TICO

FPGA

intel FPGA Design Solutions Network Gold

The disruptive **lossless quality video compression**, **extremely tiny** in **FPGA**

A TECHNOLOGY SERVING THE GLOBAL AV 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 2110-22) and over SDI infrastructures (4K over 3G-SDI)
- Selected as the baseline of the new JPEG-XS standard

intoPIX

Typical applications from HD to Ultra HD

- Video over IP systems (SMPTE 2022, SMPTE 2110-22, ...)
- 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 streams 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, 12, 14 & 16 • Resolutions: Any up to 10K (10240 x 10240) • 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 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 • Fits 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 an 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: Max resolution	Max FPS	Color sampling	Bit depth	Target Intel FPGA: 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	/	✓
	IPX-TICO-HD-60-444	2048x1200	60	4:2:2 / 4:4:4	8, 10, 12, 16	✓	✓
	IPX-TICO-HD-120-444	2048x1200	120	4:2:2 / 4:4:4	8, 10, 12, 16	✓	✓
	IPX-TICO-HD-240-444	2048x1200	240	4:2:2 / 4:4:4	8, 10, 12, 16	✓	✓
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	/	✓
	IPX-TICO-UHD4K-60-444	4096x2160	60	4:2:2 / 4:4:4	8, 10, 12, 16	✓	✓
	IPX-TICO-UHD4K-120-444	4096x2160	120	4:2:2 / 4:4:4	8, 10, 12, 16	/	✓
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

HEADQUARTERS: intoPIX SA
Rue Emile Francqui 9
B-1435 Mont-Saint-Guibert - Belgium
Tel.: +32 10 23 84 70
sales@intopix.com

CHINA: sales.china@intopix.com
INDIA: sales.india@intopix.com
ISRAEL: sales.israel@intopix.com
JAPAN: sales.japan@intopix.com

S. KOREA: sales.korea@intopix.com
USA: sales@intopix.com

TICO INTEL FPGA may 19