



## Ittiam MPEG-4 ASP Encoder (Low Delay, Interlace) on TMS320DM6446

### FEATURES

- Version 1.53.2.25.2.46
- eXpressDSP™ Algorithm Interface Standard (XDAIS) Compliant
- eXpressDSP™ Multimedia Interface (XDM) Compliant
- Encodes streams compliant with MPEG-4 Advanced simple profile decoder
- Supports resolutions up to D1
- Supports YUV420 planar and YUV422i as raw video output formats
- Supports adaptive Intra Refresh to obtain better resilience when transmitted over error prone channels
- Supports Low Delay Rate Control to generate a CBR stream
- Full interlace support
- Supports motion estimation up to half pel
- Image coprocessors used (Accelerated version)
- Re-entrant multi channel implementation
- Compliant with TI IDMA3 interfaces and TI ACPY3 callbacks
- Dynamic change in bit-rate
- Dynamic change in frame-rate
- Force I-frame at run time

### Unsupported Features

- AC Prediction
- 8x8 partitions, B-VOPS, RVLC, Data partitioning, and GMC

### DESCRIPTION

The MPEG-4 standard, published by the International Telecommunications Union (ITU), is a video compression (coding) standard supporting a wide range of applications for entertainment, video-conferencing and video-telephony applications. The standard defines different profiles and levels by specifying the permissible set of coding tools to target multiple applications based on the complexity, coding efficiency, error resilience requirements, etc. MPEG-4 ASP is extensively used for achieving good video quality in applications such as surveillance, and video streaming.

This data sheet describes the features and performance of the Ittiam MPEG-4 Advanced simple profile (ASP) encoder on TI's DM6446 platform. This codec is designed to run on a TMS320DM6446 device. Performance data was taken using a DM6446 DV-EVM processor.

**PRODUCT PREVIEW**



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## Product Support

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## Validation

The encoder has been validated by running it on the DM6446 platform and measuring the resource usage during this process. The implementation has been verified by decoding the streams produced by it with the Microsoft reference decoder.

## Performance Summary

This section describes the performance of the Ittiam MPEG-4 Encoder. Performance summary data generated using CCS 3.2.39.5 using a DM6446 DV-EVM processor.

**Table 1. Configuration Table**

CONFIGURATION	ID
MPEG4 ASP ENCODER - Low Delay Rate Control with full Interlace support - Interlace D1 PAL Encoding	MPEG4ASP_ENC_001
MPEG4 ASP ENCODER - Low Delay Rate Control with full Interlace support - Interlace D1 NTSC encoding	MPEG4ASP_ENC_002
MPEG4 ASP ENCODER - Low Delay Rate Control - Progressive D1 NTSC encoding	MPEG4ASP_ENC_003

**Table 2. Cycles Information - Profiled on a DM6446 DV-EVM With Code Generation Tools v 6.0.10**

CONFIGURATION ID	PERFORMANCE STATISTICS (MEGA CYCLES PER SECOND) <sup>(1)</sup>		
	TEST DESCRIPTION	AVERAGE	PEAK <sup>(2)</sup>
MPEG4ASP_ENC_001	Interlace encoding, rugby PAL (720x576) @ 5mbps & 30 fps	368	383
MPEG4ASP_ENC_002	Interlace encoding football d-1 NTSC (720x480) @5mbps & 30fps	320	355
MPEG4ASP_ENC_003	Progressive encoding parkrun D-1 (720x480) @ 5 mbps & 30fps	215	235

(1) Measured with program memory, stack, and I/O buffers in external memory and with cache configuration: 16KB L1P Cache, 16KB L1D Cache, and 64KB L2 Cache.

(2) Peak numbers are measured by taking the maximum MCPS on a running average of 30 frames over the entire stream. The performance numbers are measured on the DSP side.

**Table 3. Memory Statistics - Generated with Code Generation Tools v 6.0.10**

CONFIGURATION ID	MEMORY STATISTICS <sup>(1)</sup>				TOTAL
	PROGRAM MEMORY	DATA MEMORY			
		INTERNAL	EXTERNAL	STACK	
MPEG4ASP_ENC_001	165	64	2640	8	2,877
MPEG4ASP_ENC_002	165	64	2200	8	2,437
MPEG4ASP_ENC_003	165	64	2200	8	2,437

(1) All memory requirements are expressed in kilobytes (1 kilobyte = 1024 bytes) and there could be a variation of around 1-2% in numbers.

**Table 4. Internal Data Memory Split-Up**

CONFIGURATION ID	DATA MEMORY - INTERNAL <sup>(1)</sup>		
	SHARED		INSTANCE <sup>(2)</sup>
	CONSTANTS	SCRATCH	
MPEG4ASP_ENC_001	0	64 (L1D)	0
MPEG4ASP_ENC_002	0	64 (L1D)	0
MPEG4ASP_ENC_003	0	64 (L1D)	0

- (1) Internal memory refers to L1D RAM. All memory requirements are expressed in kilobytes (1 kilobyte = 1024 bytes) and there could be a variation of around 1-2% in numbers.  
 (2) I/O buffers not included. Some of the instance memory buffers could be scratch.

**Table 5. External Data Memory Split-Up**

CONFIGURATION ID	DATA MEMORY - EXTERNAL <sup>(1)</sup>		
	SHARED		INSTANCE <sup>(2)</sup>
	CONSTANTS	SCRATCH	
MPEG4ASP_ENC_001	40	0	2640
MPEG4ASP_ENC_002	40	0	2200
MPEG4ASP_ENC_003	40	0	2200

- (1) All memory requirements are expressed in kilobytes (1 kilobyte = 1024 bytes) and there could be a variation of around 1-2% in numbers.  
 (2) Does not include I/O Buffers.

**Table 6. Co Processor(s) Memory Statistics <sup>(1)</sup>**

CONFIGURATION ID	SEQ DATA MEMORY	SEQ PROG MEMORY	IMX WORKING MEM	IMX IMG BUF	IMX CMD MEM
MPEG4ASP_ENC_001	1	4	32	16	8
MPEG4ASP_ENC_002	1	4	32	16	8
MPEG4ASP_ENC_003	1	4	32	16	8

- (1) The encoder treats these memories as scratch.

## Notes

- I/O Buffers
  - Input Buffer Size = 830 Kbytes (Assuming a D1 stream in 422ILE input format)
  - Output Buffer Size = 384 Kbytes
- 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)
- Stack also includes stack and sysstack
- Memory configuration
  - L1P : 16kB Cache + 16 kB Program memory
  - L1D: 16kB Cache + 64 kB Data memory
  - L2: 64kB Cache
- DMA resources needed
  - 4 channels of QDMA
  - 4 channels of EDMA
  - 12 PARAM Sets

## References

- MPEG-4 Standard Part 2 (ISO/IEC 14496-2): Visual

## 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
DMA	Direct memory access
DV-EVM	Digital Video Evaluation Module
ISO	International Organization for Standardization
IEC	International Electro-technical Commission
MPEG4	Moving Picture Experts Group-4

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