

## MPEG4AAC LD Encoder (v1.00) on C64x+

### FEATURES

- eXpressDSP™ Digital Media (XDM 1.0 IAUDENC1) interface compliant
- MPEG4 AAC Low Delay (LD) object type implementation supported
- Encoding of mono and stereo streams supported
- LATM/LOAS output format compliant with 14496-3 and raw output format is supported
- Sampling frequency 22050, 24000, 32000, 44100 and 48000 supported as per ISO/IEC 14496-3 standard
- Bit-rate range of 24kbps – 128kbps per channel supported
- 480 samples and 512 samples per frame supported
- Maximum bit-rate based on the sampling frequency supported as per standard
- Validated on the DM6446 EVM
- This codec also supports C6455, DRA446, DM648, DM6437, DM644x, DM6467, OMAP2530, and OMAP3530 platforms

### DESCRIPTION

Advance Audio Coding (AAC) is an audio data compression format. This coding technique uses a perceptual filter bank, a sophisticated masking model, noise-shaping techniques, and channel coupling. It provides best quality at lower bit-rates.

Low Delay Advanced Audio Coding (AAC-LD) is the high-quality low-delay audio coding standard within MPEG-4. It features an algorithmic delay of 20 ms and offers good compression ratios and high sound quality for all types of audio signals including speech, music, and atmospheric sounds.

MPEG-4 AAC-LD is designed to combine the advantages of perceptual audio coding with the low delay necessary for bi-directional communication. The codec was developed by Fraunhofer IIS and is derived from MPEG-4 Low Complexity Advanced Audio Coding (AAC-LC). It is validated on DM6446 EVM with Code Composer Studio version 3.3.38 and Code Generation tools version 6.0.7.

PRODUCT PREVIEW



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.

eXpressDSP is a trademark of Texas Instruments.  
All other trademarks are the property of their respective owners.

## Performance Summary

This section describes the performance of the MPEG4AAC LD Encoder on DM6446 EVM.

**Table 1. Configuration Table**

CONFIGURATION	ID
MPEG4 AAC LD Encoder	MPEG4_AACLD_001

**Table 2. Cycles Information – Profiled on DM6446 EVM with Code Generation Tools Version 6.0.7**

CONFIGURATION ID	PERFORMANCE STATISTICS (MEGA CYCLES PER SECOND) <sup>(1)(2)</sup>		
	TEST DESCRIPTION	AVERAGE <sup>(3)</sup>	PEAK <sup>(3)</sup>
MPEG4_AACLD_001	wooden_toys_2_b256_r0_t3_x1_y1_f480.ass sampling rate:48kHz	24.22	31.75

(1) Measured with program memory, stack, and I/O buffers in external memory and with cache configuration 32K-bytes L1P cache, 16 K-bytes L1D cache, 64K-bytes L2 cache.

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

(3) L1 and L2 Cache Invalidation done for every frame.  
Measured average MIPS for peak test vector which has 1007 frames.  
Measured with frame size= 480/512 samples.

**Table 3. Memory Statistics - Generated with Code Generation Tools Version 6.0.7**

CONFIGURATION ID	MEMORY STATISTICS <sup>(1)</sup>				TOTAL
	PROGRAM MEMORY	DATA MEMORY			
		INTERNAL	EXTERNAL	STACK	
MPEG4_AACLD_001	104.6	0.00	47.27	0.52	152.39

(1) All memory requirements are expressed in kilobytes (1K-byte= 1024 bytes).

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

CONFIGURATION ID	DATA MEMORY - EXTERNAL <sup>(1)</sup>			INSTANCE <sup>(2)</sup>
	SHARED			
	CONSTANTS	SCRATCH		
MPEG4_AACLD_001	22.74	17.61	6.92	

(1) All memory requirements are expressed in kilobytes.

(2) Does not include I/O buffers.

## Notes

- The above profile values were observed with following macros defined:
  - #define RAWPACKETS\_ENABLE
  - #define LOAS\_ENABLE
  - #define LATM\_ENABLE
  - #define DISABLE\_BITRES\_CONTROL
  - #undef SMOOTH\_CORRECTION
  - #define OPTIMIZED\_LATM\_WRITER
  - #define PCM16
  - #define NO\_INBUF\_OVERLAYS
  - #define CR\_ON
  - #define AACLD\_TII\_ENC\_MAX\_ITERATIONS 2
- I/O Buffers:
  - Input buffer size = 2048 bytes
  - Output buffer size = 1536 bytes for 16-bit audio sample size, 2 channel output (stereo)
- 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 14496-3:2005-12-01 Information technology -- Coding of audio-visual objects -- Part 3: Audio
- ISO/IEC 14496-4:2004-12-15 Information technology — Coding of audio-visual objects —Part 4:Conformance testing
- *MPEG4AAC LD Encoder on C64x+ User's Guide* (literature number: SPRUGE4)

## 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
AAC	Advanced Audio Coding
AAC-LD	Low Delay Advanced Audio Coding
EVM	Evaluation Module
IEC	International Electro-technical Commission
ISO	International Organization for Standardization
LATM	Low-overhead MPEG-4 Audio Transport Multiplex
LOAS	Low Overhead Audio Stream
MPEG4	Moving Pictures Experts Group-4
XDM	eXpressDSP Multimedia

## 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	<a href="http://amplifier.ti.com">amplifier.ti.com</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
RF/IF and ZigBee® Solutions	<a href="http://www.ti.com/lprf">www.ti.com/lprf</a>

### Applications

Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
Broadband	<a href="http://www.ti.com/broadband">www.ti.com/broadband</a>
Digital Control	<a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a>
Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Military	<a href="http://www.ti.com/military">www.ti.com/military</a>
Optical Networking	<a href="http://www.ti.com/opticalnetwork">www.ti.com/opticalnetwork</a>
Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
Telephony	<a href="http://www.ti.com/telephony">www.ti.com/telephony</a>
Video & Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>
Wireless	<a href="http://www.ti.com/wireless">www.ti.com/wireless</a>

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