CMX878 Line-Powered Modem with DAA

A V.22bis Modem IC with Transformerless DAA and Real Line-Power Capabilities

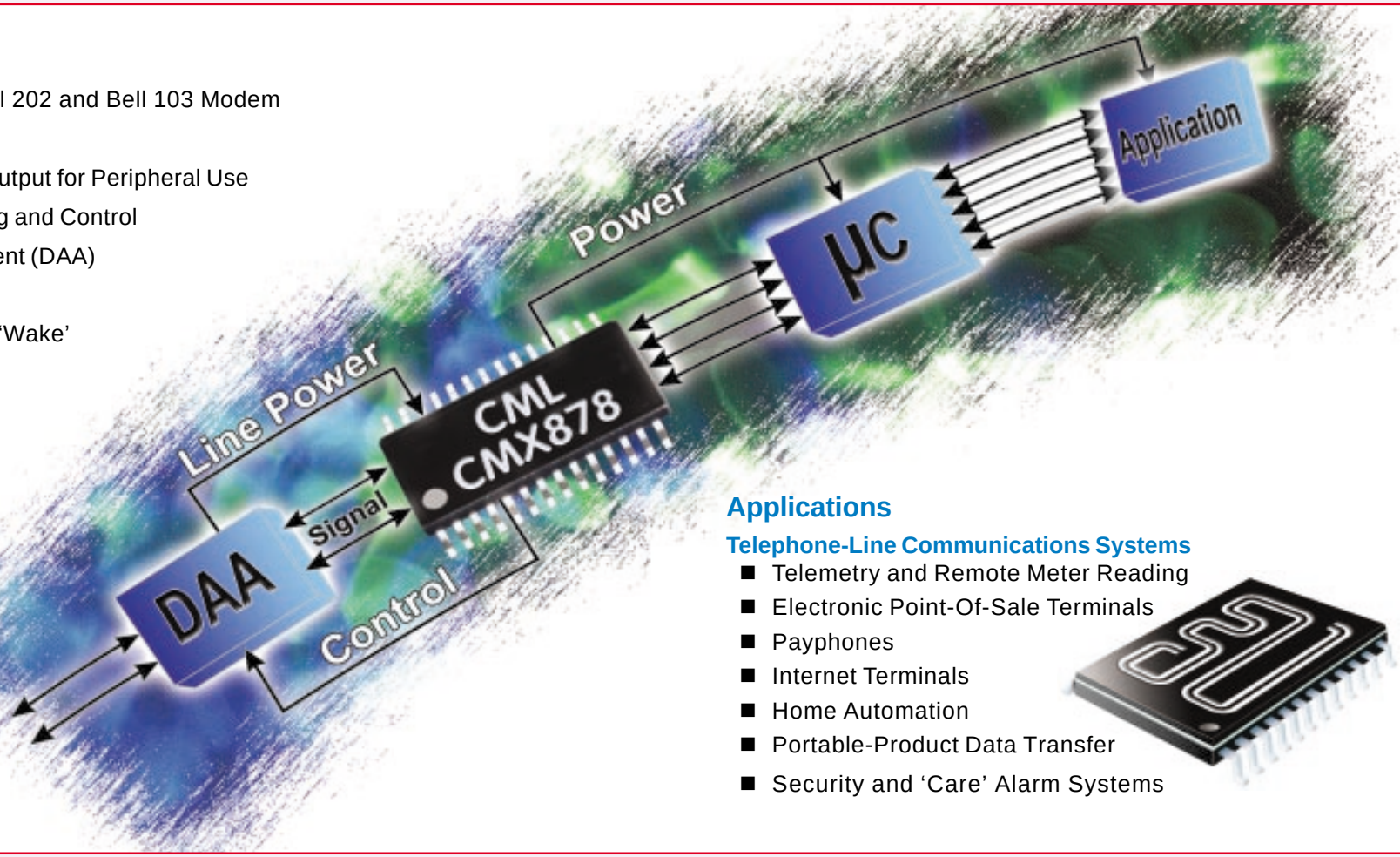
INNOVATIONS
INV/Telecom/878/1 January 2003

www.cmlmicro.com

- V.22bis Modem; *with fallback features* - Line-Power Operation with On-Chip Line and Power Regulation - Line Interfacing - - Inband Tone Signalling - Compact 28-pin Packaging -

The CML Advantage

- V.22bis, V.22, V.23, V.21, Bell 212A, Bell 202 and Bell 103 Modem
- Optimised for Real Line-Power Operation
- Controlled and Regulated 3.3V Supply Output for Peripheral Use
- Integral DAC and ADC for Line Monitoring and Control
- Transformerless Data Access Arrangement (DAA)
- Gyrator Switch for Line Load Operation
- 'Ring' and 'Line-Reversal' Detection and 'Wake' Functions
- Inband 'Telephone Signalling' Facilities
- Adaptive Rx and Tx Signal Equalizers
- Parallel Phone Intrusion (PPI) 'Off-hook' Detection
- 'Line-in-Use' 'On-hook' Detection
- Serial Control and Communication Bus
- Versatile General Purpose Control Outputs for Peripheral Switching
- Load Selection for CLI Operation
- Telecoms Approvable Interface Design
- Compact 28-pin Packaging
- DE8781 Demonstration Kit Available



Applications

Telephone-Line Communications Systems

- Telemetry and Remote Meter Reading
- Electronic Point-Of-Sale Terminals
- Payphones
- Internet Terminals
- Home Automation
- Portable-Product Data Transfer
- Security and 'Care' Alarm Systems

- No External Power - No Isolation Barrier - No Line Transformer - Small PCB Area - Faster Design Time - - Low Chip and Component Count - Low Cost -

The System

- Save Design Time - Save Space - Save Components - Save Money - Save Power -

The CMX878

■ The CMX878 is primarily targeted at ‘stand-alone’ applications where no external power supply or connections are required. The main advantage of such a line-powered configuration (CMX878/DAA and the associated µC/Application) is that no ‘isolation barrier’ is required.

■ Offering full-duplex QAM, DPSK and FSK modulation via a transformerless line interface, this exciting telecoms product provides everything that is required for a line-data transaction including, in both on and off-hook modes, the extraction of power from the line.
It provides, from line: ‘Ring’ and ‘Line Reversal’ detection as well as having a dedicated wake-up function for external activation. Acknowledging the varying line-current requirements whilst on and off-hook, the CMX878’s power extraction circuits provide both standby maintenance power, control switching and the provision and regulation of main-power for both the CMX878 and its peripheral µProcessor. Real line-power enables the use of the CMX878, with its companion µProcessor on the exchange-side of the installation; no barrier components are required for basic operation.

■ Under the µProcessor control the CMX878 can use its on-board functions to monitor and characterise the line’s parameters; a handy option for automatic ‘off-hook sensing’, ‘line-in-use’ and ‘parallel phone intrusion (PPI)’ actions.
Line current can be dynamically monitored and adjusted.
These ‘dynamic’ functions make the CMX878 ideal for deployment in global systems of varying specifications and protocols.

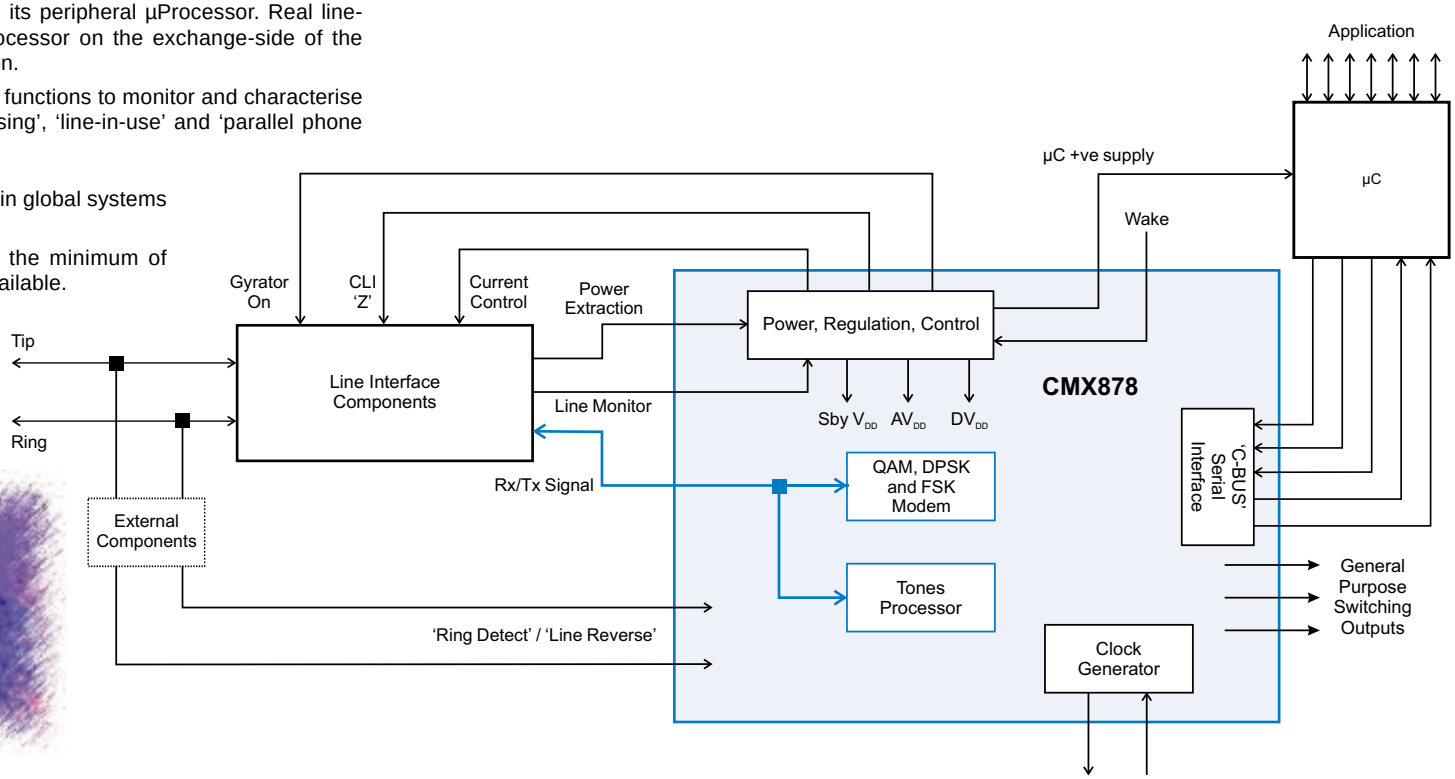
A simple transformerless hybrid Rx/Tx function is formed using the minimum of external components. Gyrator and CLI impedance switching is available.

Fixed and programmable in-band tone signalling is available on-chip to provide: progress and answer tones, guard tones and DTMF configurations.

The system’s power requirements are:
On-hook = 0.7µA and when operating = 4.5mA.

"A 'real line power' modem with controllable line-interface"

"Line-power supports the CMX878 in both on and off-hook modes. On-chip regulation and control ensure local regulatory standards are adhered to."



Contents

The System . . . . . .

Line-Power Operation

With its internal functions and external components, flexible line-power operation is possible:

Standby

- **Standby** power and regulation from line via on-chip facilities

Regulated Supply

- On-chip regulator supplies 3.3V (nom.) from line to all parts of CMX878 and associated µController and application

Control

- Control, Command and Data via 'C-BUS' serial interface
- Separate, individual registers for standby operations

Remote Meter Reading

DAA Functions

- Transformerless line-signal interface
- Line-power extraction and regulation with control switching
- CMX878, µController and peripheral supply provision
- Standby power supply
- Parallel 'local-phone' detect
- Line conditioning and recognition functions
- Caller Line ID facilities
- Gyrator control for on and off-hook line characteristic maintenance

Calling Line Identity

- DAA provides CLI matching impedance whilst on-hook; selected by the CMX878
- V.23 or Bell 202 modem available for demodulation

Line-Reversal, Ring and Wake

- A line-signalling input or a dedicated pin event can be utilised to indicate the start of a telecoms data transaction

Payphone Management

Inband Tone Signalling

- DTMF Rx and Tx
- Single-tone Tx (from a range of pre-programmed options)
- Call progress signal detect
- 2100 and 2225 Hz answer-tone detect
- User programmed single or tone-pairs (Tx and Rx)

Full Duplex Data Facilities

- QAM, DPSK and FSK options
  - V.22bis, V.22, V.23, V.21
  - Bell 212A, Bell 202, Bell 103
- Scramble/De-scramble modes for QAM and DPSK operation
- Selectable line-equaliser
- V.14 Compatible (Rx and Tx) USART facility

Alarm Systems

Line-Power Extraction and Transformerless Interfacing

Line Power Operation

With its internal functions, monitoring and external components, flexible line power operation is possible:

Standby

- **Standby** regulator generates 3.3V (nom.) from line to maintain standby registers and 'ring' and 'line-reverse' detect and 'wake' functions

Regulated Supply

- **On Wake and Start up -** on-chip regulator supplies 3.3V (nom.) from line to all parts of CMX878 and associated µController/application
- **On-Chip Bandgap Reference** ensures stable operating voltage

Power Switching and Control

- **ADC** available for dynamic line monitoring and condition characterisation
- **DAC** available for line current control

Safety Considerations - *The Isolation Barrier*

A safety 'isolation barrier' is always required between the phone-line and the low-voltage circuits that users' can touch:

- When stand-alone and line-powered, the CMX878 and its application can work within the product's isolation barrier
- When operating with a supplementary (battery) supply, the CMX878 and its application can also work within the isolation barrier
- Any CMX878 application operating with mains-power or other external mediums will need to be connected to line via an isolation interface

Line and External Wake-ups

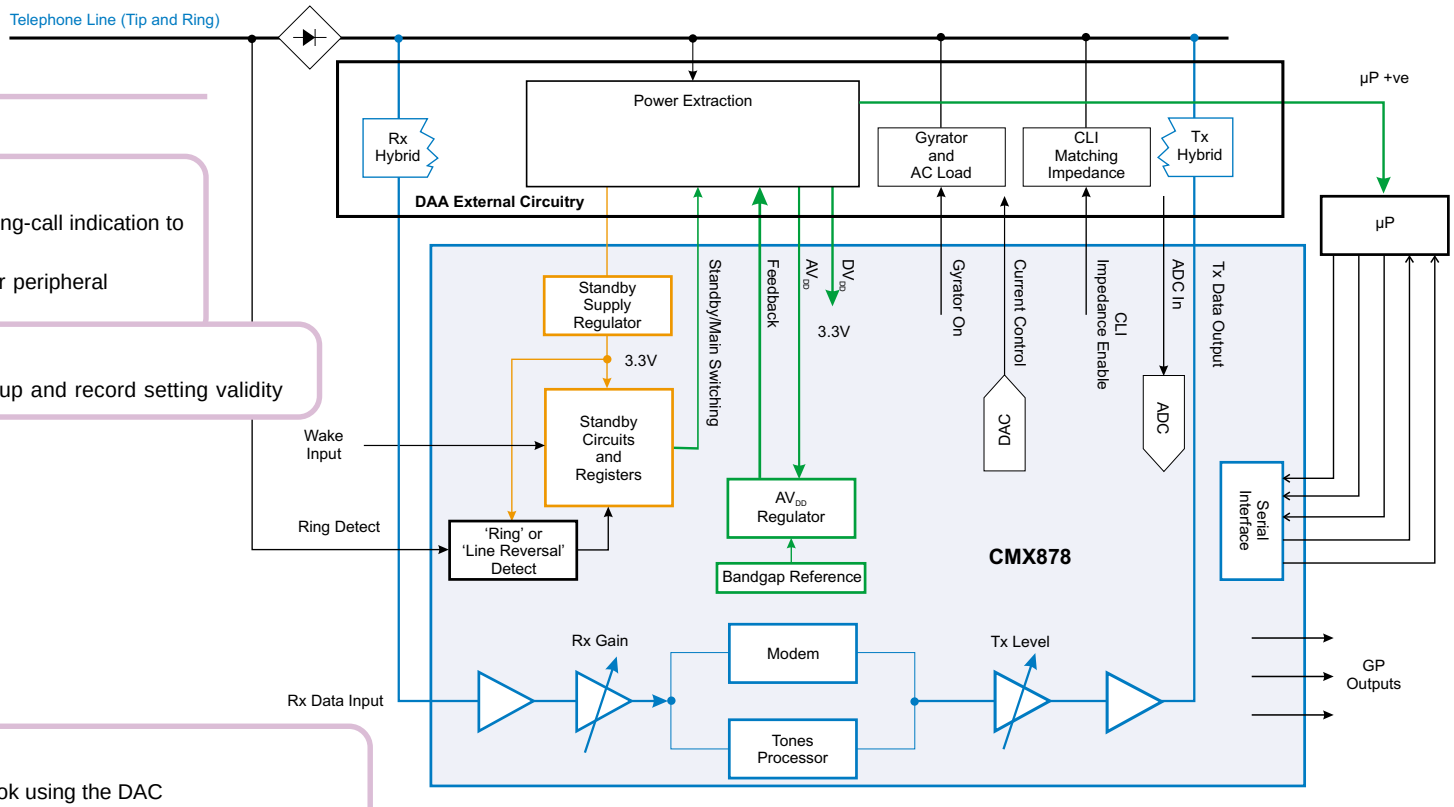
- 'Ring' tone and 'Line Reversal' detect circuits provide incoming-call indication to Standby Registers
- External 'Wake' input allows full-function start-up from µC or peripheral sensors

Standby Registers

- Maintain setting information, control start-up and record setting validity

DAA Functions

- Gyrator and AC load selectable for off-hook operations
- Rx/Tx Hybrid components provide > 7dB rejection
- For CLI operation the CLI Z En output can be used to switch-in the relevant line loads and circuitry
  Note that for CLI (on-hook) operation a supplementary power supply will be required



Line Monitoring and Characterisation

- Parallel Phone Intrusion (PPI) detection is possible off-hook using the DAC
- On-hook 'Line-in-Use' detection is facilitated by the on-chip ADC circuit
- Line current and voltage monitoring allows line values to be measured and stored

Communication; The Data and Signalling Section

Full Duplex QAM Data Operation

V.22bis 2400b/s (Low Band Call - High Band Answer)
QAM data operation offers, additionally, Scramble and Descramble modes

Full Duplex DPSK Data Operation

V.22 600/1200 b/s (Low Band Call - High Band Answer)
Bell 212A 600/1200 b/s (Low Band Call - High Band Answer)

DPSK data operation offers, additionally, Scramble and Descramble modes

Full Duplex FSK Data Operation

V.21 300b/s (Low Band Call - High Band Answer)
Bell 103 300b/s (Low Band Call - High Band Answer)
V.23 1200/75 b/s
Bell 202 1200/150 b/s

Individual (V.14 Compatible) Rx and Tx USART facility:

USART Modes

- Disable
- Continuous patterns
- Start/Stop (asynchronous)
- Synchronous

Selectable Rx and Tx line-equaliser facility for 600, 1200 and 2400 b/s modes

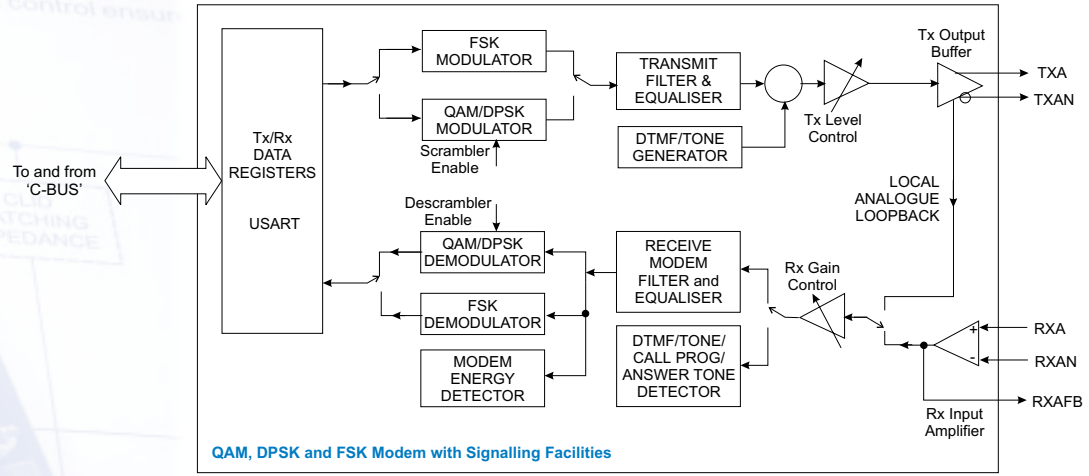
Data and Signalling

■ The CMX878's versatile signalling and data functions are available to provide an end-to-end communications service to a large number of systems.

As the originating modem, the CMX878 can check the line, dial out, monitor call-progress, set-up the call using the relevant modulation scheme and handshaking, transfer the data, negotiate the responses and terminate the call.

As the receiving modem, it can answer the call, negotiate the handshake and transfer the data as required.

Data transactions between the CMX878 and its companion µProcessor are via the 'C-BUS' serial interface.



QAM, DPSK and FSK Modem with Signalling Facilities

Local Analogue Loopback

- A test mode for complete modem (Tx/Rx) operation checks
- Allows off-line end-to-end communication testing

Signalling Tones: Single or Pairs

Rx

- Programmed single or tone-pair
- Call progress
- 2100, 2225 Hz Answer Tone detect

Tx

- Fixed single (including 'calling' and 'answer' tones) and programmed single or tone pairs
- Selectable guard-tones in QAM and DPSK modem modes

Dual Tone Multi Frequency (DTMF)

- Detects (Rx) and generates (Tx) standard DTMF signals

Level Setting

- Adjustable Rx and Tx level controls (0 to -10.5dB)
- Component adjustable Rx and Tx buffer amplifiers

The CMX878 in Action

. . . . . application suggestions for the CMX878

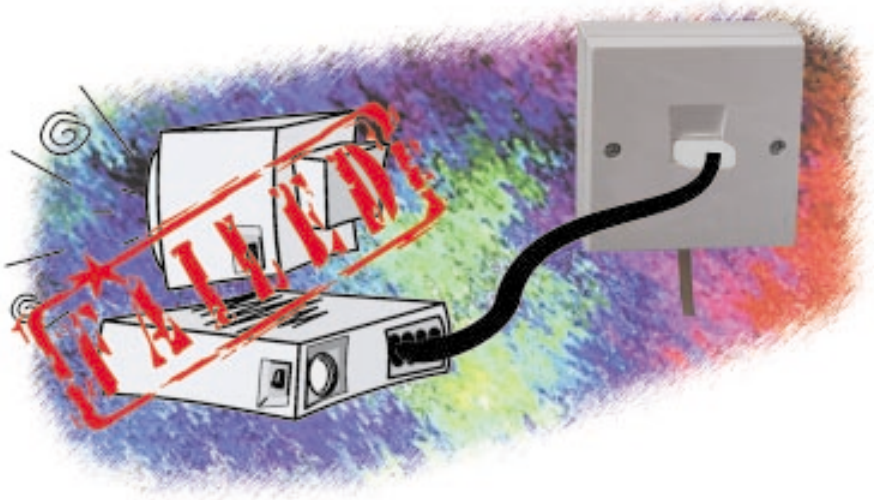
‘Man-Down’ or Invalid Alarm

- A simple broach-type button alarm transmits a ‘pulse’ when pushed (inductive or RF Tx)
- Rx in the telecoms master socket provides ‘signal’ to start-up a line-powered CMX878 installation
- The CMX878 set-up dials up the service-provider and all relevant data is sent - help is alerted
- Customer data (personal information, phone numbers and location) can be reprogrammed via the line

- For cable-free downloading of data from portable equipment (EPOS, laptop PCs, PDAs); avoids the confusion of cables, power and connections in someone else’s office!
- Simple receiver cradle is plugged into master socket
- Portable unit is placed in the cradle and download initiated
- Line powered CMX878 installation within cradle detects download-initiation, dials ‘home database’ and transfers data

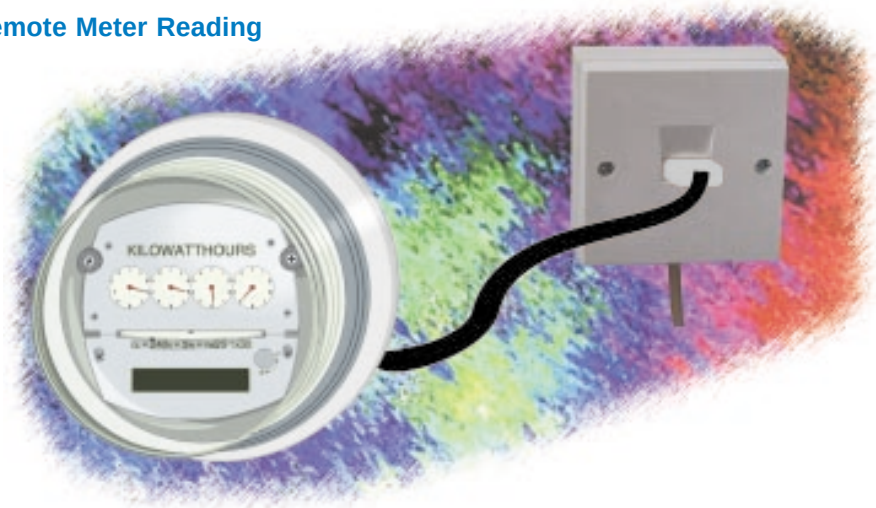
Handsfree Portable Equipment Download Facility

Power-Failure Reporting from Remote Locations



- When the system power supply failure is detected, the line powered CMX878 dials a central control facility to report status

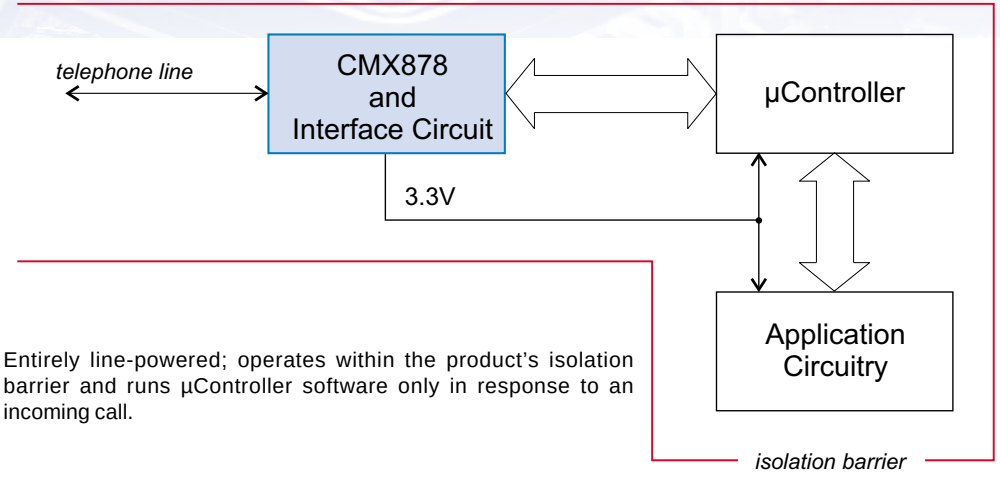
Remote Meter Reading



- Data collection system rings (interrogates) CMX878 integrated metering system
- CMX878 responds, wakes-up both the µC and metering application
- Metering data is passed, via the line, to the collection system
- When download complete, CMX878 puts system back into standby

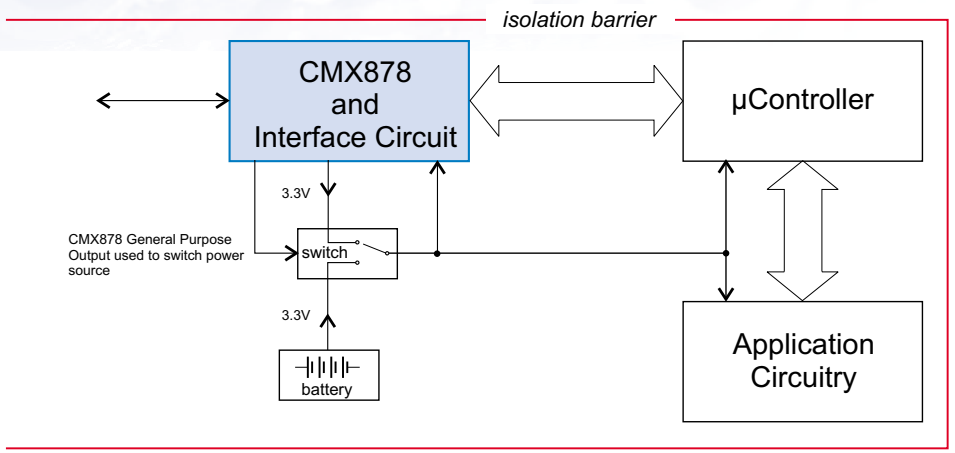
The CMX878 in Action

. . . . . operational formats for the CMX878



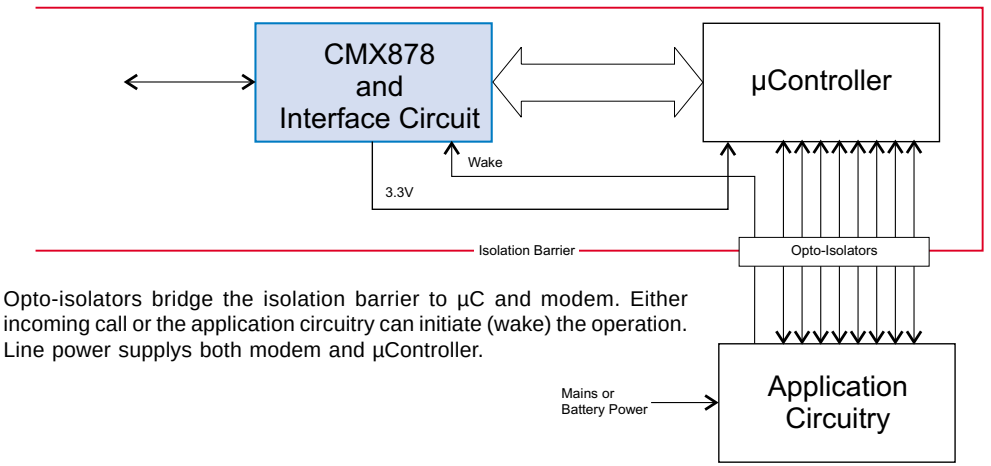
Entirely line-powered; operates within the product's isolation barrier and runs µController software only in response to an incoming call.

Basic Exchange-Side Installation



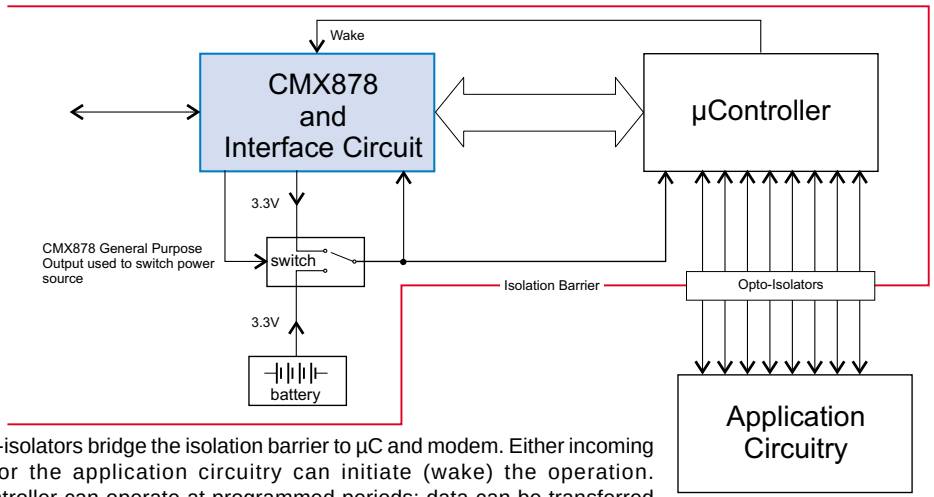
Partially battery-powered; requires no isolation barrier. µController can operate at programmed periods; data can be transferred as required. Line-power during modem operations extends battery life.

Exchange-Side Installation (Battery Supported)



Opto-isolators bridge the isolation barrier to µC and modem. Either incoming call or the application circuitry can initiate (wake) the operation. Line power supplys both modem and µController.

Basic with 'Wake-up' Across Barrier



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Battery Supported with 'Wake-up' via µController Across Barrier

Recent Wireline Telecom Products From CML

CMX683 Call Progress and 'Voice Audio' Detector

- Worldwide call-progress detection with voice or music recognition

CMX850 Communications Controller

- A powerful, versatile communications processor with on-chip (80C51) µController

CMX866 V.22bis Modem with 'AT' Command Set

- Multi-standard modem with integral 'AT' command and signalling facilities

CMX867 Low Power V.22 Modem

- Versatile V.22, V.23, V.21 and Bell data with telephone signalling

CMX868 Low Power V.22bis Modem

- V.22bis, V.22, V.23, V.21 and Bell data with telephone signalling capabilities

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Packages	*-40º to +85ºC*
CMX878D1	28-pin SOIC
CMX878D6	28-pin SSOP
CMX878E1	28-pin TSSOP

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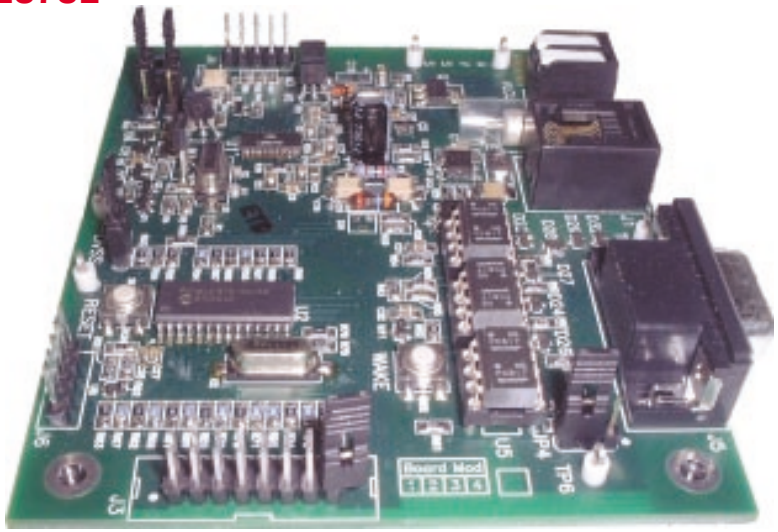
Evaluation, Demonstration and Design: The DE8781



- CMX878-based Modem Reference Design with Transformerless DAA
- Line-Powered Operation (with local supply facilities)
- Demonstrates: Data Transfer, AT Command Operations, Line-In-Use, Caller ID and Parallel Phone Intrusion (PPI) Detection
- AT Command Compatible Firmware
- Safety Barrier via Opto-Isolated Serial Port
- Firmware and PCB Layout Files Supplied - Upgrades Available from CML Website
- On-Board FLASH PIC µController with In-Circuit Re-Programming Capabilities
- Designed to Meet FCC68/TBR21 Telecom Approval Requirements
- Communication and Control via an RS232 (PC) Computer Terminal

Information - www.cmlmicro.com
www.cmlmicro.com/products/wtelecom/CMX878.htm
www.cmlmicro.com/products/evkits/DE8781.htm

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