CML Microcircuits
COMMUNICATION SEMICONDUCTORS

Product Preview

PP973/1 June 2012

CMX973

Quadrature Modulator/Demodulator

(RF Building Block)

Introduction

The CMX973 Quadrature Modulator/Demodulator is a new addition to the CML RF Building Block product range, where low power consumption, flexibility and high performance are key values .

The CMX973 Quadrature Modulator/Demodulator offers very low power consumption and high performance over a wide operating range.

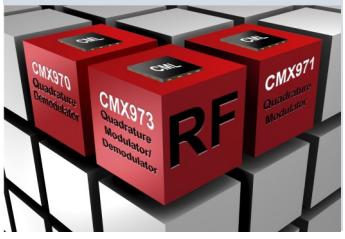
The CMX973 forms the basis of a high-performance RF transceiver system combining a flexible IF/RF quadrature modulator and quadrature demodulator, in one chip.

Wide signal bandwidth at RF, 0dBm output, low noise and serial bus control, delivers maximum flexibility and high performance, all at an attractive low operating power.

Size is an important factor in many radio designs, the CMX973 addresses this with its availability in a very small, RF optimised 32-pin VQFN package (5mm x 5mm x 1mm).

Applications

- Wireless data terminals
- HF, VHF and UHF mobile radio
- Avionics radio systems
- Telemetry modems
- High-performance professional radios
- Satellite terminals
- Software Defined Radio (SDR)



CMX973 Brief Description

The CMX973 integrates a quadrature (I/Q) modulator and a low-power quadrature IF/RF demodulator, both featuring a wide operating frequency range and optimised power consumption.

The demodulator is suitable for superheterodyne architectures with IF frequencies up to 300MHz and the device may be used in low IF systems or those converting down to baseband. The modulator converts directly from baseband to the desired transmit frequency and features quadrature phase correction to minimise unwanted spectral components.

An on-chip PLL and VCO, together with uncommitted baseband differential amplifiers, provide additional flexibility. Control of the CMX973 is by serial bus. The CMX973 is supplied in an RF-optimised 32-lead VQFN package.

Features

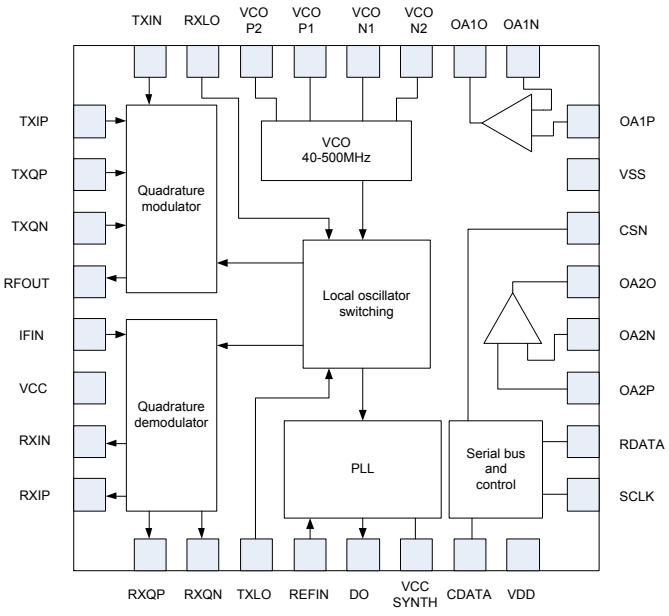
- 20MHz - 300MHz IF/RF demodulator
- 20MHz - 1GHz RF modulator
- I/Q bandwidth: 10MHz Rx and 25MHz Tx
- 0dBm modulator output level
- < 1degree I/Q phase matching
- < 0.5dB I/Q gain matching
- Serial bus control
- Low-power operation 3.0V - 3.6V
- Very small 32-lead Package

Key benefits

- Flexible RF Building Block solution
- Low power consumption
- High performance
- Flexibility
- Low noise
- Small VQFN packaging
- Simple interfacing to existing modem/ baseband products



32-pin VQFN
(5mm x 5mm x 1mm)



CMX973 Function Diagram

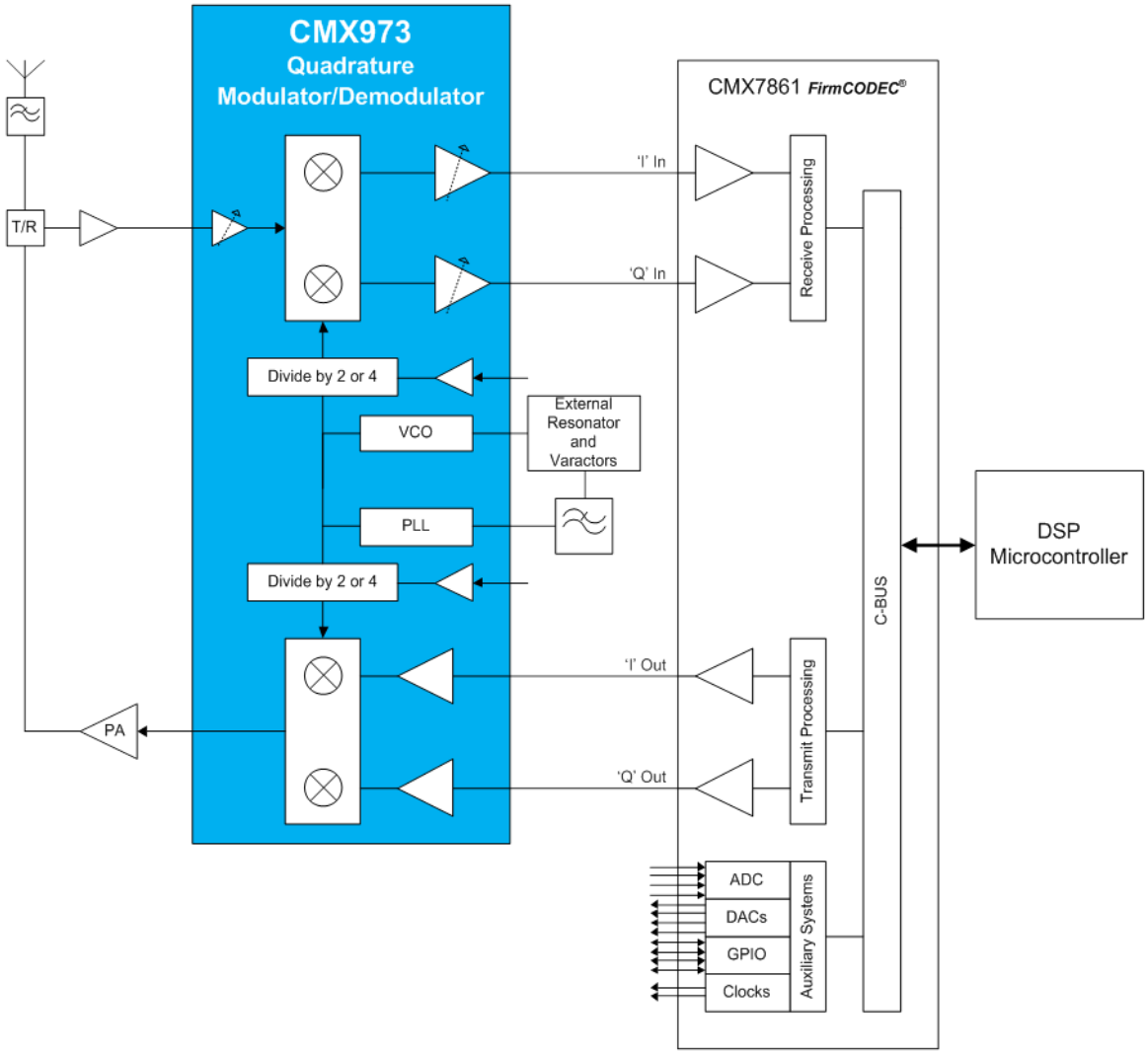
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Quadrature Modulation

Quadrature (I/Q) modulation provides a number of advantages over conventional two-point modulation schemes. Two-point modulation requires calibration/adjustment to achieve optimum performance. I/Q modulation is the answer, providing maximum flexibility in the digital domain and allowing coherent phase to be achieved. An I/Q modulator provides accurate phase modulation. I/Q baseband signals are mixed up to RF by two double-balanced mixers driven by the same frequency but separated in phase by 90 degrees. The outputs of the two mixers are then summed to provide the modulated output.

Quadrature Demodulation

The quadrature demodulator is designed for IF/RF operation and has very low power consumption. Input frequencies in the range 20 to 300 MHz are allowed. The demodulator system has two gain stages, one before and one after the I/Q down-converters and the gain elements can be independently controlled. This flexible architecture allows users to optimise characteristics depending on their system requirements. Optimum noise figure can be achieved by maximising the gain in first gain stage and minimising gain in the second stage. Intermodulation performance can be optimised by decreasing gain in the first or second stages. A lower gain in the second gain stage will tend to reduce dc offsets in the output I/Q signal. Further detailed information on the effects of controlling gain stages is available in the CMX973 datasheet.



Typical system application using:

CMX973—Quadrature Modulator/Demodulator

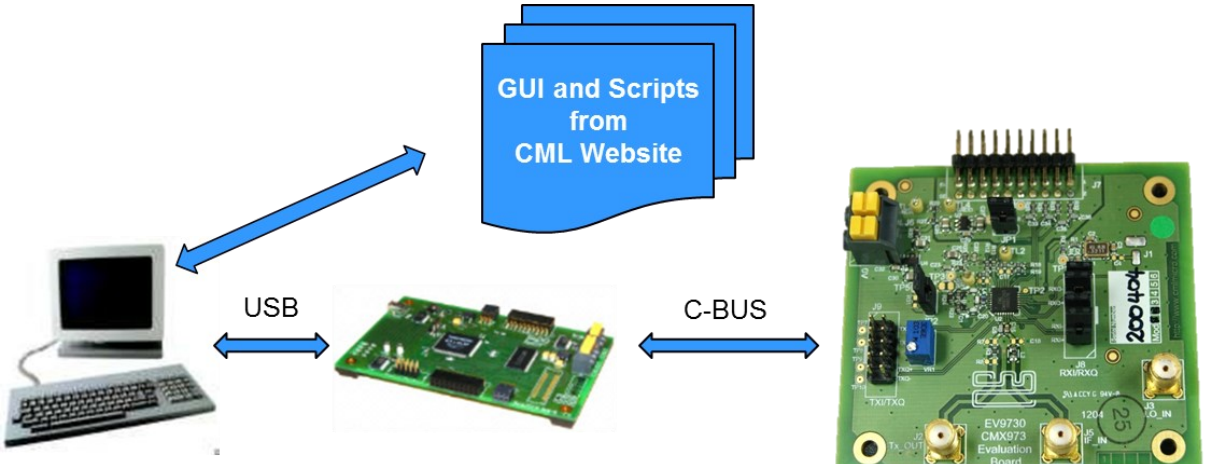
CMX7861—Programmable Baseband Interface IC

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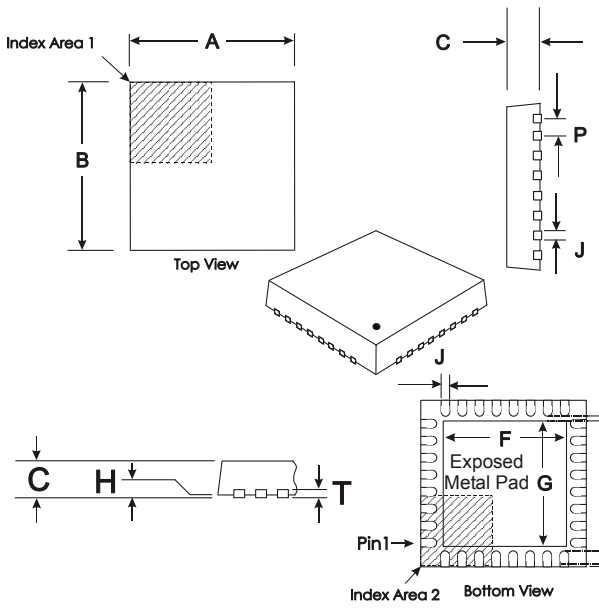
Evaluation Support

The EV9730 is an Evaluation Kit designed for evaluating and demonstrating the capabilities of the CMX973 integrated circuit. All the circuits necessary to demonstrate the facilities provided by the IC, such as matching circuits, power supply regulators, etc. are provided on the EV9730 board.

A C-BUS serial interface connector is provided for control of the EV9730 by a host microcontroller or CML PE0002 interface card. Alternatively any microcontroller evaluation/emulator kit can be used to drive the CMX973/EV9730 serial bus.



Package



DIM.	MIN.	TYP.	MAX.
* A		5.00 BSC	
* B		5.00 BSC	
C	0.80	0.90	1.00
F	3.00		3.80
G	3.00		3.80
H	0.00		0.05
J	0.18	0.25	0.30
K	0.20		
L	0.30		0.55
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



Index Area 1 is located directly above Index Area 2

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

Mechanical Outline of the 32-pin VQFN (Q5)

Electrical Specification Summary

Operating Limits	Min	Typ	Max	Unit
Supply Voltage:				
Digital Supply ($V_{DD} – V_{SS}$)	3.0	-	3.6	V
Analogue Supply ($V_{CC} – V_{RFGND}$)	3.0	-	3.6	V
Operating Temperature	-40	-	+85	°C
Local Oscillator Input	40	-	2000	MHz
Output Frequency Range	20	-	1000	MHz

DC Parameter - Supply Current	Min	Typ	Max	Unit
Total Current Consumption:				
Powersave mode	-	7	-	µA
Bias only	-	1.7	-	mA
Operating Tx	-	63	-	mA
Operating Rx	-	15	-	mA

Quadrature Modulator	Min	Typ	Max	Unit
Performance Figures:				
Output Power (PEP)	-	0	-	dBm
Noise Floor	-	-150	-	dBm/Hz
Equivalent Output IP3	-	21	-	dBm

IF/RF Amplifier and Quadrature Demodulator	Min	Typ	Max	Unit
Performance Figures:				
Gain	-	56	-	dB(V/V)
Noise figure	-	10	-	dB
Third order intercept point (input)	-	-15	-	dBm

Comprehensive technical datasheet and support material is available from the CML website.

Click here to link to the CML website or search for: CMX973

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