



Displaying Stereoscopic 3D (S3D) with Intel® HD Graphics

Software Developers Guide

August 2011



INFORMATION IN THIS DOCUMENT IS PROVIDED IN CONNECTION WITH INTEL PRODUCTS. NO LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT. EXCEPT AS PROVIDED IN INTEL'S TERMS AND CONDITIONS OF SALE FOR SUCH PRODUCTS, INTEL ASSUMES NO LIABILITY WHATSOEVER AND INTEL DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY, RELATING TO SALE AND/OR USE OF INTEL PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS OTHERWISE AGREED IN WRITING BY INTEL, THE INTEL PRODUCTS ARE NOT DESIGNED NOR INTENDED FOR ANY APPLICATION IN WHICH THE FAILURE OF THE INTEL PRODUCT COULD CREATE A SITUATION WHERE PERSONAL INJURY OR DEATH MAY OCCUR.

Intel may make changes to specifications and product descriptions at any time, without notice. Designers must not rely on the absence or characteristics of any features or instructions marked "reserved" or "undefined." Intel reserves these for future definition and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to them. The information here is subject to change without notice. Do not finalize a design with this information.

The products described in this document may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request.

Contact your local Intel sales office or your distributor to obtain the latest specifications and before placing your product order.

Copies of documents which have an order number and are referenced in this document, or other Intel literature, may be obtained by calling 1-800-548-4725, or go to:
<http://www.intel.com/design/literature.htm>



Contents

1	Introduction	4
2	S3D Overview	5
	2.1 Stereoscopic Display	5
	2.2 Scope and Assumptions	6
3	Setting an S3D mode	7
	3.1 Display	7
	3.2 IGFXS3DControl Class	8
	3.3 Typical Modes Returned by Driver	8
4	Reference Documents/Links	10



1 *Introduction*

The purpose of this document is to give an overview and description of the Stereoscopic 3D (S3D) Application Programming Interface (API) for Intel® HD Graphics-based hardware.

The target audience of this document is the software developer wanting to utilize S3D in Microsoft Windows* 7 applications.

The S3D API for Intel HD Graphics-based hardware is implemented in a static C++ library, included in the Intel® Media SDK v3.0 package, available at no charge from <http://software.intel.com/en-us/articles/media/>.

This document does **not** describe how to encode or decode video (movie) data that contains two images (left and right eyes). This document simply describes a method to get the S3D-capable monitor or TV to display the two images needed to present a perceived 3D image.



2 S3D Overview

2.1 Stereoscopic Display

Stereoscopic 3D (S3D) imagery (a.k.a. stereoscopy) is, of course, two 2D images, one for each eye, giving the illusion of depth.

PCs have a long history of displaying S3D images. This has generally been achieved by various proprietary methods.

The following are a few legacy solutions used in the past, and some problems and side effects associated with those solutions:

- The PC can use a normal 2D display and directly control a pair of glasses (known as active glasses) which can block one eye from seeing an image, then alternate to block the other eye for the next image.

Problems:

- Each eye only sees half of the images it would normally see. If the display is presenting 60 frames per second, each eye only sees 30 frames per second. This can increase headaches.
 - Users cannot connect multiple S3D sources (game consoles, Blu-ray* players, cameras, etc.) to their display.
- The PC can rely on a proprietary display that controls what the user sees. There are many types of these displays. One popular type is a polarized display that uses passive polarized glasses. Others require no glasses by projecting two images, requiring the user to place their eyes in exactly the right spot.

Problems:

- There are dozens of types of displays.
- Users must manually switch their display between normal 2D and one of several possible 3D modes.
- Users cannot connect multiple S3D sources (game consoles, Blu-ray* players, cameras, etc.) to their display.

With newer display link technologies (like HDMI* 1.4 or eDP* 1.1, etc), devices (PCs, Blu-ray* players, game consoles, etc.) can now **automatically** switch the display between normal 2D and 3D.



This document describes a software interface that developers can use to utilize the newer automatic switching to/from 3D modes when displaying with Intel® HD Graphics-based processors.

Once the display is in 3D, an application can utilize the powerful Intel® Media SDK to prepare the left and right images, or it can directly utilize Microsoft DirectX® Video Acceleration (DXVA) APIs to generate the two images. An application (e.g., a game) could also generate its own left and right images.

2.2 Scope and Assumptions

The following is a list of limitations and restrictions to consider for S3D support:

1. Microsoft Windows® 7 only. Supports windowed or full screen usage models.
2. Microsoft Direct3D® 9 Overlay swap chain usage is required.
3. HDMI® 1.4, special eDP®, or similar based monitors/TVs.
4. The host application should not send S3D content when the display is set to 2D mode or vice versa. Changing between 2D/S3D display mode involves an OS mode set operation.
5. The cursor will only display in left image.
6. Requires creation and use of a Microsoft® DXVA video processing device, even if DXVA decoding is not used.



3 *Setting an S3D mode*

3.1 Display

Summary

Only HDMI* 1.4-based monitors or special Embedded DisplayPort* (eDP*) 1.1a displays are supported.

Details

An API to allow an application to set a S3D display mode is included in the Intel® Media SDK. However, it can be used by itself as a standalone library. The library is a simple 32-bit Win32 static library. The Intel Media SDK 3.0 beta is available from: <http://software.intel.com/en-us/articles/intel-media-sdk-30-beta>



3.2 IGFXS3DControl Class

Summary

The IGFXS3DControl C++ class (included in the Intel® Media SDK) contains the methods and structures needed to control S3D display modes.

C++ Header File:

`\samples\sample_common\igfx_s3dcontrol.h`

Library File <32-bit or 64-bit>:

`\samples\sample_common\lib\win32\igfx_s3dcontrol.lib` or
`\samples\sample_common\lib\x64\igfx_s3dcontrol.lib`

Typical steps to use this class are as follows:

An application:

1. Creates an instance of **`IGFXS3DControl::`**
2. Determines what screen resolutions and refresh rates are currently possible by calling **`->GetS3DCaps()`**
3. Switches the TV/Monitor to 3D via **`->SwitchTo3D()`**
4. Creates a Direct3D9 device (with `D3DSWAPEFFECT_OVERLAY`)
5. Calls **`DXVA2CreateDirect3DDeviceManager9()`**
 - a. Calls **`->SetDevice()`**
6. Calls **`DXVA2CreateVideoService`**
 - a. Calls **`->SelectLeftView()`** then **`CreateVideoProcessor()`**
 - b. Calls **`->SelectRightView()`** then **`CreateVideoProcessor()`**
7. Acquires the render target via **`target GetBackBuffer()`**
8. Renders left eye
 - a. Using the left VideoProcessor, calls **`->VideoProcessBlt()`**
9. Renders right eye
 - a. Using the right VideoProcessor, calls **`->VideoProcessBlt()`**
 - b. Calls **`->Present()`**
10. Repeats steps 10 & 11 as appropriate
11. Calls **`->SwitchTo2D()`**
12. Deletes instance of **`IGFXS3DControl::`**

3.3 Typical Modes Returned by Driver

The table below shows the typical modes supported by the display driver for switching to automatic S3D.



	Mode
HDMI* 1.4a S3D display	1080p24
	1080p23
	720p50
	720p59
	720p60
eDP* 120Hz	All modes*

*Note: For non-native modes, default S3D behavior is to scale OS mode to native mode of panel.



4 *Reference Documents/Links*

- Intel Graphics Developer's Guides: <http://software.intel.com/en-us/articles/intel-graphics-developers-guides/>
- Intel® Software Network - Media: <http://software.intel.com/en-us/articles/media/>
- Intel® Media SDK 3.0 beta: <http://software.intel.com/en-us/articles/intel-media-sdk-30-beta/>
- Intel® Media SDK Features in Microsoft Windows 7* Multi-Monitor Configurations on 2nd Generation Intel® Core™ Processor-Based Platforms : http://www.intel.com/support/graphics/intelhdgraphics3000_2000/sb/cs032112.pdf
- Enabling High-Performance Video Encoding, Decoding, and Preprocessing: <http://software.intel.com/en-us/articles/enabling-high-performance-video-encoding-decoding-and-preprocessing/>