



## SIGNALS+SOFTWARE

# ITU G.728 Speech Coder



### Processor

Texas Instruments TMS320C6000 DSP range.

### Background

The algorithm implemented is the ITU-T recommendation G.728 fixed rate speech coder. The encoder compresses linear narrowband speech data, at a sample rate of 8kHz, to a data rate of 16 000 bps. The decoder also incorporates an adaptive post-filter to enhance performance for multiple transcodings. The post-filter function can be omitted for single coder-decoder operation to reduce the processing power required on the DSP.

G.728 is an essential addition to all video conferencing systems and is increasingly being used in Voice and DSL applications.

### Features and Performance

- TI eXpressDSP™ Compliant software available
- 7 channels of G.728 on 200MHz device
- Less than 35Kbytes program memory required
- Less than 29Kbytes data memory required for 7 channels of G.728 (including buffers and stack)
- Passes all ITU-T test vectors.

G.728	Program Memory		Data Memory			Interrupt Latency (Cycles)	Typical call Period (ms)	Processing Load (MHz)
	Code (Kbytes)	Tables (Kbytes)	Static Memory		Stack Memory (Kbytes)			
			Heap (Kbytes)	Tables (Kbytes)				
Encoder	21.61	0.05	n * 1.38	2.23	0.55	15988	2.50	n * 16.14
Decoder	24.23	0.05	n * 2.06	2.23	0.55	9736	2.50	n * 12.20
Encoder + Decoder	33.23	0.05	n * 3.42	2.23	0.55	15988	2.50	n * 28.34

**Table 1 : DSP Requirements for G.728**

**Note:** Processing loads quote worst-case scenarios with n representing the number of channels. Program memory table values are initialisation values. Kbytes equals 1024 bytes.

### Technical Notes

The software is written using only fixed-point instructions and is compatible with both the TMS320C6000 fixed-point family and the TMS320C6700 floating-point family. It is supplied in both big-endian and little-endian variants.

G.728 is a complex coder using a Low-Delay Code-Excited Linear Prediction (LD-CELP) algorithm that employs backward-adaptive Linear Predictive Coding (LPC) analysis in order to achieve a low transcoding delay.

### Interface Details

The eXpressDSP™ G.728 software uses the IG728 interface specified by Texas Instruments in the eXpressDSP™ developers' kit.

The software is also available in a non-eXpressDSP version with a basic multi-channel interface. The DSP requirements for this version are similar to those given in Table 1.

### Availability

The code is available now, for a one-off payment and/or royalties depending on the commercial application.

Software for the TMS320C6000 is available for a full range of vocoders including G.711, G.722, G.723.1, G.726, G.729, G.729A, G.729B, G.729AB, and for other communication algorithms. G.728 is also available for the TMS320C5000.

### SIGNALS+SOFTWARE

**SIGNALS+SOFTWARE** was founded in 1992 as a developer of high quality Digital Signal Processing application software for the communications industry. Supplying to a whole range of customers, including large blue chip corporations, **SIGNALS+SOFTWARE** has quickly established itself as the world leader in DSP software design and production.

---

**For further information please contact:**

**SIGNALS+SOFTWARE Ltd.**  
The Heights,  
Lowlands Road,  
Harrow,  
HA1 3AW  
United Kingdom

Tel: +44 (0) 20 8872 9000  
Fax: +44 (0) 20 8872 9001

[www.signalsandsoftware.com](http://www.signalsandsoftware.com)

[sales@signalsandsoftware.com](mailto:sales@signalsandsoftware.com)