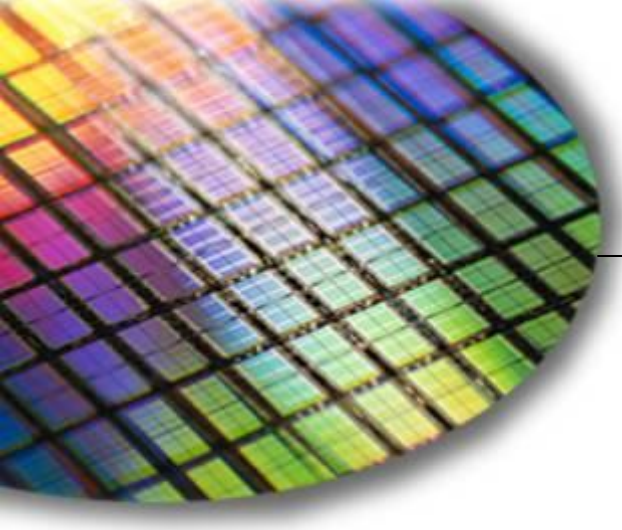


The World Leader in High Performance Signal Processing Solutions

Industry's Performance Leading Ultra-Low-Power DSP Solution

The New ADSP-BF70x Series of DSP Processors

June 12, 2014 **v4.0**

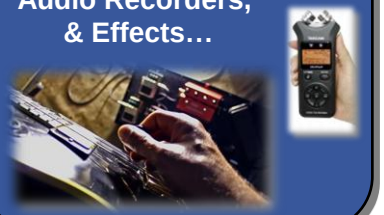
ANALOG DEVICES

Processor Market Trends Driving Change

- **Ever Increasing Need for Cost Effective Real-time Processing**
  - Low latency, deterministic performance
  - Access to low power 32-bit processing
  - Demand for cost effective machine intelligence
    - e.g. real-time image analysis & detection
  - Faster time-to-market & optimized algorithms
- **Lowest Power Solutions**
  - More portable equipment, extended battery life
  - Shrinking power budgets (limited bus power)
  - Green energy products & regulation…..
- **System integration**
  - Reduced footprint & BOM cost requirements
  - Glue-less peripheral connectivity
  - Software IP Protection & fast boot time
  - Handling of soft-error issues in safety critical systems

Intelligent Lighting & Occupancy Detection

Portable Audio
Audio Recorders, & Effects…



Industrial Imaging
Barcode, Biometrics, Cameras

Automotive
Audio & more….

Communications & Mil/Aero

Healthcare
Patient Monitoring

ANALOG DEVICES

BF70x Series : Next Generation Blackfin

Low Power High Performance Fixed-point DSP

New Blackfin+ Core
Single-Cycle 2x16-bit, 32-bit & Complex Math
16bit: 800MMACS, 32bit: 400MMACS
Blackfin Code Compatible

1MByte SRAM Large On-Chip Memory

Ultra Low Power
95mW @ 400MHz
V_{DDINT} Power at 25°C T_j

Low BoM Cost & Glue-less Connectivity Options

Starting at only $3.99
(1K units)

Quad-SPI, I2C, UART, SPORT, Video ePPI, 4-ch 12-bit ADC & more

Enhanced Connectivity Options

CAN **LPDDR DDR2**

Ease-of-Use & Fast Time-to-Market

CrossCore® Embedded Studio

Efficient C Compiler, Optimized Libraries & Algorithms

Hardware Reference Designs & JTAG Emulators

Experienced 3rd Party Network

Security/IP Protection & Data Integrity

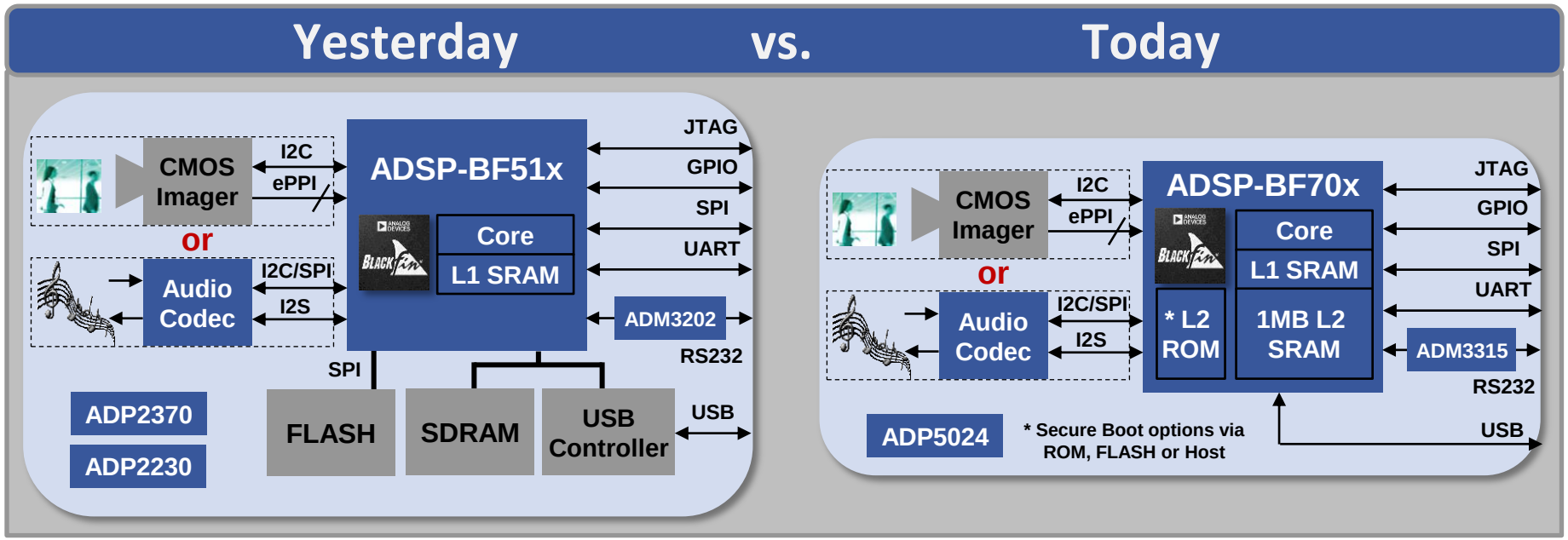
Cryptography Accelerators On-Chip

Fast Secure Booting

ECC Parity CRC On-chip Memory Protection & Integrated Safety Features
Ultra-low SER-FIT

ANALOG DEVICES

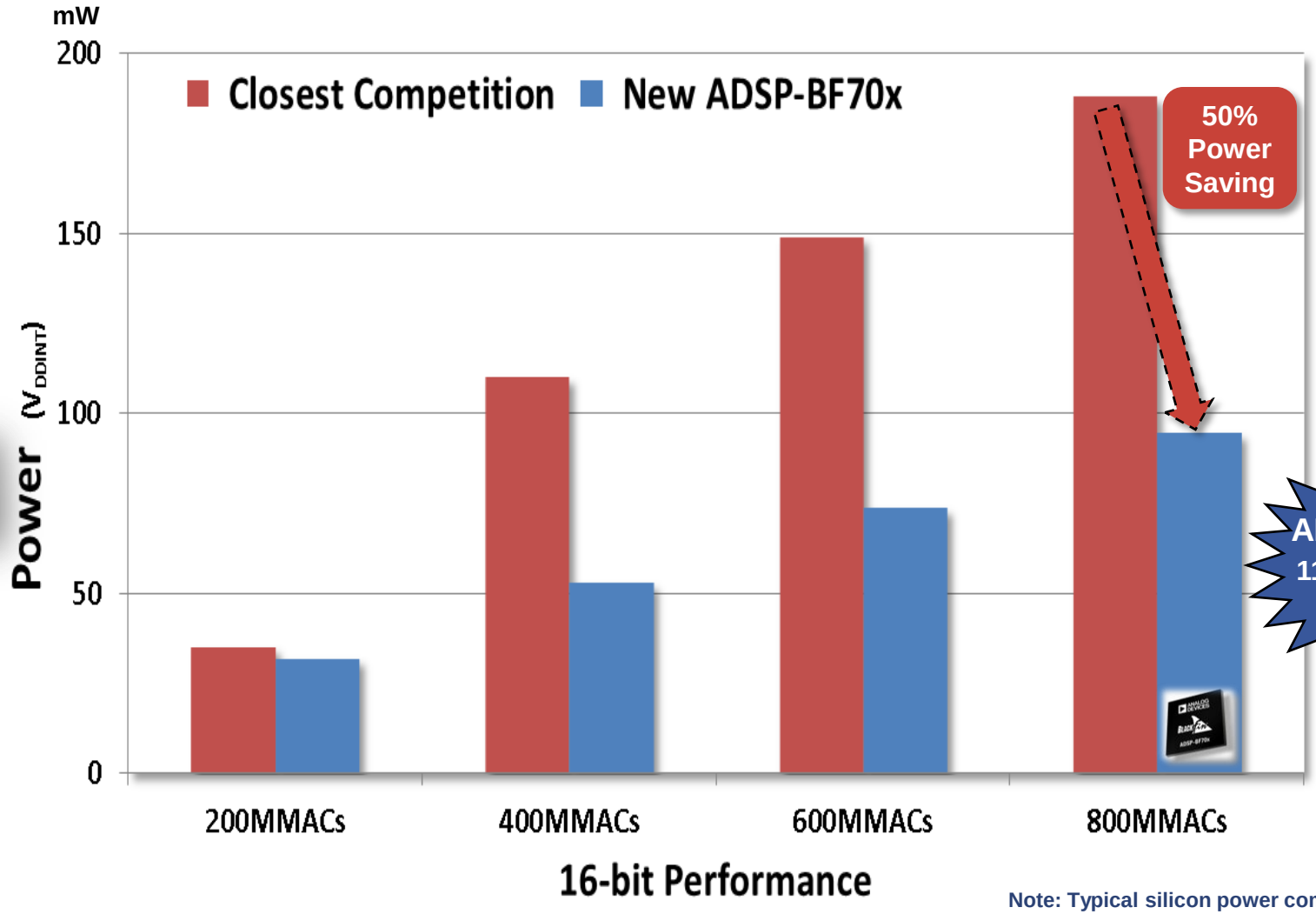
Example Use Case Comparison



- **Example Imaging Use Cases**
  - Occupancy Sensing
  - People Counting
  - Access Monitoring
  - Barcode Reader
  - Banknote Reader
- **Example Audio Use Cases**
  - Guitar Effects
  - Portable Audio/Voice Recorders

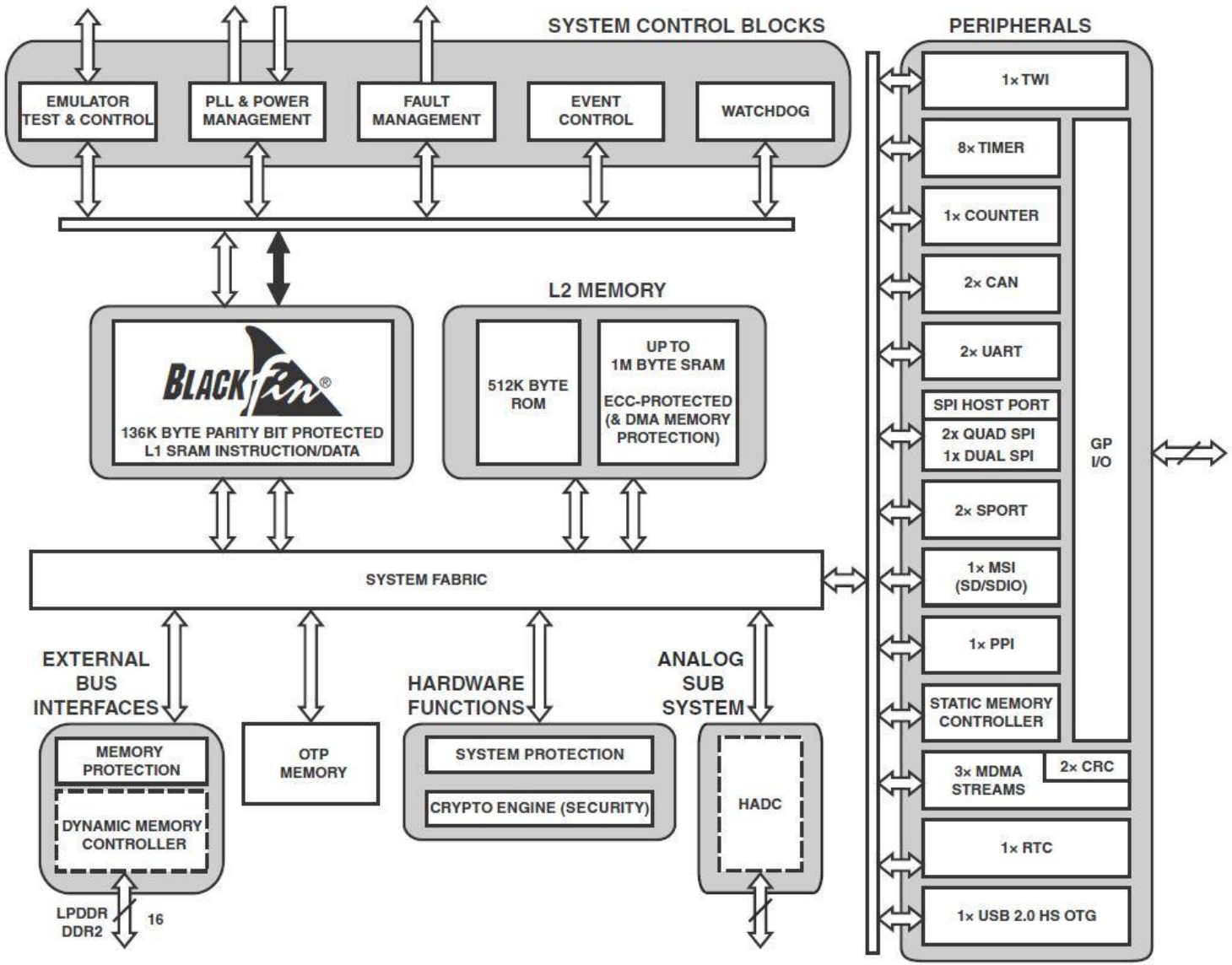
ADSP-BF70x Series : Lowest Power Blackfin

Extending ADI's Leadership Position for Low Power DSP Performance



Note: Typical silicon power comparison at $T_{junction}$ 25°C & comparable setup conditions

ADSP-BF70x Processor Architecture



Enhanced Blackfin+ DSP Core

- **Evolved Blackfin core: "Blackfin+":**
  - Single-cycle 32 x 32-bit Multiply/MAC (with 72-bit accumulate)
  - 16-bit complex multiplication and MAC
  - Cache enhancements & parity on L1 memory
  - Branch prediction, memory system & instruction set enhancements
- **Provides performance increase with benefits in power**
  - Equivalent or better performance per cycle vs. previous Blackfin core
    - 30% improved 16-bit CFFT benchmarks due to complex math improvements
    - Improved 32-bit benchmarks e.g. 2-3x filtering benefit for FIR & IIR
    - 20% improvement in subset of typical benchmark suites
    - Additional performance increases due to major enhancements in device fabric and internal/external memory system
- **Instruction set compatibility with low software impact & full binary backward compatibility**

Key New Features to Blackfin

- **First use of Blackfin+ core**
- **40nm low power technology**
  - **35% lower power than previous Blackfin products at the same MHz**
- **Improved memory bandwidth compared to previous Blackfins**
  - **More cache fill buffers, internal 64-bit data paths, support for misaligned access and improved choices to accelerate cache fills**
    - Large L2 SRAM with 1.5x-3x improved cache throughput
    - DDR cache throughput increased by up to 2x
    - Memory-to-memory DMA up to 800 MBytes/sec
- **High-speed memory-mapped Quad-SPI** (25MBytes/sec)
  - **With HOST & Execute-in-Place modes**
- **Advanced Security for IP protection & more**
- **Integrated house-keeping ADC**
- **ARM® CoreSight™ & SWD Debug enabling trace capability**

plus **many other performance & usability enhancements…..**

ANALOG DEVICES

Advanced Security Features

Safeguarding software & algorithm investments

- **IP Protection via on-chip Cryptography Accelerators**
  - **Intended Use Cases include**
    - Fast Secure Boot with Authentication and Decryption
    - Options for Authentication Only
  - **Memory-based encryption/decryption**
    - Providing fast run-time security options
  - **Power optimized hardware design**
    - Ultra-low power when inactive

- **Key Hardware Blocks & Performance**
  - **Ciphers: AES128..256, DES/3DES**
    - Performance : AES-128 decrypt – 2.46 bits/cycle
  - **HASH Functions: SHA-1, SHA-2 (224/256)**
    - Performance : SHA-224 – 7.88 bits/cycle
  - **Public Key Acceleration**
    - ECC Verify (224-bit ECDSA) in 1.7M cycles
  - **True Random Number Generator**
- **OTP Memory 4KBytes**

512KByte secure boot with Decrypt & Authentication in < 55ms

Best-in-Class Memory Protection Performance

Providing ultra-low "Soft-Error-Rates" for harsh environments

- **Soft Errors are due to external ambient radiation sources**
  - Causing transient errors in processor execution or data results
  - Examples include Alpha Particles & Cosmic Rays
  - Not due to design or manufacturing defects & no permanent damage to device
- **Growing awareness & demand for low SER-FIT in Safety Critical Apps**
  - Automotive
  - Military, Space & Avionics
  - Industrial - 24/7 safety critical apps
- **ADSP-BF70x: Data Integrity features provide significant SER-FIT reduction**
  - On-chip SRAM Protection
    - Detection for L1 (Parity) & Correction for L2 (ECC)
  - Peripheral memory protection & CRC engine for off-chip traffic
  - Effective SRAM SER-FIT can be reduced to significantly below 1 FIT

Note: SER = Soft Error Rate, FIT = Failures in Time (Faults per 10^9 Device Hours)
Example : 1 SER-FIT equals approx. 114,100 years between device failures

ADSP-BF70x Product Feature Matrix

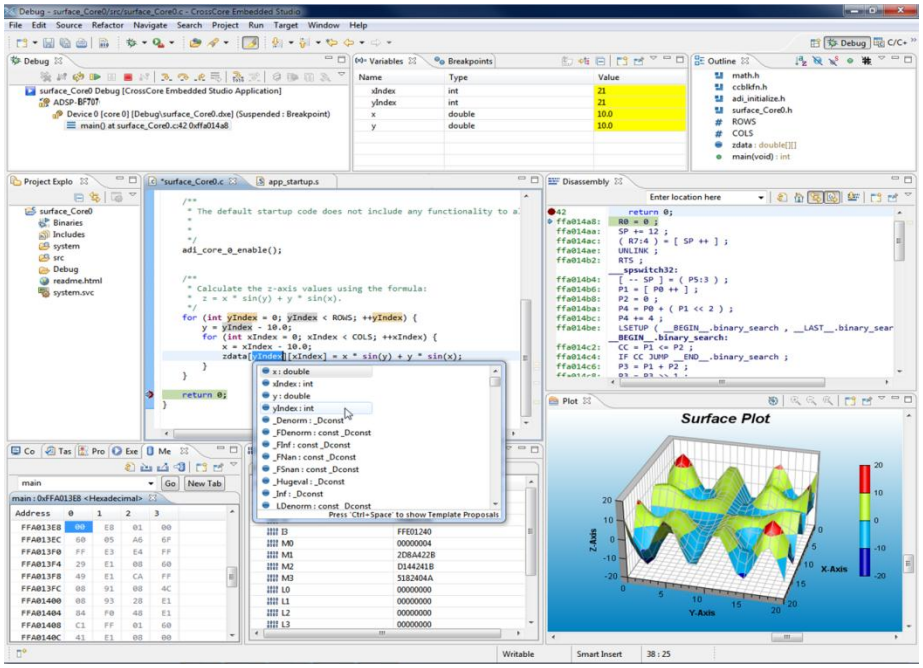
Generic Device	DSP Core Performance	On-chip Memory	External Memory	Key Connectivity Options	Other Features	Package
ADSP-BF700 **ADSP-BF702** **ADSP-BF704** **ADSP-BF706**	100MHz to 400MHz 800MMACs 16-bit 400MMACS 32-bit	132KB L1 SRAM/Cache L2 SRAM options of **128KB** **256KB** **512KB** **1MBytes** 512KB L2 ROM	N/A	ePPI, SPORT(2), Quad/Dual SPI(3), I²C, UART(2), CAN2.0B (2) SD/SDIO/MMC(4-bit) SD SDHC SDXC USB2.0 HS OTG	OTP, Security Accelerator, Data Integrity (with L1 parity & L2 ECC), WDT, RTC	QFN 88-lead 12x12mm
ADSP-BF701 **ADSP-BF703** **ADSP-BF705** **ADSP-BF707**			16-bit LPDDR DDR2	*Above options plus* SDIO/MMC/eMMC (8-bit) SD SDHC SDXC 4-ch 12-bit ADC		BGA 184-ball 12x12mm 0.8p

Price range (1K) : $3.99 → $10 (with different variants & features)
Support for Commercial / Industrial / Automotive grades

Product Status :		
	Sample availability	June 2014
	CCES, EZ-KIT, ICE	June 2014
	Production	3Q 2015

ANALOG DEVICES

CrossCore® Embedded Studio 1.1.0



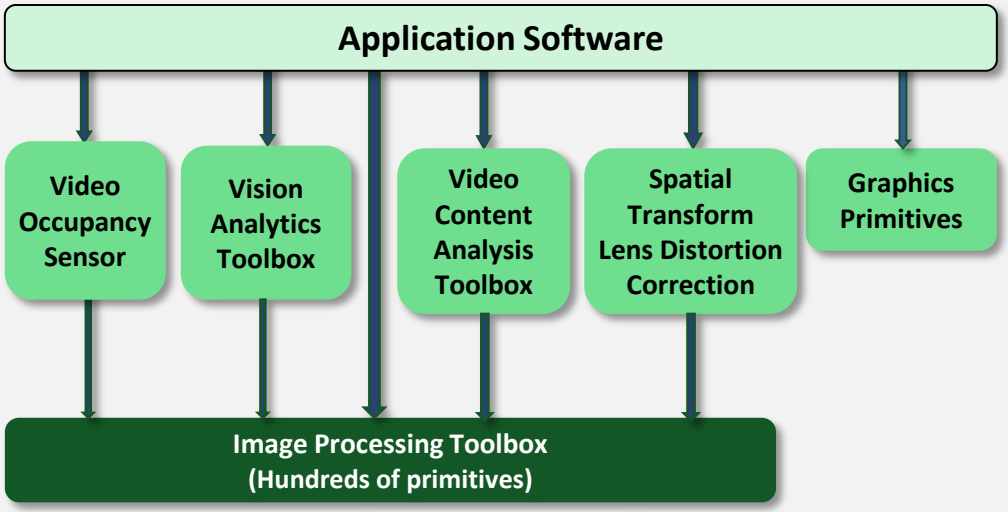
CrossCore® Embedded Studio

- **CrossCore® Embedded Studio is ADI's New Eclipse™ based Tool Chain**
  - IDE
  - Debugger
  - Compilers
  - Assemblers
  - Linker
  - Loader
  - Algorithm & DSP Libraries
- **Add-ins enable graphical configuration and code generation**
  - System Services and Device Drivers
  - And much more…

Blackfin Software Module Examples

Optimized and available with no ADI license-fee

Image Processing Software



Sobel Edge Detection

Occupancy & Object Detection

Industrial Defect Detection

Imaging & SD Video

Encode & Decode

JPEG, H.264 BP/MP, MPEG-4, WMV9

Audio

Audio Decoders & Post Decoders

DTS Neo:6; 5.1 Decoder

Dolby Digital (AC-3) 5.1 Decoder; Headphone v2; Virtual Speaker; Pro Logic IIx Decoder

Audio Encoder & Decoders

MP3, MPEG-4 AAC-LC/HE-AACv2, WMA9

Audio Post Processing

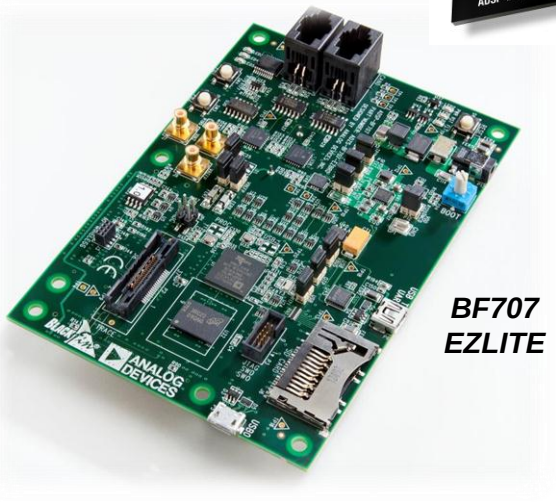
Asynchronous Sample Rate Converter

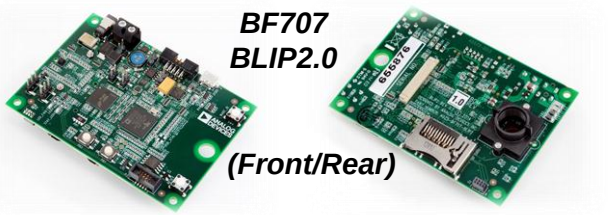
Multi-band Graphic Equalizer

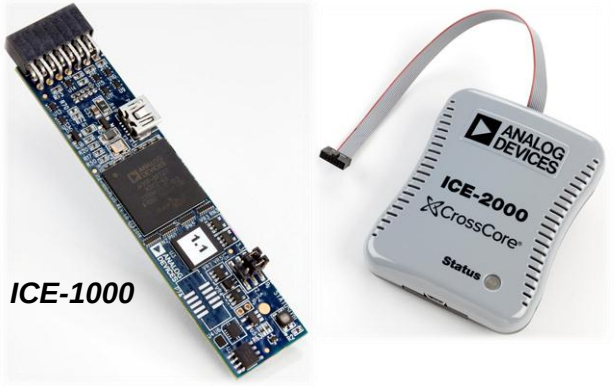
For complete list & latest info: www.analog.com/BlackfinModules

ADI Hardware Development Tools

- **Low Cost BF70x Development Boards**
  - **400MHz BF707 EZKIT board with DDR and key peripherals supported**
    - Optional EZ-Extenders for increased features
    - ADZS-BF707-EZLITE (includes CCES & ICE-1000)
  - **Blackfin Low-Power Imaging Platform (BLIP)**
    - Advanced Occupancy Detection Solution
- **New USB based JTAG Emulators**
  - **$150 Low Cost ICE-1000** *(ADZS-ICE-1000)*
  - **High Performance ICE-2000** *(ADZS-ICE-2000)*
  - **USB-bus powered & JTAG/SWD up to 46MHz**
  - **ARM® CoreSight™ based trace for program & system debug**
- **Watch out for future announcements of additional hardware platforms…..**
  - **Including ultra-low-cost Audio**







Example Blackfin 3rd Party Support

www.analog.com/3rdParty

expresslogic

BLUETECHNIX
Embedding Ideas

BOSTON ENGINEERING™

VOCAL TECHNOLOGIES, LTD.

unicoi SYSTEMS

BDTi

Kaztek Systems

MathWorks®

- **Recent ADSP-BF70x Solution Partners**
  - **EBSYS - Europe**
    - Vision & Image algorithm expertise in Industrial, Consumer & Automotive
  - **DSP Concepts – North America**
    - Accelerating the development of embedded audio products & technology
  - **Twisthink – North America**
    - Image Processing & Algorithm Development for Industrial Applications

twisthink
design | technology | strategy

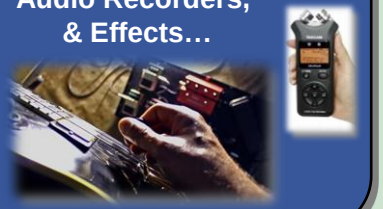
EBSYS®
Embedded Systems Technology

DSP CONCEPTS

ANALOG DEVICES

ADSP-BF70x Summary

Broad Range of Markets with Strong Feature Alignment

Feature	Key Markets Addressed
Scalable Performance Up to 400MHz Blackfin+ core Single-Cycle 2x16-bit, 32-bit & complex math	**Intelligent Lighting & Occupancy Detection** 
Best-in-Class Power Efficiency 118µW / MMAC @ 400MHz 95mW at 800MMACs	**Industrial Imaging** Barcode, Biometrics, Cameras 
Lowest BOM Cost Starting at $3.99, Large SRAM (up to 1MByte), Glue-Less Connectivity, ADC & DDR Option & Cost Optimized Packaging	**Portable Audio** Audio Recorders, & Effects… 
Advanced Security IP Protection with Fast Secure Boot < 55msec for 512KByte Boot Image	
Memory Protection SRAM Parity & ECC for Safety Providing Best-in-Class SER-FIT Performance	**Communications & Mil/Aero** 
Industry Standard Connectivity Options USB2.0HS, SDIO/eMMC, CAN2.0 & more…	**Automotive** Audio & more…. 
Fast Time-to-Market Efficient C Compiler, Optimized Libraries, Blackfin Family Code Compatibility & Hardware Reference Designs	**Healthcare** Patient Monitoring 

ANALOG DEVICES

Industry's Performance Leading Ultra-Low-Power DSP Solution

Delivering High Performance, Lowest Power, Low BOM Cost And Fast Time-to-Market

For More Information on the ADSP-BF70x DSP Processor Products

visit

www.analog.com/BF70x

ANALOG DEVICES