- **eXpressDSP™ Digital Media (XDM IVIDENC2 Compliant)**
- **Multi-channel, reentrant implementation.**
- **Compliant with JPEG2K Core Coding System as specified in ISO/IES 154444-1 and ITU-T T.800.**
- **Optimized for C66x DSP and validated on the C6678 EVM**
- **Supports up to 12-bits per color sample**
- **Support grey-scale or 3 component images**
- **Supports RGB, YUV444, YUV422, and YUV420 image formats**
- **Supports ICT/RCT color transform**
- **Supports arbitrary tiling of image**
- **Supports 9/7 and 5/3 wavelet filters.**
- **Supports up to 6 resolution levels**
- **Support for image sizes up to 6600 x 4400 pixels**
- **Supports explicit and derived quantization modes under lossy compression mode.**
- **Supports code-block sizes of 64 and 32 respectively.**
- **Supports default, 128, 64, and 32 precinct sizes**
- **Supports up to 5 quality layers**
- **Supports LRCP, RPCL, RLCP, PCRL, and CPRL progression modes.**
- **Supports JP2/J2K and JPC file formats.**
- **Supports DCI 2K, DCI 4K bit-stream formats.**

DESCRIPTION

JPEG2000 Standard was introduced in the year 2000. It provides improved compression performance and flexible code-stream format when compared to the JPEG Standard. It supports both lossy as well as lossless operating modes. JPEG2K Encoder is validated on C6678 EVM with Code Composer Studio version 5.2.1.00018 and code generation tools version 7.4.0.

PRODUCT PREVIEW

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

Summary of performance

Table 1. Configuration Table

CONFIGURATION	ID
VGA Profile on 1-core (640 x 480, RGB, 8 bits per component)	J2K_ENC_L1
2K Digital Cinema Profile on 1-core (2048 x 858, RGB, 12 bits per component, compression ratio = 0.16)	J2K_ENC_L2
2K Digital Cinema Profile on 1-core (2048 x 858, RGB, 12 bits per component, compression ratio = 0.08)	J2K_ENC_L3
4K Digital Cinema Profile on 1-core (4096 x 1716, RGB, 12 bits per component, compression ratio = 0.04)	J2K_ENC_L4
6K Profile on 1-core (6600 x 4400, RGB,, 8 bits per component)	J2K_ENC_L5
Full HD Profile on 1-core (1920 x 1080, YUV 422, 10 bits per component, compression ratio = 0.16)	J2K_ENC_L6

Table 2. Cycles Information – Profiled on C6678 EVM with CGTools Version 7.4.0

CONFIGURATION	PERFORMANCE STATISTICS (IN MILLION CYCLES)[1]	
	TEST DESCRIPTION	MILLION CYCLES[2,3]
J2K_ENC_L1	Orig01_bird_vga.ppm (640 x 480, 8 bits per components, lossless mode, decomposition level = 5, progression order = cprl)	206.7
J2K_ENC_L1	Orig01_bird_vga.ppm (640 x 480, 8 bits per components, rate = 0.25, explicit quantization, decomposition level = 5, progression order = cprl)	166.6
J2K_ENC_L1	Orig01_bird_vga.ppm (640 x 480, 8 bits per components, rate = 0.1, explicit quantization, decomposition level = 5, progression order = cprl)	165.6
J2K_ENC_L2	MM_2K_XYZ_1256.ppm (2048 x 858, 12 bits per component, rate = 0.16, mct enabled, explicit quantization, decomposition level = 5, progression order = cprl)	964
J2K_ENC_L3	MM_2K_XYZ_1256.ppm (2048 x 858, 12 bits per component, rate = 0.08, mct enabled, explicit quantization, decomposition level = 5, progression order = cprl)	1022
J2K_ENC_L4	Reel_2ab_1256_12b.ppm (4096 x 1716, 12 bits per component, rate = 0.04, mct enabled, explicit quantization, decomposition level = 6, progression order = cprl)	2876
J2K_ENC_L5	image000002b.ppm (6600 x 4400, 8 bits per component, rate = 0.03, mct enabled, explicit quantization, decomposition level = 6, progression order = pcrl, code-block size 64 x 64, precinct size = default, tile size = 512 x 512)	7843

J2K _ ENC _L6	Ducks_take_off.yuv (1920x1080, 10 bits per component, rate = 0.16, mct enabled, explicit quantization, decomposition level = 5, progression order = cprl)	814

[1]Program placed in SL2, I/O buffers in external memory, stack in LL2, 32-KB L1P Cache, 32-KB L1D Cache, 64-KB L2 Cache, DDR speed at 1333 MHz, DSP at 1250 MHz.
[2]The MCycles numbers reported in this column were measured while running only on Core-0 of the device, while the other 7 cores were idling. If the codec is loaded on all 8 cores, the cycles consumed would be 6-10% higher, primarily due to DDR contention
[3]The MCycles numbers reported in this column are for a single Image in the video sequence

Table 3. Memory Statistics - Generated with Code Generation Tools Version 7.4.0

CONFIGURATION ID	MEMORY STATISTICS				
	PROGRAM MEMORY[2]	DATA MEMORY			
		INTERNAL	EXTERNAL[3]	STACK	TOTAL DATA
J2K _ ENC _L1	137 KB	290 KB	10319 KB	2 KB	10748 KB
J2K _ ENC _L2	137 KB	290 KB	10319 KB	2 KB	10748 KB
J2K _ ENC _L3	137 KB	290 KB	10319 KB	2 KB	10748 KB
J2K _ ENC _L4	137 KB	290 KB	10319 KB	2 KB	10748 KB
J2K _ ENC _L5	137 KB	290 KB	10319 KB	2 KB	10748 KB
J2K _ ENC _L6	137 KB	290 KB	10319 KB	2 KB	10748 KB

All memory requirements are expressed in kilobytes (1 kilobyte = 1024 bytes)
[2]Program placed in SL2
[3]External memory placed in DDR3

Table 4. Internal Data Memory Split-up

CONFIGURATION ID	DATA MEMORY – INTERNAL[4]		
	CONSTANTS	SCRATCH	INSTANCE[5]
J2K _ ENC _L1	3 KB	280 KB	7 KB
J2K _ ENC _L2	3 KB	280 KB	7 KB
J2K _ ENC _L3	3 KB	280 KB	7 KB
J2K _ ENC _L4	3 KB	280 KB	7 KB
J2K _ ENC _L5	3 KB	280 KB	7 KB
J2K _ ENC _L6	3 KB	280 KB	7 KB

[4]Constants are placed in SL2 and Scratch buffer is placed in LL2. All memory requirements are expressed in kilobytes and there could be a variation of around 1-2% in numbers.
[5]I/O buffers not included. Some of the instance memory buffers could be scratch

notes

- Evaluation version performance values may be higher than the values specified in the performance table.
- Input buffer size for supporting up to 6600 x 4400 frame size and 16-bits per color component requires 166.2 MB.
- Maximum output buffer size allowed for a given input bit-stream is 16 MB.
- The performances obtained in Table 2 are sensitive to algorithm code placement. Refer the sample linker file provided in the test application setup for algorithm code placement. This is used for profiling in Table 2.
- Memory configuration:
  - L1P: 32 KB program cache
  - L1D: 32 KB data cache
  - L2: 64 KB cache
- The algorithm uses 6 EDMA channels. Channel 0 to 5 use a maximum of 6 PARAM sets.

references

1.	ITU-T T.800 ISO/IEC 15444-1	Information technology – JPEG 2000 image coding system: Core coding system (2004)
2.	ITU-T T.803 ISO/IEC 15444-4	Information technology -- JPEG 2000 image coding system: Conformance Testing (2004)
3.	DCI Specifications	Digital Cinema System Specification Version 1.2, March 07, 2008.

glossary

Constants	Elements that go into const memory section
Scratch	Memory space that can be reused across different instances of the algorithm or across different algorithms
Shared	Sum of Constants and Scratch
Instance	Memory that contains persistent information - allocated for each instance of the algorithm

acronyms

XDAIS	eXpressDSP Algorithm Interface Standard
XDM	eXpressDSP Digital Media

DMA	Direct Memory Access
EVM	Evaluation Module
JPEG	Joint Picture Expert Group
MJPEG	Motion JPEG
ISO	International Organization for Standardization
ITU-T	International Telecommunications Union – Telecommunications Standardization Sector

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