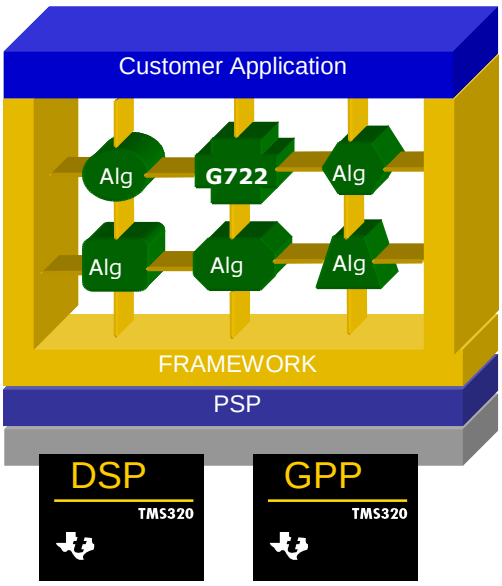
- **This is an implementation of ITU G.722.1 recommendations on TI C64X+ processor**
- **Mixed C and C64X+ assembly code implementation**
- **eXpressDSP™ compliant**
- **Bit-exact with all ITU G.722.1 test sequences**
- **Validated on TMS320C6455 DSK with Code Composer Studio 4.2 and Code Generation Tools version 7.2.0A10197**
- **Supports both ELF and COFF formats**



description

The ITU G.722.1 is the codec for wideband and super wideband speech. It is a low complexity encoder and decoder that may be used for 7KHz or 14KHz bandwidth audio signals. Encoder takes linear PCM input signals (14, 15, or 16 bit 2's compliment) sampled at 16/32KHz sampling rate and encodes using Modulated Lapped Transform (MLT) technology to give 24kbps or 32kbps bit rates for wideband speech and 24kbps or 32kbps or 48kbps for super wideband speech. Decoder expands encoded bit stream into linear PCM samples.

- 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
- This release supports Big Endian and Little Endian Mode of operation
- Efficient Scratch memory management with reduced stack requirements
- The implementation support run time data buffers relocation & table relocation
- The implementation supports both ELF and COFF formats
- Fully validated on TMS320C6455 DSK, using CCS version 4.2 with the code generation tools version 7.2.0A10197

Summary of performance

Table 1. Configuration Table

CONFIGURATION	ID
Encoder ,Big Endian	G722_001
Decoder, Big Endian	G722_002
Full Duplex, Big Endian	G722_003
Encoder ,Little Endian	G722_004
Decoder, Little Endian	G722_005
Full Duplex, Little Endian	G722_006

Table 2. Cycles Information (wideband) – TMS320C6455 DSK (COFF Library)

CONFIGURATION ID	PERFORMANCE STATISTICS (IN MEGACYCLES/SEC) [1]	
	AVERAGE	PEAK
G722_001	1.15	1.23
G722_002	1.45	1.56
G722_003	2.60	2.79
G722_004	1.14	1.22
G722_005	1.44	1.54
G722_006	2.58	2.76

[1] Measured with frame size= 320 samples (20ms)
Measured with 32K L1P configured as cache, 32K L1D configured as cache , with all program and data in L2 Memory configured as SRAM. Both L1P and L1D are invalidated before each encoder and decoder execution

Table 3. Cycles Information (super wideband) – TMS320C6455 DSK (COFF Library)

CONFIGURATION ID	PERFORMANCE STATISTICS (IN MEGACYCLES/SEC) [1]	
	AVERAGE	PEAK
G722_001	2.16	2.37
G722_002	2.75	2.87
G722_003	4.91	5.24
G722_004	2.15	2.36

G722_005	2.71	2.83
G722_006	4.86	5.19

[1] Measured with frame size= 640 samples (20ms)
Measured with 32K L1P configured as cache, 32K L1D configured as cache , with all program and data in L2 Memory configured as SRAM. Both L1P and L1D are invalidated before each encoder and decoder execution

Table 4. Cycles Information (wideband) – TMS320C6455 DSK (ELF Library)

CONFIGURATION ID	PERFORMANCE STATISTICS (IN MEGACYCLES/SEC) [1]	
	AVERAGE	PEAK
G722_001	1.15	1.23
G722_002	1.42	1.53
G722_003	2.57	2.76
G722_004	1.14	1.22
G722_005	1.41	1.52
G722_006	2.55	2.74

[1] Measured with frame size= 320 samples (20ms)
Measured with 32K L1P configured as cache, 32K L1D configured as cache , with all program and data in L2 Memory configured as SRAM. Both L1P and L1D are invalidated before each encoder and decoder execution

Table 5. Cycles Information (super wideband) – TMS320C6455 DSK (ELF Library)

CONFIGURATION ID	PERFORMANCE STATISTICS (IN MEGACYCLES/SEC) [1]	
	AVERAGE	PEAK
G722_001	2.16	2.37
G722_002	2.69	2.81
G722_003	4.85	5.18
G722_004	2.15	2.36
G722_005	2.66	2.78
G722_006	4.81	5.14

[1] Measured with frame size= 640 samples (20ms)
Measured with 32K L1P configured as cache, 32K L1D configured as cache , with all program and data in L2 Memory configured as SRAM. Both L1P and L1D are invalidated before each encoder and decoder execution

Table 6. Memory Statistics - Generated with Code Generation Tools Version 7.2.0A10197 (COFF Library)

CONFIGURATION	MEMORY STATISTICS [2]		
	PROGRAM	DATA MEMORY	TOTAL

	MEMORY	INTERNAL	EXTERNAL	STACK	
G722_001	10.5	36.24	0	0.25	46.99
G722_002	9.94	36.88	0	0.34	47.16
G722_003	18.6	38.17	0	0.34	57.11
G722_004	10.38	36.24	0	0.25	46.87
G722_005	9.94	36.88	0	0.34	47.16
G722_006	18.48	38.17	0	0.34	56.99

[2] All memory requirements are expressed in kilobytes (1 kilobyte = 1024 8-bit bytes).

Table 7. Memory Statistics - Generated with Code Generation Tools Version 7.2.0A10197 (ELF Library)

CONFIGURATION	MEMORY STATISTICS[2]				
	PROGRAM MEMORY	DATA MEMORY			TOTAL
		INTERNAL	EXTERNAL	STACK	
G722_001	10.5	36.24	0	0.25	46.99
G722_002	9.94	36.88	0	0.34	47.16
G722_003	18.6	38.17	0	0.34	57.11
G722_004	10.34	36.24	0	0.25	46.83
G722_005	9.94	36.88	0	0.34	47.16
G722_006	18.44	38.17	0	0.34	56.95

[2] All memory requirements are expressed in kilobytes (1 kilobyte = 1024 8-bit bytes).

Table 8. Internal Data Memory Split-up

CONFIGURATION	DATA MEMORY – INTERNAL[2]		
	SHARED		INSTANCE[3]
	CONSTANTS	SCRATCH	
G722_001	28.7	6.25	1.29
G722_002	28.7	6.25	1.93
G722_003	28.7	6.25	3.22
G722_004	28.7	6.25	1.29
G722_005	28.7	6.25	1.93
G722_006	28.7	6.25	3.22

[3] All memory requirements are expressed in kilobytes (1 kilobyte = 1024 8-bit bytes)
[4] 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 Recommendation G.722

glossary

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

ITU	International Telecommunication Union
ITU-T	Telecommunication Standardization Sector of ITU

REVISION HISTORY

Scope: Applicable updates to the G722 on C6455 have been incorporated.

DATE	VERSION	ADDITIONS/CHANGES/DELETIONS
08 FEB 2005	1.0	Initial Version
07 MAR 2005	1.1	Updated after re-release
10 NOV 2006	1.00	Adding xDM APIs.
MAR 2009	1.11.00	Big endian support
JUNE 2009	1.12.00	ITU-T Appendix IV (plc) support
January 2012	2.00.00	Added ELF support

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