



CML Microcircuits

COMMUNICATION SEMICONDUCTORS

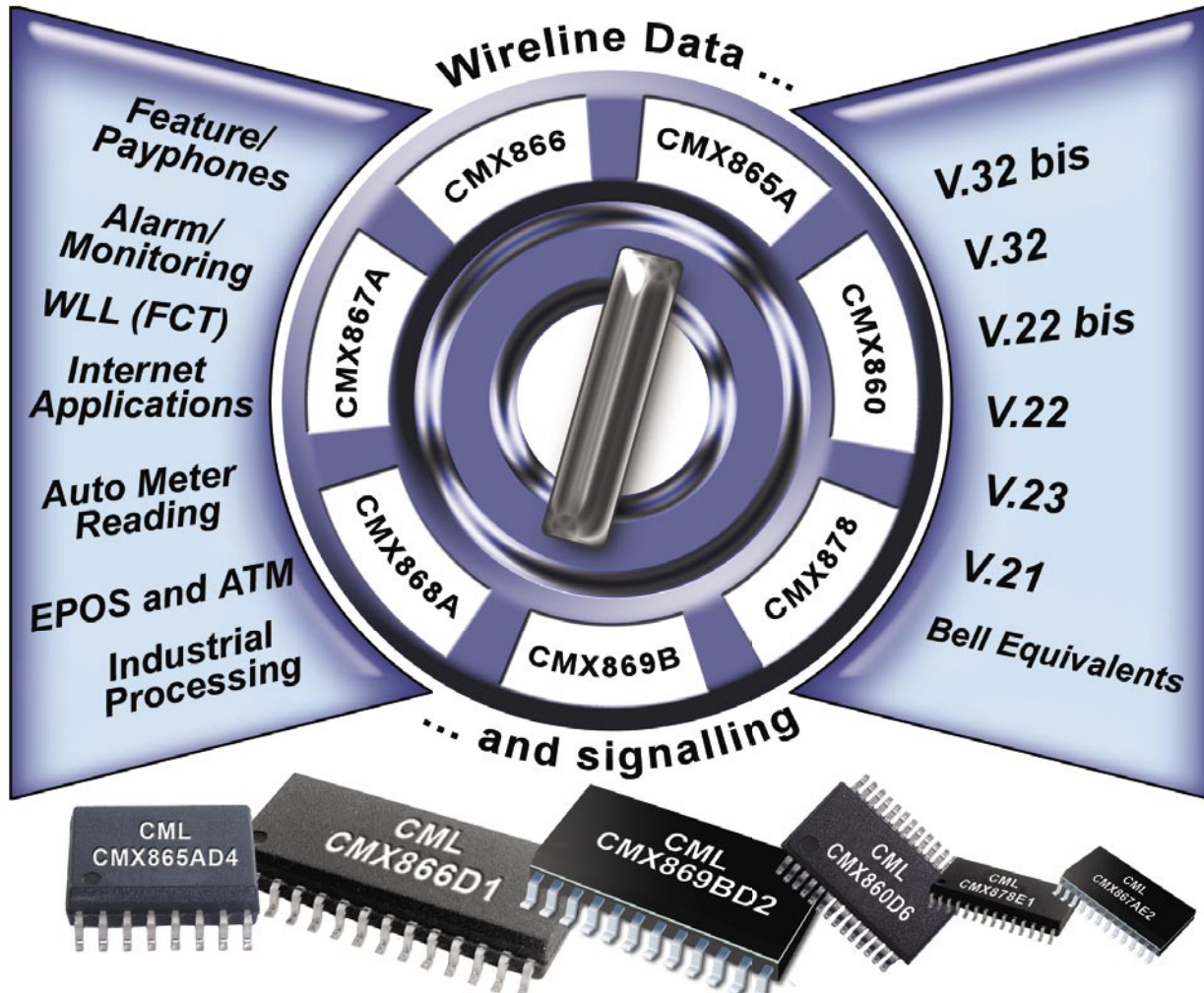
Wireline Signalling and Data

Low Power Wireline Modem ICs

75bps to 14400bps - FSK, DPSK and QAM

INV/Telecom/86x/5

www.cmlmicro.com



The CML Family of Wireline Modem ICs

- **CMX860** Telephone Signalling Transceiver
- **CMX865A** DTMF Codec and Telecom Signalling Combo
- **CMX866** V.22 bis Modem with AT Command Set
- **CMX878** V.22 bis Modem plus DAA
- **CMX867A** Low Power V.22 Modem
- **CMX868A** Low Power V.22 bis Modem
- **CMX869B** V.32 bis Modem with Auto/Manual Connect

- Multi-standard ITU and Bell data capabilities
- Comprehensive programmable wireline signalling with enhanced DTMF decoders
- Flexible line driver and telephone hybrid circuits
- Simple control, data and signal interfaces
- Low-overhead control and data via C-BUS serial interface
- Lowest industry power requirements
- Compact SOIC, SSOP and TSSOP packaging
- Evaluation and demonstration kits available
- World Wide Web and Application support

Applications

- Wireless Local Loop (FCT/FWT) - Alarm and Monitoring Systems - PBXs - Featurephones and Payphones - Least/Low Cost Routers - Auto Dialling Systems -
- Internet Applications - Remote Meter Reading - Vending/Gambling Machines - Set-Top Boxes - EPOS and ATM Systems -
- Short Messaging Service (SMS) for Fixed Networks - Security Systems - Industrial Process and Control -

The CML Wireline Signalling and Data Family

CML's wireline telecoms products are used worldwide in many telephone applications, including control, data and signalling systems. These highly integrated ICs address the majority of telecom functions on-chip whilst demanding very little power or μC assistance. This often means that these products can be line powered.

Your **wireline data** requirements are more than adequately catered for by at least one of this family of data ICs. Data rates from 75bps to 14400bps are available, using, as required, FSK, DPSK or QAM modulation.

This product family offers an upgrade path that will require very little development effort to migrate designs between its members.

Available as part of each fully-inclusive package are the on-chip hybrid circuits for data operations; all offering both Rx and Tx telephone line interfaces capable of working to either 2 or 4 wire systems with analogue switching between phone and line interfaces.

Working with a host $\mu\text{Controller}$, each of these products offers a full suite of **telephone signalling** facilities. Twin sets of fixed and programmable audio tone generators and decoders provide the ability to generate and detect such functions as: standard DTMF encode and enhanced DTMF decode functions, call progress signals, caller line ID and fax/modem call and answer tones.

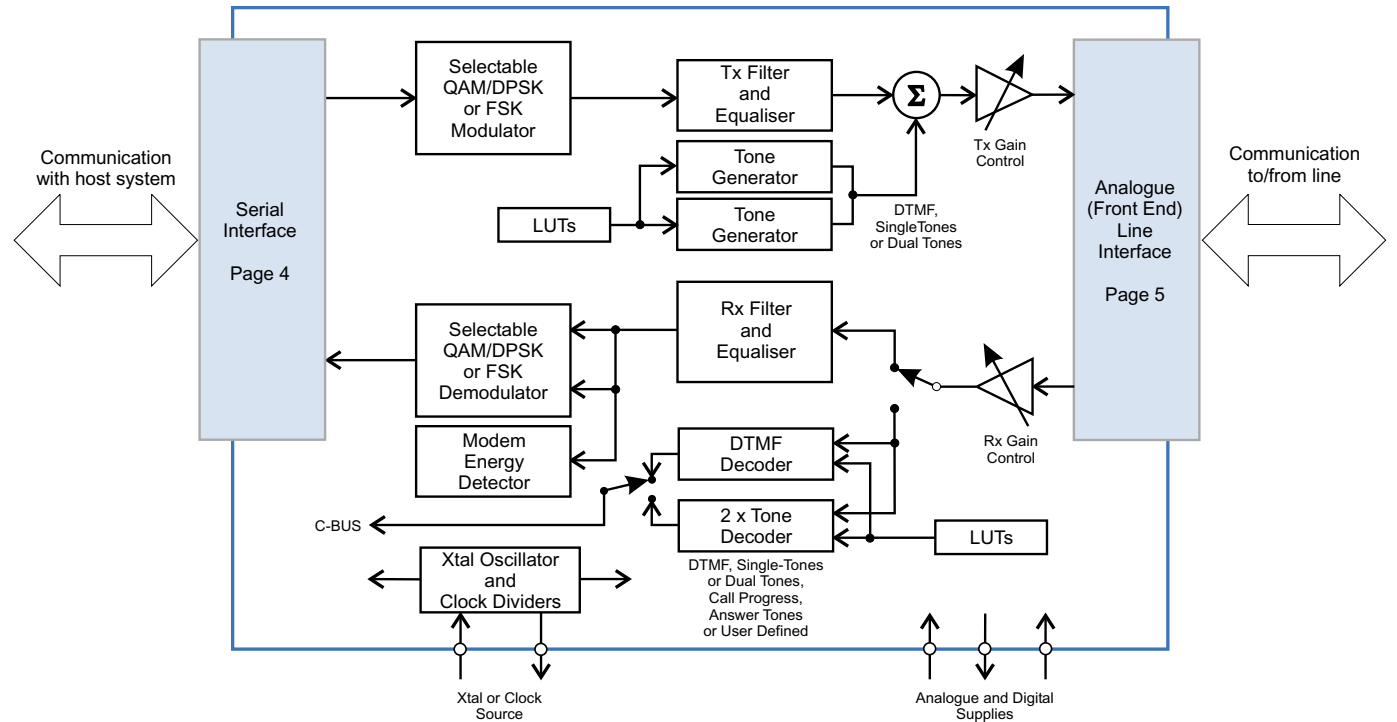
Control and data to and from all but the CMX866 is via the CML C-BUS serial interface, a control and data system compatible with most types of μC serial bus.

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The CML Advantage

- Single-chip control, data, interface and telephone signalling features reduce design-time, space and components - and cost
- Versatile ITU and Bell data modes and configurations: V.32 bis, V.32, V.22 bis, V.22, V.23, V.21, Bell 212A, Bell 212A, Bell 103
- Supports multi-standard modulation protocols: FSK, DPSK, QAM
- Comprehensive wireline signalling as standard
- High DTMF immunity to 'falsing-on-voice'
- Flexible on-chip signal interfaces
- Rx and Tx filters and selectable line-equalisers
- Software programmable Rx and Tx gain controls
- Flexible serial command and data interfaces with programmable Rx and Tx USARTS
- Lowest industry power requirements - line power is possible
- Compact low-profile packaging - SOIC, SSOP and TSSOP
Small package - less pins - smaller footprint
- Technical and commercial support - field-sales and in-house application support
- Reference design information available as free downloads from the CML website: www.cmlmicro.com
- Evaluation/demonstration kits, socket-modem designs and modem firmware available



Basic Functional IC Layout

Ultra-Low Power Requirements

With their ultra-low power requirements, these ICs have the capability to be line-powered.

To enable optimum power usage, these products can be dynamically 'powersaved' via a C-BUS command.

When in full powersave mode, to permit system set-up and line monitoring, only the C-BUS interface and the Ring Detector circuitry remain powered.

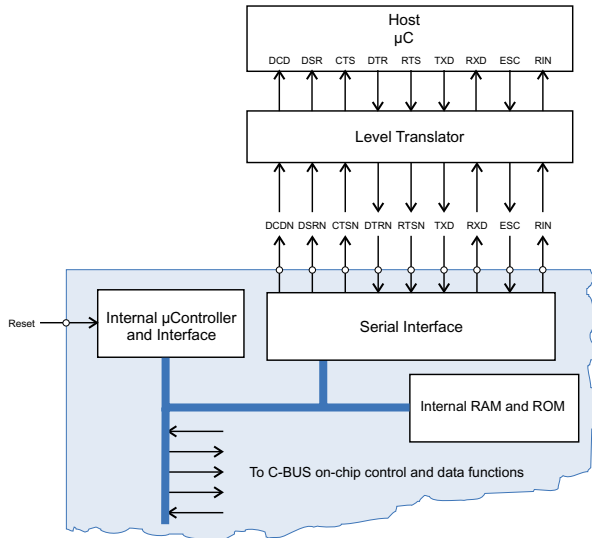
	V.32 bis	V.32	V.22 bis	V.22	V.23	V.21	Bell 212A	Bell 202	Bell 103
CMX860					Yes			Yes	
CMX865A					Yes	Yes		Yes	Yes
CMX866			Yes	Yes	Yes	Yes	Yes	Yes	Yes
CMX867A				Yes	Yes	Yes	Yes	Yes	Yes
CMX868A			Yes	Yes	Yes	Yes	Yes	Yes	Yes
CMX869B	Yes (auto mode)	Yes (auto mode)	Yes (auto/manual modes)	Yes (auto/manual modes)	Yes	Yes		Yes	Yes
CMX878			Yes	Yes	Yes	Yes	Yes	Yes	Yes

Product	Voltage Range	
CMX860	2.7 to 5.5	Volts
CMX865A	3.0 to 3.6	
CMX866	2.7 to 5.5	
CMX867A	2.7 to 5.5	
CMX868A	2.7 to 5.5	
CMX869B	3.0 to 3.6	
CMX878	2.7 to 5.5	

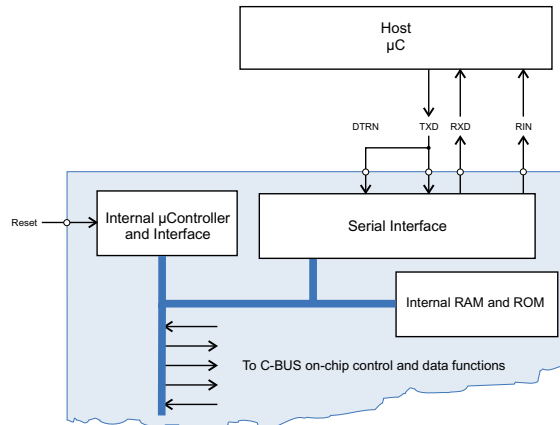
Serial Interfaces

CMX866 Serial Interface

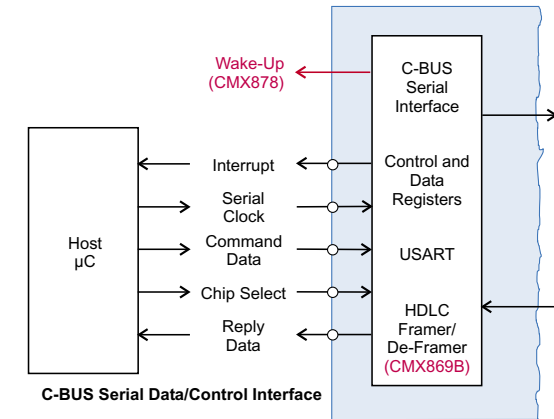
9-Pin Serial Interface



Reduced-Pin Serial Interface



CMX860, CMX865A, CMX867A, CMX868A and CMX869B C-BUS Serial Interface



Features

Flexible On-Chip USARTS

- Multi-format modes
- Framing detection
- Selectable parity settings
- Break detection
- V.14 compatibility

Modem Pattern Generation/Detection

- Continuous 1s or continuous 0s
- Data reversals (1010...)
- Scrambled and unscrambled 1s or 0s
- HDLC flags (CMX869B)
- S1 (1100...)

C-BUS Interfacing

- C-BUS (SPI compatible) serial interface
- Software controlled levels and routing
- On-chip programmable Rx and Tx USARTS
- 16-bit (2-character mode)
- Simple register-based handling
- C-BUS interface operates during 'Powersave' periods

AT Serial Interface (CMX866)

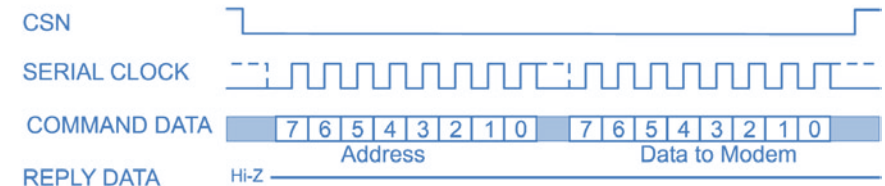
- Standard AT Command parser
- Asynchronous protocol over 9600 baud serial interface
- Reduced-pin serial interface

C-BUS Command, Data and Control

Compatible with most serial ports, C-BUS provides for the transfer of data and control and/or status information between the target IC's internal on-chip registers and the host µC, over a simple serial bus.

Each transaction consists of a single 'address' byte from the host followed by one or more data bytes, either from the host or from the IC, depending on whether the transaction is a 'command' or a 'reply'.

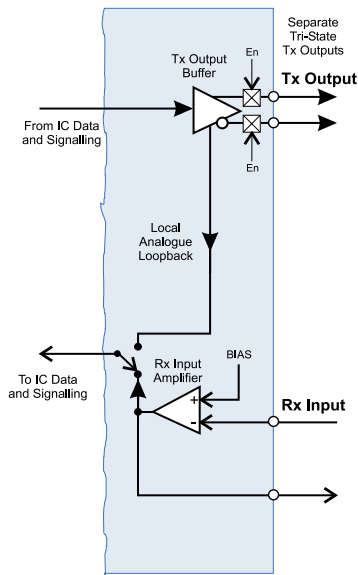
One Address and one Data byte from µC to Modem



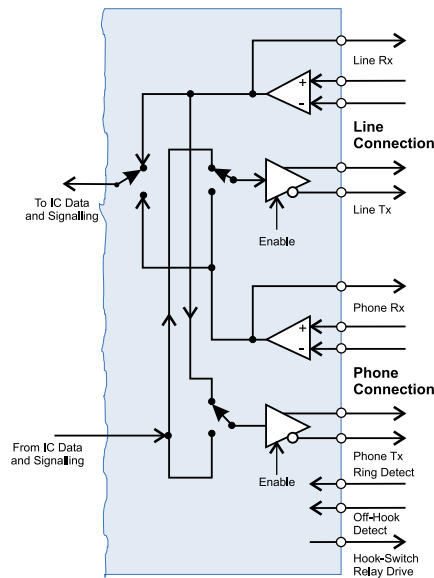
A Simple C-BUS Transaction

Analogue Front-End (Line) Interfaces

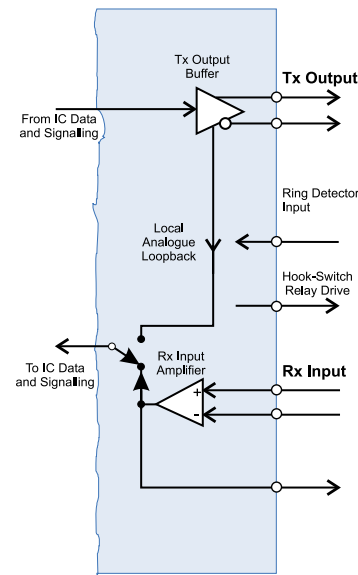
CMX865A



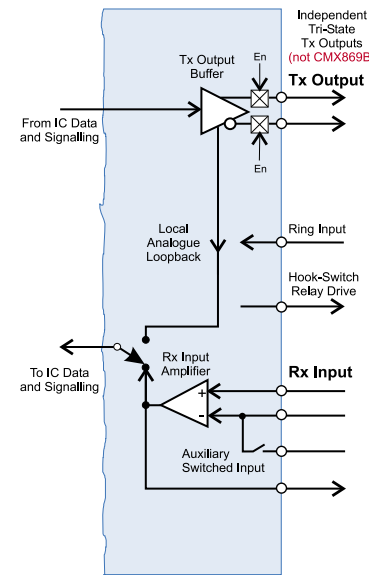
CMX860



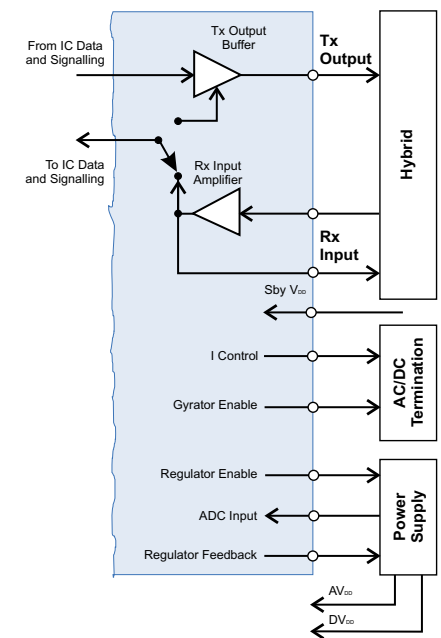
CMX866



CMX867A, CMX868A, CMX869B



CMX878



Features

- Differential or single-ended output drive
- Single, self biasing input
- Two or four wire line interface
- High current Tx output buffering for direct line driving
- Internal hybrid
- Single resistor Rx gain setting

- Off-hook detector
- Line and 'phone interface and switching
- Internal source switching
- Ring, line reversal detection

- High gain by-pass for Calling Line ID (CMX869B)
- Independent tri-state Tx output (CMX867A and CMX868A)
- Ring and line reversal detection (CMX866, CMX867A and CMX868A)
- Digital ring input (CMX869B)

Common Features

- Two and Four Wire Line Interface
- Hook-Switch Relay Drive
- Single-Resistor Rx Gain Setting
- High Current Tx Output Buffering for Direct Line Driving
- Internal Hybrid
- Differential or Common Mode Interfacing

- Line-powered on-chip DAA
- Gyration and impedance matching
- Ring/line reversal detection
- Regulated power from line for host μ C
- Parallel phone off-hook detection
- High current Tx output buffering for direct line connections
- Gain adjustable Rx input stages
- ADC input for line state measurements
- Hook control

Wireline Signalling

As the basis of a telephone data system from "call set-up" through "call progress" to modem "call and answer" tones and "calling line ID" frequencies.

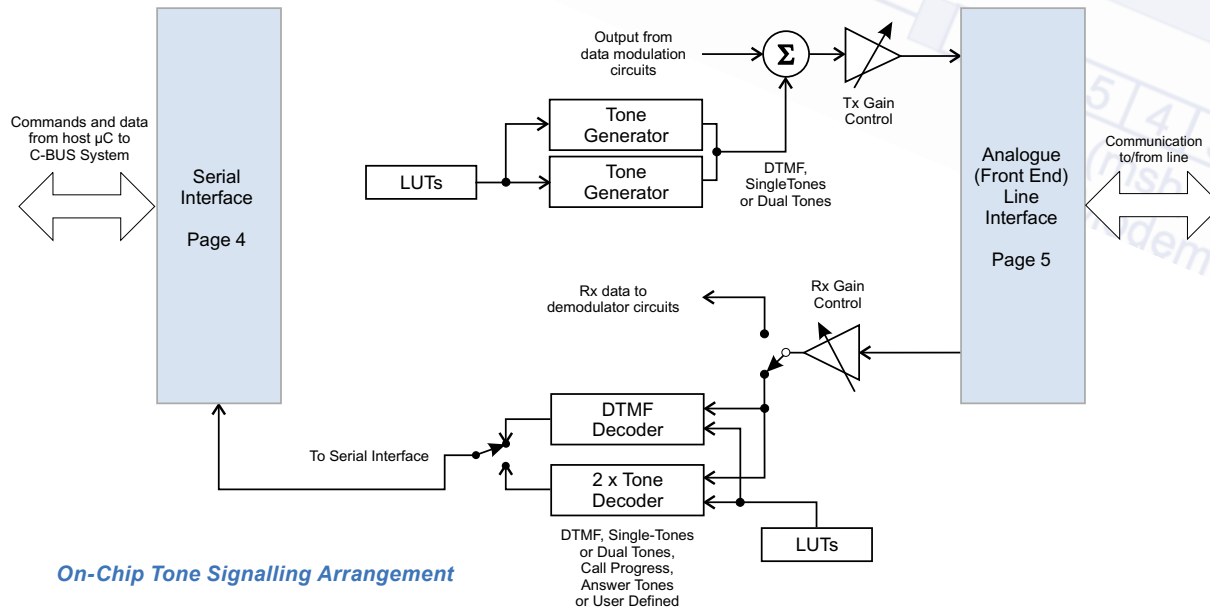
The standard duplex DTMF tone-set. In addition, custom signalling tone frequencies can be user-programmed for either single or dual tone use. The enhanced DTMF decoder exhibits very high performance with an outstanding immunity to interfering speech signals.

Tone Signalling Encoders

- High performance DTMF
- Two programmable single tone encoders
- Programmable tone pairs
- Call progress band (275Hz to 665Hz) tones
- Preset answer tones (2100Hz and 2225Hz)
- Melody tone generation

Tone Signalling Decoders

- Enhanced DTMF detection
- Two Programmed single tone detectors
- Programmed tone-pair detection
- Call progress band (275Hz to 665Hz) detection
- Answer tone (2100Hz and 2225Hz) detection



On-Chip Tone Signalling Arrangement

Dual Tone Multi-Frequency (DTMF)

- DTMF: Standard encode mode
- DTMF: Enhanced decode mode
- Decode function provides high immunity to falsing on voice
- DTMF twist adjustment

Standard DTMF Configurations (Hz)

Keypad Symbol	Low Tone	High Tone
D	941	1633
1	697	1209
2	697	1336
3	697	1477
4	770	1209
5	770	1336
6	770	1477
7	852	1209
8	852	1336
9	852	1477
0	941	1336
*	941	1209
#	941	1477
A	697	1633
B	770	1663
C	852	1633

Single and Dual Tones (Hz)

Preset Tones	
NoTone	
697	
770	
852	
941	
1209	
1336	
1447	
1633	
1300	(Calling Tone)
2100	(Answer Tone)
2225	(Answer Tone)
Programmable Tones	
Tone-Pair A	Programmed single tones or tone-pairs (f = 300Hz to 3400Hz max)
Tone-Pair B	
Tone-Pair C	
Tone-Pair D	
Guard Tones	
550	Guard tones for CMX866, CMX867A, CMX868A, CMX869B and CMX878
1800	

Data and Modulation Schemes

With data rates from 75bps to 14400bps in a wide range of modulation schemes, these products each offer, as standard, on-chip USARTS, Rx and Tx filters and the appropriate line equalisers. In addition, the CMX866 includes an AT (standard and extended) Command interpreter for installation of the IC into allied systems. To comply with the various modulation specifications, these products, where relevant, include a data scramble/descramble function.

Pattern Generators

- Continuous 0s or 1s
- 1010 ...
- 1100 ... (S1 Pattern)
- HDLC Flags (CMX869B only)
- HDLC Abort - 13 x 1s (CMX869B only)

USART Modes

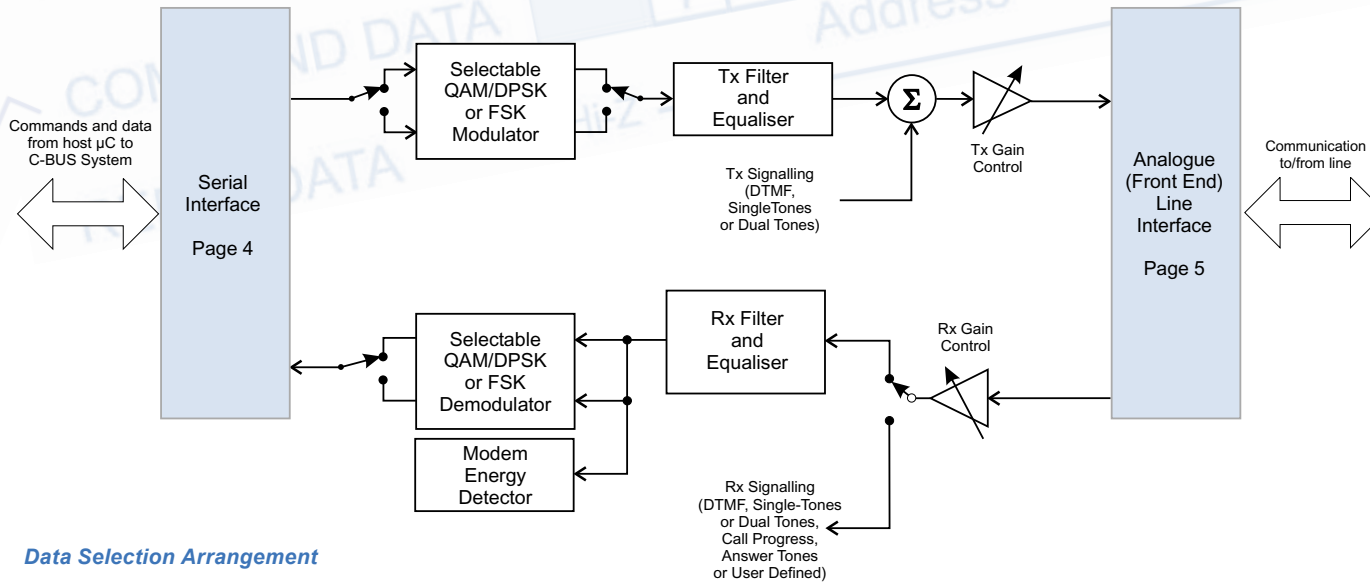
- 8, 7, 6 or 5 data bits
- Parity - Odd, Even, None
- 1% or 2.3% overspeed modes
- Automatic loop of sync data
- HDLC Framer/De-framer (CMX869B only)

Pattern Detectors

- Continuous 0s or 1s
- 1010 ...
- 1100 ... (S1 Pattern)
- HDLC Flags (CMX869B only)
- HDLC Abort (CMX869B only)
- Break Detection

Guard Tones

- Selectable 550Hz and 1800Hz available for CMX866, CMX867A, CMX868A, CMX869B and CMX878
- Automatically enabled and disabled once selected
- Interlock prevents selection when not valid
- Level controlled automatically



Data Selection Arrangement

Scrambling

- Available in QAM and DPSK modes
- Scrambled to ITU recommendations
- Scrambler/Descrambler all independently controllable
- 64 x 1s detector (scrambler unlock) can be disabled

Equalisers

- Manual control of auto-equalisers in QAM and DQPSK modes
- Auto-equaliser 'freeze' mode - QAM only

Automodem Modem (CMX869B)

The CMX869B is capable of operating in two distinct modes: Automodem and Manual modem. Once started in automodem mode, the operation is virtually autonomous. An 'event-register' signals any significant event, such as: 'retrain requests' or 'carrier-lost'. Regular updating of the received signal-to-noise performance is provided.

The automodem mode minimizes the host interaction, allowing the host to perform other system-related tasks.

Product	Modulation Type	Data Rate Range
CMX860	FSK	75 to 1200 bps
CMX865A	FSK	75 to 1200 bps
CMX866	QAM	75 to 2400 bps
	DPSK	
CMX867A	DPSK	75 to 1200 bps
	FSK	
CMX868A	QAM	75 to 2400 bps
	DPSK	
	FSK	
CMX869B	QAM	75 to 14400 bps
	DPSK	
	FSK	
CMX878	QAM	75 to 2400 bps
	DPSK	
	FSK	

Package Styles


	D1 28 pin SOIC	D2 24-pin SOIC	D4 16-pin SOIC	D6 28-pin SSOP	E1 28-pin TSSOP	E2 24-pin TSSOP	E4 16-pin TSSOP
CMX860	Yes			Yes	Yes		
CMX865A			Yes				Yes
CMX866	Yes			Yes			
CMX867A		Yes				Yes	
CMX868A		Yes				Yes	
CMX869B		Yes				Yes	
CMX878	Yes			Yes	Yes		

DIL packages or SOIC-to-DIL adapters for evaluation are available in small quantities

CML's full range of products for Two-Way Radio, Wireline Telecom and Wireless Data environments can be viewed at

www.cmlmicro.com

Member Companies

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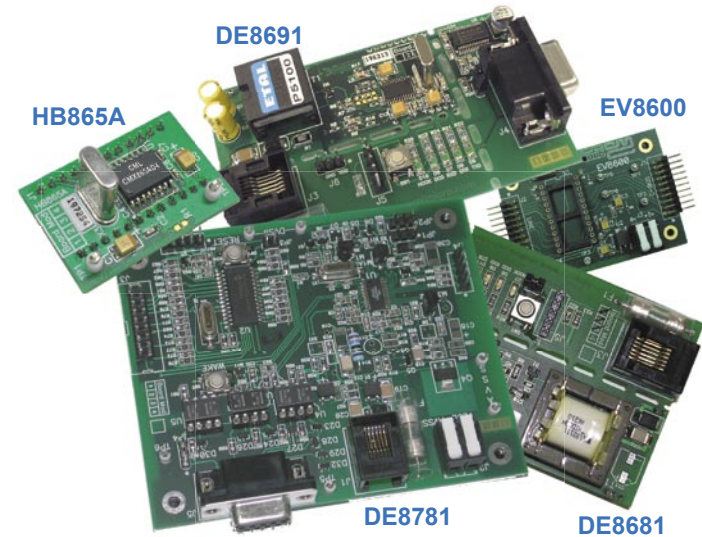
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Design Resources

Design and application support is available from: www.cmlmicro.com

- Technical Datasheets
- Application Notes
- Frequently Asked Questions (FAQs)
- Software Downloads
- DAA Reference Designs and Modem Firmware
- Application Support via Local Help Desks

Evaluation and Demonstration



A demonstration DE kit (DemoKit) is available for each modem IC. The DemoKit is a fully operational modem controlled from a host PC using AT commands. A Data Access Arrangement (DAA) circuit allows the direct connection of a simulator or telephone line (via a suitable isolator).

- EV8600 for CMX865A, CMX867A and CMX868A Evaluation
- HB865A Adapter Board for CMX865A Evaluation on EV8600
- DE8681 for CMX865A, CMX867A and CMX868A Evaluation and Demonstration
- DE8781 for CMX878 Evaluation and Demonstration
- DE8691 for CMX869B Evaluation and Demonstration

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