



- eXpressDSP Digital Media (XDM1.0 IVIDENC1) compliant
- Generates bit-streams compliant with the MPEG4 standard
- Progressive frame type picture encoding supported
- Supports MPEG4 Advanced Simple Profile levels 0,1,2,3,4,5.
- H.263 baseline profile levels 10, 20, 30, and 45 supported
- AC prediction supported up to CIF resolution
- Resync marker (packet mode) is supported.
- TI's proprietary motion estimation supported
- Upto Quarter Pixel Interpolation (HPI) for motion estimation supported
- 4MV (four motion vectors) mode is supported
- Unrestricted Motion Vectors (UMV) supported
- Addition of video sequence end code in the bit stream supported
- Resolutions up to PAL D1 (720 x 576) are supported
- Setting of Quantization Parameter (QP) for I-frames and P-frames supported
- Rate Control (CBR and VBR) supported
- YUV420 semi-planar format for input frames is supported

description

MPEG4(from ISO/IEC) is a popular video coding algorithm enabling high quality multimedia services on a limited bandwidth network. MPEG4 standard defines several profiles and levels, which specify restrictions on the bit stream, and hence limits the capabilities needed to encode/decode the bit-streams. This project is developed using Code Composer Studio version 3.3.49 and using the code generation tools version 6.0.8



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.



All trademarks are the property of their respective owners.

PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.

Copyright © 2008, Texas Instruments Incorporated

P
R
O
D
U
C
T
P
R
E
V
I



Summary Of Performance

This section describes performance of Standalone MPEG4 ASP Encoder tested on DM6467 EVM.

Table 1. Configuration Table

CONFIGURATION	ID
MPEG4 Advanced simple profile levels 0,1,2,3,4,5; H263 baseline profiles 10, 20, 30, and 45	MPEG4_ENC_001

Table 2. Cycles Information – Profiled on DM6467 EVM with Code Generation Tools Version 6.0.8

CONFIGURATION ID	TEST DESCRIPTION	PERFORMANCE STATISTICS					
		AVERAGE			PEAK		
		DSP (C64X+) MHZ NON-BLOCKING CYCLES	DSP BLOCKING CYCLES	FPS (DSP @ 600 MHZ)	DSP (C64X+) MHZ NON-BLOCKING CYCLES	DSP BLOCKING CYCLES	FPS (DSP @ 600 MHZ)
MPEG4_ENC_001	foreman_176x144_420p_400fr.yuv (QCIF@30fps, 128 kbps, 300 frames)	12.30	14.91	798	12.69	15.46	778
	akiyo_352x288_420p_300fr.yuv (CIF@30fps, 256 kbps, 300 frames)	39.99	45.83	316	40.38	47.45	307
	akiyo_352x288_420p_300fr.yuv (CIF@30fps, 1 Mbps, 300 frames)	40.27	47.41	308	41.03	49.86	295
	BUS_640x480_15_orig_01_420p_75fr.yuv (VGA@30fps 1Mbps, 75 frames)	116.5	143.3	122	117.8	145.8	120
	BUS_640x480_15_orig_01_420p_75fr.yuv (VGA@30fps 2Mbps, 75 frames)	116.8	143.5	122	118.1	146.2	120
	mobile_720x480_420p_300fr.yuv (NTSC-D1 @30fps 2Mbps, 300 frames)	133.6	165.1	106	135.3	167.9	105
	mobile_720x480_420p_300fr.yuv (NTSC D1 @30 fps 4Mbps, 300 frames)	135.09	166.6	105	137.6	170.5	103

Note:

1. These figures depict the load on DSP and HDVICP separately. For calculating FPS, frame level overhead (on DSP) is added to maximum of DSP and HDVICP loads. These are actual cycles as seen from host on DM6467 EVM and will be close to cycles seen on the final system (for average case).
2. These figures are with Cache enabled on C64x+ side.
3. They are measured in standalone mode without actual framework.
4. All numbers are based on numbers collected [both average and peak] at frame level processing @ 30fps.

P R O D U C T P R E V I

5. The version of the code used to collect these numbers have the following features included:
 - i. Interrupt mode of operation – one interrupt signal processing overhead perMB pair.
 - ii. Resetting of vIMCOP and loading of code into ARM968 DTCM – once per frame.
6. Measured with program memory, stack, and I/O buffers in external memory with cache configuration : 32 KB L1P Program Cache, 32 KB L1D Data Cache and 64 KB L2 Cache. There could be a variation of approximately 1-2% in the values.

Table 3. External memory Statistics (Host DSP)

CONFIGURATION ID		MEMORY STATISTICS ^{1,2}					
		PROGRAM MEMORY	DATA MEMORY				TOTAL
			CONSTANT	HEAP		STACK	
		PERSISTENT		SCRATCH			
MPEG4_ENC_001	PAL-D1 (720x576)	142	16	1460	0	32	1650
	NTSC-D1 (720x480)	142	16	1239	0	32	1429
	VGA (640x480)	142	16	1116	0	32	1306
	CIF (352x288)	142	16	436	0	32	626
	QCIF (176x144)	142	16	162	0	32	352

¹ All these memory requirements are for DSP encoder library only. Program memory size includes DMA library also. They do not include any memory requirements from test application side. Stack, heap and code requirements for test-application are extra. Constant memory size includes code size of ARM968 since it forms constant table on DSP to enable code transfer from DSP to ARM968. All memory requirements are expressed in terms of kilobytes. There could be a variation of approximately 1-2% in the values. ²The constant size is the sum of .cinit, .bss, and .const sections used by MPEG4 encoder library.

It includes the frame buffers.

² All memory requirements are expressed in terms of kilobytes..

Table 4. Internal Data Memory Split-up

CONFIGURATION ID	DATA MEMORY – INTERNAL		
	SHARED		PERSISTENT
	CONSTANTS	SCRATCH	
MPEG4_ENC_001	NA	32	NA

All memory requirements are expressed in terms of kilobytes.

Resource requirement:

- The entire HDVICP-0 is a video resource and uses 16K ITCM and 8K DTCM.
- 28 EDMA channels and 66 param entries are required.

References

- ISO/IEC 14496-2:2004, Information technology - Coding of audio-visual objects -- Part 2: Visual (Approved in 2004-05-24)



- H.263 ITU-T Standard - Video Coding for low bit rate communication
- User Guide for MPEG4 ASP Encoder (literature number: SPRUFC0A)

Glossary

Constants Elements that go into const memory section

Acronyms

AC	Alternate Current
AIR	Adaptive Intra Refresh
CIF	Common Intermediate Format (352x288 resolution)
CBR	Constant Bit Rate control
DMA	Direct Memory Access
DP	Data Partitioning
D1	720x576 resolution for PAL and 720x480 resolution for NTSC
DSP	Digital Signal Processor
EVM	Evaluation Module
FPS	Frames Per Second
H263	ITU-T video compression standard
HPI	Half Pixel Interpolation
ITU	International Telecommunication Union
MPEG	Motion Picture Expert Group
MV	Motion Vector
NTSC	National Television Standards Committee (Television standard)
PAL	Phase Alteration by Line (Television standard)
PSNR	Peak Signal to Noise Ratio
QP	Quantization Parameter
QCIF	Quarter Common Intermediate Format (176x144 resolution)
QVGA	Quarter Video Graphics Array (320x240 resolution)
RVLC	Reversible Variable Length Coding
SQCIF	Sub Quarter Common Intermediate Format
TCM	Tightly Coupled Memory
UMV	Unrestricted Motion Vectors
VBR	Variable Bit Rate control

**P
R
O
D
U
C
T
P
R
E
V
I**



VGA	Video Graphics Array (640x480 resolution)
vIMCOP	Video and Imaging co-processor
WVGA	Wide VGA resolution (864x480)
XDAIS	eXpressDSP Algorithm Interface Standard
XDM	eXpressDSP Digital Media
YUV	Raw video format Y(luminance) UV (Chrominance)

P
R
O
D
U
C
T
P
R
E
V
I

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

Amplifiers
Data Converters
DSP
Clocks and Timers
Interface
Logic
Power Mgmt
Microcontrollers
RFID
RF/IF and ZigBee® Solutions

amplifier.ti.com
dataconverter.ti.com
dsp.ti.com
www.ti.com/clocks
interface.ti.com
logic.ti.com
power.ti.com
microcontroller.ti.com
www.ti-rfid.com
www.ti.com/lprf

Applications

Audio
Automotive
Broadband
Digital Control
Medical
Military
Optical Networking
Security
Telephony
Video & Imaging
Wireless

www.ti.com/audio
www.ti.com/automotive
www.ti.com/broadband
www.ti.com/digitalcontrol
www.ti.com/medical
www.ti.com/military
www.ti.com/opticalnetwork
www.ti.com/security
www.ti.com/telephony
www.ti.com/video

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright 2008, Texas Instruments Incorporated