



Family 15h Models 30h-3Fh AMD A-Series Accelerated Processor Product Data Sheet

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Revision History

Date	Revision	Description
January 2014	3.00	First Public Release

1 Family 15h Models 30h-3Fh AMD A-Series Processor Features

1.1 Family 15h Models 30h-3Fh AMD A-Series Processor Features

This section lists the features and design capabilities of the Family 15h Models 30h-3Fh AMD A-Series Processor.

- **Compatible with Existing 32-Bit x86 and 64-bit AMD64 Code Base**
 - Including support for SSE, SSE2, SSE3, SSE4a, SSE4.1, SSE4.2, SSSE3, ABM, AVX, AVX1.1, AES, BMI, XSAVE/XRSTOR, XGETBV/XSETBV, PCLMULQDQ, FMA, FMA4, TBN, XOP, POPCNT, F16C, MMX™, OSXSAVE, CMPXCHG8B, CMPXCHG16B, FXSAVE, FXRSTOR CLFLUSH, and legacy x86 instructions
 - Runs existing operating systems and drivers
 - Local APIC on the chip
 - Light Weight Profiling (LWP) support
- **AMD64 Technology**
 - AMD64 technology instruction-set extensions
 - 64-bit integer registers, 48-bit virtual addresses, and 40-bit physical addresses
 - Sixteen 64-bit integer registers
 - Sixteen 128-bit SSE/SSE2/SSE3/SSE4a registers
- **Family 15h Architecture**
 - Dual-core and quad-core options
 - Shared L2 cache architecture storage in addition to exclusive L1 cache
 - Dedicated decode, dispatch, and microcode sequencer per thread
- **Cache Structures**
 - **16-Kbyte 4-Way Associative, Write-through Parity-Protected L1 Data Cache per Core**
 - Two 64-bit operations per cycle, 3-cycle latency
 - **96-Kbyte 3-Way Associative Parity-Protected L1 Instruction Cache per Two Cores**
 - With advanced branch prediction
 - **2048¹ -Kbyte Maximum 16-Way Associative ECC-Protected L2 Cache Shared between Four Cores**
 - Dynamic L2 cache sizing with power gating

¹ 2048 Kbytes of L2 cache are available on quad-core options, and 1024 Kbytes of L2 cache are available on dual-core options.
- **Floating-Point Unit**
 - Dedicated 128-bit floating-point unit (FPU)
- **Management and Virtualization Features**
 - AMD Virtualization™ technology
 - SVM pause count capability
 - SVM disable and lock
 - Rapid virtualization indexing (nested paging)
 - Improved world-switch speed

- IOMMU v2.0
 - Refer to the *AMD I/O Virtualization Technology (IOMMU) Specification*, order# 34434, for additional information.
 - Address translation support
 - Page request interface
 - Nested paging
 - Flush all command
 - Architected performance counters
- **Power Management**
 - Multiple low-power states
 - AMD PowerNow!™ technology
 - System Management Mode (SMM)
 - ACPI-compliant, including support for processor performance states (P-states)
 - Supports processor power states C0, C1, CC6, and PC6
 - Supports sleep states including S0, S3, S4, and S5
 - Supports adaptive S4
 - PCIe® power gating
 - PCIe speed power policy
 - SmartSleep
 - AMD Turbo CORE technology with per-core power gating
 - Dynamic refresh rate supported with digital panels that support this feature
- **Electrical Interfaces**
 - Refer to the *Electrical Data Sheet (EDS) for AMD Family 15h Models 30h-3Fh Processors*, order# 48343, for electrical details of AMD Family 15h (Models 30h-3Fh) processors.
- **Thermal Controls**
 - Sideband temperature control (SB-TSI)
 - Hardware thermal control (HTC)
 - DRAM thermal protection
- **PCIe® Technology**
 - PCIe Gen 1.0 and PCIe Gen 2.0 technology supported:
 - Configurable x4 General Purpose Ports (GPP) link
 - x4 unified media interface link
 - PCIe Gen 3.0 technology supported:
 - Configurable x8 and x16 external graphics card expansion PCIe link

• Integrated Memory Controller

- DDR3 SDRAM: Compliant with JEDEC DDR3 1.5V, DDR3L 1.35V, and DDR3U 1.25V SDRAM specifications
- AMD Memory Controller PowerCap
- Low-latency, high-bandwidth
- DRAM Prefetcher:
 - Adaptive prefetching support
 - 32-entry DRAM prefetch table
 - Differentiation between core prefetch requests and core demand requests
- Socket FM2r2 package
 - Dual 64-bit DDR3 SDRAM controller operating at frequencies up to 2133 MT/s (1067 MHz)
 - DDR3 1.5V up to 2133 MT/s, DDR3L 1.35V up to 1866 MT/s, DDR3U 1.25V up to 1600 MT/s
 - Supports up to two dual-rank SODIMMs or unbuffered DIMMs
 - Supports DRAM down or single SODIMM plus DRAM down

• Platform Security Processor**• Available Packages**

- Compliant with RoHS (EU Directive 2002/95/EC), with lead used only in small amounts in specifically exempted applications
- FM2r2 package
 - Refer to the AMD FM2 Functional Processor Data Sheet, order# 48587, for functional and mechanical details of the FM2r2 package processor.
 - 904-pin, lidded, Organic Micro PGA
 - 1.27-mm pin pitch
 - 40 mm x 40 mm
 - 31 x 31 row pin array

1.2 Family 15h Models 30h-3Fh AMD A-Series Graphics Features

This section lists the graphics features available for the Family 15h Models 30h-3Fh AMD A-Series accelerated processor when the internal GPU is enabled.

• Graphics

- Discrete-level graphics processor embedded alongside the x86 CPU complex
- Dedicated graphics memory controller
- Refer to *AMD Family 15h Models 30h-3Fh Processor Power and Thermal Data Sheet*, order# 51284, for graphics engine clock speeds.
- AMD Eyefinity²
 - ² AMD Eyefinity is available on selected AMD A-Series accelerated processors and may support up to four displays, when at least two displays are operating with DisplayPort 1.2 multi-streaming.
- AMD Dual Graphics support³
 - ³ AMD Dual Graphics support is available on selected AMD A-Series accelerated processors, with limited discrete graphics processors and on the Windows[®] 8 operating system.

• Power Management

- GPU power gating
- UVD power gating
- VCE power gating
- GFX power gating
- DCE power gating
- SCLK, LCLK, DCLK and VCLK scaling
- Graphics Memory Controller (GMC) power gating
- AMD PowerPlay™ power management technology
- Dynamic refresh rate supported with digital panels that support this feature
- Vari-Bright™ technology
- Dynamic refresh rate
- Frame Buffer Compression
- Panel Self-Refresh
- PowerTune

• 3D Acceleration Features

- DirectX[®] 11.1 compliant, including full speed 32-bit floating point per component operations:
 - Shader Model 5 geometry and pixel support in a unified shader architecture
 - Graphics Core Next (GCN) architecture
 - Advanced shader instructions, including flexible flow control with CPU-level flexibility on branching
 - Read/Write caching system, replacing texture cache with a unified read-write two-level cache
 - Vertex, pixel, geometry, compute, domain, and hull shaders
 - 32-bit and 64-bit floating point processing per component
 - High performance dynamic branching and flow control
 - Shader instruction store, using an advanced caching system
 - Advanced shader design, with ultra-threading sequencer for high efficiency operations
 - Advanced, high performance branching support, including static and dynamic branching
 - High dynamic range rendering with floating point blending, texture filtering, and anti-aliasing support
 - 16-bit and 32-bit floating point components for high dynamic range computations
 - Full anti-aliasing on render surfaces up to and including 128-bit floating point formats
- Support for OpenCL™ 1.2, DirectCompute 11 and Microsoft C++ AMP
- Support for OpenGL 4.1/4.1+

- Partially Resident Texture (PRT) support
- Anti-Aliasing Filtering:⁴
 - ⁴ Support for anti-aliasing filtering is dependent on application.
 - 2x/4x/8x MSAA (multi-sample anti-aliasing) modes are supported
 - Multi-sample algorithm with gamma correction, programmable sample patterns, and centroid sampling
 - Custom filter anti-aliasing with up to 12-samples per pixel
 - Adaptive anti-aliasing mode
 - Lossless color compression (up to 16:1)
- Anisotropic Filtering:⁵
 - ⁵ Support for anisotropic filtering is dependent on application.
 - Up to 128-tap texture filtering
 - Anisotropic biasing to allow trading quality for performance
 - Improved anisotropic filtering with unified non-power of two-tap distribution and higher precision filter computations
 - Advanced texture compression (3Dc+)
 - High quality 4:1 compression for normal maps and luminance maps
 - Angle-invariant algorithm for improved quality
 - Single-channel or two-channel data format
- 3D resources virtualized to a 40-bit addressing space, for support of large numbers of render targets and textures
- Support for up to 16k x 16k textures, including 128-bit/pixel textures
- Software-upgradeable, programmable arbitration logic maximizing memory efficiency
- Fully associative texture, color, and Z cache design
- Hierarchical Z and stencil buffers with early Z Test
- Lossless Z-buffer compression for both Z and stencil
- Fast Z-buffer clear
- Fast color-buffer clear
- Z cache optimized for real-time shadow rendering
- Z and color compression resources virtualized to a 32-bit addressing space, for simultaneous support of multiple render targets and textures
- **Motion Video Acceleration Features**
 - Supports DVD, Blu-ray, and SDTV/HDTV content playback with low CPU usage
 - Supports stereoscopic 3D Blu-ray
 - Video compression engine:
 - Dedicated hardware (VCE 2.0) assisted encoding of HD video streams to H.264 (main profile)
 - Support H.264 SVC temporal scalability
 - Real-time transcoding by encoding the output from UVD with reduction of CPU utilization and power consumption
 - Motion video decode acceleration technology:
 - Dedicated hardware (UVD) for H.264, MPEG4, VC-1, MVC, and MPEG2 decode:
 - H.264 implementation based on the ISO/IEC 14496-10 specification
 - MPEG⁶ implementation based on the ISO/IEC 14496-2 specification
 - ⁶ Sprite, global motion compensation, and reversible variable length coding are not supported.
 - VC-1 implementation based on the SMPTE 421M specification
 - MPEG2 implementation based on the ISO 13818-2 specification
 - Multi View Coding (MVC) for Blu-ray 3D content
 - WMV-9 implementation
 - Real time high-definition and standard definition stream decode
 - Real time dual high-definition stream decode

- Microsoft DirectX video acceleration (DXVA) API (application programming interface) for Windows operating system
- **Motion Video Process Acceleration:**
 - Video scaling and YCrCb to RGB color space conversion for video playback and fully adjustable color controls
 - Motion adaptive and vector based de-interlacing filter eliminates video artifacts caused by displaying interlaced video on non-interlaced displays, and by analyzing image and using optimal de-interlacing functions on a per-pixel basis
 - HD HQV and SD HQV support: noise removal, detail enhancement, color enhancement, cadence detection, dynamic contrast, flesh tone correction, dynamic range, gamma, and advanced de-interlacing
 - Advanced up-conversion for SD to HD resolutions
- **Display Interfaces⁷**
 - ⁷ Refer to Table 2 on page 12 for maximum resolution, color depth, and audio support per display interface.
 - Four independent display controllers⁸ enabling four displays in extended or clone modes
 - ⁸ See the "Display Interface Design Guidelines" chapter in the *FM2+ Platform Motherboard Design Guide*, order# 51617 for simultaneous display combinations and display restrictions.
 - HDCP^{9,10} (High-bandwidth Digital Content Protection) supported on HDMI™ (High-Definition Multimedia Interface), DVI (Digital Visual Interface), Miracast, and DisplayPort
 - ⁹ HDCP content protection support is available only to HDCP licensees and can be enabled only when connected to an HDCP-capable receiver.
 - ¹⁰ HDMI/DVI support HDCP 1.4. DisplayPort supports HDCP 1.1
 - DVI/HDMI Features¹¹
 - ¹¹ Refer to Table 1 on page 11 for HDMI feature table.
 - Supports DVI or HDMI using TMDS data encoding
 - Supports industry-standard CEA-861-D/E video modes including 480p, 720p, 1080i, and 1080p
 - Supports single-link DVI with resolutions of up to 1920 x 1200 at 60 Hz, 24 bpp, RB
 - Supports dual-link DVI with resolutions of up to 2560 x 1600 at 60 Hz, 30 bpp, RB
 - Maximum pixel clock rate of 162 MHz for single-link DVI, and 297 MHz for HDMI
 - HDMI modes up to 1920 x 1080 at 60 Hz and Deep Color as well as all HDMI 4k x 2K modes at 24/30 Hz modes at 24 bpp
 - Dolby® Digital, Dolby Digital Plus, DTS Digital, DTS-HD High Res, Dolby TrueHD and DTS-HD Master Audio
 - Supports stereoscopic 3D gaming, Blu-ray 3D, and stereoscopic 3D video via HDMI¹² stereoscopic 3D packed frame format
 - ¹² Support is available through software, in full-screen and windowed mode.
 - Miracast Wireless Display Features
 - One wireless display low latency wireless display output at up to 1920 x 1080¹³
 - ¹³ 1080 is available on selected models
 - Total display head limit remains four total with up to one being Miracast
 - Supports HDCP 2.2 protection for the wireless display output
 - Miracast compliant under Windows 8 when paired with specific Wi-Fi WLAN subsystems¹⁴
 - ¹⁴ Contact AMD for current list of compatible Wi-Fi subsystems
 - DisplayPort Features
 - Supports all mandatory features of the VESA DisplayPort Standard, Version 1.2, plus the following optional features:
 - Supports DP++
 - Supports Panel Self Refresh (PSR)¹⁵

¹⁵ Contact AMD for a current list of qualified PSR panels

- DisplayPort audio
 - Linear PCM, Dolby Digital (AC-3), Dolby TrueHD, DTS, and DTS-HD Master Audio
 - LPCM at sample rates: 32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, and 192 kHz, Bits per sample: 16, 20, and 24
 - Supports up to 8 channels
- Supports 4, 2, or 1-lane transmission
- Supports 5.4 Gbps (HBR2), 2.7 Gbps, and 1.62 Gbps link bit rates
- Supports 1 Mbps Auxiliary Channel (AUX CH)
- Supports DisplayPort Multi-Stream Transport (MST) for up to four independent video and audio streams on one connector
- Maximum resolution of 4096 x 2160 at 30 Hz and 24 bpp (single stream)
 - Supports 2560 x 1600 at 60 Hz (single stream)
 - Support for tiled displays with resolution of up to 4096 x 2160 at 60 Hz DisplayPort 1.2 MST
- Supports Embedded DisplayPort (eDP) features as described in the VESA eDP Standard, Version 1.3
- Supports stereoscopic 3D gaming, Blu-ray 3D, and stereoscopic 3D video via DisplayPort/eDP for 120-Hz frame sequential monitors and internal LCD panels

Table 1. HDMI™ Features

HDMI™ Feature	Compatibility
Link Capabilities	
Maximum Signal Bandwidth (MHz)	297
Maximum HDMI Data Bandwidth (Gbit/s)	7.128
Video Capabilities	
Maximum 2D Resolution ³	1920 x 1080p at 60 Hz, 36 bpp ¹ 1920 x 1200p at 60 Hz, 24 bpp 3840 x 2160 at 30 Hz, 24 bpp 4096 x 2160 at 24 Hz, 24 bpp
RGB	Yes
YCbCr 4:4:4	Yes
YCbCr 4:2:2	Yes
HDMI™ 1.3 xvYCC	Yes
HDMI 1.3 Deep Color	Yes
Underscan	Yes
Maximum 4:4:4 Color Depth (bits per component)	12 ²
Maximum 4:2:2 Color Depth (bits per component)	12 ²
PCM (Pulse-Code Modulation) Audio Capabilities	
PCM Audio Rates Supported	192, 176.4, 96, 88.2, 48, 44.1, 32 KHz
PCM Audio Bits per Sample	24, 20, 16
PCM Audio Maximum Channels	8
PCM Audio Maximum Bandwidth (Rate × Bits × Channels)	36.864 Mbps
Compressed-Audio Capabilities	
Compressed-Audio Maximum Bandwidth	24.576 Mbps
Specific non-PCM Audio-Format Support	
IEC 61937 Compressed-Format support. For example, 5.1-channel Dolby® DTS and 5.1-channel AC-3.	Yes
Dolby-TrueHD Bitstream Capable	Yes
DTS-HD Master-Audio Bitstream Capable	Yes
DVD-A (DST) Support	No
SACD (DSD) Support	No
CEC (Consumer Electronic Control) Capabilities	
CEC	No
HDMI 3D Display Capabilities	
Packed Frame Stereo 3D Video Formats ³	1080p at 60 Hz, 1080p at 30 Hz, 1080p at 24 Hz, 720p at 60 Hz, 720p at 50 Hz ⁴

Notes:

1. 36-bpp mode uses 30 bpp of meaningfully derived data.
2. 12-bit mode uses 10 bits of meaningfully derived data.
3. Some models do not support the highest resolutions.
4. Stereo 3D refresh rates are specified per eye.

Table 2 shows the maximum resolution for each output configuration.

Table 2. Display Interface Support

Output Configuration	Maximum Resolution ³	Bit Depth	Audio
eDP ¹	1920 x 1080 at 60 Hz	18 bpp, 24 bpp, 30 bpp	Not Supported
DisplayPort	3840 x 2160 at 30 Hz	24 bpp	Supported ²
	2560 x 1600 at 60 Hz	30 bpp	
	2 x 1920 x 2160 at 60 Hz	24 bpp	
Single-link DVI	1920 × 1200 at 60 Hz	24 bpp	Not Supported
Dual-link DVI	2560 x 1600 at 60 Hz	30 bpp	Not Supported
Native HDMI™	4096 x 2160 at 24 Hz	24 bpp	Supported
	3840 x 2160 at 30 Hz	24 bpp	Supported
	1920 x 1080p/i at 60 Hz	36 bpp	Supported

Notes:

1. Internal LCD panel.
2. Audio support is available for DisplayPort.
3. Some models do not support the highest resolutions.

For display interface mapping, see the "Display Interface Design Guidelines" chapter in the *FM2+ Platform Motherboard Design Guide*, order# 51617.