



## AMD OPTERON™ 4000 SERIES EMBEDDED PLATFORM:

# Delivering Performance and Scalability at the Right Power with Overall Customer Value

### MORE CORES, WITH POWER EFFICIENCY, OUTSTANDING VALUE

The AMD Opteron™ 4100 Series processor is the industry's lowest power 1P and 2P 6-core embedded processor<sup>1</sup> that addresses the demanding needs of embedded enterprise markets including telecommunications, storage, network and security appliances. These applications require the right balance of performance per watt— and the AMD Opteron 4100 Series processor is designed to meet the need.

Data communication systems require performance in a small form factor environment and the AMD Opteron 4100 EE power band delivers 6 cores of performance at only 40W TDP—with elevated case temperature. This capability provides up to 88% improvement in performance per watt over the previous generation embedded AMD processors in the EE power band.<sup>2</sup>

Network systems require high memory bandwidth and the AMD Opteron 4100 series processor supports DDR3-1333 with a peak of 21GB/s bandwidth. This is a 66% improvement in memory bandwidth over the previous embedded AMD Processor implementations.<sup>3</sup>

Storage appliances require high performance network connectivity and disk throughput and the AMD Opteron 4100 Series processor has two 16-bit lanes of HyperTransport™ 3.0 Technology links for 25GB/s peak bandwidth per link between processors and I/O. This is a 33% improvement in I/O bandwidth over the previous embedded AMD processor implementations.<sup>4</sup>

Embedded systems can also benefit from multiple AMD 5600 Series chipsets for tremendous I/O connectivity to PCIe® Gen 2 interfaces such as 10 Gigabit Ethernet, Infiniband, FCoE. This data throughput can meet the I/O performance required by today's systems, as well as tomorrow's system demands.

All embedded enterprise systems can benefit from AMD Opteron 4100 Processors' performance at a low power and scalability without compromise and a platform upgrade path with the planned next-generation "Bulldozer" processor.

### THE INNOVATION OF DIRECT CONNECT ARCHITECTURE 2.0, THE EASE OF X86, THE CHOICE FOR EMBEDDED SYSTEMS

AMD's Direct Connect Architecture 2.0 continues to deliver a balanced approach to raw processing power, memory performance, I/O throughput, power efficiency, and scalability. The AMD Opteron 4100 Series processor is fully software and virtualization compatible with previous generation AMD Opteron processors and adds new features to innovations like AMD Virtualization™ (AMD-V™) technology, which can help customers maximize embedded system efficiency, security and provide new

innovative embedded system architectures. Performance enhancements like HT Assist technology help improve inter-processor communications via more efficient probes for improved multi-processor performance. And Direct Connect Architecture 2.0 enables several new power conservation features.

With 32- and 64-bit x86 application support and multi-core computing, high memory bandwidth, and outstanding I/O performance in a consistent thermal envelope, many embedded designers are finding their next-generation systems can enable application performance beyond their expectations.

AMD Opteron 4100 processor offers the following unique advantages for highend embedded systems:

- > **Outstanding performance per watt** Industry's first 6-core embedded enterprise processor that provides 2P scalability at only 40W at a worst case TDP.
- > **HyperTransport™ technology** provides up to 25.6GB/s per link in HT 3.0 generation, and is compatible with HT 1.0 generation implementations
- > Hardware assisted AMD-V™ technology in AMD Opteron processors with DDR3 helps streamline the efficiency of multiple servers and provides high efficiency and scalability with more CPU cores. AMD-Vi provides hardware assisted I/O virtualization that is designed to improve performance and security through virtualized I/O channels.
- > Consistent platform with Socket C32 and the AMD 5600 Series chipset offers a platform upgrade path with AMD's planned next-generation "Bulldozer" core.

#### Dual Dynamic Power Management (DDPM)

- > Allows for independent voltage control between the CPU cores and memory controller
- > Optimizes memory bandwidth to help improve system performance
- > Helps reduce system power consumption and heat generation

#### AMD CoolCore™ Technology

- > Designed to reduce processor energy consumption by turning off unused parts of the processor
- > Helps reduce power and cooling costs by lowering the energy consumption of the platform design



### Reliable, scalable

It's a fact that reliability is key in selecting embedded system components. AMD Opteron™ processors are NEBS-friendly – either with higher Tcase support or p-state control during extreme temperature conditions – supporting telecommunications industry requirements for reliability. AMD64 technology provides features like Error Correcting Code (ECC) and JTAG interfaces for effective debug during system development.

**The AMD Opteron 4100 processor provides unique scalability options** with glueless multi-processing from one to four socket systems. This, combined with AMD64's reliability, helps enable an embedded design that can provide customers a long range plan for the life cycle of their systems.

### Beyond outstanding processors:

#### Longevity, exceptional design support, quick time to market

The AMD64 Longevity Program is designed so that the high performance processors you select for an embedded design are available when you need them. AMD understands the unique requirements of the embedded market and our AMD64 Longevity Program is in place to help maximize the available choice of leading edge x86 processors – delivering a wide range of performance, power, thermal, and packaging features.

AMD has a strong design support program in place. From Reference Designs to extensive and readily available documentation to a suite of leading debug tools, our goal is to make your design cycle quick and efficient, and to help you get your embedded products on the market quickly.

## Six-Core and Four-Core AMD Opteron™ 4100 Series Processors - Socket G32

Model	OPN	Multi-CPU Scalability	Core Frequency	Cache	TDP	Memory Interface	HyperTransport™ Interface	Planned Product Release
41KX HE	OE41KXOHU6DGOE	6 cores up to 2 sockets	2.2GHz	L2 512K x6; L3 6MB	65W	DDR3-1333 2-ch Registered ECC & Chipkill	Two 16-lanes@2.2GHz Full Duplex	Q3-10
41QS HE	OE41QSOHU4DGOE	4 cores up to 2 sockets	2.5GHz	L2 512K x4; L3 6MB	65W	DDR3-1333 2-ch Registered ECC & Chipkill	Two 16-lanes@2.2GHz Full Duplex	Q3-10
41LE HE	OE41LEOHU4DGOE	4 cores up to 2 sockets	2.3GHz	L2 512K x4; L3 6MB	65W	DDR3-1333 2-ch Registered ECC & Chipkill	Two 16-lanes@2.2GHz Full Duplex	Q3-10
41GL EE	OE41GLHUKU6DGOE	6 cores up to 2 sockets	1.8GHz	L2 512K x4; L3 6MB	40W	DDR3-1333 2-ch Registered ECC & Chipkill	Two 16-lanes@2.2GHz Full Duplex	Q3-10

## SR565-, SR5670, SR5690 Product Specifications - Northbridge

Model	Processor Interface	PCI Express®	Number of PCIe® Ports/engines	Virtualization	Error Detection/Isolation	Max. TDP/Idle	Process Technology	Package
SR5650	HyperTransport™ 3.0 technology (5.2GT/s)	2.0 v1.0	22 lanes/ 8 engines	AMD-V1 (IOMMU 1.2)	HyperTransport error handling, PCIe® Advanced Error Reporting, PCIe® end-to-end Cycle Redundancy Check	13W/7.1W	TSMC 65nm	29 x 29mm FCBGA
SR5670	HyperTransport™ 3.0 technology (5.2GT/s)	2.0 v1.0	30 lanes/ 9 engines	AMD-V1 (IOMMU 1.2)	HyperTransport error handling, PCIe® Advanced Error Reporting, PCIe® end-to-end Cycle Redundancy Check	17W/7.3W	TSMC 65nm	29 x 29mm FCBGA
SR5690	HyperTransport™ 3.0 technology (5.2GT/s)	2.0 v1.0	42 lanes/ 11 engines	AMD-V1 (IOMMU 1.2)	HyperTransport error handling, PCIe® Advanced Error Reporting, PCIe® end-to-end Cycle Redundancy Check	18W/7.5W	TSMC 65nm	29 x 29mm FCBGA

### WHAT CAN THIS BALANCED ARCHITECTURE DELIVER?

- High compute performance with 6-cores
- Scalability up to 2 sockets or 12 cores
- Memory bandwidth with 2-channel DDR3 memory controller
- Tremendous I/O bandwidth with 2 HyperTransport™ 3.0 technology links between processors and I/O
- Embedded longevity with AMD Embedded Solutions program<sup>5</sup>
- Fully software and virtualization compatible with existing AMD processors
- Platform upgrade path with drop-in socket of planned next-generation "Bulldozer" processor

1: As of June 23, 2010, AMD Opteron 4100 Model 41GL EE (6c 40W 1.8 GHz) compared to Intel Westmere L5638 (6-core 2.0 GHz) (60W).  
 2: Internal testing of AMD Opteron 4100 Model 41KXHE (6c 65W 2.2GHz) versus published results of EWRR6TWR RFDWE5FTAMD Opteron 2300 Model 23QS (4c 71W 2.4 GHz).  
 3: AMD Opteron 4100 Processor 2ch DDR3-1333 vs AMD Opteron 2300 series 2 ch DDR2-800.  
 4: AMD Opteron 4100 Processor HT3 6400MT/s (25.6GB/s) vs AMD Opteron 2300 HT3 4800MT/s (19.2 GB/s).  
 5: Terms and Conditions apply See your AMD Sales contact for details.



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