

MAGEWELL

Flex I/O SDI 4i2o Technical Specifications

Preliminary

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Supported OS

- Windows
 - Windows 7/8/8.1/10/Server 2008/Server 2008 R2/Server 2012/Server 2016 (x86 & x64)
- Linux (support x86, x64 & ARM architecture)
 - Ubuntu 12.04/14.04/16.04/17.04/17.10/18.04 (x86 & x64)
 - CentOS 6.5/7 (x86 & x64)
 - Fedora 25/26/27 (x86 & x64)
 - Red hat 6.5 and above (x86 & x64)
 - Other Linux OS with kernel version 2.6.35 and above

Recommended OS (tested)

- Windows
 - Windows 7 Ultimate/8.1 Enterprise/10 Enterprise/Server 2008 R2 DataCenter/Server 2012 R2 DataCenter/Server 2016 R2 DataCenter (x86 & x64)
- Linux
 - Ubuntu 12.04/14.04/16.04 (x86 & x64)
 - Ubuntu 17.04/17.10/18.04 (x64)
 - CentOS 6.5/7.2 (x86 & x64)
 - Fedora 25/26 (x64)
 - Red hat 6.5 (x86 & x64)

Supported APIs

- Windows
 - DirectShow
 - DirectKS
 - Wave API/DirectSound/WASAPI
- Linux
 - V4L2
 - ALSA

Supported Software

- VLC
- VirtualDub
- OBS
- XSplit
- vMix
- VidBlaster
- Wirecast
- Microsoft Media Encoder
- Adobe Flash Media Encoder
- Any other DirectShow, V4L2, QuickTime, AV Foundation based encoding or streaming software

Input Interfaces

- 4x HD-BNC
 - SD/HD/3G/2K SDI

Output Interfaces

- 2x HD-BNC
 - SD/HD/3G/2K SDI

Host Interfaces

- PCIe Gen2 x4

Input features

- Integrated cable equalizer supporting cable lengths up to 230M for HD-SDI signals
- Support for SD/HD/3Ga/3Gb/3Gb-DL/3Gb-DS standards
- Support for 2K (2048x1080) mode
- Support for RGB 4:4:4, YCbCr 4:4:4, YCbCr 4:2:2 color sampling
- Support for 3Gb-DL. Combine input channel 1&2 or 3&4 to one dual-link for input
- Support for 10/12-bit color depth
- Support for extraction of SMPTE 352 payload identifier
- Support for up to 16 audio channels at 48KHz
- Support for extraction of audio information and channel status
- Support for extraction of timecode
- Support for obtaining ANC data
- Limited support of 3Gb-DS: only the first stream can be captured

Video Capture format

- Support for video resolutions up to 2048x1080
- Support capture format 4:2:0 8-bit: NV12, I420, YV12
- Support capture format 4:2:2 8-bit: YUY2, YUYV, UYVY
- Support capture format 4:4:4 8-bit: V308, IYU2, V408, BGR24, BGR32
- Support capture format 4:4:4 10-bit: V410, Y410
- More capture format can be set using Flex I/O SDK (based on DirectKS)

Video Capture Processing Features

- Two video processing pipelines with 180 Mpixels/s processing bandwidth
- Fully capable of processing at 10 bit
- Video cropping
- Video scaling
- Video de-interlacing
 - Weave
 - Blend top & bottom field
 - Top field only
 - Bottom field only
- Video aspect ratio conversion
 - Auto or manual selection of input aspect ratio
 - Auto or manual selection of output aspect ratio
 - Three aspect ratio conversion modes: Ignore (Anamorphic), Cropping or Padding (Letterbox or Pillarbox)
- Video color format conversion
 - Auto or manual selection of input color format & quantization range
 - Auto or manual selection of output color format, quantization range & saturation range
 - Support for RGB, YCbCr 601, YCbCr 709, YCbCr 2020 color formats
 - Support for Limited or Full quantization range
 - Support for Limited, Full & 'Extended gamut' saturation range
- Video frame rate conversion
- Video OSD composition
 - Support for PNG OSD image (up to 2048x2160)
 - Support for dynamic loading of RGBA OSD image via SDK

Deliver Multiple Streams of Captured video

- For any one input channel, deliver multiple streams to the computer

- Independent cropping, aspect ratio, color format, resolution, frame rate, de-interlacing, color adjustment and OSD settings for each individual stream

Video capture SG-DMA

- ~400MB/s per channel DMA bandwidth in PCIe 2.0 system
- ~200MB/s per channel DMA bandwidth in PCIe 1.0 system
- Support for auto detection of Intel tiled GPU surface
- Support for DirectGMA by AMD GPU
- Support for GPUDirect by Nvidia GPU

Video Playback Features

- Integrated cable driver supporting cable lengths up to 230M for HD-SDI signals
- Support for SD/HD/3Ga/3Gb/3Gb-DL/3Gb-DS standards
- Support for 2K (2048×1080) mode
- Support for RGB 4:4:4, YCbCr 4:4:4, YCbCr 4:2:2 color sampling
- Support for 3Gb-DL. Combine two output channels to one dual-link for output
- Support for 10/12-bit color depth
- Support for up to 16 audio channels at 48KHz
- Support for timecode output
- Support for custom ANC data output

Video Playback Format

- Support for video resolutions up to 2048x1080
- Support for output format 4:2:0 8-bit : NV12, I420
- Support for output format 4:2:2 8-bit : YUY2, UYVY
- Support for output format 4:4:4 8-bit : V308, IYU2, V408, BGR24, BGR32
- Support for output format 4:4:4 10-bit : V410, Y410

Video Playback Processing Features

- Video processing pipelines with 180 Mpixels/s processing bandwidth
- Fully capable of processing at 10 bit
- Video scaling
- Video aspect ratio conversion
 - Auto or manual selection of input aspect ratio
 - Auto or manual selection of output aspect ratio
 - Three aspect ratio conversion modes: Ignore (Anamorphic), Cropping or Padding (Letterbox or Pillarbox)
- Video color format conversion
 - Auto or manual selection of input color format & quantization range
 - Auto or manual selection of output color format, quantization range & saturation range
 - Support for RGB, YCbCr 601, YCbCr 709, YCbCr 2020 color formats
 - Support for Limited or Full quantization range
 - Support for Limited, Full & 'Extended gamut' saturation range
- Video frame rate convert & output or directly output

Video playback SG-DMA

- ~400MB/s per channel DMA bandwidth in PCIe 1.x system
- ~600MB/s per channel DMA bandwidth in PCIe 2.x system
- Support for DirectGMA by AMD GPU
- Support for GPUDirect by Nvidia GPU

Multiple devices on one computer

- Support for multiple cards plugged to one system
- On-board rotary switch to set card number, with 16 positions from 0 to F
- System hardware device tree will display "01: Flex I/O 4i2o" when rotary switch is set to 1, and so on
- The video and audio device names displayed in your software will include the card number (set by the rotary switch)

Ultra Low Latency Support

- Latency of 64 video lines
- Partial notification mode in SDK

Timestamp & A/V Synchronization

- Hardware based 100ns high resolution clock
- Audio frames (192 audio samples) & video frames are stamped with hardware clock
- Hardware clock can be synchronized across cards (via SDK)

SDK

- Flex I/O SDK for DirectShow provides the developer a quick way to integrate the extended features of the cards (Windows)
- Flex I/O SDK for DirectKS provides the developer the most flexibility and highest performance(Windows)

Windows Driver Tweaks

- All options can be controlled by three levels of registry key: global level, product level and device level
- Video, Audio, Crossbar filter names can be customized via registry keys

Firmware Upgrade

- Multiple cards in one system can be upgraded simultaneously
- Cards can be upgraded without a system power shutdown when it is not in use
- Safe upgrade. If power off or system break down occur when the firmware is being upgraded, it will automatically restore to the initial version. This function is only available for firmware version 1.21 and above.

LED Indicator

- Status LEDs indicate the working state of each channel:
 - Pulsing slowly: idle
 - On: input signal locked
 - Off: input signal unlocked
 - Double blinks: memory failed or FPGA configuration failed

Form Factor

- Normal profile PCIe x4 Add-on Card
- 140mm x 91mm (without PCI bracket)

Power Consumption

- 12V max current: TBD
- 3.3V max current: TBD
- Max power consumption: TBD

Working Environment

- Operating temperature: 0 to 40 deg C
- Storage temperature: -20 to 70 deg C
- Relative Humidity: 5% to 90% non-condensing