CMX7364

Multi-mode High Performance Wireless Data Modem

The CMX7364 is a flexible high performance wireless data modem featuring a high level of integration, including RF ADCs and DACs as well as additional low power data converters for monitoring and control purposes. At its heart a powerful DSP core is coupled to optimised hardware accelerators to provide efficient, low power implementation of data modem functionality, principally PHY and MAC layers.

Features

- Modem PHY

    Rx and Tx data converters

    Programmable channel filters

- Modem lower MAC

    AFSD

    FEC

    Packet build

    Pilot symbol insertion

- C-BUS (SPI Compatible) Serial Interfaces

- Auxiliary functions

    Low speed ADCs/DACs

    Power amplifier Ramp DAC

    Programmable clock generator

- Power management

    Integrated core LDO

    Automatic clock gating

- Diagnostic functions

Applications

- VHF/UHF modems

    Telemetry

    SCADA

    RTK

- Satellite modems

- Custom ISM radios

The device supports a range of formatted data modes as well as a raw mode that allows users to freely develop their own link protocols. The formatted data models include optimised forward error correction and pilot symbol insertion where appropriate.

The CMX7364 provides a range of flexible digital interfaces to allow easy interfacing with microcontrollers and a pass through interface for control of RF circuits. The internal filters support channel bandwidths from 6.25 to 50 kHz enabling over air data rates of up to 40 ksamples/s.

The design is capable of interfacing to different radio architectures but is ideally matched to CML's CMX994 family of direct conversion receivers and CMX998 I/Q modulator with Cartesian linearization and built-in support for these devices via appropriate Function Images includes DC offset correction and AGC control.

Functionality of the CMX7364 is determined by loading a Function Image™ supplied by CML. The Function Image™ is downloaded on power up and configures the device for the required modulation scheme and associated parameters.

The CMX7364 operates from a single 3.3V supply voltage and is available in a 64VQFN package.
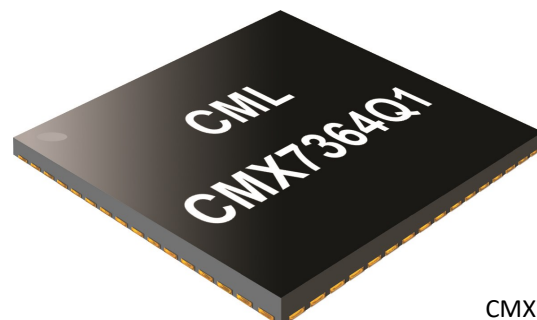
CMX7364 Chip
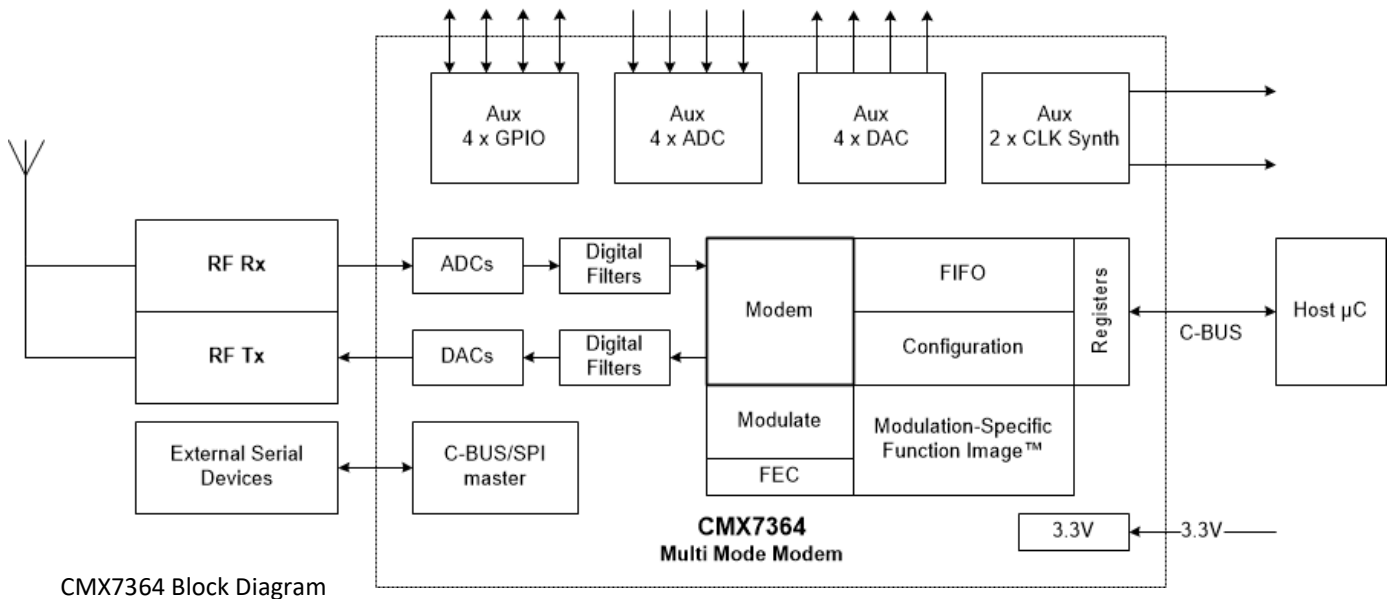
CMX7364 Block Diagram

Functionality of the CMX7364 is determined by loading a Function Image™ supplied by CML. The Function Image™ is downloaded on power up and configures the device for the required modulation scheme and associated parameters.

Function Image™	Functionality
FI-1	Multimode GMSK/GFSK modem supporting BT=0.5/0.3/0.27/0.25
FI-2	Multimode FSK modem supporting 2/4/8/16FSK
FI-4	Multimode QAM Modem supporting 4/16/32/64QAM

Key Hardware Functionality

- **Main functionality**

    Optimised 180MHz DSP core

    Integrated high SINAD sigma-delta ADCs and DACs with flexible configuration

    Differential input and output paths for improved SNR performance

    Hardware programmable channel FIR filters

    1x Aux 10-bit ADC (8-way input mux) with threshold monitoring and wake-up

    4x Aux 10-bit DAC (one with RAMDAC)

    2x System Clock outputs

    Co-processors for accelerated Equaliser, RS and Viterbi algorithms

- **Digital interface**

    Dual 20MHz SPI/PCM/McBSP interfaces

    C-BUS (SPI compatible) interfaces – supporting streaming C-BUS and C-BUS monitor modes

    Dedicated GPIOs and other interfaces switchable to GPIO by Function Image™

- **Power management**

    2.7 to 3.6V main supply (3.3V typical), 1.8V core supply

    STOP and WAIT modes

    Function Image™ defined clock scaling

    Flexible power saving modes, automatic and manually controlled

- **-40 to +85°C operating temperature range**

- **9x9mm 64 lead VQFN package (Q1)**

FI-1x Firmware Functionality

GMSK and GFSK modulations are supported with BT=0.5, 0.3, 0.27, or 0.25. User-programmable filters are also possible. The 7364FI-1.x supports up to 40kbps. Flexible bit rates support a wide range of applications requiring a selectable bit rate and robustness. The 7364FI-1.x supports zero IF (I/Q) and two-point modulation (Mod1/2) transmit modes, with zero IF receive mode. The GMSK/GFSK data is over-air compatible with the FX/MX909B and the CMX7143FI-1.x.

FI-2x Firmware Functionality

2-FSK, 4-FSK, 8-FSK, and **16-FSK** modulations are supported, with root raised cosine filtering with α=0.2 with optional sync filtering and user-programmable filters also possible. The 7364FI 2.x supports up to 20ksymbols/s in a 50kHz channel. Flexible bit rates support a wide range of applications requiring a selectable bit rate and robustness. The 7364FI-2.x supports zero IF (I/Q) and two-point modulation (Mod1/2) transmit modes, with zero IF receive mode. The data is over-air compatible with the FX/MX919B and the (CMX)7143FI-2.x. Additionally, 4-FSK coded mode also supports RD-LAP channel coding which is over-air compatible with CMX969.
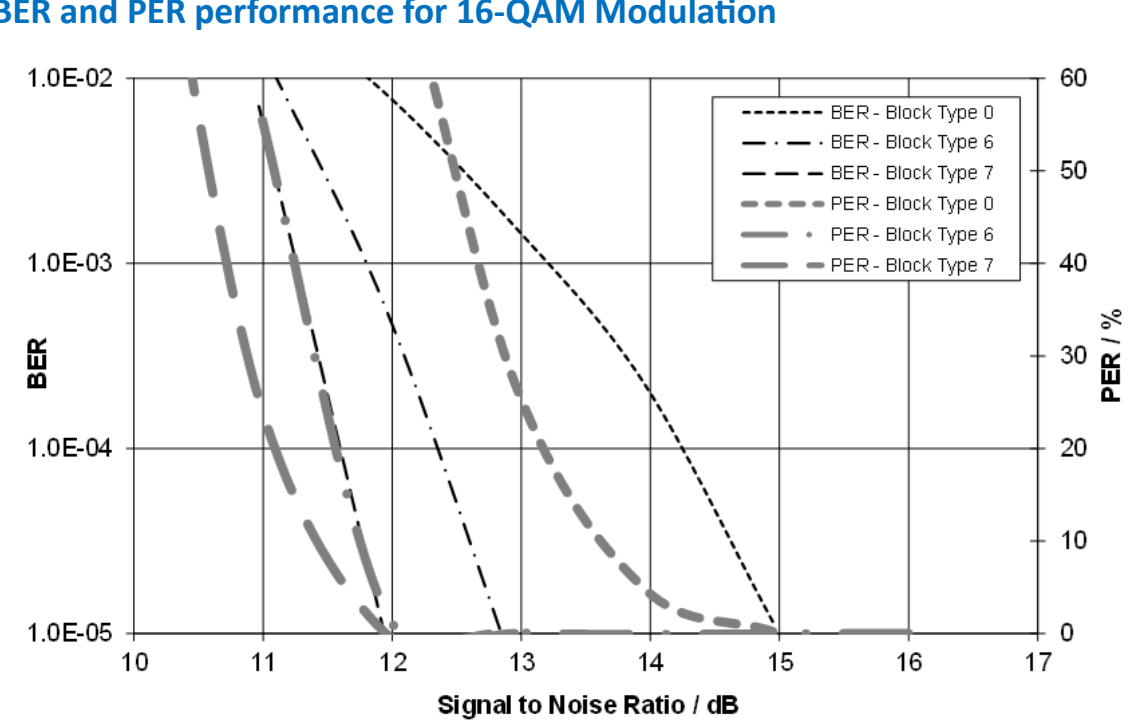
FI-4x Firmware Functionality

4-QAM, 16-QAM, 32-QAM and **64-QAM** modulations are supported, with root raised cosine filtering with α=0.2, 0.35 or a user programmable filter. The 7364FI 4.x supports up to 192kbps in a 50kHz channel, with channel estimation and equalization to provide robust performance under demanding channel conditions. For greater flexibility, different rate FEC modes are provided. Receive signal quality measurement is supported, making a useful assessment of link conditions. The 7364FI-4.x supports zero IF (I/Q) transmit and receive. QAM data is over-air compatible with the CMX7163FI-4.x.

FI2.x and FI-4.x Function Images support Adaptive Coded Modulation (ACM) features allow modulation type and block format to be changed on the fly via over-air commands that control a receiving CMX7364. These enable a Tx host to select optimum modulation and coding per burst to suit application message size, link channel quality and can also relax required Rx host message parsing speed. This feature makes the CMX7364 a powerful solution that can operate in an optimised way whatever the state of the radio channel.
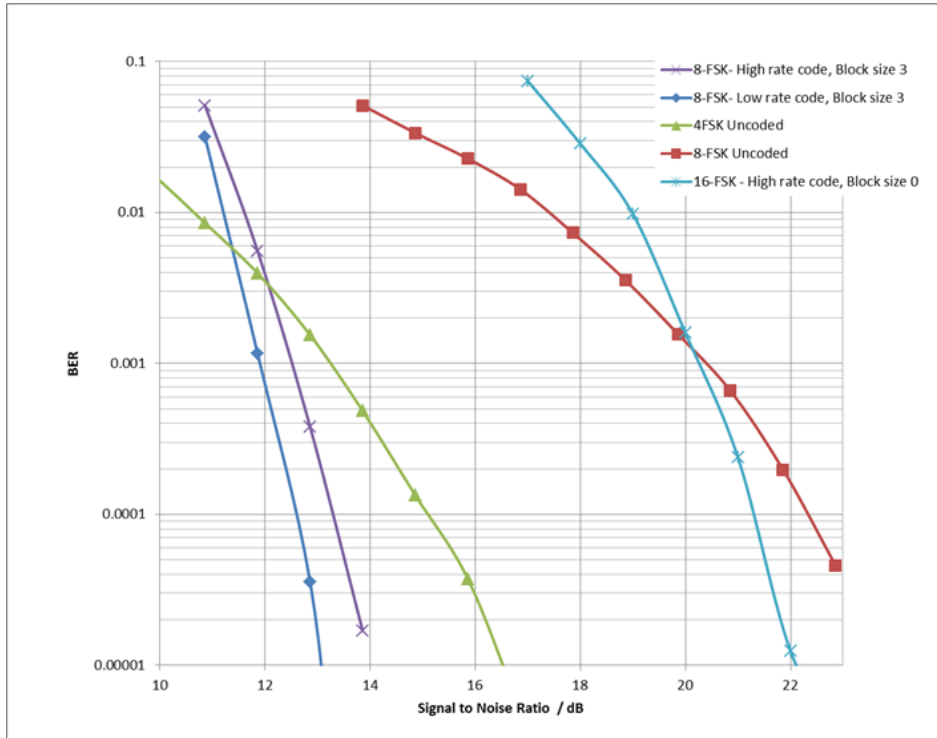
Key Specifications - (All parameters specific at DVDD=AVDD=3.3V, 25°C, running 7364 FI-4 (QAM))

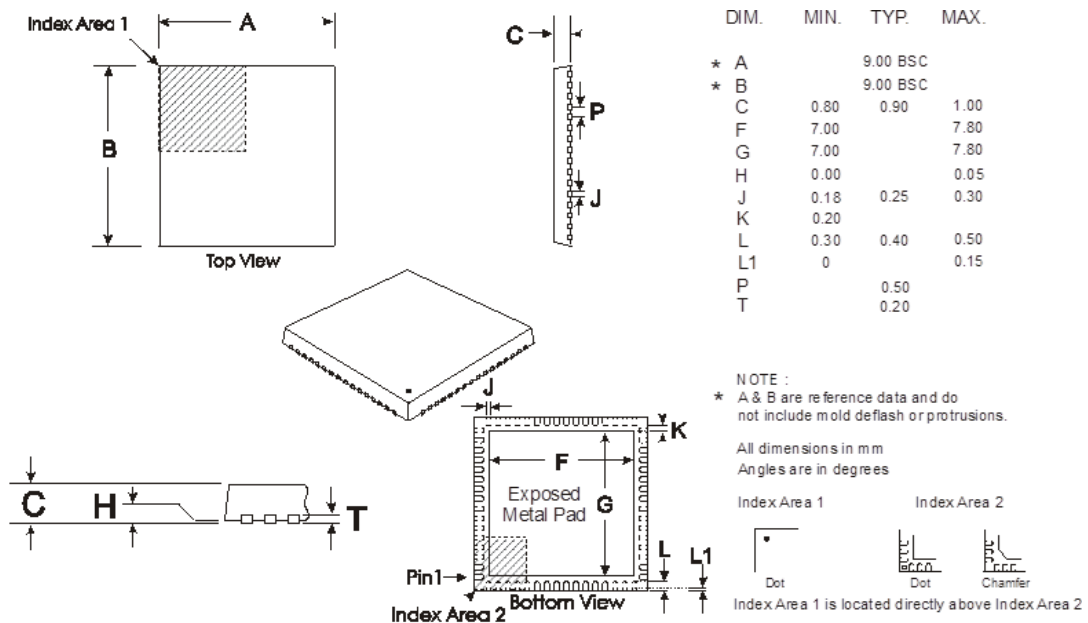| General parameters	Min	Typ	Max	Unit
Operating temperature range	-40		+85	°C

Supply voltage
    AVDD
    DVDD
	3.0
	3.0
		3.3
		3.3
			3.6
			3.6
				V

Supply current Standby – supplies present, C-BUS active		200		uA

Supply current - Rx Mode
    DIDD (9.6ksymbols/s – search for FS)
    DIDD (18ksymbols/s – search for FS)
    DIDD (40ksymbols/s – search for FS)
    DIDD (9.6ksymbols/s – FS found)
    DIDD (18ksymbols/s – FS found)
    DIDD (40ksymbols/s – FS found)
    AIDD (AVDD = 3.3V)
		14.7
		26
		54
		8.3
		14.3
		28.4
		6.6
				mA
				mA
				mA
				mA
				mA
				mA
				mA

Supply current - Tx Mode
    DIDD (9.6ksymbols/s)
    DIDD (18ksymbols/s)
    DIDD (40ksymbols/s)
    AIDD (AVDD = 3.3V)
		7.3
		12.2
		23.5
		8.4
				mA
				mA
				mA
				mA

Typical BER and PER performance for 16-QAM Modulation

Typical 8-FSK and 16-FSK Coding Performance

Packaging

DIM.	MIN.	TYP.	MAX.
★ A		9.00 BSC	
★ B		9.00 BSC	
C	0.80	0.90	1.00
F	7.00		7.80
G	7.00		7.80
H	0.00		0.05
J	0.18	0.25	0.30
K	0.20		
L	0.30	0.40	0.50
L1	0		0.15
P		0.50	
T		0.20	

NOTE :
★ A & B are reference data and do not include mold deflash or protrusions.

All dimensions in mm
Angles are in degrees

Depending on the method of lead termination at the edge of the package, pull back (L1) may be present.
L minus L1 to be equal to, or greater than 0.3mm
The underside of the package has an exposed metal pad which should ideally be soldered to the pcb to enhance the thermal conductivity and mechanical strength of the package fixing. Where advised, an electrical connection to this metal pad may also be required

Q1 Mechanical Outline: *Order as part no. CMX7364Q1*

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DATA RESOURCE**

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CML Microcircuits Benefits

Faster time to market

Developing proven high performance and field tested ASSP ICs, CML is helping engineers to cope with increasing
pressure in delivering shorter project design cycles.

Design flexibility

CML's *FirmASIC®* reconfigurable technology with the use of a Function Image upload enables a single hardware platform to be used for multiple communications systems.

High Quality

With 100% of products being tested before shipping,
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Product Longevity

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Being at the forefront of low power chip technology, manufacturers can develop smaller equipment with extended battery life.

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provide focused customer support to ease the development process.

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