CML’s DuraTALK® product family offers a wide range of digital voice ICs, from the very basic CVSD codec to the high integration Multi-transcoder and RALCWI™ series of vocoders and voice codecs. CML owns the exclusive rights to the RALCWI™ low bit-rate vocoder technology.

All products have very low power requirements and are ideal for use in fixed, mobile and portable voice communications.

Under the DuraTALK® umbrella, the family currently consists of the following technologies:

- **RALCWI™** - Low Bit-rate Vocoders
- **Transcoding** - Analogue-to-digital/digital-to-analogue; with dynamic on-chip conversion of various data formats
- **CVSD and ADM** - Flexible voice coders and decoders for analogue-to-digital/digital-to-analogue voiceband conversion.

These DuraTALK® products are to be found in a large number of digital voice and voice storage, retrieval and manipulation applications globally. CML’s military and Eurocom delta codecs are extensively used in battlefield and higher specification communications products.

**Digital Voice Communications Applications**

- DMR, dPMR®, PMR, LMR, Trunked Radio, TDMA and FDMA,
- Voice Scrambling and Encryption, Wireless Local Loop,
- Paging, Voice Storage, Delay and Playback, Annunciators,
- Messaging, Voice-over-Packet, Digital Radio Repeaters, Vocoders,
- Transcoders, Cordless Telephones, Multiplexers
CMX608, CMX618 and CMX638 Flexible Low Bit-rate RALCWI™ Vocoders

CMX608  Half-duplex Low Bit-rate RALCWI™ Vocoder IC
CMX618  Half-duplex Low Bit-rate RALCWI™ Vocoder IC with Integral Audio Codec
CMX638  Full-duplex Low Bit-rate RALCWI™ Vocoder IC with Integral Audio Codec

A family of flexible, high performance RALCWI™ Vocoders for use in many wireless and wireline voice applications. With selectable bit rate modes and an FEC function, these ICs offer near toll-quality voice (Mean Opinion Score (MOS) is 3.5 - 3.6) at extremely low bit rates.

RALCWI™ technology uses proprietary signal decomposition and parameter encoding methods which ensure optimum recovered speech quality at high compression and low bit rates.

These products, with their low-power requirements, offer versatile encode and decode facilities with the ability to operate to externally generated 'soft-decision' FEC inputs. Added to this is a range of auxiliary functions: Voice Activity Detection, Comfort Noise Generation and DTMF and single-tone detect and regeneration.

Provision is made for operation in digital radio repeaters by using the extracted Rx FEC at the repeater to correct any errors in the voice-data before retransmitting (repeating) with a new FEC.

The CMX618 and CMX638s’ integral audio codec removes the need for an external voice codec whilst providing variable gain earphone and loudspeaker interfaces, ADC and DAC voice-data and data-voice converters with high-order 4kHz channel input and output digital filters.

These vocoder ICs are free from any licence and royalty costs and comfortably meet the requirements of many high-performance audio applications.
CMX618 and CMX638 RALCWI™ Vocoder with Integral Audio Codec

**Functional Example of CMX608, CMX618 and CMX638 RALCWI™ Vocoder/s**

- **Synchronous Serial (SSP) Port...**
  - Serial Clock
  - Strobe Input
  - ADC Serial Input
  - Balanced Audio Input
  - Balanced Audio Output
  - DAC Serial Output
  - SSP Port...
  - (Digital Input)
  - (Digital Output)

- **Integral Audio Codec (CMX618 and CMX638)**
  - ADC
  - 4kHz Filter
  - DAC
  - 4kHz Filter

- **Voice Encoder**
  - STD/DTMF Tx Frame Management
  - STD/DTMF Rx Frame Management

- **FEC Encoder**
  - Protected Data
  - Repeater Support

- **FEC Decoder**
  - Repeater Support

- **Power Management and Distribution**
  - Analogue, Digital and Bias Supplies

- **C-BUS Interface and Registers**
  - Enable External Codec
  - Reset External Codec
  - Serial Clock
  - Command Data
  - Reply Data
  - Chip Select
  - Interrupt
  - Synchronisation
  - Codec Select

- **System Clocks**
  - Xtal/Clock Input
  - Xtal/Clock Output

- **Analogue Audio Codec**
  - Gain/Attenuation
  - Audio Codec
  - RALCWI™ Coder/Decoder
  - Special Functions: DTMF, Single Tone, FEC, Viterbi Handling DTX

- **External Audio Codec**
  - RALCWI™ Coder/Decoder
  - Special Functions: DTMF, Single Tone, FEC, Viterbi Handling DTX

- **CMX618 RALCWI™ Vocoder**
**CMX7261 Transcoder**

This *DuraTalk®* IC is a multi-transcoder chip that performs encoding and decoding of PCM, CVSD and G.729A formats, as well as transcoding between these standards.

The CMX7261 can be operated either as a half-duplex or as a full-duplex transcoder. For full duplex operation, the CMX7261 employs the IC’s two transcoder blocks: Channel 1 and Channel 2. This means that as one type of transcoding may be specified on one channel (Ch 1) and the opposite transcoding will then be implemented on the second (Ch 2) audio stream. In this format the two separate audio streams are processed simultaneously.

With the choice of signal sources and output routes, this IC can flexibly employ any one three input and one, two or three output paths: analogue, C-BUS and SPI ports.

A flexible power control facility allows the device to be placed in its optimum powersave mode when not actively processing signals. The device includes a crystal clock generator, with a phase-locked-loop to enable operation from a range of reference xtal frequencies.

In common with many CML *FirmASIC™* products, the CMX7261 additionally offers three FI configurable GPIO ports and analogue input and output gains.

The CMX7261 is built on CML’s *FirmASIC™* technology, its feature and function set is configured by the loading of a Function Image™ file prior to operation. The Function Image™ file can be included in the host controller software or programmed into an external serial memory.

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**Features**
- Built on *FirmASIC™* Technology
- Configured by Function Image™ (FI) File
- Half and Full Duplex Operation
- Using One or Two Transcoding Blocks
- Multiple Codec Support
  - PCM (Linear, A-Law and µ-Law to G.711 standard), CVSD and G.729A
- Multiple Transcode Support
- No External DSP or Codecs Required
- Transcode Routing:
  - Choice of Input Sources
  - Choice of Output Sources
  - Voice Activity Detection (VAD)
  - C-BUS Host Serial Interface
  - SPI-like with Register Addressing
  - Read/Write 128-byte FIFOs and Data Buffers Streamline Transfers and Relax Host Service Latency
- Auxiliary Functions
  - Three FI Configurable GPIOs
  - Analogue Input and Output Gain Adjustment
  - Master/Slave PCM Serial Interface for External Audio Codec

**Packages**
- CMX7261Q1: 64-pin VQFN

**Supply Voltages**
- 3.0 to 3.6 V (AVDD and DVDD)
- 2.5V (DVCORE)

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**Signal Sources/Outputs**

<table>
<thead>
<tr>
<th>In</th>
<th>Out</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analogue</strong></td>
<td><strong>Analogue</strong></td>
</tr>
<tr>
<td><strong>PCM: µ/A/Linear</strong></td>
<td><strong>C-BUS from host</strong></td>
</tr>
<tr>
<td><strong>CVSD</strong></td>
<td><strong>C-BUS to host</strong></td>
</tr>
<tr>
<td><strong>G.729A</strong></td>
<td><strong>PCM from external codec</strong></td>
</tr>
<tr>
<td><strong>G.711</strong></td>
<td><strong>PCM to external codec</strong></td>
</tr>
</tbody>
</table>
Note that the CMX7261 contains two Transcoder Blocks, referred to as Channel 1 and Channel 2. Only one is shown in this diagram. Two are used for full duplex operation.
CVSD and ADM IC Products

**FX619**  ‘Eurocom’ Delta Codec  
**MX629**  ‘Military’ Delta Modulation Codec  
**CMX639**  CVSD Voice Codec

**FX/MX619, MX629 and CMX639**
CML’s full duplex CVSD ICs serve a variety of application fields including DECT, Eurocom and many military and general-purpose voice applications.

With separate Rx and Tx paths, encode and decode output filters are incorporated on-chip. Sampling clocks, working with a 3- or 4-bit compand algorithm, can operate at internally or externally generated rates of between 8kbps and 64kbps (with the CMX639 increasing the range up to 128kbps). The sampling clock frequency is also available as an output for the synchronisation of external circuits.

With simple pin-selected control functions, the IC provides: CVSD encoder and decoder both with force idle facilities, and a data-enable selector at the encode output to allow the use of the codec IC in multiplex and time domain environments.

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**Features**
- Full Duplex CVSD Codecs
- Separate Rx and Tx Paths
- 3 or 4-bit Compand Algorithm
- Programmable Sample Rates
  - FX619: 8 to 64 kbps
  - MX629: 8 to 64 kbps
  - CMX639: 8 to 128 kbps
- Encoder and Decoder Force Idle
- Anti-alias Voice Filters
- Data Clock Recovery

**Supply Voltages**
- FX/MX619 and MX629: 4.5 to 5.5 V
- CMX639: 2.7 to 5.5 V

**Package Styles**
- FX619J: 22-pin DIL
- FX619L1: 24-pin PLCC
- FX619L2: 24-lead PLCC
- FX619M1: 28-pin CLCC
- MX629J: 22-pin DIL
- MX629LH: 24-pin PLCC
- CMX639E2: 24-pin TSSOP
- CMX639D4: 16-pin SOIC

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**CVSD Codec**  
Continuously Variable Slope Delta Modulation and Adaptive Delta Modulation
Adaptive Delta Modulation Codec

As an advance on CML’s full duplex CVSD ICs this ADM voice codec offers full duplex ADM, µ-law, A-law and linear PCM codec and transcoder functions for wireless, wireline telephony and general purpose ‘voice’ applications. Control, communications and data setting is via CML’s C-BUS serial interface.

CMX649 Features
- Multiple Codec Modes: 16 to 128 kbps
- ADM and CVSD
- CPCM: µ-law, A-law and 13-bit Linear
- Flexible Data Interfaces
  - 8 and 16-bit Burst Data with Sync Strobe
  - 1-bit Serial Data with Clock
  - Host Serial Control and Data
- Dual Channel Transcode/Decode Functions
- Versatile Programmable Functions:
  - Input and Output Gains
  - Anti-alias Voice Filters
  - Digital Scrambling
  - Rx and Tx Voice Activity Detectors (VAD)
- Data Clock Recovery
- Control and Communications via C-BUS Serial Interface
- Supported by DE6491 DemoKit

Supply Voltage
- 2.7 to 5.5 V

Package Styles
- CMX649D3 20-pin SOIC
- CMX649E3 20-pin TSSOP
To help the equipment/system designer evaluate the relevant CML IC and to quickly produce a working prototype, a set of evaluation and demonstration kits (EvKits and DemoKits) is available. Based upon a printed circuit board acting as a hardware development platform, each kit offers a complete set of circuit schematics and layout diagrams and, where relevant, on-board and/or host (PC) control and GUI software. Each pcb provides signal, supply and interface headers with additional access available to many of the system’s and IC’s signal and voltage paths via test points and configurable links. In addition to Ev/Demo Kit support information and updates, to further support the design task, CML offers both Frequently Asked Questions (FAQ) and Application Note sections on its website: www.cmlmicro.com.

### Design Resources

Design and application support available:
- CML website: www.cmlmicro.com/
- CML Technical Portal
- Scripts and video guides
- Datasheets, application notes, user manuals and layout information
- CML's global 'Help Desks'

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