CMX838 FRS, PMR446 and GMRS Family Radio Processor

Audio Processing, Sub-Audio Signalling and RF Synthesis for Short-Range Radio Systems

The implementation of a complete baseband communication system with RF control functions on a single chip; the provision of a singular global design configurable to multiple standards and markets.
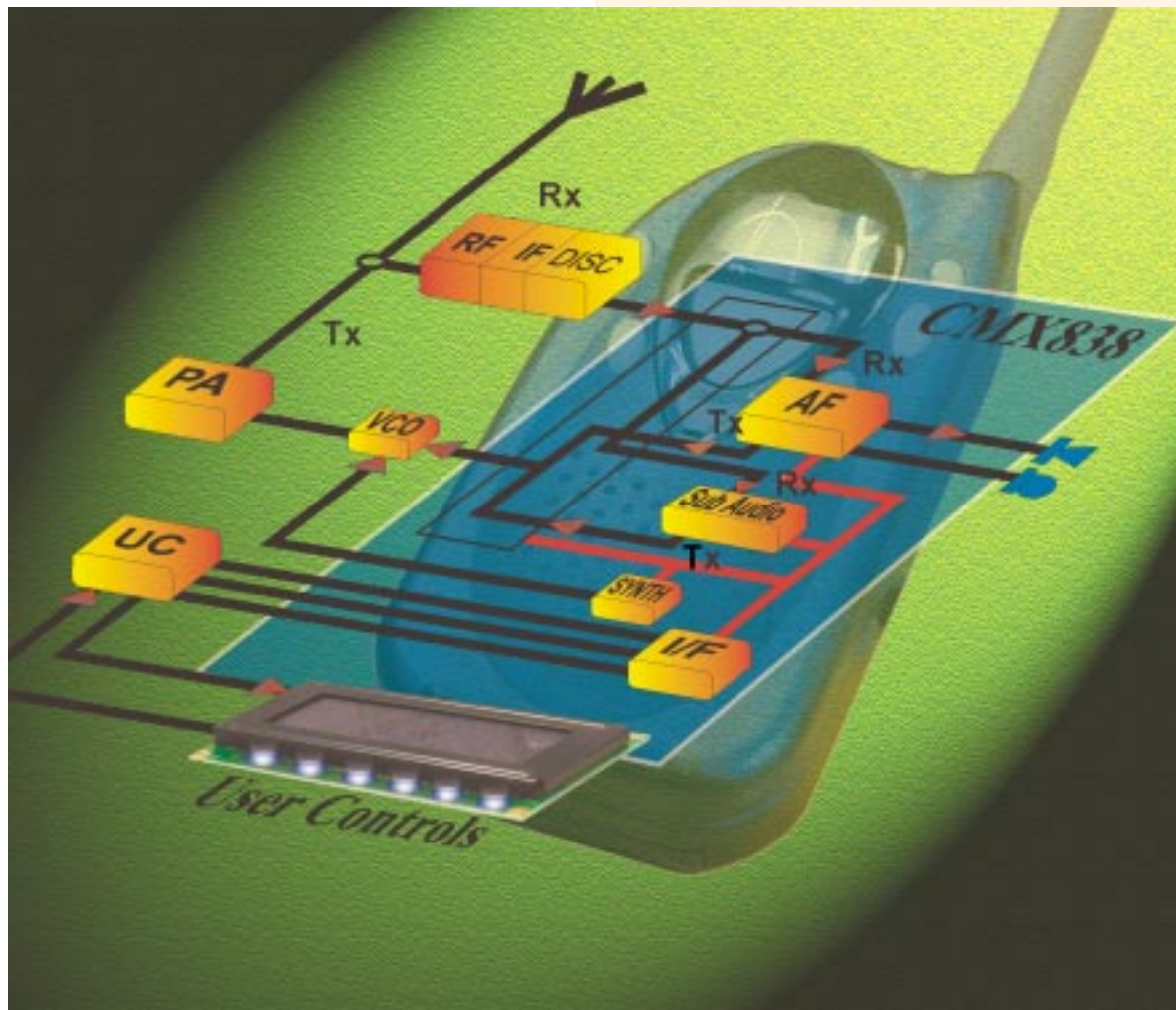
Features

- ☐ **Configurable On-Chip Audio and Sub-Audio Processing with RF Synthesiser**
- ☐ **Advanced CTCSS Functions with Fast Response/De-response Times**
- ☐ **51 TIA-603 and Non Standard CTCSS Tones**
- ☐ **RF Synthesiser (100 - 500 MHz Range)**
- ☐ **Low Power Operation, Compact Packaging**
- ☐ **External Processes (Compress, Scramble, FSK/MSK Data) Path and 'Ring' and 'Alert' Tones Generation**

The CMX838

The highly integrated **CMX838** Family Radio Processor IC includes audio, subaudio and RF synthesizer functions to serve as the core engine for low cost, high performance FRS, PMR446, GMRS and mobile radio designs.
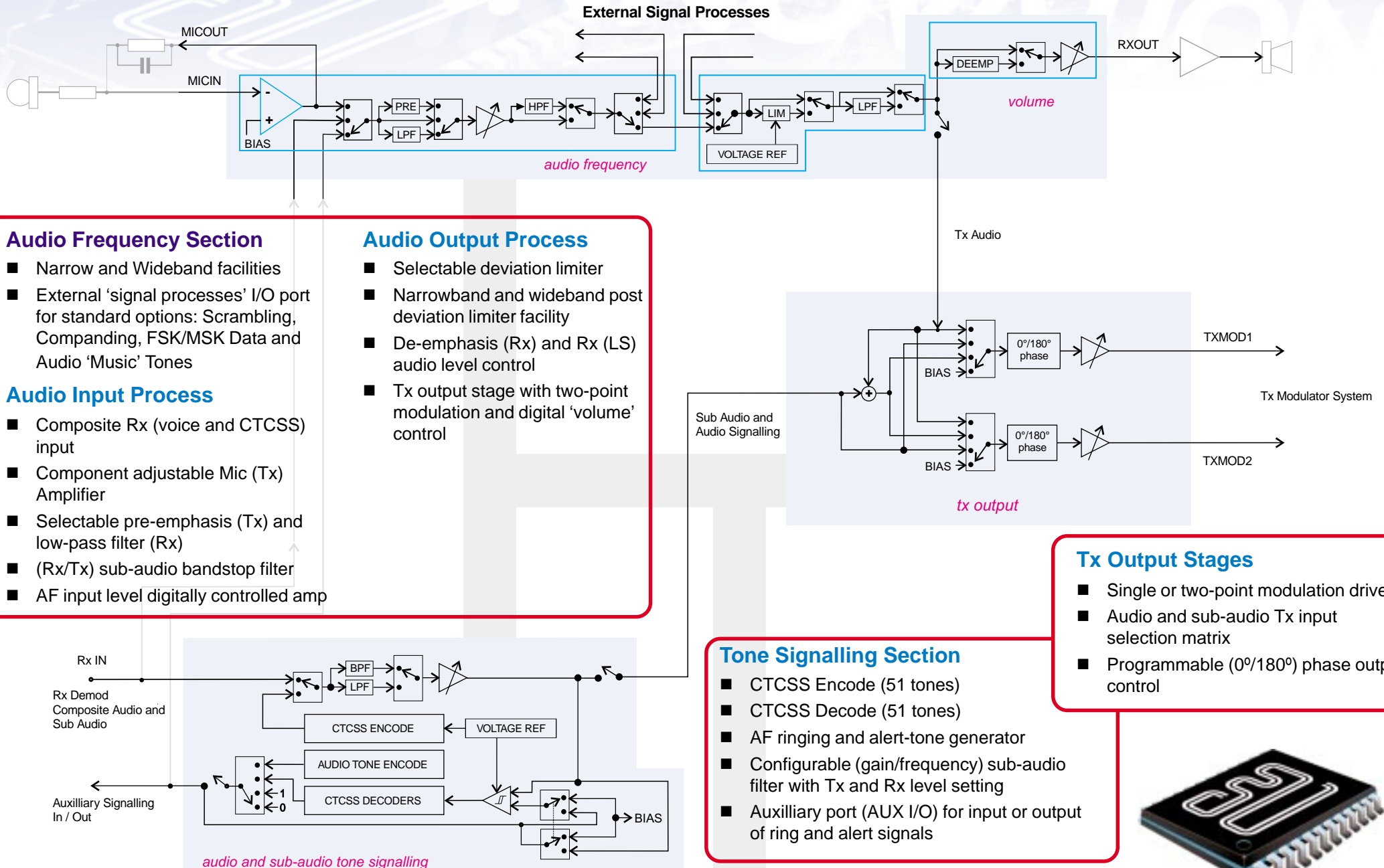
Its flexibility supports both simple and advanced multi-channel radio designs without size, cost and time penalties.

Integrated Tx voltage reference and baseband clock generation circuits eliminate the need for many external components.

The **CMX838's** features directly supports advanced end product functions such as: group calling, scanning, automatic scanner response tone setup, and Tone Cloning™.

Consumer Microcircuits Limited
COMMUNICATION SEMICONDUCTORS

Two-Way Radio

CMX838 Schematic Functions

External Signal Processes

MICOUT

MICIN

BIAS

PRE

LPF

HPF

LIM

LPF

VOLTAGE REF

DEEMP

RXOUT

volume

audio frequency

Tx Audio

BIAS

0°/180° phase

TXMOD1

Tx Modulator System

Sub Audio and Audio Signalling

BIAS

0°/180° phase

TXMOD2

tx output

Audio Frequency Section

- Narrow and Wideband facilities
- External 'signal processes' I/O port for standard options: Scrambling, Companding, FSK/MSK Data and Audio 'Music' Tones

Audio Input Process

- Composite Rx (voice and CTCSS) input
- Component adjustable Mic (Tx) Amplifier
- Selectable pre-emphasis (Tx) and low-pass filter (Rx)
- (Rx/Tx) sub-audio bandstop filter
- AF input level digitally controlled amp

Audio Output Process

- Selectable deviation limiter
- Narrowband and wideband post deviation limiter facility
- De-emphasis (Rx) and Rx (LS) audio level control
- Tx output stage with two-point modulation and digital 'volume' control

Tx Output Stages

- Single or two-point modulation driver
- Audio and sub-audio Tx input selection matrix
- Programmable (0º/180º) phase output control

Tone Signalling Section

- CTCSS Encode (51 tones)
- CTCSS Decode (51 tones)
- AF ringing and alert-tone generator
- Configurable (gain/frequency) sub-audio filter with Tx and Rx level setting
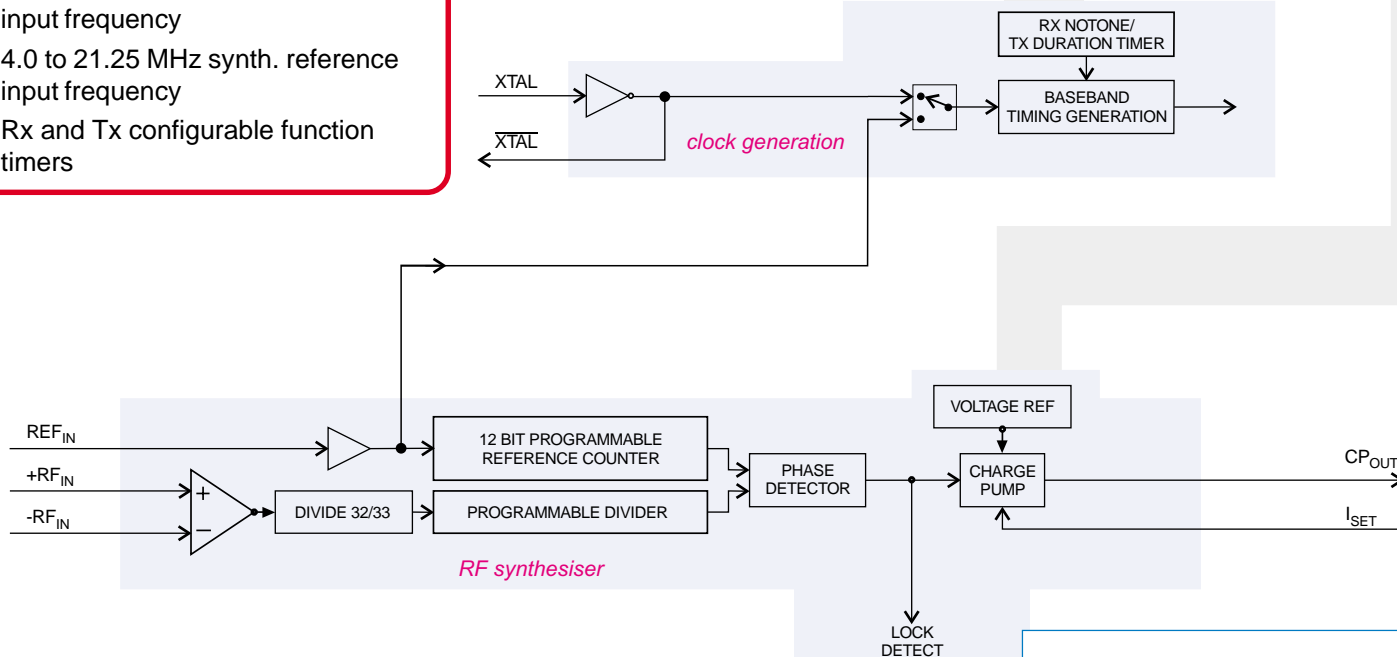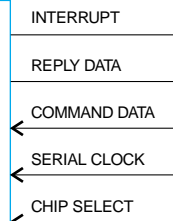- Auxilliary port (AUX I/O) for input or output of ring and alert signals

Rx IN

Rx Demod Composite Audio and Sub Audio

BPF

LPF

CTCSS ENCODE

VOLTAGE REF

AUDIO TONE ENCODE

CTCSS DECODERS

1

0

BIAS

Auxilliary Signalling In / Out

audio and sub-audio tone signalling

Clocks and Timing

- Configurable baseband and synthesiser control-source selection
- Xtal, external clock or synthesizer reference input source
- 4.0, 8.0, 9.6 or 12.0 MHz Xtal/Clock input frequency
- 4.0 to 21.25 MHz synth. reference input frequency
- Rx and Tx configurable function timers

Digitally Controlled Levels

- Audio Preprocess In
- Rx Audio (Volume) Out
- Tx Mod 1 and 2 Out
- Encoded Sub-Audio Out

'C-BUS' Interface

INTERRUPT

REPLY DATA

COMMAND DATA

SERIAL CLOCK

CHIP SELECT

XTAL

$\overline{XTAL}$

clock generation

RX NOTONE/ TX DURATION TIMER

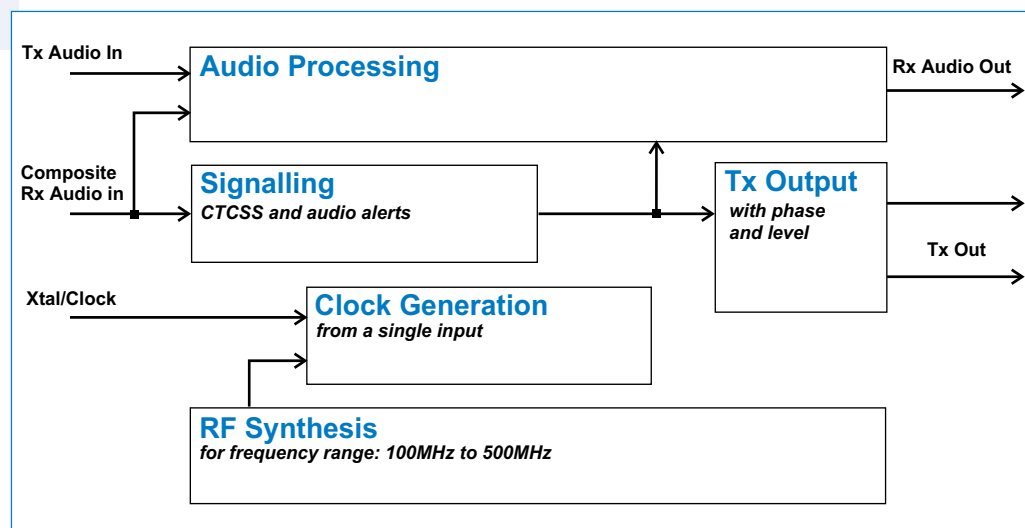BASEBAND TIMING GENERATION

RF Synthesiser

- Integer-N frequency synthesiser
- FRS, PMR446 and GMRS RF frequency support via simple 'channel-select' commands
- Support for several REF_{IN} clock frequencies (4.0 to 21.25 MHz)
- 'Lock Detect' function
- Supports 6.25kHz to 25kHz channel applications in the RF range: 100 to 500 MHz

REF_{IN}

$+RF_{IN}$

$-RF_{IN}$

DIVIDE 32/33

12 BIT PROGRAMMABLE REFERENCE COUNTER

PROGRAMMABLE DIVIDER

PHASE DETECTOR

VOLTAGE REF

CHARGE PUMP

CP_{OUT}

I_{SET}

RF synthesiser

LOCK DETECT

'C-BUS' Serial Control

- Serial control, data and program command interface compatible with SCI, SPI and Microwire type interfaces
- **Serial Clock:** Max data rate = 5MHz
- **Command Data:** Command, control and information data to the device
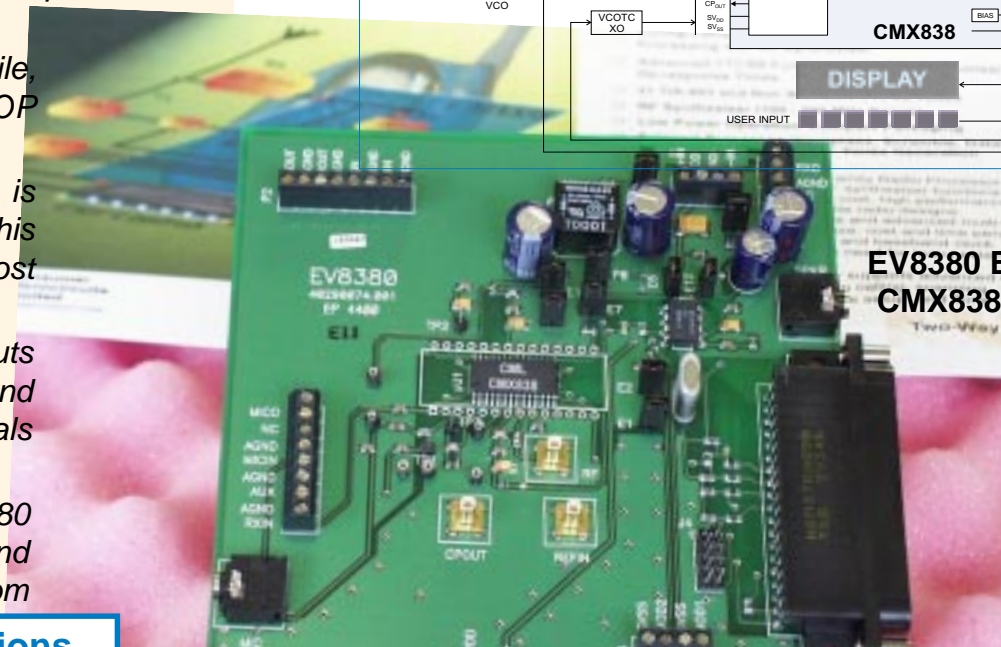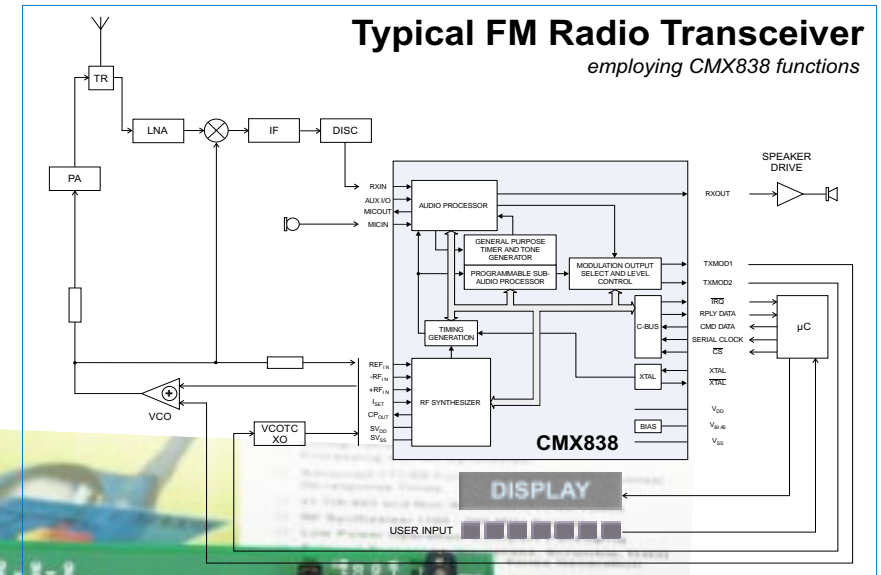- **Reply Data:** Status and information data from the device

Power Supply

- 2.7 to 5.5 volt supply requirement
- Low operating current: 14mA (max with RF synthesiser enabled) at 3.0V
- Versatile 'powersaving' and 'sleep' functions in both Rx and Tx

Tx Audio In

Composite Rx Audio in

Xtal/Clock

Audio Processing

Rx Audio Out

Signalling
CTCSS and audio alerts

Tx Output
with phase and level

Tx Out

Clock Generation
from a single input

RF Synthesis
for frequency range: 100MHz to 500MHz

The CML Advantage

- **Mulitple Features at Low-Cost** - *the singular integration of a comprehensive audio processor, sub-audio signalling system and RF synthesiser minimises the 'chip' and component count and required PCB area . . . . . all at a very low cost!*

- **Versatile CTCSS Functions** - *fast response and deresponse times (140/145 ms) and 51 standard TIA-603 and non-standard tones available*

- **Ultra-Low Power Requirement** - *with a total full-operational power requirement of 14mA at 3.0 volts; or as little as 2mA if the synthesiser is not enabled, the CMX838 embodies many configurable 'powersave' and 'sleep' modes to optimise battery usage*

- **High Integration in a Compact Package** - *low profile, low pin count packaging in 28-pin SOIC and TSSOP encapsulation minimises the required PCB area*

- **Simple Interface** - *the 'C-BUS' serial µC interface is compatible with SCI, SPI and Microwire type systems. This enables implementation of the CMX838 with many host systems*

- **External Signalling Path** - *accommodates external inputs and outputs to compression and scrambling circuits and allows the input of voice, MSK/FSK data and 'alert' signals to the final stages*

- **Accelerated Development** - *the availability of the EV8380 Evaluation Kit speeds testing, evaluation and design and reduces time to market. Full product data available from CML Web Site*

Typical FM Radio Transceiver
employing CMX838 functions

EV8380 EvKit for CMX838

Packages	-40º to +85ºC
CMX838D1	28-pin SOIC
CMX838E1	28-pin TSSOP

Information

www.cmlmicro.co.uk/products/two_way_radio/CMX838.htm

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Applications

Family Radio System (FRS): *A licence-free private, two-way, short range voice communication service for individual and group activities.*

PMR446: *A licence-free handportable short-range, voice only communication system.*

General Mobile Radio System (GMRS): *A licenced land mobile radio service for short range two-way communications.*

Mobile Radio Systems: *With its baseband, data and RF compatible features, the CMX838 lends itself to many mobile radio applications*

Oval Park, Langford, MALDON, Essex CM9 6WG, England Tel: +44 (0)1621 875500   Fax: +44 (0)1621 875600 sales@cmlmicro.co.uk   www.cmlmicro.co.uk