Intel Built-in Visuals

Product Guide

July 2013

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Contents

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Revision History

Document Number	Revision Number	Description	Revision Date
325650	001	Initial release.	June 2011
325650	002	Update for 3rd Gen HD Graphics	October 2012
325650	003	Updated for 4th Gen HD Graphics	March 2013
325650	004	Updated to add Intel® Iris™ graphics information	July 2013

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1 Introduction

Intel® Built-in Visuals combines cutting-edge 3D graphics, stunning HD visuals, advanced video capabilities and enhanced display connectivity all built-in to the processor, delivering seamless visual experiences without the need of a discrete graphics card. It integrates high-performance graphics and media processing on the processor, putting two key embedded application components – CPU processing and graphics – on a single chip.

2 Intel® HD Graphics

Intel® HD Graphics is the next-generation graphics technology available on the Intel® Core™ processor family. It is graphics built into the CPU providing best-in-class compute, integrated media and graphics performance over the previous generation while creating additional headroom for tomorrow's embedded usages. It delivers an enhanced visual experience, including excellent 3D performance and support for three independent displays.

Table 1. Graphics Versions by Generation

Processor	Graphics Version
2010 Intel® Core™ processor	HD Graphics
2nd Generation Intel® Core™ processor	HD Graphics 2000, 3000
3rd Generation Intel® Core™ processor	HD Graphics 2500, 4000
4th Generation Intel® Core™ processor	HD Graphics 4200, 4400, 4600, 5000, 5100, 5200

3 Intel® Clear Video HD Technology

Intel® Clear Video HD Technology (Intel® CVT HD) is a collection of video playback and enhancement features that improve the end user's viewing experience. These features are a combination of industry standardized playback and image enhancement features as well as additional Intel® specific features. It integrates a wide array of image processing technologies including noise and jitter removal, total color control, contrast and skin tone enhancements and intelligent color space mapping, ensuring colors and images are viewed the way they are meant to be seen.

4 Intel® Quick Sync Video

In the video creation and editing space, Intel® Quick Sync Video provides accelerated media conversion equating to improved compatibility between devices and file formats. It uses hardware on the processor instead of software to accelerate video decoding and encoding, reducing video conversion time and enabling the processor to complete other tasks, improving overall performance.

5 InTru™3D Technology

Users can now enjoy the ultimate in 3D visuals with *InTru™3D*. Stereoscopic 3D Blu-ray* playback support is available using active shutter 3D glasses in full high definition 1080p resolution over the HDMI* V1.4 interface.

6 Intel® Advanced Vector Extensions (Intel® AVX)

Intel® Advanced Vector Extensions is a new 256-bit instruction set extension to SSE and is designed for applications that are Floating Point (FP) intensive. Introduced with the 3rd Generation Intel® Core™ processor, it improves performance due to wider vectors, new extensible syntax, and rich functionality. This results in better management of data and general purpose applications such as image, audio/video processing, scientific simulations, financial analytics and 3D modeling and analysis.

7 Collage Display

The Collage Display feature allows display of a screen across multiple displays with each display showing a portion of a larger screen image. A user can implement this feature to connect multiple displays to a single system and see picture/video across multiple displays with higher quality/resolution (up-to 4K).

If multiple displays are placed horizontally its known as Horizontal Collage Display (i.e., positioning displays one next to another where one image stretches across panels, as shown in Figure 1). If multiple displays are placed vertically its known as Vertical Collage Display (i.e., where the upper part of the image is shared by one display panel and the lower part of the image by another display panel, as shown in Figure 2).

Figure 1. Horizontal Collage

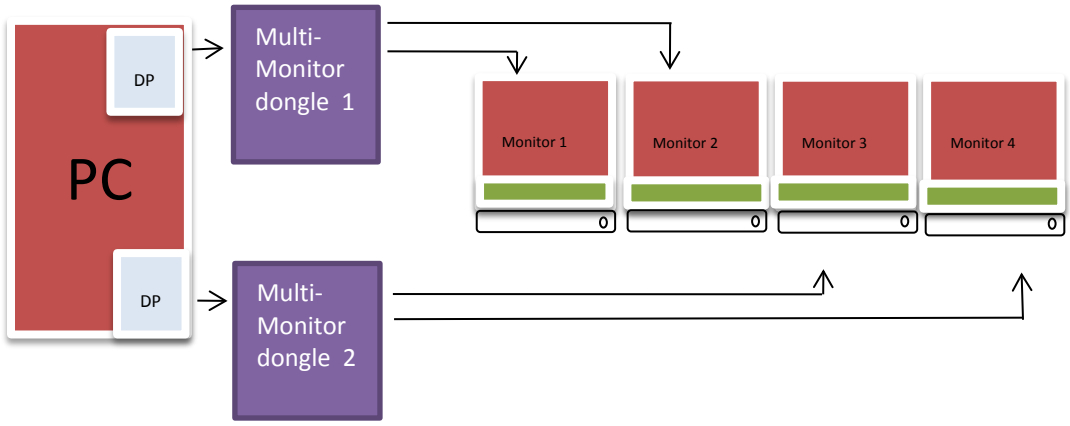
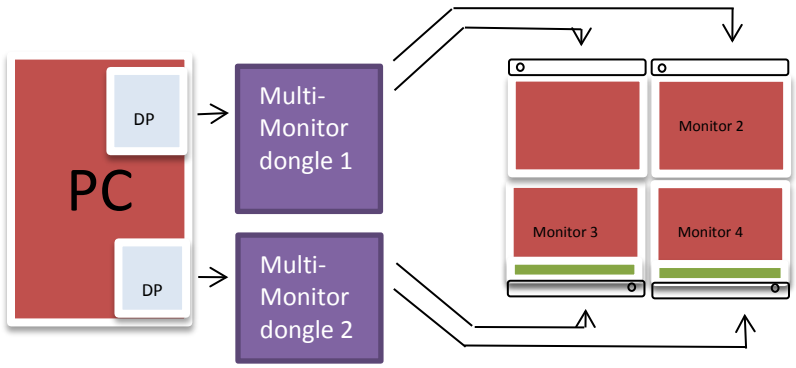


Figure 2. Vertical Collage



8 Intel® Iris™ Graphics and Iris™ Pro Graphics for Embedded

Intel® Iris™ Graphics Powers Built-in Beautiful

Intel Iris graphics brings you a built-in, eye-popping visual experience—no extra graphics card required

Intel® Iris™ graphics, together with the 4th generation Intel® Core™ processor, delivers amazing and vibrant multimedia experiences. Get immersed in high-speed, stunning, 3D gaming. Do advanced photo and video editing quickly and easily. Sit back and enjoy the best in movies with gorgeous HD and brilliant 4K Ultra HD display.

Intel Iris graphics is Intel's newest and most powerful graphics product, built right in to the processors. With double the performance of the previous generation of Intel® graphics, Intel Iris graphics lets you enjoy heightened immersive experiences when playing games optimized specifically for Intel Iris graphics.[1] From the newly released *GRID 2* to the world renowned *StarCraft II: Heart of the Swarm,* Intel Iris graphics provides you with an immersive gaming experience with faster 3D rendering, more complex shading, and fluid character motion.

At home or on the go, Intel Iris graphics powers built-in beautiful.

Intel Iris Pro graphics and Intel Iris graphics are available on specific versions of Intel 4th generation Intel® Core™ processors.

9 Features

All combined, the Intel® Core™ processors with built-in visuals boasts a competitive advantage, ideal to suit the needs of a broad embedded market whether that be in the Retail, Digital Signage, Gaming, Industrial, Military, Aerospace, Government, Digital Security/Surveillance or Medical segments. Table 2 describes the new built-in visual features introduced in the 4th Generation Intel® Core™ processor as well as those best suited for the embedded computing market. Table 3 describes the existing built-in visual features in the 2nd and 3rd Generation Intel® Core™ processor.

For a comprehensive list of supported features, refer to *the Intel® Graphics Software for Intel® HD Graphics Family Product Requirements Document (PRD)*. The latest Intel® HD Graphics Driver packages are available for download at http://www.intel.com.

Table 2. New Features - 4TH Gen

Features	Description and Benefits
Graphics	
Intel® Iris™ Pro graphics and Intel® Iris™ graphics	Highest performance Intel graphics and media built in to certain SKUs of the 4th generation Intel® Core™ embedded processors.
Media	
Accelerated support for SVC h.264 encode/decode - Baseline profile	Adds Scalable Video Coding capability
Accelerated support for MJPEG	Adds Motion JPEG capability
3D Graphics	
DirectX* 11.1	New API support and performance enhancements for improved 3D visuals
OpenCL 1.2	API support and performance enhancements for improved 3D visuals
Display	
Improved 3 independent displays	3 non-symmetric, independent and concurrent display support with fewer restrictions
Post Processing	
Gamut Color Conversion w/ compression & expansion	Improves color
Spatial Noise Reduction	Improves image quality
Video Stabilization	Improves video playback by eliminating shakiness in videos
Frame Rate Conversion w/ 24p frame interpolation	Improves video quality during playback
12bcp Precision Processing Pipeline	Higher quality processing pipeline
Sharpness-adaptive Scaling	Sharper display when adaptive scaling is used.

Power Management	
eDP Panel Self Refresh (PSR)	Allows use of Panel Self Refresh eDP panels.
Low Power Single Pipe (LPSP)	Shuts off other pipes to save power when eDP is the only active display
Display Refresh Rate Switching (40Hz up to 120Hz on eDP)	Allows a wider range of refresh rate switching for eDP
Platform Noise Mitigation (adaptive clocking)	Helps reduce system EMI to make passing certifications (like FCC) easier.

Table 3. Existing Features – 2nd / 3rd Gen

Features	Description and Benefits
Media	
improved MPEG2/AVC/VC1 decode performance	HW Accelerated decode for improved media playback for MPEG2, AVC and VC1
improved AVC/H.264 encode performance	Compression of raw content to AVC and MPEG2 streams
3D Graphics	
DirectX* 11	New API support and performance enhancements for improved 3D visuals
OpenGL* 3.1	3rd Gen - New API support and performance enhancements for improved 3D visuals
OpenGL* 3.2	3rd Gen - New API support and performance enhancements for improved 3D visuals
OpenGL* 3.3	3rd Gen - New API support and performance enhancements for improved 3D visuals
OpenGL* 4.0	3rd Gen - New API support and performance enhancements for improved 3D visuals
OpenCL 1.1	3rd Gen - API support and performance enhancements for improved 3D visuals
Post-Processing	
Adaptive Contrast Enhancement	Dynamically adjust image contrast levels resulting in improved visibility in darker scene areas
Skin Tone Enhancement	Dynamically correct hue and saturation levels on pixels detected with skin-like colors without affecting other video regions
Total Color Control	Independent adjustment of RGB and CMY video channels provides precise control over video feeds without affecting other on screen elements
ProcAmp	Adjust hue, brightness, saturation and contrast of video channels independently of other on screen content

Display	
Embedded DisplayPort* (eDP)	Dedicated Embedded DisplayPort (eDP) support on low-power CPUs and support for eDP on PCH for low-power and scalable CPU's offers design flexibility
HDMI v1.4 with Stereoscopic 3D	Support for HDMI v1.4 displays with Stereoscopic 3D functionality
12bpc Color Depth (DisplayPort* and HDMI)	Increased color depth for improved accuracy and vividness
3 independent displays	3rd Gen - 3 non-symmetric independent and concurrent display support
Collage Display	Display a single large framebuffer on multiple displays
Power Management	
Render Standby	Impressive power savings allows reduction of core graphics voltage down to 0V
Extended Power Saving State (Power Reduction During Idle)	Power savings technology allowing powering down of High Definition Audio bus when not in use to help meet Energy Star requirements

9.1 Supported Operating Systems

The following operating systems are supported:

- Microsoft* Windows* XP
- Microsoft* Windows* 7 Starter/Home Basic/Home Premium/Professional/Ultimate
- Microsoft* Windows* Embedded Standard 7
- Microsoft* Windows* 8
- Microsoft* Windows* Embedded Standard 8
- Microsoft* Windows* Embedded POSReady 8
- Microsoft* Windows* Embedded Standard 2009
- Microsoft* Windows* Embedded POSReady 2009
- Linux* [1,2]

Notes:

1. Intel does not develop distribution-specific drivers for Intel® HD Graphics. All Linux driver components are up-streamed to their respective repositories once a quarter. Information on these components is posted on www.intellinuxgraphics.com under the Downloads section. Distributions may pick up components as they choose.

2. Linux driver features represent only a subset of those supported by the Intel® HD Graphics driver. For additional information, visit www.intellinuxgraphics.com.

9.2 Feature Support by Platform

Table 4 represents a subset of the features available on these platforms. Some features are also Operating System dependent. Refer to the Software Graphics Product Requirements Document or embedded Technical Product Spec. for full details.

Table 4. Feature Support by Platform

Feature	2010 Intel® Core™ Processor Family with Intel® 5 Series Chipset	2nd Gen Intel® Core™ Processor Family with Intel® 6 Series Chipset	3rd Gen Intel® Core™ Processor Family with Intel® 7 Series Chipset	4th Gen Intel® Core™ Processor Family with Intel® 8 Series Chipset
Media				
Hardware Accelerated MPEG2 Decode	Y	Y	Y	Y
Hardware Accelerated VC1 Decode	Y	Y	Y	Y
Hardware Accelerated AVC/H.264 Decode	Y	Y	Y	Y
Hardware Accelerated SVC/H.264 Decode	N	N	N	Baseline only
Hardware Accelerated Decode (MPEG2, VC1, AVC/H.264. SVC) in All Rotated Modes	Y	Y	Y	Y
Multi-Function Decode + De-blocking	N	Y	Y	Y
Dual Video Hardware Accelerated Decode	Y	Y	Y	Y
Accelerated MPEG2 Encode	N	Y	Y	Y
Accelerated AVC/H.264 Encode	N	Y	Y	Y
Accelerated SVC/H.264 Encode	N	N	N	Baseline only
Motion JPEG* (MJPEG)	N	N	N	Y
Accelerated Transcode	N	Y	Y	Y
Advanced Deinterlacing	N	N	Y	Y
SD/HD Sharpness Control (Post Processing)	Y	Y	Y	Y
Blu-ray S3D (eDP and HDMI only)	N	Y	Y	Y
Adaptive Contrast Enhancement (Post Processing)	N	Y	Y	Y
Skin Tone Enhancement (Post Processing)	N	Y	Y	Y
Total Color Control (Post Processing)	N	Y	Y	Y

12bpc Color Depth (DisplayPort* and HDMI)	Y	Y	Y	Y
Gamut Color Conversion w/ compression & expansion	N	N	N	Y
Spatial Noise Reduction	N	N	N	Y
Video Stabilization	N	N	N	Y
Frame Rate Conversion w/ 24p frame interpolation	N	N	N	Y
12bcp Precision Processing Pipeline	N	N	N	Y
Sharpness-adaptive Scaling	N	N	N	Y
Display / Audio				
DisplayPort 1.1a Audio Support (LPCM 2 channel & AC3)	Y	Y	Y	Y
HDMI v1.4 with Stereoscopic 3D	N	Y	Y	Y
Dual Stream Audio	Y	Y	Y	Y
HDCP 1.3(for basic Blu-ray playback)	N	Y	Y	Y
Embedded DisplayPort* (eDP)	Y	Y	Y	Y
Integrated LVDS	Y	Y	Y	N
Dual LVDS (Integrated LVDS + SDVO LVDS)	Y	Y	Y	N
EDID-less display support	Y	Y	Y	Y
Wireless Display[1]	Y	Y	Y	Y
SDVO-DVI Support	Y	Y	Y	N
SDVO-LVDS Support	Y	Y	Y	N
SDVO-HDMI Support	N	N	N	N
SDVO-TV Out Support	Y	N	N	N
SDVO-CRT Support	Y	Y	Y	N
Support for External Digital Displays (DVI, HDMI, DP)	Y	Y	Y	Y
Support for Analog CRT	Y	Y	Y	Y[2]
Three active displays	N	N	Y	Y (improved)
3D Graphics				
DirectX 9.0c	Y	Y	Y	Y
DirectX 9.0L	Y	Y	Y	Y
DirectX* 10.0	Y	Y	Y	Y
DirectX* 10.1	N	Y	Y	Y
DirectX* 11.0	N	Y	Y	Y

DirectX* 11.1	N	N	N	Y
OpenGL* 2.1	Y	Y	Y	Y
OpenGL* 3.0	N	Y	Y	Y
OpenGL* 3.1	N	N	Y	Y
OpenGL* 3.2	N	N	Y	Y
OpenGL* 3.3	N	N	Y	Y
OpenGL* 4.0	N	N	Y	Y
Open CL 1.1	N	N	Y	Y
Open CL 1.2	N	N	N	Y
Power Management				
Intel® Graphics Dynamic Frequency	Y	Y	Y	Y
Render Standby	Y	Y	Y	Y
Intel® Display Refresh Rate Switching – For Seamless and Static Panel Displays	Y	Y	Y	Y
Intel® Graphics Performance Modulation Technology	Y	Y	Y	Y
Intel® Display Power Savings Technology (DPST)	Y	Y	Y	Y
Intel® Smart 2D Display Technology (S2DDT)	Y	Y	Y	Y
Intel® Rapid Memory Power Management	Y	Y	Y	Y
Intel® Automatic Display Brightness (ADB)	Y	Y	Y	Y
Extended Power Saving State	N	Y	Y	Y
eDP Panel Self Refresh (PSR)	N	N	N	Y
Low Power Single Pipe (eDP)	N	N	N	Y
Display Refresh Rate Switching (40Hz up to 120Hz on eDP)	N	N	N	Y
Platform Noise Mitigation (adaptive clocking)	N	N	N	Y

[1] Intel® Wireless Display is not Plan of Record for embedded long life support, requires Intel® My WiFi Technology and is supported only on Mobile products. Contact your local FAE for interest in this feature.

[2] Analog CRT is supported only on certain 4th Generation Intel® Core™ processor SKUs.