

The disruptive **visually lossless** light **video compression**, **extremely tiny** in **FPGA**

A TECHNOLOGY SERVING THE GLOBAL AV INDUSTRY

TICO is a new visually lossless compression specifically designed for the industry. This revolutionary technology is extremely tiny in FPGAs fitting the smallest Intel FPGA Cyclone devices, robust for real-time operation with no latency.

Up to now, image and video are sent or stored uncompressed into many displays and systems such as cameras, videos servers, or recorders. TICO is a smart upgrade path to manage higher resolutions (4K, 8K, ...) and frame rates while assuring visual quality, keeping power and bandwidth at a reasonable budget, and significantly reducing the complexity and cost of the system.

Technology benefits

- > Visually lossless quality:
 - 2:1 to 8:1
 - Robust over multiple encoding generations
 - Math. lossless at lower compression ratio
- > Fixed latency: down to microseconds
 - Selectable from 2 to x pixel lines
- > Very low FPGA resource requirement:
 - No external memory - only compressed line buffer
 - Low power consumption
- > Powerful, real-time or faster than real-time in CPU
- > Compatible with different resolutions, from mobile, HD to 4K/8K UHDTV, via multiple usual transport schemes
- > Designed to be a standard for industry-wide support: TICO compression technology is available on multiple software and hardware technologies
- > SMPTE RDD35 Compliant:
 - TICO over IP (SMPTE 2022 5/6 & RTP for SMPTE 2110) and over SDI infrastructures (4K over 3G-SDI)



Typical applications from HD to Ultra HD

- Video over IP systems (SMPTE 2022, SMPTE 2110, AVB, ...)
- Video servers, routers and switchers
- Cameras (high-res, real-time or high speed)
- Video monitors and displays
- Frame grabbers and video capture devices
- Cable extenders
- UHD/4K over 3G-SDI, over 10GbE
- UHD/8K over 12G-SDI, over 25GbE/40GbE, ...
- Video recorders & players
- (...)

TICO is a smart solution to

- Support higher data stream using existing systems & infrastructures (HD/4K/8K/HFR)
- Increase the number of streams or the stream resolution
- Reduce the internal video bandwidth (and power!)
- Cost effectively increase video buffer and storage capacity
- Reduce the number of lanes needed to transport a stream at a display interface or at an image sensor to save power, cost or both

FPGA implementation

Image features

- Color modes : 4:0:0, 4:2:0, 4:2:2 and 4:4:4, RGB, YCbCr, XYZ, RAW bayer
- Bit Depth : 8, 10 or 12
- Resolutions : Any up to 8K (8192 x 8192)
- Frame Rates : Any (depending on intoPIX IP-core configuration)

Compression

(Latency, Quality, Rate Control)

- (Sub) Intra-frame
- Real-time operation guaranteed (no overflow or underflow)
- Fixed latency
 - Selectable from 3 lines up to 11 at decoder, from 6 lines up to 18 at encoder, lowest latency is with Profile 1
- Adjustable rate for Lossy/Visually lossless (up to 4:1) /Math. lossless (1.2:1 to 1.8:1)
- CBR (constant bit rate) operation (optional capped VBR mode)
- TICO Profile 1 & 2 support
- SMPTE RDD35 compliant
- Embedded x2 downscaler option in Decoder

FPGA

- Low cost implementation in any Intel FPGAs: very low FPGA logic and internal RAM usage
- Fit in the smallest Intel FPGA Cyclone V, Arria V, Stratix V, Arria 10 families
- Encoder and decoder have approximately the same complexity
- IP-core customizable per application, delivered within a HDK to speed up the integration
- Various pixel per clock implementations

FPGA IP-Cores releases

Reference IP-cores (Profile 1 or 2, -Enc or -Dec)	Video formats				Target Intel FPGA		
	Max Resolution	Max FPS	Color Sampling	Bit Depth	Low end FPGAs Intel Cyclone V & Arria V	High-end FPGAs Intel Arria V GX, Stratix V & Arria 10	
HDTV/2K	IPX-TICO-HD-60-422	1920x1080	60	4:2:2	10	✓	✓
	IPX-TICO-HD-120-422	1920x1080	120	4:2:2	10	✓	✓
	IPX-TICO-HD-180-422	1920x1080	180	4:2:2	10	✓	✓
	IPX-TICO-HD-240-422	1920x1080	240	4:2:2	10	✓	✓
	IPX-TICO-HD-360-422	1920x1080	360	4:2:2	10	/	✓
HDTV/4K	IPX-TICO-HD-60-444	2048x1200	60	4:2:2 / 4:4:4	8,10,12	✓	✓
	IPX-TICO-HD-120-444	2048x1200	120	4:2:2 / 4:4:4	8,10,12	✓	✓
	IPX-TICO-HD-240-444	2048x1200	240	4:2:2 / 4:4:4	8,10,12	✓	✓
UHDTV/4K	IPX-TICO-UHD4K-60-422	4096x2160	60	4:2:2	10	✓	✓
	IPX-TICO-UHD4K-120-422	4096x2160	120	4:2:2	10	✓	✓
	IPX-TICO-UHD4K-180-422	4096x2160	180	4:2:2	10	/	✓
UHDTV/4K	IPX-TICO-UHD4K-60-444	4096x2160	60	4:2:2 / 4:4:4	8,10,12	✓	✓
	IPX-TICO-UHD4K-120-444	4096x2160	120	4:2:2 / 4:4:4	8,10,12	/	✓
UHDTV2/8K	IPX-TICO-UHD8K-60-422	7680x4320	60	4:2:2	10	/	✓
	IPX-TICO-UHD8K-120-444	7680x4320	120	4:4:4	10	/	✓*

* Available in pre-order only.

CONTACT INTOPIX FOR YOUR OWN CUSTOM IP-CORE CONFIGURATION

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