CML Microcircuits
COMMUNICATION SEMICONDUCTORS

Product Preview

PP/72417341/3 December 2014

CMX7241/CMX7341

PMR Common Platform Processors

Supporting Digital/Analogue FDMA and Digital 2-slot TDMA PMR/LMR Systems

Small 48-lead Package

Introduction

The Two-way Radio market (TWR), commonly referred to as business critical radio, Professional/Private Mobile Radio (PMR) or Land Mobile Radio (LMR), has become fragmented in its migration to digital.

A number of digital FDMA and TDMA PMR/LMR systems have emerged along with the ongoing requirement for a radio platform to support legacy analogue. With each system potentially having different requirements and specification down to radio architecture level, the radio manufacturer's goal of a single, cost effective radio platform to fit all has become complex.

The CMX7241/CMX7341 PMR Common Platform Processor solves this challenge.

The CMX7241/CMX7341 provides a common platform that can deliver FDMA digital, TDMA digital and legacy analogue PMR/LMR with direct connection to an I/Q based RF receiver. The chip-set comprising CMX7341 (PMR Common Platform Processor) + CMX994 (Direct Conversion Receiver) enables the highest integration and cost-effective radio platform to be realised.

Applications

- Multi-mode PMR/LMR Radio
- FDMA digital PMR/LMR
- 2-slot TDMA PMR/LMR
- Analogue PMR/LMR

Brief Description

The CMX7241/CMX7341 provides a common platform to support digital and analogue FDMA and 2-slot TDMA PMR/LMR.

Based on CML's proprietary *FirmASIC*® component technology, a Function Image™ (FI) upload determines the CMX7241/CMX7341 overall function and operating characteristics. The CMX7241 and CMX7341 provide the same system functionality and can accept the same FI but are targeted at different system implementations:

- CMX7241 is pin compatible with the CMX7141 enabling a smooth forward evolution with power saving features and enhancements.
- CMX7341 has a differential I/Q Rx interface for optimum performance and direct connection to I/Q based RF circuits such as CML's CMX994 Direct Conversion Receiver (DCRx).

The combination of CMX7341 and CMX994 DCRx enables the smallest, lowest cost common platform system to be realised.

Function Image™ 7241/7341FI-1.x (Available now)

This is intended for use in half duplex digital PMR/LMR equipment using 4FSK modulation at 4.8kbps suitable for 6.25kHz channels and analogue FM using 12.5/25kHz channels. Both analogue and digital Rx modes may be enabled simultaneously, allowing automatic detection of the signal type on the RF channel.

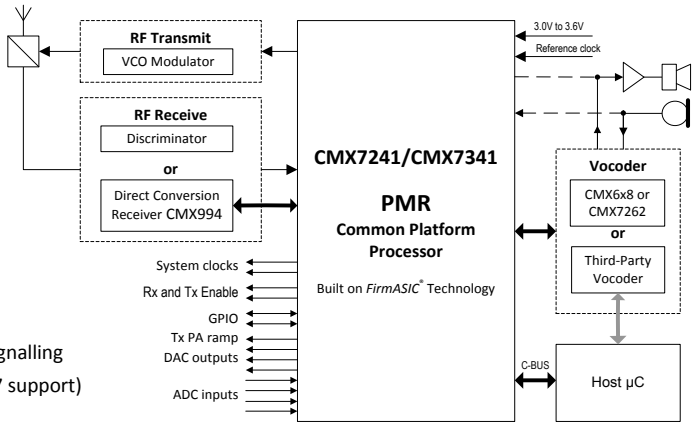
- Combined dPMR™ mode 1/2/3 Air Interface and analogue PMR/LMR operation
- Rx I/Q support (CMX7341 includes differential inputs)
- Automatic digital/analogue call detection
- dPMR™ - ETSI TS 102 490, TS 102 658 compliant
- Analogue PMR/LMR - EN 300 08, EN 300 296 and TIA-603-D compliant

Function Image™ Roadmap includes:

- DMR Air Interface
- NXDN™ Air Interface
- PDT Air Interface

Features Function Image™ 7241/7341FI-1.x

- Automatic Digital and Analogue detection
- Digital PMR/LMR functions
  - dPMR ™ TS 102 490, TS 102 658 and EN 301 166 compliant
  - Air Interface Physical Layer (Layer 1)
  - Air Interface Data Link Layer (Layer 2)
  - Status, Type 1, Type 2 packet data
  - Mode 1/2/3 operation
  - Tx sequencer
- Auxiliary Features
  - 2 x ADCs (4 mux inputs)
  - 4 x auxiliary DACs
  - 2 x system clock outputs
- Analogue PMR/LMR
  - EN 300 086, EN 300 296 and TIA-603-D compliant
  - Complete voice processing
  - Voice scrambler
  - Sub-audio and audio-band signalling
  - FFSK/MSK modem (MPT1327 support)
- Interface
  - Limiter/discriminator or I/Q receive inputs
  - Two-point modulation outputs
  - C-BUS serial interface to CMX994 receiver
  - Vocoder management and control
  - C-BUS serial interface to host micro
  - Low-power (3.3V) operation and powersave modes



Key Feature Descriptions

Function Image™ 7241/7341FI-1.x embeds the dPMR™ ETSI TS 102 490 and TS 102 658 standard Air Interface protocol and provides full audio/voice processing to suit the requirements of EN 300 086, EN 300 296, TIA-603-D and includes a comprehensive signalling suite.

Digital Features

Air Interface Physical Layer 1

- 4FSK modulation and demodulation
- Bit and symbol definition
- Frequency and symbol synchronisation
- Transmission burst building and splitting

Air Interface Data Link Layer 2

- Channel coding (FEC, CRC)
- Interleaving, de-interleaving and bit ordering
- Frame and superframe building and synchronising
- Burst and parameter definition
- Link addressing (source and destination)
- Interface of voice applications (voice data) with the Physical Layer
- Data bearer services
- Exchanging signalling and/or user data with the Call Control Layer
- Automatic Own-ID and Group-ID detection

Mode 1 – Peer-to-peer direct communication using a single frequency channel

Mode 2 – Centralised repeater network where communication between devices is via a repeater/base station

Mode 3 – Managed centralised repeater network with multi-channel and multi-site trunked networks

Analogue Features

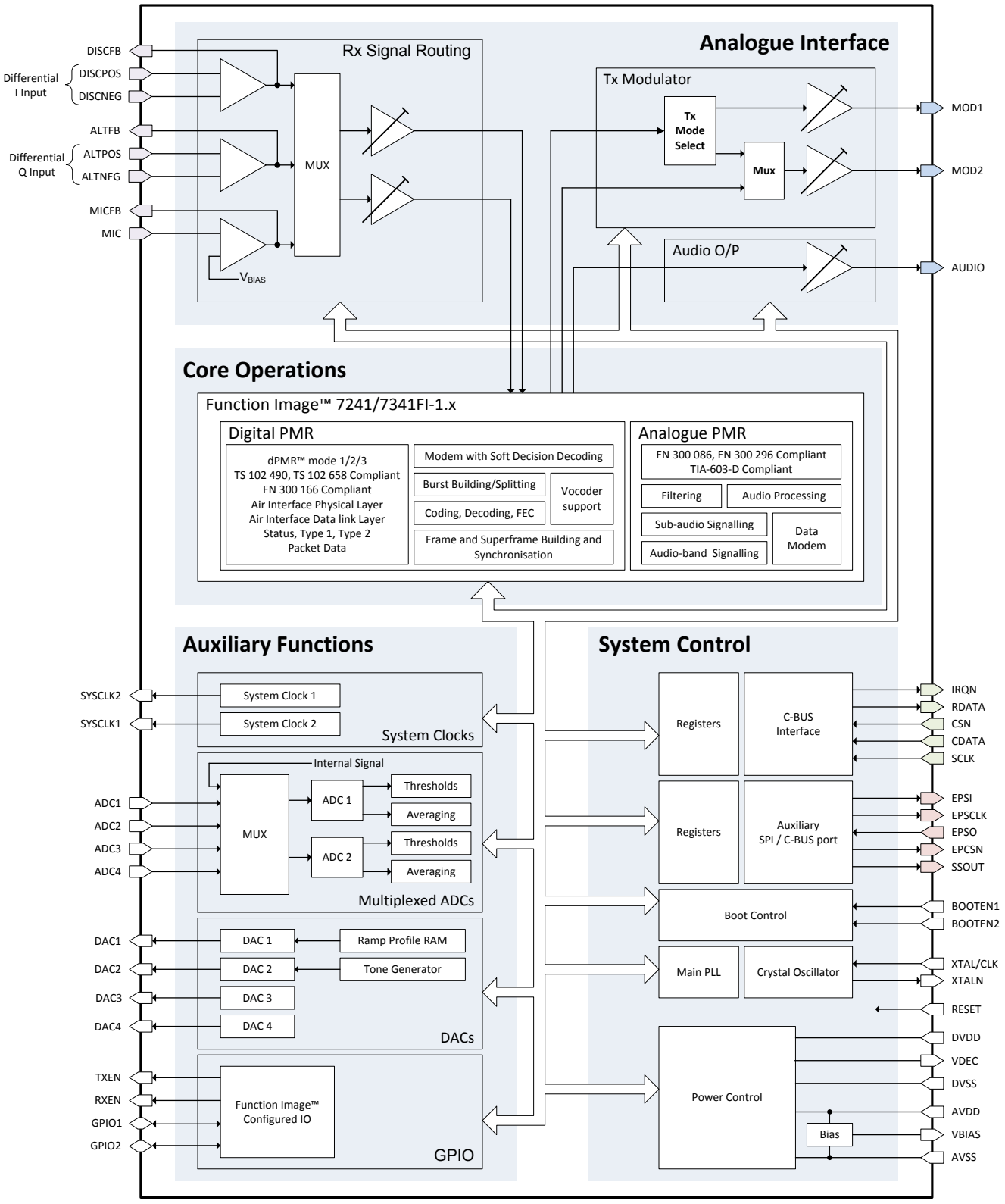
- Selectable pre-emphasis and de-emphasis
- Selectable audio equaliser in mic and speaker paths
- Selectable voice compandor
- Selectable frequency inversion scrambler
- Tx limiter and splatter filter
- Mic AGC
- Selectable sub-audio rejection filter
- CTCSS and DCS generator and decoder
- Support for external CTCSS/DCS generation and decoding with selectable filters (low speed data)
- 1200 bps FFSK modem for MPT1327
- ADSW and CCSW reporting in MPT1327 mode
- 16-tone Selcall generator and decoder
- DTMF generator and decoder
- Tone generator

Auxiliary Functions

- Automatic Tx sequencer simplifies host control
- RAMDAC operation
- TXENA and RXENA hardware signals
- Two-point or I/Q modulation outputs
- Hard or soft decision Rx data output options
- Two programmable system clock outputs
- Two auxiliary ADCs with four selectable external input paths
- Four auxiliary DACs, one with built-in programmable RAMDAC

Interface

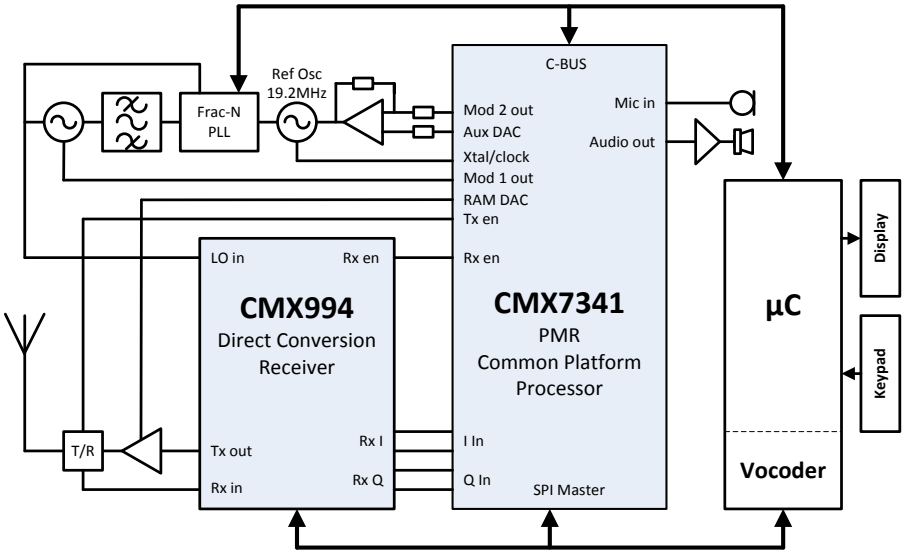
- C-BUS - high-speed synchronous serial command/data interface to host for control and data transfer
- Auxiliary SPI/C-BUS interface to CMX6x8/CMX7262 or CMX994 with pass-through mode from host
- SPI bus interface for PCM speech codec to support third-party vocoders, e.g. AMBE+2
- Two GPIO pins
- Flexible power control facility enables optimum powersave mode when not actively processing signals
- The device includes a crystal clock generator, with buffered output, to provide a common system clock if required.



CMX7341 Function Block Diagram

System Overview

The simplified diagram below shows a typical digital/analogue PMR/LMR radio application. The CMX994 Direct Conversion Receiver provides maximum on-chip integration, allowing a very small RF receiver to be realised with minimal external components. Improvements in semiconductor technologies have seen DCRx increasingly displace superhet as the technology choice for radio receivers in many applications. The CMX7241/CMX7341 PMR takes baseband processing to another level by providing a common platform for FDMA digital PMR, 2-Slot TDMA and analogue PMR/LMR, together enabling a compact, flexible, low BOM cost and easy-to-manufacture radio platform.



Common Platform Multi-mode Analogue/Digital PMR/LMR Radio Block Diagram

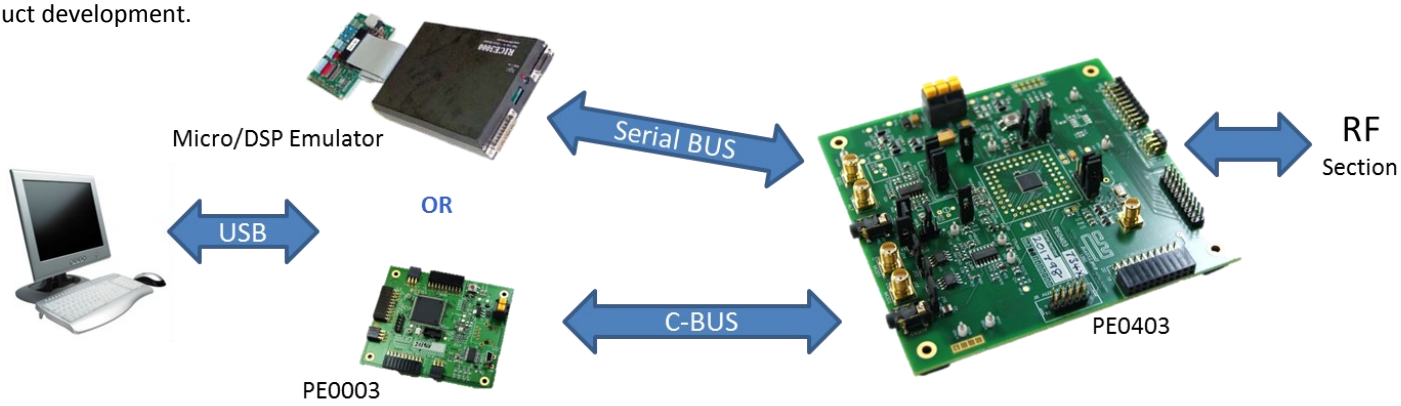
Electrical Specification Summary

Operating Limits	Min	Typ	Max	Unit
Supply Voltage				
$DV_{DD} - DV_{SS}$	3.0	3.3	3.6	V
$AV_{DD} - AV_{SS}$	3.0	3.3	3.6	V
Operating Temperature	-40	-	+85	°C
XTAL/CLK (External Clock)	3.0	-	24.576	MHz

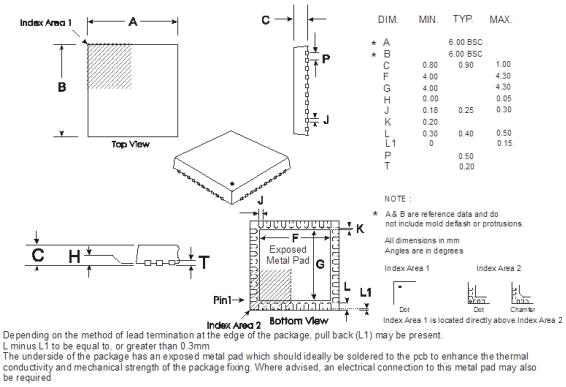
Supply Current	Min	Typ	Max	Unit
All Powersaved				
DI_{DD}	-	8	-	µA
AI_{DD}	-	4	-	µA
Rx Mode (LD)				
DI_{DD} (4.8kbps - search for FS)	-	4.7	-	mA
DI_{DD} (4.8kbps - FS found)	-	2.8	-	mA
AI_{DD}	-	1.6	-	mA
Tx Mode				
DI_{DD} (4.8kbps - 2-point)	-	4.3	-	mA
AI_{DD}	-	1.5	-	mA

Evaluation Support

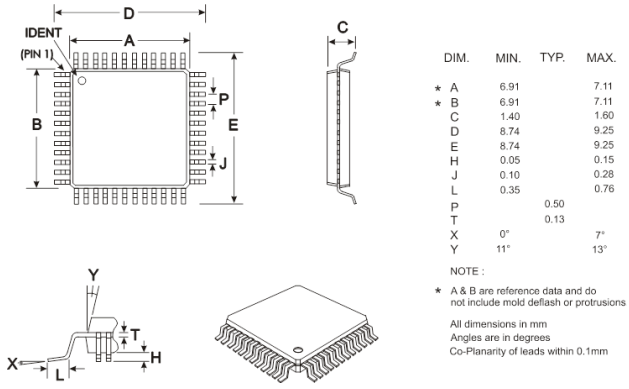
The PE0403 kit supports evaluation for the CMX724x and CMX734x series of products. The board allows fast and efficient evaluation of the target product. The boards schematics are also available to assist the designer with an end product development.



CMX7241/CMX7341 Packages



48-pin VQFN Mechanical Outline (Q3)
CMX7241Q3 / CMX7341Q3



48-pin LQFP Mechanical Outline (L4)
CMX7241L4

CML's proprietary *FirmASIC*® component technology reduces cost, time to market and development risk, with increased flexibility for the designer and end application. *FirmASIC*® combines Analogue, Digital, Firmware and Memory technologies in a single silicon platform that can be focused to deliver the right feature mix, performance and price for a target application family. Specific functions of a *FirmASIC*® device are determined by uploading its Function Image™ during device initialization. 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. *FirmASIC*® devices provide significant time to market and commercial benefits over Custom ASIC, Structured ASIC, FPGA and DSP solutions. They may also be exclusively customised where security or intellectual property issues prevent the use of Application Specific Standard Products (ASSP's).

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