

MPEG2 Main Profile Decoder (v02.02.01) on C66x

FEATURES

- eXpressDSP™ Digital Media (XDM 1.0 IVIDDEC2) interface compliant
- Validated on the TMS320C6678 EVM
- MPEG-2 main-profile-at-high-level (MP@HL) feature of the ISO/IEC 13818-2 standard supported
- ISO/IEC 13818-4 conformance standard, based on inverse discrete cosine transform (IDCT) compliant
- YUV 420 planar and YUV 422 interleaved output formats supported
- Interlaced and progressive decoding supported
- Only elementary video stream input formats supported
- MPEG-1 constrained parameters bit-streams (CPB) supported
- Bottom field reordering for non-progressive sequences where bottom field is sent ahead of top field for frame pictures supported

- Trick play and reverse play supported
- Display width feature supported
- Streams that are non-multiples of 16 are supported
- Feature XDM_Parse_Header supported. This allows parsing of only the headers, skipping the picture data decoding
- Supports ELF ABI format
- Supports “ecpy” for EDMA and “IRES” interface

DESCRIPTION

MPEG2 video standard specifies the decompression and coded representation for entertainment-quality digital video. This codec has been built and tested on the TMS320C6678 EVM with on board USB Emulation XDS100, Code Composer Studio™ version 5.2.1.00018 and code generation tools version 7.4.0.

PRODUCT PREVIEW



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Performance Summary

This section describes performance of the MPEG2 main profile decoder on TMS320C6678 EVM.

Table 1. Configuration Table

| CONFIGURATION | ID |
|--|---------------|
| MP@ high level features. YUV 4:2:0 planar output, default memory | MPEG2_DEC_001 |

Table 2. Cycles Information – Profiled on TMS320C6678 EVM With Code Generation Tools Version 7.4.0

| CONFIGURATION ID | PERFORMANCE STATISTICS (MEGA CYCLES PER SECOND) ^{(1) (2)} | | |
|------------------|--|------------------------|---------------------|
| | TEST DESCRIPTION ⁽³⁾ | AVERAGE ⁽⁴⁾ | PEAK ⁽³⁾ |
| MPEG2_DEC_001 | stefan250.m2v, 352 X 288 @ 4 mbps,252 frames | 41.6 | 44.9 |
| | TM5_football_4.0M.bs.mpg, 704 X 480 @ 4 mbps,149 frames | 124.6 | 168.2 |
| | gi_stream.mpeg, 720 X 480 @ 14.987 mbps,20 Frames | 169.9 | 182.5 |
| | Vipertakeoff_420p_24fps_p1280x720_MP_10Mbps_296frames.m2v | 253.4 | 354.3 |
| | R1m2v_hd1920x1080_18mbps_pt1_apartment.m2v, 442 frames | 605.5 | 648.6 |

- (1) Measured with program memory and I/O buffers in external memory, stack in internal memory and with cache configuration 32 K-bytes L1P program cache, 32K-bytes L1D data cache and 64K-bytes L2 cache DDR @ 666.7 MHz, CPU @ 1 GHz and only used by decoder.
- (2) There may be a variation of $\pm 5\%$ in the mentioned profiling data.
- (3) Peak values are calculated assuming that the most demanding frame is repeated 30 times in the sequence, rather than finding the most demanding 30 frames sequence in the bit-stream.
- (4) Average is calculated over number of frames specified for each stream.

Note: For an input encoded stream in the big-endian format, byte swap inside the library with the frameLevelByteSwap flag ON, leads to approximately 1 MHz increase in average cycles per sec for 1 mbps stream. For 4 mbps stream, it will be an increase of approximately 4 MHz.

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

| CONFIGURATION ID | MEMORY STATISTICS ⁽¹⁾ | | | | TOTAL |
|---------------------------|----------------------------------|-------------------------|----------|-------|-------|
| | PROGRAM MEMORY | DATA MEMORY | | | |
| | | INTERNAL ⁽²⁾ | EXTERNAL | STACK | |
| MPEG2_DEC_001 (352 x 288) | 123 | 39 | 676 | 12 | 850 |
| MPEG2_DEC_001 (704 x 480) | 123 | 39 | 2113 | 12 | 2287 |
| MPEG2_DEC_001 (720 x 480) | 123 | 39 | 2159 | 12 | 2333 |

- (1) All memory requirements are expressed in kilobytes (1K-byte = 1024 bytes) and there could be a variation of approximately 1-2% in values.
- (2) Internal memory is placed in L2 SRAM.

Table 4. Internal Data Memory Split-Up

| CONFIGURATION ID | DATA MEMORY - INTERNAL ⁽¹⁾ | | INSTANCE |
|------------------|---------------------------------------|---------|----------|
| | SHARED | | |
| | CONSTANTS | SCRATCH | |
| MPEG2_DEC_001 | 0 | 39 | 0 |

- (1) All memory requirements are expressed in kilobytes and there could be a variation of approximately 1-2% in values.

Table 5. Co Processor(s) Memory Statistics⁽¹⁾

| CONFIGURATION ID | SEQ DATA MEMORY | SEQ PROG MEMORY | SEQ PROG MEMORY | IMX IMG BUF | IMX CMD MEM |
|------------------|-----------------|-----------------|-----------------|-------------|-------------|
| MPEG2_DEC_001 | 0 | 0 | 0 | 0 | 0 |

- (1) The decoder does not use co-processors; therefore, all the values are zeroes.

Notes

- Evaluation version performance may be off by up to 30 MHz.
- Does not use internal memory for persistent buffers. Relieves algorithm from preserving persistent memory in task switch scenario.
- No constants are on internal memory.
- Display buffer for YUV422 interleaved format is 4050K-bytes.
- Input buffer to algorithm is assumed to have at least one encoded frame data
- Memory configuration:
 - L1P: 32K-bytes program cache
 - L1D: 32K-bytes data cache
 - L2: 64K-bytes cache
- Total data memory for N non pre-emptive instances = Constants + Runtime Tables + Scratch + N*(Instance + I/O buffers + Stack)
- Total data memory for N pre-emptive instances = Constants + Runtime Tables + N*(Instance + I/O buffers + Stack + Scratch)

References

- ISO/IEC 11172-2:1993 Information technology -- Coding of moving pictures and associated audio for digital storage media at up to about 1.5 Mbps -- Part 2: Video (MPEG-1 video standard).
- ISO/IEC 13818-2:2000 Information technology -- Generic coding of moving pictures and associated audio information: Video (MPEG-2 video standard)
- *MPEG2 Main Profile Decoder (v02.02.00) on C66X (on TMS320C6678 EVM) User's Guide (SPRUH72A)*

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/Abbreviation | Description |
|----------------------|------------------------------------|
| ABI | Application Binary Interface |
| CPB | Constrained Parameters Bit-streams |
| DMA | Direct-Memory Access |
| DMAN3 | DMA Manager |
| EDMA | Enhanced Direct Memory Access |
| ELF | Executable and Linkable Format |
| EVM | Evaluation Module |
| IDCT | Inverse Discrete Cosine Transform |
| IRES | Resource Interface |
| MCPS | Mega Cycles Per Second |
| MPEG | Motion Picture Expert Group |
| QDMA | Quick Direct Memory Access |
| XDM | eXpressDSP Digital Media |

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