



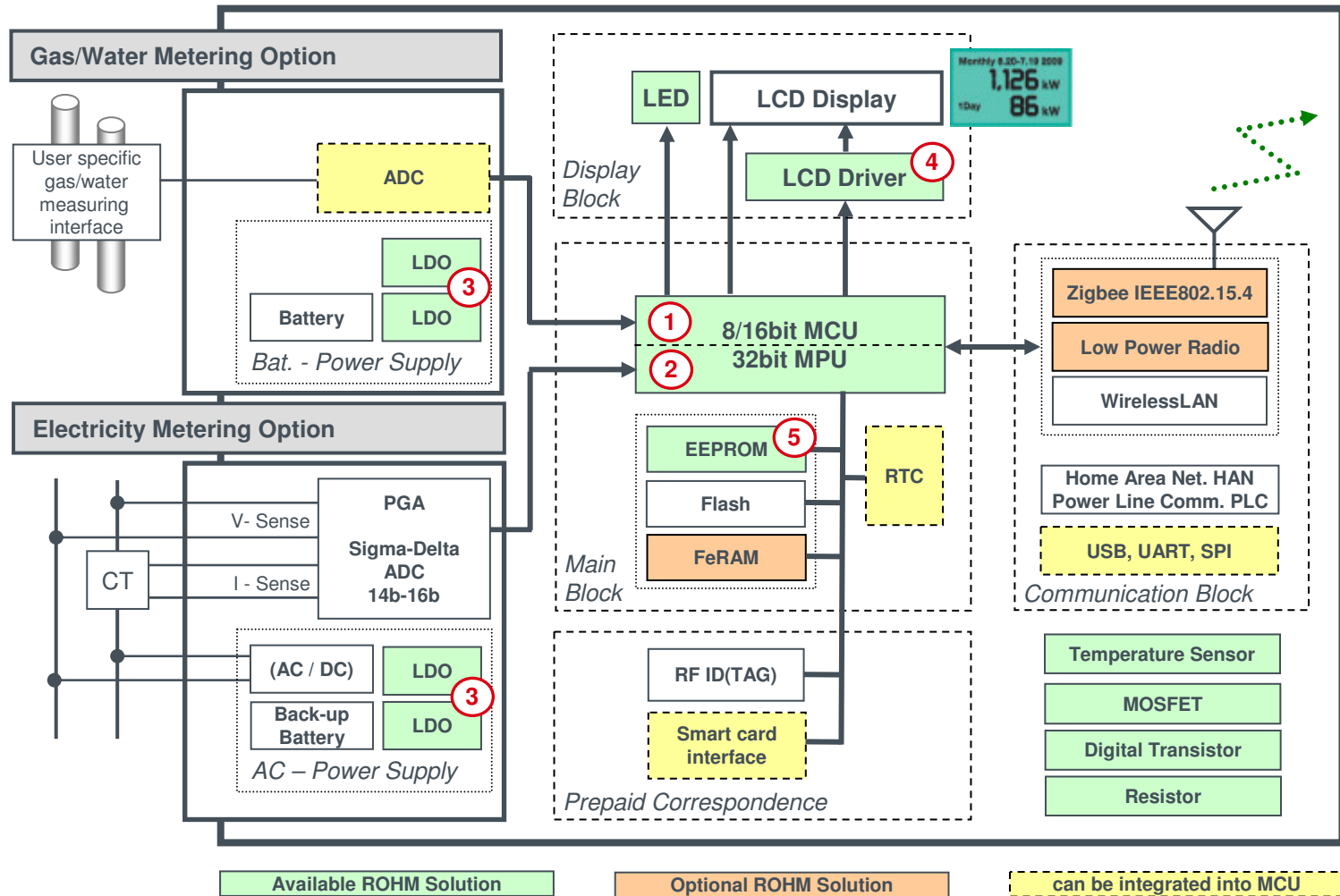
ROHM Products for Smart Metering Applications

- Product Overview -

2010 August 24

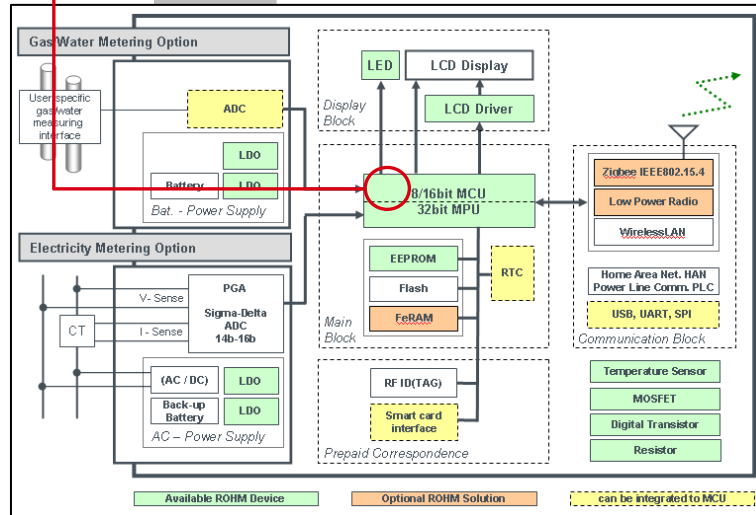
Raimund Wagner – European Product Marketing

Smart Metering Applications



1

8bit MCU



Functions

Main system control:

- Receiving and analyzing data from measurement system.
- Storing data to internal or external memory.
- Controlling communication with external systems.
- Controlling Display module and menu / data
- Controlling payment correspondence (optional)
- Controlling Security / Anti-tamper functions (optional)

ROHM Proposal

ROHM propose customized MCU

	Customized MCU (example)
CPU Clock	4MHz (RISC)
ROM	Flash: 64KByte
SRAM	8KByte
Peripherals	ADCs, PWM, UART, SPI, WDT, Comparator etc.
Power consumption	Active: 200uA @1Mhz P-Down mode: <0.1uA
Voltage	0.9V – 5.5V
Package	Die or TQFP

Additional Options:

- Integrating LCD Drivers to drive display module
- Integrating hardware accelerated sensor control logic
- Integrating RTC function
- Support wide power supply voltage range down to 0.9V

- **Less external components because of higher integration!**
- **Customized MCU perfectly adapted to requirements!**

For more details refer to:

<http://www.okisemi.com/en/semicon/miconlp/index.html>

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**Optimized
RISC Core**

**Low leakage
process**

**Ultra low
Voltage**

**Customized
Solutions**

**Rich IP
Database**

**Integrated
Dev. System**

more information

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Low Power 8 bit Microcontroller family ML610Qxxx

ROHM offers a full line-up of Low Power MCUs optimized for various applications

Ultra Low Power
&
Int. LCD Driver

Low Power
&
Speech Playback

Low Power
&
Security



Standard
Products



Proprietary 8bit CPU "nX-U8/100"

RISC architecture
One Clock Instruction and 3 stage pipeline

Optimized
RISC Core

Unique low power/voltage technology

0.9V – 5.5V
800 uA @ PLL4MHz; 0.2uA @HALT; 0.1uA @ STOP

Ultra low
Voltage

Embedded Flash Memory

Ultra Low Voltage Operation 0.9V
Highly customizable

Embedded
Flash

Rich set of peripherals

LCD Driver, Serial IO, Timers, RTC as well as
Speech & Sound Playback and Security IPs

Rich IP
Database

Low Cost & Compact Debugging

Card Size On-board Debugger "uEASE"
Integrated development system

Integrated
Dev. System

ROHM offers the development of fully customized
MCUs based on OKI Semi's low power technology.

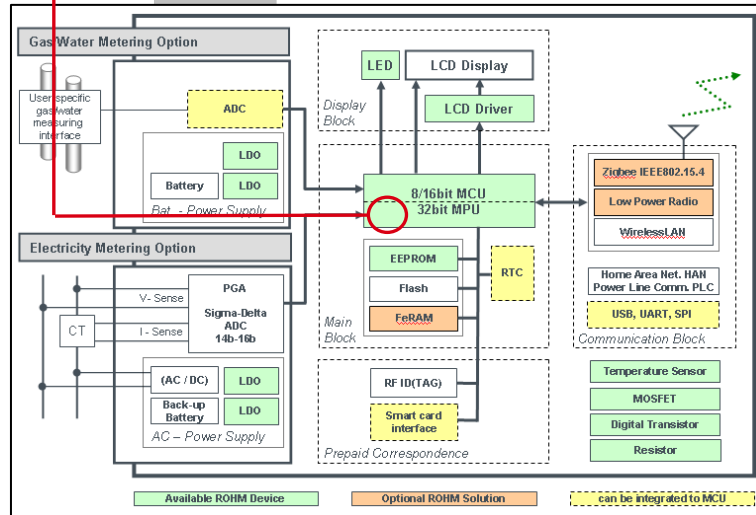
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2

32bit MCU



Functions

Main system control:

- Receiving and analyzing data from measurement system.
- Storing data to internal or external memory.
- Controlling communication with external systems.
- Controlling Display module and menu / data
- Controlling payment correspondence (optional)
- Controlling Security / Anti-tamper functions (optional)

ROHM Proposal

ROHM propose ARM based MCU

	For example ML675055
CPU Clock	ARM7TDMI 80MHz (RISC)
ROM	external
SRAM	16KByte
Peripherals	ADCs, UART, SPI, I2C, USB, WDT, RTC, ISO-7816 Card Interface
Power consumption	Active: 2.5mA @1Mhz Power-Down: 10uA
Voltage	Core 1.5V; IO: 3.3V
Package	BGA

Additional Options:

- Adding Anti-Tamper function and hardware encryption.

- **Less external components because of higher integration!**
(it is possible to integrate functions like ADC, RTC, Smart Card Interface, USB, UART, SPI etc.)
- **Possibility to add high level of security and anti tamper functions to metering applications!**

For more details refer to:

<http://www.okisemi.com/en/semicon/micon32/index.html>

<http://www.okisemi.com/en/semicon/miconlp/index.html>

ROHM
SEMICONDUCTORARM RISC
CoreRich
PeripheralsHigh
SecurityRich IP
DatabaseStandard
Dev. System

more information

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Security & Anti Tamper Technology

ROHM offers a Line-Up of ARM and U8 based MCUs optimized for various applications

General Purpose
ML67Q4k/5k

Biometric
ML67Q5250/50

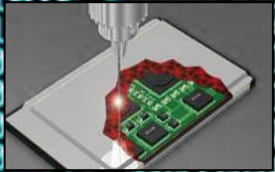
Security
ML675050/55

Low Power & Security
ML610Q413

Standard
Products



Library of Secure IPs



Physical Security



MCU Platform

Secure Design Platform platform

allows the fast and efficient integration of security functions to ARM or U8 based microcontrollers

Design
Platform

Effective anti tamper measures

Option to integrate active metal mesh, internal sensors (temperature, voltage and frequency) as well as external sensors

Anti
Tamper

Hardware encryption and protection

Internal and external memory bus is automatically encrypted using a unique, random generated key for each device

Secure
Storage

Hardware accelerators and RNG

Hardware encryption available for RSA, DES, 3DES, AES and SHA-1 as well as optimized crypto libraries.

Hardware
Encryption

Certified Technology

Evaluated according PCI 2.0 requirements
Full evaluation report is available for ML675055

Certified

ROHM offers to implement security functions to customized MCUs based on ARM or OKI Semi's U8 architecture

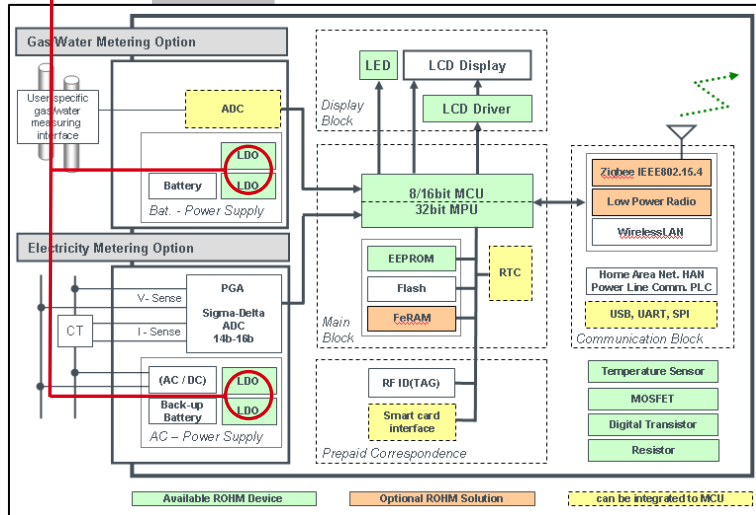
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3

Power Management



Functions

AC power supply:
(for electricity meters)
- Main Power from AC-line
- Battery used for backup

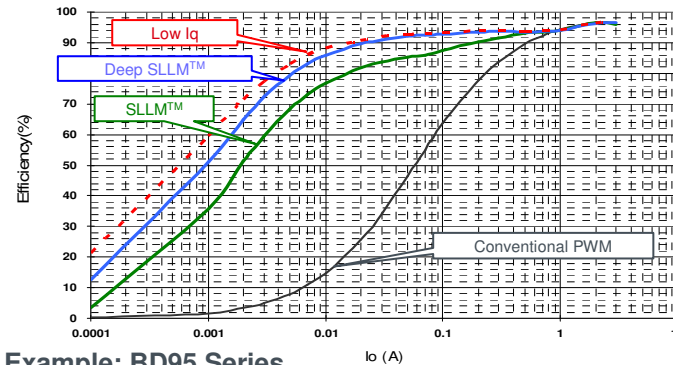
Battery power supply:
(for water/gas meters)
- Main Power from Battery

Regulators/LDO needed to generate voltage for display, communication, microcontrollers and other components.

ROHM Proposal

ROHM provides a wide line-up of Power ICs incl. LDOs, Switching Regulators etc.

ROHMs ECO IP cores for high efficiency and low power.



Example: BD95 Series

High-efficiency Step-up Switching Regulators with Built-in Power MOSFET
H3 Reg™ technology : High efficiency + High speed + High performance.
ROHM's original SLLM control enables high-efficiency operation.
H3 Reg™ technology ensures stable output even during sudden load changes.

Example: BD33/34/35DV1G for 2cell batteries

New Low Iq – Low Voltage Regulator Series Under development

- Supply voltage 1.8 – 3.5V
- Fixed output 3.3V/3.4V/3.5V
- Synchronous rectifier
- 75mA at 1.8Vin/3.3Vout (Iq ~20uA)

➤ **Industry leading efficiency and low power consumption.**

For more details refer to:

<http://www.rohm.com/products/lsi/power/>

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High Efficiency

Build-in MOSFET

Low Iq

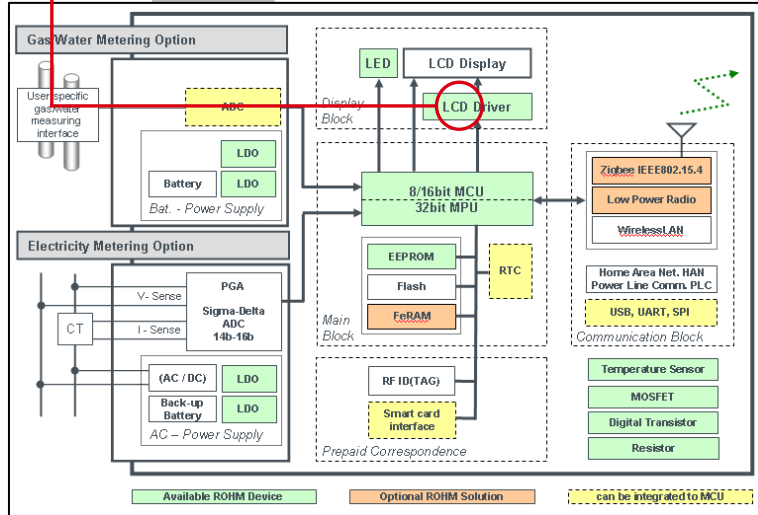
High Speed Response

Rich protection

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4

Display Drivers



Functions

Using of LCD display to provide user interface:

These displays require driver components if they are not already integrated in the display module or in the Microcontroller.

ROHM Proposal

ROHM provides a full line-up of LCD, TFT, OLED and VFD drivers.

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Ultra low power

No external components

Small packages

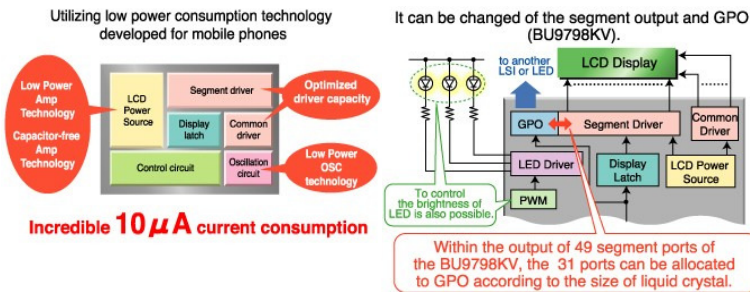
Int. Function like PWM

High Reliability

Example: BU979x Series

Low Power LCD Segment Driver Series

- 80-204 segments
- Supply: 2.5 to 5.5V or 1.8V to 3.6V
- 2 or 3 line serial interface
- Ultra Low Power consumption
- Integrated functions like PWM, LED drive, GPO



➤ Line-up perfectly suited for battery driven devices

For more details refer to:

<http://www.rohm.com/products/lcd/led/segment/selection/>

<http://www.okisemi.com/en/semicon/display/index.html>

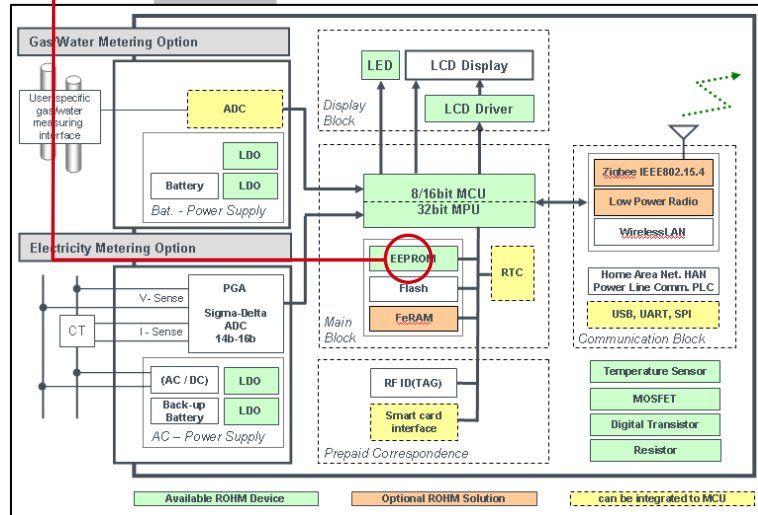
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5

EEPROM



Functions

Additional EEPROM is used to store information like:

- Calibration data
- Log and History information

ROHM Proposal

ROHM provides a full line-up of high reliable EEPROM devices.

ROHM High Reliability Serial EEPROMs



ROHM's high reliability serial EEPROMs are available in a range of capacities, bus interfaces (Microwire, I2C, SPI), operating voltages (1.8V to 5.5V, 2.5V to 5.5V) and package types, making them ideal for battery powered devices.

Other features:

- Double cell architecture
- Double reset
- Up to 8kV ESD resistance
- Gold bonding
- Integrated production

➤ ROHM's EEPROMs featuring industry leading reliability.

For more details refer to:

<http://www.okisemi.com/en/semicon/security/index.html>

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Highest
Reliability

Complete
Line-Up

High ESD
resistance

Ultra small
package opt.

Complete
Line-Up

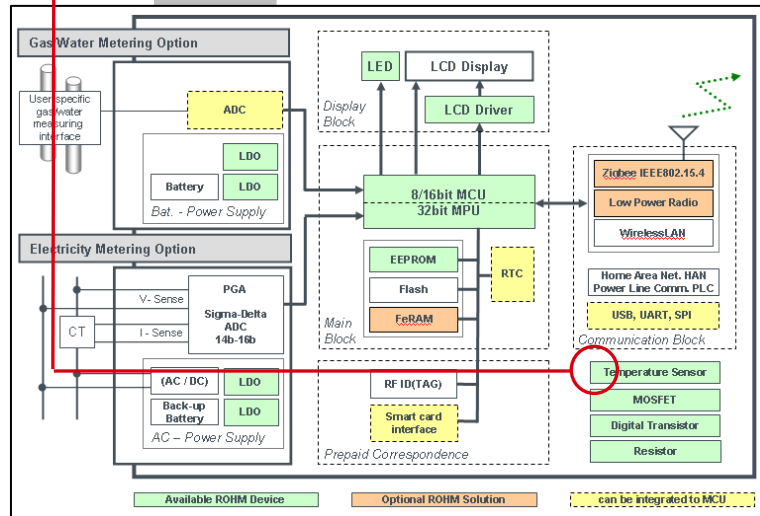
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6

Temperature Sensor



Functions

Temperature Sensors are used to store information like:

- Stabilize and calibrate measurement unit
- Power management and safety

ROHM Proposal

ROHM propose ultra-compact temperature Sensor IC.

ROHM's temperature sensor ICs integrate a temperature detection element, constant current circuit, and high-accuracy reference voltage source in a single chip.

This combination eliminates the need for troublesome circuit design. ROHM's temperature sensor ICs are suitable for Electrical equipment requiring temperature protection.

BD1020HFV

High accurate Analog Output Temperature Sensor IC

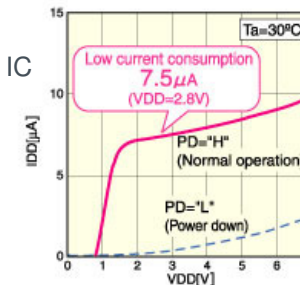
BDExxx0G series

Thermostat Temperature Sensor IC

BDJxxxHFV series

Low Current Consumption

Thermostat Temperature Sensor IC



Low current (I_{DD}) vs. Power supply voltage characteristic

➤ Easy design in of temperature management to any kind of application.

For more details refer to:

http://www.rohm.com/products/lsi/sensor/temperature_sensor/selection

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High
Reliability

Easy to use

Small
package

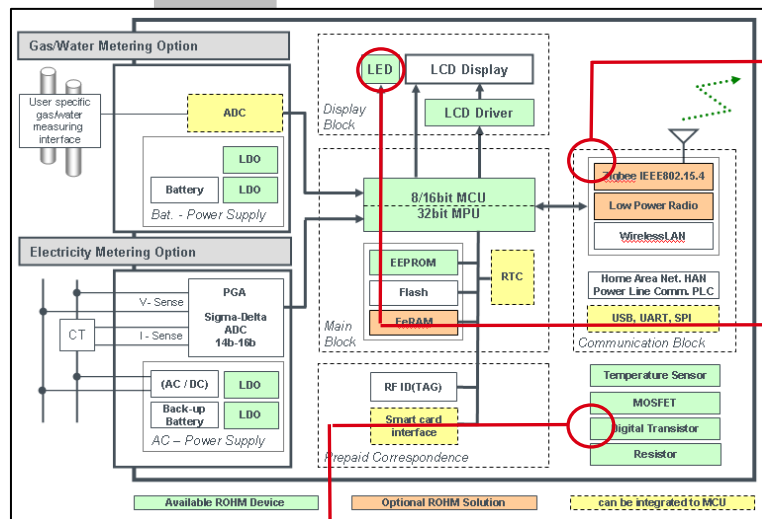
Low power
consumption

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Other Proposals



7 ROHM develops wireless communication modules

2.4GHz wireless module complies with IEEE 802.15.4

- MK72220-01: Comfortable all-in-one module
- MK72660-01: Simple module aiming low cost

For more details refer to:

<http://www.okisemi.com/en/semicon/telecom/mk72220.htm>



8 ROHM provides a rich line-up of LED for all applications

ROHM's portfolio of LEDs includes a large selection of chip LEDs, LED lamps and infrared emitting diodes. They combine ultra small packaging option with high efficiency and low power consumption.

For more details refer to:

http://www.rohm.com/products/opto_device/led/



9 ROHM provides a rich line-up of discrete components

Small Signal MOSFETs

Rohm offers a wide selection of MOSFETs ranging from ultra-low on-resistance device utilizing micro-processing technology, high-efficient/breakdown device for switching purpose and up to power device for various applications.

For more details refer to:

<http://www.rohm.com/products/discrete/transistor/mosfet/>

Digital Transistors

Rohm's production offers top class digital transistors with ultra-small packages for space-saving and also various combination of resistor layout/resistance value.

For more details refer to:

<http://www.rohm.com/products/discrete/transistor/digital/>

Compact Thick Film Chip Resistors

ROHM's chip resistors for various applications ranging from consumer electronics to industrial and automotive uses. Products are available in a wide lineup from ultra-compact package to larger packages.

For more details refer to:

http://www.rohm.com/products/passive/resistor/thick_film/





Excellence in Electronics
ROHM is a semiconductor and
electronic component manufacturer

Please visit us at: <http://www.rohm.com>

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