

H.264 Baseline Profile Decoder (v1.12) on DM648/TNETV2685

FEATURES

- eXpressDSP™ Digital Media (XDM 0.9 IVIDDEC) interface compliant
- Validated on the DM648/TNETV2685 EVM
- Features of the Baseline Profile (BP) up to level 3.0 supported
- Progressive frame type picture decoding supported
- Multiple slices and multiple reference frames supported
- CAVLC decoding supported
- Up to 16 MV per MB supported
- Frame based decoding with frame size being multiples of 16 supported
- Byte-stream syntax of the input bit stream supported
- Outputs available in YUV 420 planar and 422 interleaved little endian formats
- Tested for compliance with JM version 10.1 reference decoder
- ASO and FMO error concealment features supported
- Redundant slices supported
- Supplemental Enhancement Information (SEI) and Video Usability Information (VUI) supported
- Error concealment supported
- NAL unit stream supported
- Adaptive reference picture marking supported
- Reference picture list reordering supported
- Frame cropping and display width supported
- Configurable display delay supported

DESCRIPTION

H.264 is a popular video coding algorithm enabling high quality multimedia services on a limited bandwidth network. H264 Decoder is validated on DM648/TNETV2685 EVM with Code Composer Studio version 3.3.24.1 and code generation tools version 6.0.8.



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Performance Summary

This section describes performance of the H.264 baseline profile decoder on DM648/TNETV2685.

Table 1. Configuration Table

CONFIGURATION	ID
Level 1.0 Baseline Profile	H264_DEC_001
Level 2.0 Baseline Profile	H264_DEC_002
Level 3.0 Baseline Profile	H264_DEC_003

Table 2. Cycles Information – Profiled on DM648/TNETV2685 EVM With Code Generation Tools Version 6.0.8

CONFIGURATION ID	PERFORMANCE STATISTICS (MEGA CYCLES PER SECOND) ⁽¹⁾⁽²⁾		
	TEST DESCRIPTION	AVERAGE ⁽³⁾	PEAK ⁽⁴⁾
H264_DEC_001	foreman_i_p1.264, YUV422ILE, 4 MV, QCIF (176 x 144), @ 300 kbps	25	31
	FM1_BT_B.264, YUV422ILE, FMO with all types of slice-groups, QCIF (176x144), @ 270 kbps	42	52
	FM1_FT_D.264, YUV422ILE, 40% non-FMO, non-ASO frames and 60% ASO/FMO frames, QCIF (176x144), @ 187 kbps	36	45
	FM2_SVA_A.264, YUV422ILE, ASO/FMO frames, QCIF (176x144), @ 151 kbps	42	45
	FM3_FT_A.264, YUV422ILE, ASO/FMO present, QCIF (176x144), @ 241 kbps	41	52
H264_DEC_002	cities_CIF_500Kbps.264, YUV422ILE, 4 MV, CIF (352 x 288), @ 500 kbps	76	104
	traffic_multiple_slice_aso.264, YUV422ILE, only ASO present on all frames, CIF (352x288), @ 560 kbps	74	112
H264_DEC_003	foreman_vga_1mbps_100f.264, YUV422ILE, 4 MV, VGA (640x480), @ 1 mbps	201	293
	fire_30frames_2_Mbps.264, YUV422ILE, 16 MV, D1 (720x480), @ 2 mbps	274	290

(1) Measured with program memory, stack and I/O buffers in external memory, 32K-bytes L1P cache, 64K-bytes L2 RAM memory, 32K-bytes L1D cache, 256K-bytes L2 cache and DDR speed at 266 MHz, CPU speed at 594 MHz.

(2) Average and peak MCPS measurements can vary by +/-5%.

(3) Based on average number of cycles per frame @30 fps.

(4) Based on worst case cycles per frame @30 fps.

Table 3. Memory Statistics - Generated With Code Generation Tools Version 6.0.8

CONFIGURATION ID	MEMORY STATISTICS ⁽¹⁾				
	PROGRAM MEMORY	DATA MEMORY			TOTAL
		INTERNAL	EXTERNAL	STACK	
H264_DEC_001	255	61.125	1090	12	1357
H264_DEC_002	255	61.125	3550	12	3817
H264_DEC_003	255	61.125	5397	12	5664

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

Table 4. Internal Data Memory Split-Up

CONFIGURATION ID	DATA MEMORY - INTERNAL ⁽¹⁾		
	SHARED		INSTANCE ⁽²⁾
	CONSTANTS	SCRATCH	
H264_DEC_001	0	61.125	0
H264_DEC_002	0	61.125	0
H264_DEC_003	0	61.125	0

(1) Internal memory refers to L1D RAM. All memory requirements are expressed in kilobytes and there could be a variation of approximately 1-2% in values.

(2) I/O buffers not included. Some of the instance memory buffers could be scratch.

Notes

- Display buffer for YUV422 interleaved format is 810K-bytes for 625 SD format (720 x 576)
- Input buffer to algorithm is assumed to have at least one encoded frame data. Otherwise, the application must provide CPB buffer size amount of valid data to the algorithm. For a specific level the CPB size could be referred from the standard.
- Memory Configuration
 - L1P : 32K-bytes program cache (32 bytes cache line width, direct mapped cache)
 - L1D : 32K-bytes data cache (64 bytes cache line width, 2 way set associative cache)
 - L2: 64K-bytes data memory and 256K-bytes cache (128 bytes cache line width, 4-way set associative cache)
- The performances obtained in [Table 2](#) are sensitive to algorithm code placement. See the sample linker file provided in the test application setup for algorithm code placement. This is used for profiling in [Table 2](#).
- The algorithm uses 4 QDMA channels. Channels 0, 2, and 3 each require up to a maximum of 8 linked transfers. Channel 1 requires 24 PARAM sets to perform 24 linked transfers. The algorithm uses DMAN3 interface for logical allocation of these channels.
- The following QDMA properties are not programmed/configured inside the codec. They need to be programmed by the application:
 - Mapping of QDMA channels to queues
 - Mapping of queues to transfer controllers
 - Queue priorities
- 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 14496-10: March 2005 (E) Rec. H.264 (E) ITU-T Recommendation
- *H.264 Baseline Profile Decoder on DM648/TNETV2685 User's Guide* (literature number: SPRUF67A)

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
625SD	Level 3.0 maximum resolution format size 720 x 576
CIF	Common Intermediate Format
CPB	Coded Picture Buffer
D1	SDTV image resolution (720x480)
QCIF	Quarter Common Intermediate Format
QDMA	Quick Direct Memory Access
SDTV	Standard Definition Television
SEI	Supplemental Enhancement Information
VGA	Video Graphics Array (640 x 480 resolution)
VUI	Video Usability Information
XDM	eXpressDSP Digital Media

Revision History

This datasheet revision history highlights the changes made to the SPRS453 codec specific data manual to make it SPRS453A.

Table 5. Revision History of H264 Baseline Profile Decoder on DM648/TNETV2685

SECTION	ADDITIONS/MODIFICATIONS/DELETIONS
Section 1	Features: <ul style="list-style-type: none"> • Deleted XDAIS complaint • Added supported platforms
Table 2	Cycles Information: <ul style="list-style-type: none"> • Updated Average and Peak values • Updated the table footnotes
Table 3	Memory Statistics: <ul style="list-style-type: none"> • Updated Program Memory values

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