

G722.1 Encoder/Decoder (v1.00) on C64x+ – 20ms

FEATURES

- eXpressDSP™ Digital Media (XDM 1.0 ISPHENC1 or ISPHDEC1) interface compliant
- Codec operates at 20ms frames
- Bit-compliant with ITU-T G.722.1 specifications
- Optimized for TI C64x+ DSP
- C callable interface for encoder and decoder
- Re-entrant multi-channel implementation
- Implementation compatible with TI XDAIS rules
- Fully interruptible code
- Relocatable tables
- Little Endian Mode of operation supported
- Wideband and super wideband implementation supported
- Efficient scratch memory management with reduced stack requirements
- Implementation supports G722.1 Annex C (super wideband mode)
- Implementation supports run-time data buffers relocation and table relocation
- Validated on DM6446 EVM with Code Composer Studio version 3.3.38.2 and code generation tools version 6.0.15

- This codec can be used on any of TI's C64x+ based platforms such as DM644x, DM648, DM643x, DM646x, OMAP35xx and their derivatives

DESCRIPTION

ITU-T G.722.1 is the coder for wideband and super wideband speech. It is a low complexity encoder and decoder that may be used for 7 kHz or 14 kHz bandwidth audio signals. Encoder takes linear PCM input signals (14, 15 or 16 bit 2's complement) sampled at 16 kHz/ 32 kHz sampling rate and encodes using Modulated Lapped Transform (MLT) technology to give 24 kbit/s or 32 kbit/s bit-rates for wideband speech and 24 kbit/s or 32 kbit/s or 48 kbit/s for super wideband speech. Decoder expands encoded bit-stream to linear PCM samples.



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Performance Summary

This section describes the performance of the G722.1 Codec on C64x+ (DM6446 EVM) – 20ms.

Table 1. Configuration Table

CONFIGURATION	ID
Encoder – 20ms	G722_1_001
Decoder – 20ms	G722_1_002
Full Duplex – 20ms	G722_1_003

Table 2. Cycles Information (Wideband) – Profiled on DM6446 EVM with Code Generation Tools Version 6.0.15

CONFIGURATION ID	PERFORMANCE STATISTICS (MEGA CYCLES PER SECOND) ⁽¹⁾⁽²⁾⁽³⁾	
	AVERAGE	PEAK
G722_1_001	2.17	2.31
G722_1_002	2.77	2.93
G722_1_003	4.94	5.24

(1) MCPS is measured with L1p=32kB, L1d=16kB, L2=64kB with all the program and data in external memory. L1P, L1D, and L2 are invalidated after each encoder and decoder execution. Also, measured with frame size=20ms.

(2) Optimal function placement order followed as per the user guide. See Appendix B.

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

Table 3. Cycles Information (Super Wideband) – Profiled on DM6446 EVM with Code Generation Tools Version 6.0.15

CONFIGURATION ID	PERFORMANCE STATISTICS (MEGA CYCLES PER SECOND) ⁽¹⁾⁽²⁾⁽³⁾	
	AVERAGE	PEAK
G722_1_001	3.52	3.77
G722_1_002	4.53	4.74
G722_1_003	8.05	8.51

(1) MCPS is measured with L1p=32kB, L1d=16kB, L2=64kB with all the program and data in external memory. L1P, L1D, and L2 are invalidated after each encoder and decoder execution. Also, measured with frame size=20ms.

(2) Optimal function placement order followed as per the user guide. See Appendix B.

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

Table 4. Memory Statistics - Generated with Code Generation Tools Version 6.0.15

CONFIGURATION ID	MEMORY STATISTICS ⁽¹⁾				
	PROGRAM MEMORY	DATA MEMORY			TOTAL
		INTERNAL	EXTERNAL	STACK	
G722_1_001	9.72	0	36.24	0.25	46.21
G722_1_002	10.29	0	36.88	0.34	47.51
G722_1_003	18.19	0	38.17	0.34	56.70

(1) All memory requirements are expressed in kilobytes (1 kilobyte = 1024 bytes).

Table 5. Internal Data Memory Split-Up

CONFIGURATION ID	DATA MEMORY - INTERNAL ⁽¹⁾		
	SHARED		INSTANCE ⁽²⁾
	CONSTANTS	SCRATCH	
G722_1_001	Not used	Not used	Not used
G722_1_002	Not used	Not used	Not used

(1) All memory requirements are expressed in kilobytes (1 kilobyte = 1024 bytes).

(2) Does not include I/O buffers.

Table 5. Internal Data Memory Split-Up (continued)

CONFIGURATION ID	DATA MEMORY - INTERNAL ⁽¹⁾		
	SHARED		INSTANCE ⁽²⁾
	CONSTANTS	SCRATCH	
G722_1_003	Not used	Not used	Not used

Table 6. External Data Memory Split-Up

CONFIGURATION ID	DATA MEMORY - EXTERNAL ⁽¹⁾		
	SHARED		INSTANCE ⁽²⁾
	CONSTANTS	SCRATCH	
G722_1_001	28.7	6.25	1.29
G722_1_002	28.7	6.25	1.93
G722_1_003	28.7	6.25	3.22

- (1) All memory requirements are expressed in kilobytes (1 kilobyte = 1024 bytes).
 (2) Does not include I/O buffers.

Notes

- 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

- ITU-T Recommendation G.722.1
- *G.722.1 Encoder/Decoder on C64x+ User's Guide* (literature number: SPRUGA4)

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
EVM	Evaluation Module
ITU	International Telecommunication Union
ITU-T	Telecommunication Standardization Sector of ITU
PCM	Pulse Code Modulation
XDM	eXpressDSP Multimedia

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