core with on-chip memory, flexible peripheral sets and robust power management techniques to create a compelling solution for a broad variety of DSP applications.

For more information on innovative broadband products and solutions, visit our Broadband Communications website at:

www.analog.com/comms

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