



Introduction of HD-PLC inside product



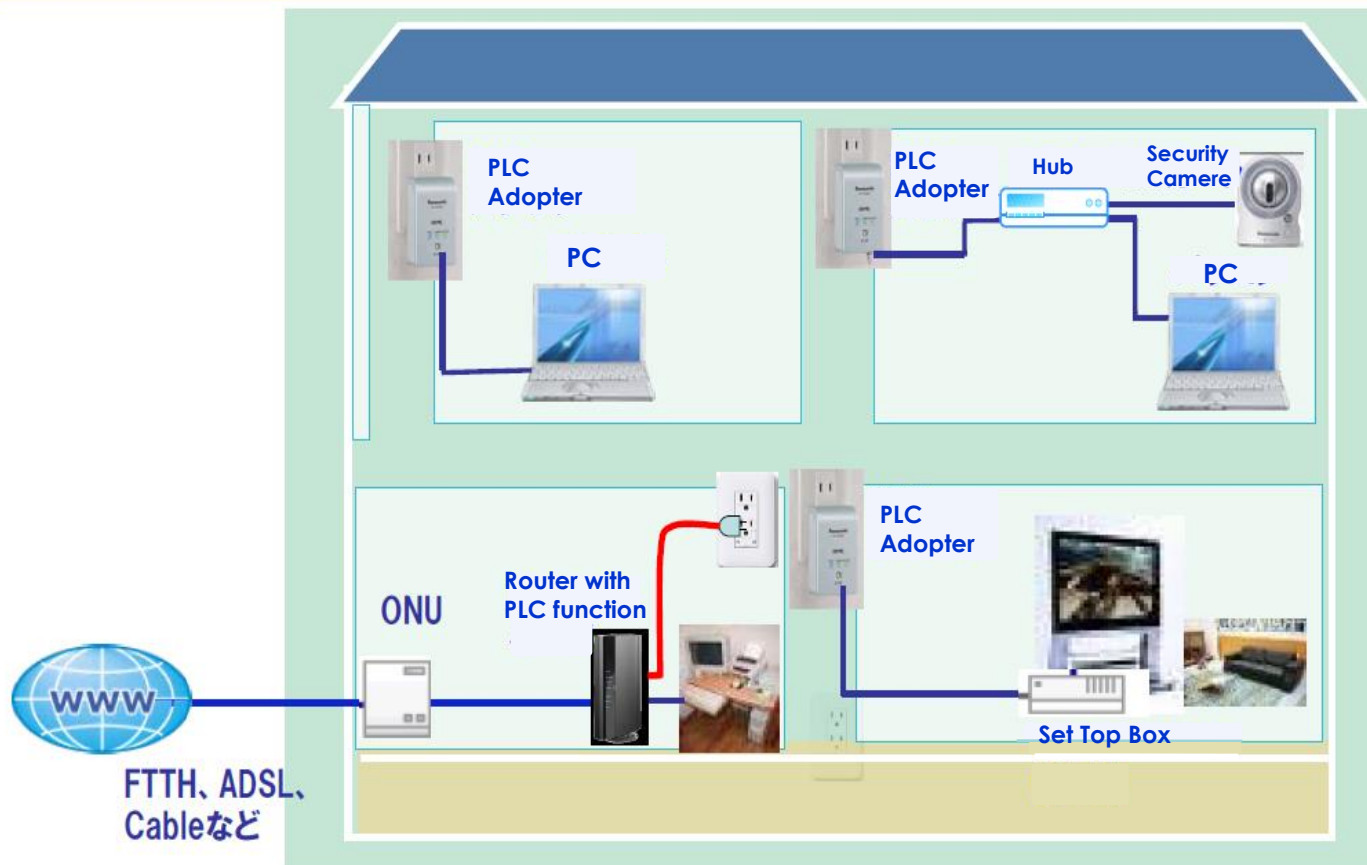
ROHM Co.,Ltd.
LSI Corporate Strategy HQs
Marketing & Product Planning Unit
Industry Segment

What's HD-PLC?

1

「HD-PLC」 is one of high-speed data communication method using power line.
It stand for **H**igh **D**efinition - **P**ower **L**ine **C**ommunication

Power outlet will be at the entrance of the network.



HD-PLC Alliance Member Roster

2

Panasonic

ACN

I-O DATA



AsahiKASEI
ASAHI KASEI MICRODEVICES

BUFFALO

Egretcom

HOSIDEN



Logic Research

MegaChips

MICREL
Innovation Through Technology®

MITSUMI

muRata

OKI

Progilon

株式会社クールテクノロジー
Cool Technologies Ltd.



Shinko Shoji Co., Ltd.

Ubiquitous

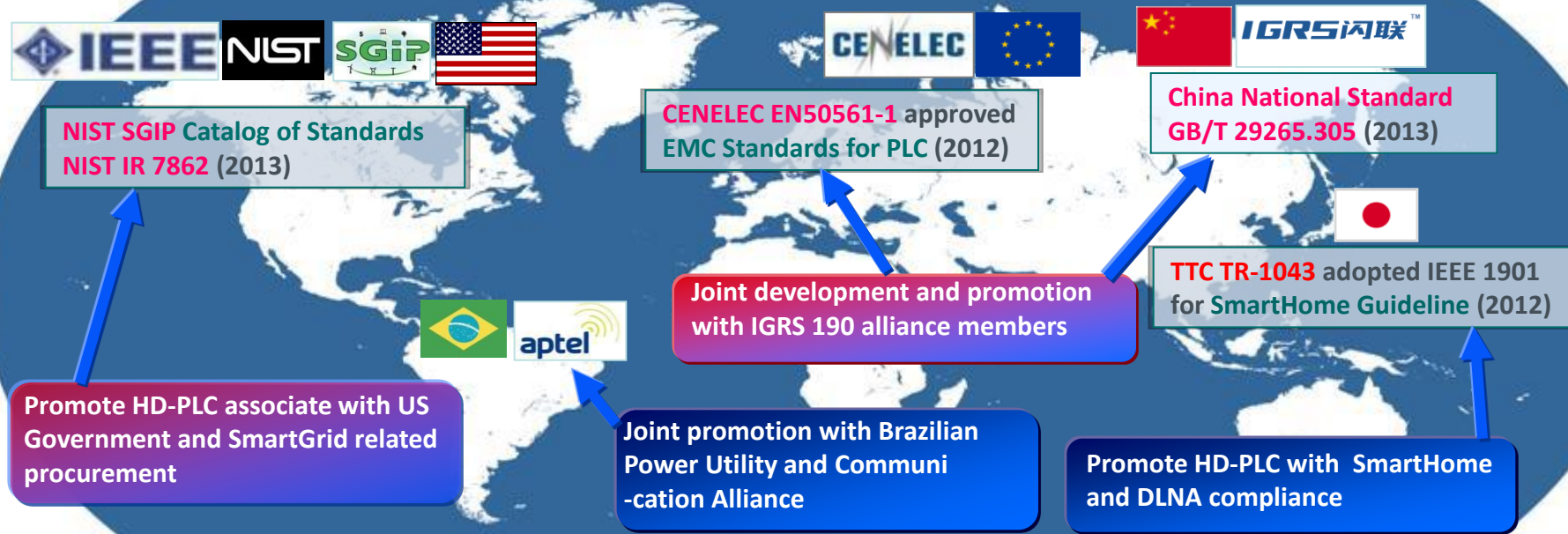


We joined HD-PLC Alliance in Oct. 2012.

HD-PLC Covered Major Global and Region Standards

3

HD-PLC is Now Ready for Global Penetration!



Grouping by Layers and Categories

Baseband PHY/MAC	APIs	Regulation
IEEE 1901 PLC Global Standard ITU-T G.9972 Coexistence Global Standard	IGRS Approved HD-PLC DLNA Approved HD-PLC IEEE 1905.1 Convergence of Ether, HD-PLC, Wifi, MoCA TTC TR-1043 Smart Home	EN50561-1 EMC for Broadband PLC NIST IR 7862 for Coexistence

HD-PLC Family

3

HD-PLC Complete It corresponds to the high speed of 240Mbps for mass data transfer.
HD-PLC Inside it is miniaturized with low-power-consumption for incorporate in apparatus.

HD-PLC standard corresponds to application with household
Appliance inclusion to various AV/PC apparatus.

The license-out to start in January 2013.
ROHM entered into a license agreement Same month.

Complete



For equipment for handling large volume data
Max 240Mbps



High Speed

Inside



For equipment for handling small volume data
It's ideal for Integration into equipment.
Max 106Mbps



Low Power
consumption

Space Saving

Comparison table (Complete vs inside)

5

	HD-PLC Complete	HD-PLC inside
Maximum PHY Rate	240Mbps	106Mbps (T.B.D)
Frequency Band	2-28MHz	2-28MHz
Modulation method	2-32PAM	2-4PAM (T.B.D)
Error collection	RS-CC LDPC-CC.	RS-CC
Master / Slave	Master/Slave	Only Slave function
PLC to I/F	Ethernet / UART / GPIO	UART (max 1Mbps)
The number of device connection	128	128
Connecting cable length	200m	200m
Mounting Area	Low	Very Small
Current Consumption	Low	Very Low
Target Products	Router, AV product , Security camera etc. For equipment for handling large volume data	White goods, Lighting equipment , Water Heater etc. For equipment for handling small volume data

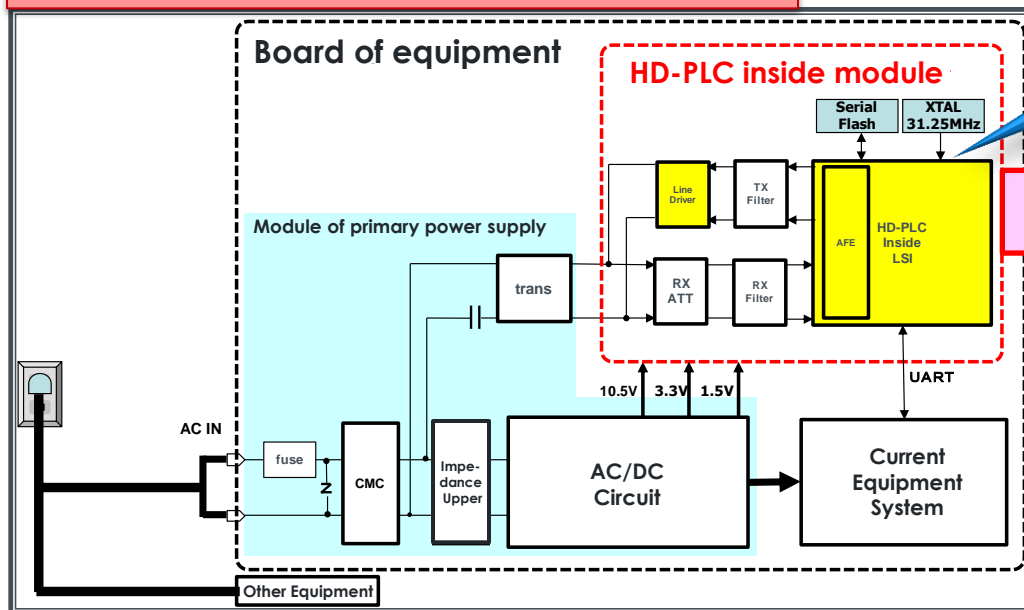
The built-in external Parts & Miniaturization of the IC

built-in Intermittent operation function

Inside can lower power consumption and miniaturization compared to Complete

Minimization of the mounting area

Example of Built-in to the product



- Miniaturization of IC
- Including external parts

Module size :
Expect to be able to
achieve 25mm square.

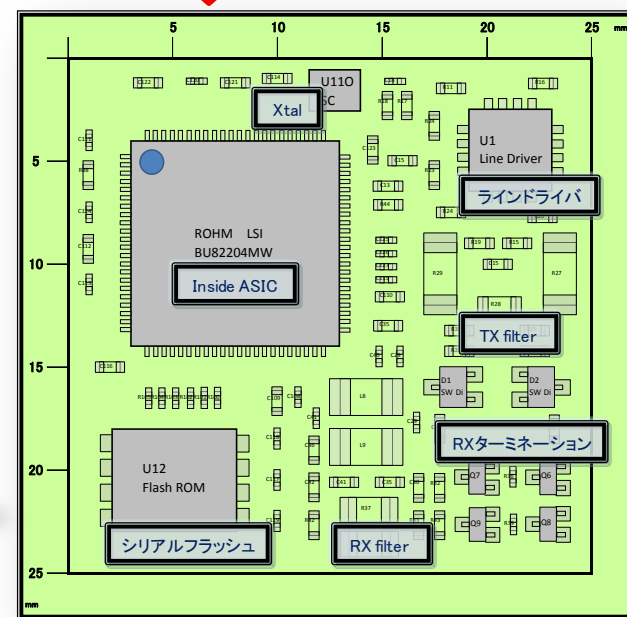
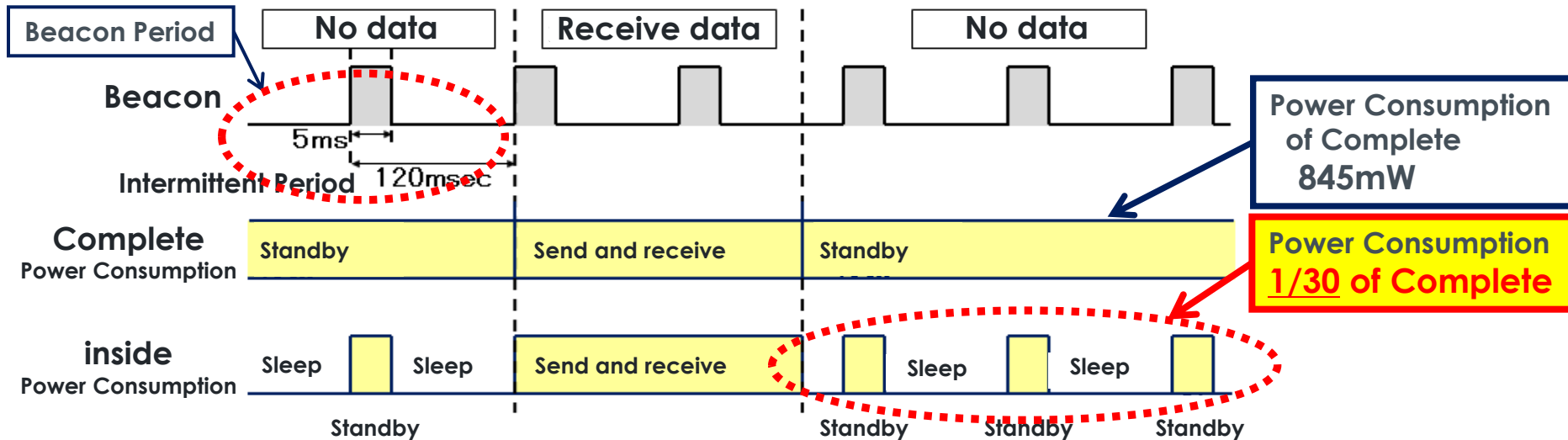
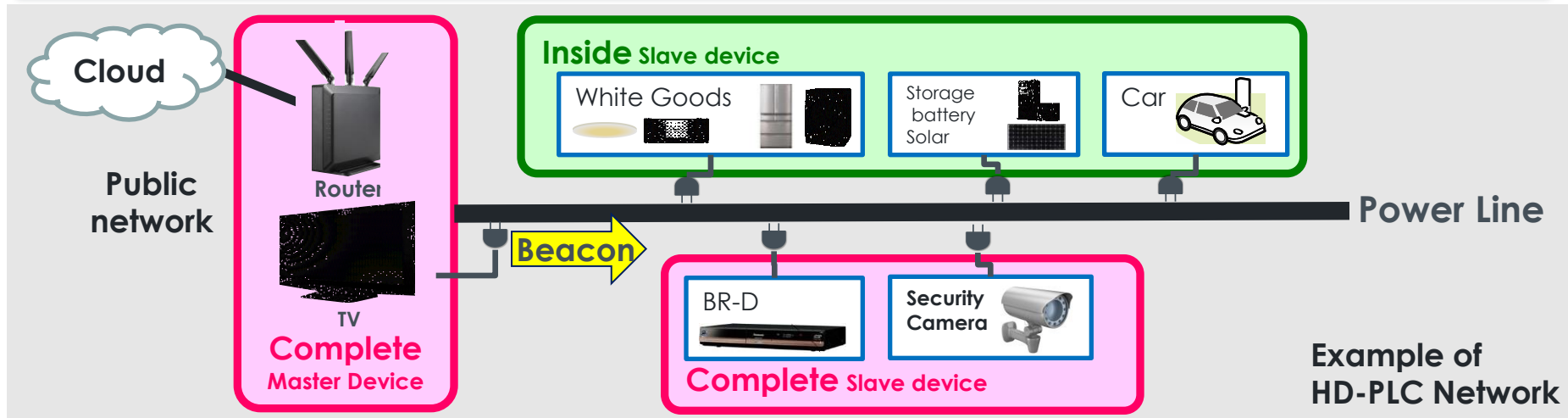


Image of inside module

HD-PLC3 inside

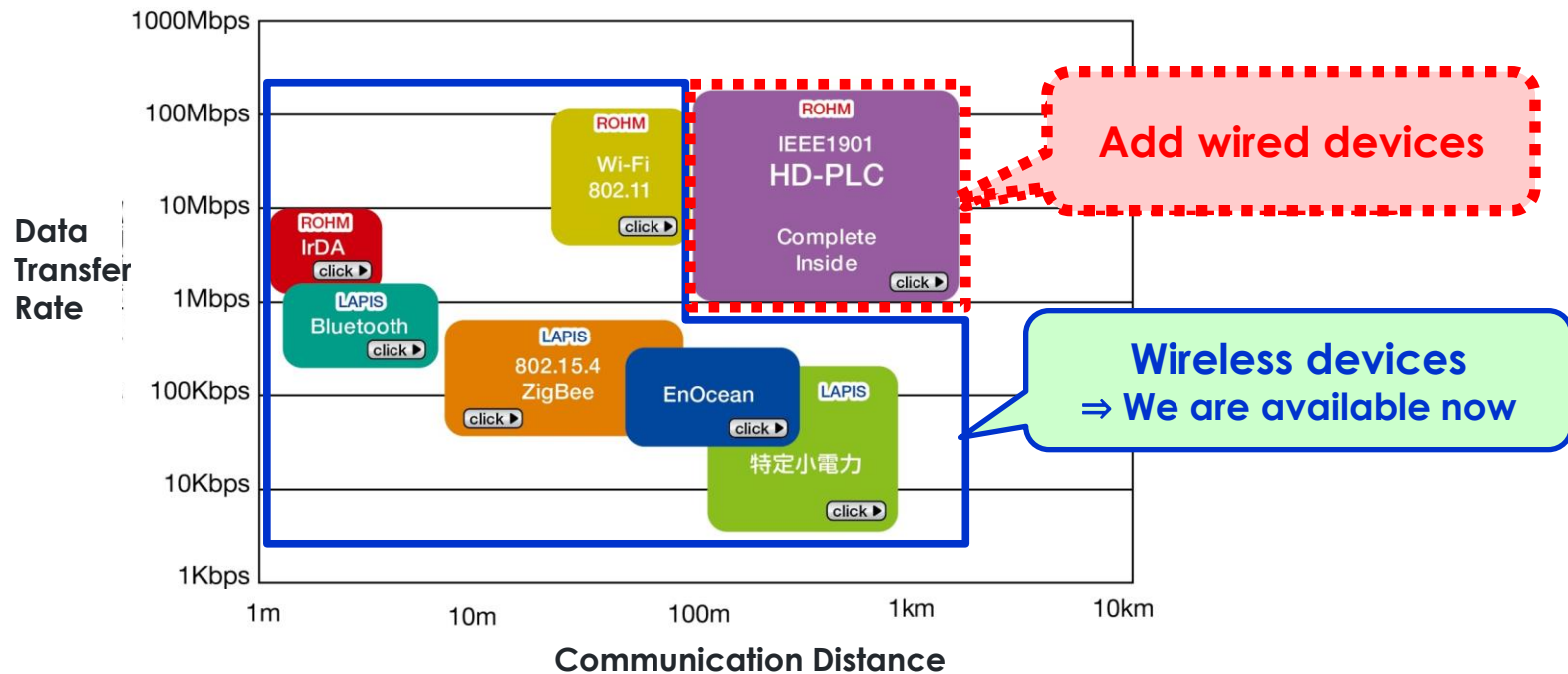
Low power consumption due to intermittent operation



Reduce the power consumption of listening by intermittent operation

Movement to create such as to enable the remote control and energy management by connecting to the network devices such as consumer electronics and lifestyles more convenient is activated. Demand for communication devices is expanding.

Line up of ROHM's Communication Solutions

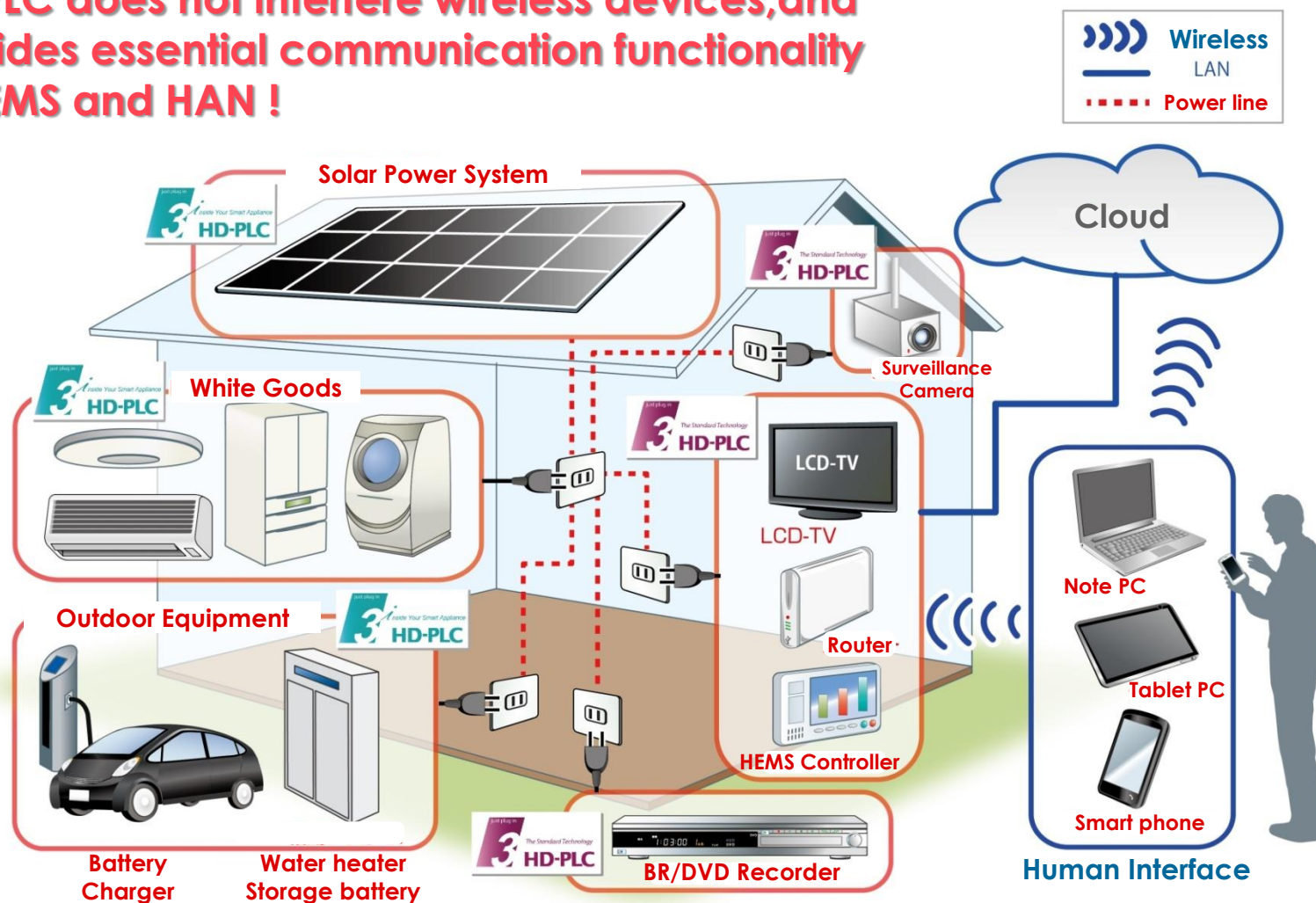


By utilizing the HD-PLC in addition to the wireless communication device
Communication network in any environment can be achieved!

HD-PLC Family use case for HAN

9

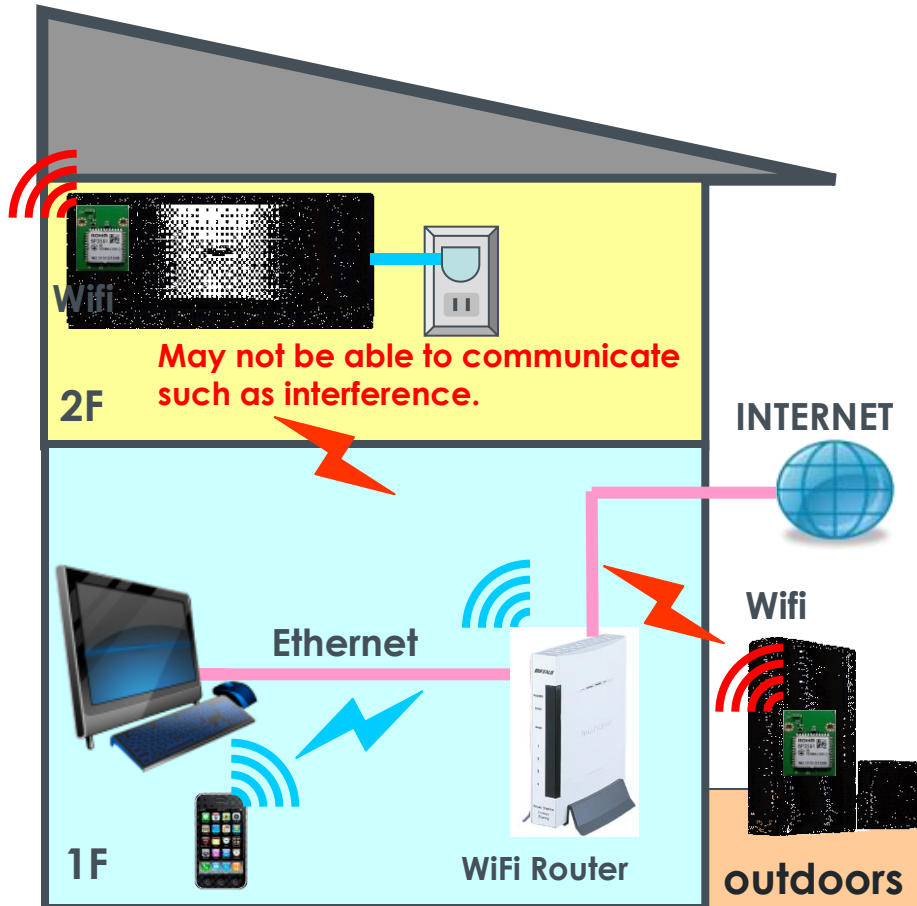
HD-PLC does not interfere wireless devices, and provides essential communication functionality in HEMS and HAN !



Use case of home area network

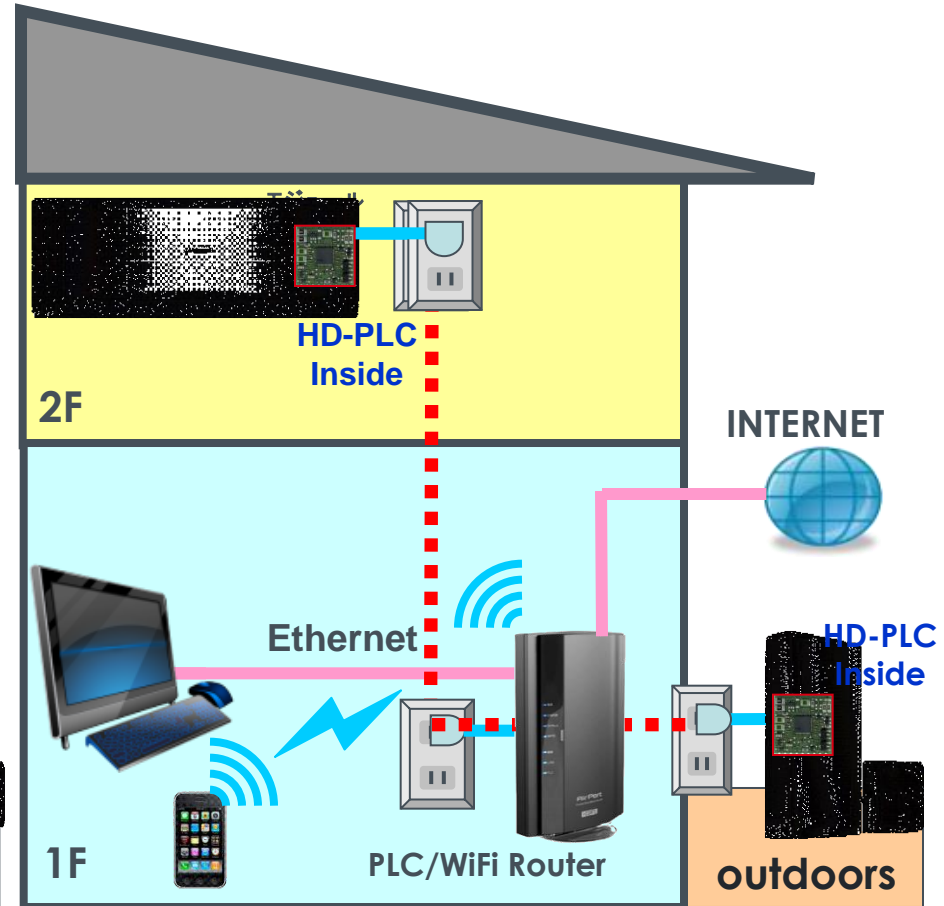
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● In case of WiFi



- Radio wave interference & shielding
- Risk of hacking (WEP)

● In case of HD-PLC



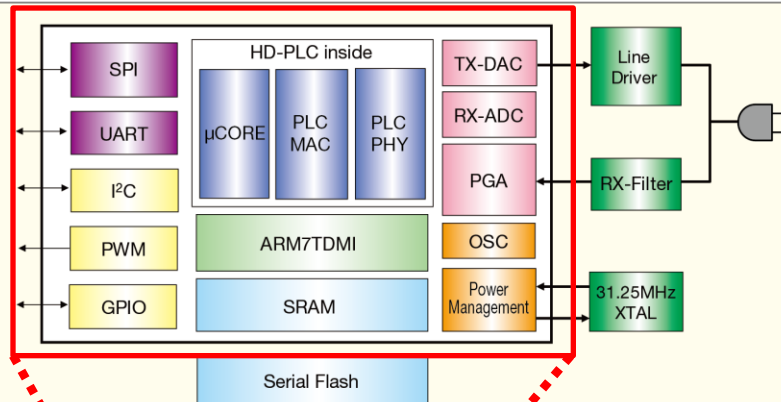
- Stable communication
- Higher security (AES128bit)

HD-PLC inside baseband LSI and module

Specifications

BU82204MWV

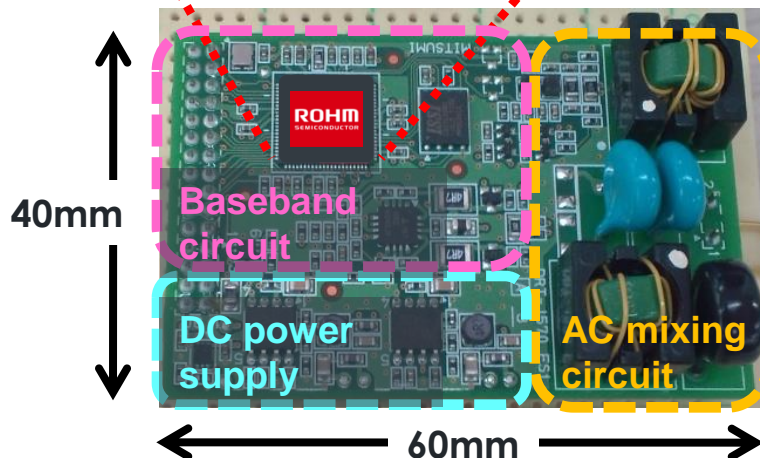
- Sample : March. 2014
- Mass Production : June. 2014



With application CPU embedded, this IC can develop not only PLC network function but also TCP/IP protocol stack function and the application.
It communicates with Host CPU via UART.

< Features >

- HD-PLC inside core
Media Access Controller
PHY Controller
- CPU
ARM7TDMI
- Host interfaces
UART (Max 962Kbps)
SPI Slave (Max 6Mbps)
- Various interfaces
I²C PWM GPIO
- Analog Front End
TX-DAC RX-ADC PGA
- Operating conditions
IO, Analog power supply voltage : 3.0V to 3.6V
Digital core power supply voltage : 1.45V to 1.55V
Operating temperature range : -40°C to +85°C
- Package
UQFN88MV0100
10.0 × 10.0 × 1.0mm
0.4mm pin pitch



Low power
1/30 of Complete

Small size
Half of Complete

Mitumi electric -made HD-PLC inside module
HD-PLC communication is available with built-in this module.

User's development load is greatly reduced.

simple connection with host CPU

ex) White goods

(air conditioner/refrigerator etc.)



Host
CPU

Communication
software

Serial I/F

HD-PLC inside BB IC+Module

HostCPU I/F

Web API

SSL

HTTP

ECHONET Lite

TCP/UDP/IP

OS Kernel/PLC Driver

Rohm provides com. Software
to make user's load reduced

By taking a built-in TCP/IP protocol stack,
possible to be connected to the network via the
PLC without modifying significantly the system of
the host CPU.

In addition, as WEB sever, possible to building
applications, such as the device status check
and remote control.

cloud

router

Power line

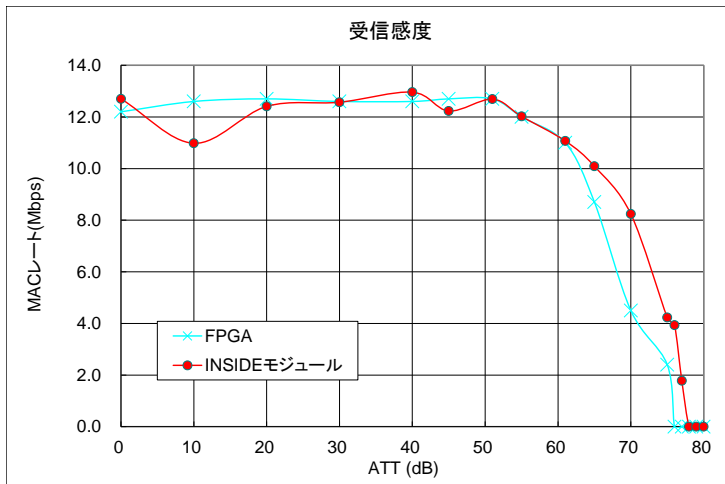
PC

Tablet PC
Smart phone

Control/monitor power consumption etc. via network

inside baseband IC evaluation status

evaluated inside module



PLC receive characteristic
under attenuated condition

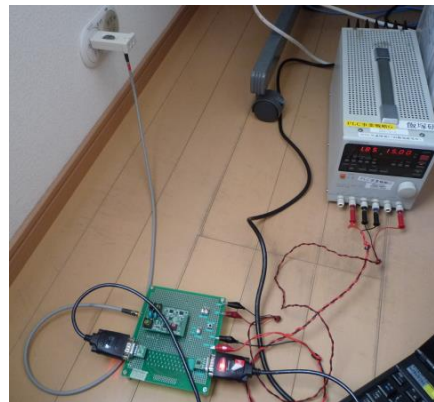
Realize performance is equal with
reference board

at PLC verification house
(Panasonic) as real condition,
PLC communication ability was
tested (31/Jan/2014)

Even under the worst electrical
outlet condition, the inside
module is able to communicate.
Connectivity is same level as the
complete module.



HD-PLC Master
(mitsumi electric -made)



HD-PLC inside module
(mitsumi electric -made)

○Europe

- Certain company is evaluating HD-PLC tech. for control streetlight. The purpose is improvement about communication speed against current method.
- Certain company is planning HD-PLC tech. for security camera of Paris subway. Their target is change from analog camera to IP camera. But they try to use current equipment(coaxial cable). So, HD-PLC is suitable for this application.
- use for smart grid

○Japan

- communication among industrial devices.
- communication to control elevators

First of all, we'd like demand survey



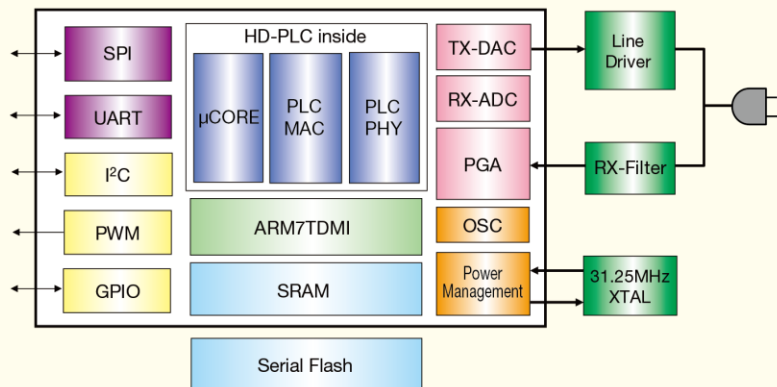
Thank you

Future Relationship



BU82204MWV

Specifications



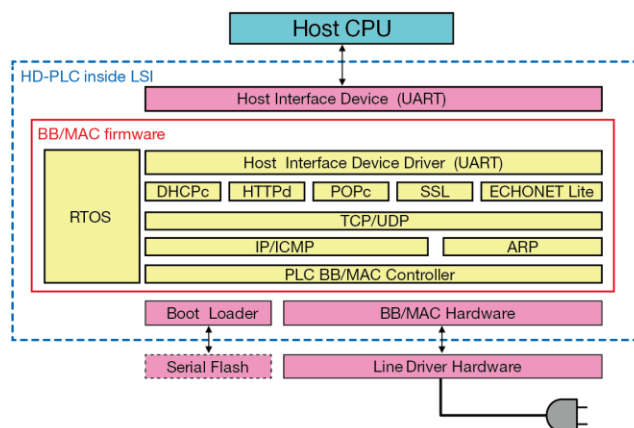
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Firmware configuration diagram



Connection Example

PLC通信に必要な処理をベースバンドLSIで実現しているので、8bit CPUでも簡単に通信することができます。
Baseband LSI helps processing the PLC communication enabling 8bit CPU to communicate.

