

VC1 SP,MP and AP(Progressive Only) (v01.00.00)Decoder on DM365

FEATURES

- eXpressDSP Digital Media (XDM 1.0 IVIDDEC2) interface compliant
- Validated on DM365 EVM with and without LINUX
- VC1 decoder Simple, Main and advanced(progressive only) compliant (limited to maximum of 1920x1088 frame resolution)
- Progressive type picture decoding supported
- Multiple slices(advanced profile) supported
- Minimum resolution supported is 64x16.
- Non-multiples of 16 resolutions are also supported.
- Upto 4 MV per MB supported.
- All Block type partitions and mode supported.
- Supports baseline intra frame compression.
- Supports variable size transform.
- Supports overlap transform and loop filtering
- Luma and Chroma quarter-pixel motion compensation supported.
- Extended motion vectors are supported.
- Adaptive macroblock quantization supported.
- Supports decoding of Bidirectional(B) frames.
- Intensity Compensation is supported.
- Range adjustment(Range mapping and Range reduction) is supported.
- Sequence Level metadata supported.
- Supports RCV versions V1 and V2.
- Supports start codes and entry-point layer decoding.
- Outputs are available in YUV420 interleaved big endian format
- Uses configurable frame display delay for out of order display
- Performs basic error concealment on erroneous frames and reports the type of error occurred
- Supports up to 1080p (1920x1088) resolution.
- This version of the decoder does not support the following features:
 - Dynamic change in resolution
 - Interlace format
 - Display metadata
 - Multi-resolution decoding(Simple and Main profiles)

DESCRIPTION

VC1 is the Society of Motion Picture and Television Engineers(SMPTE) standardized video decoder. VC1 consists of three profiles namely, simple, main and advanced. Simple and Main profiles are developed for use in lower-bit-rate networked computing environments. This project is developed using Code Composer Studio version 3.3.38.2 and using the code generation tools version 4.1.3.



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Performance Summary

This section describes the performance of the VC1 Decoder on DM365.

Table 1. Configuration Table

CONFIGURATION	ID
VC1 SP, MP and AP (Progressive only)	VC1_DEC_01

Performance measurement procedure

- Measured with program memory and I/O buffers in external memory, I/D cache enabled, ARM @297 MHz, DDR @ 243 MHz, Monta Vista Linux 5.0
- Linux is used to measure the performance numbers in this Datasheet.
- The process time is measured across algActivate/process/algDeactivate function call using gettimeofday() utility of linux.
- NFS File system is used as an environment in performance measurement

Table 2. Cycles Information for VC1_DEC_01

INPUT NAME	PERFORMANCE STATISTICS (MEGA CYCLES)						
	RESOLUTION	AVERAGE			PEAK		
		ARM926 PER FRAME	DECODE PER FRAME (ARM926 and HDVICP)	FPS	ARM926 PER FRAME	DECODE PER FRAME (ARM926 and HDVICP)	FPS
mobcal_pal_50_sp	SP 720x576	0.758	5.297	56.073	0.999	5.636	52.693
shields_720p_60_sp	SP 1280x720	0.793	9.893	30.020	1.401	10.514	28.249
1080p_pedestrian_sp	SP 1920x1080	3.420	24.213	12.266	4.154	25.134	11.817
mobcal_pal_50_mp	MP 720x576	0.877	6.560	45.276	1.024	6.827	43.507
shields_720p_60_mp	MP 1280x720	1.091	12.984	22.874	1.741	14.140	21.004
1080p_pedestrian_mp	MP 1920x1080	4.053	29.275	10.145	5.213	31.504	9.427
mobcal_pal_50_ap_singleslice	AP Single Slice 720x576	0.895	6.956	42.699	1.305	7.402	40.124
shields_720p_60_ap_singleslice	AP Single Slice 1280x720	1.136	13.098	22.676	2.615	14.407	20.615
1080p_pedestrian_60frames_ap_singleslice	AP Single Slice 1920x1080	4.102	29.058	10.221	5.301	331.835	9.329
mobcal_pal_50_ap_multislice	AP Multi Slice 720x576	0.234	6.365	46.664	0.304	6.864	43.268
shields_720p_60_multislice	AP Multi Slice 1280x720	0.264	12.295	24.157	0.391	13.162	22.566
1080p_pedestrian_60frames_ap_multislice	AP Multi Slice 1920x1080	0.298	25.373	11.705	0.441	27.270	10.891

Note:

- Decode frame depicts the cumulative load on ARM926 and ARM968.
- The values in Table 2 are as measured on the ARM926 side. These are the actual cycles as seen from the host on the DM365 EVM board and will be close to cycles seen on the final system (for average case).
- ARM926 represents mega cycles per frame spend on ARM926.
- Decode frame time is the time seen from ARM926 only. Since most of the processing happens at HDVICP, the active load on ARM926 is the value mentioned in ARM926 column. Decoder frame time has no connection with HDVICP running at 243 MHz.
- All the values are collected (both average and peak) at frame-level processing.
- They are measured with Linux without any system traffic.
- The version of the code used to collect these numbers have the following features included: :
 - Interrupt mode of operation – one interrupt signal processing overhead per frame.
 - Resetting of HDVICP and loading of code into ARM968 DTCM – once per stream.
 - Cache is enabled on ARM926.

Table 3. Memory Statistics (Host ARM926 External Memory)

CONFIGURATION ID	MEMORY STATISTICS (IN BYTES) ⁽¹⁾					TOTAL
	PROGRAM MEMORY	DATA MEMORY			STACK	
		CONSTANT ⁽²⁾	HEAP			
			PERSISTENT	SCRATCH		
VC1_DEC_01	728180	2256	1587021	96384	12288	2426129

- (1) All these memory requirements are for ARM926 decoder library only. They do not include any memory requirements from test application side and input/output buffers for decoding. Stack, heap and code requirements for test-application are additional.
- (2) Constant memory size requirements include code memory of HDVICP since it forms a constant table on ARM926 before transfer. The constant size is the sum of .cinit, .bss, and .const sections used by VC1 decoder library.

Table 4. Internal Data Memory Split-Up

CONFIGURATION ID	DATA MEMORY - HDVICP (IN BYTES)		
	PROGRAM MEMORY (BYTES)	DATA MEMORY (BYTES)	HDVICP BUFFERS
VC1_DEC_01	49152	32768	ALL

Table 5. VC1 Decoder DM365 Codec Usage of Memory Through CMEM

BUFFER	YUV420P
Input Buffer	1048576
Output Buffer	3491840
MEMTAB NUMBER	SIZE IN BYTES
Memtab 0	1152
Memtab 1	1152
Memtab 2	110809
Memtab 3	7680
Memtab 4	7808
Memtab 5	7808
Memtab 6	7680
Memtab 7	7680
Memtab 8	272896
Memtab 9	272896
Memtab 10	1024
Memtab 11	1024
Memtab 12	47232
Memtab 13	128
Memtab 14	2688

Table 5. VC1 Decoder DM365 Codec Usage of Memory Through CMEM (continued)

BUFFER	YUV420P
Memtab 15	128
Memtab 16	551680
Memtab 17	8192
Memtab 18	319264
Memtab 19	384
Memtab 20	10240
Memtab 21	13184
Memtab 22	30720

Note:

- The size of the input buffer should be equal to or greater than one frame data.
- The table has numbers for 1080p resolution.
- Some of the CMEM allocations are dependent on the maxWidth and maxHeight given by the application in create time params. Given below is the formula used to compute the size of the output buffer.
 - Output buffer size = luma size +chroma size
 Luma size = (maxWidth +alignment+64) * (maxHeight +alignment+64)
 Chroma size = (maxWidth +alignment+64) * ((maxHeight +alignment) /2 +64)

Where alignment is the minimum number of bytes required to be added to make the maxWidth a multiple of 32 and the maxHeight a multiple of 16.

Notes

- HDVICP and VICP
 - The entire HDVICP is a video resource and is used by the codec
- DMA configuration

Table 6. DMA Configuration

TC Q's	TC 0	TC 1	TC 2	TC 3	TOTAL
Usage	Used by Codec	Used by Codec	Used by Codec	Reserved for system	-
Priority	1	1	1	0	-
EDMA channels	15	3	8	NA	26
PaRAM Entries	22	22	8	NA	52
QDMA channels	0	0	0	NA	0

- The HDVICP/VICP/EDMA resources are acquired using a generic resource manager known as Framework component. Please refer VC1 SP,MP and AP(Progressive only) Decoder User's Guide for details.
- Code Placement
 - All the algorithm code are placed in external memory. The performance quoted is not sensitive to algorithm code placement.

References

- SMPTE 421M. – VC1 Compressed video bit-stream format and decoding process.
- VC1 SP, MP and AP (Progressive Only) Decoder on DM365 (Literature Number: SPRUGS8A)

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
CIF	Common Intermediate Format
D1	720x480 or 720x576 resolutions in progressive scan
720p	1280x720 resolution in progressive scan
1080p	1920x1080 resolution in progressive scan
DMA	Direct Memory Access
EVM	Evaluation Module
QVGA	Quarter Video Graphics Array
VGA	Video Graphics Array
HDVICP	High Definition Video and Imaging Co-processor sub-system.
XDAIS	eXpressDSP Algorithm Interface Standard
XDM	eXpressDSP Digital Media

PRODUCT PREVIEW

Revision History

This datasheet revision history highlights the changes made to SPRS634 codec specific datasheet to make it SPRS634A

Table 7. Revision History for VC1 SP,MP and AP(Progressive Only) (v01.00.00)Decoder on DM365

SECTION	CHANGES
Table 2	<ul style="list-style-type: none"> Modified Average and Peak values
Table 3	<ul style="list-style-type: none"> Modified memory values
Table 5	<ul style="list-style-type: none"> Modified Memtab values

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