CML Microcircuits

COMMUNICATION SEMICONDUCTORS

Communications IC Selection Guide

EDITION

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Contents List

CML Microsystems Plc

CML Microsystems Plc was founded in 1968 in the United Kingdom (as Consumer Microcircuits Limited). Today, through eight operating subsidiaries located in the UK, the United States, Germany, Singapore and Taiwan, the Group designs, manufactures and markets a range of integrated circuits (ICs) for global industrial, professional and consumer applications within wireless communication, wireline communication, storage and networking market areas.
The Group maintains and enhances its market position by delivering an array of products that are often designed in conjunction with customers' specifications and/or complex international standards.
CML Microsystems Plc Ordinary shares are traded on the Official List of the London Stock Exchange. Full information can be found on the Group website: www.cmlmicroplc.com.

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CML Microcircuits

COMMUNICATION SEMICONDUCTORS

CML Microcircuits (CML) comprises three member companies of the CML Microsystems Plc group: CML Microcircuits (UK) Ltd, CML Microcircuits (USA) Inc. and CML Microcircuits (Singapore) Pte Ltd. Additionally CML Microcircuits (Singapore) Pte Ltd operates a satellite sales office in Shanghai, China.

Founded in 1968, CML Microcircuits has developed to become a world-leader in the design, development and supply of low-power analogue, digital and mixed-signal semiconductors for communications systems worldwide.

CML is supportive of conserving the natural environment and aims to manage its operations in ways that are environmentally friendly and economically viable. CML can provide RoHS compliant, lead-free (Pb-free) products. CML's Environmental Policy can be found on the CML website (www.cmlmicro.com).

CML Microcircuits (UK) Ltd

COMMUNICATION SEMICONDUCTORS

As the strategic lead company, CML Microcircuits (UK) Ltd designs, manufactures and markets highly innovative digital, mixed-signal and RF integrated circuits.

CML's expertise in the sub-micron CMOS process allows it to produce highly integrated circuits with high performance, ultra-low power-consumption and small form factor. CML's semiconductor products are available throughout the world via an extensive network of distributors and representatives.

Located at the Group headquarters in rural Essex, CML (UK) provides the main design centre, co-ordinating semiconductor design and strategic activities including sales and marketing. From this facility CML provides full customer support in the form of comprehensive product documentation, application support and commercial advice, with access to the CML team of field sales engineers backed-up by its in-house help desk staff: qualified engineers providing up-to-date technical and product information.

The activities at this location, combined with the activities in the USA, Singapore and China, enables CML to serve customers around the world quickly and effectively.

CML Microcircuits (UK) Ltd is certified to ISO 9001: 2000.
Established 1968 as Consumer Microcircuits Limited, CML Microcircuits (UK) Ltd is 100% owned by CML Microsystems Plc.

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- Design
- Manufacturing
- Sales and Marketing
- Technical and Commercial Support

CML Microcircuits (USA) Inc.

COMMUNICATION SEMICONDUCTORS

Located in Winston-Salem, North Carolina, CML Microcircuits (USA) Inc. provides sales, marketing, technical and commercial support for the company's highly innovative analogue, digital, mixed-signal and RF integrated circuits.

As an integral part of the CML Microcircuits' global sales and marketing channels, the dedicated sales and customer support teams provide on-going service, application support and commercial advice.

As the company's presence in the Americas, CML (USA), with its network of distributors and representatives, can respond to customers' requirements armed with an extensive knowledge of local systems and technologies, whilst also supplying the other CML member companies with feedback on local specifications, requirements and operational climates.

The activities at this location, combined with support and advice from the UK and Singapore companies, enables CML Microcircuits (USA) Inc. to serve its customers quickly and effectively.

CML Microcircuits (USA) Inc. is certified to ISO 9001: 2000.
Established 1980 as MX-COM, Inc., CML Microcircuits (USA) Inc. is 100% owned by CML Microsystems Plc.

CML Microcircuits (USA) Inc.

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- Sales and Marketing
- Technical and Commercial Support

CML Microcircuits (Singapore) Pte Ltd

COMMUNICATION SEMICONDUCTORS

Located in the central vicinity of Singapore, CML Microcircuits (Singapore) Pte Ltd markets CML's highly innovative analogue, digital, mixed-signal and RF integrated circuits.

CML (Singapore) plays a dominant role in the presentation of the CML brand image to the highly competitive and high growth Asia Pacific region.

Together with its established distribution network in the Far East and ASEAN regions, CML (Singapore) generates sales and marketing opportunities and constantly feeds back to other member companies the requirements and specifications from local regions to generate product definitions and applications.

Working closely with the other CML member companies, CML (Singapore) identifies manufacturing locations and companies within its regions for design activities that have been carried-out outside its regions and guides and supports the customers commercially and technically.

CML (Singapore) has established a representative office in Shanghai, China to provide local sales and technical support to the local distributors and customers.
Established 1995, CML Microcircuits (Singapore) Pte Ltd is 100% owned by CML Microsystems Plc.

CML Microcircuits (Singapore) Pte Ltd

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- Sales and Marketing
- Technical and Commercial Support

CML Support Services

The CML Microcircuits IC Selection Guide - *this document*

A basic introduction to CML Microcircuits, its constituent companies and its products.
Presents, in shortform, a comprehensive overview of the company's current product portfolio whilst providing contact information to CML's worldwide network of distributors and representatives.

The CML Microcircuits Website

The CML website (www.cmlmicro.com) is available to provide you with up-to-the-minute information and news on CML's activities, products and technologies. Product information is easily located via a comprehensive search function which achieves product location by product number, market application and product features.

With convenient on-page links to the other CML Microsystems Plc companies, this site gives you access to all current CML products and resource listings in both overview and full-data format.
All CML datasheets are available for download in Adobe Acrobat (.pdf) format.

In addition to, and in support of the datasheets, this site carries the latest in CML product evaluation and application information.

Providing the latest press information, a frequently-asked-questions (FAQ) section, distributor and representative contact information and an on-line registration service for technical updates, it is CML's proud boast that the majority of product information is 'posted' to the website within 24 hours of its 'technical release'. Quality and technical support sections are the latest additions to this resource.

The website 'registration service' allows users to register for regular e-mail updates of products and topics of interest.

'My CML' Technical Portal

A recent introduction to the website is the 'My CML' Technical Portal. This unique resource is available to provide comprehensive technical support on many of CML's new generation ICs and evaluation aids, including a new range of products designed on *FirmASIC*® technology.

Using a higher level of registration, downloadable from these areas are:

- IC datasheets and separate user manuals
- EvKit and DemoKit user manuals and software/firmware
- IC, EvKit and DemoKit Function Image™ data files
- Beta Function Image™ data files
- Operational update notices

All registered users will receive immediate e-mail notification of any changes and/or additions to their relevant portal area/s. Registration to this resource is easily arranged via CML sales or support staff.
For access and further information, please contact your local CML distributor or representative.

'Innovations' Documents

Descriptive documents which illustrate a product or system's main features, applications and operation. These documents provide basic information on a product or family of products to enable design engineers to quickly target a CML IC for a particular end-product design.

Product Datasheets and User Manuals

Complete technical documentation for the operation, implementation and use of a CML product in an end-product design. These documents provide all the information, including technical specifications, required to use a CML product in a communications system. It is always recommended that before commencing a circuit design, users confirm that they have the most up-to-date product datasheet; these are available from the CML website (www.cmlmicro.com).

Application Notes

Downloadable from the CML website, these documents provide additional 'late-breaking' or alternative 'application' information for the implementation and/or operation of CML products or allied specific systems.

Frequently Asked Questions (FAQs)

Extensive lists of questions that have been previously asked. CML has formulated explanatory answers to the most common problems encountered by customers in the past. As a part of the CML website, it is recommended that users view these indexed pages before, or if any, problems arise when dealing with CML products or allied systems.

CML's products are well supported in terms of documentation, presentational CD-ROMs and the CML website. Additionally, in support of these publications, all customers have access to:

- The CML field sales teams
- The CML help desks
- CML distributors and representatives

CML Field Sales

Teams of commercially and technically qualified sales engineers, with territorial knowledge, providing front-line support to the distributor, representative and customer.

This 'customer-facing' function is available to provide continuous awareness and training in current communications technologies and in particular, the successful implementation of CML products.

CML Help Desks

Interactive teams of highly qualified Application Engineers providing global technical and product support.

Having full access to the company's marketing, engineering-design and production facilities, these teams will provide fast, accurate application support and high-quality design advice.

The CML Help Desk staff are also active in the production of product application notes, flow diagrams, system sketches and any other information that will assist with emerging new and existing designs.

The Frequently Asked Questions (FAQ) section of the CML website is regularly updated to provide instant answers to the most popular queries and is an excellent starting point when implementation difficulties arise.

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CML's Worldwide Network of Distributors and Representatives

CML's operations worldwide are served, on all continents, by local distributors and representatives providing support to customers by local qualified staff with a comprehensive knowledge of the region and its industries.

Distributors and representatives constantly update CML with local technical and commercial trends to further enhance CML's products, support and service.

A list of CML distributors and representatives can be found on pages 17, 18 and 19 of this IC Selection Guide and on the CML website. It is recommended that you always check the CML website for the most up-to-date contact information (www.cmlmicro.com).

Product Prefix Codes

Until the latter part of 1996, the differentiator between products manufactured and sold from MX-COM, Inc. (US) and Consumer Microcircuits Limited (UK) were denoted by the prefixes MX and FX respectively. These products use the same silicon etc. and today still carry the same prefixes if they were in production at that time.
In the latter part of 1996, both companies adopted the common prefix: CMX.

FX
MX = CML Microcircuits
CMX *COMMUNICATION SEMICONDUCTORS*

Please Note: The information and product overviews provided in this guide are for information purposes only. CML does not assume any responsibility for the use of any circuitry described.
No IPR or circuit patent licences are implied. CML reserves the right at any time without notice to change the said circuitry and product specifications.

Product information is available from this document in short-form, however it is recommended that before commencing a circuit design, users check the relevant product datasheet or user manual, available from the CML website (www.cmlmicro.com), to ensure that they have the most up-to-date product data.

The Product List - Focus Products

Focus IC Products detailed in this selection guide and indexed on these two pages are products that are production-released and recommended for new designs.

Mature IC Products are those that are production-released but not recommended for new designs (see page overleaf).
Further details of both Focus and Mature products can be obtained from the CML Microcircuits website (www.cmlmicro.com).

		Wireless		Wireline	
		Two-way Radio	Wireless Data	Wireline Data	Telephony
FX/MX019	Digitally Controlled Quad Amplifier Array				102
FX/MX029	Dual Digitally Controlled Amplifier Array				103
FX/MX128	Audio Band Scrambler	32			
CMX138	Audio Scrambler and Sub-audio Signalling Processor	33			
FX214/FX224	Variable Split-band Audio Scrambler	34			
CMX264	Frequency Domain Split-band Scrambler	35			
FX/MX465	Extended-code CTCSS Encoder/Decoder	36			
CMX469A	1200/2400/4800 Baud FFSK Modem		52		
CMX589A	GMSK Modem		53		
CMX602B	Calling Line Identifier plus Call Waiting				104
FX/MX604	V.23 Compatible Modem			88	
CMX605	Digital-to-Analogue (POTS) Signalling Interface - with DTMF Codec				105
CMX608	Half-duplex RALCWI Vocoder	70			70
CMX612	Calling Line ID plus Dial Tone Decode for VMWI (Voice-Message Waiting Indicator)				106
FX/MX614	Bell 202 Compatible Modem			87	
CMX618	Half-duplex RALCWI Vocoder - with Audio Codec	70			70
FX/MX619	'Eurocom' Delta Codec	71			
MX629	'Military' Delta Modulation Codec	72			
CMX631A	SPM Detector				107
CMX635	ISDN Subscriber Processor			90	
CMX638	Duplex RALCWI Vocoder - with Audio Codec	70			70
CMX639	CVSD Voice Codec	73			
CMX641A	Dual SPM Detector plus Payphone Security				106
CMX649	Adaptive Delta Modulation (ADM) Voice Codec	74			
CMX654	V.23 Transmit Modulator			91	
CMX661	Dual SPM Decoder for Pair-gain Applications				109
CMX673	Call Progress Tone Detector				110
CMX683	Call Progress and 'Voice-audio' Detector				111
CMX7031	- Two-way Radio Processor with RF Support - 4-Level FSK Modem with RF Support - C4FM Modem with RF Support	37			
CMX7032	- AIS Baseband Processor with RF Synthesiser - AIS Rx Only Data Processor with NMEA 0183-HS Output		64		

		Wireless		Wireline	
		Two-way Radio	Wireless Data	Wireline Data	Telephony
CMX7041	- Two-way Radio Processor - 4-Level FSK Modem with RF Support - C4FM Modem	37			
CMX7042	- AIS Baseband Processor		65		
CMX7141	- Digital PMR/LMR Processor - dPMR Processor	47			
CMX7143	- GMSK/GFSK Modem - 4-Level FSK Modem - FFSK/MSK Modem		54		
CMX823	Multi-standard Analogue Paging Decoder	39			
CMX838	FRS/PMR446/GMRS 'Family Radio' Processor	40			
CMX850	Communications Controller				80
CMX860	Telephone Signalling Transceiver			92	
CMX865A	DTMF Codec/FSK Modem Combo			93	
CMX866	V.22 bis Modem with AT Command Set			94	
CMX867A	Low Power V.22 Modem			95	
CMX868A	Low Power V.22 bis Modem			96	
CMX869B	V.32 bis Modem			97	
CMX878	V.22 bis Modem plus DAA				98
CMX881	PMR and Trunked Radios and Baseband Processor	41			
CMX882	FRS, MURS, PMR446 and GMRS 'Leisure' Radio Baseband Processor plus GPS Data Transport	41			
CMX883	FRS, MURS, PMR446 and GMRS 'Leisure' Radio Baseband Processor	41			
CMX909B	GMSK Packet-data Modem		56		
CMX910	AIS Baseband Processor		67		
FX/MX919B	4-Level FSK Packet-data Modem		57		
FX/MX929B	4-Level FSK RD-LAP Packet-data Modem		58		
CMX969	4-Level FSK (MOTIENT/ARDIS/RD-LAP) Modem		59		
CMX980A	Digital Radio Baseband Processor	48			
CMX981	Advanced Digital Radio Baseband Processor	49			
CMX989	CDPD MAC and Data Pump Processor		60		
CMX990	GMSK Packet-data Modem and RF Transceiver		26		
CMX991	RF Quadrature Transceiver		27		
CMX992	RF Quadrature Receiver		28		
CMX998	Cartesian Feedback Loop Transmitter	29			

Mature Products

Mature IC Products are those that are production-released but not recommended for new designs.
Further details of both Focus and Mature products can be obtained from the CML Microcircuits website (www.cmlmicro.com).

Wireless Comms

Two-way Radio

FX/MX102	QTC Tone Processor
MX014	Half-duplex Frequency Inversion Scrambler
MX165C	Low Voltage CTCSS Codec
FX315	CTCSS Encoder
MX315A	CTCSS Encoder
FX/MX316	NMT Audio Filter Array
FX/MX335	CTCSS Encoder/Decoder
FX336	R2000 Filter Array
MX355	CTCSS Encoder/Decoder
FX365C	CTCSS Encoder/Decoder
FX/MX375	Private Squelch Circuit
FX/MX506	PMR Audio Processor
FX/MX609	CVSD Codec
FX709	Voice Store Retrieve Codec
FX803	Audio Signalling Processor
MX803A	Audio Signalling Processor
FX805	Sub-audio Signalling Processor
MX805A	Sub-audio Signalling Processor
FX806	Audio Processor
FX/MX806A	PMR Audio Processor
CMX813	Multi-standard Analogue Paging Decoder

Wireless Data

FX/MX429A	FFSK Modem
FX/MX429	FFSK Modem
FX/MX439	FFSK Modem
FX/MX469	1200/2400/4800 Baud FFSK Modem
FX529	FFSK Modem
FX/MX809	FFSK Modem
FX/MX909A	GMSK Packet-data Modem

Wireline Comms

Telephony

FX/MX611	SPM Detector
FX/MX613	Universal Call Progress Decoder
FX631	SPM Detector
FX/MX641	Dual SPM Detector
CMX867	Low Power V.22 Modem
CMX868	Low Power V.22 bis Modem
CMX869A	V.32 bis Modem

Evaluation Resources

CML offers a wide range of evaluation and demonstration products. Usually these kits are in the form of populated printed circuit boards, including where relevant, software. Images of the product are published on the relevant IC overview pages of this guide.
Further in-depth information on each individual 'kit' can be found on the CML Microcircuits website (www.cmlmicro.com).

Integrated Circuit Evaluation and Demonstration Kits

DE6491	CMX649 Wireless Voice Link Demonstration Kit
EV6180	CMX608 and CMX618 Evaluation Kit
DE6181	CMX618 and CMX7141 Digital PMR/LMR Demonstration Kit
EV6380	CMX638 Evaluation Kit
DE70321	AIS Technology Demonstration Kit - Additional downloadable design resources are available from the CML website
EV8500	CMX850 Evaluation Kit
EV8600	CMX865A, CMX867A and CMX868A Evaluation Kit
HB865A	DIL Header Board for CMX865A
DE8661	CMX866 Demonstration Kit, DAA Reference Diagram and 'Socket-type' Modem
DE8681	CMX865A, CMX867A and CMX868A Demonstration Kit, 'Socket-type' Modem and DAA Reference Diagram
DE8691	CMX869B Demonstration Board and 'Socket-type' Modem
DE8781	CMX878 Demonstration Kit
EV8810	CMX881, CMX882 and CMX883 Evaluation Kit
EV9000	CMX909B, FX/MX919B, FX/MX929B and CMX969 Evaluation Kit
EV9100	CMX910 Evaluation Kit
EV9810	CMX981 Evaluation Kit
EV9900A	CMX990 Evaluation Kit
EV9902	CMX990 Evaluation Kit with Interface and GUI for EV9900A
EV9910	CMX991 and CMX992 Evaluation Kit
EV9980	CMX998 Evaluation Kit
PE0001	Evaluation Kit Interface Card
PE0002	Evaluation Kit Interface Card *PE0001 and PE0002 cards provide a global interface system for use with evaluation kits for CML's* new generation ICs
PE0201	CMX703x Series Evaluation Kit
PE0401	CMX704x Series Evaluation Kit

Product Search by Application

		Wireless Comms																			Wireline Comms												
Page Numbers		RF	PA Linearisation	Digital PMR/LMR	Wireless Data	Analogue TWR	Amateur Radio	Leisure Radio	NWR/NOAA/SAME	Trunked Radio	Marine AIS	Marine VHF	Ardis/Motient	CDPD	MDC4800	Mobitex	RD-LAP	Voice Storage	Voice Scramblers	Paging	Cordless Phone	Auto Meter Reading	Telemetry	Alarm/Monitoring	EPOS	WLL/FWT/FWP	Least Cost Routing	Set Top Box	Feature Phone	Payphone	Pair Gain	PBX/PABX	ISDN
102	**FX/MX019**					●	●	●		●	●	●									●			●					●	●		●	
103	**FX/MX029**					●	●	●		●	●	●									●			●					●	●		●	
32	**FX/MX128**					●		●											●		●								●				
33	**CMX138**					●		●											●														
34	**FX214/224**					●													●														
35	**CMX264**					●		●											●		●								●				
36	**FX/MX465**					●		●																									
52	**CMX469A**				●	●				●		●										●	●	●	●								
53	**CMX589A**				●		●			●	●		●	●	●	●						●	●	●	●	●							
104	**CMX602B**																					●		●					●	●		●	
88	**FX/MX604**						●				●	●											●	●									
105	**CMX605**																								●				●	●	●	●	●
70	**CMX608/618/638**			●														●	●														
106	**CMX612**																				●	●							●	●		●	
89	**FX/MX614**						●																										
71	**FX/MX619**			●		●																											
72	**MX629**			●		●																											
107	**CMX631A**																												●	●	●	●	
90	**CMX635**																												●	●		●	●
73	**CMX639**			●		●												●			●				●								
108	**CMX641A**																														●	●	
74	**CMX649**			●		●												●	●		●												
91	**CMX654**						●																										
109	**CMX661**																							●						●	●	●	
110	**CMX673**																					●		●	●								
111	**CMX683**																					●		●	●				●	●	●	●	
37	**CMX7031**			●	●	●	●	●	●	●		●							●	●													
64	**CMX7032**										●	●																					
37	**CMX7041**			●	●	●	●	●	●	●		●							●	●													
65	**CMX7042**										●	●																					
47	**CMX7141**			●																													
54	**CMX7143**				●																		●	●	●	●							
39	**CMX823**						●													●													
40	**CMX838**					●		●																									
80	**CMX850**																					●	●	●	●				●	●		●	
92	**CMX860**																					●	●	●		●	●	●	●	●		●	
93	**CMX865A**																					●	●	●		●	●	●	●	●		●	
94	**CMX866**																						●					●	●	●		●	
95	**CMX867A**																					●	●		●		●	●	●	●		●	
96	**CMX868A**																					●	●		●		●	●	●	●		●	
97	**CMX869B**																					●	●		●		●	●	●	●		●	
98	**CMX878**																					●	●	●			●	●	●	●			
41	**CMX881**					●				●										●													
41	**CMX882**					●		●											●														
41	**CMX883**							●											●														
56	**CMX909B**				●	●							●		●	●							●		●	●							
67	**CMX910**										●	●																					
57	**FX/MX919B**				●	●				●			●											●		●	●						
58	**FX/MX929B**				●								●				●							●									
59	**CMX969**												●		●		●							●		●							
48	**CMX980A**			●	●					●																							
49	**CMX981**		●		●					●																							
60	**CMX989**													●																			
26	**CMX990**	●	●		●		●									●						●	●		●								
27	**CMX991/992**	●		●	●	●				●						●							●										
29	**CMX998**	●	●				●			●																							

Product Search by Function

		Wireless Comms																			Wireline Comms																	
Page Numbers		CTCSS/DCS	Selcall	DSC	XTCSS	Baseband Processing	FFSK/MSK	4-Level FSK	GMSK	Pi/4 DQPSK	C4FM	RF Synthesiser	Cartesian Loop	CVSD/ADM	Audio Scrambling	Tone Detectors	Tone Generators	DTMF	Vocoder	Aux ADCs/DACs	Aux Synth Clocks	Digital Amplifiers	Voice Detector	V.32 bis/V.32	V.22 bis	V.22/Bell 212A	V.23/Bell 202	V.21/Bell 103	CLI/CIDCW	VMWI	PCM Codec	SPM	Call Progress	Line-Powered	Embedded µC
102	**FX/MX019**																					●													
103	**FX/MX029**																					●													
32	**FX/MX128**														●																				
33	**CMX138**	●				●									●	●	●			●	●														
34	**FX214/224**														●																				
35	**CMX264**														●																				
36	**FX/MX465**	●																																	
52	**CMX469A**						●																												
53	**CMX589A**								●																										
104	**CMX602B**																										●		●						
88	**FX/MX604**			●																							●								
105	**CMX605**															●	●	●				●					●		●				●		
70	**CMX608/618/638**																		●																
106	**CMX612**																										●		●	●					
89	**FX/MX614**																										●								
71	**FX/MX619**													●																					
72	**MX629**													●																					
107	**CMX631A**															●	●															●			
90	**CMX635**															●	●	●				●					●		●		●	●	●		
73	**CMX639**													●					●																
108	**CMX641A**															●	●															●			
74	**CMX649**													●								●	●								●				
91	**CMX654**																																		
109	**CMX661**																															●			
110	**CMX673**															●																	●		
111	**CMX683**															●							●										●		
37	**CMX7031**	●	●		●	●	●	●			●	●			●	●	●	●		●	●	●												
64	**CMX7032**			●					●			●								●	●	●													
37	**CMX7041**	●	●		●	●	●	●			●				●	●	●	●		●	●	●												
65	**CMX7042**			●					●											●	●	●													
47	**CMX7141**							●											●	●	●	●													
54	**CMX7143**							●	●											●	●														
39	**CMX823**		●													●																			
40	**CMX838**	●				●						●				●	●					●													
80	**CMX850**															●	●	●		●		●			●	●	●	●	●				●		●
92	**CMX860**															●	●	●				●					●	●	●				●	●	
93	**CMX865A**															●	●	●				●					●	●	●				●	●	
94	**CMX866**															●	●	●				●			●	●	●	●	●				●		
95	**CMX867A**															●	●	●				●				●	●	●	●				●	●	
96	**CMX868A**															●	●	●				●			●	●	●	●	●				●		
97	**CMX869B**															●	●	●				●		●	●	●	●	●	●				●		
98	**CMX878**															●	●	●				●			●	●	●	●	●				●		
41	**CMX881**	●	●			●	●									●	●	●	●			●													
41	**CMX882**	●			●	●	●								●	●	●	●	●			●													
41	**CMX883**	●			●	●									●	●	●	●	●			●													
56	**CMX909B**								●																										
67	**CMX910**			●					●											●														
57	**FX/MX919B**							●																											
58	**FX/MX929B**							●																											
59	**CMX969**							●	●																										
48	**CMX980A**									●										●		●													
49	**CMX981**					●				●										●		●									●				
60	**CMX989**								●																										
26	**CMX990**								●			●								●															
27	**CMX991/992**											●								●															
29	**CMX998**									●			●																						

Package Styles

Legend

Cerdip
ceramic dual-in-line

CLCC
ceramic leaded chip carrier

DIL
dual-in-line

LQFP
low-profile quad flat pack

PDIP
plastic dual-in-line

PLCC
plastic leaded chip carrier

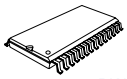
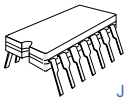
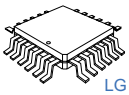
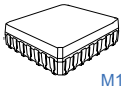
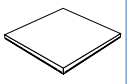
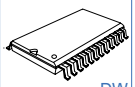
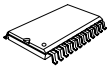
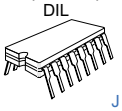
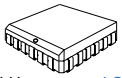
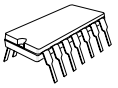
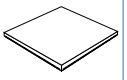
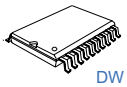
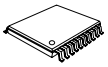
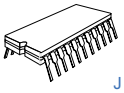
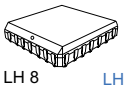
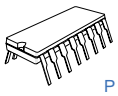
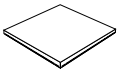
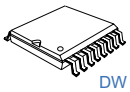
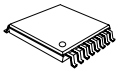
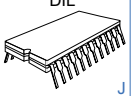
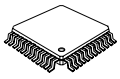
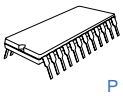
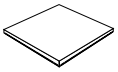
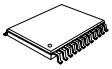
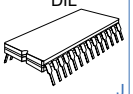
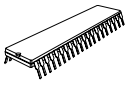
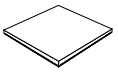
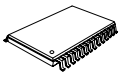
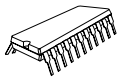
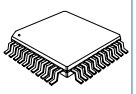
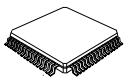
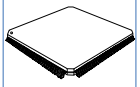
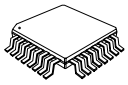
SSOP
shrunk small-outline package

SOIC
small-outline integrated circuit

TQFP
thin quad flat pack

TSSOP
thin shrunk small-outline package

VQFN
very-thin quad flat pack

	D	E	J	L	M	P	Q
1	28-pin SOIC  DW	28-pin TSSOP 	14-pin cerdip DIL  J	24-pin PLCC  LG	28-pin ceramic CLCC  M1	8-pin PDIP  P	64-pin VQFN 
2	24-pin SOIC  DW	24-pin TSSOP  TN	16-pin cerdip DIL  J	24-pin PLCC  LH LS		14-pin PDIP  P	56-pin VQFN 
3	20-pin SOIC  DW	20-pin TSSOP 	22-pin cerdip DIL  J	28-pin PLCC  LH 8 LH		16-pin PDIP  P	48-pin VQFN 
4	16-pin SOIC  DW	16-pin TSSOP 	24-pin cerdip DIL  J	48-pin LQFP 		24-pin PDIP  P	40-pin VQFN 
5	24-pin SSOP  DS		28-pin cerdip DIL  J			40-pin PDIP 	32-pin VQFN 
6	28-pin SSOP 			44-pin PLCC 		22-pin PDIP 	
7				44-pin LQFP 			
8				100-pin LQFP 			
9				64-pin LQFP 			
10				144-pin LQFP 			
11				32-pin TQFP 			

Note: Package illustrations are not to scale

Package Styles - Alternative Suffixes

CML's IC package styles are recognised by the suffixes described on the axes of the table above.
However, some previously published documents refer to these same package styles with other suffixes. Such publications would be pre-1995 CML datasheets and older published product data bulletins. These alternative (older) package suffixes are shown, where appropriate, in the relevant cell of the table.

Nomenclature: For the purposes of this document, the physical IC connection descriptions of 'lead', 'leadless' and 'pin' etc. are represented by the single term of 'pin'. The relevant descriptions are given by the images above.

Packaging for Despatch

The table on the opposite page illustrates the physical appearances of CML's integrated circuit packages (for clarity, suffixes used in older documentation are shown within the relevant cell).

For handling/loading ease and convenience, CML products are packed for despatch in industry-standard bulk or individual packaging as described below:

- Trays and cardboard boxes with conductive foam.
- Pocketed conductive trays for surface-mount microcircuits.
- Antistatic coated tubes, of various sizes, with thumbplugs or pins.
- 13-inch reel Tape-and-Reel packaging which fully conforms to the latest International Electrotechnical Commission (IEC) specification. The conductive embossed tape provides a secure cavity sealed with a peel-back cover tape. Relevant configurations are shown in the table below; no partial reel counts are available.

CML can provide RoHS compliant, lead-free (Pb-free) products. CML's Environmental Policy can be found in the 'Quality' section of the CML website (www.cmlmicro.com).

Note: For the purposes of this document, the physical IC connection descriptions of 'lead', 'leadless' and 'pin' etc. are represented by the single term of 'pin'. The relevant descriptions are given by the images on the previous page.

Suffix	Description	Tube	Tape	Tray
D1	28-pin SOIC	27	1000/1500	
D2	24-pin SOIC	31	1000/1500	
D3	20-pin SOIC	38	1000/1500	
D4	16-pin SOIC	47	1000/1500	
D5	24-pin SSOP	59	1000/1500	
D6	28-pin SSOP	47	1000/1500	
E1	28-pin TSSOP	50	1000/2000/3000	
E2	24-pin TSSOP	62	1000/2000/3000	
E3	20-pin TSSOP	74	1000/2000/3000	
E4	16-pin TSSOP	95	1000/2000/3000	
J1	14-pin cerdip DIL	25		
J2	16-pin cerdip DIL	25		
J3	22-pin cerdip DIL	18		
J4	24-pin cerdip DIL			20
J5	28-pin cerdip DIL			20
L1 (LG)	24-pin PLCC (Gull)		500	50
L2 (LS)	24-pin PLCC (Hook)	45	500	
L3 (LH)	28-pin PLCC (Hook)	39	500	50
L4	48-pin LQFP (Gull)		1000/2000	250
L6	44-pin PLCC (Hook)	27	500	
L7	44-pin LQFP (Gull)		1000	160
L8	100-pin LQFP (Gull)		1000	90
L9	64-pin LQFP (Gull)		1000	160
L10	144-pin LQFP (Gull)		*contact CML*	
L11	32-pin TQFP (Gull)		*contact CML*	
M1	28-pin CLCC (Hook)		500	50
P1	8-pin PDIP	50		
P2	14-pin PDIP	25		
P3	16-pin PDIP	25		
P4	24-pin PDIP	15		
P5				
P6	22-pin PDIP	17		
Q1	64-pin VQFN		1000/2000/3000/3500	*contact CML*
Q2	56-pin VQFN		1000/2000/3000/3500	*contact CML*
Q3	48-pin VQFN		1000/2000/3000/3500	*contact CML*
Q4	40-pin VQFN		1000/2000/3000/3500	*contact CML*
Q5	32-pin VQFN		1000/2000/3000/4000/5000	*contact CML*

Where your packaging requirement is not detailed above, please contact CML Microcircuits or your local distributor or representative. 'Tape and Reel' products are ordered by adding the suffix "T/R" to the part number.

Product Reliability

Design for Reliability

New products are only approved for production after undergoing the CML approved formal design process that has been certified to ISO 9001: 2000.

A design authority is allocated at the conceptual stage of the project. This person is responsible for the technical aspects of the design; both throughout the design stages and during the lifetime of the product.

Design rules automatically check and ensure that IC layouts comply with the appropriate requirements for the design and technology.

Design verification includes automated simulation, design checking, layout checking, evaluation of prototypes and characterisation.

Design reviews are held at critical stages throughout the design. This ensures that all necessary requirements have been met before continuing on to the next stage of the design process.

Manufacture for Reliability

Package manufacturing is carried out at the CML assembly facility certified to ISO 9001: 2000, or by similarly qualified outside sources.

A process owner is allocated to each process used within the CML production life cycle. That person is responsible for all process qualification and approval.

The CML Quality Managers are responsible for ensuring that reliability qualification tests are planned, carried out, and any problems are resolved.

Typical conditions for reliability qualification tests are illustrated below:

Reliability Qualification Test Items and Conditions

	Test Items	Reference Standard
Life Test	Operating Life Test	Mil Std 883G - Method 1005.8
Stress Test	Latch Up	EIJ/JESD78 - March 1997
	ESD	Mil Std 883G - Method 3015.7
Environmental Test	Temperature Cycle[1]	Mil Std 883G - Method 1010.8
	High Temperature Store	Mil Std 883G - Method 1008.2
	Low Temperature Store	EIAJ ED-4701/202
	PCT	JESD22-A102C
	Thermal Shock	Mil Std 883G - Method 1011.9
Mechanical Test	Resistance to Soldering Heat Test	Mil Std 750A - Method 2031
	Solderability	Mil Std 883G - Method 2003.8
	Lead Fatigue	Mil Std 883G - Method 2004.5
	Lead Tension	Mil Std 883G - Method 2004.5
	Marking Permanence	Mil Std 883G - Method 2015.13

Note - Please refer to the CML Microcircuits website (www.cmlmicro.com) quality section for further details.

[1] May be replaced by Thermal Shock.

Distributors and Representatives

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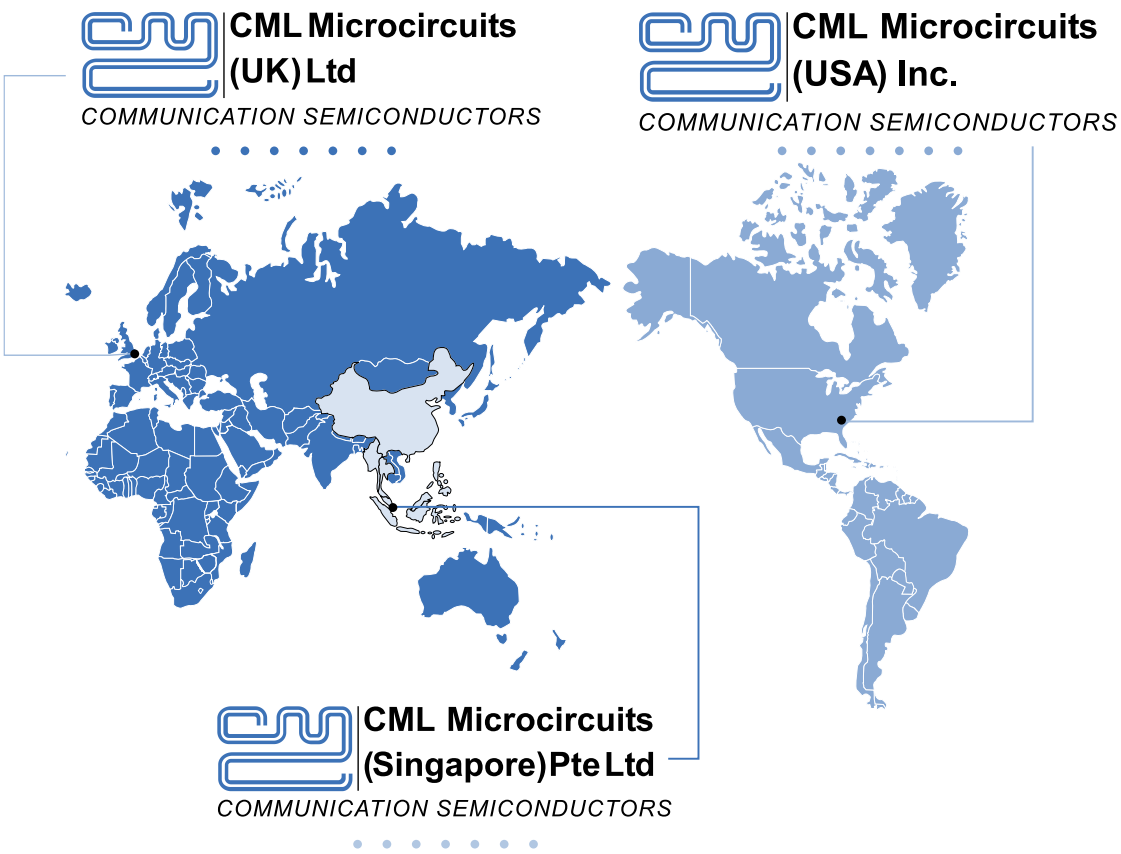
- Location maps for the above offices can be obtained via the 'Company/Contacts' area of the CML Microcircuits website - www.cmlmicro.com

CML Microcircuits
COMMUNICATION SEMICONDUCTORS



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CML Product Overviews

Application Specific Semiconductor Products for Global Communications Systems


RF
Analogue Two-way Radio and Digital PMR/LMR
Wireless Data
Marine AIS
Digital Voice
Custom
Embedded
Wireline Data and Telephony

CML Products

Welcome
To the latest edition of the CML Microcircuits IC Selection Guide. For ease of location, the products detailed in this shortform catalogue are divided into the application sections as described below:

RF
Versatile RF, IF and synthesiser support circuitry for voice and data applications in both the analogue and digital radio fields of operation.

Analogue Two-way Radio
ICs supporting all aspects of voice, data and signalling in analogue PMR, trunked and leisure radio and paging applications. Most functions are available singularly or in comprehensive baseband-processing combinations.

Digital PMR/LMR
ICs covering voice, data and signalling requirements in digital PMR/LMR applications. Features available include voice codecs, high performance filters, external circuit monitoring and air interfaces.

Narrowband Wireless Data
Custom, freeformat and packet data products for use in PMR, trunked and leisure radio and telemetry, AIS and data-transfer applications. Most common data-transfer protocols are addressed at a range of speeds, utilising: FSK, FFSK/MSK, GMSK, pi/4DQPSK and 4-Level FSK schemes.

Marine AIS
Comprehensive baseband processing and data functions for both Class A and Class B marine Automatic Identification System equipments.

Digital Voice
Digitally-coded voice processing products employing Robust Advanced Low Complexity Waveform Interpolation (RALCWI), Continuously Variable Slope Delta Modulation (CVSD) and Adaptive Delta Modulation (ADM) voice-data schemes.

Custom Product Resources
By using both CML's *FirmASIC*® and/or custom IC platforms we offer a complete turnkey service for the design and supply of ASIC devices, supporting all stages of ASIC development, from concept through design, layout, prototype test, debug and supply of production devices.

Embedded Products
The range of embedded products detailed includes the Hyperstone portfolio of memory card controllers and network communication controllers. CML Microcircuits (UK) Ltd is the official distribution partner for Hyperstone products outside of the areas covered directly by Hyperstone in Germany, Taiwan and the USA.

Wireline Data
A comprehensive portfolio of data products operating to a range of ITU 'V' and Bell specifications.
The majority of these versatile products include, on-chip, wireline signalling applications to offer true end-to-end communications.

Wireline Telephony
Voice, signalling and ISDN products for wireline applications. Analogue, digital and mixed-mode (POTS-to-ISDN) products are available singularly or in multi-feature combinations.

RF Products

NOTES

RF Products by Function

	GMSK	pi/4DQPSK	Synthesiser/s	RF Circuits	IF Circuits	Cartesian Loop	Page No.
CMX990 GMSK Packet-data Modem with RF Transceiver	•		•	•	•		26
CMX991 RF Quadrature Transceiver			•	•	•		27
CMX992 RF Quadrature Receiver			•	•	•		28
CMX998 Cartesian Feedback Loop Transmitter						•	29

Relevant Products in Other Sections

CMX7031 Two-way Radio Processor with RF Support	Analogue Two-way Radio Products	37
CMX7032 AIS Baseband Processor with RF Synthesisers	Marine AIS Products	64

Versatile RF, IF and synthesiser support circuitry for voice and data applications in both the analogue and digital radio fields of operation.

RF Products

CMX990 GMSK Packet-data Modem with RF Transceiver

A Single-Chip Synthesised Narrowband Wireless-Modem IC

Features

- Single-Chip RF Transceiver and GMSK Modem
- Versatile Data-Rates: 4kbps to 16kbps
- Selectable BT = 0.3 or 0.5
- IF, RF, Control and Synthesiser Stages
- Full Mobitex Compatibility
- Packet and Freeformat (Raw) Data
- Simple Parallel Interfacing
- Low-Power, Low Profile, Low-cost BOM
- Flexible System Clocks
- Supply Requirement Range: 3.0 to 3.6 V / 2.25 to 2.75 V

Applications

- Narrowband Data Over Radio
- Mobitex Data Terminals
- 400MHz to 1GHz Radio Data Systems
- Radio Modems - Wireless Telemetry - SCADA Terminals
- Suitable for EN 300 113 and FCC CFR 47 Part 90 Applications

A single-chip GMSK packet-data modem and RF transceiver, the CMX990 provides the majority of circuits and functions, including host µC interfaces, to implement a full-feature 'wireless modem' subsystem. The CMX990 can operate in RF ranges of 400MHz to 1GHz at data rates of 4 to 16 kbps and is fully Mobitex compatible.

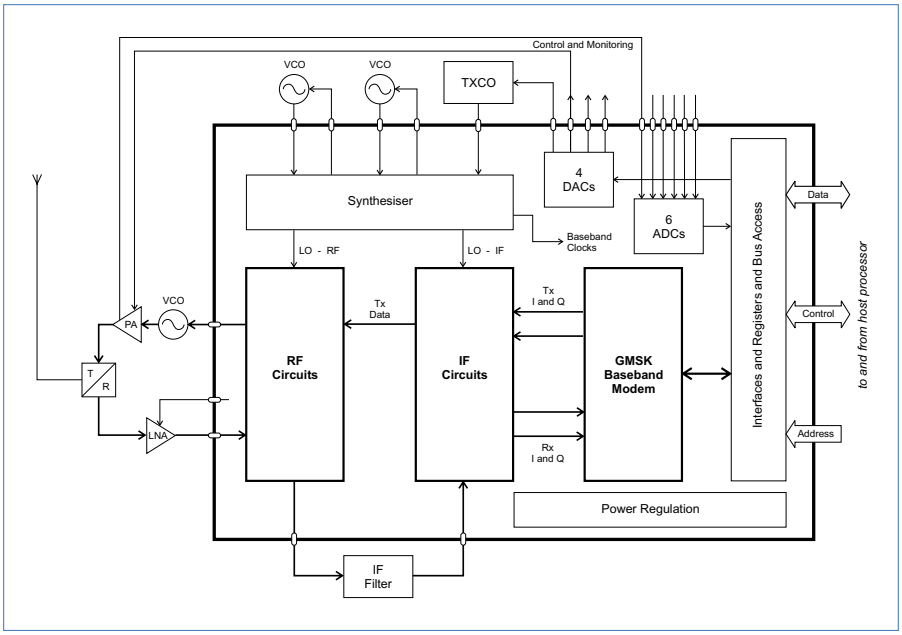
With a minimum of external components and circuits, this half-duplex device provides on-chip: a flexible, formattable GMSK packet and freeformat modem, a dual operation synthesiser fed from an external source, IF and RF stages for both Rx and Tx modes, and auxiliary ADCs and DACs for system control and monitoring.

This versatile GMSK modem is programmable to both packet and freeformat data operations via an efficient task-oriented Rx and Tx format and command structure, which is combined with data scrambling, interleaving and FEC and CRC capabilities. Rx data acquisition, extraction and tracking abilities, allied with Rx data quality feedback, allow the CMX990 to operate seamlessly in varying signal environments.

IF and RF functions in the Tx path handle all the required signal mixing and up-conversion to produce the FM modulation for the final external PA circuitry. In the Rx path these circuits provide initial selectivity and rejection characteristics and mix down the inputs to provide baseband signals for the modem.

Comprehensive internal and external system control and monitoring is provided by the 8-bit host interface registers and the on-chip ADCs and DACs. Requiring a power supply input in the range 3.0 to 3.6 volts, the CMX990 can be used in wireless products designed to comply with such standards as EN 300 113 and FCC CFR 47 Part 90.

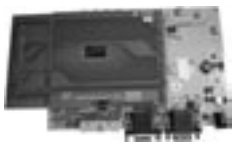
Operating over a temperature range of -40°C to +85°C, the CMX990 consolidates the core radio modem functions to enable a new generation of small, narrowband wireless data modems.



Packages	
CMX990Q1	64-pin VQFN
Operating Temperature	-40 to +85 ˚C

Support

- EV9900A EvKit
- EV9902 General Purpose Evaluation Support



Brief CMX990 Technical Basics

	min	typ	max	
Typical Supply Current at 3.3V				
Tx	-	137	-	mA
Rx	-	148	-	mA
Powersave	-	50	200	µA
Modulation Type		GMSK		
1st Rx Mixer Input Frequency Range	400	-	950	MHz
Rx IF Stage Input Frequency Range	44.0	45.0	46.0	MHz
Tx Offset Mixer Input Frequency Range	400	-	950	MHz
Tx Limiter/Modulator/Phase Detector Input Frequency Range	40.0	-	90.0	MHz
Auxiliary ADC and DAC Resolution		10		Bits

CMX991 RF Quadrature Transceiver

Low Power Transceiver Sub-system

Features

- IF:
  - Mixer with A/B Output Select
  - Input A/B Select
  - LO Synthesiser
  - VCO Negative Resistance Amplifier
- Two-mode Modulator:
  - I/Q Zero IF with Differential Output
  - A and B Mixers to Low IF
  - Demodulator Output OpAmps
- Versatile Architecture
  - I/Q or Low IF (450 or 455 kHz)
- Compatible Rx Functions with CMX998
  Similar LO Archtecture
  Compatible Register Set
- Tx:
  - I/Q Modulator to IF
  - Image-reject Up-converter
  - IF or RF Output
- C-BUS Serial Control/Data Interface
- Supply Requirement Range:
  3.0 to 3.6 V

Applications

- Analogue/Digital Multi-mode Radio
- Software Defined Radio (SDR)
- TETRA, APCO P25: Phase 1 and 2, TDMA
- Automatic Identification Systems (AIS)

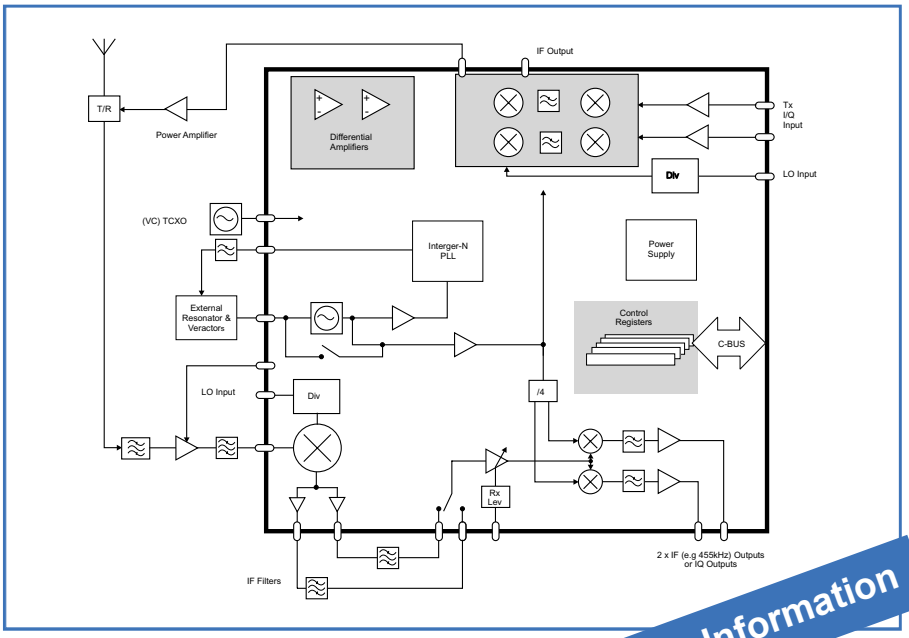
The CMX991 is a single-chip, high performance, RF transceiver that provides the majority of functions to implement a transceiver subsystem. It operates from 100MHz to 1GHz and its I/Q architecture supports multiple modulation types and bandwidths with a single radio design.

The Tx path includes an I/Q modulator to accurately generate modulation at the IF frequency, which may then be translated to the final RF frequency by an integrated image-reject up-converter system. The I/Q modulator IF output is also made available for conversion to RF external circuits, if required.

The Rx path includes an integrated 1st RF mixer having two outputs to support two external 1st IF filter choices, then an integrated 2:1 filtered 1st IF input mux followed by VGA and wideband RSSI functions to support AGC implementation. The 1st IF signal is then either I/Q demodulated to zero IF or mixed to a Low IF output.

The CMX991 provides differential and single-ended Rx output options and differential amplifers for flexible signal conditioning.

The CMX991 includes the core RF and IF functions of a high performance transceiver and can be used in a wide range of narrowband and wideband wireless products including multi-mode analogue/digital terminals.

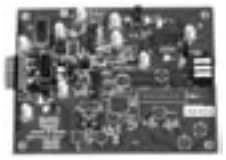


Advance Information

Packages	
CMX991Q3	48-pin VQFN
Operating Temperature	-40 to +85 ˚C

Support

- EV9910 EvKit
- PE0001 EvKit Interface Card



RF Products

CMX992 RF Quadrature Receiver

High Performance 100MHz to 1GHz RF Reception

Features

- 1st IF:
  - Mixer with A/B Output Select
  - Input A/B Select
  - Input VGA Supports AGC
  - IF Signal Level Indicator
- IF:
  - LO Synthesiser
  - VCO Negative Resistance Amplifier
- Two-mode Demodulator
  - I/Q Zero IF with Differential Output
  - A and B Mixers to Low IF
  - Demodulator Output OpAmps
- Versatile Architecture
  - I/Q or Low IF (450 or 455 kHz)
- Compatible Rx Functions with CMX998
  - Similar LO Archtecture
  - Compatible Register Set
- C-BUS Serial Control/Data Interface
- Supply Requirement Range: 3.0 to 3.6 V

Applications

- Analogue/Digital Multi-mode Radio
- Software Defined Radio (SDR)
- TETRA, APCO P25: Phase 1 and 2, TDMA
- Automatic Identification Systems (AIS)

The CMX992 is a single-chip, high performance, RF Receiver that provides the majority of functions to implement a receiver subsystem. It operates from 100MHz to 1GHz and its I/Q architecture supports multiple modulation types and bandwidths with a single radio design.

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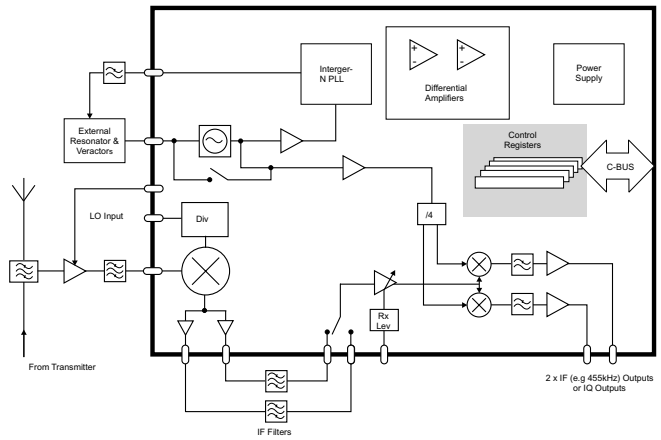
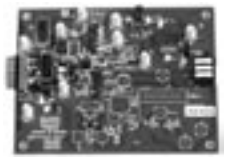


Packages	
CMX992Q3	48-pin VQFN
Operating Temperature	-40 to +85 ˚C

Support

- EV9910 EvKit
- EV9810 EvKit
- PE0001 EvKit Interface Card



Brief CMX992 Technical Basics

	min	typ	max	
Rx 1st Mixer Gain	-	10.0	-	dBV/V
IF Amplifier and I/Q Demodulator Gain	-	40.0	-	dBV/V
I/Q Filters' Gain	-	6.0	-	dBV/V
Differential Amplifier Gain Bandwidth Product	11.0	14.0	-	MHz

CMX998 Cartesian Feed-back Loop Transmitter Array

Improved Efficiency and Linearity for Transmitters in Non-Constant Envelope Modulation Systems

Features

- Frequency Range: 100MHz to 1GHz
- Wide Band Noise: -145dBc/Hz
- C-BUS (SPI Compatible) Serial Interface
- Gain Control
- Error Amplifier
- Up-converter Forward Path
- Down-converter for Feedback Linearisation
- 360° Loop Phase Shift Control
- DC Offset Measurement Output
- Open Loop Function
- Instability Detector
- Supply Requirement Range: 3.0 to 3.6 V

Applications

- TETRA Terminals (up-to 3W)
- TETRA 2 Terminals
- APCO P25 Phase 2
- Aviation Systems
- Mobile Satellite Terminals
- Linear Modulation Schemes: QPSK, pi/4-DQPSK, 8PSK, QAM, OFDM, F4FM
- Direct Interface to CMX981 and CMX980A

A Cartesian Loop improves the efficiency and linearity of transmitters for non-constant envelope modulation systems.

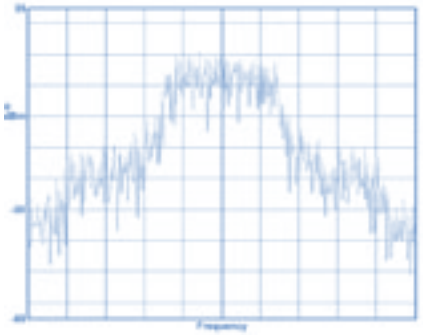
The CMX998 is an integrated solution for a Cartesian Feedback Loop (CFBL) based linear transmitter. Acting as a direct conversion quadrature mixer from I and Q to RF output, it provides the capability to linearise the power amplifier (PA) via feedback from the PA's output.

Included on-chip are forward and feedback paths; local oscillator circuitry including loop phase control; an instability detector and uncommitted op-amps for input signal conditioning.

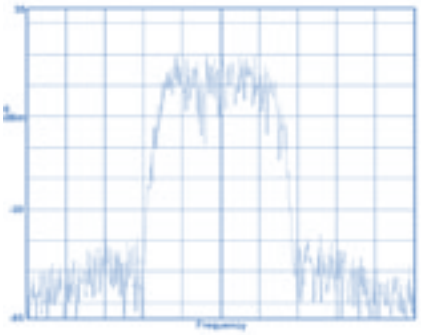
The device operates from a single 3.3V supply over a temperature range of -40°C to +85°C and is available in a 64-pin VQFN (Q1) package.

CMX998 Performance

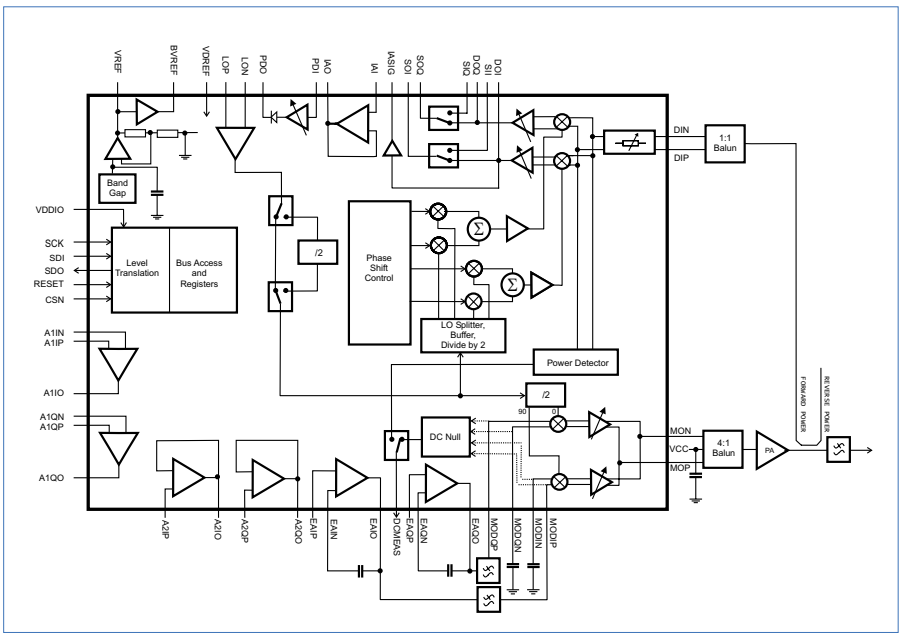
Tx output spectrum in open loop and CMX998 closed loop operation



Open loop (no linearization) gives poor performance



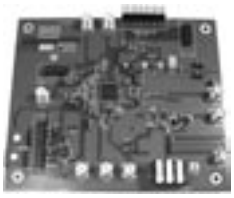
Closed loop (CMX998 linearization) gives much improved performance



Packages	
CMX998Q1	64-pin VQFN
Operating Temperature	-40 to +85 ˚C

Support

- EV9980 EvKit
- PE0001 EvKit Interface Card



Brief CMX998 Technical Basics

	min	typ	max	
Operating Current	-	135	160	mA
Powersave	-	-	10.0	µA
Operating Frequency Range		100 to 1000		MHz
Local Oscillator Frequency Range		200 to 2000		MHz
Forward Power				
Max. (PEP) Output Power	-3	-	3	dBm
Feedback Path Max.(PEP) Input Power	-22	-	7	dBm

Analogue Two-way Radio Products

NOTES

Analogue Two-way Radio by Function

	Audio Scrambler	Tone Detector	Tone Generator	DTMF	CVSD/ADM	PCM Codec	Selcall	XTCSS	CTCSS/DCS	Baseband Processing	4-Level FSK	FFSK/MSK	C4FM	Data Packeting	RF Synthesiser	Synthesised Aux Clock	Aux ADC	Aux DAC	Digitally Controlled Amp	Cartesian Loop	Page No.
FX/MX128 Audio Band Scrambler	•																				32
CMX138 Audio Scrambler and Sub-audio Signalling Processor	•								•	•							•	•			33
FX214/FX224 Variable Split-band Audio Scrambler	•																				34
CMX264 Frequency Domain Split-band Scrambler	•																				35
FX/MX465 Extended-code CTCSS Encoder/Decoder									•												36
CMX7031 Two-way Radio Processor with RF Support																					37
CMX7041 Two-way Radio Processor																					37
7031/7041FI-1.x Two-way Radio Processor		•	•	•			•	•	•	•		•		•	•	•	•	•	•		
7031/7041FI-2.x 4-Level FSK Modem											•			•	•	•	•	•	•		
7031/7041FI-3.x C4FM Modem													•	•	•	•	•	•	•		
CMX823 Programmable Paging-tone Decoder		•					•														39
CMX838 FRS, PMRS446 and GMRS 'Family Radio' Processor							•		•	•					•						40
CMX881 Baseband Processor for PMR and Trunked Radios	•	•	•				•	•	•	•		•					•		•		41
CMX882 Baseband Processor with GPS Data Transport for FRS, MURS and GMRS 'Leisure' Radios																	•		•		41
CMX883 Baseband Processor with GPS Data Transport for FRS, MURS and GMRS 'Leisure' Radios	•	•					•	•	•	•							•		•		41

ICs supporting all aspects of voice, data and signalling in analogue PMR, Trunked and Leisure radio and Paging applications. Most functions are available singularly or in comprehensive baseband-processing combinations.

Analogue Two-way Radio Products

FX128 Audio Band Scrambler
MX128 *High Quality Voiceband Scrambling*

Features
- Full Duplex Frequency Inversion Scrambling
- Separate Rx and Tx Paths
- On-Chip Bandpass and Lowpass Audio Filters
- High Quality Audio Output
- Carrier Rejection >55dB
- Selectable Xtal/Clock Frequency *10.24MHz or 3.58/3.6864 MHz*
- Supply Requirement Range: 3.0 to 5.5 V

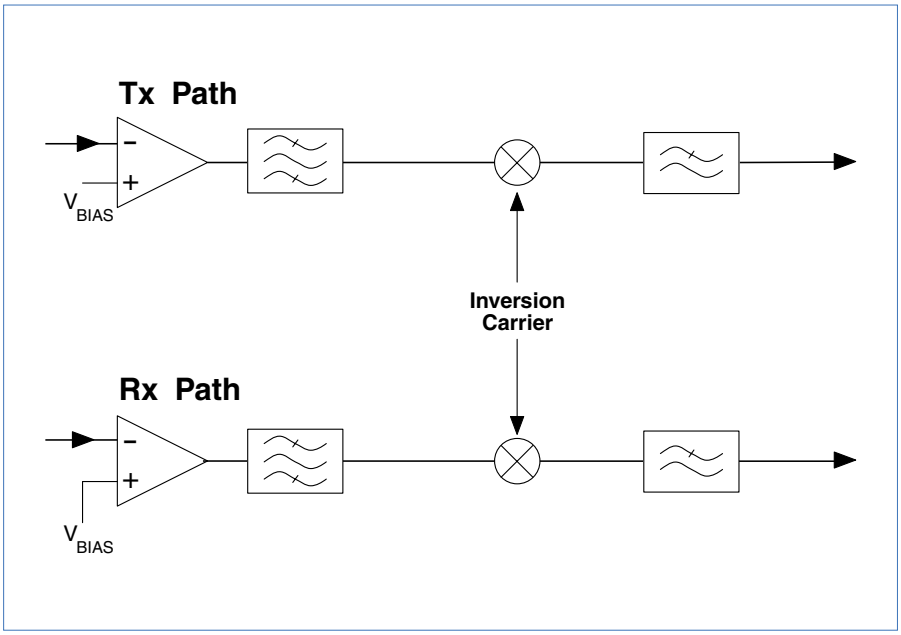
Applications
- Cordless Telephones
- Leisure Radio (FRS, GMRS, MURS and PMR446)
- Two-Way Radio
- Wireless PABX
- Base and Portable Comms Systems

The FX/MX128 is a full-duplex frequency-inversion scrambler IC designed to provide secure conversations over audio systems, including cordless telephones.

The separate Rx and Tx audio paths each consist of the following:
- A switched-capacitor balanced modulator with high baseband and carrier rejection
- A 3.3kHz inversion carrier (injection tone)
- A 3.1kHz lowpass filter
- Input op-amps with externally adjustable gain

The FX/MX128 uses mixed signal CMOS switched-capacitor filter technology and operates from a single supply in the range of 3.0 to 5.5 volts.

The inversion carrier's frequency and filter switching clock are generated on-chip using an external 10.24MHz or 3.58/3.6864 MHz crystal or clock input (selectable).



Packages		
FX128E4		16-pin TSSOP
MX128E4		16-pin TSSOP
FX128D4		16-pin SOIC
MX128DW	(D4)	16-pin SOIC
FX128P3		16-pin PDIP
MX128P	(P3)	16-pin PDIP
Operating Temperature		-40 to +85 ˚C

Brief FX/MX128 Technical Basics

	min	typ	max	
Typical Supply Current at 3.3V	-	2.0	-	mA
Analogue Signal Input Levels	-16.0	-	3.0	dB
Clear Mode Response				
Passband (-3dB) Cut-Off - Low Frequency	-	-	300	Hz
Passband (-3dB) Cut-Off - High Frequency	3000	-	-	Hz
Invert Mode Combined Rx and Tx Response				
Passband (-3dB) Cut-Off Frequencies				
Low	-	-	400	Hz
High	2800	-	-	Hz

CMX138 Audio Scrambler and Sub-audio Signalling Processor

- Built on FirmASIC® Technology -

High Quality Voiceband Scrambling

Features

- Programmable Audio Scrambler
- Concurrent Audio and Signalling Operations
- Full Audio-band Processing:
  - Pre and De-emphasis
  - Companding
  - Scrambling
  - Selectable 2.55/3.0 kHz Filters
- Selectable Audio Processing Order
- Sub-audio Signalling: CTCSS, DCS
- Auxiliary ADC and DAC Services
- C-BUS Serial Control/Data Interface to Host µC
- 2 x Analogue Inputs (Mic. or Disc.)
- Tx Output for Single-point Modulation
- Auxiliary System Clock Output
- Supply Requirement Range: 3.0 to 3.6 V

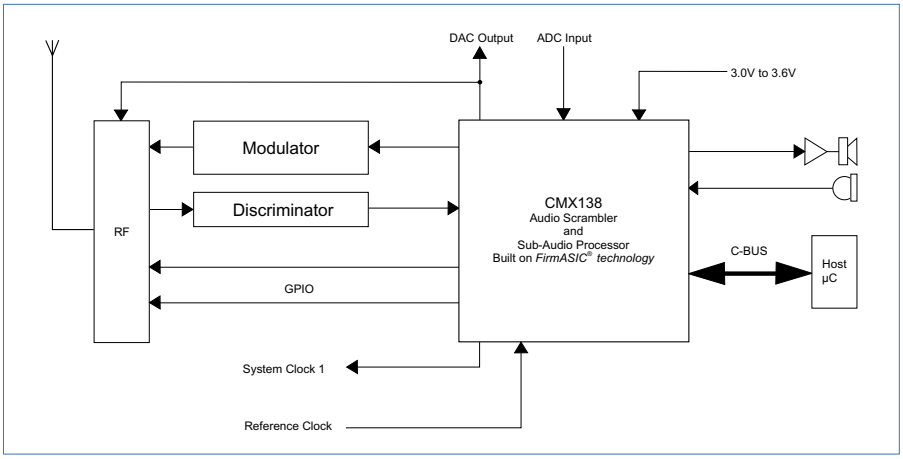
Applications

- Analogue Radio Systems: FRS, MURS, PMR446 and GMRS

The CMX138 is a half-duplex, audio scrambler and sub-audio signalling processor IC for analogue two-way radio applications. This makes it a suitable device for the leisure radio markets (FRS, MURS, PMR446 and GMRS).

This device provides a user programmable frequency inversion audio scrambler, companding and pre/de-emphasis – performing simultaneous processing of sub-audio and in-band signalling.

Other features include an Auxiliary ADC channel and an Auxiliary DAC interface (with optional RAMDAC to facilitate transmitter power ramping).



Packages	
CMX138E1	28-pin TSSOP
Operating Temperature	-40 to +85 ˚C

Brief CMX138 Technical Basics

	min	typ	max	
Typical Supply Current (A and D) at 3.3V				
Idle	-	1.0	-	mA
Rx	-	7.0	-	mA
Tx	-	8.5	-	mA
Powersaved	-	35	120	µA
Mic. and Disc Programmable Input Gain (at 0dB)	-0.5	-	0.5	dB
Modulator Attenuator (at 0dB)	-1.0	-	1.0	dB
Audio Attenuator (at 0dB)	-1.0	-	1.0	dB
Auxiliary ADC and DAC Resolution		10		Bits
CTCSS (Tx/Rx) Frequency Range		60 to 260		Hz
In-band Tone (Tx/Rx) Frequency Range		288 to 3000		Hz
DCS Encoder Bit Rate	-	134.4	-	bps
Audio Scrambler				
Inversion Frequency	2632	3300	3496	Hz
Passband (3300Hz inversion frequency)		300 to 3000		Hz

Analogue Two-way Radio Products

FX214 Variable Split-band Audio Scrambler
FX224 *VSB Scrambling with High Recovered Audio Quality*

Features

- Variable Split-band (VSB) Frequency Inversion Voice Scrambler
- 32 Programmable Split Frequencies
- CTCSS High-pass Filter
- High Recovered Audio Quality
- Half-duplex Switching
- Serial and Parallel Load Options:
  FX214: Serial
  FX224: Parallel
- Supply Requirement Range:
  4.5 to 5.5 V

Applications

- Mobile and Cellular Radio
- Fixed or Rolling Code Speech Scramblers

The FX214 and FX224 are low-power CMOS LSI devices designed as Variable Split-band (VSB) Voice Scramblers.

Each device uses separate Rx and Tx paths which are switched for half-duplex operation. To prevent interference from sub-audio products, an on-chip Continuous Tone Controlled Squelch System (CTCSS) highpass filter is automatically switched to the input in Rx and to the output in Tx.

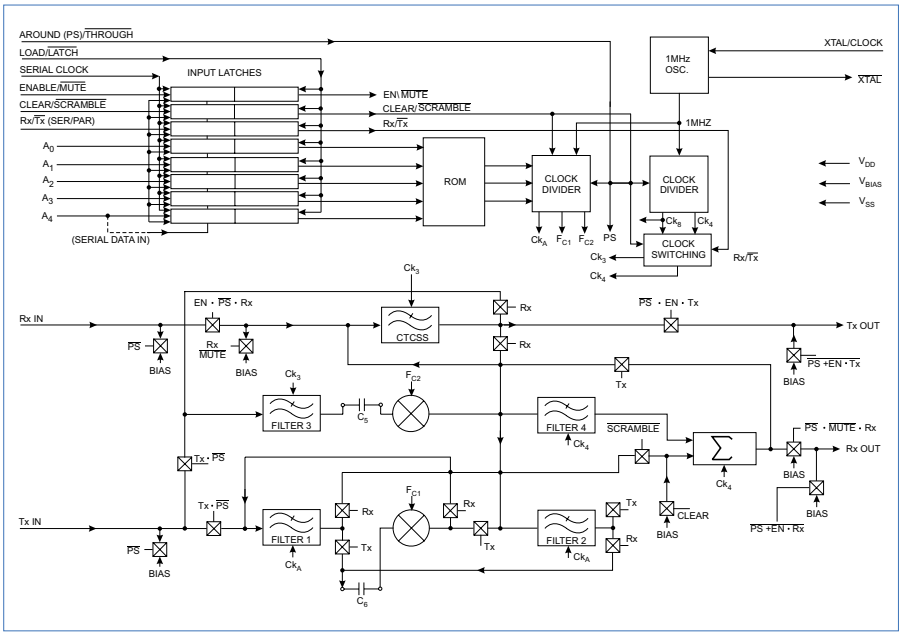
Scrambling is achieved by splitting the input voice frequencies into upper and lower frequency bands using switched capacitor filters, modulating each band with selected carrier frequencies to 'frequency invert' the bands and then summing the output.

A total of 32 different split-point and carrier frequency combinations are externally programmable using a 5-bit code; this code can be either fixed or varying (rolling) for greater security.

'Sync/ Speech Mute', 'Powersave', 'Clear' and 'Audio-Bypass' facilities are controlled via external commands. Timing and filter clocks are derived internally from an on-chip oscillator requiring only a single external 1MHz Xtal or clock pulse input. This device demonstrates high baseband and carrier frequency rejection with good 'recovered audio' quality.

These ICs are available in serial or parallel command-loading functions:

FX214: Serial
FX224: Parallel



Packages		
FX214J	(J3)	22-pin cerdip DIL
FX214LG	(L1)	24-pin PLCC
FX214LS	(L2)	24-pin PLCC
FX224J	(J4)	24-pin cerdip DIL
FX224LG	(L1)	24-pin PLCC
FX224LS	(L2)	24-pin PLCC
Operating Temperatures		
Plastic		-40 to +85 ˚C
Cerdip		-30 to +85 ˚C

Brief FX214 AND FX224 Technical Basics

	min	typ	max	
Typical Supply Current at 5.0V	-	8.0	-	mA
Powersaved	-	1.2	-	mA
Passband Characteristics				
Clear Mode Gain	-	0	-	dB
Frequency Range		300 to 3400		Hz
Scramble/Descramble				
Rx Gain	-	0	-	dB
Rx Frequency Range (-3dB)		300 to 2700		Hz
Tx Frequency Range (-3dB)		300 to 3400		Hz
CTCSS -3dB Point	-	300	-	Hz

CMX264 Frequency Domain Split-band Scrambler

Versatile Split-band Inversion Scrambling

Features

- Full Duplex Operation
  - Separate Rx and Tx Paths
- High Quality Recovered Audio
- Uses Split-band Inversion
- Fixed or Rolling Code Capabilities
- Simple Serial Interface
- Low Power Requirement with Standby Mode
- Audio Scrambling Demonstration Available from CML Website
- Supply Requirement Range: 2.7 to 3.3 V

Applications

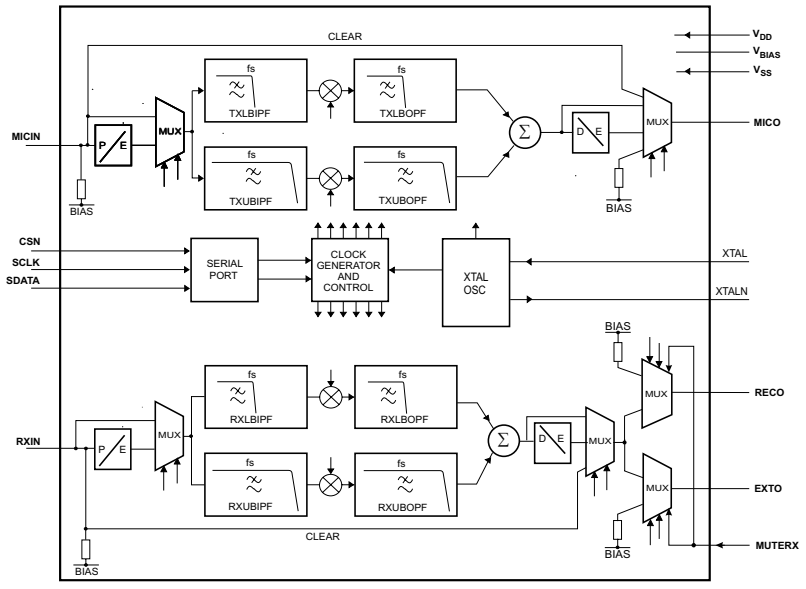
- Mobile Radio
- Fixed and Rolling Code Speech Scramblers

The CMX264 is a frequency domain scrambler. It contains separate Tx and Rx paths for full duplex operation and operates under µProcessor control via a simple serial interface.

In the Tx path, scrambling is achieved by splitting the audio band into two parts (sub-bands) and separately frequency inverting each one. The frequency at which the signal is split, the 'split-point', can be either fixed or rolling between four possible settings resulting in a transmitted audio signal which is unintelligible to eavesdroppers.

Descrambling is achieved by a receive device set to the same split-point as the remote transmitter. Thus, if the Tx and Rx devices are synchronously cycled through the same sequence of split-points, a clear recovered signal will emerge at the output of the receiver.

A 4.433619MHz crystal is used allowing up to four split-points to be programmed.



Packages	
CMX264D5	24-pin SSOP
Operating Temperature	-40 to +85 ˚C

Brief CMX264 Technical Basics

	min	typ	max	
Typical Supply Current at 3.0V	-	3.0	-	mA
Powersave	-	-	300	µA
Audio Input Spectrum				
Lower 3dB Point	-	230	-	Hz
Upper 3dB Point	-	2700	-	Hz
Input Signal Level	-	250	1000	mVrms
Scrambled Audio Out Spectrum				
Lower 3dB Point	-	230	-	Hz
Upper 3dB Point	-	2700	-	Hz
Selectable Split-Points		1966/1482/1276/1027		Hz

Analogue Two-way Radio Products

FX465 Extended-code CTCSS Encoder/Decoder
MX465 *47 Tone Programmable CTCSS*

Features
- 47 Programmable Sub-audio Tones + Notone
- Meets TIA/EIA 603 Specification
- High Voiceband/CTCSS Isolation
- Separate Sub-Audio and Rx/Tx Audio Paths and Filtering
- Serial or Parallel Control
- Supply Requirement Range: 3.3 to 5.0 V

Applications
- Mobile Radio Systems
- Community Base Stations
- 'Low Power Radio' (Japan)
- Sub-Audio Signalling and Selective Calling
- Status and Alarm Systems
- Amateur Radio

The FX/MX465 is a low power, half-duplex predictive Continuous Tone Controlled Squelch System (CTCSS) encoder/decoder microcircuit. The FX/MX465 has integral voice-band filtering for prefiltering of Tx audio and for the rejection of the CTCSS tone in receive mode.

Under µProcessor control, the FX/MX465 will encode and decode any one of 47 sub-audio frequencies (+NOTONE) in the range 67.0Hz to 254.1Hz. Tone frequencies and all functional commands can be loaded to the device in either pin-selectable 8-bit parallel or serial format.

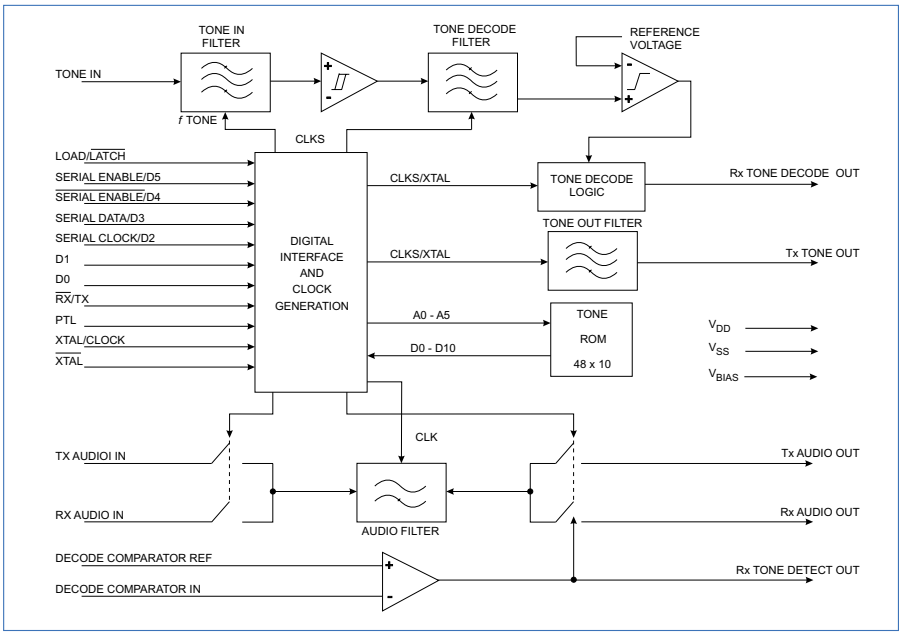
A separate, Rx/Tx voice-audio path is available with a highpass (sub-audio reject) filter automatically placed in the relevant Rx or Tx voice line.

The Rx sub-audio (CTCSS) path contains a (selected tone frequency) bandpass filter and period detector providing a logic level output (Rx Tone Detect) to indicate a successful decode operation.

Rx “Press to Listen” (PTL) and Tx “Squelch-Tail Elimination” functions are available in both command loading modes. The squelch-tail elimination function will provide (Tx tone) phase-reversal to minimise the annoying audio outputs that occur at the receiver on completion of a transmission.

Tone frequencies and filter accuracies are maintained by an on-chip 4.0MHz clock oscillator employing an external crystal or clock pulse input.

The FX/MX465 exhibits high audio and sub-audio performance with low falsing.



Packages		
FX465D5		24-pin SSOP
MX465DS	(D5)	24-pin SSOP
MX465DW	(D2)	24-pin SOIC
MX465J	(J4)	24-pin cerdip DIL
MX465P	(P4)	24-pin PDIP
MX465TN	(E2)	24-pin TSSOP
Operating Temperature		-40 to +85 ˚C

Brief FX/MX465 Technical Basics

	min	typ	max	
Typical Supply Current at 3.3V	-	1.3	-	mA
Decode Input Signal Level Range	-20	-	3.5	dB
Pure Tone Decode Response Time	95.0	-	140	ms
Pure Tone Decode De-response Time	95.0	-	170	ms
Decode Response Time	-	-	250	ms
Decode De-response Time	-	180	250	ms
Encoder Output Level	-1.0	0	1.0	dB
Tx Tone Frequency Error	-0.3	-	0.3	%fo
Audio Filter Lower Cut-Off Frequency	-	300	-	Hz
Stopband Attenuation <250Hz	33.0	36.0	-	dB
Audio Filter Passband Gain at 1kHz	-0.5	0	0.5	dB

CMX7031 Two-way Radio Processor - with RF Support
CMX7041 *Audio, Signalling, Data and Synthesiser Operations*

- Built on FirmASIC® Technology -

Features

- Concurrent Audio/Signalling/Data
- Dual-mode Operation
- Full Audio-band Processing:
  - Pre and De-emphasis, Companding, Scrambling and Selectable Filters
- In-band Signalling: Selcall and DTMF
- Auxiliary ADCs, DACs and System Clocks
- C-BUS Serial Interface to Host µC
- Three Analogue Inputs (Mic or Discriminator)
- Single and Two-point Modulation Output
- Two RF Synthesisers (CMX7031):
- FFSK/MSK Modem with Packet and Freeformat Modes with FEC, CRC, Interleaving and Scrambling
- Sub-audio Signalling: CTCSS, DCS and XTCSS Combo Signalling
- NOAA, WAT Decoder and SAME Demodulation
- Upgrades via Function Image™
- Supply Requirement Range: 3.0 to 3.6 V

Applications

- Professional and Semi-professional:
  - PMR, LMR and Trunked Radio
- Leisure: FRS, GMRS, MURS and PMR446
- Marine UHF, Aviation Comms, Amateur and Weather Radio

The CMX7031 and CMX7041 two-way radio processors enable a revolutionary new platform approach to radio design. They provide a comprehensive feature-set as standard plus a roadmap of function enhancements available through CML's *FirmASIC®* technology. The CMX7031 and CMX7041 are full-function, half-duplex, audio, signalling and data processor ICs. They are suitable for implementation in professional radio (PMR/LMR, Trunking etc.), leisure radio (GMRS, FRS, PMR446, and MURS), Marine VHF, Aviation and Amateur radio products. These products provide concurrent sub-audio band and in-band signalling, complete audio processing and a comprehensive data modem implementation.

The FFSK/MSK data modem provides a freeformat data mode and a robust flexible packet data mode, utilising CRC, FEC, interleaving and scrambling.

The CMX7031 features two on-chip RF synthesisers that can be used for efficient switching of the radio between Rx and Tx operating modes. Additionally, two user programmable system clock outputs are provided and auxiliary ADC and DAC blocks are provided, to enable full control of the radio functions and minimise the overall chip count.

A user-programmable PLL generates all internal clocks and is driven from the Xtal/reference clock input. This supports a wide selection of Xtal/reference clock frequencies and allows one clock source to be internally reused for both baseband and RF synthesiser functions (for CMX7031 only). A flexible power control facility allows the device to maximise power-saving whilst not processing signals or when specific functions are not enabled.

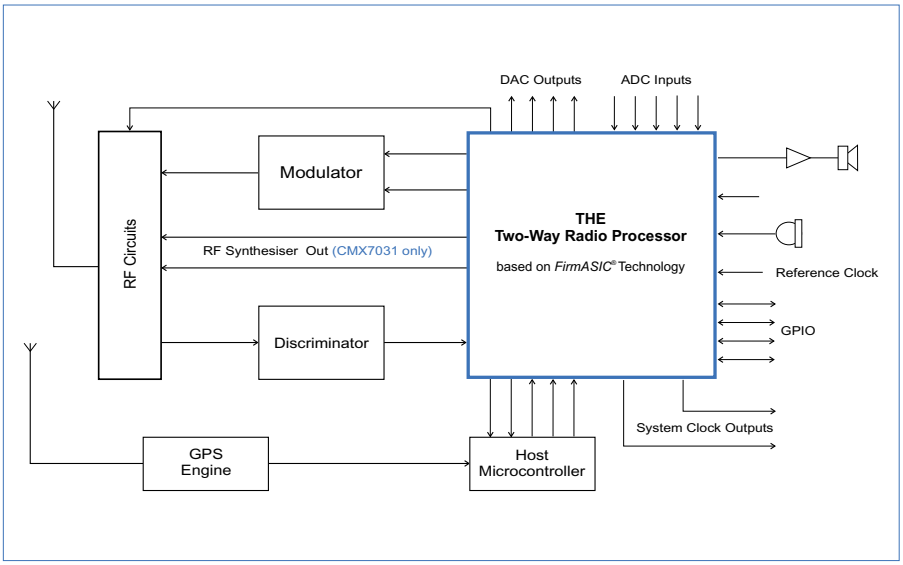
Product Configuration

The overall CMX7031 or CMX7041 product functions and feature-sets are determined by a Function Image™ data file that configures the on-chip internal systems. The Function Image™ can be stored in the host microcontroller's FLASH memory and uploaded to the IC after power-up, or transferred to an EEPROM attached to the IC for automatic uploading of the data file after power-up.

Function Images currently available:

7031/7041FI-1.x	Two-way Radio Processor
7031/7041FI-2.x	4-Level FSK Modem
7031/7041FI-3.x	C4FM Modem

See next page for more details > > > >



Packages	
CMX7031L9	64-pin LQFP
CMX7031Q1	64-pin VQFN
CMX7041L4	48-pin LQFP
CMX7041Q3	48-pin VQFN
Operating Temperature	-40 to +85 ˚C

Support

- PE0201
- PE0401
- PE0001

Brief CMX7031 and CMX7041 Technical Basics

	min	typ	max	
Typical Supply Current at 3.3V				
Rx or Tx (Digital)	-	3.4	-	mA
Rx or Tx (Analogue)	-	1.5	-	mA
Powersave	-	100	-	µA
Additional Current for each RF Synthesiser (CMX7031)	-	2.5	-	mA
Auxiliary DAC and ADC Resolution	-	10	-	Bits
RF Synthesisers - Frequency Range	100		600	MHz
CTCSS Frequency Range	60		260	Hz
In-band Tone Frequency Range	400		3000	Hz
DCS Encoder Bit Rate	-	134.4	-	bps

Analogue Two-way Radio Products

CMX7031 Two-way Radio Processor - with RF Support
CMX7041 *Audio, Signalling, Data and Synthesiser Operations*

> > > > continued from the previous page

The Function Image™ is the key to the CMX7031 and CMX7041 flexibility.
Specific functions of these *FirmASIC®* devices are determined by the uploading of its relevant Function Image™ file during device initialisation. An on-going program exists within CML to provide new function images to supplement and enhance device functions, expanding or modifying end-product features without the need for expensive and time-consuming design changes.

The Function Image™ is a data file that can be stored and handled in one of two ways. It can be stored in the host microcontroller's FLASH memory and uploaded to the IC via C-BUS after power-up. A maximum of 46kbytes of memory must be reserved to accomodate the Function Image™.

Alternatively, to reduce microcontroller overhead, it can be transferred to, and stored in, an EEPROM attached to the device, for automatic uploading after power-up.

The lists below show the relevant Function Image™ details.

7031/7041FI-1.x
Two-way Radio Processor

- Single/dual microphone inputs with input amplifier and programmable gain
- Selectable filtering for 12.5kHz and 25kHz channels
- Selectable:
  - Pre- and de-emphasis
  - Compression and expansion
  - Frequency inversion voice scrambling
  - Audio processing order
- Pre-programmed 51 tone CTCSS encoder/decoder + Tone Clone™ mode
- 120/180 degree CTCSS phase shift generation/detection
- Programmable:
  - 23/240-bit DCS encoder/decoder
  - Selcall generator
  - Audio tone generator (for custom tones)
  - DTMF generator/decoder
- Pre-programmed XTCSS and Inband tone encoder
- 1200/2400 baud MSK/FFSK modem and data packet encoder with interleaving, FEC, CRC and data scrambling
- 1200bps FSK modem for DSC use (to ITU-R M.493-11)
- Single/dual demodulator inputs with input amplifier and programmable gain
- Audio-band and sub-audio rejection filtering
- Software volume control
- Selcall decoder
- NWR SAME and WAT detector

7031/7041FI-2.x
4-Level FSK Modem

- 4-level FSK baseband modulator/ demodulator
- 72-bit Tx and Rx data buffers
- Automatic Preamble and Frame Sync insertion
- Root Raised Cosine (RRC) and Sinc filter
- RAMDAC operation
- Discriminator input with input amplifier and programmable gain
- Automatic Frame Sync detection simplifies host control
- Selectable squelch source
- Hard or soft data options

7031/7041FI-3.x
C4FM Modem

- C4FM baseband modulator/demodulator
- 72-bit Tx and Rx data buffers
- Automatic Preamble and Frame Sync insertion
- Raised Cosine (RC) and Inverse Sinc filter
- RAMDAC operation
- Discriminator input with input amplifier and programmable gain
- Automatic Frame Sync detection simplifies host control
- Selectable squelch source
- Modulation (Sinc) filtering (selectable)
- Hard or soft data options

Common Functions

The functions listed below are common to both the CMX7031 and the CMX7041 Function Image™ Implementations:

- Rx Enable hardware control signal
- Tx Enable hardware control signal
- Two programmable system clock outputs
- Two auxiliary ADCs with four selectable input paths
- Four auxiliary DACs, one with built-in programmable RAMDAC
- Two-point or I/Q modulation outputs
- Two RF synthesiser/PLLs (CMX7031 only)
- Optimised C-BUS (4 wire high speed synchronous serial control/data bus) interface to host
- Two GPIO pins (CMX7041 only)
- EEPROM boot mode
- Selectable squelch source
- Programmable RAMDAC
- EEPROM boot mode
- C-BUS (host) boot mode

Function Image™ files are downloadable from the relevant product area in CML's My CML technical portal on the CML website (www.cmlmicro.com). Authorisation to this portal can be arranged through your local CML contact.

CMX823 Programmable Paging-tone Decoder

Multi-Standard Tone Decoding for Analogue Paging

Features

- Decodes 32 User-programmed Tones
- Stores Two Lists of 32 Tones to 'Fast-switch' Between Tone Sets
- Configurable Decode Response Time and Decode Bandwidths
- Superior Signal-to-Noise Performance
- Low Cost 3.58MHz Xtal/Clock
- Low-power Operation and 'Zero-Power' Powersaving Mode
- Supply Requirement Range: 2.7 to 5.5 V

Applications

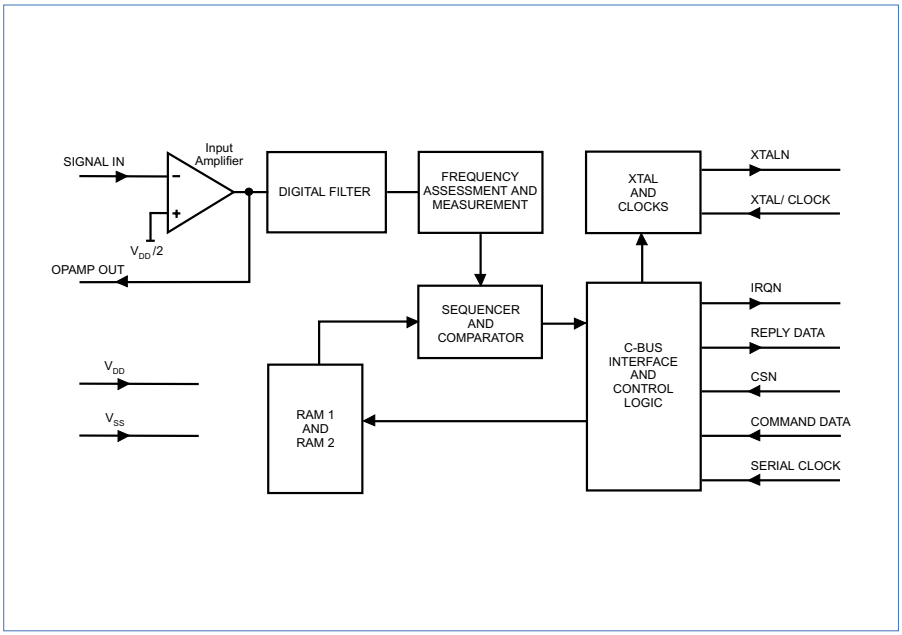
- Two-tone, 5/6 Tone and Voice Pagers
- Selective Calling (Selcall) Systems
- Wireless Local Loop Signalling
- Voice Pager Switching and Signalling
- Revertive Paging Systems
- Audio Tone Signalling Applications

The CMX823 is a high performance, low-power, audio tone decoder that can operate on low S/N signals. Each decoded tone frequency is user-defined to provide the flexibility to operate in a variety of paging, two-way radio and proprietary systems.
Example systems and tones include: Motorola Quick Call series; GE groups A, B and Zetron, Reach and Plectron 2-tone radio paging; Motorola 5/6-tone paging; and the EIA, CCIR, ZVEI1 and EEA tonesets used for HSC radio paging and Selcall.

Up to 32 user-defined decode tone frequencies from 280Hz to 3500Hz are written to an internal RAM-based FIFO. Two separate 32-tone FIFOs are provided and support fast switching between tone sets. Each programmed tone (entry in the list) is user-assigned to one of two (or both) tone groups.

Two-tone sequence decoding is simplified by dynamically enabling one or the other tone groups via a mode selection function.

The CMX823 asserts an interrupt on tone decoding state transitions, e.g. NOTONE-to-decoded tone, decoded tone-to-NOTONE. 'Status' and 'Decoded Tone' parameter registers may then be read to indicate the decoder status, the target tone decoded and its tone group.



Packages	
CMX823E4	16-pin TSSOP
CMX823P3	16-pin PDIP
Operating Temperature	-40 to +85 ˚C

Brief CMX823 Technical Basics

	min	typ	max	
Typical Operating Current at 2.7V	-	0.75	1.5	mA
Powersave (Zero Power)	-	1.0	2.0	µA
Decoder Sensitivity	-	-65	-	dB
Response Time (Slow Measurement Mode)	-	33	49	ms
Deresponse Time (Slow Measurement Mode)	-	79	85	ms
Response Time (Fast Measurement Mode)	-	28	37	ms
Deresponse Time (Fast Measurement Mode)	-	46	65	ms
Frequency Range		280 to 3500		Hz

Analogue Two-way Radio Products

CMX838 FRS/PMR446/GMRS 'Family Radio' Processor

Versatile Sub-Audio Implementation

Features

- Advanced 'Any One of Any' CTCSS Sub-audio 50-tone Processor:
  - Fast Decode Time
  - IRQ on Any/All Valid Tones
  - Fast Scan, Group Calling, Auto-response Tone Select and Tone Cloning Support
- RF Synthesiser
- FRS, PMR446 and GMRS RF Channels
- Configurable Charge-pump
- Audio Call-tone Generator
- Audio Processing:
  - Mic. Amplifier, Pre/De-Emphasis, Limiter, Post Limiter Filtering, Mic, Rx and Tx Digital Gain Controls, Single and Dual Tx Outputs
- C-BUS Serial Control/Data Interface
- Signal Source and External Function Selection
- Supply Requirement Range: 2.7 to 5.5 V

Applications

- Family Radio Service (FRS)
- Pan-European PMR 446; Hand Portable Mobile Radio
- General Mobile Radio Service (GMRS)

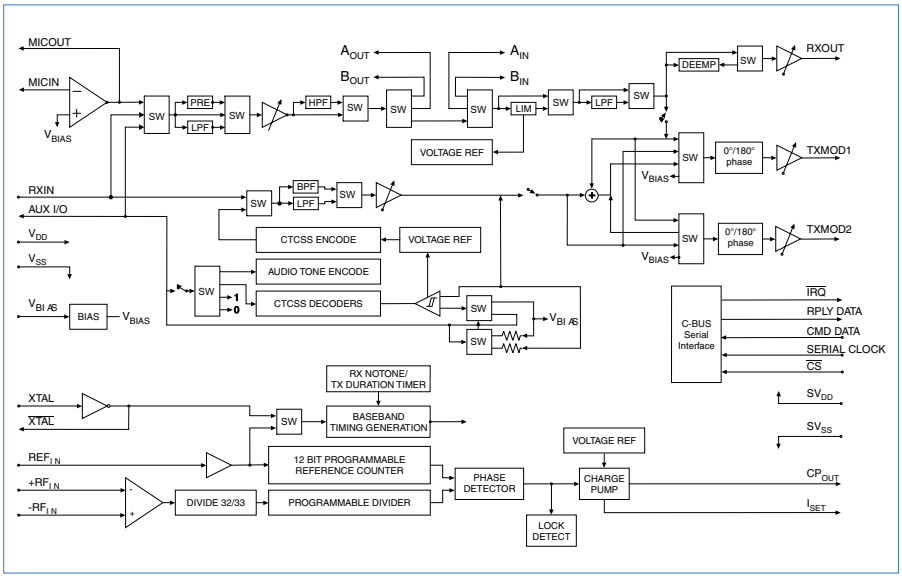
The highly integrated CMX838 'Family Radio' (FRS) Processor includes sub-audio, audio and synthesiser functions to serve as the core engine for low cost, high performance FRS, PMR446 and GMRS radio designs.

Its flexibility supports both simple and advanced multi-channel radios without cost penalties. Integrated Tx voltage reference and baseband clock generation circuits eliminate the need for external components.

The CMX838's features directly support advanced end-product functions such as: group calling, scanning, automatic scanner response tone set-up and tone cloning.

By using the CMX838, one global radio design can support mulitiple standards and markets.

Controlled via a serial interface (C-BUS) the Family Radio Processor operates from a single 2.7 to 5.5 V supply.



Packages	
CMX838D1	28-pin SOIC
CMX838E1	28-pin TSSOP
Operating Temperature	-40 to +85 ˚C

Brief CMX838 Technical Basics

	min	typ	max	
Operating Current at 3.0V				
Rx (CTCSS + Audio + Synth)	-	11.0	15.1	mA
Rx (CTCSS + Audio)	-	2.0	2.4	mA
Tx (CTCSS + Audio + Synth)	-	11.3	15.4	mA
Tx (CTCSS + Audio)	-	2.3	2.7	mA
All Powersaved	-	0.2	0.3	mA
CTCSS				
Frequency Range		60 to 255		Hz
Tone Decoder Sensitivity (Pure Tone)		15.0		mVrms

CMX881 CMX882 CMX883 Baseband Processors for PMR, Trunked and Leisure Radios

Full-Feature Audio Processing, Signalling and Data Family of ICs

Features

- Automatic Signal Scanning with IRQ on Detection of Valid Rx Signals
- Single/Dual Mic. and Demodulator Inputs with Programmable Input Gain
- Selectable 12.5 and 25 kHz Channel Filters
- Pre- and De-emphasis
- Companding
- Frequency Inversion Scrambling (CMX882/CMX883)
- CTCSS and DCS Encoding/Decoding
- DTMF Encoding (CMX881)
- XTCSS Signalling (CMX882/CMX883)
- Inband (Selcall) Tone Encoding/ Decoding
- FFSK/MSK Modems (IC Dependant)
- Single/Two-point Modulation Outputs with Level Adjustment
- Supply Requirement Range: 2.7 to 5.5 V

Applications

- PMR, Trunked and Leisure Radio Systems

The CMX881, CMX882 and CMX883 offer a family of full function, half duplex baseband processors for use in a wide range of two-way radio systems.

Each designed for a specific genre of radio operation, the products offer full voiceband processing including: channel path selection and filtering, pre- and de- emphasis, companding and versatile gain-adjustable input and output stages. In addition, the CMX882 and CMX883 offer selectable frequency inversion scrambling facilities.

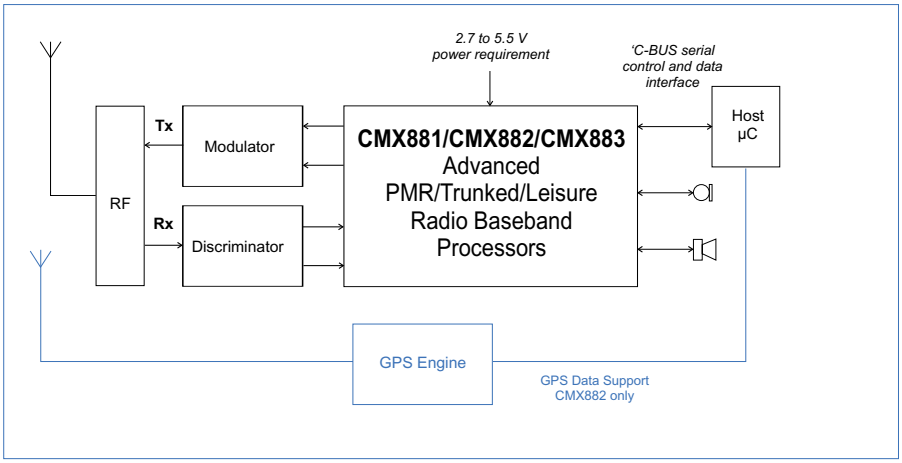
The combination of new and standard signalling functions of these products provide, under software control, increased functionality, versatility and privacy via on-chip inband (Selcall) tone, versatile sub-audio (CTCSS and DCS) generation and detection and the combination signalling features of XTCSS, a system that employs CTCSS and inband signalling concurrently.

System and functional data requirements of the CMX881 and CMX882 are catered for with the provision of integrated FFSK/MSK data modems with freeformat and packet facilities.

In addition, for system support, each product includes an auxiliary ADC circuit for the monitor of external signals or levels.

With their ultra low power requirements and graduated powersave features, these products, in their compact plastic encapsulations, offer a smaller footprint, are easier to design in and require less external components in portable, mobile and base radio systems.

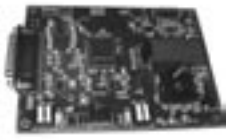
See next page for more details > > > >



Packages	
CMX881D6	28-pin SSOP
CMX881E1	28-pin TSSOP
CMX882D6	28-pin SSOP
CMX882E1	28-pin TSSOP
CMX883D6	28-pin SSOP
CMX883E1	28-pin TSSOP
Operating Temperature	-40 to +85 ˚C

Support

- EV8810 EvKit



Brief CMX881, CMX882 and CMX883 Technical Basics

	min	typ	max	
Operating Current (I_{DD}(A)) at 3.0V	-	1.0	2.0	mA
Powersave	-	2.0	10.0	µA
Operating Current (I_{DD}(D)) at 3.0V	-	4.5	8.0	mA
Powersave	-	2.0	10.0	µA
Rx Signal Type Identification				
- probability of correct type-indentification	-	>99.9	-	%
CTCSS Facility Frequency Range		60 to 260		Hz
DCS Encoder Bit Rate	-	134	-	bps
In-band Tone Facility Frequency Range		400 to 3000		Hz
FFSK/MSK Bit Rates		1200 and 2400		bps

Analogue Two-way Radio Products

CMX881 CMX882 CMX883 Baseband Processors for PMR, Trunked and Leisure Radios

Full-Feature Audio Processing, Signalling and Data

> > > > continued from the previous page

These products, under the control of a host µController, offer a multitude of versatile on-chip functions. The availability of these voice, signalling and data functions on a single chip reduces the need, in an end product radio/system, for individual circuits each requiring its own components, power and control infrastructure.

The columns below detail the individual functions of each IC.

CMX881
For PMR and Trunked Radios

Tx functions

Audio

- Single/dual microphone inputs with input amplifier and programmable gain
- Filtering selectable for 12.5kHz and 25kHz channels
- Selectable pre-emphasis
- Two-point modulation outputs with programmable level

Signalling

- Pre-programmed 39 tone CTCSS encoder
- Programmable 23/24bit DCS encoder
- Programmable audio tone generator (for custom audio tones)
- Programmable Selcall encoder
- DTMF encoder
- 1200/2400 bps MSK modulator

Rx functions

Audio

- Single/dual demodulator inputs with input amplifier and programmable gain
- Voice-band and sub-audio rejection filtering
- Selectable de-emphasis
- Software volume control

Signalling

- 1 from 39 CTCSS decoder + Tone Clone mode
- 23/24 bit DCS decoder
- Programmable Selcall decoder
- 1200/2400 bps MSK demodulator and 16-bit frame sync detector
- Signal Monitor (RSSI/Microphone/Rx channel level monitor)

CMX882
For Leisure Radios

Tx functions

Audio

- Single/dual microphone inputs with input amplifier and programmable gain
- Filtering selectable for 12.5kHz and 25kHz channels
- Selectable pre-emphasis
- Selectable compression
- Selectable frequency inversion voice scrambling
- Two-point modulation outputs with programmable level

Signalling

- Pre-programmed 51 tone CTCSS encoder
- Programmable 23/24 bit DCS encoder
- Programmable audio tone generator (for custom audio tones)
- Pre-programmed XTCSS and in-band tone encoder
- 1200/2400 bps MSK data packet encoder (suitable for text messaging/paging, caller identification, caller location, digital poll of remote radio location, GPS information via NMEA 0183 data transfer), incorporating interleaving, FEC, CRC and data scrambler

Rx functions

Audio

- Single/dual demodulator inputs with input amplifier and programmable gain
- Voice-band and sub-audio rejection filtering
- Selectable de-emphasis
- Selectable expansion
- Selectable frequency inversion voice de-scrambling
- Software volume control

Signalling

- 1 from 51 CTCSS decoder + Tone Clone mode
- 23/24 bit DCS decoder
- Pre-programmed in-band tone decode with XTCSS 4 tone addressing
- 1200/2400 bps MSK data packet decoder with automatic bit rate recognition, 16 bit frame sync detector, error correction, data de-scrambler and packet disassembly
- Signal Monitor (RSSI/Microphone/Rx channel level monitor)

CMX883
For Leisure Radios

Tx functions

Audio

- Single/dual microphone inputs with input amplifier and programmable gain
- Filtering selectable for 12.5kHz and 25kHz channels
- Selectable pre-emphasis
- Selectable compression
- Selectable frequency inversion voice scrambling
- Two-point modulation outputs with programmable level

Signalling

- Pre-programmed 51 tone CTCSS encoder
- Programmable 23/24 bit DCS encoder
- Programmable audio tone generator (for custom audio tones)
- Pre-programmed XTCSS and in-band tone encoder

Rx functions

Audio

- Single/dual demodulator inputs with input amplifier and programmable gain
- Voice-band and sub-audio rejection filtering
- Selectable de-emphasis
- Selectable expansion
- Selectable frequency inversion voice de-scrambling
- Software volume control

Signalling

- 1 from 51 CTCSS decoder + Tone Clone mode
- 23/24 bit DCS decoder
- Pre-programmed in-band tone decode with XTCSS 4 tone addressing
- Signal Monitor (RSSI/Microphone/Rx channel level monitor)

Analogue Two-way Radio Products

Digital PMR/LMR Products

NOTES

Digital PMR/LMR Products by Function

	Baseband Processor	pi/4DQPSK	4-Level FSK	PCM Codec	Vocoder	Aux ADC	Aux DAC	Synthesised Aux Clocks	Digitallly Controlled Amps	Page No.
DE6181 Demonstration Kit for CMX618 and CMX7141	Demonstration for Design									46
CMX7141 Digital PMR Processor										47
7141FI-1.x 4-Level FSK Modem			•			•	•	•	•	
CMX980A Digital Radio Baseband Processor	•	•				•	•			48
CMX981 Advanced Digital Radio Baseband Processor with Voice Codec	•	•				•	•			49
Relevant Products in Other Sections										
CMX608, CMX618 and CMX638 RALCWI Vocoders	Digital Voice Products									70
CMX991 RF Quadrature Transceiver	RF Products									27
CMX992 RF Quadrature Receiver	RF Products									28
CMX998 Cartesian Feed-back Loop Transmitter	RF Products									29

ICs covering voice, data and signalling requirements in digital PMR/LMR applications. Features available include voice codecs, high performance filters, external circuit monitoring and air interfaces.

Digital PMR/LMR Products

DE6181 Demonstration Kit for CMX618 and CMX7141

- Built on FirmASIC® Technology -

Features

- CMX7140[1] and CMX618 Devices On Board
- Function Image™ load from C-BUS or Serial Flash Memory
- Mic., Speaker, Line-out and Tx/Rx Interfaces
- Auxiliary ADC and DAC Interfaces
- C-BUS Serial Interface
- Control by PC via the User's Microcontroller
- Interfaces to RF Daughterboard with all Necessary Signals
- On-Board Power Regulation and Distribution

Applications

- For Demonstration and Design-in of CMX618 with CMX7141

The DE6181 is designed to assist in the evaluation of the CMX7140[1] family of products, when loaded with a Function Image™ (FI) and the CMX618 ICs.

The kit is in the form of a populated PCB comprising CMX7140[1] and CMX618 ICs and appropriate supporting components and circuitry. Function Images™ (FI) for dPMR radio designs and other applications are available from the CML website.

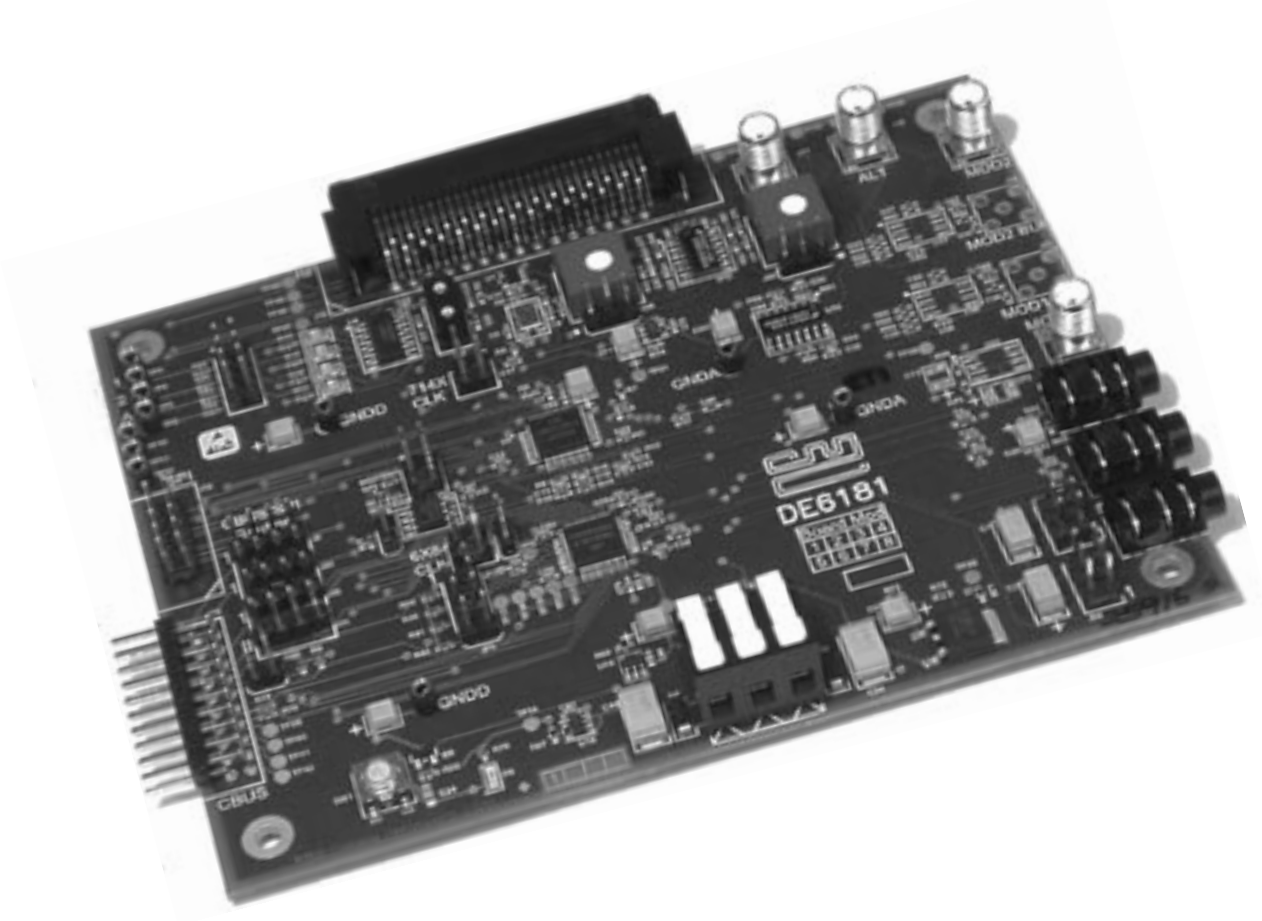
The board is fitted with connectors allowing the DE6181 to be operated with a CML PE0001 Interface Card and associated PC GUI software, or by direct connection between the CMX7140[1] C-BUS serial port and the user's µC development application or emulation system.

The CMX7140[1] Function Image™ (FI) can be loaded, on power-up, directly into the on-board target CMX7140[1] IC using the PE0001 interface or the user's system. Alternatively, it can be pre-loaded, separately, into the on-board Flash EEPROM for automatic operation on power-up. The CMX7140[1] device is specially configured for use on the DE6181 kit and is not available as a production part. It is capable of demonstrating the operation of any CMX714x product.

The DE6181 board also incorporates all the necessary power-supply regulation facilities for operation from a single 5 volt supply, together with a number of board jumpers to enable various circuit arrangements to be effected.

[1] The CMX7140 is a functional emulation IC for use with this DE6181 DemoKit and is not available as a production IC.

[2] This product is currently supplied with the 7141FI-1.x Function Image™ .



CMX7141 Digital PMR Processor

Audio and Data Operations

- Built on FirmASIC® Technology -

Features

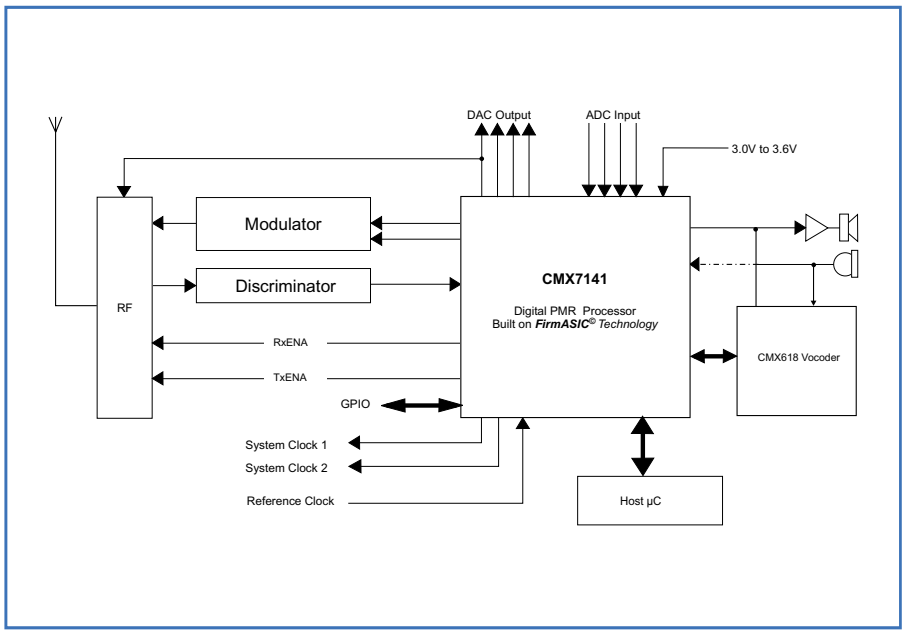
- Digital PMR:
  - dPMR (ETSI TS 102 490) Compliant
  - Air Interface for Physical Layer (1)
  - Air Interface for Data Link (2)
- 4-Level FSK Modem:
  - Data Rates: 4.8 and 9.6 kb/s
  - 'Soft-Decision Decode' Option
  - Automatic Frame Sync Detection (AFSD)
  - Raw Data Mode
- Vocoder Connectivity, Management and Control
- Auxilliary ADCs and DACs
- Auxiliary System Clock Outputs
- Digital PMR Tx Outputs for Two-point and I/Q Modulation
- Supply Requirement Range: 3.0 to 3.6 V

Applications

- Digital PMR/LMR Radios

The CMX7141 (7141FI-1.x) is a half-duplex 4-Level FSK modem suitable for use in dPMR radio designs. In conjunction with a suitable host controller and RF circuits, this provides the digital baseband processing to implement a radio to satisfy the requirements of ETS 102 490 and EN 301 166 or EN 300 113.
When used with the CMX618 or the CMX608 Vocoder, these devices provide a highly integrated baseband solution for dPMR radio designs.
The device utilises CML's proprietary *FirmASIC*® component technology. On-chip sub-systems are configured by a Function Image™: this is a data file that is uploaded during device initialisation and defines the device's function and feature set.
The Function Image™ can be loaded automatically from an external EEPROM or host µController over the built-in C-BUS serial interface.
The device's functions and features may be enhanced by subsequent Function Image™ releases, facilitating in-the-field upgrades.
Other features include two Auxiliary ADCs with four selectable inputs and four auxiliary DAC interfaces with an optional RAMDAC on the first DAC output, to facilitate transmitter power ramping).
Function Images currently available:

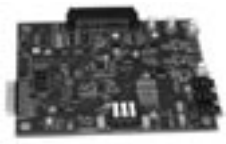
7141FI-1.x	4-Level FSK Modem



Packages	
CMX7141L4	48-pin LQFP
CMX7141Q3	48-pin VQFN
Operating Temperature	-40 to +85 ˚C

Support

- DE6181 - this product is available as a demonstrator with the CMX608 or CMX618
- PE0401



Brief CMX7141 Technical Basics

	min	typ	max	
Supply Current (D/A) at 3.3V				
Powersaved	-	8/4	100/20	µA
Idle	-	1.4/1.6	-	mA
Rx (9600bps search for FS)	-	7.5/1.6	-	mA
Tx (9600bps Two-point)	-	5.2/1.5	-	mA
Tx (9600bps I/Q)	-	7.3/1.5	-	mA
Input Amp Open-loop Voltage Gain	-	80	-	dB
Modulation		4-Level FSK		
Modem Symbol Rate		2400 to 4800		s/sec
Input Stage Gain (in steps)		0 to 22.4		dB
Analogue Output Stage Attenuation (in steps)		0dB to 40		dB

Digital PMR/LMR Products

CMX980A Digital Radio Baseband Processor

Baseband Processing for Digital Radio Systems . . . . . including TETRA

Features

- Root Raised Cosine Filters in both Rx and Tx Paths
- pi/4 DQPSK Modulation
- Two 14-bit Resolution Sigma-Delta DACs
- Two 16-bit Resolution Sigma-Delta ADCs
- Four 10-bit DACs
- Single 4-Input 10-bit ADC
- Transmit Output-power Control
- Economic Power-down Modes
- Supply Requirement Range: 3.0 to 5.5 V

Applications

- Digital Radio Including TErrestrial Trunked RAdio (TETRA) Systems
- RCR-39 Systems (Japan)
- Digital Wireless Local Loop
- SATCOM Terminals
- Terrestrial Flight Telephone Systems
- High Speed Wireless Data Modems
- Mixed-Mode Analogue/Digital Radio Networks

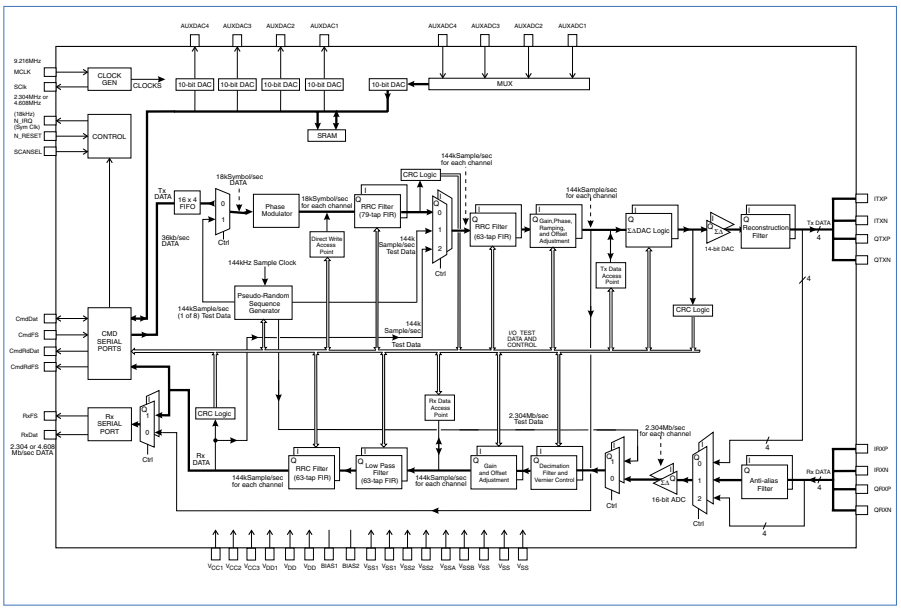
This device is intended to act as an interface between the analogue and digital sections of a digital radio system, and performs many critical and DSP-intensive functions.

The chip is designed with the necessary capability to meet the requirements for use in both mobile and base station applications in TErrestrial Trunked RAdio (TETRA) systems.

The transmit path comprises all the circuitry required to convert digital data into suitably filtered analogue I and Q signals for subsequent up-conversion and transmission.
This includes digital control of the output amplitudes, digital control of the output offsets and fully programmable digital filters: default coefficients provide the RRC response required for TETRA.

The receive section accepts differential analogue I and Q signals at baseband and converts these into a suitably filtered digital form for further processing and data extraction. A facility is provided for digital offset correction and the digital filters are fully programmable with default coefficients providing the RRC response required for TETRA.

Auxiliary DAC and ADC functions are included for the control and measurement of the RF section of the radio system. This may include AFC, AGC, RSSI, or may be used as part of the control system for a Cartesian Feedback Loop.



Packages	
CMX980AL6	44-pin PLCC
CMX980AL7	44-pin LQFP
Operating Temperature	-40 to +85 ˚C

Brief CMX980A Technical Basics

	min	typ	max	
■ Typical Supply Current at 3.3V	-	16.0	-	mA
Tx Powersave	-	9.5	-	mA
Rx Powersave	-	8.0	-	mA
All Powersave	-	-	50.0	µA
■ Transmit Parameters				
Input Bit Rate	-	36	-	kbits/s
Number of Channels		2		
■ Modulation		pi/4DQPSK		

CMX981 Advanced Digital Radio Baseband Processor - with Voice Codec

Low Power Baseband Processing for Digital Radio Systems

Features

- pi/4 DQPSK and Other Modulations
- High Performance Codecs
  - Rx: Two 16-bit Sigma-Delta ADC
  - Tx: Two 14-bit Sigma-Delta DAC
  - Aux: Six 10-bit ADC and
  - Four 10-bit DAC
  - Voice: 14-bit Linear Codec with Digital Filter
- Full Duplex Operation
- C-BUS and 3 Fast Serial Bus Interfaces
- 100mW Speaker Amplifier
- 16.5mW Earpiece Amplifier
- Low Power Operation with 3.3V Tolerant I/O
- Supply Requirement Range: 2.5 to 3.6 V

Applications

- Digital Radio Including TErrestrial Trunked RAdio (TETRA) Systems
- RCR-39 Systems (Japan)
- Digital Wireless Local Loop
- SATCOM Terminals
- Terrestrial Flight Telephone Systems
- High Speed Wireless Data Modems
- Mixed-Mode Analogue/Digital Radio Networks

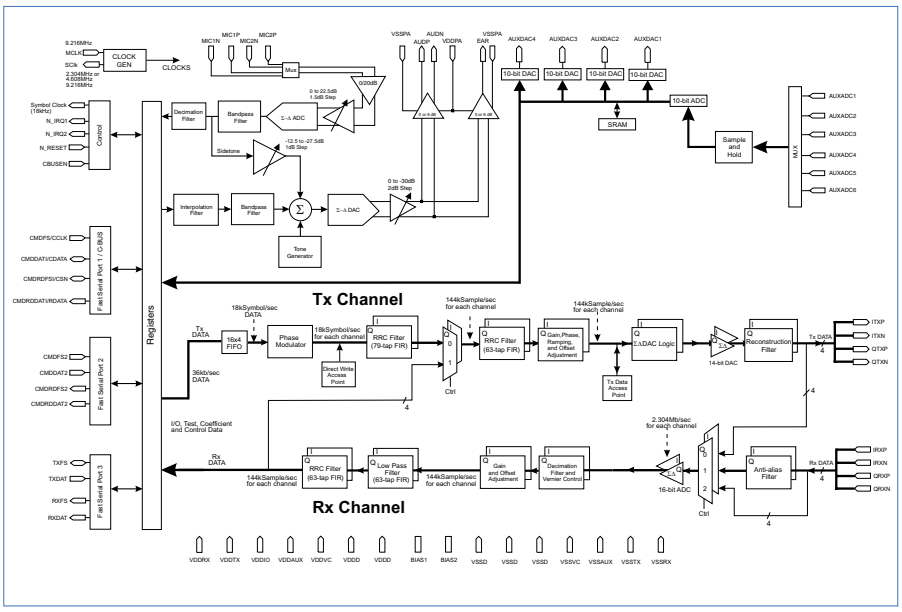
The CMX981 Advanced Digital Radio Baseband Processor is a combination codec and processor that interfaces analogue and digital sections of a digital radio system and performs critical DSP-intensive functions. The device supports portable, mobile and base-station TErrestrial Trunked RAdio (TETRA) system applications and is also sufficiently flexible for use in other demanding digital radio systems.

The CMX981 transmit path comprises all functions required to convert digital 'symbol' data into suitably filtered analogue I and Q signals for external up-conversion and transmission. This includes digital control of output amplitudes and offsets and fully programmable digital filters. Default coefficients provide the root raised cosine (RRC) response required for TETRA.

The CMX981 receive path accepts differential analogue baseband I and Q signals, samples them and performs digital channel select filtering to simplify host processing and data extraction. Internal digital offset correction and the digital filters are fully programmable. Default coefficients provide the RRC response required for TETRA operation.

Auxiliary DAC and ADC functions are included for the control and measurement of the radio system RF section. This may include AFC, AGC, RSSI, or part of the control system for a Cartesian Feedback Loop.

The voice codec converts voice signals into and from digital form and can be configured to apply a digital voice filter per specification G.712. The encode path accepts a differential analogue audio input signal, converts it to digital form and applies digital voice filtering to produce a processed digital stream.
The decode path accepts a digital stream written to the serial interface, applies digital voice filtering, converts the result to an analogue signal, and presents the signal at differential speaker or single-ended earphone analogue driver outputs. This path also includes a sidetone feature and a ring-tone generator.



Packages	
CMX981Q1	64-pin VQFN
Operating Temperature	-40 to +85 °C

Support

- EV9810 EvKit

Brief CMX981 Technical Basics

	min	typ	max	
DC Operating Current	-	10.5	16.0	mA
AC Operating Current	-	30.0	35.0	mA
DC Powersave Current	-	-	50.0	µA
AC Powersave Current	-	1.0	1.5	mA
Rx Signal-to-Noise	88.0	92.0	-	dB
Rx SINAD	85.0	88.0	-	dB
Nominal Clock Frequency *(variable from 0.5 to 12.5 MHz)*	-	9.216	-	MHz

Narrowband Wireless Data Products

NOTES

Narrowband Wireless Data Products

Narrowband Wireless Data Products by Function

	Packet Data	Freeformat Data	4-Level FSK	FFSK/MSK	GMSK/GFSK	Page No.
CMX469A 1200/2400/4800 Baud FFSK Modem		•		•		52
CMX589A GMSK Modem		•			•	53
CMX7143 Multi-mode Wireless Data Modem						54
7143FI-1.x GMSK/GFSK Modem	•	•			•	
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Custom, freeformat and packet data products for use in PMR, trunked and leisure radio and telemetry, AIS and data-transfer applications. Most common data-transfer protocols are addressed at a range of speeds, utilising: FSK, FFSK/MSK, GMSK, pi/4DQPSK and 4-Level FSK schemes.

Narrowband Wireless Data Products

CMX469A 1200/2400/4800 Baud FFSK Modem

1200, 2400 and 4800 Baud Duplex FFSK/MSK

Features

- Selectable Data Rates:
  - 1200, 2400 and 4800 Baud
- Full Duplex FFSK
- Rx and Tx Bandpass Filters
- Clock Recovery and Carrier Detect Facilities
- Pin Selected Xtal/Clock Inputs:
  - 1.008MHz or 4.032MHz
- Supply Requirement Range: 2.7 to 5.5 V

Applications

- Data Over Radio
- PMR and Cellular Radio Signalling
- Automatic Vehicle Location (Differential GPS) Links
- Portable Data Terminals
- Personal/Cordless Telephone
- Industrial Control Signalling

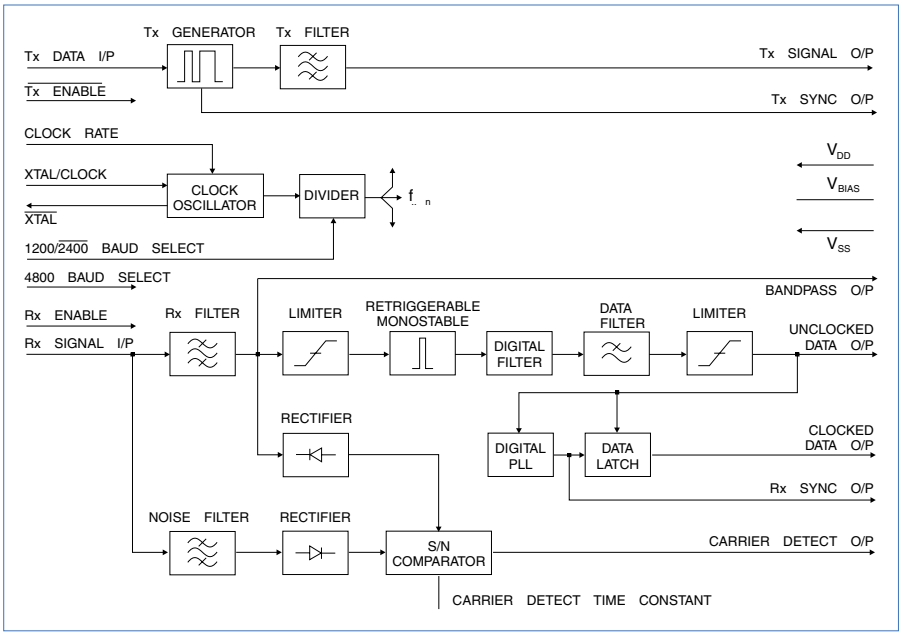
The CMX469A is a single-chip CMOS LSI circuit which operates as a full-duplex 1200, 2400 or 4800 baud FFSK/MSK modem.

The mark and space frequencies are 1200/1800, 1200/2400 and 2400/4800 Hz respectively. Tone frequencies are phase continuous; transitions occur at the zero crossing point.
A common Xtal oscillator with a choice of two clock frequencies (1.008MHz or 4.032MHz) provides baud-rate, transmit frequencies, and Rx and Tx synchronisation.

The transmitter and receiver operate entirely independently, including the individual section powersave functions. The CMX469A includes on-chip circuitry for Carrier Detect and Rx Clock recovery, both of which are made available at output pins.

Rx, Tx and Carrier Detect paths contain bandpass filters to optimise signal conditions in each section of the modem.

The CMX469A demonstrates good sensitivity and bit-error rate performance under adverse signal conditions. The Carrier Detect time-constant is set by an external capacitor, so that product performance can be optimised in high noise environments.



Packages	
CMX469AD3	20-pin SOIC
CMX469AE2	24-pin TSSOP
CMX469AP6	22-pin PDIP
Operating Temperature	-40 to +85 ˚C

Brief CMX469A Technical Basics

	min	typ	max	
Typical Supply Current at 3.0V	-	2.0	-	mA
Powersave	-	300	-	µA
Modulation		FFSK/MSK		
Signal Input Dynamic Range		100 to 1000		mVrms
Tx Output Level	-	775	-	mVrms
Logic Frequencies (‘1/0’)				
1200Baud	-	1200/1800	-	Hz
2400Baud	-	1200/2400	-	Hz
4800Baud	-	2400/4800	-	Hz

CMX589A GMSK Modem

Versatile (4kbps to 200kbps) GMSK Data

Features

- Full or Half Duplex Gaussian Minimum Shift Keying (GMSK)
- Data Rates: 4kbps to 200kbps
- Selectable BT: 0.3 or 0.5
- Low Current Non-DSP Solution
- TSSOP Pack fits PCMCIA and PC Cards
- Supply Requirement Range: 3.0 to 5.5 V

Applications

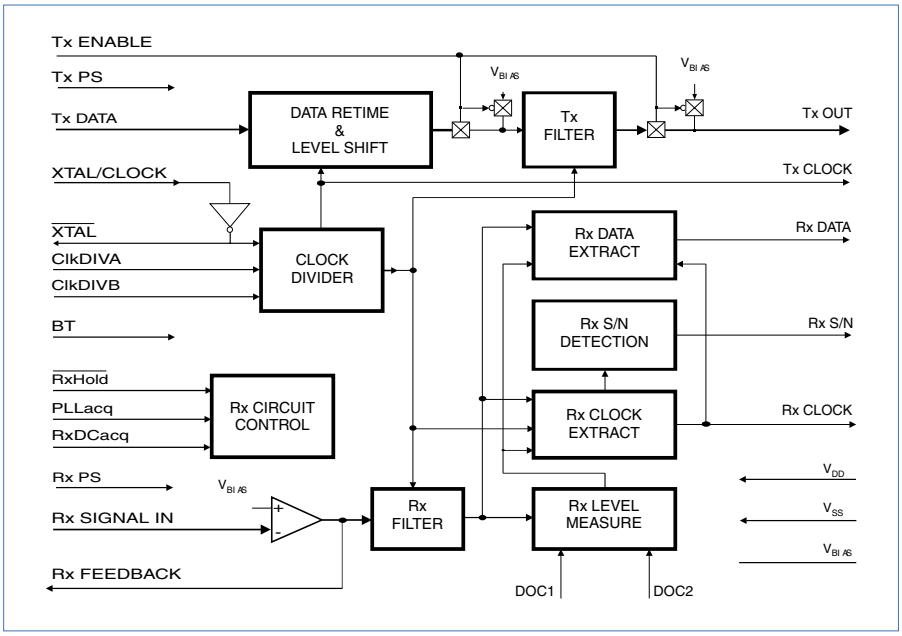
- Meets RCR STD-18
- Wireless LAN/Modems
- Handy Data Terminals
- Automatic Vehicle Location (Differential GPS) Links
- Low Power Wireless Data Links for PCs, Laptops and Printers
- Point-Of-Sale Terminals
- Wireless Bar-Code Readers and Stock Controllers
- Wireless Local Loop
- Amateur Packet Radio
- Wireless ISDN

The CMX589A is a single-chip synchronous data pump/modem designed for wireless data applications. Employing Gaussian filtering for Minimum Shift Keying (GMSK) baseband modulation applications, the CMX589A features a wide range of available data rates from 4kbps to 200kbps. Data rates and the choice of BT (0.3 or 0.5) are pin programmable to provide for different system requirements.

The Tx and Rx digital data interfaces are bit-serial, synchroniszed to generated Tx and Rx data clocks.
Separate Tx and Rx Powersave inputs allow full or half-duplex operation. Rx input levels can be set by suitable AC and DC level adjusting circuitry built with external components around an on-chip Rx Input Amplifier.

Acquisition, Lock, and Hold of Rx data signals is made easier and faster by the use of Rx Control Inputs to clamp, detect, and/or hold input data levels and can be set by the µProcessor as required.

The Rx S/N output provides an indication of the quality of the received signal.



Packages	
CMX589AD2	24-pin SOIC
CMX589AD5	24-pin SSOP
CMX589AE2	24-pin TSSOP
CMX589AP4	24-pin PDIP
Operating Temperature	-40 to +85 ˚C

Brief CMX589A Technical Basics

	min	typ	max	
Typical Supply Current at 3.0V	-	1.5	-	mA
Powersave	-	0.5	-	mA
Modulation		GMSK		
BT		0.3 and 0.5		
Rx and Tx Data-rate Range		4.0 to 200		kbps
Rx Filter Signal Input Level	0.7	1.0	1.3	V p-p
Tx Output Level	0.8	1.0	1.2	V p-p

Narrowband Wireless Data Products

CMX7143 Multi-mode Wireless Data Modem

- Built on FirmASIC® Technology -

Flexible Data Modes on a Versatile IC Platform

Features

- Multiple Modulation Types:
  - 7143FI-1.x: GMSK/GFSK
  - 7143FI-2.x: 4-Level FSK
  - 7143FI-3.x: FFSK/MSK
- Flexible Bit-rates
- Formatted or Raw Data Modes
- Raw Mode, Data Pump and Carrier Sense Facilities
- Automatic Preamble and Frame Sync Detection and Insertion
- 3 x Analogue Signal Inputs
- Tx Outputs For Two-point and I/Q Modulation
- Auxiliary ADCs and DACs
- Auxiliary System Clock Outputs
- Supply Requirement Range: 3.0 to 3.6 V

Applications

- Wireless Data Modems
- Point-to-Point Telemetry Systems
- M2M Applications
- Traffic Location Systems

Designed for use in wireless data environments, the CMX7143 is a half-duplex modem with carrier sense and automatic control of transmit hardware, including RAMDAC for PA ramping.

The device utilises CML's proprietary *FirmASIC*® component technology. On-chip sub-systems are configured by a Function Image™: this is a data file that is uploaded during device initialisation and that defines the device's function and feature set.

The Function Image™ can be loaded automatically from an external EEPROM or from a host µController over the built-in C-BUS serial interface. The device's functions and features can be enhanced by subsequent Function Image™ releases, facilitating in-the-field upgrades.

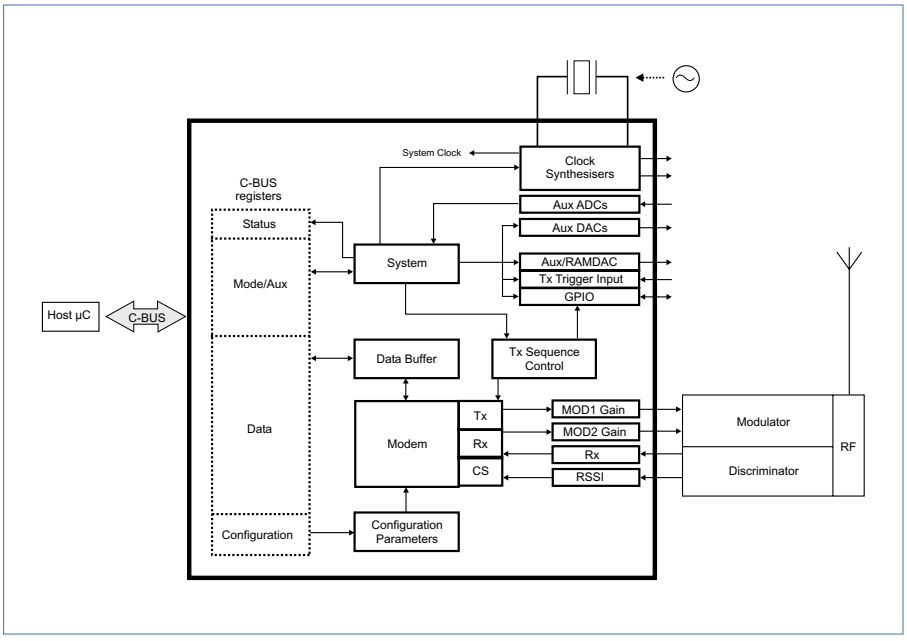
Carrier sense provides a listen before talk capability, automatically reverting to receive if activity on channel is detected.

In receive, automatic frame sync detection provides acquisition of the received signal with minimal host intervention. Two different frame sync patterns may be searched for concurrently, with little need for preamble.

Other features include two auxiliary ADC channels with four selectable inputs and up to four auxiliary DAC outputs (with an optional RAMDAC on the first DAC output, to facilitate transmitter power ramping). System timing is supported by the on-chip system clock outputs.

Function Images currently available:

7143FI-1.x	GMSK/GFSK Modem
7143FI-2.x	4-Level FSK Modem
7143FI-3.x	FFSK/MSK Modem



Packages	
CMX7143L4	48-pin LQFP
CMX7143Q3	48-pin VQFN
Operating Temperature	-40 to +85 ˚C

Support

- PE0401
- PE0001

Brief CMX7143 Technical Basics

Please contact CML or visit the CML Microcircuits website (www.cmlmicro.com) for further information.

See next page for more details > > > >

CMX7143 Multi-mode Wireless Data Modem

Flexible Data Modes on a Versatile IC Platform

> > > > continued from the previous page

The Function Image™ is the key to the CMX7143 flexibility.
Specific functions of this *FirmASIC*® device are determined by the uploading of its relevant Function Image™ file during device initialisation. An on-going program exists within CML to provide new function images to supplement and enhance device functions, expanding or modifying end-product features without the need for expensive and time-consuming design changes.

The Function Image™ is a data file that can be stored and handled in one of two ways. It can be stored in the host microcontroller's FLASH memory and uploaded to the IC via C-BUS after power-up. A maximum of 46kbytes of memory must be reserved to accomodate the Function Image™.

Alternatively, to reduce µController overhead, it can be transferred to and stored in an EEPROM attached to the device, for automatic uploading after power-up.

The lists below show the relevant Function Image™ details.

7143FI-1.x
GMSK/GFSK Modem

- Modulator producing two-point or I/Q outputs with programmable deviation
- Flexible Rx and Tx data transfer blocks
- Automatic Preamble, Frame Sync insertion and detection
- Demodulator input with input amplifier and programmable gain
- Data pulse shape filtering
- RAMDAC capability for PA ramping control
- Tx trigger feature allowing precise control of burst start time
- Tx burst sequence for automatic RAMDAC ramp and Tx hardware switching
- Carrier sense for "listen before talk"
- Rx filtering
- Tracking of symbol timing and received signal levels
- Raw and formatted (channel coded) data modes

7143FI-2.x
4-Level FSK Modem

- Modulator producing two-point or I/Q outputs with programmable deviation
- Flexible Rx and Tx data transfer blocks
- Automatic Preamble, Frame Sync insertion and detection
- Demodulator input with input amplifier and programmable gain
- Data pulse shape filtering
- RAMDAC capability for PA ramping control
- Tx trigger feature allowing precise control of burst start time
- Tx burst sequence for automatic RAMDAC ramp and Tx hardware switching
- Carrier sense for "listen before talk" operation
- Raw and Formatted (Channel coded) data modes
- Rx filtering
- Tracking of symbol timing and received signal levels
- Raw and formatted (channel coded) data modes

7143FI-3.x
1200/2400 bps FFSK/MSK Modem

- 1200/2400 baud MSK/FFSK modem and data packet encoder with interleaving, FEC, CRC and data scrambling
- Flexible Rx and Tx data transfer blocks
- Automatic Preamble, Frame Sync insertion and detection
- Demodulator input with input amplifier and programmable gain
- Data pulse shape filtering
- RAMDAC capability for PA ramping control
- Tx trigger feature allowing precise control of burst start time
- Tx burst sequence for automatic RAMDAC ramp and Tx hardware switching
- Carrier sense for "listen before talk" operation
- Raw and Formatted (Channel coded) data modes
- Rx filtering
- Tracking of symbol timing and received signal levels
- Raw and formatted (channel coded) data modes

Common Functions

The functions listed below are common to all CMX7143 Function Image™ Implementations:

- Two programmable system clock outputs
- Two auxiliary ADCs with four selectable input paths
- Four auxiliary DACs, one with built-in programmable RAMDAC
- Optimised C-BUS interface to host for control/data transfer
- Four GPIO pins
- Tx trigger input
- Flash/EEPROM and C-BUS boot modes

Function Image™ files are downloadable from the relevant product area in CML's My CML technical portal on the CML Microcircuits website (www.cmlmicro.com).
Authorisation to this portal can be arranged through your local CML contact.

Narrowband Wireless Data Products

CMX909B GMSK Packet-data Modem

GMSK Packet-data Modem

Features

- GMSK Modulation
- Rx and Tx Modes up to 38.4kbps
- Full Data Packet Framing
- Full 'Mobitex' Compatibility Including R14N Short-Block Frames
- Data Carrier Detect
- Checksum Generation and Checking
- Two-Level Xtal Drive Circuit
- Flexible Operating Modes
- Host Processor Interface
- Pin and Function Compatible with FX909A
- Supply Requirement Range: 2.7 to 5.5 V

Applications

- Mobitex Base, Mobile and Portable Terminals
- Wireless Telemetry
- Licence-free Radio Data
- ISM-Band Radio Schemes

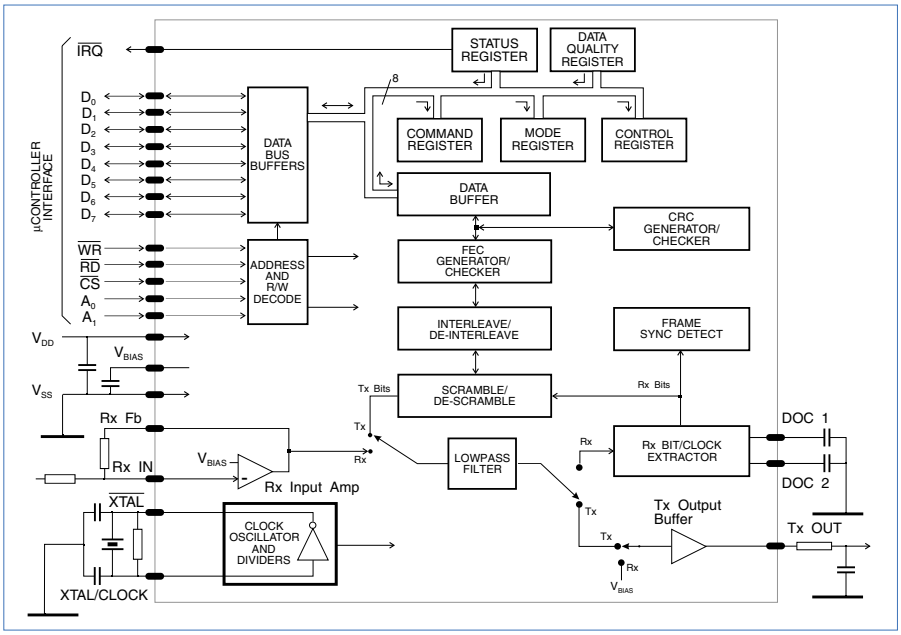
The CMX909B is a CMOS product that contains all of the baseband signal processing and Medium Access Control (MAC) protocol functions required for a high performance GMSK wireless packet data modem. It interfaces with the modem host processor and the radio modulation/demodulation circuits to deliver reliable two-way transfer of the application data over the wireless link.

The CMX909B assembles application data received from the processor, adds an error correction code (FEC), adds an error detection code (CRC), time-spreads this data by interleaving (burst-error protection) and scrambles (randomises) the bit pattern. After adding bit and frame sync codewords, it converts the packet into analogue GMSK signals for modulating the radio transmitter.

In receive mode, the CMX909B performs the reverse function using the analogue signals from the receiver discriminator. After error correction and removal of the packet overhead, the recovered application data is supplied to the processor. Any residual uncorrected errors in the data will be flagged. A readout of the SNR value during receipt of a packet is also provided.

The CMX909B uses data block sizes and FEC/CRC algorithms compatible with the Mobitex Wide Area Network over-air standard. The format used is suitable for other private applications which require the high-speed transfer of data over narrowband wireless links.

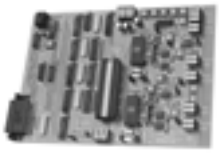
The CMX909B is programmable to operate at most standard bit-rates from a wide choice of Xtal/clock frequencies; to facilitate a choice of Xtals, the Xtal drive circuit can be configured to two different drive levels.



Packages	
CMX909BD5	24-pin SSOP
CMX909BE2	24-pin TSSOP
CMX909BP4	24-pin PDIP
Operating Temperature	-40 to +85 ˚C

Support

- EV9000 EvKit



Brief CMX909B Technical Basics

	min	typ	max	
Typical Supply Current at 3.0V	-	2.0	-	mA
Powersave	-	400	-	µA
Modulation		GMSK		
Rx and Tx Data Rate Range		4.0 to 38.4		kbps
Rx Signal Input Level	0.7	1.0	1.3	V p-p
Transmitter Output Level	0.9	1.0	1.1	V p-p

FX919B 4-Level FSK Packet-data Modem
MX919B *4-Level FSK Packet-data Modem*

Features

- 4-Level FSK Modulation
- Half Duplex, 4.8 to 19.2 kbps Operation
- Full Data Packet Framing
- Flexible Operating Modes
- Host Processor Interface
- Supply Requirement Range: 3.0 to 5.5 V

Applications

- High-Speed Packet Data
- Wireless Bar-Code Readers
- Point-Of-Sale Terminals
- Two-way Paging
- Digital Radio
- Wireless Telemetry

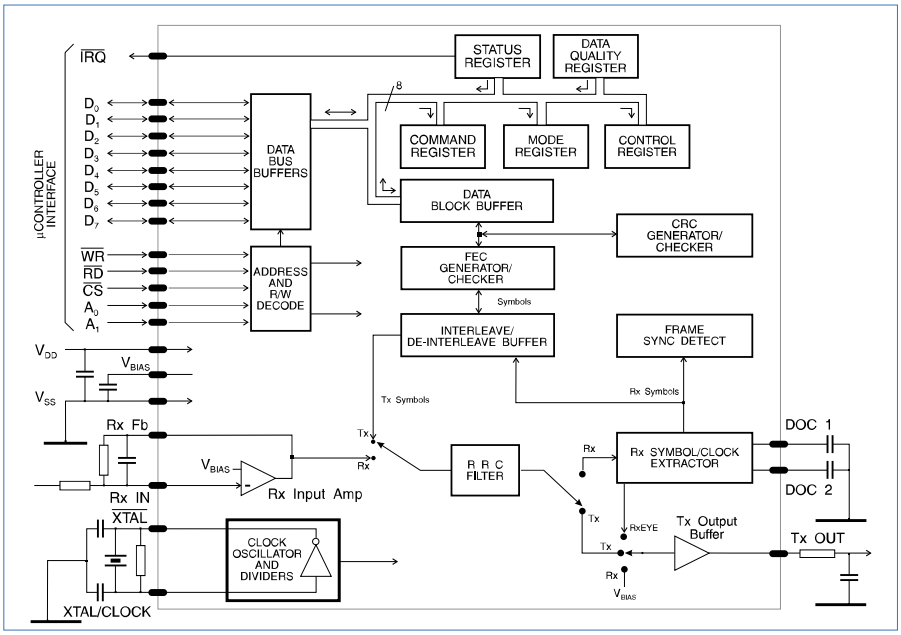
The FX/MX919B is a CMOS product that contains all of the baseband signal processing and Medium Access Control (MAC) protocol functions required for a high performance 4-level FSK wireless packet data modem. It interfaces with the modem host processor and the radio modulation/demodulation circuits to deliver reliable two-way transfer of the application data over the wireless link.

The FX/MX919B is backwards compatible with the FX/MX919A but offers better performance during radio link fading and selectable Tx symbol shapes.

The FX/MX919B assembles application data received from the processor, adds forward error correction (FEC) and error detection (CRC) information and interleaves the result for burst-error protection. After adding symbol and frame synchronisation codewords, it converts the packet into a filtered 4-level analogue baseband signal for modulating the radio transmitter.

In receive mode, the FX/MX919B performs the reverse function using the analogue baseband signals from the receiver discriminator. After error correction and removal of the packet overhead, the recovered application data is supplied to the processor. Any residual uncorrected errors in the data will be flagged. A readout of the SNR value during receipt of a packet is also provided.

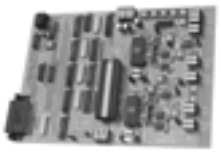
The FX/MX919B uses data block sizes and FEC/CRC algorithms suitable for applications which require the high-speed transfer of data over narrow-band wireless links. The device is programmable to operate at most standard bit-rates from a wide choice of Xtal/Clock frequencies.



Packages		
FX919BD2		24-pin SOIC
MX919BDW	(D2)	24-pin SOIC
FX919BD5		24-pin SSOP
MX919BDS	(D5)	24-pin SSOP
MX919BLH	(L2)	24-pin PLCC
FX919BP4		24-pin PDIP
MX919BP	(P4)	24-pin PDIP
Operating Temperature		-40 to +85 ˚C

Support

- EV9000 EvKit



Brief FX/MX919B Technical Basics

	min	typ	max	
Typical Supply Current at 3.3V	-	2.5	-	mA
Powersave	-	600	-	µA
Modulation		4-Level FSK		
Rx and Tx Data Rate Range		2.4 to 9.6		ks/s
Rx Signal Input Level	0.7	1.0	1.3	V p-p
Transmitter Output Level	0.8	1.0	1.2	V p-p

Narrowband Wireless Data Products

FX929B 4-Level FSK RD-LAP Packet-data Modem
MX929B *4-Level FSK Packet-data Modem*

Features
- 4-Level FSK Modulation
- Half Duplex, 4.8 to 19.2 kbps Operation
- Full Data Packet Framing
- RD-LAP Compatible
- Flexible Operating Modes
- Host Processor Interface
- S-DSM Controlled Systems
- Supply Requirement Range: 3.0 to 5.5 V

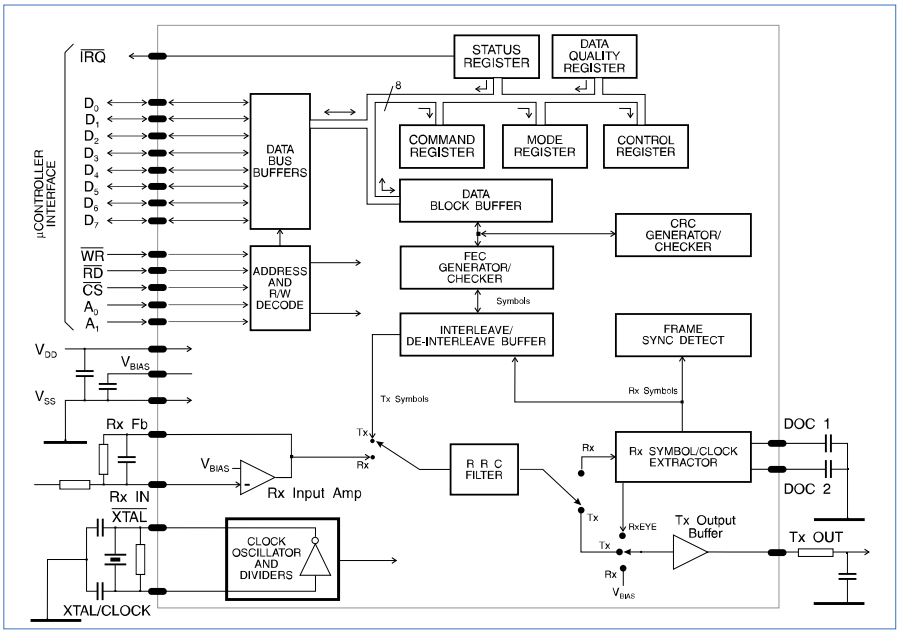
Applications
- RD-LAP Systems
- DataTAC Terminals
- RCR STD-47 Systems
- Mobile Data Systems
- Wireless Telemetry

The FX/MX929B is a CMOS product that contains all of the baseband signal processing and Medium Access Control (MAC) protocol functions required for a high performance 4-Level FSK wireless packet data modem. It interfaces with the modem host processor and the radio modulation/demodulation circuits to deliver reliable two-way transfer of the application data over the wireless link.

The FX/MX929B is backwards compatible with the FX/MX929A but offers better performance during radio link fading and selectable Tx symbol shapes. The FX/MX929B assembles application data received from the processor, adds forward error correction (FEC) and error detection (CRC) information and interleaves the result for burst-error protection. After adding symbol and frame synchronisation codewords, it converts the packet into a filtered 4-level analogue baseband signal for modulating the radio transmitter.

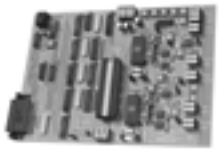
In receive mode, the FX/MX929B performs the reverse function using the analogue baseband signals from the receiver discriminator. After error correction and removal of the packet overhead, the recovered application data is supplied to the processor. Any residual uncorrected errors in the data will be flagged. A readout of the SNR value during receipt of a packet is also provided.

The FX/MX929B uses data block sizes and FEC/CRC algorithms compatible with the RD-LAP over-air standard. The device is programmable to operate at most standard bit-rates from a wide choice of Xtal/Clock frequencies.



Packages	
FX929BD2	24-pin SOIC
MX929BDW (D2)	24-pin SOIC
FX929BD5	24-pin SSOP
MX929BDS (D5)	24-pin SSOP
FX929BP4	24-pin PDIP
MX929P (P4)	24-pin PDIP
Operating Temperature	-40 to +85 ˚C

Support
- EV9000 EvKit



Brief FX/MX929B Technical Basics

	min	typ	max	
Typical Supply Current at 3.3V	-	2.5	-	mA
Powersave	-	600	-	µA
Modulation		4-Level FSK		
Rx and Tx Data Rate Range		2.4 to 9.6		ks/s
Rx Signal Input Level	0.7	1.0	1.3	V p-p
Transmitter Output Level	0.8	1.0	1.2	V p-p

CMX969 4-Level FSK (MOTIENT/ARDIS/RD-LAP) Modem

4-Level FSK (RD-LAP/DataTAC) and MDC4800 Packet-data Modem

Features

- DataTAC, Dual-Mode RD-LAP and MDC Systems
- Full Packet Data Framing
- Supply Requirement Range: 2.7 to 5.5 V

Applications

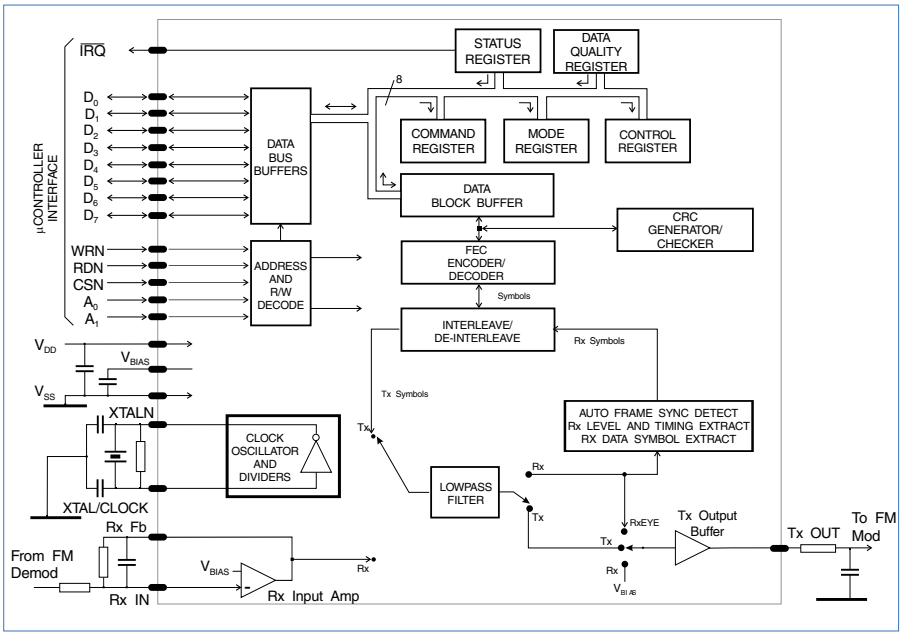
- Two-way Paging Equipment
- Mobile Data Systems
- Wireless Telemetry
- DataTAC Terminals

The CMX969 is a CMOS product that contains all of the baseband signal processing and Medium Access Control (MAC) protocol functions required for a high performance DataTAC dual mode (RD-LAP: 19200bps and MDC: 4800bps) FSK wireless packet data modem suitable for use with the MOTIENT/ARDIS network. It interfaces with the modem host processor and the radio modulation/demodulation circuits to deliver reliable two-way transfer of the application data over the wireless link.

The CMX969 assembles application data received from the processor, adds forward error correction (FEC) and error detection (CRC) information and interleaves the result for burst-error protection. After adding symbol and frame synchronisation codewords and channel status symbols, it converts the packet into a filtered 4-level analogue baseband signal for modulating the radio transmitter.

In receive mode, the CMX969 performs the reverse function using the analogue baseband signals from the receiver discriminator. After error correction and removal of the packet overhead, the recovered application data is supplied to the processor. Any residual uncorrected errors in the data will be flagged. A readout of the SNR value during receipt of a packet is also provided.

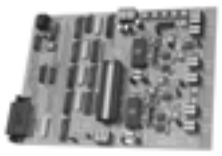
The CMX969 uses signal filtering, data block formats and FEC/CRC algorithms compatible with the MDC and RD-LAP over-air standards.
The device is programmable to operate at most standard bit-rates from a wide choice of Xtal/clock frequencies.



Packages	
CMX969D5	24-pin SSOP
CMX969E2	24-pin TSSOP
CMX969P4	24-pin PDIP
Operating Temperature	-40 to +85 ˚C

Support

- EV9000 EvKit



Brief CMX969 Technical Basics

	min	typ	max	
Typical Supply Current at 3.0V	-	2.5	-	mA
Powersave	-	600	-	µA
Rx and Tx Data Rate Range				
MDC	-	4,800	-	bps
RD-LAP		9,600 to 19,200		bps
Receiver				
Signal Input Level (MDC)	0.5	-	1.2	V p-p
Signal Input Level (RD-LAP)	1.0	-	2.5	V p-p
Transmitter				
Output Level (MDC)	0.71	0.89	1.07	V p-p
Output Level (RD-LAP)	1.6	2.0	2.4	V p-p

Narrowband Wireless Data Products

CMX989 CDPD MAC and Data Pump Processor

High Integration CDPD Facilities with GMSK Data Pump

Features

- 19.2kbps (BT = 0.5) GMSK Modem Data Pump
- Reed-Solomon Encode, Decode and Error Correction
- MAC and Physical Layer Functions:
  - Minimal Host µC Burden and Power Requirement
- Tx and Rx Byte-wide CDPD Frame FIFOs
- Encapsulates/De-encapsulates CDPD Frames (to and from over-air baseband signals)
- Parallel Bus Host CPU Hardware Interface
- Supply Requirement Range: 2.7 to 5.5 V

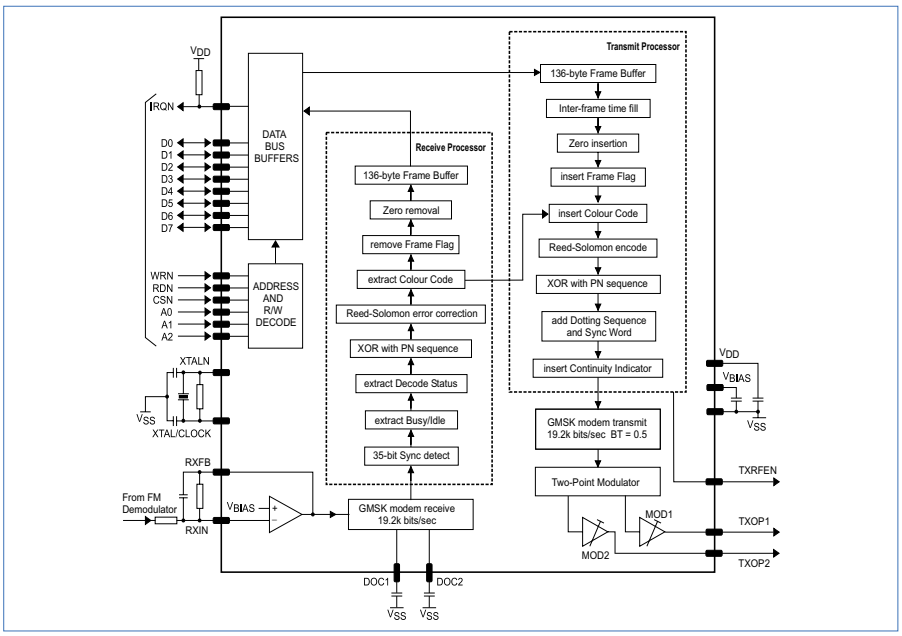
Applications

- Cellular Digital Packet Data Terminals
- PCMCIA/PC-Card Wireless Modem Modules
- Wireless Internet Terminals
- Portable and Mobile Wireless Data Terminals

The highly integrated CMX989 CDPD MAC and data-pump processor integrates complex CDPD MAC and physical layer functions to serve as a core engine for high performance, low power CDPD terminal designs. MAC layer functions decouple the host CPU from the CDPD airlink to simplify and reduce CDPD protocol stack programming, free CPU capacity for applications, eliminate interface components, and allow CPU sleep time for power savings. Physical layer functions mate MAC layer to baseband radio signals with minimal host involvement. MAC and physical layer functions are intelligently coupled to meet airlink timing requirements. For example: Tx emissions automatically start in synchronisation with Forward Channel busy/idle status. The Rx CDPD frame FIFO is automatically managed to wait for valid synchronisation to occur when first started and after lost signal recovery.

The radio interface supports simple, low cost, VCO-based RF modulators and discriminator-based receivers. Independent, programmable gain Tx outputs are provided for software trimming and balancing of modulating signals.

The host CPU interface is FIFO based and organized in CDPD frames, to provide a simple programming interface with low service latency requirements. Over-the-air frames are automatically encapsulated and de-encapsulated and include complete Reed-Solomon encoding, decoding and error correction, colour code insertion and related functions. Device status bits are accessible and may be individually configured to interrupt the host via the parallel hardware interface.



Packages	
CMX989E1	28-pin TSSOP
Operating Temperature	-40 to +85 ˚C

Brief CMX989 Technical Basics

	min	typ	max	
Operating Temperature	-40		+85	˚C
Typical Supply Current at 3.0V				
Rx only	-	1.0	1.5	mA
Tx only	-	2.0	3.0	mA
Rx and Tx	-	2.0	3.0	mA
Zero Power (Powersave) (3V and 5V)	-	1.0	10.0	µA
Modulation Type		GMSK		
Rx and Tx Data Rates		19.2		kbps
BT		0.5		
Rx Input Signal Level	0.1	-	1.0	V p-p

Marine AIS Products

NOTES

Marine AIS Products

Marine AIS Products by Function

	FSK	GMSK	DSC Handling	AIS Baseband Processing	RF Synthesiser/s	ADC and DAC	Demonstration Kit	Page No.
CMX7032 AIS Baseband Processor with RF Synthesisers								64
7032/7042FI-1.x AIS Baseband Processor	•	•	•	•	•	•		
7032FI-2.x AIS Rx Only Data Processor with NMEA 0183-HS Output	•	•	•	•	•	•		
CMX7042 AIS Baseband Processor								65
7032/7042FI-1.x AIS Baseband Processor	•	•	•	•		•		
DE70321 CMX7032 (AIS) Development and Demonstration Kit							•	66
CMX910 Marine AIS Baseband Processor	•	•	•	•		•		67
Relevant Products in Other Sections								
FX/MX604 V.23 Compatible Modem	Wireline Data Products							86
CMX589A GMSK Modem	Narrowband Wireless Data Products							53

Comprehensive baseband processing and data functions for both Class A and Class B marine Automatic Identification System equipments.

The AIS system allows ships and base stations to communicate their position and other data to each other without the need for a centralised controller. This allows vessels to “see” each other and take appropriate action to avoid collision and so improve marine safety. The system uses a GMSK 9600baud data link in the Marine VHF radio band.

Marine AIS Products

CMX7032 Automatic Identification System (AIS) Baseband Processor with RF Synthesisers

- Built on FirmASIC® Technology -

Comprehensive AIS Processing for Marine Safety Equipments

Features

- Half-duplex GMSK and FSK Modem
- AIS and DSC Data Formats
- Supports Carrier-sensing Channel Access (CSTDMA) Operation
- Configurable by Function Image™
- Optimum Co-channel Performance
- Flexible Signal Channels:
  - Two Simultaneous Rx
  - One Tx
- Two Flexible Integer-N Synthesisers
- Two Synthesised Auxiliary System Clocks
- Limiter-discriminator Rx Interface
- Flexible Tx Interface: I and Q or Two-point Modulation
- Auxiliary ADC and DAC Functions:
  - Four x 10-bit DACs
  - Two x 10-bit ADCs
- Supply Requirement Range: 3.0 to 3.6 V

Applications

- Automatic Identification System (AIS) for Marine Safety
- Class B AIS Transponders
- AIS Rx-only and Tx-only Modules
- Aids to Navigation

A highly integrated baseband signalling processor IC, the CMX7032 fulfils the requirements of the Class B marine Automatic Identification System (AIS) transponder market.

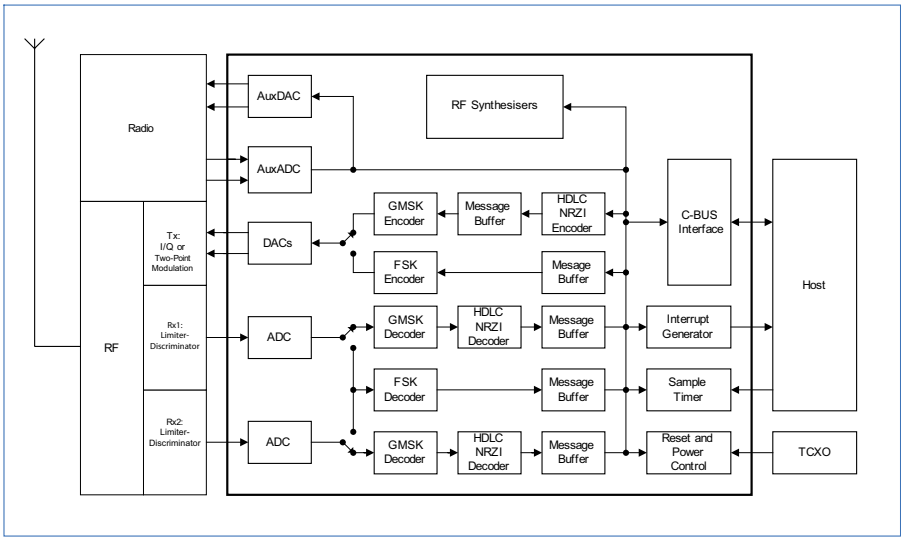
The CMX7032 is half duplex in operation, comprising two parallel Limiter-discriminator Rx paths and one I and Q or two-point modulation Tx path; configurable for AIS or DSC operation. The device performs signal modulation/demodulation with associated AIS functions, such as training sequence detection, NRZI conversion and HDLC processing (flags, bit stuffing/de-stuffing, CRC generate/check). Integrated Rx/Tx data buffers are also provided. All of this greatly reduces the processing requirements of the host µC. Provision of a number of auxiliary ADCs and DACs further simplifies the system hardware design, reducing the overall equipment cost and size. In addition, the CMX7032 features, on-chip, two flexible Integer-N synthesisers and auxiliary system clocks.

The device utilises CML's proprietary *FirmASIC®* component technology. On-chip sub-systems are configured by a Function Image™: this is a data file that is uploaded during device initialisation and defines the device's function and feature set. The Function Image™ can be loaded automatically from an external EEPROM or from a host µController over the built-in C-BUS serial interface. The device's functions and features can be enhanced by subsequent Function Image™ releases, facilitating in-the-field upgrades.

Function Images currently available:

7032/7042FI-1.x	AIS Baseband Processor
7032FI-2.x	AIS Rx-only Data Processor with NMEA 0183-HS Output

In addition, there is available, the DE70321: a complete AIS Class B (IEC 62287) technology demonstrator aimed at speeding manufacturers' design and development of AIS Class B transponders and AIS receiver products using the CMX7032 AIS Class B Baseband Processor with on-chip RF Synthesiser IC.



Packages	
CMX7032L9	64-pin LQFP
CMX7032Q1	64-pin VQFN
Operating Temperature	-40 to +85 ˚C

Support

- PE0201
- PE0001
- DE70321 - this product is available as an AIS Class B (IEC 62287) technology demonstrator

Brief CMX7032 Technical Basics

	min	typ	max	
Typical Supply Current (D/A) at 3.3V				
Rx or Tx	-	3.4/1.5	-	mA
Powersave (D/A)	-	8/4	100/20	µA
Modulation Types		GMSK and FSK		
Operational Mode		Half-duplex		
Input Signal Gain Range		0 to 22.4		dB
Modulator Output Attenuation Range		0 to 40		dB
Aux DACs - Resolution		10		bits
Aux ADCs - Resolution		10		bits

CMX7042 Automatic Identification System (AIS) Baseband Processor

- Built on FirmASIC® Technology -

Comprehensive AIS Processing for Marine Safety Equipments

Features

- Half-duplex GMSK and FSK Modem
- AIS and DSC Data Formats
- Supports Carrier-sensing Channel Access (CSTDMA) Operation
- Configurable by Function Image™
- Optimum Co-channel Performance
- Flexible Signal Channels:
  - Two Simultaneous Rx
  - One Tx
- Limiter-discriminator Rx Interface
- Two Synthesised Auxiliary System Clocks
- Flexible Tx Interface: I and Q or Two-point Modulation
- Auxiliary ADC and DAC Functions:
  - Four x 10-bit DACs
  - Two x 10-bit ADCs
- Supply Requirement Range: 3.0 to 3.6 V

Applications

- Automatic Identification System (AIS) for Marine Safety
- Class B AIS Transponders
- AIS Rx-only and Tx-only Modules
- Aids to Navigation

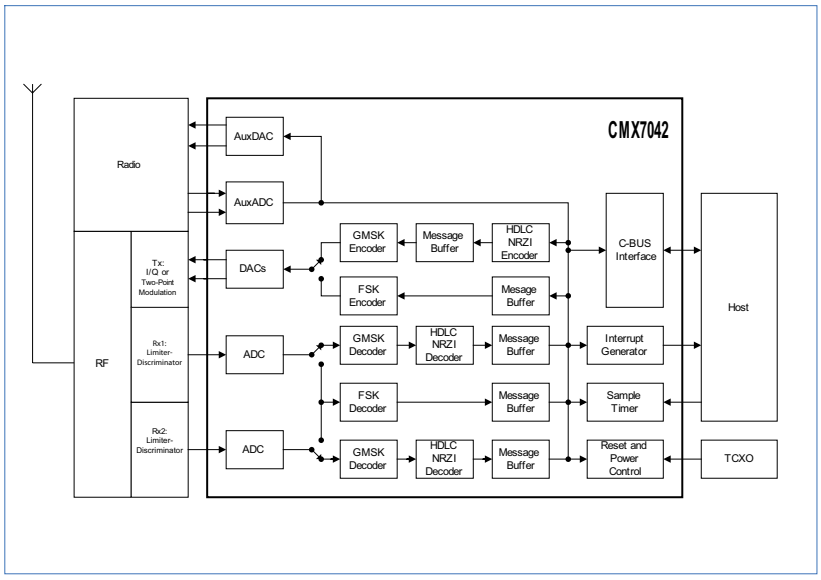
A highly integrated baseband signalling processor IC, the CMX7042 fulfils the requirements of the Class B marine Automatic Identification System (AIS) transponder market.

The CMX7042 is half duplex in operation, comprising two parallel Limiter-discriminator Rx paths and one I and Q or two-point modulation Tx path. These are configurable for AIS or DSC operation. The device performs signal modulation/demodulation with associated AIS functions, such as training sequence detection, NRZI conversion and HDLC processing (flags, bit stuffing/de-stuffing, CRC generate/check). Integrated Rx/Tx data buffers are also provided. All of this greatly reduces the processing requirements of the host µC. Provision of a number of auxiliary ADCs, DACs and system clocks further simplify the system hardware design, reducing the overall equipment cost and size.

The device utilises CML's proprietary *FirmASIC®* component technology. On-chip sub-systems are configured by a Function Image™: this is a data file that is uploaded during device initialisation and defines the device's function and feature set. The Function Image™ can be loaded automatically from an external EEPROM or from a host µController over the built-in C-BUS serial interface. The device's functions and features can be enhanced by subsequent Function Image™ releases, facilitating in-the-field upgrades.

Function Images currently available:

7032/7042FI-1.x AIS Baseband Processor



Packages	
CMX7042L4	48-pin LQFP
CMX7042Q3	48-pin VQFN
Operating Temperature	-40 to +85 ˚C

Support

- PE0401
- PE0001

Brief CMX7042 Technical Basics

	min	typ	max	
Typical Supply Current (D/A) at 3.3V				
Rx or Tx	-	3.4/1.5	-	mA
Powersave (D/A)	-	8/4	100/20	µA
Modulation Types		GMSK and FSK		
Operational Mode		Half-duplex		
Input Signal Gain Range		0 to 22.4		dB
Modulator Output Attenuation Range		0 to 40		dB
Aux DACs - Resolution		10		bits
Aux ADCs - Resolution		10		bits

Marine AIS Products

DE70321 AIS Development and Demonstration Kit

- Built on FirmASIC® Technology -

Features

- Class B AIS Transceiver Technology Demonstration
- Designed to Meet IEC62287
- 2 Watt Tx Operation
- Dual Channel Rx-only Operation
- Dual, Independent GMSK Receivers
- C-BUS Serial Control/Data Interface to Host µC
- 19.2MHz Reference for 9600bps Data Rate
- On-board EEPROM
- RS232 NMEA 0183 Interface for Host-less Operation

Applications

- AIS Demonstration and Development
- Class B AIS Transponders
- AIS Rx-only Monitors
- Aids to Navigation

The DE70321 is a complete AIS Class B (IEC 62287) technology demonstrator aimed at speeding manufacturers' design and development of AIS Class B transponders and AIS receiver products using the CMX7032 AIS Class B baseband processor with on-chip RF synthesiser IC.

The design is a flexible platform to allow users to configure and evaluate with two build options:

Class B Transceiver (using 7032/7042FI-1.x)

Dual Channel Rx-only (using 7032FI-2.x)

The default board configuration is for dual channel receive on 161.975MHz (AIS channel 1) and 162.025MHz (AIS channel 2) with 25kHz channel spacing and 9600bps over-air data rate. An EEPROM is included which can automatically load the Function Image™ into the CMX7032 at power-up.

Received data is automatically provided as NMEA 0183-HS sentences at 38,400bps from the DB9 RS232 port.

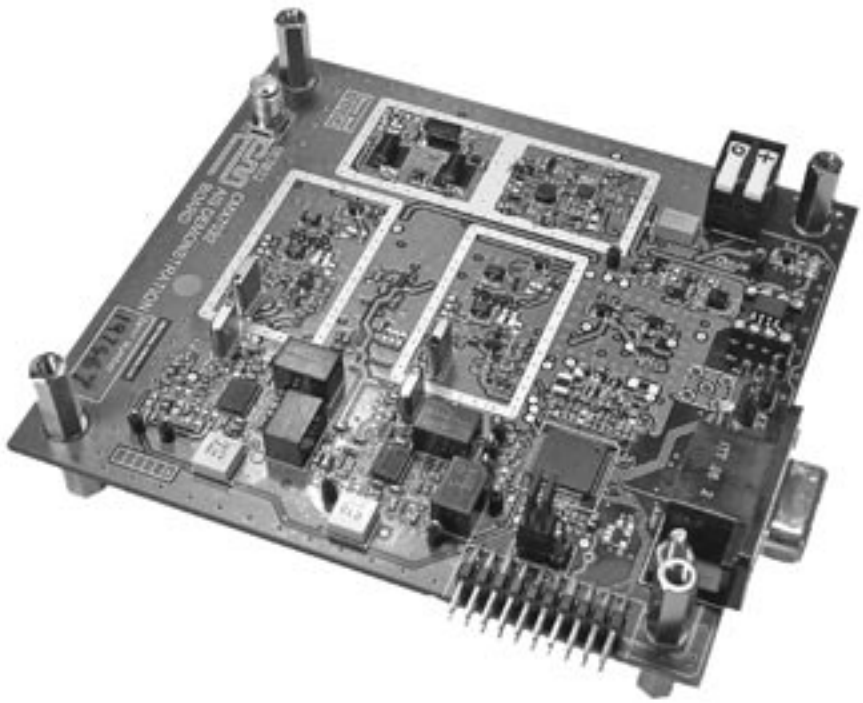
Function Image™ 7032FI-1.x allows full host control over all CMX7032 functions whereas Function Image™ 7032FI-2.x automatically programs the CMX7032 RF synthesisers to the correct frequencies.

All necessary RF circuits, such as VCOs, a 2 watt PA, harmonic filter, antenna switching and LNA, are provided on the DE70321 to facilitate easy evaluation and demonstration of the design as a Class B unit.

A C-BUS interface is provided for control of the CMX7032 by a host microcontroller (required to perform the higher level protocol functions on a Class B implementation).

Further Design Support

There is available, on the CML technical portal, a library of files (Schematics, Bill of Materials and Gerber files) that will further assist in the progress of the design-in process.
Please note that you need to be authorised to enter the My CML Technical Portal.
Please contact your CML Distributor for further information.



CMX910 Marine AIS Baseband Processor

for Class A and Class B Marine Automatic Identification Systems

Features

- Half-duplex GM(F)SK, FSK and DSC Capabilities
- Slot/Sample Counter with UTC Timing Interface
- Optimum Co-channel and Adjacent-channel Performance
- Flexible Signal Channels
  - Two Simultaneous Rx
  - One Tx
  - Optional FSK Interface
- AIS Formatted and Raw Data Modes
- Supports Carrier-sensing Channel Access (CSTDMA) Operation
- RF Device-Enable Facilities
- C-BUS Serial Interface with Expansion Port
- I and Q Radio Interface
- Auxiliary ADC and DAC Functions
- Supply Requirement Range: 3.0 to 3.6 V

Applications

- Automatic Identification System (AIS) for Marine Safety
- Class A or Class B AIS Transponders
- AIS Rx-only Modules
- Aids to Navigation

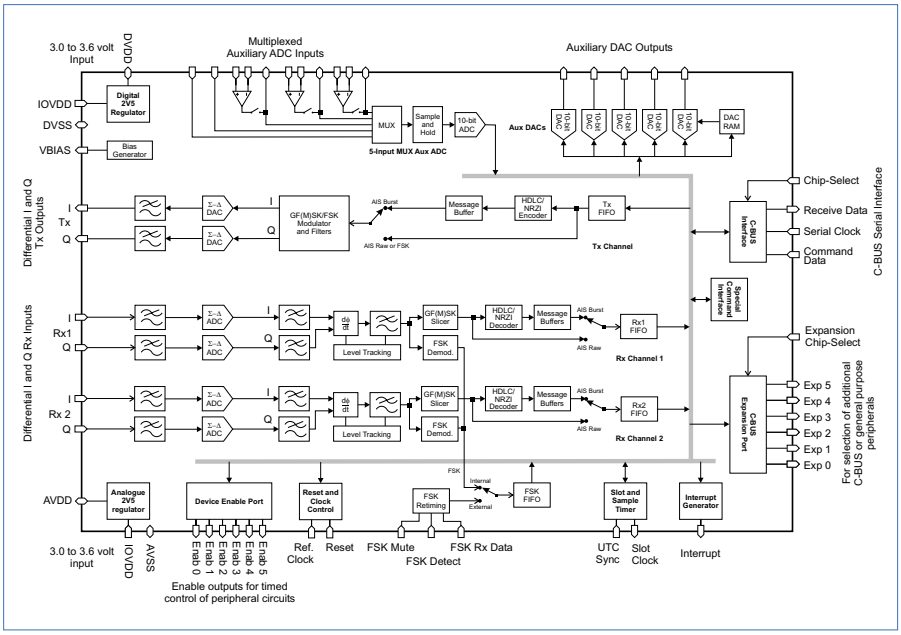
A highly integrated baseband signalling processor IC, the CMX910 fulfils the requirements of the class A and class B marine Automatic Identification System (AIS) transponder market.

The CMX910 is half duplex in operation, comprising two parallel I and Q Rx paths and one Tx path. These are configurable for AIS or DSC operation.

The device performs channel filtering and signal modulation/demodulation with associated AIS functions, such as training sequence detection, NRZI conversion and HDLC processing (flags, bit stuffing/de-stuffing, CRC generation/checking).

An external 1200bps FSK demodulator interface provides a third parallel decode path for DSC, as required by the Class A market. Integrated Rx/Tx data buffers and a flexible slot/sample timer are also provided, all of which greatly reduce the processing requirements of the host µC.

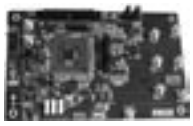
Provision of a C-BUS expansion port, an RF device-enable port and a number of auxiliary ADCs and DACs further simplifies the overall system hardware design, reducing the final equipment cost and size.



Packages	
CMX910L9	64-pin LQFP
CMX910Q1	64-pin VQFN
Operating Temperature	-40 to +85 ˚C

Support

- EV9100 EvKit



Brief CMX910 Technical Basics

	min	typ	max	
Fully Operational Supply Current at 3.3V	-	35	60	mA
Powersave	-	20	100	µA
AIS Modulation		GFSK		
12.5kHz Channel (9600bps)				
BT (Tx)		0.3		
25kHz Channel (9600bps)				
AIS Modulation		GMSK		
BT (Tx)		0.4		
DSC (1200bps)				
Modulation		FSK		
ADC Resolution		16		bits
DAC Resolution		14		bits

Digital Voice Products

NOTES

Digital Voice Products

Digital Voice Products by Function

	RALCWI Vocoder	ADM	CVSD	PCM	Audio Codec	Page No
CMX608 Low Bit-rate RALCWI Vocoder	•					70
CMX618 Low Bit-rate RALCWI Vocoder with Integral Audio Codec	•				•	70
FX/MX619 'Eurocom' Delta Codec			•			71
MX629 'Military Delta Modulation Codec			•			72
CMX638 Duplex RALCWI Vocoder with Integral Audio Codec	•				•	70
CMX639 CVSD Voice Codec			•			73
CMX649 Adaptive Delta Modulation Voice Codec		•	•	•		74

Digitally-coded voice processing products employing Robust Advanced Low Complexity Waveform Interpolation (RALCWI), Continuously Variable Slope Delta Modulation (CVSD) and Adaptive Delta Modulation (ADM) voice-data schemes.

Digital Voice Products

CMX608 Low Bit-rate RALCWI Vocoders
CMX618 *Robust Advanced Low Complexity Waveform Interpolation*
CMX638

Features

- Near Toll Quality RALCWI Coding Algorithm
- Multiple Bit Rates
  - 2050, 2400 and 2750 bps
  - 3600bps with FEC
- 4-bit Viterbi Soft Decision Decoding
- Integrated Audio Codec (CMX618 and CMX638)
- Integrated Input and Output Channel Filters
- Varying Packet Lengths:
  - 20, 40, 60 and 80 ms
- Ancillary Audio Functions
  - Voice Activity Detector
  - Comfort Noise Generator
  - DTMF and Single Tone Regeneration
- Supply Requirement Range: 3.0 to 3.6 V

Applications

- Digital Radio:
  - PMR/LMR and Trunked
  - DMR TDMA and FDMA
- Voice Storage, Security and Playback
- Voice-over-IP (VoIP)
- Regenerative Digital Voice Systems

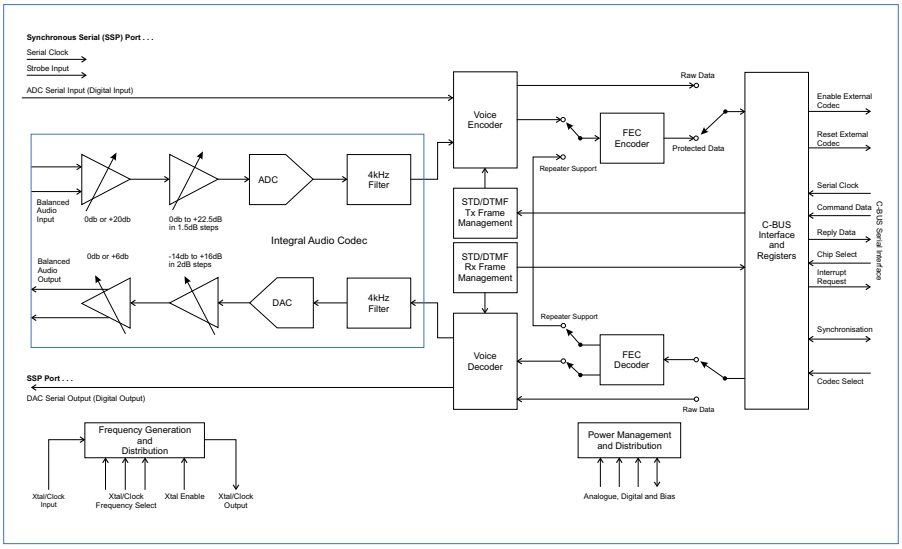
The CMX608, CMX618 and CMX638 are flexible, high integration, high performance RALCWI (Robust Advanced Low Complexity Waveform Interpolation) Vocoders, offering near toll quality voice at very low bit rates. A Forward Error Correction (FEC) engine provides optimum performance in real life applications. The RALCWI Vocoder comprises four independent functions which are by the host: Voice Encoder, FEC Encoder, Voice Decoder and FEC Decoder. In addition, the CMX618 includes an integrated voice CODEC, offering a complete analogue voice to low bit rate vocoded data function, with integrated channel filters removing the need for external components.

In encode mode, the voice encoder uses a 20ms voice frame size with 3 programmable bit rates: 2050bps, 2400bps or 2750bps. The optional FEC encoder performs channel coding of the encoded voice (2050bps, 2400bps or 2750bps, depending on the selected mode) and forms an encoded, interleaved bitstream of 3600bps (216 bits per 60ms packet or 288 bits per 80ms packet). The FEC operation utilises a packet of either 3 or 4 x 20ms Vocoder frames to provide optimum error correction performance.

In decode mode, the optional FEC decoder performs de-interleaving and channel decoding of the coded bit-stream (216 bits per 60ms packet or 288 bits per 80ms packet) and forms an error-corrected bitstream of encoded voice at 2050bps, 2400bps or 2750bps rate, depending on the selected mode. The FEC decoder can optionally use 'soft decision' metrics to improve its decoding ability. The voice decoder then converts the error-corrected bit-stream back into a digitised voice signal.

Soft Decision Decoding (SDD), Discontinuous Transmission detection (DTX), Voice Activity Detection (VAD) and Comfort Noise Generation (CNG) functions are also included, to further enhance the overall performance. Single (STD) and Dual (DTMF) Tones can be detected and sent separately in the coded bitstream, then regenerated at the far end.

- CMX608 Half-duplex Low Bit-rate RALCWI Vocoder
- CMX618 Half-duplex Low Bit-rate RALCWI Vocoder with Integrated Audio Codec
- CMX638 Full-duplex Low Bit-rate RALCWI Vocoder with Integrated Audio Codec



Packages	
CMX608L4	48-pin LQFP
CMX608Q3	48-pin VQFN
CMX618L4	48-pin LQFP
CMX618Q3	48-pin VQFN
CMX638L4	48-pin LQFP
CMX638Q3	48-pin VQFN
Operating Temperature	-40 to +85 ˚C

Support

- EV6180
- EV6380
- DE6181 - available as a demonstrator of the CMX608 or CMX618 with the CMX7141

Brief Vocoder Technical Basics

	min	typ	max	
Typical Supply Current at 3.3V	-	33.0	-	mA
Powersave	-	35.0	-	µA
Vocoder Performance				
Sample Rate	-	8	-	k s/s
Data Rate (with FEC)	-	3600	-	bps
Data Rate (without FEC)	2050	-	2750	bps
Lower Frequency Limit	60	-	-	Hz
Upper Frequency Limit	-	-	3900	Hz

FX619 'Eurocom' Delta Codec
MX619 *Continuously Variable Slope Delta Modulation*

Features

- Single Chip Full-duplex CVSD Codec
- On-chip Input and Output Filters
- Programmable Sampling Clocks
- 3 or 4 bit Compand Algorithm
- Force-idle and Powersave Facilities
- Fully Meets 'Eurocom D1-IA8'
- Separate Rx and Tx Paths
- Simple Control
- Supply Requirement Range: 4.5 to 5.5 V

Applications

- Military Communications:
  - Field Exchange and Telephone
- Delta Multiplex, Switch and Telephone

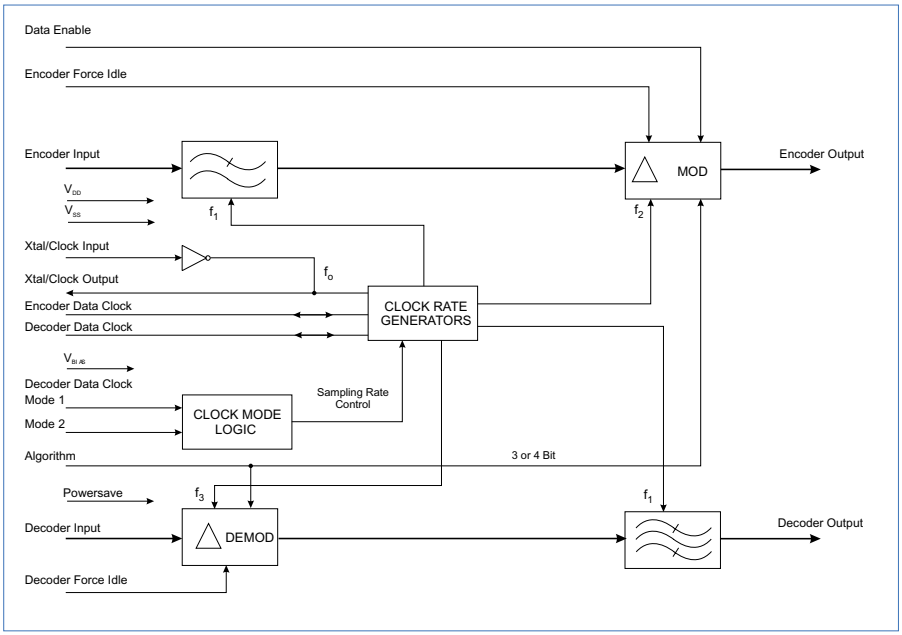
The FX/MX619 is an LSI circuit designed as a Continuously Variable Slope Delta (CVSD) Codec, and is intended for use in military communications systems.

Designed to meet Eurocom D1-IA8 with external components, the device is suitable for applications in military Delta Multiplexers, Switches and 'Phones.

Encode input and decode output filters are incorporated on-chip. Sampling clock rates can be programmed to 16, 32 or 64 kbps from an internal clock generator or may be externally applied in the range 8 to 64 kbps. Sampling clock frequencies are output for the synchronisation of external circuits.

The encoder has an enable function for use in multiplexer applications. Encoder and Decoder forced idle facilities are provided forcing a 10101010..... pattern in encode and a $V_{DD}/2$ bias in decode. The companding circuits may be operated with a 3 or 4 bit algorithm which is externally selected.

The device may be put in the standby mode by selection of the powersave facility.
A reference 1.024MHz oscillator uses an external clock or Xtal.



Packages		
FX619J	(J3)	22-pin cerdip DIL
MX619J	(J3)	22-pin cerdip DIL
FX619L1		24-pin PLCC
FX619L2		24-pin PLCC
MX619LH	(L2)	24-pin PLCC
FX619M1		28-pin ceramic CLCC
MX619P	(P6)	22-pin PDIP
Operating Temperature		-40 to +85 ˚C

Brief FX/MX619 Technical Basics

	min	typ	max	
Typical Supply Current at 5.0V	-	4.5	-	mA
Powersave	-	1.0	-	mA
Encoder				
Analogue Signal Input Levels	-35.0	-	6.0	dBm0
Passband	-	3400	-	Hz
Decoder				
Analogue Signal Output Levels	-35.0	-	6.0	dBm0
Passband		300 to 3400		Hz
Encoder - Decoder (full codec)				
Passband		300 to 3400		Hz
Stopband		6 to 10		kHz

Please note that the FX619J, MX619J and FX619M1 packages undergo additional process and test controls - *contact CML for more information.*

Digital Voice Products

MX629 'Military' Delta Modulation Codec

Continuously Variable Slope Delta Modulation

Features

- Single Chip Full Duplex CVSD Codec
- On-chip Input and Output Filters
- Separate Rx and Tx Paths
- Programmable Sampling Clocks
- 3- or 4-bit Compand Algorithm
- Force-Idle and Powersave Facilities
- Fully Meets 'Mil-Std-188-113'
- Simple Control
- Supply Requirement Range: 4.5 to 5.5 V

Applications

- Military Communications:
  - Field Exchange and Telephone Systems
- Delta Multiplex, Switch and Telephone

The MX629 is an LSI circuit designed as a Continuously Variable Slope Delta (CVSD) Codec and is intended for use in military communications systems.

Designed to meet Mil-Std-188-113 with external components, the device is suitable for applications in military Delta Multiplexers, Switches and 'Phones.

Encode input and decode output filters are incorporated on-chip. Sampling clock rates can be programmed to 16, 32 or 64 kbps from an internal clock generator or may be externally applied in the range 8 to 64 kbps.

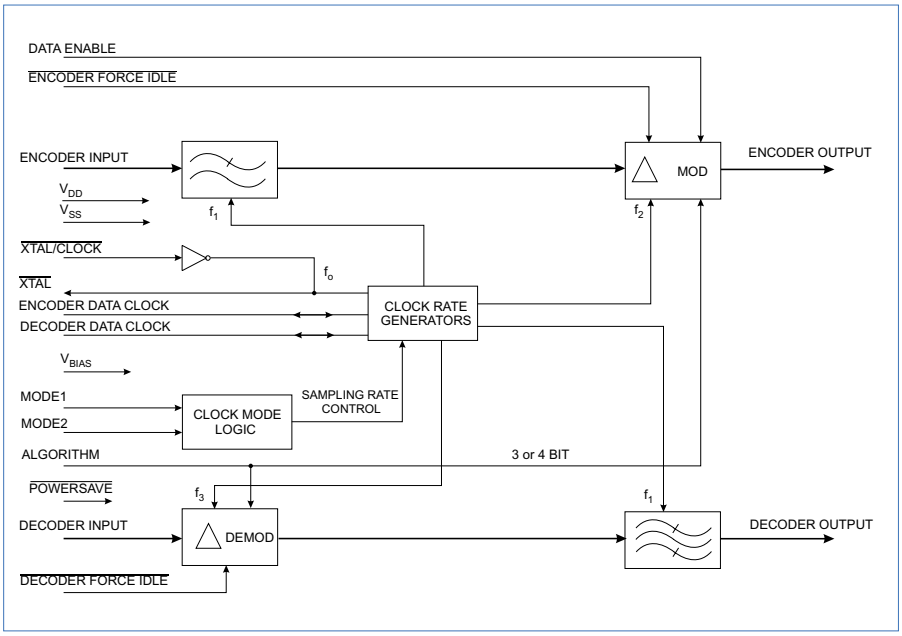
Sampling clock frequencies are output for the synchronisation of external circuits.

The encoder has an enable function for use in multiplexer applications. Encoder and Decoder forced idle facilities are provided, forcing a 10101010..... pattern in encode and a $V_{DD}/2$ bias in decode.

The companding circuits may be operated with a pin-selected 3 or 4 bit algorithm.

The powersave facility puts the device into the standby mode thereby reducing current consumption when not operating.

A reference 1.024MHz oscillator uses an external clock pulse or Xtal input.



Packages		
MX629J	(J3)	22-pin cerdip DIL
MX629LH	(L1)	24-pin PLCC
MX629P	(P6)	22-pin PDIP
Operating Temperature		-40 to +85 ˚C

Brief MX629 Technical Basics

	min	typ	max	
Typical Supply Current at 5.0V	-	5.5	-	mA
Powersave	-	400	-	µA
Encoder				
Analogue Signal Input Levels	-35.0	-	12.0	dBm0
Passband	-	3400	-	Hz
Decoder				
Analogue Signal Output Levels	-35.0	-	12.0	dBm0
Passband		300 to 3400		Hz
Encoder - Decoder (full codec)				
Passband		300 to 3400		Hz
Stopband	4.2	-	-	kHz

Please note that MX629J packages undergo additional process and test controls - *contact CML for more information.*

CMX639 CVSD Voice Codec

Continuously Variable Slope Delta Modulation

Features

- Single Chip Full Duplex CVSD Codec
- On-chip Input and Output Filters
- Programmable Sampling Clocks
- 3 or 4 bit Compand Algorithm
- Robust Coding for Wireless Links
- Encode and Decoder Force Idle
- Separate Rx and Tx Paths
- Simple Control
- Supply Requirement Range: 2.7 to 5.5 V

Applications

- Consumer and Business Handheld Equipment
- Digital Voice Systems
- Spread Spectrum Wireless
- Cordless Telephones
- Voice Recording and Storage
- Delay Lines
- Time Domain Scramblers
- Mutiplexers and Switches

The CMX639 is an LSI circuit designed as a Continuously Variable Slope Delta (CVSD) Codec intended for use in two-way radio communications systems.

Encode input and decode output filters are incorporated on-chip. Sampling clock rates can be programmed to 16, 32 or 64 kbps from an internal clock generator or may be externally applied in the range 8 to 64 kbps.

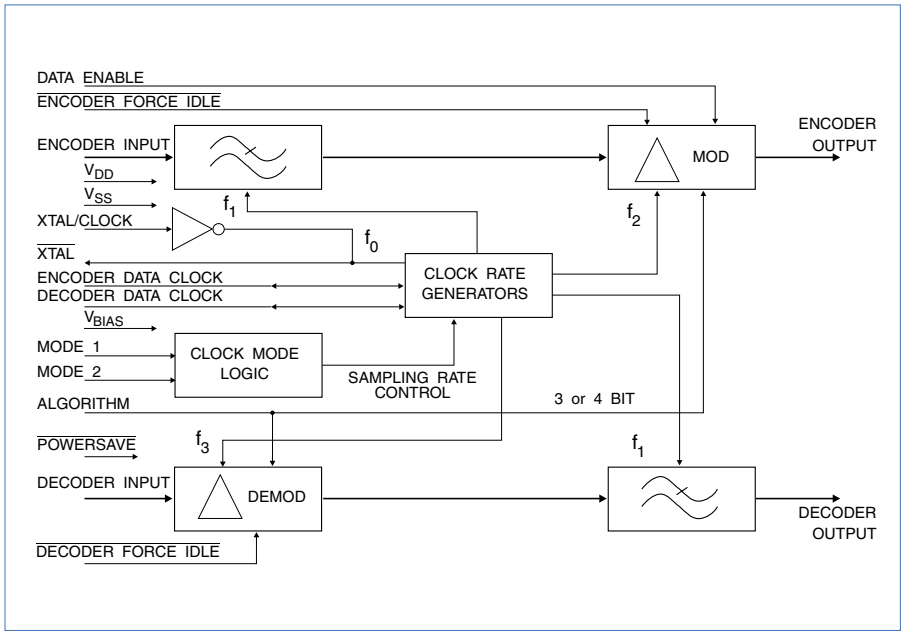
Sampling clock frequencies are output for the synchronisation of external circuits.

The encoder has an enable function for use in multiplexer applications. Encoder and Decoder forced idle facilities are provided, forcing a 10101010..... pattern in encode and a $V_{DD}/2$ bias in decode.

The companding circuits may be operated with a pin-selected 3 or 4 bit algorithm.

The powersave facility puts the device into the standby mode thereby reducing current consumption when not operating.

An on-chip reference 1.024MHz oscillator uses an external clock pulse or Xtal input.



Packages	
CMX639E2	24-pin TSSOP
CMX639D4	16-pin SOIC
CMX639P6	22-pin PDIP
Operating Temperature	-40 to +85 ˚C

Brief CMX639 Technical Basics

	min	typ	max	
Typical Supply Current at 3.0V	-	1.9	-	mA
Powersave	-	600	-	µA
Analogue Signal Input Levels	-37.0	-	6.0	dB
Encoder Passband	-	3240	-	Hz
Analogue Signal Output Levels	-37.0	-	6.0	dB
Decoder Passband	-	3200	-	Hz
Full Codec Passband		300 to 3400		Hz
Stopband		6 to 10		kHz
Stopband Attenuation	-	60.0	-	dB

Digital Voice Products

CMX649 Adaptive Delta Modulation (ADM) Voice Codec

Full Duplex ADM, CVSD and PCM for Cordless Applications

Features

- Multiple Codec Modes: 16 to 128 kbps - ADM and CVSD, PCM: A-Law, µ-Law and Linear
- Programmable Time Constants for ADM Codec
- Dual Channel Transcoder/Decoder Functions
- On-chip Programmable Anti-Alias and Anti-Image Filters
- Programmable Analogue Inputs and Outputs
- Data Clock Recovery
- Programmable Digital Scrambling and Voice Activity Detector (VAD)
  Flexible Data Interfaces
  - 8 and 16 bit Burst Data + Sync Strobe
  - 1 bit Serial Data with Clock
  - Host Serial Control and Data
- Supply Requirement Range: 2.7 to 5.5 V

Applications

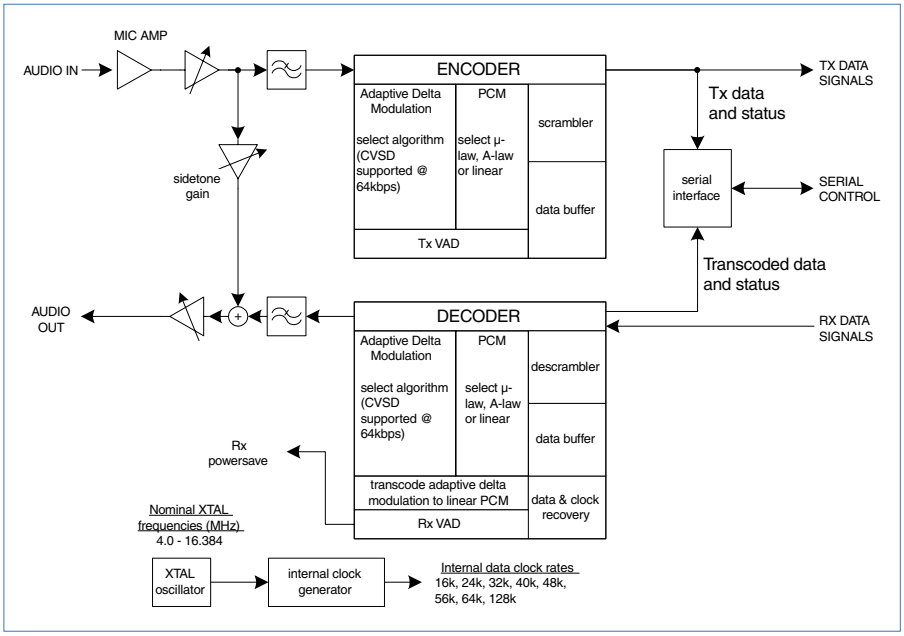
- Digital Headsets and Telephones
- Personal Area Networks (PAN)
- Wireless Digital PBXs
- Digital Radio Systems
- Time-Division Duplex (TDD) Systems
- Voice Storage and Voice Delay

The CMX649 Adaptive Delta Modulation (ADM) voice codec provides full duplex ADM, µ-law, A-law, and linear PCM codec and transcoder functions for cost effective, low power, wireless voice applications.

Selectable operating modes and algorithms support many applications. Robust ADM coding (CVSD) reduces host protocol and software burdens, eliminating forward error correction, framing protocols and algorithm processing. The dual transcode/decode mode supports multi-channel applications.

Integrated audio filter responses adjust independently from the codec's 16 to 128 kbps data rates. Codec sample clocks are externally applied or internally generated.

High performance analog interfaces and sidetone include digital gain controls. Encoder and decoder voice activity detectors (VAD) support powersaving.



Packages	
CMX649D3	20-pin SOIC
CMX649E3	20-pin TSSOP
Operating Temperature	-40 to +85 ˚C

Support

- DE6491 DemoKit

Brief CMX649 Technical Basics

	min	typ	max	
Typical Supply Current at 3.0V	-	2.4	2.9	mA
Powersave	-	2.5	20.0	µA
Encoder Analogue Signal Input Levels	-37.0	-	40.0	dB
Decoder Analogue Signal Output Levels	-37.0	-	40.0	dB
Encoder/Decoder (Full Codec) Passband		(programmable)		
Lowest Corner Frequency	-	2900	-	Hz
Highest Corner Frequency	-	1400	-	Hz
Encoder/Decoder (Full Codec) Stopband		(programmable)		
Lowest Corner Frequency	-	6.0	-	kHz
Highest Corner Frequency	-	24.0	-	kHz

Digital Voice Products

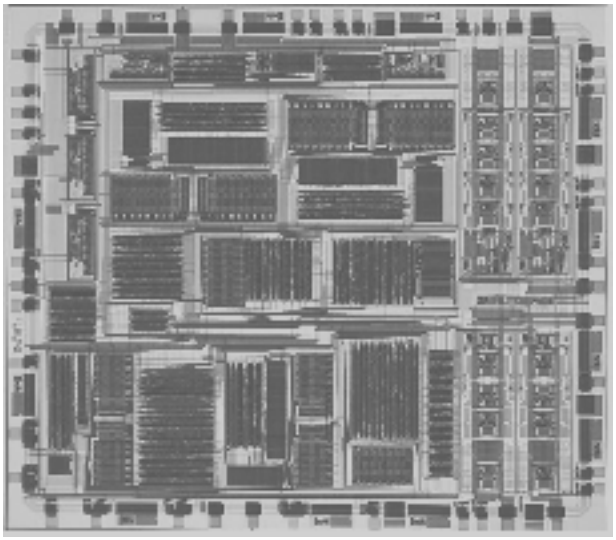
Custom ASIC Design Resource

Introduction

CML Microcircuits offers a complete 'turnkey' service for the design and supply of custom ASIC solutions. Supporting all stages of ASIC development, from concept through design, layout, prototype-testing and the supply of production tested devices.

Through CML, customers gain access to leading-edge technologies and a design team with extensive expertise specialising in: Analogue, Digital, Mixed-Signal, Memory and RF integrated circuit design.

Technologies available are state-of-the-art processes and geometries, including: CMOS, BiCMOS, BiPOLAR and SiGe. Extensive custom cell libraries are available comprising: logic, analogue/mixed-signal, digital; including memory, microcontroller, RISC/DSP and IP cores.



Routes to Market

Two basic custom product development paths are available: full-custom ASIC and CML's proprietary technology, *FirmASIC*®.
The ability to choose the appropriate path based on the product/customer requirement is the enabler in providing high performance, low cost end products in the appropriate timeframe.

Custom ASIC

CML offers a fast and competitive full-custom ASIC design service, with a ground-up design or based on the CML's vast design library resource.

FirmASIC

- Built on FirmASIC® Technology -

FirmASIC®

This CML proprietary technology enables the lowest overall cost, fastest time-to-market, lowest risk and provides unsurpassed flexibility.

FirmASIC® technology opens up completely new opportunities for deployment in the ASIC, structured ASIC, FPGA and DSP replacement markets, and is not confined to just high quantity applications.

FirmASIC® provides the optimum combination of analogue, digital, firmware and memory technologies in a single silicon platform. A family of approved, stable hardware platforms is available, each providing a different mix of fixed and re-definable functions. The *FirmASIC*® approach focuses on delivering the right feature mix, performance and cost for the target application.

FirmASIC® products can be offered in very small outline surface mount packages and operating over the temperature range -40°C to +85°C

The *FirmASIC*® path can be further sub-divided to provide semi-custom and full custom product offerings, providing a completely new approach to system designers.

Two basic custom product development paths are available:

Full custom ASIC and CML's proprietary technology, FirmASIC®.

FirmASIC® Semi-custom

The route utilises available *FirmASIC*® hardware platforms and requires a Function Image™(FI) data file to be uploaded to the device during device initialisation. The Function Image™ data file configures on-chip subsystems to determine the specific end product function and specification.

The Function Image™ data file can be held in the host microcontroller Flash memory or in a serial Flash memory attached to the *FirmASIC*® device.

The advantages of this route include:

- No silicon hardware development required
- A Function Image™ can be provided at the earliest opportunity to allow customer evaluation
- A Function Image™ can be modified and adapted based on the customer evaluation through to approval
- Provides the lowest risk
- Fastest evaluation samples and production devices
- Custom marking available
- Future proof design approach - New Function Images™ may be later provided to supplement and enhance device functions, expanding or modifying end-product features without the need for expensive and time-consuming design changes
- System-on-Chip (SoC) possibilities
- This route can be used as a stepping-stone to a full-custom device

FirmASIC® Custom

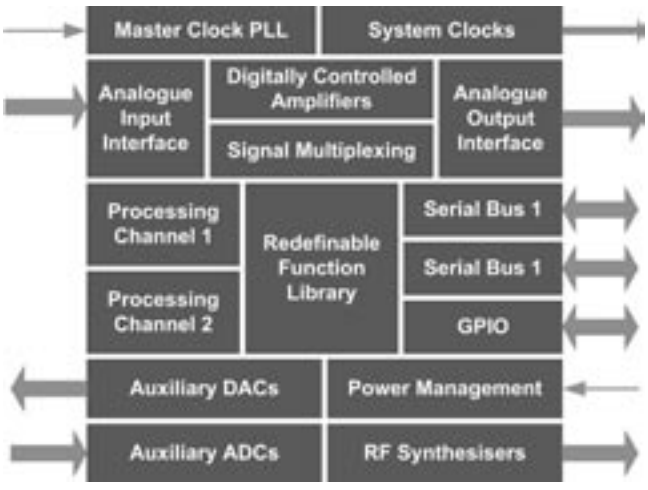
This is an advancement on the semi-custom route that is ideally suited to larger quantity opportunities. Once the product function is fully approved following the semi-custom route, the Function Image™ can be embedded on-chip therefore, eliminating the need for any external Flash memory. This route provides the ultimate security of intellectual property and products can be labelled with customer-specific markings.

FirmASIC® Platforms and Function Modules

Silicon based hardware configurations are available to address the needs of audio and signal processing applications.
The diagram shows a typical *FirmASIC*® hardware platform.
Note that not all functions are included on every available platform.

Typical functional modules include:

- Audio processing
- Wireless data modems
- Wireline data modems
- Signal processing
- Tone encoding/decoding including DTMF
- Vocoder management
- Protocol stack implementation
- Measurement and conditioning
- Filtering and equalisation
- RF systems control
- Custom functions
- System-on-Chip (SoC) operation



FirmASIC® is ideally positioned to fulfil all requirements and replace today's ASIC/DSP/FPGA implementations.

Discuss your specific requirements with CML today.

Embedded Products

NOTES

Embedded Products by Function

	8051 µController	V.22 bis	V.22/Bell 212A	V.23/Bell 202	V.21/Bell 103	DTMF	Tone Generation	Tone Detection	Call Progress	GPIO	ADC	UART	Flash Memory	Page No.
CML Microcircuits														
CMX850 Communications Controller	•	•	•	•	•	•	•	•	•	•	•	•	•	80
Hyperstone														
E2 General Purpose 32-bit RISC and DSP Processor - with µController Functions	www.hyperstone.com													
hyNet XS Network Communication Controller														
hyNet S Network Communication Controller														
F3 Memory Card Controller for CF/ATA Card and Solid State Disks														
S6 Memory Card Controller for SD and MMC Memory Cards														

The range of embedded products detailed includes the Hyperstone portfolio of memory card controllers and network communication controllers. CML Microcircuits (UK) Ltd is the official distribution partner for Hyperstone products outside of the areas covered directly by Hyperstone in Germany, Taiwan and the USA

Embedded Products

CMX850 Communications Controller

A Powerful, Versatile Communications Processor, with On-Chip Microcontroller

Features

- 8051 µC with 8k Internal RAM
- Addressing for 4Mbytes of External Flash Memory
- RAM, LCD and Controller Interfaces
- Integral Modem:
  - V.22 bis, V.22, V.23, V.21 (and Bell)
- Tx and Rx DTMF/Tones
- Line and Phone Differential Amplifiers
- Call Progress Decoder
- CAS Tone Detection and Generation
- 'Line Reverse', 'Ring' and 'Off-Hook' Detection
- Watchdog Timer
- GPI/O, UART and Timer Port with External Interrupts
- Multiplexed 2-input 10-bit A-to-D Converter
- Keypad: (8 x 16) GPI/O
- Two Low Power PWM Outputs
- Supply Requirement Range: 3.0 to 3.6 V

Applications

- SMS, ADSI and EPOS Terminals
- Telemetry, Remote Meter Reading, E-Mail and Internet Appliances
- Security and Alarm Systems
- Feature Phones and Call Routers

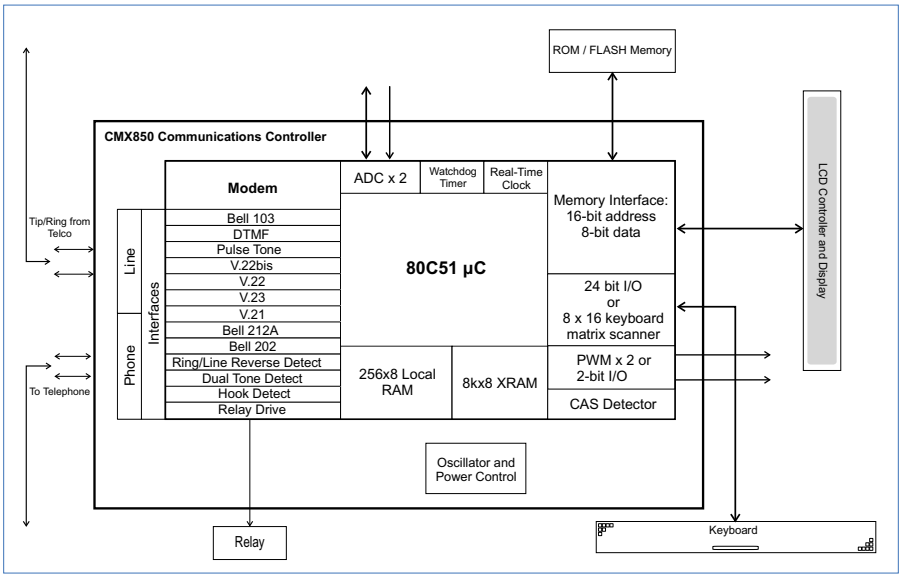
The CMX850, combines an extended function CMX860 with a full-function 8051 microcontroller (including UART and timer/counters), and has 8kbytes of RAM to form a powerful communications processor. Extended addressing offers page mode access to 4Mbytes of external Flash memory.
A 32.768kHz clock system allows a very low power interrupt-driven real time clock, watchdog timer, and keyboard encoder.

The device also includes a separate CAS-tone detector, two low-power PWM outputs and a multiplexed two-input ten-bit A to D converter with auto-convert and threshold detect.
Advanced low power and sleep modes, including the ability to operate from an on-chip RC oscillator, contribute to low battery consumption.

The 8051 runs from the ~12MHz oscillator with a choice of sub-multiple frequencies, or the 32kHz RTC crystal, giving a range of low power operating modes.
A Watchdog Timer, one 16-bit timer, and two 8 bit timers are available; one of the 8-bit timers controls the UART Clock output.

I/O facilities include an LCD controller interface, 8x16 keypad interface with interrupts, a UART, two low power PWM outputs, and a multiplexed 2-input 10-bit A-to-D converter. Unused functions can be alternatively used as GPIO. Low power and very low power (sleep) modes contribute to low battery consumption.
The MSEL pin allows the 8051 to multiplex the eight lower address and data bus lines to release further pins for I/O (debug support etc.).

The V.22 bis modem can be woken from sleep mode by 'ringing' or 'line-reversal' inputs.



Packages	
CMX850L8	100-pin LQFP
Operating Temperature	-40 to +85 ˚C

Support

- EV8500 EvKit

Brief CMX850 Technical Basics

	min	typ	max	
Typical Supply Current (AV_{DD} = DV_{DD} 3.0V)	-	6.5	16.0	mA
Zero-Power Mode	-	6.0	60	µA
Modem Rx Signal Level	-45	-	-9.0	dBm
Modem Rx S/N Ratio	20	-	-	dB
Modem Tx Signal Level	-3.2	-2.2	-1.2	dBm
Single Tones				
Tx Signal Level	-3.2	-2.2	-1.2	dBm
DTMF Output Levels				
Low Group	-1.2	-0.2	+0.8	dBm
High Group (wrt Low Group)	+1.0	+2.0	+3.0	dB
DTMF Input Levels (each tone of composite)	-30	-	0	dBm
Call Progress Energy Detector Bandwidth (-3dB)		275 to 665		Hz

The table below gives a basic guide to the Hyperstone product families. More information is provided on the following pages.

Product	Applications	External Data Bus Width	Flash ICs	Timers/ Resolution	Internet RAM (kB)	Boot ROM (kB)	Voltage Range	Operating Temperature	Packages	External Interfaces and Additional Features
E1-16XSR	General Purpose RISC + DSP, Multimedia, Telecoms.	16		2 1uS	16		2.5V+/5% 3.3V+/10%	0°C +85°C	LQFP 100	DRAM, EDO-DRAM, SDRAM, DRAM Controller, DSP, Automatic power-down, PLL, Watchdog, EvKit.
E1-L16XSR										
E1-32XSR		32							LQFP 144	
E1-L32XSR										
E2-LAL07	General Purpose RISC + DSP, Sensing, Analogue Input Signal Processing.	32		2 1uS	32 DPRAM 8	8	1.8V+/-5% 3.3V+/10%	0°C +85°C	LQFP 144	Similar to E1 in 0.18µm with additional 10-bit successive approximation ADC with 8 multiplexed inputs, RTC, Programmable Serial Engine (up to 4 UART, I²C, I²S, SPI, PWM), EvKit.
F2-16XT-FU5A	CF Cards, IDE Flash Disks, DOM DOC, PCMCIA Cards.	16	10	2 1uS	16	8	5V +/-10% 3.3V+/10%	0°C +85°C	TQFP 100	PCMCIA 2.1, PC Card ATA, ATA 3, CF 1.3, ECC, Wear levelling, Automatic power-down and Sleep modes, Voltage regulators, True IDE modes.
F2-L16XT-FU5A										
F2-16XN-FU5A			16						TQFP 128	
F2-L16XN-FU5A										
F2-IL16XN-FU5A								-40°C +85°C		
F3-LB05	High-speed CF/ATA Cards, Solid State Disks (SSD), IDE Flash Disks, DOM, DOC, PCMCIA Cards.	16	8	2 1uS	16	16	5V+/-10% 3.3V+/10%	0°C +85°C	TQFP 100	PCMCIA 2.1, PC Card: ATA, ATA 6, CF 3.0. 2 x channel, ECC, Wear levelling, Automatic Power-down and Sleep modes, Voltage regulators, PIO mode 6, MDMA mode 4, UDMA (true IDE) Mode 5.
F3-LBT06			16						TQFP 128	
S2-16XL SU3C	SD Cards, MMC Cards.	8/16	4	2 1uS	16	8	2.7V to 3.6V	0°C +85°C	LGA 72	SD 1.01, MMC 3.31.
S3-16XL SU4A	SD/MMC/MiniSD/ MicroSD Cards, MMC, MMCmicro, RSMMC, Embedded Flash, eMMC.	8/16	4	2 1uS	20	8	2.7V to 3.6V	-25°C +85°C	LGA 64	SD 1.01 and 1.1, MMC 3.31 and 4.0, Serial interface to security chip.
S4-LDK01		8	4	2 1uS	20	16	1.65 to 1.95 V 2.7 to 3.6 V	-25°C +85°C	LGA 50	SD 1.01 and 1.1. MMC 3.31 and 4.1. Pad-optimised for µSD, Dual voltage operation.
S6-LAK05		8	4	2 1uS	20	16	1.65V 1.95V 2.7V 3.6V	-25°C +85°C	LGA 54	SD 1.01, 1.1 and 2.0, MMC 3.31, 4.1 and 4.2. 2 x Channel, Pad-optimised for µSD, Serial interface to security chips.
S7-LAK05		8	8	2 1uS	20	12	1.65 to 1.95V 2.7 to 3.6 V	-25°C +85°C	LGA 54	2 x Channel, Pad-optimised for µSD, Serial interface to security chip, 6/14 -bit ECC, SD 1.01, 1.1 and 2.0, MMC 3.31, 4.1 and 4.2.
hyNet XS-LBB09	Real-time Ethernet, Networking, Telecommunica-tions, Image control, Robotics, Communication, Access Points, Bridges,	32		1 timer 1 x 32-bit counter 2 x 16-bit counter	128kB SRAM, 16kB IRAM, 16kB DPRAM	8	1.8V/3.3V +/- 5%	-40°C +85°C	TF-BGA 256	ATM Utopia/DSL, PCM/ISDN, CAN 2.0, USB 2.0 OTG, 1.1 Phy, YUV CCIR 656/100, SD/CF Host, PCMCIA, UART, SPI, IRDA, I²C/I²S Master/Slave, EvKit, 10/100 Ethernet, 2 MAC, 1 Phy.
hyNet S-LBB09	IP-Cameras, Digital Video Recorders, Industrial Automation	32		1 timer 1 x 32-bit counter 2 x 16-bit counter	64kB SRAM, 16kB IRAM, 4kB DPRAM	8	1.8V/3.3V +/-5%	-40°C +85°C	TF-BGA 256	SDRAM, SD/CF Host, PCMCIA, PCI 2.2, PCM/ISDN, Can 2.0, YUV CCIR 656/601, Ethernet 10/100, 1 x MAC, 2 x MII, UART, SPI, IRDA, I²C/I²S Master/Slave, EvKit.

Product Suffix L = RoHS compliant

Embedded Products

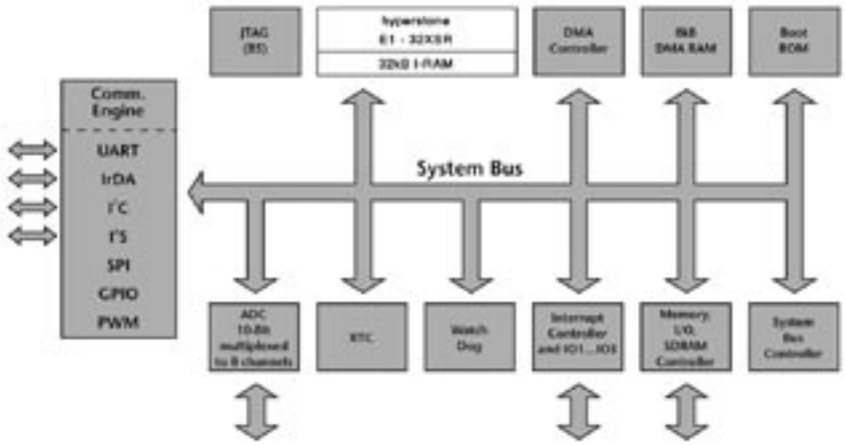
E2 RISC/DSP Microcontroller

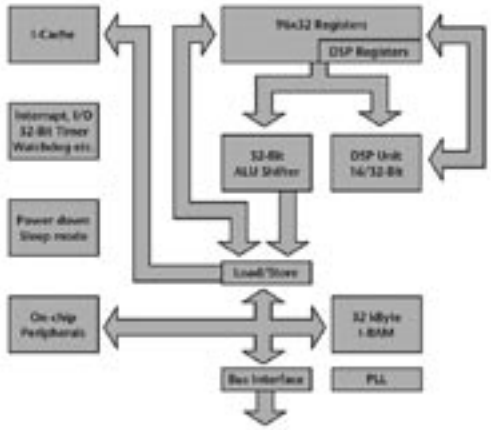
Multi-purpose RISC and DSP Processor with Microcontroller Function

- 32-bit Unified RISC and DSP Processor Architecture
- Peak Performance of 640MOPS and 160MHz
- Dynamic Frequency Scaling, Power-down and Sleep Mode
- Instruction Set Compatible to all Hyperstone E1-based Controllers
- Parallel Execution of ALU, DSP and Load/Store Instructions
- Very High Code Density Using Variable Length 16, 32 and 48 bit Instructions
- 32kB Fully Static On-chip Memory (I-RAM)
- Programmable 8-Channel Serial Communication Engine
- Implementation of up to 4 UART Ports Possible
- 10-bit, 8-channel Multiplexed A/D Converter
- Versatile 2-channel DMA Engine for I/O Device Data Transfer
- Battery-backed Real Time Clock
- Power Consumption: Typically 200mW

The Hyperstone E2 microcontroller combines a high-performance RISC processor with a powerful DSP unit.
Additional on-chip highlights include a programmable serial communication engine, an analogue-to-digital converter (ADC) and a full 32kBytes of on-chip I-RAM complemented by a flexible external memory and peripheral interface controller. Maximum efficiency in terms of power-consumption, gate count and ease of programming when utilising RISC and DSP functionality are inherent features of the unique Hyperstone RISC/DSP architecture.

E2 Block





E1 Block

Development Tools

- Development Kit Including Board and Serial Debug Interface
- Integrated Development Environment (IDE), C/C++ Compiler, Linker, Assembler, Source-level Debugger with Profiler, Run-time Kernel and DSP Library

hyNet XS and hyNet S Communication Controllers

Network Communication Controllers with a Wide Range of Applications

Integrated features of the hyNet XS

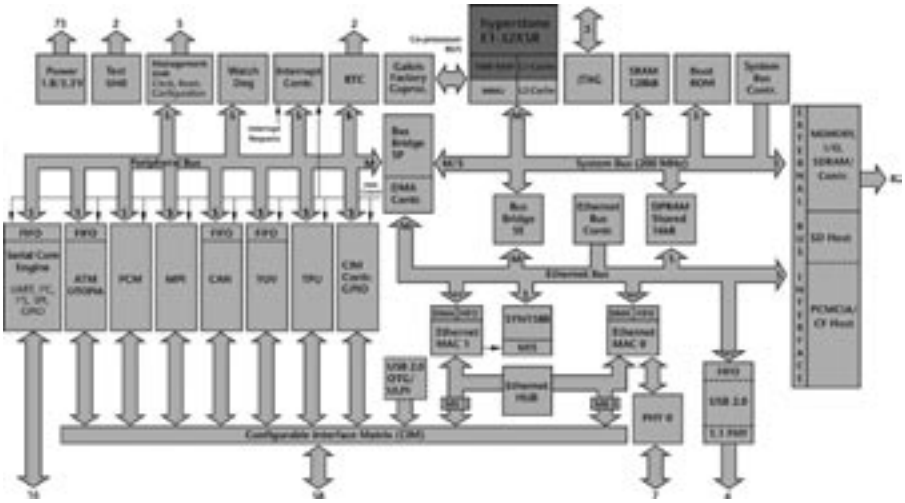
- Highly Integrated RISC and DSP System-on-Chip including Integrated PHY
- Excellent RISC/DSP Performance of up to 200MIPS and 800MOPS
- 4 Internal Busses with Multi Channel DMA Controller
- 8, 16 or 32 bit External Bus Interface with Variable Timing
- DMA Controller with 6 Independent Configurable Channels
- Memory Management Unit (MMU)
- Galois Factory Co-processor, Reed Soloman Hardware Error Correction
- Multiplexed Processor Interface (MPI) for Connection of Co-processors
- Real Time Clock, Battery Buffered
- Watchdog and Power-saving Features

Main Interfaces:

JTAG, dual 10/100 Mbit/s Ethernet MAC+PHY, 8/16 bit YUV, IOM-2, CAN 2.0, ATM-UTOPIA Level2, UART, IrDA, SPI, I²S, I²C master and slave, 16 GPIOs

hyNet XS

Network communication controller with a wide range of possible applications, such as Industrial Automation, Control and Robotics, Real-Time Ethernet, PROFINET, Ethernet Powerlink, Ethernet/IP, cost sensitive network enabling and embedded web servers, communication infrastructure, Bus Bridges, Residential gateways, Data and Voice over IP (VoIP), Power-line communications and many more.



hyNet XS Block

Integrated features of the hyNet S

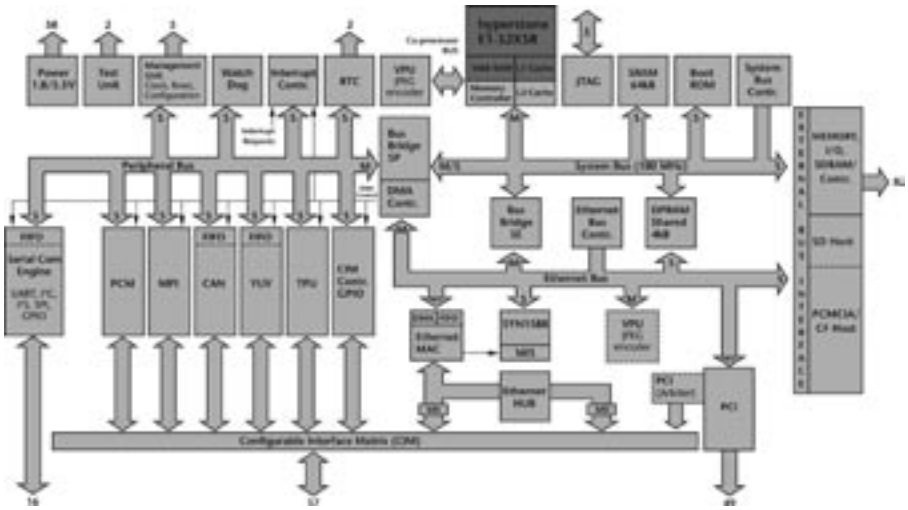
- Highly Integrated RISC and DSP System-on-chip
- Excellent RISC/DSP Performance of up to 180MIPS and 720MOPS
- 4 Internal Buses with Multi-channel DMA Controller
- 8, 16 or 32 bit External Bus Interface with Variable Timing
- DMA Controller with 3 Independent Configurable Channels
- Memory Controller Unit
- Video Processing Unit VPU with Automatic JPEG Encoding
- Multiplexed Processor Interface (MPI) for Connection of Co-processors
- Real Time Clock, Battery Buffered
- Watchdog and Power-saving Features

Main Interfaces:

32-bit PCI, JTAG, 10/100 Mbits/s Ethernet MAC, 8-bit YUV, IOM-2, CAN 2.0, UART, IrDA, SPI, I²S, I²C master and slave, 16 GPIOs

hyNet S

A communication controller with a wide range of possible applications, such as security, Internet Protocol Cameras (IP-Cam), Digital Video Recorders (DVR), Data and Voice over IP (VoIP), cost sensitive network enabling and embedded web servers, Industrial Automation, Control and Robotics, Real-Time Ethernet, PROFINET, Ethernet Powerlink, Ethernet/IP, Bus Bridges and many more.



hyNet S Block

Embedded Products

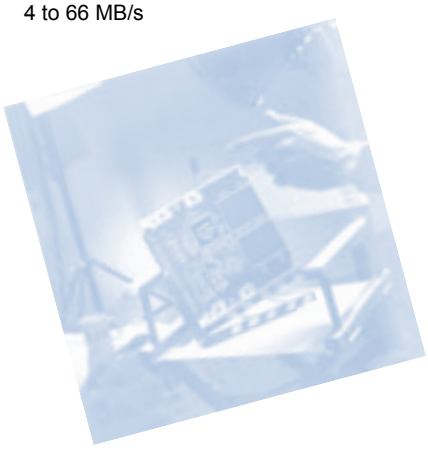
F3 Flash Memory Controller

Optimised for CF/ATA Cards and Solid State Disks (SSD)

The Hyperstone F3 family of Flash Memory Controllers together with provided application and Flash specific firmware offers an easy-to-use turnkey platform for high endurance Flash disks of various form-factors and interface standards.

Compliance and Performance

- Fully Compliant to CompactFlash™ 3.0 and Compatible to 4.1 Specifications
- Fast ATA Supporting PIO Mode 6, MDMA Mode 4, UDMA Mode 4 in True-IDE Mode
- PCMCIA Specification Version 2.1
- Configurable as Removable, Hot Swappable and Fixed Drive
- Sustained Read up to 45MB/s
- Sustained Write up to 30MB/s with Interleaving
- Random Read up to 35MB/s
- Random Write up to 6MB/s
- Custom Performance Optimisations for Specified File Sizes Possible
- Data Transfer Rate to Flash Memories: up to 80MB/s
- Host Data Transfer Rate in PIO Mode 6 or MDMA Mode 4 to 25MB/s
- Host Data Transfer Rate in UDMA Mode 4 to 66 MB/s



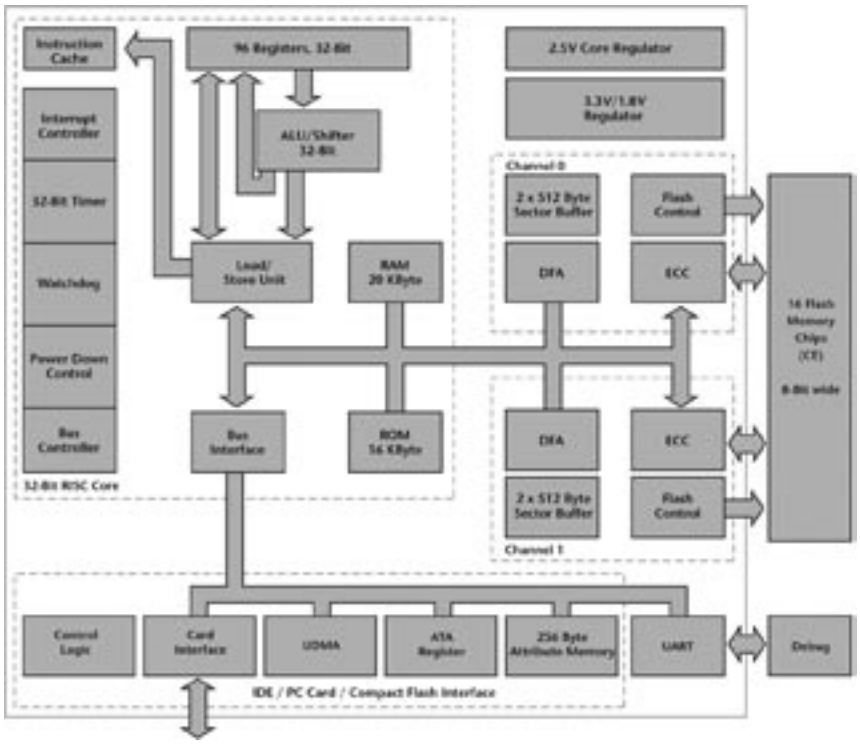
Flash Memory Interface and Handling

- Dual Channel Direct Flash Memory Access (DFA)
- Supporting all Control Signals for NAND Type Flash Memory Connection
- Supporting Direct Connection for up-to 16 Flash Memory Chip Enables (CE) - Eight per Channel
- Flash Memory Power-down Logic and Flash Memory Write Protect Control
- Error Correcting Code (ECC) Capable of Correction 4 Symbols in a 512Bytes Sector with Additional CRC Supporting all Current and Future Vendor Flashes and Technologies (NAND, AG-AND, MLC/SLC, NROM, …) by Firmware Upgrades
- Firmware Storage in Flash Memory
- Firmware is Loaded into Internal Memory by the Boot ROM
- Flash Management Including Mapping of Logical Block Addressed (LBA) to Corresponding Physical Block Addresses (PBA) Bad Block Management
- Wear Levelling
- Power Loss Protection
- Interleaving, Cache, and Multi-plane Programming

Target Applications

- High Reliability and Industrial CompactFlash™ Cards (CFC)
- Solid State Disks (SSD)
- IDE Disk-on-Modules (DoM)
- Embedded Flash
- Multi-Chip-Modules (MCM)
- Multi-Chip-Package (MCP)
- PCMCIA or ATA PC cards
- Disk-on-Board

F3 Block



Host Interface and Compliance

- Fully Compliant to CompactFlash™ 3.0 and Compatible to 4.1 Specifications
- Fast ATA Host-to-buffer Transfer Rates Supporting PIO Mode 6, MDMA Mode 4, UDMA Mode 4 in True-IDE Mode
- PCMCIA Specification Version 2.1
- Configurable as Removable, Hot Swappable and Fixed Drive
- Memory Mapped or I/O Operation
- Automatic Sensing of PCMCIA of True-IDE Mode
- Four Integrated 512Byte Sector Buffers and 256Byte PCMCIA Attribute Memory
- PCMCIA Configuration Option Register, Card Configuration and Status Register and Pin Replacement Register Support

Controller and CPU

- High Performance 32-bit Hyperstone RISC Microprocessor
- 10 to 70 MHz Clock Frequency Using Adjustable Internal Oscillator
- 16kB Internal Boot ROM and 20kB Internal SRAM
- Card Operation Current 75mA max.
- Automatic Power-down During Wait Periods, Power-saving with Automatic Wake-up and Sleep Modes (Icc<200µA)
- Supply Voltage: 5.0V+/-10 % or 3.3V+/-10 %
- On-chip Voltage Regulator for 3.3V Flash Power Supply
- On-chip Voltage Regulator for 2.5V Core Power Supply
- Internal Voltage Detector

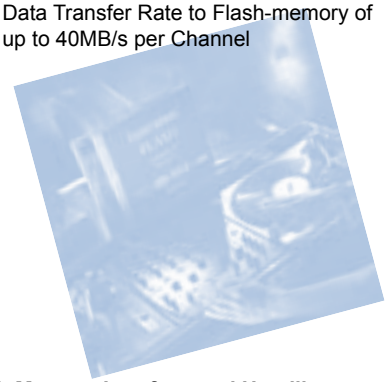
S6 Flash Memory Controllers

SSD and MMC Memory Card Controllers

The Hyperstone S6 family of Flash Memory Controllers together with provided application and Flash specific firmware offers an easy-to-use turnkey platform for high reliability and high performance Flash solutions compliant to MMC 4.2 and SD 2.0 interfaces.

Compliance and Performance

- Fully Compliant to SD 1.01, 1.10, and 2.0 Standards
- Fully Compliant to MMC 3.31, 4.1, and 4.2 Standards
- 2 x 4kB Large Page Buffers per Channel Achieving Optimal Performance for SLC and MLC Flash Chips with 4kB Page Size
- Sustained Read and Write up to 24 and 23 MB/s Respectively using SLC in SD Mode
- Sustained Read and Write up to 22 and 9 MB/s Respectively using MLC in SD Mode
- Sustained Read and Write up to 42 and 25 MB/s Respectively using SLC in MMC Mode
- Sustained Read and Write up to 42 and 9 MB/s Respectively using MLC in MMC Mode
- Data Transfer Rate to Flash-memory of up to 40MB/s per Channel



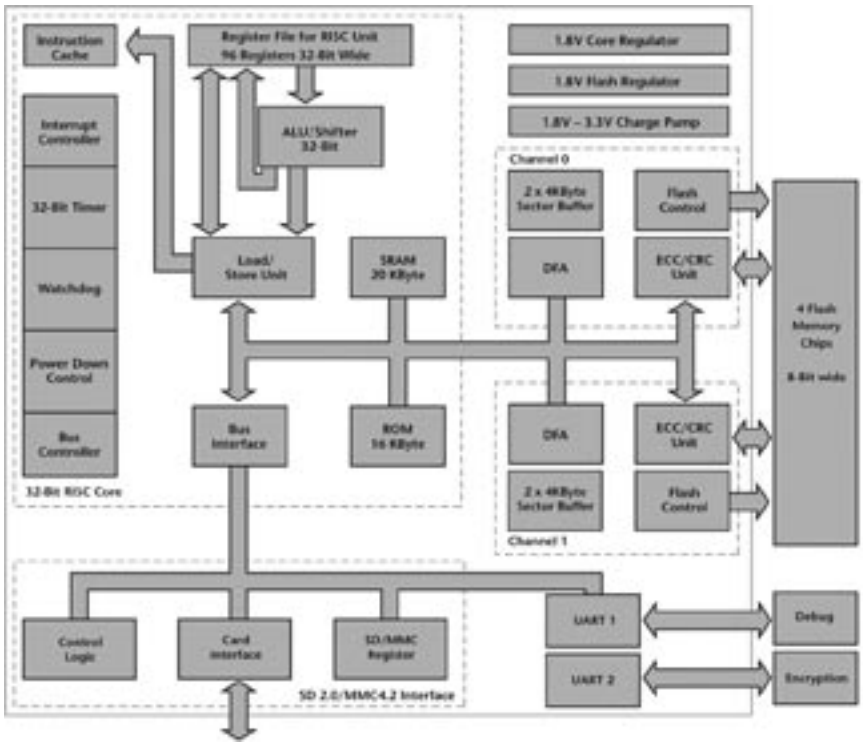
Flash Memory Interface and Handling

- Dual Channel Direct Flash Memory Access (DFA)
- Supporting all Control Signal for NAND Type Flash Memory Connection
- Supporting Direct Connection of up to 4 Flash Memory Chip Enables (CE) – 2 per Channel
- 2 x 4kB Large Page Buffers per Channel Achieving Optimal Performance for SLC and MLC Flash Chips with 4kB Page Size
- Flash Memory Power Down Logic and Flash Memory Write Protect Control
- Error Correcting Code (ECC) Capable of Correcting 4 Symbols in a 512Bytes Sector with Additional CRC
- Supporting all Current and Future Vendor Flashes and Technologies (NAND, AG-AND, MLC/SLC, NROM, ...) by Firmware Upgrades
- Firmware Storage in Flash Memory
- Firmware is Loaded into Internal Memory by the Boot ROM
- Flash Management Including Mapping of Logical Block Addresses (LBA) to Corresponding Physical Block Addresses (PBA)
- Bad Block Management
- Wear Levelling
- Power Loss Protection
- Interleaving, Cache and Multi-plane Programming

Target Applications

- SecureDigital™ – SD Cards for Industrial and Consumer Applications
- MicroSD Cards for Consumer and Mobile Applications
- MultiMediaCards™ (MMC)
- eMMC Embedded Flash
- Multi-Chip-Packages (MCP)
- SmartCards

S6 Block



Host Interface and Compliance

- Fully Compliant to SD 1.01, 1.1, and 2.0 (SDHC) Standards
- Fully Compliant to MMC 3.31, 4.1, and 4.2 Standards
- Additional General Purpose UART and Optional ISO 7816-3 Interface

Controller and CPU

- High Performance 32-bit Hyperstone RISC Microprocessor
- 10 to 60 MHz Clock Frequency using Adjustable Internal Oscillator
- 16kB Internal Boot ROM
- 20kB Internal RAM
- Card Operation Current of Less than 25mA
- Automatic Power-down Mode during Wait Periods, Power Saving Mode including Automatic Wake-up and Sleep Mode (Icc <120µA)
- Dual Supply Voltage 1.8V and 3.3V
- On-chip Voltage Regulator for 1.8V and Charge Pump for 3.0V Flash Memory Power Supply
- On-chip Voltage Regulator for 1.8V Processor Core Supply
- Internal Voltage Detector
- Optimized Die Size, Shape and Pad Layout for Multi Die Packages and Die Stacking

Wireline Data Products

Wireline Data Products

Wireline Data Products by Function

	V.32 bis	V.32	V.22 bis	V.22/Bell 212A	V.23/Bell 202	V.21/Bell 103	ISDN Functions	Tone Detection	Tone Generation	DTMF	PCM Codec	Call Progres	CLI/CIDCW	AT Command Set	Line Drivers	Digital Amplifiers	Page No.
FX/MX604 V.23 Compatible Modem					•												88
FX/MX614 Bell 202 Compatible Modem					•												89
CMX635 ISDN Subscriber Processor							•	•	•	•	•	•	•		•	•	90
CMX654 V.23 Transmit Modulator					•										•		91
CMX860 Telephone Signalling Transceiver					•			•	•	•		•			•	•	92
CMX865A DTMF Codec/FSK Combo					•	•		•	•	•					•	•	93
CMX866 V.22 bis Modem with AT Command Set			•	•	•			•	•	•			•	•	•	•	94
CMX867A Low Power V.22 Modem				•	•	•		•	•	•		•			•	•	95
CMX868A Low Power V.22 bis Modem			•	•	•	•		•	•	•		•			•	•	96
CMX869B Low Power V.32 bis Modem	•	•	•	•	•	•		•	•	•		•			•		97
CMX878 V.22 bis Modem plus DAA			•	•	•	•		•	•	•					•		98
Relevant Products in Other Sections																	
CMX850 Communications Controller							Embedded Products										80

A comprehensive portfolio of data products operating to a range of ITU 'V' and Bell specifications. The majority of these versatile products include, on-chip, wireline signalling applications to offer true end-to-end communications.

Wireline Data Products

FX604 V.23 Compatible Modem
MX604 *Versatile Full-duplex V.23 Wireline Data*

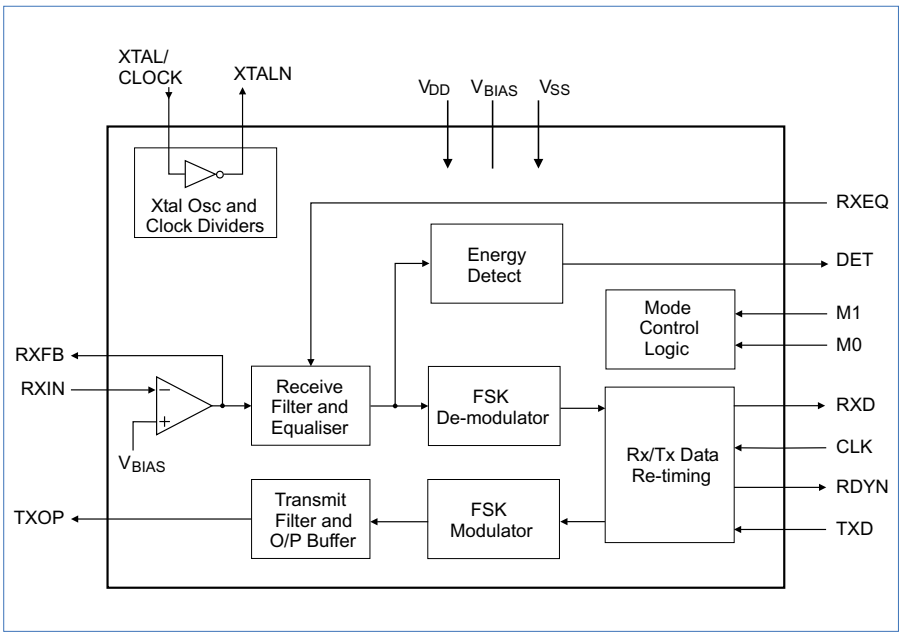
Features
- Full Duplex 1200/75 bps Operation
- Optional 75bps Back Channel
- Optional 1200bps (Tx and Rx)
- Data Retiming Facility
- Optional Line Equalisation
- Low Power Operation with 'Zero-Power Mode'
- Supply Requirement Range: 3.0 to 5.5 V

Applications
- Wireline and Wireless Telemetry Systems
- Security and Alarm Systems
- AIS Digital Selective Calling (DSC)
- Amateur Radio Packet Data Systems

The FX/MX604 is a low power CMOS product for the reception and transmission of asynchronous 1200bps data in accordance with CCITT V.23 and ETSI specifications. It is also capable of generating the 75bps 'back channel'.

The device incorporates an optional Tx and Rx data retiming function that removes the need for a UART in the associated µC when operating at 1200bps. The device can disable the back channel or be operated so only the mark or space tone is produced. An optional line equaliser is incorporated into the receive path, this is controlled by an external logic level.

The FX/MX604 may be used in a wide range of telephone and wireless telemetry systems and is suitable for both portable, terminal and line powered applications.
With a very low current 'sleep' mode and a mean operating current of 1mA, the device is ideal for line powered applications.
A 3.58MHz standard Xtal/Clock rate is required and the device operates from a 3.0 to 5.5V supply.



Packages		
FX604D4		16-pin SOIC
MX604DW	(D4)	16-pin SOIC
FX604P3		16-pin PDIP
MX604P	(P3)	16-pin PDIP
MX604TN	(E2)	24-pin TSSOP
Operating Temperature		-40 to +85 ˚C

Brief FX/MX604 Technical Basics

	min	typ	max	
Typical Supply Current at 3.0V	-	1.0	-	mA
Powersave (ZP)	-	1.0	-	µA
FSK Demodulator				
Acceptable Signal-to-Noise Ratio	20.0			dB
FSK Modulator				
Tx Output Level	-1.0	0	1.0	dB
FSK Retiming				
Acceptable Rx Data Rate	1188	1200	1212	Baud
Tx Data Rate	1194		1206	Baud

FX614 Bell 202 Compatible Modem
MX614 *Versatile Half-duplex Bell 202 Wireline Data*

Features

- Optional 5 and 150 bps Back Channels
- Optional 1200bps Data Retiming
- Optional Line Equalisation
- Supply Requirement Range: 3.0 to 5.5 V

Applications

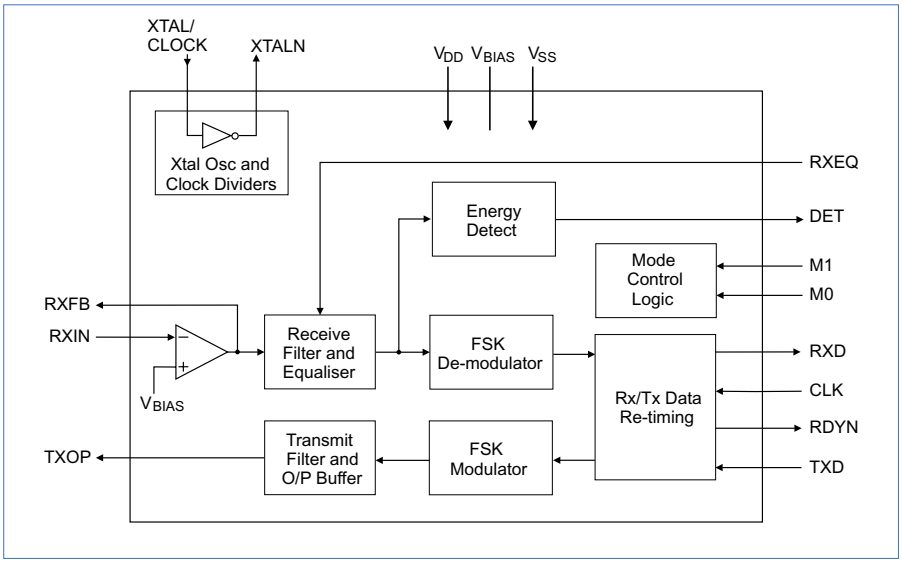
- Bell Wireline Telephone and Telemetry Systems

The FX/MX614 is a low power CMOS product for the reception and transmission of asynchronous 1200bps data and is suitable for use in Bell 202 type systems. It is also capable of generating the 5 or 150 bps 'back channel'.

The device incorporates an optional Tx and Rx data retiming function that removes the need for a UART in the associated µC when operating at 1200bps. An optional line equaliser in incorporated into the receive path, this is controlled by an external logic level.

With a low operating voltage, a very low current 'sleep' and an operating modes the FX614 may be used in a wide range of telephone systems and is ideal for portable, terminal and line powered applications.

A 3.58MHz standard Xtal/Clock rate is required.



Packages		
FX614D4		16-pin SOIC
FX614P3		16-pin PDIP
MX614DW	(D4)	16-pin SOIC
MX614P	(P3)	16-pin PDIP
MX614TN	(E2)	24-pin TSSOP
Operating Temperature		-40 to +85 ˚C

Brief FX/MX614 Technical Basics

	min	typ	max	
Typical Supply Current at 3.0V	-	1.0	-	mA
Powersave (ZP)	-	1.0	-	µA
FSK Demodulator				
Acceptable Signal-to-noise Ratio	20.0			dB
FSK Modulator				
Tx Output Level	-1.0	0	1.0	dB
FSK Retiming				
Acceptable Rx Data Rate	1188	1200	1212	Baud
Tx Data Rate	1194		1206	Baud

Wireline Data Products

CMX635 ISDN Subscriber Processor

Core ISDN Voice, Signalling and Data Functions

Features

- ISDN S-Bus to POTS Signalling Interface with HDLC Controller and PCM Codec
- Support for ISDL HDLC Functions
- SPM, Ring and Call Progress Tone Generators
- PCM Codec: Selectable to A-Law or µ-Law Compand Algorithm
- On-chip POTS Port Signalling
- On-chip Speaker-phone Functions
- Dual Independent Differential Analogue Inputs and Outputs
- Full DTMF Encode/Decode Functions
- POTS CLI/CIDCW Facilities
- 1024-Byte FIFO Configurable for B and D Channels
- Programmable IOM2/GCI Peripheral Bus Controller
- Supply Requirement Range: 3.0 to 5.5 V

Applications

- ISDN Voice, Data and Signalling Telephones, Payphones and PABX
  - Data Adapters
  - Alarm Systems
  - Point-of-sale Terminals
  - 'Group 4' Fax Equipment

The CMX635 ISDN Subscriber Processor circuit provides maximum functional integration combined with optimum product implementation costs.

This cost-effective device, combined with ROM, RAM, µController and a power controller are all that is needed for a basic, CCITT power-compliant telephone or terminal.

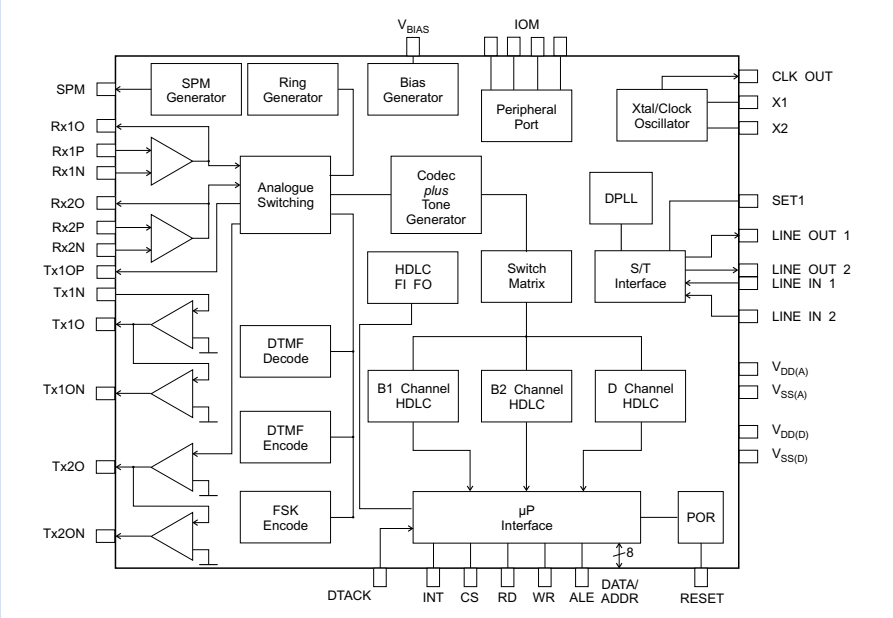
The CMX635 allows the realization of highly-integrated Terminal Equipment (TE) for ISDN; it is fully compatible with the CCITT-I-series recommendations for the S and T reference points, ensuring that the user of the device may design TEs which conform to international standards.

The CMX635 provides a 192kbps full duplex digital path over four wires between the TE located on the subscriber's premises and the NT or PABX linecard.
All physical layer functions and procedures are implemented in accordance with CCITT Recommendation I.430, including framing, synchronisation, maintenance, and multiple terminal contentions. Both point-to-point and point-to-multipoint configurations are supported.

The CMX635 processes the ISDN basic rate bit-stream, which consists of B1 (64kbps), B2 (64kbps), and D (16kbit/s) channels. The B and D channels are routed to dual FIFO buffered HDLC controllers under software control. The D channel is partially processed by the DSC/IDC circuit and then passed to the microprocessor for further processing.

The codec port uses digital signal processing techniques to implement a high performance codec/filter function. The interface supports a speakerphone function or an analogue POTS port. Programmable gain blocks simplify the use of microphones which, together with the PA, provide an on-chip 'hands-free' facility.
In the 'POTS port' mode of operation tone generators are included to implement ringing, call progress, metering, CLI and DTMF signals. A 'ringing' signal generator and a DTMF decode function are also provided.

A Peripheral Port (PP) is provided to allow all the primary (2B + D) and the intercommunication channels to be routed off-chip for processing by other peripherals. This port is configurable as either an industry-standard IOM-2 or GCI port.



Packages	
CMX635L4	48-pin TQFP
Operating Temperature	-40 to +85 ˚C

Brief CMX635 Technical Basics

	min	typ	max	
Supply Current at 3.3V				
All Enabled	-	24.0	-	mA
All Disabled	-	20.0	-	mA
Audio Tone Range		17 to 3500		Hz
Passband	300		3400	Hz
Input Amplifiers - RX1 and RX2				
Open Loop Gain (input 1mV at 100Hz)	-	60.0	-	dB
Output Amplifiers TX1				
Open Loop Gain (input 1mV at 100Hz)	-	40.0	-	dB
Output Amplifiers TX2				
Output Voltage Swing	-	3.2	-	V p-p

CMX654 V.23 Transmit Modulator

Simple V.23 Transmission System

Features

- 1200bps, V.23 Transmit Modulator with Tx Data Retiming
- Meets ITU and ETSI Specifications
- Supply Requirement Range: 3.0 to 5.5 V

Applications

- Calling Line ID (CLID) Generation for:
  - ISDN Terminal Adapters
  - Wireless Local Loops
  - ISDN PABX Applications
  - Pair-Gain Systems
  - Public Switched Telephone Networks (PSTN)
  - Trunk Exchanges

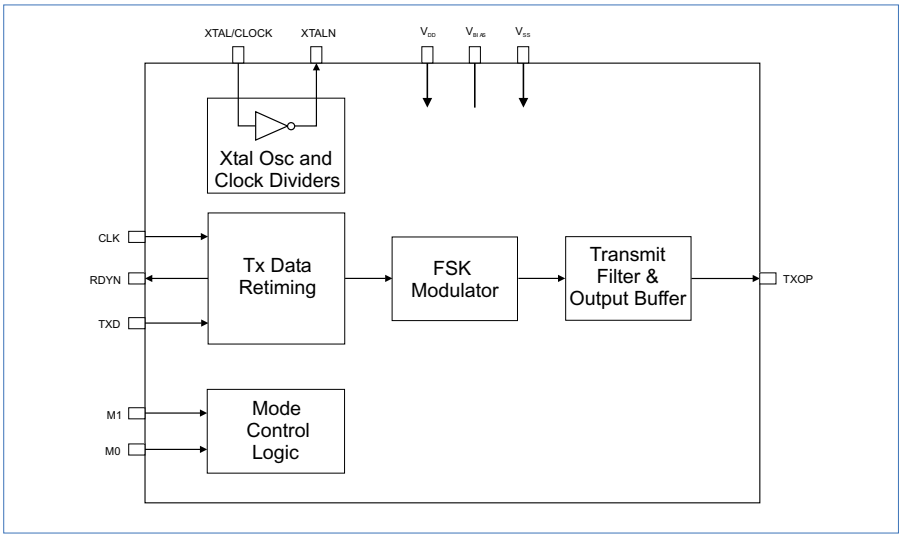
The CMX654 is a low power CMOS product for the transmission of asynchronous 1200bps data in accordance with ITU, V.23 and ETSI specifications.

The device incorporates an optional Tx data retiming function. The device can be operated so that only the mark or space tone is produced.

The CMX654 may be used in a wide range of telephone telemetry systems. With a low power requirement it is suitable for both portable terminal and line powered applications.

Very low-power 'sleep' and operating modes make the device is ideal for line powered applications.

A 3.58MHz standard Xtal/Clock rate is required.



Packages	
CMX654D4	16-pin SOIC
CMX654P3	16-pin PDIP
Operating Temperature	-40 to +85 ˚C

Brief CMX654 Technical Basics

	min	typ	max	
Supply Current at 3.0V All Enabled	-	1.0	1.25	mA
FSK Retiming Tx Data Rate	1194	-	1206	Baud
FSK Modulator Tx Output Level	-1.0	0	1.0	dB

Wireline Data Products

CMX860 Telephone Signalling Transceiver

Versatile, Integrated Telephone Signalling

Features

- V.23 1200/75 bps FSK Rx and Tx
- Bell 202 1200/150 bps
- Transmit and Receive DTMF/Tones
- Line and Telephone Complimentary Drivers
- Call Progress Decoder
- Dual-Tone Detection and Generation
- Simple 'C-BUS' Serial Control/Data Interface
- Low-Power Operation with Powersave 'Standby' Mode
- Supply Requirement Range: 2.7 to 5.5 V

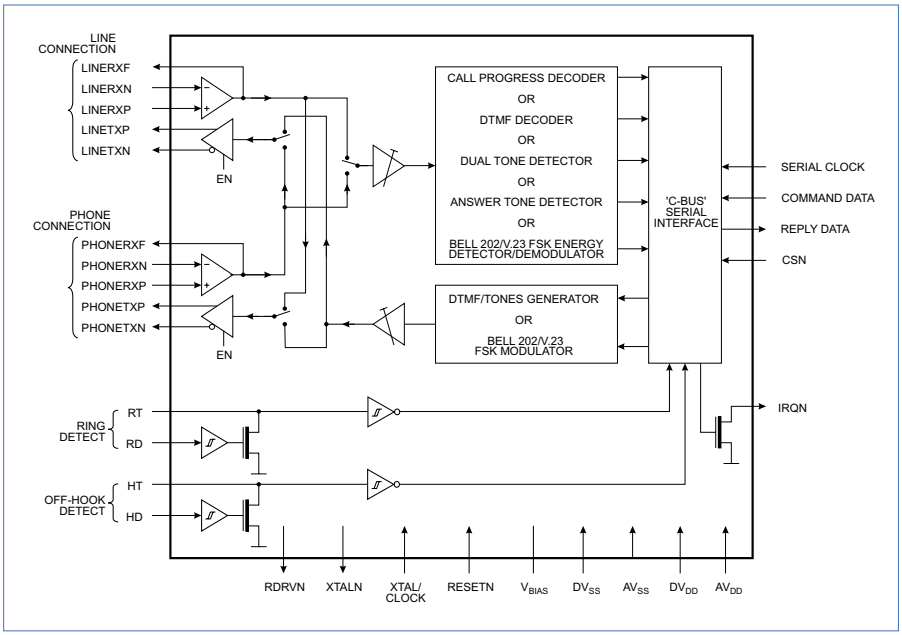
Applications

- Least Cost Routers
- Vending Machines
- Internet Appliances
- Home Management Systems
- Remote Meter Reading
- Alarm Systems
- Set-Top Boxes

The CMX860 is a flexible, low-power telephone signalling transceiver, designed for use in a wide range of line-powered telephone equipments.

The device combines the functions of a DTMF encoder and decoder, V.23 modulator and demodulator plus call progression circuitry with analogue-switching between line and phone interfaces.
Ring detection, local phone off-hook detection and a relay driver for line hook-switch operation are also provided under the control of 'C-BUS'. The ring and hook detectors operate whilst the remainder of the IC is powersaved, generating an interrupt to wake-up the host µC when further processing or signalling is required.

All on-chip functions and switching arrangements are controlled via a serial control/data bus ('C-BUS').
The CMX860 is designed to operate at 2.7V and utilises CML's low power DTMF decoder and V.23 modem technology.



Packages	
CMX860D1	28-pin SOIC
CMX860D6	28-pin SSOP
CMX860E1	28-pin TSSOP
Operating Temperature	-40 to +85 ˚C

Brief CMX860 Technical Basics

	min	typ	max	
Typical Supply Current at 3.0V	-	3.0	-	mA
Reset (not powersaved)	-	1.0	-	mA
Powersave	-	2.0	-	µA
V.23 FSK Mode				
Data Rate	-	1200/75	-	bps
Bell 202 FSK Mode				
Data Rate	-	1200/150	-	bps
DTMF/Single Tone Transmit Frequency Accuracy	-0.2	-	0.2	%

CMX865A DTMF Codec/FSK Combo

Multi-standard Modem with On-chip Signalling

Features

- V.23: 1200/75, 1200/1200, 75, 1200 bps
- Bell 202: 1200/150, 1200/1200, 150, 1200 bps
- V.21 or Bell 103: 300/300 bps
- Transmit and Receive DTMF/Tones
- Low Voice Falsing DTMF Decoder
- Software and Hardware Compatible with CMX86x Series of ICs
- Supply Requirement Range: 3.0 to 3.6 V

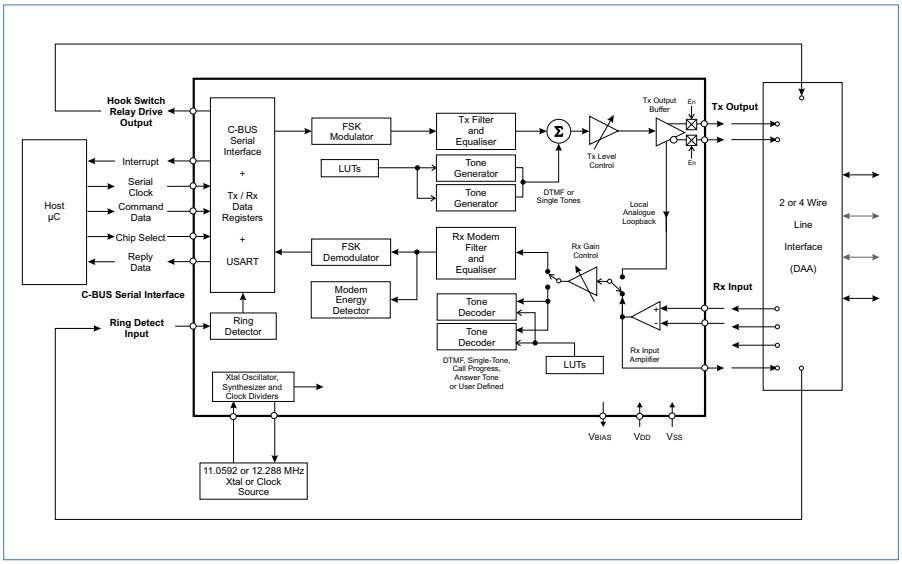
Applications

- Wireless Local Loop
- Fixed Wireless Terminals
- SMS Phones
- POTS Signalling
- Security Systems
- Remote Utility Reading
- Industrial Control Systems
- PayPhones
- Set-Top Boxes

The CMX865A is a multi-standard modem for use in Wireless Local Loop and Short Message Service telephone based information and telemetry systems. Flexible line-driver, hybrid and receiver circuits are integrated on chip, requiring only passive external components to build a 2 or 4-wire line interface.

A high-quality DTMF decoder with excellent immunity to falsing on voice and a standard DTMF encoder are included. Alternatively, these blocks can be used to transmit and detect user-specific, programmed single and dual-tone signals, simple melodies, call progress signals or modem calling and answering tones.

Host control and data transfer is via a high-speed serial bus that operates in normal and powersave modes and which is compatible with most simple types of µC serial interface. An embedded USART allows multi-format asynchronous data and unformatted synchronous data to be received or transmitted as 8-bit bytes.



Packages	
CMX865AD4	16-pin SOIC
CMX865AE4	16-pin TSSOP
Operating Temperature	-40 to +85 ˚C

Support

- EV8600 EvKit
- DE8681 DemoKit
- HB865A Header Board

Brief CMX865A Technical Basics

	min	typ	max	
Typical Supply Current (at 3.3V)	-	4.0	7.0	mA
Powersave	-	6.5	-	µA
Rx Modem Signal Input Level	-	-45	-9.0	dBm
Operation Modes				
Bell 202	-	1200/150	-	Baud
V.23		1200/75	-	Baud
V.21 and Bell 103	-	300	-	Baud
DTMF/Single Tone Tx Frequency Accuracy	-0.2	-	0.2	%
DTMF Decoder				
Detect Response Time	-	-	40.0	ms
Detect De-response Time	-	-	30.0	ms

Wireline Data Products

CMX866 V.22 bis Modem with AT Command Set

Multi-standard Data plus Telephone Signalling; with AT Interpreter

Features

- V.22 bis, V.22 and Bell 212A QAM/ DPSK
- V.23, Bell 202, V.21 and Bell 103 FSK
- Integral AT Command Set with 'Fast Connect'
- V.23 and Bell 202 'Fast Turnaround'
- Support for Type 1 Caller Line Identification
- Transmit and Receive DTMF/ Programmable Tones
- 'Zero-Power' and Powersave Standby Modes
- Low Power Operation
- Supply Requirement Range: 2.7 to 5.5 V

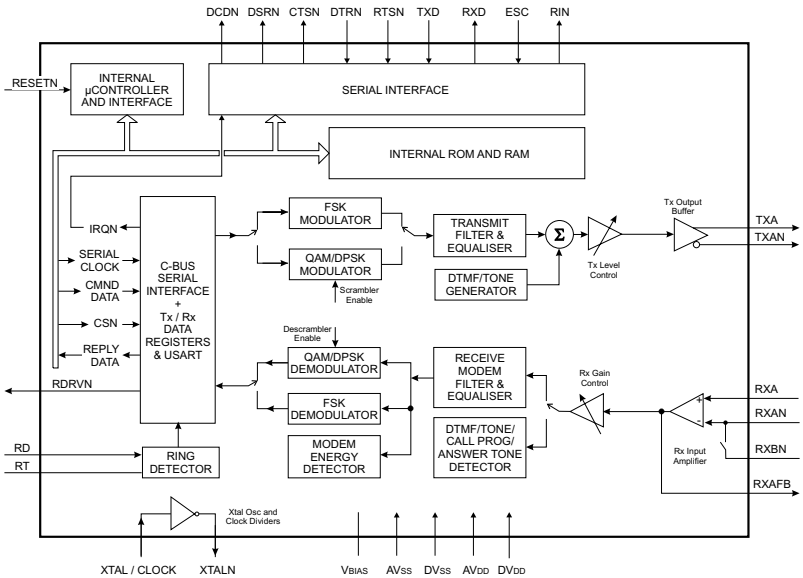
Applications

- Telephone Telemetry Systems
- Remote Utility Meter Reading
- Security Systems
- Industrial Control Systems
- Electronic Cash Terminals and ATMs
- Pay-Phones
- Set-Top Boxes
- EPOS Terminals

The CMX866 is a multi-standard modem for use in telephone-based information and telemetry systems. Control of the device is via AT commands over a simple 9600bps serial interface, compatible with most types of host µController. An RS232 compatible interface can be created by the addition of a level converter.
The data transmitted and received by the modem is also transferred over the same serial interface. The on-chip µController interprets these AT commands and controls an internal DSP, which provides the modem and ancillary functions such as Ring Detection, Call Progress Detection, Hook Switch control and DTMF autodialling. User-specific DSP functions are also available via the AT command set.

Hardware support is provided for V.23 and Bell 202 Fast Turnaround and for rapid return to AT Command mode. A Fast Connect mode has been implemented to reduce modem connection time. Flexible line driver and receive hybrid circuits are integrated on chip, requiring only passive external components to build a 2 or 4-wire line interface. Complete examples of 2-wire line interfaces to an external host µC and to an RS232 interface, including the additional components required for Type 1 CLI, are provided.

The device features a Hook Switch relay drive output and a Ring Detector circuit that remain operational when the CMX866 is in 'Zero-Power' or powersave mode, providing an interrupt which can be used to wake up an external host µC, as well as the CMX866, when line voltage reversal or ringing is detected.



Packages	
CMX866D1	28-pin SOIC
CMX866D6	28-pin SSOP
Operating Temperature	-40 to +85 ˚C

Support

- ☐ DE8661 DemoKit

Brief CMX866 Technical Basics

	min	typ	max	
■ Typical Supply Current at 3.0V	-	3.4	-	mA
Zero Power Mode	-	3.0	10.0	µA
■ DTMF/Single Tone Tx				
Tone Frequency Accuracy	-0.2	-	0.2	%
■ Tx Output Level				
Modem and Single Tones Mode	-4.0	-3.0	-2.0	dBm
DTMF Mode; Low Group Tones	-2.0	-1.0	0	dBm
DTMF Mode; High Group Tones wrt Low Group	+1.0	+2.0	+3.0	dB
■ Rx Modem Signal (FSK, DPSK and QAM Modes)				
Signal Level	-45.0	-	-9	dBm
Signal-to-Noise Ratio (noise flat 300-3400 Hz)	20.0	-	-	dB

CMX867A Low Power V.22 Modem

Versatile V.22, V.23, V.21, Bell Data with Telephone Signalling

Features

- V.22, Bell 212A, 1200/1200 or 600/600 bps DPSK
- V.23 1200/75, 1200/1200, 75, 1200 bps FSK
- Bell 202 1200/150, 1200/1200, 150, 1200 bps FSK
- V.21 or Bell 103 300/300 bps FSK
- DTMF/Tones Transmit and Receive
- Software and Hardware Compatible with CML's CMX868A
- 'Powersave' Standby Mode
- Supply Requirement Range: 2.7 to 5.5 V

Applications

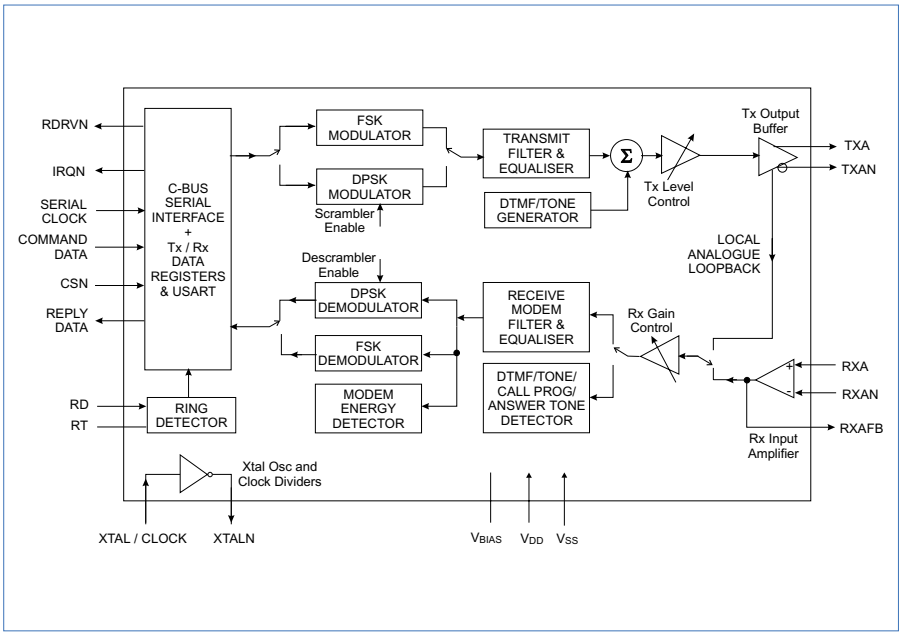
- Telephone Telemetry Systems
- Remote Utility Meter Reading
- Security Systems
- Industrial Control Systems
- Electronic Cash Terminals
- Pay-phones
- Set-Top Boxes

The CMX867A is a multi-standard V.22-based modem for use in telephone based information and telemetry systems. Control of the device is via a simple high speed serial bus, compatible with most types of µC serial interface. The data transmitted and received by the modem is also transferred over the same serial bus. On-chip programmable Tx and Rx USARTs meeting the requirements of V.14 are provided for use with asynchronous data and allow unformatted synchronous data to be received or transmitted as 8-bit words.

It can transmit and detect standard DTMF and modem calling and answer signals or user-specific programmed single or dual tone signals. A general purpose call progress signal detector is also included.

Flexible line driver and receive hybrid circuits are integrated on chip, requiring only passive external components to build a 2 or 4-wire line interface.

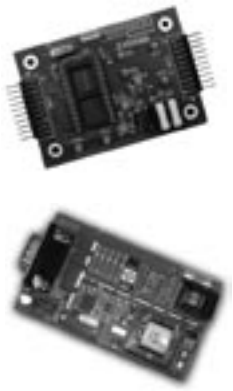
The device also features a Hook Switch Relay Drive output and a Ring Detector circuit which continues to function when the device is in the powersave mode, providing an interrupt which can be used to wake up the host µController when line voltage reversal or ringing is detected.



Packages	
CMX867AD2	24-pin SOIC
CMX867AE2	24-pin TSSOP
Operating Temperature	-40 to +85 ˚C

Support

- EV8600 EvKit
- DE8681 DemoKit



Brief CMX867A Technical Basics

	min	typ	max	
Typical Supply Current at 3.0V Powersave Mode	-	3.0	-	mA
DTMF/Single Tone Tx				
Tone Frequency Accuracy	-0.2	-	0.2	%
Transmit Output Level				
Modem and Single Tone Modes	-4	-4	-2	dBm
DTMF: Low Group Tones	-2	-1	0	dBm
DTMF: Level of High Group Tones (wrt low group)	-1	-	1	dB

Wireline Data Products

CMX868A Low Power V.22 bis Modem

V.22 bis and Multi-Standard Data Capabilities

Features

- V.22 bis Compatible Modem
  - V.22 bis 2400/2400 bps
  - V.22 and Bell 212A 1200/1200 bps
  - V.23 1200/75, 1200/1200, 75, 1200 bps
  - Bell 202 1200/150, 1200/1200,150, 1200 bps
  - V.21, Bell 103 300/300 bps
- Software Adjustable Rx and Tx Levels
- Simple Serial Control/Data Interface
- Answer/Originate Tone Detector/ Generator
- Call-Progress Tone Detection
- Integrated DTMF Encoder and Decoder
- Line Reversal Ring Detector/Off-Hook Relay Driver and On-Chip Line/Hybrid
- Supply Requirement Range: 2.7 to 5.5 V

Applications

- Telephone Telemetry Systems
- Remote Utility Meter Reading
- Security Systems
- Payphones
- Set-Top Boxes
- Industrial Control Systems
- Electronic Cash and Vending Machines

The CMX868A V.22 bis modem is ideal for use in any telephone based information and telemetry system. Using V.22 bis signalling, fast call set up times and robust error resistant transmission can be implemented by efficient low power circuits. The device uses low geometry CMOS techniques to provide multi-mode operation with very low power requirements.

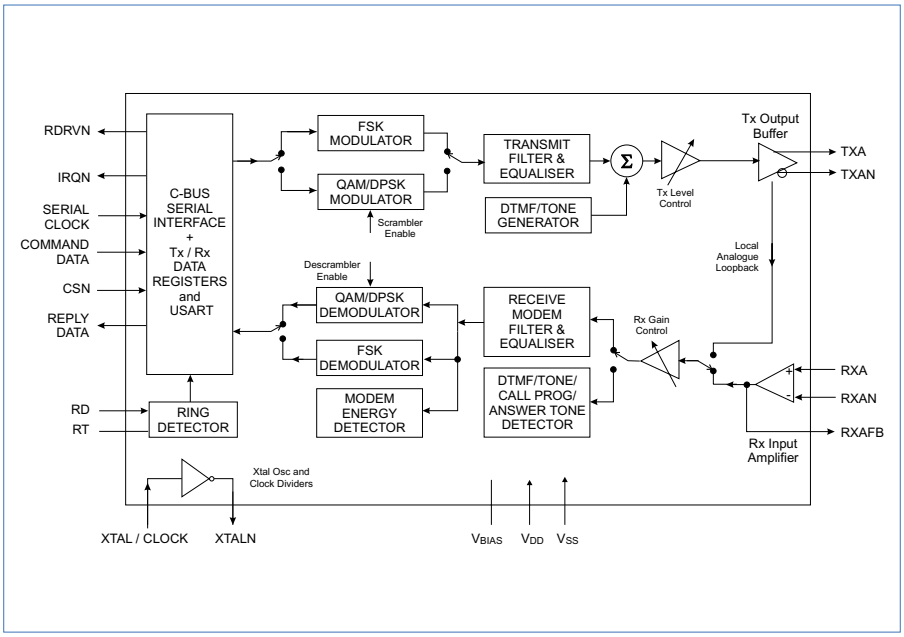
The circuit can operate with full duplex operation at 2400/1200/300 bps over 2 or 4 wire circuits. Control of the device is via a simple high speed synchronous serial bus. This allows easy interfacing to a host µController. The data to be transmitted and that received by the modem is also downloaded over the same high speed serial bus. This ensures a very efficient hardware implementation in systems with a host µController. A V.22 bis/V.22 compatible data randomiser and UART function is included in the device.

The integrated DTMF encoder/decoder can be used as part of the dial-out function to enable the host µController to set-up a data call easily. All 16 DTMF tone combinations are available along with encoder of a single tone 'melody' mode. A high current drive output is provided to drive an external 'off hook' relay. To allow simple line interfacing the device includes an on chip line hybrid driver.

The 'answer', 'originate' generators/detectors and call progress tone detectors included on the device make the set-up of the telephone call a simple matter for the host µController.

In many data collection and telemetry systems power consumption is of critical importance. This device features a 'Zero Power' standby mode. While in standby the device may be automatically activated by a ringing voltage or line voltage reversal input to the Ring/Line reversal detector.

The very low power requirement of the device makes it ideally suited to applications which draw their power supply from the telephone line itself. On exiting from the 'Zero power' standby mode the device will generate an interrupt signal. This can be used to wake the host µController allowing it to service the incoming data call.



Packages	
CMX868AD2	24-pin SOIC
CMX868AE2	24-pin TSSOP
Operating Temperature	-40 to +85 ˚C

Support

- EV8600 EvKit
- DE8681 DemoKit

Brief CMX868A Technical Basics

	min	typ	max	
Typical Supply Current at 3.0V	-	3.0	-	mA
Powersave	-	2.0	-	µA
DTMF/Single Tone Tx Tone Frequency Accuracy	-0.2	-	0.2	%
Distortion	-	1.0	2.0	%
Tx Output Level				
Modem and Single Tone Modes	-4.0	-3.0	-2.0	dBm
DTMF Mode; Low Group Tones	-2.0	-1.0	0	dBm
Rx Modem (FSK, DPSK and QAM Modes)				
Signal Level	-45.0	-	-9.0	dB
Rx Call Progress Bandwidth	275	-	665	Hz

CMX869B Low Power V.32 bis Modem

V.32 bis and Multi-standard Data Capabilities

Features

- Full Duplex V.32 bis and V.32
- V.22 bis, V.22/Bell 212A, V.23/Bell 202, V.21/Bell 103
- Dual and Single Tone Generation (DTMF and Answertone)
- Dual and Single Tone Detection (DTMF, Call Progress, Answertones)
- Line Reversal and Ring Detection
- Low-Power Requirement with Powersave
- Supply Requirement Range: 3.0 to 3.6 V

Applications

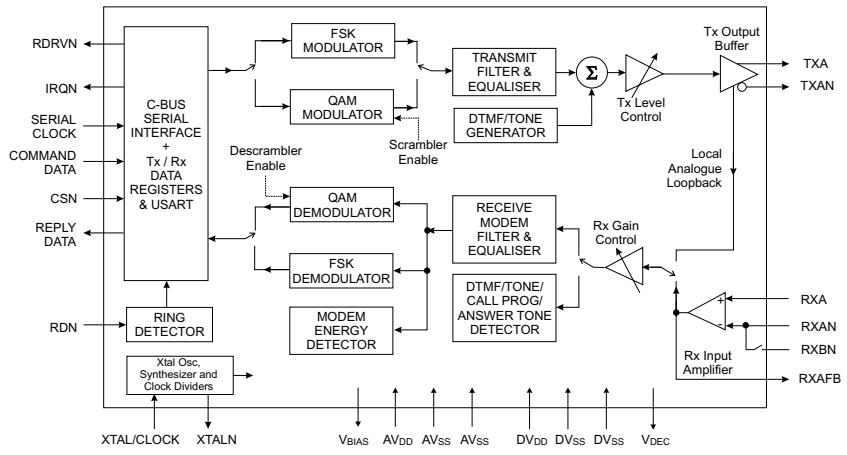
- Voice-over-IP (VoIP) Payphones
- Telemetry and Remote Meter Reading Systems
- Security Systems
- Cash and Business Terminals
- Set-Top Boxes
- E-mail Terminals and Internet Appliances

The CMX869B, a V.32 bis modem, is targeted at communications terminals which do not need V.90 data rates or have low-power requirements which preclude high-speed operation. The maximum speed of 14.4kbps will meet the requirements of many mid-range applications, while the low operating and very low standby currents are attractive for battery powered terminals.

The ring/line reversal detection circuit which is operational in the standby mode further conserves power by allowing the host microcontroller to switch to a low power mode when not in use. A relay drive output is available, which, once again, reduces host I/O requirements.

The interface to the host controller is a 'C-BUS' serial link running at 150kbps. All data transfers pass through this link including access to the modem control and status registers.
V.42 is supported by the provision of HDLC (programming option) to generate frames and CRCs, and to detect transmission errors.

The CMX869B can transmit and detect standard DTMF and modem calling/answering signals or user-programmed single or dual tone signals. A general purpose Call Progress signal detector is also included. Flexible line-driver and receive hybrid circuits are integrated on-chip, requiring only passive external components to build a 2 or 4-wire line interface.



Packages	
CMX869BD2	24-pin SOIC
CMX869BE2	24-pin TSSOP
Operating Temperature	-40 to +85 ˚C

Support

- DE8691 DemoKit

Brief CMX869B Technical Basics

	min	typ	max	
Typical Supply Current at 3.3V				
Operating V.32 bis/V.32	-	8.6	13.0	mA
Operating V.22 bis and below	-	4.7	7.0	mA
Reset	-	3.0	5.0	mA
Powersave	-	20.0	100	µA
Tx Output Level				
Modem and Single Tone Modes	-1.5	-0.5	0.5	dBm
DTMF Mode; Low Group Tones	0.5	1.5	2.5	dBm
DTMF Mode; High Group Tones wrt Low Group	+1.0	+2.0	+3.0	dB
Rx Call Progress Energy Detector				
Bandwidth (-3.0dB)	275	-	665	Hz

Wireline Data Products

CMX878 V.22 bis Modem plus DAA

V.22 bis and Multi-standard Data with Interface Circuitry

Features

- V.22 bis, V.22, Bell 212A, V.23/Bell 202, V.21/Bell Modulation Schemes
- Optimised for 'Real' Line-power Operation
- Transformerless DAA
- DTMF/Tones - Tx and Rx
- Line Reversal and Ring Detection
- 'Gyrator' and 'Anti-reflective' Load Control
- Parallel Phone Detection
- Supply Requirement Range: 2.7 to 5.5 V

Applications

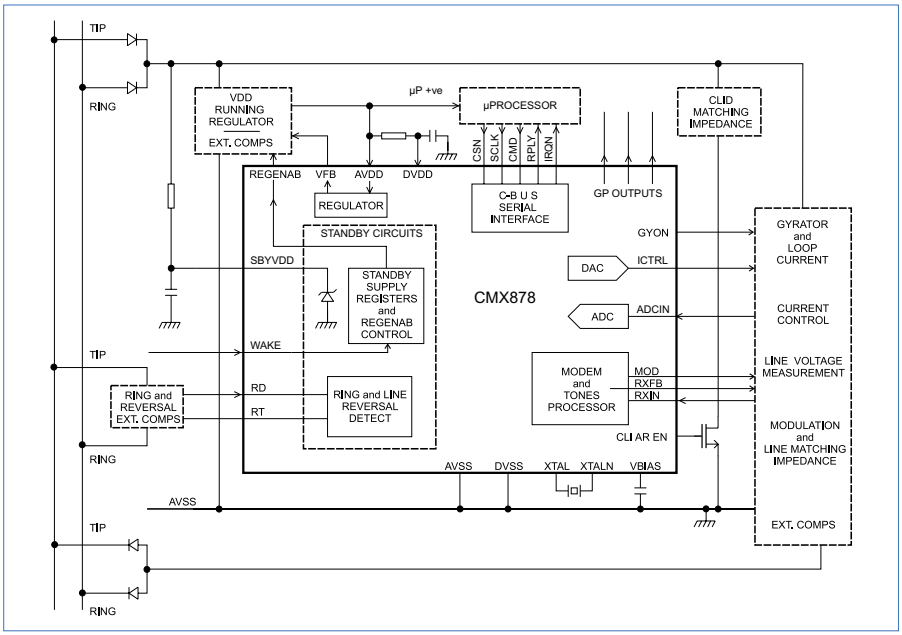
- Line-Powered Telephone Data
- Payphone Management
- Remote Utility Meter Reading
- Electronic Point-Of-Sale Terminals (EPOS)
- Telephone Telemetry Systems
- Set-Top Boxes
- Automatic Teller Machines (ATM)
- Electronic Cash Terminals
- Internet and e-mail Terminals
- Security Systems
- Home Automation

The CMX878 is a line-powered V.22 bis-based multi-standard modem for use in telephone based information and telemetry systems. It provides the building blocks for interfacing to the telephone line without the need for a transformer - this is the Data Access Arrangement (DAA) – allowing for the coupling of data signals to and from the line; it can also detect Ringing and Line Reversals.

Provision is made for the conditioning and monitoring of other aspects of the telephone line – this includes the gyrator/DC mask, anti-reflective (AR) impedance control, and line voltage measurement. A complete line interface can be implemented with a small external component count, using low cost components.

Ultra low power consumption and built-in power management makes the CMX878 suitable for telephone line power usage. Furthermore the microprocessor can be de-powered whilst awaiting the detection of a Ring, Line Reversal, or WAKE pin event.

Control of the device is via a simple high speed serial bus, compatible with most types of µC serial interface. Data transmitted and received by the modem is transferred over the same serial bus.



Packages	
CMX878D1	28-pin SOIC
CMX878E1	28-pin TSSOP
Operating Temperature	-40 to +85 ºC

Support

- DE8781 DemoKit

Brief CMX878 Technical Basics

	min	typ	max	
Typical Supply Current at 3.3V	-	3.5	5.5	mA
Modem Reset (but not powersaved)	-	2.0	3.0	mA
Modem Powersave	-	100	130	µA
Tx QAM and DPSK Modes	-	600	-	Baud
Tx V.21 FSK Mode	-	300	-	Baud
Tx Bell 103 FSK Mode	-	300	-	Baud
Tx V.23 FSK Mode	-	1200/75	-	Baud
Tx Bell 202 FSK Mode	-	1200/150	-	Baud

Wireline Data Products

Wireline Telephony Products

NOTES

Telephony Products by Function

	Call Progress	CLI/CIDCW	SPM	VMWI	Digital Amplifiers	V.23/Bell 202	V.22 bis Data	DTMF/Tones	Line Driver	DAA	Page No.
FX/MX019 Digitally Controlled Quad Amp Array					•						102
FX/MX029 Dual Digitally Controlled Amplifier Array					•						103
CMX602B Calling Line Identifier plus Call Waiting		•				•			•		104
CMX605 Digital-to-Analogue (POTS) Signalling Interface - with DTMF Codec		•	•			•				•	105
CMX612 Calling Line ID plus Dial Tone Decode for Voice Message Waiting Indicator (VMWI)		•		•		•			•		106
CMX631A SPM Detector			•								107
CMX641A Dual SPM Detector plus Payphone Security			•								108
CMX661 Dual SPM Decoder for Pair-Gain Applications			•								109
CMX673 Call Progress Tone Decoder	•										110
CMX683 Call Progress and 'Voice-audio' Detector	•										111

Voice, signalling and ISDN products for wireline applications. Analogue, digital and mixed-mode (POTS-to-ISDN) products are available singularly or in multi-feature combinations.

Wireline Telephony Products

FX019 Digitally Controlled Quad Amplifier Array
MX019 *Four Channels of Gain Control via Serial Data*

Features
- Four Digitally Controlled Low-noise Amplifiers (DCA)
- Fifteen Gain/Attenuation Steps
- Three Trimmers, each with a ±3dB Range in 0.43dB Steps
- One 'Volume' Trimmer with a ±14dB Range in 2.0dB Steps
- 8-bit Serial Data Control
- Output Mute Function
- Supply Requirement Range: 4.5 to 5.5 V

Applications
- PMR and Cellular Communications Systems
- Automatic and Manual Test Equipment
- Remote Gain Adjustment
- Telephone Audio Settings
- Medical Equipment
- Audio and Data Gain Setting

The FX/MX019 Digitally Adjustable 'Quad' Amplifier Array is available to replace trimmer potentiometers and volume controls in cellular, PMR, telephony and communications applications where d.c., voice or data signal levels need adjustment.

The FX/MX019 is a single-chip LSI consisting of four digitally controlled amplifier stages, each with fifteen distinct gain/attenuation steps. Control of each individual amplifier is by an 8-bit serial data stream.
Three of the amplifier stages each offer a +/-3dB range in steps of 0.43dB, whilst the remaining amplifier offers a +/-14dB range in steps of 2dB, and is suggested for volume control applications. Each amplifier includes a 16th 'Off' state which when applied mutes the output audio from that channel.

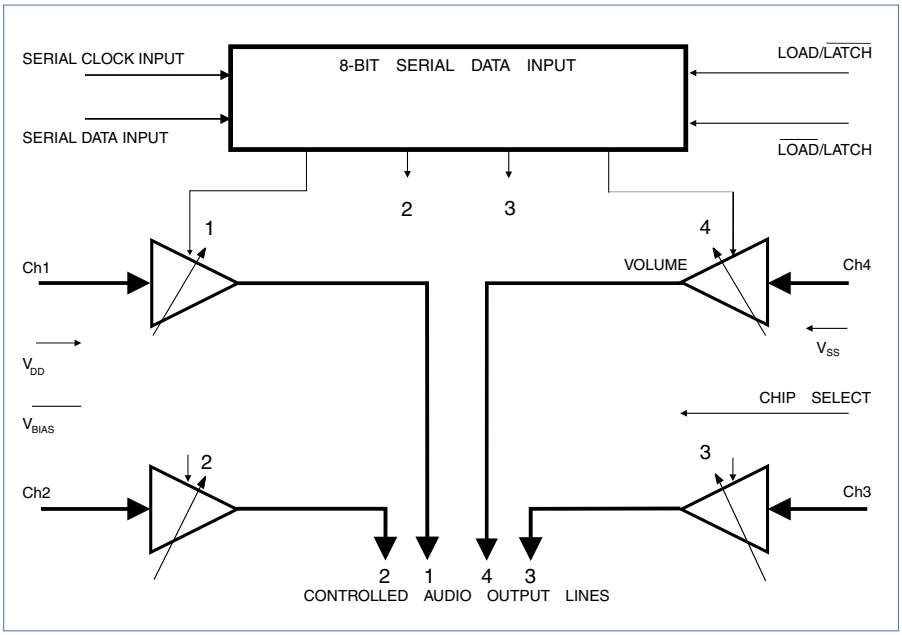
Using a Chip Select input to select one of many devices in a system, this product replaces the need for manual trimming of audible signals by using the host microprocessor to digitally control the set-up of all audio levels during development, production/calibration and operation.

Applications include:

(i) Control, adjustment and set-up of communications equipment by an Intelligent ATE without manual intervention eg. deviation, microphone and loudspeaker levels, Rx audio level.

(ii) Automatic dynamic compensation of drift caused by variations in temperature, linearity.

(iii) Fully automated servicing and re-alignment.



Packages		
FX019DW	(D4)	16-pin SOIC
MX019DW	(D4)	16-pin SOIC
FX019J	(J2)	16-pin cerdip DIL
MX019J	(J2)	16-pin cerdip DIL
FX019P	(P3)	16-pin PDIP
MX019P	(P3)	16-pin PDIP
MX019TN	(E2)	24-pin TSSOP
Operating Temperature		-40 to +85 ˚C

Brief FX/MX019 Technical Basics

	min	typ	max	
Typical Supply Current at 5.0V		1.5		mA
Amplifier Stages (general)				
Bandwidth (-3dB)	20.0	-	-	kHz
Gain Range of Trimmer Stages (Ch1 to Ch3)		-3.0 to 3.0		dB
Gain per Step (15 steps)	-	0.43	-	dB
Gain Range of Volume Stage (Ch4)		-14.0 to 14.0		dB
Gain per Step (15 steps)	-	2.0	-	dB

FX029 MX029 Dual Digitally Controlled Amplifier Array

Two Channels of Gain Control via Serial Data

Features

- Two Digitally Controlled Low-noise Amplifiers (DCA)
- Gain/Attenuation Range of ±48dB
- Gain/Attenuation Levels set by Serial Interface
- Separate Fixed-ain Uncommitted Amplifier
- Supply Requirement Range: 4.5 to 5.5 V

Applications

- PMR and Cellular Communications Systems
- Automatic and Manual Test Equipment
- Remote Gain Adjustment
- Telephone Audio Settings
- Medical Equipment
- Audio and Data Gain Setting

The FX/MX029 single-chip Dual Digitally Controlled Amplifier Array can replace manual audio-level controls in most electronic applications including radio and line communications systems.

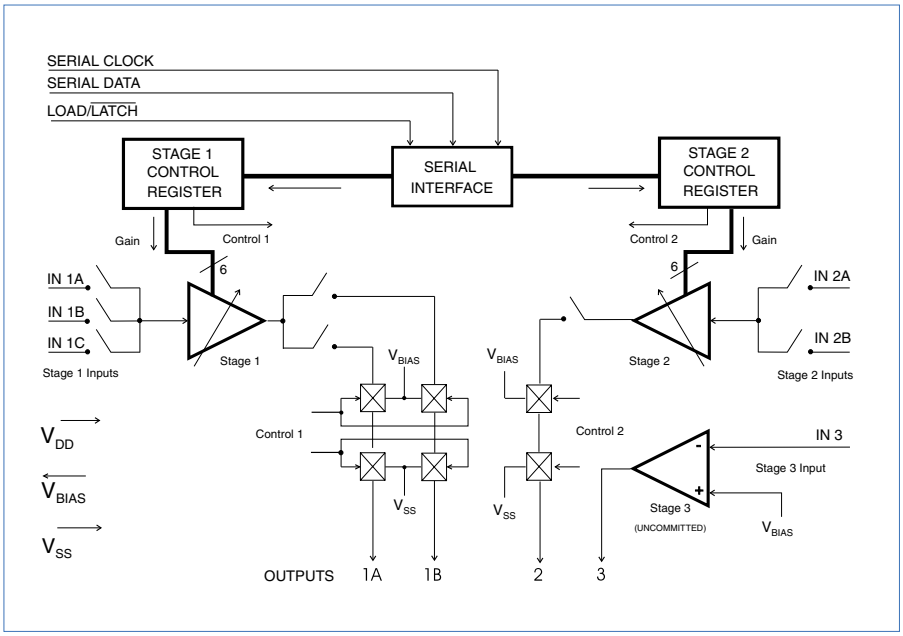
The FX/MX029 comprises two digitally controlled gain and attenuation stages, with each stage having 48 distinct gain steps (range: between -48dB and +48dB in 2dB steps) plus a MUTE state to powersave the addressed section. Minimum current drain results from muting both sections.

Both gain stages have selectable inputs. This switching allows for selection of three different input signals to stage 1 and two to stage 2.

Stage 1 also provides output switching. In addition to the two digitally controlled gain stages, there is a general purpose, uncommitted inverting amplifier; the gain of this particular amplifier is component controlled externally using negative feedback.

Control of each gain stage section is accomplished through the serial interface.

All switching is accomplished using controlled rise and fall times, thereby ensuring no annoying transients (clicks or pops).



Packages		
FX029D5		24-pin SSOP
FX029DW	(D4)	16-pin SOIC
MX029DW	(D4)	16-pin SOIC
MX029TN	(E2)	24-pin SSOP
FX029J	(J2)	16-pin cerdip DIL
MX029J	(J2)	16-pin cerdip DIL
MX029P	(P3)	16-pin PDIP
Operating Temperature		-40 to +85 °C

Brief FX/MX029 Technical Basics

	min	typ	max	
Typical Supply Current at 5.0Vfs	-	3.0	-	mA
Mute	-	100	-	µA
Amplifier Stages (general)				
Bandwidth (-3dB)	3.3	-	-	kHz
Gain of Stages (Ch1 and Ch2)	46.0	48.0	-	dB
Gain/Attenuation Step Size	-	2.0	-	dB/step

Wireline Telephony Products

CMX602B Calling Line Identifier plus Call Waiting

On and Off Hook Calling Line ID

Features

- CLI and CIDCW Detector with:
  - 'Zero-Power' Ring or Line Polarity Reversal Detector
  - V.23/Bell 202 FSK Demodulator with Data Retiming Facility
  - Dual Tone Alert Detector
  - On and Off-hook Operation
- Meets Bellcore, British Telecom and ETSI 'CLI and CIDCW' Specifications
- µC Interrupt/Wake-Up Output to Minimize System Operating Power
- Supply Requirement Range: 2.7 to 5.5 V

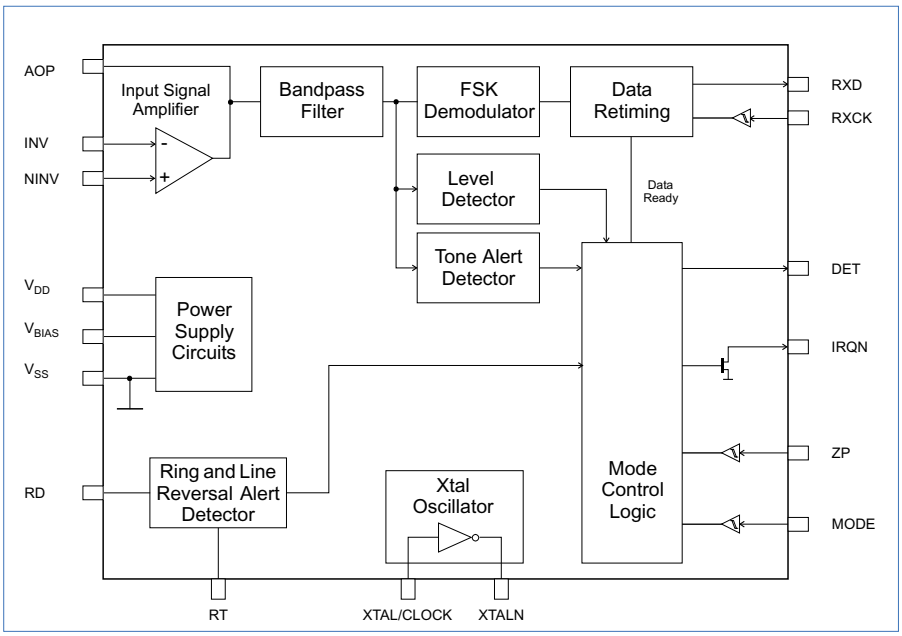
Applications

- Calling Line ID and Call Waiting Systems
- Adjunct Boxes
- Computer Security Systems
- Call Monitoring
- Computer Billing Systems
- Telephone Based Utility Metering
- No-Ring Calling

The CMX602B is a low power CMOS product for the reception of the physical layer signals used in BT's Calling Line Identification Service (CLIP), Bellcore's Calling Identity Delivery System (CID), the Cable Communications Association's Caller Display Services (CDS), and similar evolving systems. It also meets the requirements of Caller Identity with Call Waiting services (CIDCW).

The device includes a 'zero-power' ring or line reversal detector, a dual-tone (2130Hz plus 2750Hz) Tone Alert Signal and a 1200-baud FSK V.23/Bell 202 compatible asynchronous data demodulator with a data retiming circuit which removes the need for a UART in the associated µController.

The CMX602B is suitable for use in systems to BT specifications SIN227 and SIN242, Bellcore GR-30-CORE and SR-TSV-002476, CCA TW/P&E/312, ETSI ETS 300 659 parts 1 and 2 and ETS 300 778 parts 1 and 2.



Packages	
CMX602BD4	16-pin SOIC
CMX602BE4	16-pin TSSOP
CMX602BP3	16-pin PDIP
Operating Temperature	-40 to +85 ˚C

Brief CMX602B Technical Basics

	min	typ	max	
Typical Supply Current at 3.0V	-	500	-	µA
Powersave (ZP)	-	0.02	-	µA
Tone Alert Detector				
Low Tone Frequency	-	2130	-	Hz
High Tone Frequency	-	2750	-	Hz
FSK Receiver				
Data Rate: V.23, Bell 202	1188	1200	1212	Baud
Acceptable Signal-to-Noise Ratio				
V.23	20.0	-	-	dB
Bell 202	30.0	-	-	dB

CMX605 Digital-to-Analogue (POTS) Signalling Interface with DTMF Codec

Signalling and Data from Digital to Analogue Telephone Systems

Features

- Full, Global Call Progress Tonesets
- CIDCW Alert Signals (CAS Tones)
- DTMF Encode and Decode to CEPT Specifications
- Programmable Ringing Signals
- 12kHz and 16kHz Metering Pulse Generation
- Modem/Fax: Answer and Originate Tones
- CCITT R1 and R2 Tone Generation
- 'Soft-Start' to Final Level Adjustment
- V.23/Bell 202 FSK Encoder with On-Chip UART
- Serial Control Interface
- On-Chip Summing Amplifier
- Supply Requirement Range: 2.7 to 5.5 V

Applications

- Wireless Local Loop
- ISDN Terminal Adapters
- FeaturePhones
- PBX Installations

The CMX605 is an integrated telecom tone generator and DTMF encoder/decoder designed for ISDN interfaces, Wireless Local Loop and Analogue-to-Digital telephone conversion systems.

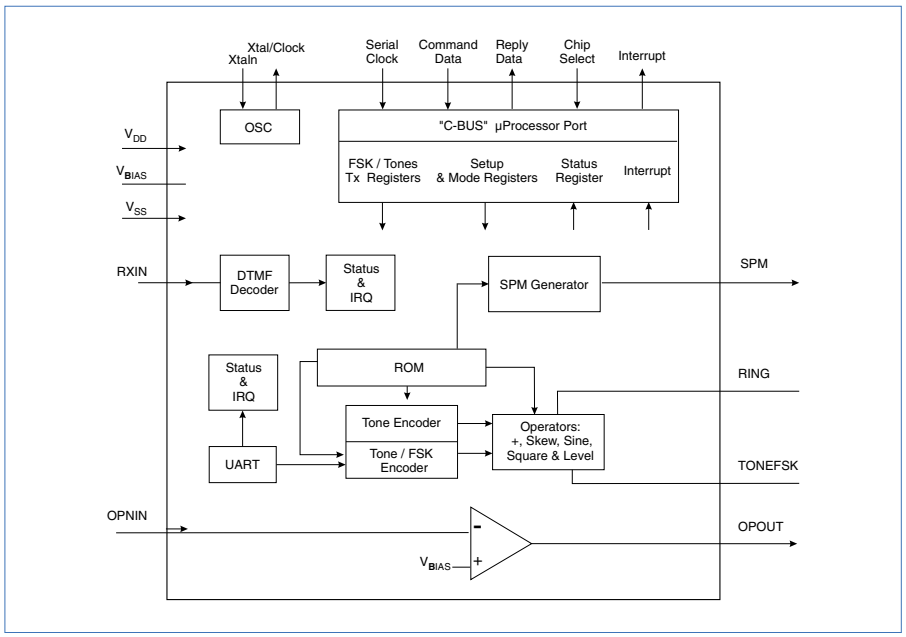
The tone generator covers an extensive range of pre-programmed tones used in analogue telephone systems (POTS).

Three outputs are provided: 'Ringing signals', 'In-band tones or FSK data', and '12kHz/16kHz Metering pulses'.

Simple software control facilitates the interface to a wide range of commonly used µCs and SLICs, enabling a comprehensive analogue telephone line presentation.

The DTMF encoder/decoder presents the digital line interface with DTMF dialling information received from the telephone user and generates the appropriate DTMF tones for the POTS interface. DTMF tone pairs can be encoded along with each tone singly or with other dual tone signals, such as those used in CIDCW systems and 'On Hook' signalling systems.

Other tone standards supported are: Fax and modem 'answer' and 'originate', ITU (CCITT) 'R1' and 'R2' signals, and sufficient tones for simple melody generation. Communication to and from the host µController is performed by a C-BUS serial interface, which is compatible with the 'SPI' interface.



Packages	
CMX605D4	16-pin SOIC
CMX605P3	16-pin PDIP
Operating Temperature	-40 to +85 ˚C

Brief CMX605 Technical Basics

	min	typ	max	
Typical Supply Current at 3.3V	-	3.5	-	mA
Powersave		- 1.0	-	µA
Tone FSK Output Level				
Single Tone	-1.0	0	1.0	dBm
Dual Tone (per tone)	-4.0	-3.0	-2.0	dBm
DTMF High	-4.0	-3.0	-2.0	dBm
DTMF Low	-6.0	-5.0	-4.0	dBm
Tone Frequency Resolution	-2.0	-	2.0	Hz
SPM Tone Frequency Accuracy	-14.0	-	14.0	Hz
DTMF Decoder				
Tone Response Time	-	-	40.0	ms
Tone De-response Time	-	-	45.0	ms

Wireline Telephony Products

CMX612 Calling Line ID plus Dial Tone Decode for VMWI (Voice-Message Waiting Indicator)

CLI, CIDCW and VMWI Decode for Multiple Extension Interworking

Features

- Bellcore, British Telecom and ETSI 'CLI and CIDCW' Compatibility
- Tested to Bellcore SR-3004
- 'Stuttered Dial Tone'/CLASS VMWI Detection (BT and Bellcore)
- CLI, CIDCW and VMWI Decoder for Multiple Extension Interworking (MEI)
- Exceptional Talk-Off/Talk-Down Performance
- CPE Alerting Signal Detector
- 'Zero-Power' Ring or Line Polarity Reversal Detector
- V.23/Bell 202 FSK Demodulator with Data Retiming
- Low Power Operation
- µC Interrupt/Wake-Up Output
- Supply Requirement Range: 2.7 to 5.5 V

Applications

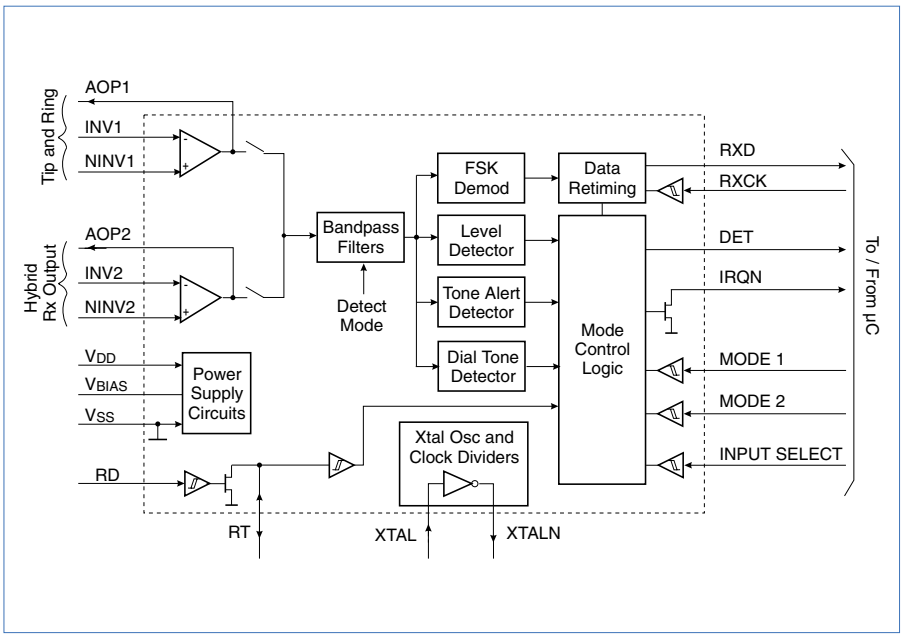
- CLI and CIDCW Feature Phones and Adjunct Boxes
- Analogue Display Services Interface (ADSI) Units
- Voice-Mail Indication Equipment
- Extension Units for CLI Units
- Computer Telephone Integration
- Call Logging Systems

The CMX612 is a low power CMOS product for the reception of physical layer signals used in British Telecom's Calling Line Identification Service (CLIP), Bellcore's Calling Identity Delivery system (CID), the Cable Communications Association's Caller Display Services (CDS) and similar evolving systems.

In addition, it provides Voice-Message Waiting Indicator (VMWI) detection in both FSK and stuttered dial tone modes. Two different signal inputs are provided to the device, to support Tip/Ring and hybrid connectivity.

The device includes a 'zero-power' ring or line reversal detector, a dual-tone (2130Hz plus 2750Hz) Tone Alert Signal detector, a dual-tone (350Hz plus 440Hz) stuttered dial-tone detector and a 1200baud FSK V.23/Bell 202 compatible asynchronous data demodulator with a data retiming circuit which removes the need for a UART in the associated µController.

Tested to Bellcore SR-3004 this product is suitable for use in systems operating to BT specifications SIN227 and SIN242, Bellcore GR-30-CORE and SR-TSV-002476, C &E/312, ETSI: ETS 300 659 parts 1 and 2 and ETS 300 778 parts 1 and 2.



Packages	
CMX612E3	20-pin TSSOP
CMX612P6	22-pin PDIP
Operating Temperature	-40 to +85 °C

Brief CMX612 Technical Basics

	min	typ	max	
Typical Supply Current at 3.0V	-	500	-	µA
Powersave	-	0.02	-	µA
Tone Alert Detector				
Low Tone Frequency	-	2130	-	Hz
High Tone Frequency	-	2750	-	Hz
FSK Receiver (V.23 / Bell 202)				
Input Level Range		-40 to -8.0		dBV
Dial Tone Detector				
Low Tone Frequency	-	350	-	Hz
High Tone Frequency	-	440	-	Hz

CMX631A SPM Detector

System-selectable Call Charge Metering Detection

Features

- Low Power (3 Volt <1mA) Operation
- Detects 12 and 16 kHz SPM Frequencies
- High Speechband Rejection Properties
- Tone-Follower and Packet-mode Outputs
- Supply Requirement Range: 3.0 to 5.0 V

Applications

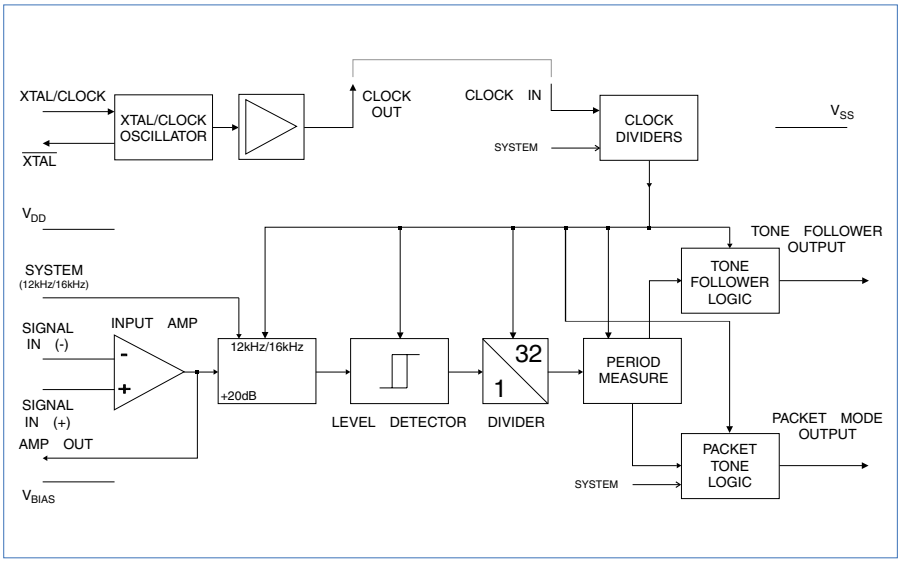
- Complex and/or Simple Telephone Systems
- Hotel and Office Call-charge/Logging Systems
- Billing Systems
- Public Call Monitoring
- Payphone Systems
- PCMCIA Fax and Data Modems

The CMX631A is a low-power, system-selectable Subscriber Pulse Metering (SPM) detector that indicates the presence of either 12 or 16 kHz telephone call-charge frequencies on a telephone line.

Deriving its input directly from the telephone line, input amplitude/sensitivities are component adjustable to the user's national 'Must/Must-Not Decode' specifications via the on-chip input amplifier. The 12 and 16 kHz frequency limits are accurately defined by the use of an external 3.579545MHz telephone-system Xtal or clock-pulse input.

The CMX631A demonstrates exceptional 12 and 16 kHz performance in the presence of both voice and noise.
This device may operate from a single or differential analogue signal input, from which two individual logic outputs will be produced; a Tone Follower Output and a Packet Mode Output.

This system (12/16 kHz) selectable integrated circuit, which may be line-powered, requires a 3.0 to 5.0 V power supply.



Packages	
CMX631AD4	16-pin SOIC
CMX631AD5	24-pin SSOP
CMX631AP3	16-pin PDIP
Operating Temperature	-40 to +85 ºC

Brief CMX631A Technical Basics

	min	typ	max	
Supply Current at 3.0V	-	-	800	µA
12kHz Detect Bandwidth	11.820	-	12.180	kHz
12kHz Not Detect Frequencies (below 12kHz)	-	-	11.520	kHz
12kHz Not Detect Frequencies (above 12kHz)	12.480	-	-	kHz
16kHz Detect Bandwidth	15.760	-	16.240	kHz
16kHz Not Detect Frequencies (below 16kHz)	-	-	15.360	kHz
16kHz Not Detect Frequencies (above 16kHz)	16.640	-	-	kHz
Sensitivity				
V_{DD} = 3.0V	-27.8	-	31.8	dBm
V_{DD} = 5.0V	-23.5	-	-27.5	dBm
Packet Mode Reponse and De-response Time	40.0	-	48.0	ms

Wireline Telephony Products

CMX641A Dual SPM Detector plus Payphone Security

System Selectable Call Charge Metering Detectors for Larger Installations, plus Security Generator/Detector

Features

- Two (12kHz/16kHz) SPM Detectors on a Single Chip
- Independently Selectable 12 and 16 kHz Detect Bandwidths
- 12kHz and 16kHz Tx Tone Generator - can be modulated by ASK
- Xtal Accuracy; Stable Frequency Limits
- "Controlled" (µC) and "Fixed" Signal Sensitivity Modes
- Selectable Tone-Follower or Packet-Mode Outputs
- High Speechband Rejection Properties
- "Output Enable" Multiplexing Facility
- Supply Requirement Range: 2.7 to 5.5 V

Applications

- PABX Line Cards
- Complex and/or Simple Telephone Systems
- Hotel and Office Call-charge/Logging and Billing Systems
- Wireless Local Loop
- Public Call Monitoring
- Payphone Systems
- PCMCIA Fax and Data Modems

The CMX641A is a low-power, system-selectable dual Subscriber Private Metering (SPM) detector (two detectors on a single chip) to indicate the presence, on a telephone line, of either 12 or 16 kHz telephone call-charge frequencies.

Under µProcessor control via a common serial interface, each channel of the CMX641A will detect call-charge pulses from a telephone line and provide a digital output for recording, billing or security purposes.

A common set of external components and a stable 3.579545MHz Xtal/clock input ensures that the CMX641A adheres accurately to most national 'Must' and 'Must-Not' decode band-edges and threshold levels.

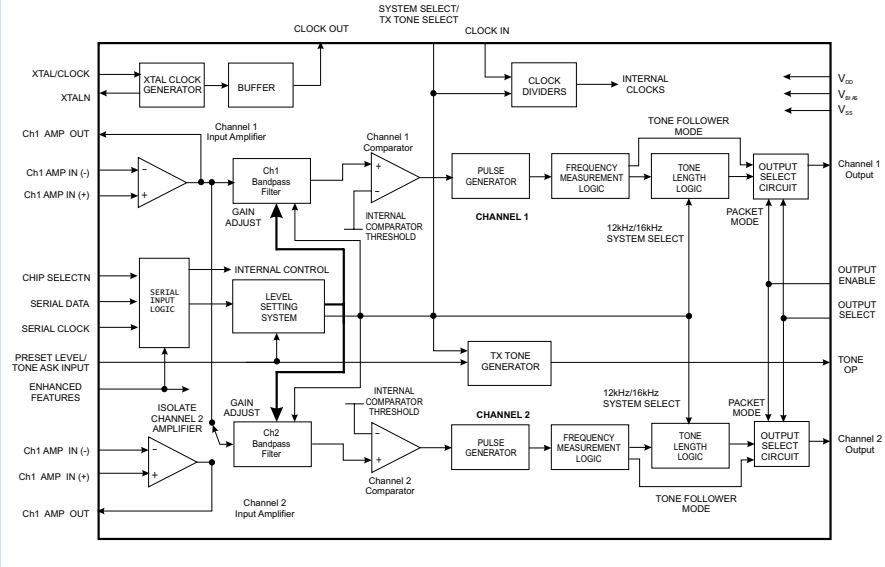
The digital output is pin-selectable to one of three modes:

(1) Tone Follower mode -a logic level for the period of a correct decode.

(2) Packet mode -respond/de-respond after a cumulative period of tone or notone in a preset period.

(3) High-impedance output -for device multiplexing.

For non-µProcessor systems a preset sensitivity/system input allows external channel level and system setting.



Packages	
CMX641AD2	24-pin SOIC
CMX641AP4	24-pin PDIP
Operating Temperature	-40 to +85 °C

Brief CMX641A Technical Basics

	min	typ	max	
Typical Supply Current at 3.0V	-	1.2	-	mA
12kHz Detect Bandwidth	11.820	-	12.180	kHz
12kHz Not Detect Frequencies (below 12kHz)	-	-	11.520	kHz
12kHz Not Detect Frequencies (above 12kHz)	12.480	-	-	kHz
16kHz Detect Bandwidth	15.760	-	16.240	kHz
16kHz Not Detect Frequencies (below 16kHz)	-	-	15.360	kHz
16kHz Not Detect Frequencies (above 16kHz)	16.640	-	-	kHz
Level Sensitivity Controlled Sensitivity Mode	2.6	1.6	0.6	dB(ref)
Tone-follower Mode Response and De-response Time	-	-	15.0	ms
Tx Output Signal Level	3.0	3.4	3.7	V p-p

CMX661 Dual SPM Decoder for Pair-Gain Applications

Adaptable Call Charge Metering Detection

Features

- Two (12/16 kHz) SPM Detectors on a Single Chip
- Programmable Decode Bandwidth
- Xtal Accuracy; Stable Frequency Limits
- High Speechband Rejection Properties
- "Output Enable" Multiplexing Facility
- Supply Requirement Range: 2.7 to 5.5 V

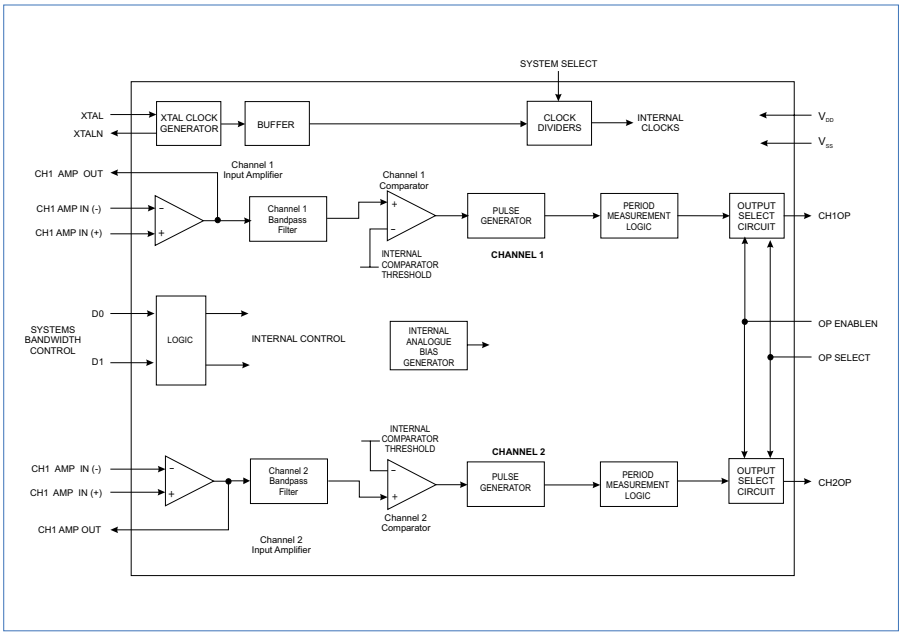
Applications

- Pair-Gain Systems
- PABX Line Cards
- Hotel and Office Call-charge/Logging and Billing Systems
- Wireless Local Loop
- Public Call Monitoring

The CMX661 is a low-power, system-selectable Dual Subscriber Private Metering (SPM) detector (two detectors on a single chip) to indicate the presence, on a telephone line, of either 12 or 16 kHz telephone call-charge signals.

Each channel of the CMX661 will detect call-charge pulses from a telephone line and provide a digital output for recording, billing or security purposes.

A common set of external components and a stable 3.579545MHz Xtal/clock input ensure that the CMX661 adheres accurately to most international 'Must' and 'Must-Not' decode band-edges and threshold levels.
For telecom application areas where stable SPM tones cannot be accurately generated the CMX661 decode bandwidth can be varied between 3% and 15%.



Packages	
CMX661D4	16-pin SOIC
CMX661P3	16-pin PDIP
Operating Temperature	-40 to +85 °C

Brief CMX661 Technical Basics

	min	typ	max	
Typical Supply Current at 3.0V	-	0.75	1.0	mA
Input Amplifiers				
Input Signal Level	-	-	100%V_{DD}	
Overall Performance				
12kHz Detect Bandwidth		11.82 to 12.90		kHz
16kHz Detect Bandwidth		15.76 to 17.20		kHz
Signal Quality Requirements for Correct Operation				
Amp Input Signal-to-Noise Ratio	22.0	20.0	-	dB
Amp Input Signal-to-Voice Ratio	-36.0	-40.0	-	dB
Amp Output Signal-to-Voice Ratio	-25.0	-27.0	-29.0	dB

Wireline Telephony Products

CMX673 Call Progress Tone Detector

Simple Low Power Call Progress Detection

Features

- Worldwide Tone Compatibility
- Single and Dual Tones Detected
- Wide Dynamic Signal Range
- Fast Response Time
- Pin-for-pin compatibility with M980 and TSC 75T980 and SSI980
- 3.58MHz Xtal/Clock Oscillator
- Low Power Operation: 500µA at 3.0V
- Supply Requirement Range: 2.7 to 5.5 V

Applications

- Worldwide Payphone Systems
- Telephone Redialling Systems
- Dialling Modems
- Banking and Billing Systems
- Telecom Test Equipment
- Telecom Security Systems

The CMX673 is a general purpose call progress tone detector for use in Public Switched Telephone System (PSTN) applications. Call progress detection allows equipment which dials into the PSTN network to monitor the progress of the resulting call. Ringing, Busy, Not Available and Answer states can be determined.

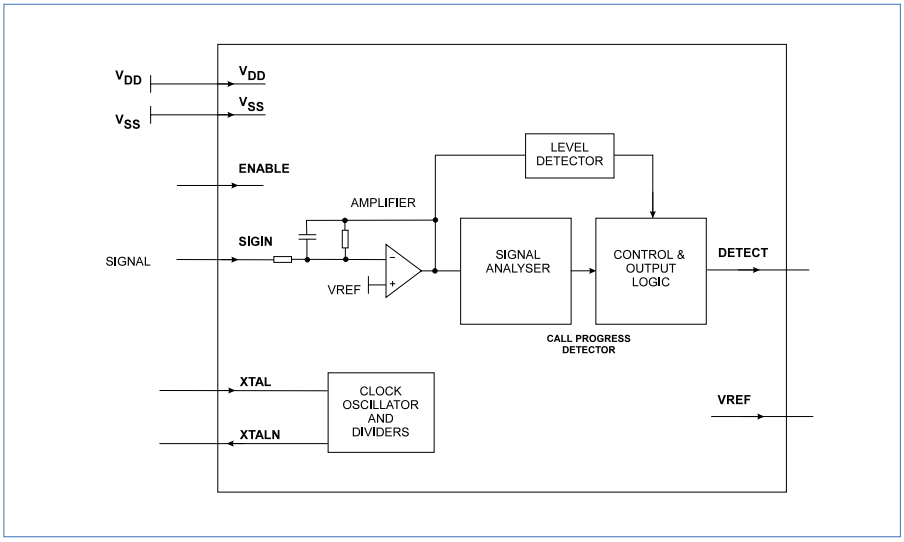
The CMX673 uses advanced digital signal processing techniques to detect tones in the frequency band 315 to 650 Hz.

The use of DSP techniques allows the CMX673 to distinguish between valid call progress tone signals and line noise or voice, low false detection rates result; this is in contrast to other call progress detection devices which are based on simple filtering techniques.

The detection timing of the CMX673 allows it to operate with almost any call progress system; in particular the 'stuttered dial tone' of voice mail messaging systems is supported.
The use of digital processing and small geometry CMOS design techniques allows the CMX673 to offer a complete call progress detector which analyses both frequency and amplitude in a single 8-pin package. This, coupled with industry leading performance and substantially lower power supply requirements than comparable devices, demonstrates CML's unique capability in this area.

A single 3.58MHz crystal ensures accurate and repeatable performance. With low power supply requirements the CMX673 can be easily integrated into a wide range of telecom products.

The CMX673 IC is pin-for-pin compatible with the M980 and TSC 75T980 and SSI980. The CMX673, coupled with cadence measurement of the signals detected, can identify virtually all call progress tones used worldwide.



Packages	
CMX673D4	16-pin SOIC
CMX673E3	20-pin TSSOP
CMX673P1	8-pin PDIP
Operating Temperature	-40 to +85 °C

Brief CMX673 Technical Basics

	min	typ	max	
Typical Supply Current at 3.0V	-	500	-	µA
Call Progress Band Frequencies				
Must Detect Range		315 to 650		Hz
Must-Not Detect Range		750 to 250		Hz
Level Detector				
Must Detect Signal Level	-38.0	-	-	dB
Must-Not Detect Signal Level	-	-	-50.0	dB

CMX683 Call Progress and 'Voice-audio' Detector

Telephone Call Progress Detection and Audio Discrimination

Features

- Detects Single and Dual Call Progress Tones
- Worldwide Tone Compatibility
- 'Voice' Detect Outputs (Fast and Slow Modes)
- Supports Stuttered Dial Tone
- Wide Dynamic Signal Range with Low Falsing
- 3.58MHz Xtal/Clock Oscillator
- Low Power Operation: 600µA at 3.0V
- Supply Requirement Range: 2.7 to 5.5 V

Applications

- Worldwide Payphone Systems
- Telephone Redialling Systems
- Auto-dialling Modems
- Banking and Billing Systems
- Telecom Test Equipment
- Telecom Security Systems

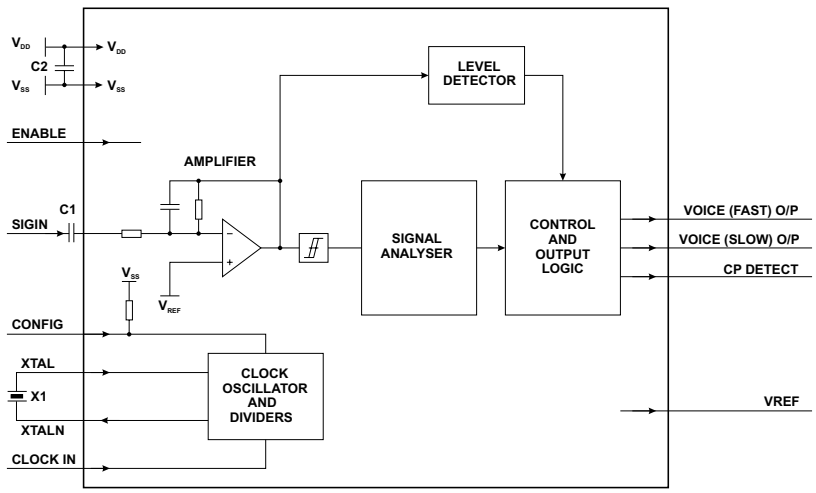
The CMX683 is a general purpose Call Progress Tone Detector for use in monitoring the progress of calls in Public Switched Telephone System (PSTN) applications. Dial Tone, Ringing, Busy and Not Available states can be distinguished by using the host µC to qualify the cadence of the CP DETECT output.

The CMX683 uses advanced digital techniques to characterise valid Call Progress tones, unwanted tones, line noise and voice or music signals. In contrast to Call Progress detection devices based on simple filtering techniques, the CMX683 offers excellent sensitivity coupled with low false detection rates.

The response time of the CMX683 allows it to operate with almost any Call Progress system. In particular the 'stuttered dial tone' of voice mail messaging systems is supported. The use of statistical processing techniques, which analyse signal frequency, duration and amplitude, enable the CMX683 to distinguish voice or music activity from DTMF or Call Progress signals. Separate outputs integrate the "voice" activity over both shorter and longer periods, enabling payphone and other billing systems to commence charging when a line connection has been established.

A single 3.58MHz crystal ensures accurate and repeatable performance. With supply requirements between 2.7 and 5.5 V and a low current consumption, the CMX683 can be easily integrated into a wide range of telecom equipments.

The CMX683 has a similar pinout to many commonly used Call Progress detectors and is available in plastic DIL, TSSOP or SOIC packages.



Packages	
CMX683D4	16-pin SOIC
CMX683E4	16-pin TSSOP
CMX683P1	8-pin PDIP
Operating Temperature	-40 to +85 °C

Brief CMX683 Technical Basics

	min	typ	max	
Typical Supply Current at 3.0 V	-	600	-	µA
Call Progress Band Frequencies				
Must Detect Range		315 to 650		Hz
Must-Not Detect Range		750 to 250		Hz
Level Detector				
Must Detect Signal Level	-38.0	-	-	dB
Must-Not Detect Signal Level	-	-	-50.0	dB