

# AMD 780G

an x86 chipset with  
advanced integrated  
GPU

Hot Chips 2008

Niles Burbank  
AMD



AMD  
Smarter Choice



# Agenda

- ▼ Evolving PC expectations
- ▼ AMD 780G Overview
- ▼ Design Challenges
- ▼ Video Playback Support
- ▼ Display Capabilities
- ▼ Power Optimizations





# Evolving Expectations of Mainstream PCs

## ▼ Traditional Usage Models

- Email
- Productivity applications
- Web browsing
- Energy consumption not a major consideration

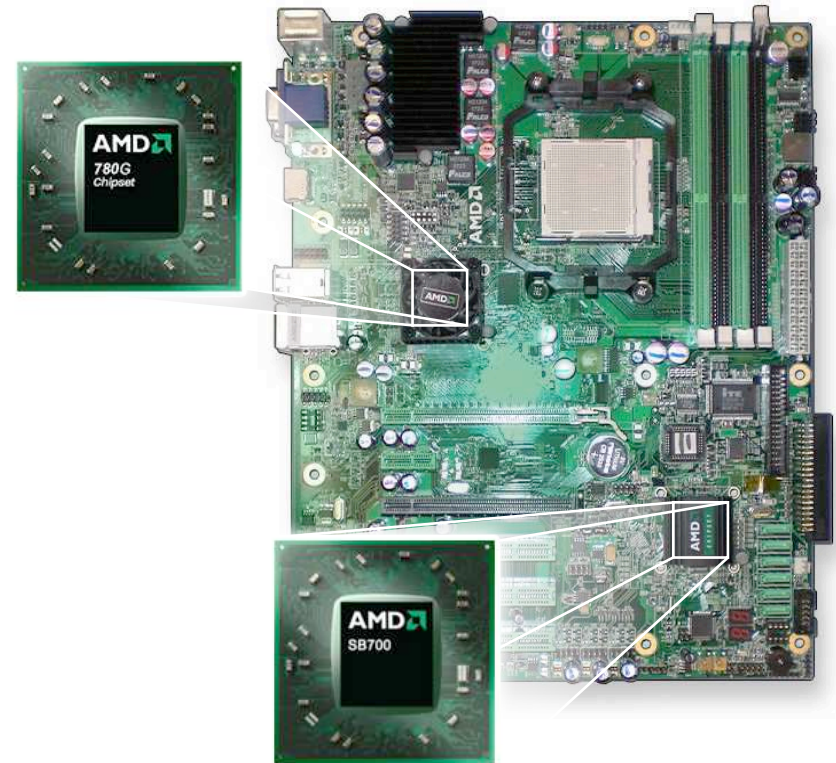
## ▼ Emerging Usage Models

- Content creation
- Gaming
- HD video playback
- Social networking
- Energy consumption an important purchase consideration

*Customers increasingly demand more media capabilities, more multitasking, and lower power - and remain value conscious*

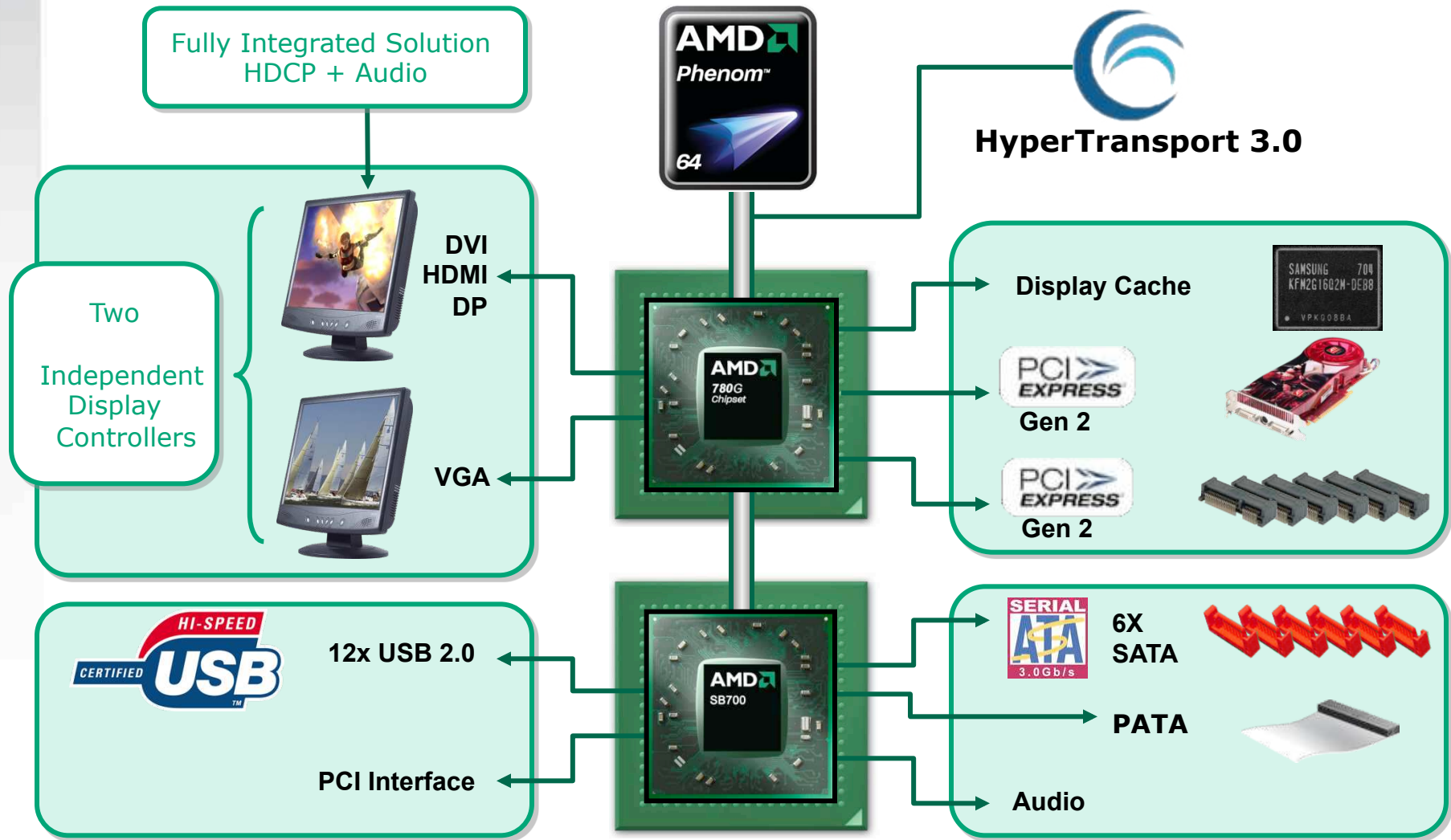
# AMD 780G Overview

Performance	<b>DirectX®10 Core, HyperTransport 3</b>
HD Video	<b>Enhanced UVD Block MPEG2, H.264, VC1</b>
Scalability	<b>ATI Hybrid Graphics</b>
Control	<b>AMD OverDrive™ *</b>
Energy Efficiency	<b>55nm, Low Power, Low Noise</b>
Connectivity	<b>PCIe Gen.2 , 12xUSB , 6xSATA</b>
Display	<b>HDMI, DVI, Display Port</b>



\* AMD product warranty does not cover damages caused by overclocking even if overclocking is enabled with AMD overdrive™ software

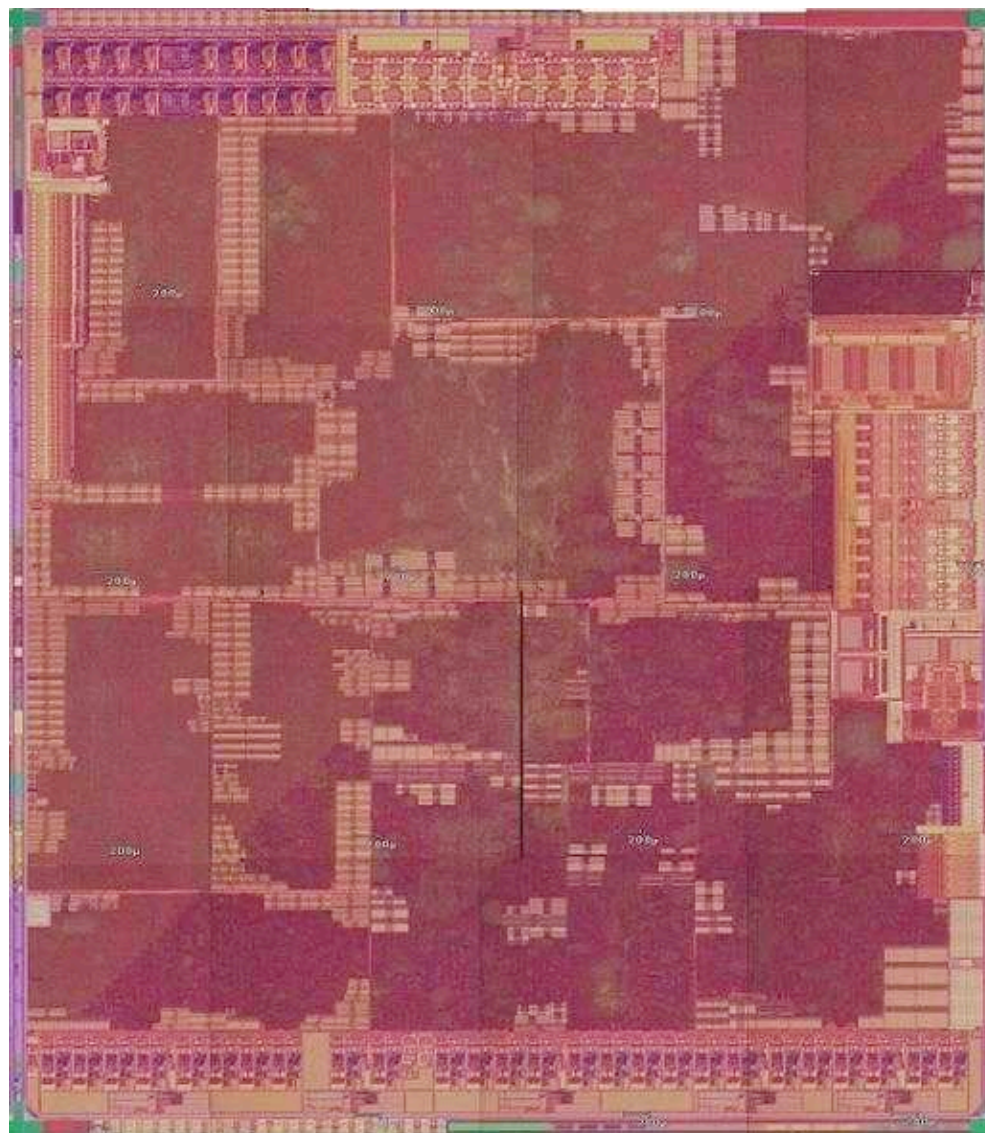
# AMD 780G Platform Architecture



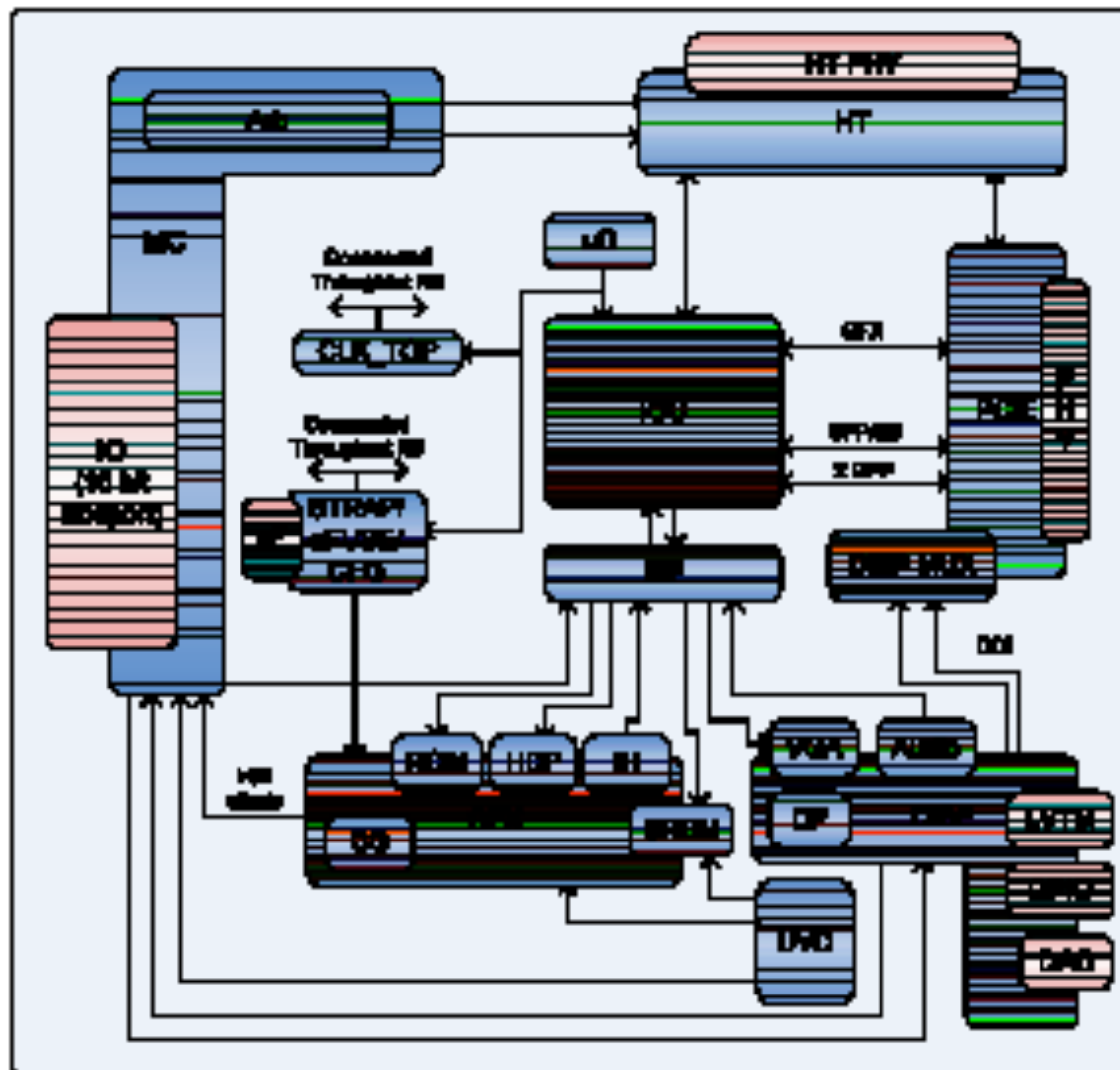


# The AMD 780G Die

- ▼ 205 million transistors
- ▼ TSMC 55nm process
- ▼ 64mm<sup>2</sup> die size
- ▼ 1.0-1.1V core operating range



# AMD 780G Internal Architecture



## ▼ Aggressive schedule requirements

- Fixed market window in early 2008
- Several key new features deemed mandatory by customers

## ▼ Demanding power and cost targets

- No room for compromise on layout efficiency
- No flexibility to defer power management features

## ▼ New process technology and new IP

- 55nm TSMC process, new versions of many key blocks

## ▼ Meeting speed targets at 1.1V

- Graphics core operation at 500MHz to meet performance goals
- HyperTransport and PCI Express at standardized frequencies



- ▼ DirectX 10/SM4.0 3D engine at 500 MHz
- ▼ 3D engine based on ATI Radeon™ HD 2400 discrete GPU
  - Features 40 stream processing units
- ▼ UVD engine offloads tasks from the CPU
  - For H.264/VC1 content, engine acts as a slice-level decoder
  - For MPEG2 content, the UVD engine acts as an IDCT-level decoder
- ▼ Full ATI Avivo™ engine for video post processing

# Unified Video Decoder (UVD) in AMD 780G

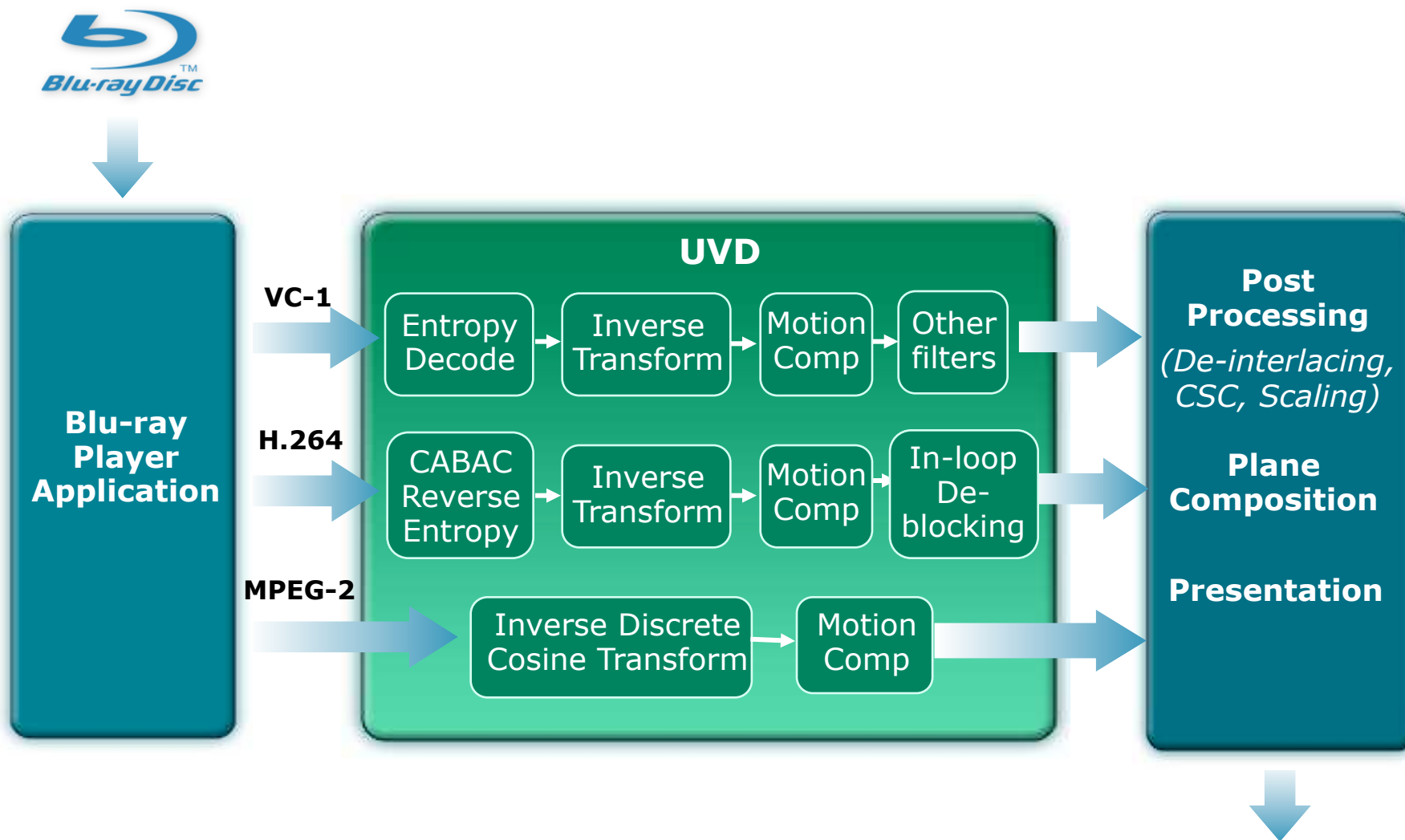


**Dedicated HW decoder for Blu-ray**  
H.264, VC-1, MPEG-2

**AMD 780G Supports the Maximum HD Spec**  
Up to 40 Mbps with full interactivity

**Helps reduce power consumption and system noise**  
By offloading both CPU and GPU

# Video Decode Data Flow in AMD 780G platform





# New interfaces

- ▼ First implementation of DisplayPort integrated with a graphics core

**2.7GHz interface**

- ▼ First implementation of HyperTransport 3.0 in an IGP product

**2.6GHz interface**

- ▼ First implementation of PCI Express Gen 2 in an IGP product

**5.0 GHz interface**

# Display Connectivity

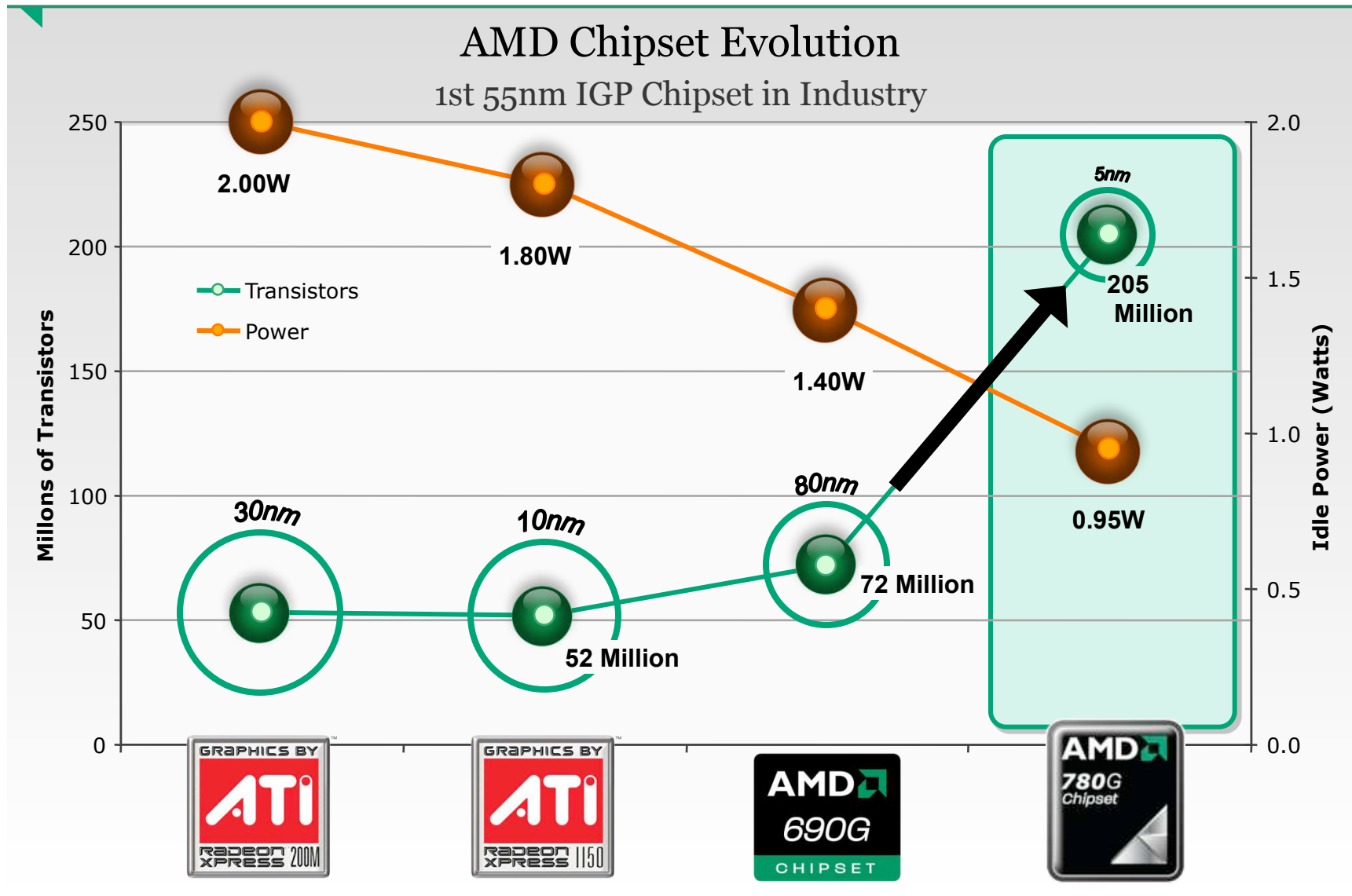
- ▶ Single VGA output up to 2048x1536
- ▶ Dual channel LVDS support up to WUXGA
- ▶ DVI up to 2560 x 1600
- ▶ HDMI up to 1080P with 48KHz audio
- ▶ DisplayPort up to 2560x1600
- ▶ Dual independent display controllers
- ▶ Full GPU support for HDCP with on-die keys

# HyperTransport Interface

- ▼ Support for HyperTransport 3.0
- ▼ 16 Bit Upstream/Downstream
- ▼ Support for Centralized Link Management Control (CLMC)
- ▼ Link width changes based on power state
- ▼ Support for LS2 low power state



# More Performance – But Less Power



Introduction of deep sleep state for GPU

Powershift technology

3D engine scales it's clock rate with no performance degradation

Pervasive use of clock gating

reduces dynamic power

High Vt transistors reduces leakage significantly

More than 50% of the transistors used are high Vt

# Display Cache reduces Power

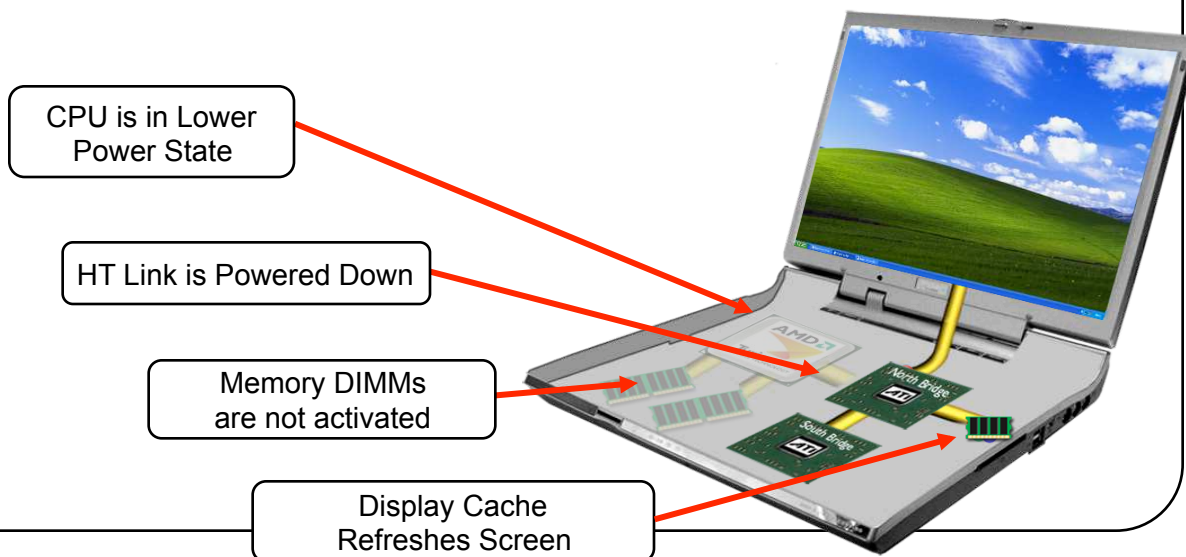
## ▼ Helps reduce power and improve performance

- 16-bit DDR2/DDR3 interface
- Support high speeds without need for power hungry termination

## ▼ Power savings achieved by storing "primary surface" in display cache

## ▼ Innovative tri-mode memory allocation

- Display cache only
- Interleaved
- UMA shared





- ▼ Market expectations of PCs are changing
  - More media rich usage models
  - More multitasking
- ▼ Met this challenge using new technologies from AMD's IP portfolio
  - DirectX 10 graphics core
  - Unified Video Decoder for HD video playback
  - PCI Express 2.0, DisplayPort 1.1 & HyperTransport 3.0 interfaces
- ▼ Applied proven & new techniques to limit power

# Disclaimer & Attribution



## **DISCLAIMER**

The information presented in this document is for informational purposes only and may contain technical inaccuracies, omissions and typographical errors.

**AMD MAKES NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO THE CONTENTS HEREOF AND ASSUMES NO RESPONSIBILITY FOR ANY INACCURACIES, ERRORS OR OMISSIONS THAT MAY APPEAR IN THIS INFORMATION.**

**AMD SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. IN NO EVENT WILL AMD BE LIABLE TO ANY PERSON FOR ANY DIRECT, INDIRECT, SPECIAL OR OTHER CONSEQUENTIAL DAMAGES ARISING FROM THE USE OF ANY INFORMATION CONTAINED HEREIN, EVEN IF AMD IS EXPRESSLY ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.**

## **ATTRIBUTION**

© 2008 Advanced Micro Devices, Inc. All rights reserved. AMD, the AMD Arrow logo, ATI, the ATI logo, Avivo, CrossFireX, Radeon and combinations thereof are trademarks of Advanced Micro Devices, Inc. Other names are for informational purposes only and may be trademarks of their respective owners.