CMX823 Programmable Paging-Tone Decoder

An Ultra-Low-Power Audio Tone Decoder for Paging Operations in Low Signal-to-Noise Environments

www.cmlmicro.com

Low Power 2.7V

The CMX823 can decode any combination of up to 32 different in-band tones from a user-programmed on-chip list, received in any order.

With a decode frequency range of 280Hz to 3500Hz and a Signal-to-Noise Ratio of -4dB, this ultra low-power product is ideal for the majority of paging and selective calling applications, offering reliability in even the most hostile of signalling environments.

Total Versatility is the thinking behind the design of this multiple-format tone-decoder as, under serial data control, this product has the selectable option of two measurement modes (Fast and Slow) to efficiently facilitate various tone format periods, operating conditions and host µController requirements.

Decode Speed: Employing two user-defined on-chip lists, the CMX823 can store up to 32 tones per list with the ability to rapidly switch between lists to facilitate different toneset formats. Each list can be further subdivided to allow even faster tone recognition. Tone lists can be dynamically uploaded by the host µC if required.

The CML Advantage

- Decodes from a List of 32 Tones
  - Two Separate 32-Tone Lists Available
  - All Tone Frequencies are User Defined
  - 'Fast Switch' Between Tone Lists
- Superior Signal-to-Noise (-4dB) Performance
- Selectable 'Fast' and 'Slow' Measurement Modes Facilitate All Toneset Formats
- Integral NOTONE Timer
- Versatile Status and Interrupt Indications
- Control and Data via C-BUS Serial Interface
- Low-Power 2.7 Volt Operation with 'Zero-Power' Mode
- 2.7 to 5.5 Volt Operating Voltage Range
- Compact 16-Pin TSSOP and DIL Packaging
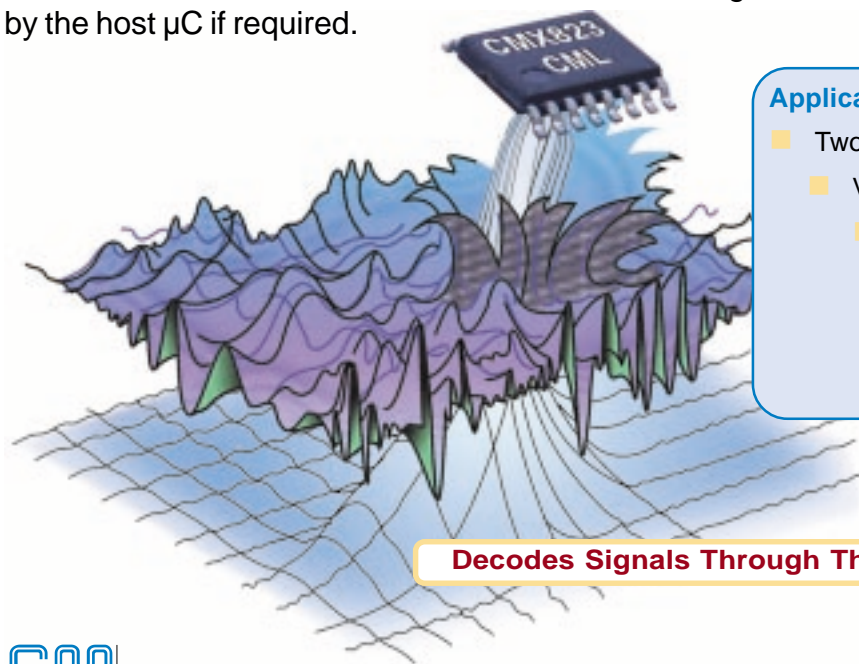
Applications

- Two-Tone and Multi-Tone Tone Pagers
  - Voice Pager Switching and Signalling
    - Selective Calling (Selcall)
      - Revertive Paging
        - Wireless Local Loop Signalling
          - Audio Tone Signalling

Decodes Signals Through The Noise Floor!

CML Microcircuits
COMMUNICATION SEMICONDUCTORS

Two-Way Radio

Application Specific Standard Products for Two-Way Radio, Wireline Telecoms and Wireless Data

The CMX823
Simple, Versatile, Efficient and Fast

Specification

Supply Voltage Range	2.7V to 5.5V
Operating Current (typ.)	
V_{DD} = 2.7V	0.75mA
V_{DD} = 5.0V	1.5mA
Zero Power Current	
V_{DD} = 2.7V	1.0µA
V_{DD} = 5.0V	1.0µA
Tone Frequency Range	280Hz to 3500Hz
Decode Signal-to-Noise Ratio	-4dB
Tone Storage Capacity	2 Sets of 32 Tones
Tone Measurement Modes	Fast and Slow
Response Time	
Fast Mode	28ms
Slow Mode	33ms
De-response Time	
Fast Mode	46ms
Slow Mode	79ms
Decode Bandwidth Range	±0.1% to ±3.1%
Control and Data	C-BUS Serial Interface
Package Styles	E4 16-pin TSSOP
	P3 16-pin DIL

The CMX823 Functional Block Diagram
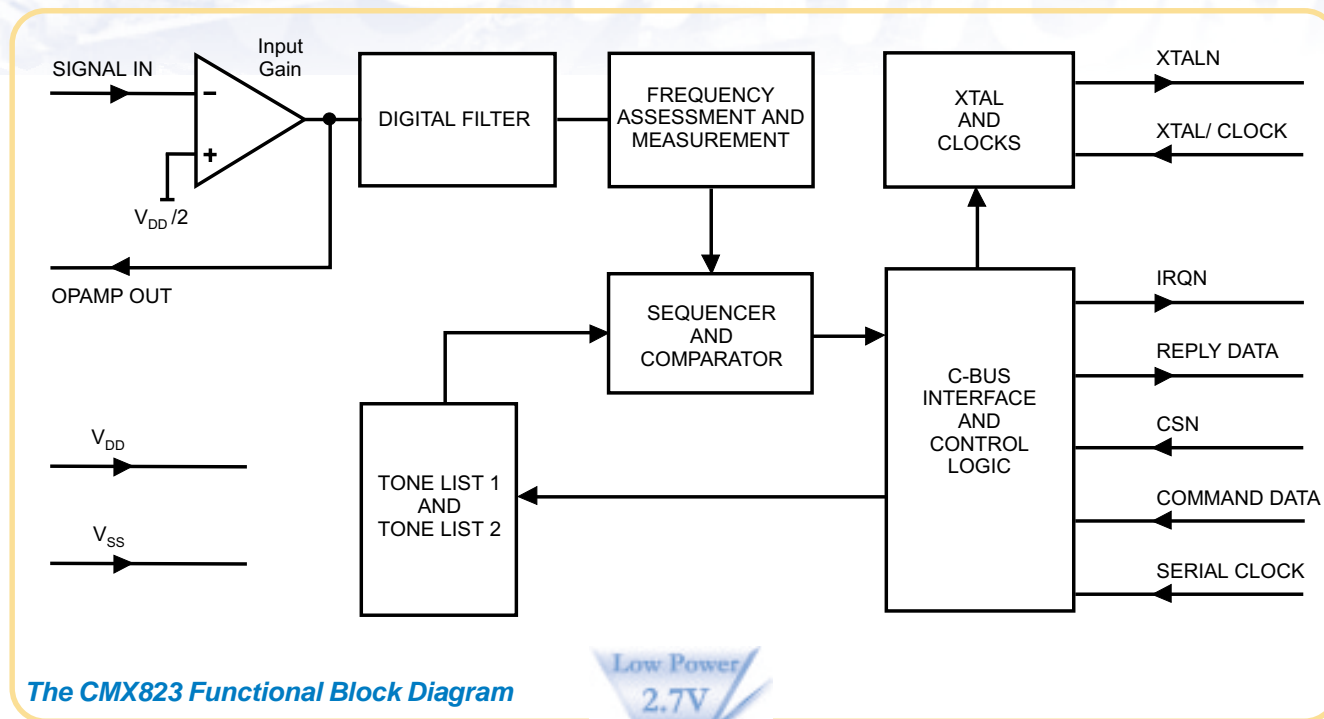
Input Gain
The component-adjustable op-amp input stage is available to adjust the received signal to the correct amplitude for the decoder process.

Control and Data
Communication with, and control of, the CMX823 is via the C-BUS hardware and software serial interface.

Frequency Stability
Decode frequency stability is ensured by the use on an on-chip 'clock' oscillator requiring an input from an external (3.58MHz) Xtal or clock source. Using this common 'telecom' Xtal frequency will reduce the external circuitry requirement. Selectable decode bandwidth settings allow the reception of tones from less stable sources.

Power Requirements
With a voltage range of 2.7V to 5.5V, a low operating power requirement and a 'zero-power' mode, the CMX823 is configurable for use in all types of tone communication paging products with many types of host µC.

Tone Operations

Tone Detection

When the CMX823 detects the start of a valid in-band tone (a tone in the selected user-defined tone list) it generates an interrupt and reports, via its on-chip C-BUS interface, which tone was detected. At the end of that tone it produces another interrupt and reports NOTONE detected. This information is available, in several forms, to enable the host µC to measure and interpret the tone and gap lengths according to the toneset requirements. These actions take place for each response/de-response action no matter what the length of the tone sequence.

Tone parameters are stored in one or both of the 'tone lists'. The tone decode parameters for the selected list and group are sequentially retrieved and matched with those of the received signal to find a tone decode. Tone decode status changes are flagged in the Status Register.

Tone Parameters

The parameters for decoding each tone in the tone list are stored separately. Two selectable lists are available; only one is accessed at any one time. List contents are preloaded by the host and are maintained during 'table-switching' and 'Zero-Power' mode powersave operations.

Tone decode parameters can be designated, within a tone list, to either one or both tone-groups; these groups can be used to represent the first or second tones in a tone sequence.

Upon reception and measurement of an input tone, the tone decode parameters of the selected group are sequentially retrieved from the selected list and compared with the decoded parameters. A match will result in the generation of an interrupt and the decoded tone's status and parameters.
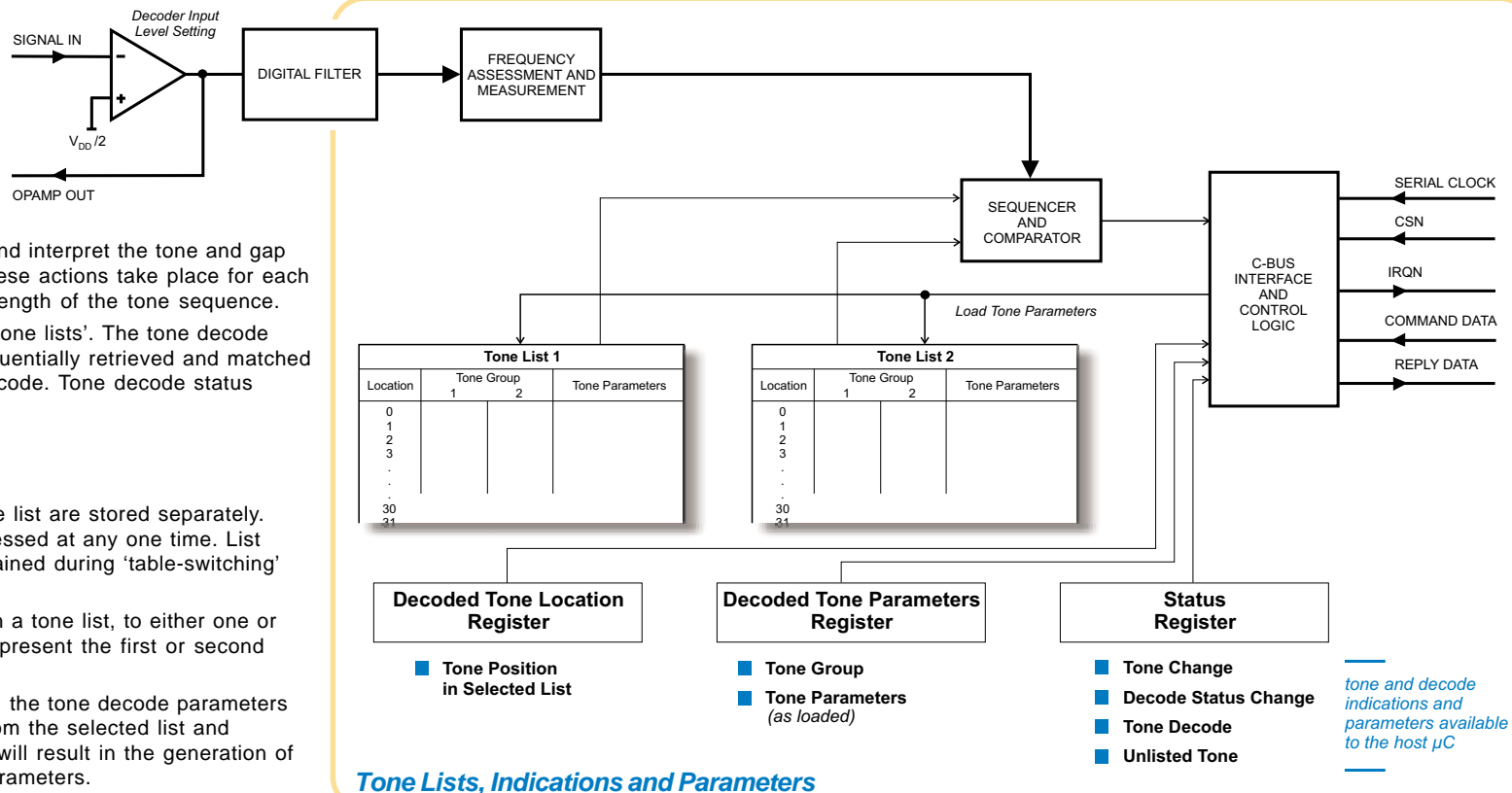

Tone Lists, Indications and Parameters

Tone Lists and Groups

The CMX823 contains two 'tone lists' (1 and 2) each capable of storing parameters for thirty-two user-designated tones. Each list can be further sub-divided into two 'tone groups'. Each 'tone list' is intended for use with a single RF channel allowing a fast list-switch (between 1 and 2) when changing RF channels.

Tone decode parameters can belong to either or both 'tone groups'; a feature which may be used to represent the first and second tones in a tone sequence; this will further speed-up the decoding process.

Fast and Slow Measurement Modes

These two modes of response/de-response time measurement are available to allow the most efficient use of µC time and to facilitate the widest range of paging tone-set format requirements. Fast mode is intended for 5/6-tone paging tonesets and Slow mode for 2-tone paging tonesets where slower response times are acceptable. For bespoke systems, these modes can be employed for the reduction of false decodes.

Decode Tone Bandwidths

These bandwidth settings, variable between ±0.1% to ±3.1%, are available for compliance to all radio signalling and toneset specifications. These settings can be also used to 'tune' the decode process by preventing false decoding due to 'bandwidth overlap' and to enable the accurate reception of unstable Rx signals.

Decode Reporting

To enable further efficiency and speed in tone decode reporting to the host, the Status Register indicates, separately, the various decode actions.

Tone Change:	Whenever a 'listed' tone-decode changes
Decode Status Change:	Any change in the decoder operation
Unlisted Tone:	The decoding of any tone in the valid frequency range but not in the selected list.
NOTONE:	The loss of a valid tone. An automatic NOTONE timer period is instigated.
Tone List:	The list that was selected when the match was found.

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- **CMX882**   **Baseband Processor with GPS Data Signalling for FRS, GMRS, MURS and PMR446 'Leisure' Radios**
- **EV8810**   **For CMX881, CMX882 and CMX883 Evaluation**
- **CMX981**   **Advanced Digital-Radio Baseband Processor**

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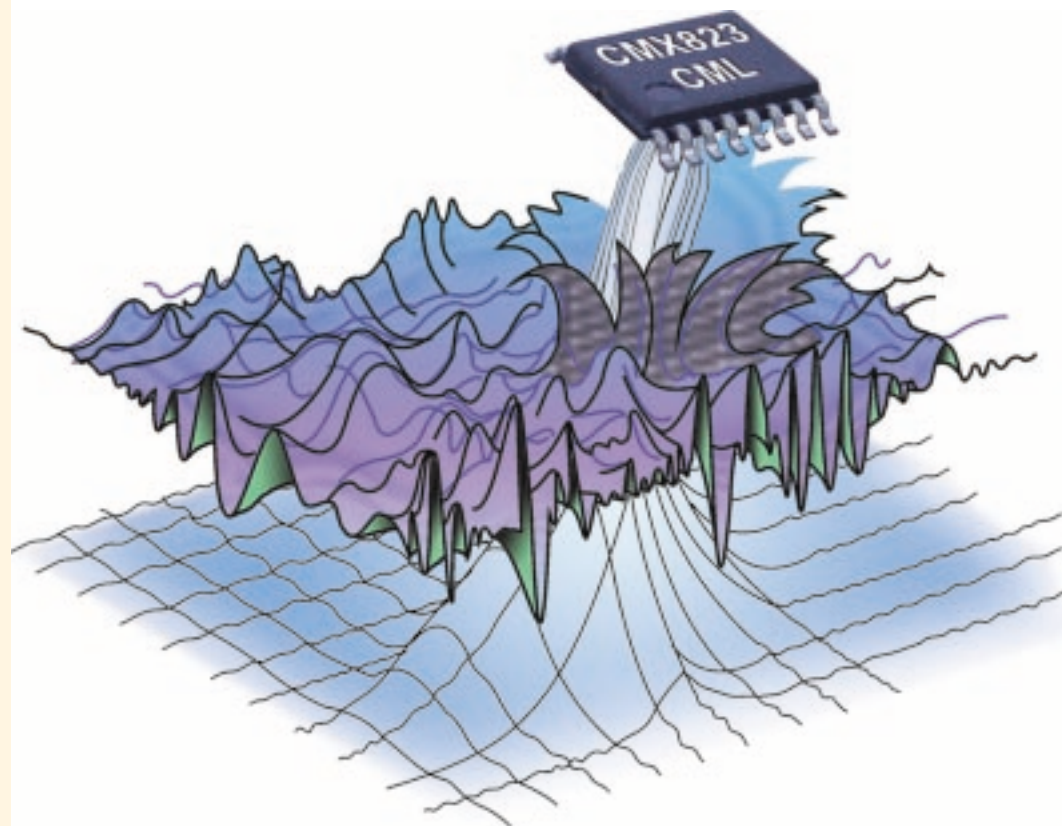
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Packages	-40º to +85ºC
CMX823E4	16-pin plastic TSSOP
CMX823P3	16-pin plastic DIL

Information

www.cmlmicro.com/products/twoway/CMX823.htm