JPEG Progressive Support Decoder (v2.00) on C64x+

FEATURES

- **eXpressDSP™ Digital Media (XDM 1.0 IIMGDEC1) interface compliant**
- **Validated on DM6446 EVM**
- **Baseline sequential mode with both interleaved and non-interleaved input format supported**
- **Progressive mode supported**
- **YUV 444, YUV 422, YUV 420, YUV 411, and Gray scale color sub-sampling formats supported**
- **YUV 422 with sampling format ((1,2), (1, 1), (1,1)) for baseline sequential mode with interleaved input format supported, baseline sequential mode with non interleaved input format supported and progressive**
- **RGB16, BGR24, and BGR32 output format supported**
- **Maximum of three components supported**
- **Maximum of three quantization tables supported**
- **Maximum of four huffman tables each for AC and DC DCT coefficients supported**
- **Arbitrary image size for both sequential and progressive JPEG images supported**
- **8-bit and 16-bit quantization tables supported**
- **Resizing the output image by a factor of 1/2, 1/4, and 1/8 supported**
- **On-the-fly resizing with respect to set maxHeight and maxWidth supported**
- **YUV planar or YUV 422 interleaved output format supported**
- **Frame level decoding of images for sequential mode and scan level decoding for progressive mode supported**
- **All the data buffers and tables are placed in the external memory**
- **Source images of 12-bits per sample not supported**
- **JPEG File Interchange Format (JFIF) header skipped**
- **Restart management for bit stream with Define Restart Interval Marker (DRI) and Restart Marker (RST) enabled**
- **Sectional Decoding is supported**
- **Supports sub region decoding**
- **Supports up scaling the output image by a factor of 2, 4, and 8**
- **This codec works on any of TI's C64x+ based platforms such as DM644x, DM64x, DM643x, OMAP35xx and their derivatives**

DESCRIPTION

JPEG is an international standard for color image compression. This standard is defined in the ISO 10918-1 JPEG Draft International Standard | CCITT Recommendation T.81. Supports baseline sequential mode with both interleaved and non-interleaved input format and progressive mode.

PRODUCT PREVIEW

Performance Summary

This section describes performance of JPEG Progressive Support Decoder on DM6446 EVM.

Table 1. Configuration Table

CONFIGURATION	ID
Progressive Support decoder (4:2:0 input and 4:2:2 interleaved output) with no internal memory	JPEG_DEC_001

Table 2. Cycles Information – Profiled on DM6446 EVM with Code Generation Tools Version 6.0.14

CONFIGURATION ID	PERFORMANCE STATISTICS (CYCLES PER PIXEL)(1)(2)		
	TEST DESCRIPTION	AVERAGE	PEAK(3)
JPEG_DEC_001	REMI0003.jpg, 2048 x 1536 , Baseline Sequential	14.25	None
	remi003_prog.jpg, 2048 x 1536 , Progressive Image	17.65	None
	REMI0003.jpg, 2048 x 1536 , Baseline Sequential with one row decode for each process call (sectional decoding)	14.65	None
	remi003_prog.jpg, 2048 x 1536 , Progressive Image with one row decode for each process call (sectional decoding)	17.8	None

(1) Measured with program memory, stack, and I/O buffers in external memory. Measured with 10:1 compression ratio
(2) Average and peak MCPS measurements can vary by +/-5%
(3) Peak value is not calculated for this version of JPEG Decoder.

Note:

- Default cache configuration (L1D cache: 16 K-bytes, L2 cache: 64 K-bytes, L1P cache: 32 K-bytes).
- If Davinci runs on 594 MHz, then Mega pixels/sec will be 594 MHz/Cycles per pixel = 594MHz/14.25 = 41.68 Mega pixels/second.

Table 3. Memory Statistics - Generated with Code Generation Tools Version 6.0.14

CONFIGURATION ID	MEMORY STATISTICS(1)				TOTAL
	PROGRAM MEMORY	DATA MEMORY			
		INTERNAL	EXTERNAL	STACK	
JPEG_DEC_001	145	0	38	8	191(2)
JPEG_DEC_001 (720 x 480)	145	0	2063	8	2216
JPEG_DEC_001 (1280 x 1024)	145	0	7718	8	7871
JPEG_DEC_001 (1600 x 1200)	145	0	11288	8	11441
JPEG_DEC_001 (2048 x 1536)	145	0	18470	8	18623
JPEG_DEC_001 (2560 x 2048)	145	0	30758	8	30911

(1) All memory requirements are expressed in kilobytes (1K-byte = 1024 bytes).
(2) Applicable for Baseline Sequential Images.

Table 4. Internal Data Memory Split-Up

CONFIGURATION ID	DATA MEMORY - INTERNAL (1)		
	SHARED		INSTANCE(2)
	CONSTANTS	SCRATCH	
JPEG_DEC_001	0	0	0

(1) All memory requirements are expressed in kilobytes.
(2) Does not include I/O buffer.

Table 5. External Data Memory Split-Up

CONFIGURATION ID	DATA MEMORY - EXTERNAL (1)		
	SHARED		INSTANCE(2)
	CONSTANTS	SCRATCH	
JPEG_DEC_001	1	7	30(3)
JPEG_DEC_001 (720 x 480)	1	7	2055
JPEG_DEC_001 (1280 x 1024)	1	7	7710
JPEG_DEC_001 (1600 x 1200)	1	7	11280
JPEG_DEC_001 (2048 x 1536)	1	7	18462
JPEG_DEC_001 (2560 x 2048)	1	7	30750

(1) Does not include I/O buffer.
(2) I/O buffers not included.
(3) Applicable for Baseline Sequential Images.

Table 6. Co-Processor(s) Memory Statistics

CONFIGURATION ID	SEQ DATA MEMORY	SEQ PROG MEMORY	IMX WORKING MEM	IMX IMG BUF	IMX CMD MEM
JPEG_DEC_001	0	0	0	0	0

Note: The decoder does not use co-processors and hence all the values are zero.

PRODUCT PREVIEW

Notes

- Total data memory for N non pre-emptive instances = Constants + Scratch + N*(Instance + I/O buffers + Stack)

References

- ITU-CCITT recommendation T.81 (reproduction of ISO/IEC 10918-1)
- eXpressDSP Algorithm Interoperability Standard (TMS320 Algorithm Interface Standard)
- *JPEG Progressive Support Decoder on C64x+ User's Guide* (literature number: SPRUEA9)

Glossary

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

Acronyms

ACRONYM	DESCRIPTION
CCITT	Committee Consultative International Telephone and Telegraph
DCT	Discrete Cosine Transform
DRI	Define Restart Interval Marker
DSP	Digital Signal Processing
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
ITU	International Telecommunication Union
JFIF	JPEG File Interchange Format
JPEG	Joint Photographic Experts Group
RST	Restart Marker
XDM	eXpressDSP Digital Media

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