Summary
The Omnitek Multi-Channel Streaming DMA Controller IP provides a small footprint, highly efficient solution for Xilinx FPGA designs. This IP Core offers both memory-based DMA for handling transfers to and from addressed memory such as on-board SRAM and SDRAM, and FIFO-based DMA for streaming applications. Omnitek’s DMA Controller and reference design applications provide the complete solution for rapid inclusion of fast PCI Express data transfers and streaming into Xilinx FPGA environments. Additionally, Omnitek’s generic software API is platform-independent thus enabling auto-discovery of applications and helping provide a route to the unique PCI identification of the final product.

Key Features
- PCIe-based DMA Controller firmware for Xilinx FPGAs
- Supports Vivado IP Integrator tool
- 64, 128 and 256-bit PCIe interface support:
  - PCIe Gen1, Gen2, Gen3 support (dependent on FPGA family)
  - 1 & 2, 4 or 8 PCIe lane support options
- PCIe 8-lane Gen3 supports up to four UHDTV1 (3840 x 2160 p60) video streams.
- Offers both streaming FIFO-based DMA and memory-based DMA channels
- Highly efficient use of PCIe bandwidth, making it particularly suited to data streaming applications
- Support for multiple outstanding read requests
- Pre-fetching of Scatter-Gather descriptors for continuous streaming
- Optimised arbiter for back-to-back packing of Transition Layer Packets (TLP)
- Configurable number of 32, 64 or 128bit FIFO-based DMA streaming channels
- Supports 32-bit or 64-bit addressing
- Free 30-day evaluation

Applications
The Omnitek Multi-Channel Streaming DMA Controller IP can be used in a range of applications including:
- Video to PCI conversion
- Video capture and storage
- Video analysis

Connectivity
Omnitek provides a large range of complementary IP Cores for video processing and connection. These IP cores can be used individually or in combination to provide FPGA solutions for applications in broadcast, AV, aerospace/defence, medical, scientific and automotive industries. Omnitek IP Cores are supplied with design integration services tailored to your specific needs, but can be supplied as discrete blocks for inclusion in your own designs by special arrangement or as single chip solutions.

Supported Devices
The Omnitek Multi-Channel Streaming DMA Controller IP can be implemented on the following Xilinx devices:
- Artix-7, Kintex-7 and Virtex-7
- Kintex UltraScale and Virtex UltraScale
- Kintex UltraScale+ and Virtex UltraScale+
- Zynq-7000 APSoC and Zynq UltraScale+ MPSoC

Example Resource Usage

<table>
<thead>
<tr>
<th>IP Core</th>
<th>LUTs</th>
<th>Registers</th>
<th>Block RAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base DMA Controller</td>
<td>1261</td>
<td>1134</td>
<td>0</td>
</tr>
<tr>
<td>Memory-based DMA Channel (64 bits)</td>
<td>626</td>
<td>684</td>
<td>4</td>
</tr>
<tr>
<td>FIFO-based Input Channel (32 bits)</td>
<td>400</td>
<td>373</td>
<td>2</td>
</tr>
<tr>
<td>FIFO-based Output Channel (32 bits)</td>
<td>390</td>
<td>430</td>
<td>5</td>
</tr>
<tr>
<td>PCIe Translation Block (64 bits)</td>
<td>1864</td>
<td>1783</td>
<td>3</td>
</tr>
</tbody>
</table>
Reference Design

The DMA Controller is demonstrated with a reference design that uses the DMA IP to create a video-streaming SDI – PCI Express bridge.

The associated application demonstrates the ability of the DMA controller to simultaneously read and write multiple input video streams. It can work with SD, HD or 3G video. The application also demonstrates the use of the Windows driver and API supplied with the DMA Controller.

Product Options

- 1 & 2, 4 or 8 PCI Express Lane support
- Streaming FIFO-based DMA support
- Number of DMA channels (up to 16)
- FPGA family
- QT application providing register/write DMA functions, source code
- Omnitek Generic API and Driver source code
- Extended evaluation period (over 30 days)
- Extended support period (over 1 year)

Deliverables

- Encrypted netlist for DMA Controller Core IP
- Example Windows DirectShow application with compiled generic API and FPGA Debug, and also compiled drivers for Windows or source for Linux.
- Project file/wrapper supporting integration with compatible FPGA components
- Comprehensive documentation
- Technical Support and Maintenance Updates

Licensing Options

- Evaluation licence - fixed configuration version, available for free for 30 days through Omnitek website. Includes pre-compiled driver, Reference design and access to documentation (unencrypted).
- Encrypted netlist licence - allowing IP to be integrated into designs.
- Full Source Code licence - allowing customisation of IP.

About Omnitek

Omnitek is a leading independent consultancy company specializing in the design of video products and IP for the broadcast, post-production, digital film, AV, medical, aerospace/defence, automotive and consumer industries. Since its foundation, Omnitek has completed many successful design projects for major equipment manufacturers throughout Europe, Asia, and the United States.

Omnitek reserves the right to change specifications without notice. Refer to the Omnitek web site for the latest specifications and further information:

www.omnitek.tv