Power Line Communication (PLC) Modem IC Accelerates Cost-Effective Development of Data Transmission Over a Variety of Existing Wired Infrastructure

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Abstract

Power Line Communication (PLC) technology, which has paralleled the development of (electric powered) smart meters, is expected to expand as the development of our social infrastructure accelerates. IT network technology has enabled regional comprehensive energy management for homes, buildings, plants, and transit systems, transforming and revolutionizing smart communities that will optimize the balance of supply and demand. Meanwhile, information and communication networks have become increasingly crucial, spotlighting the convenience of—and need for—the PLC technology enabling power networks. The R9A06G061, enabling accelerated long-distance communication, is the PLC modem LSI that can answer all of these needs.

PLC Modem IC Solutions for PLC Technology Hurdles

Communication methods are diversifying as smart societies accelerate, bringing consideration to the scope of PLC, but this requires the technology to handle increased data volume and secure real-time performance, as well as enabling long-distance communication. R9A06G061 is a narrow band PLC modem LSI consisting of an Analog Front-End circuit (AFE), DSP, and the MCU's dual core. The high-performance DSP performs OFDM modulation/demodulation signal processing (physical layer) and conducts protocol conversion processing with the upper interface of the MCU. The compact and powerful PLC modem enables accelerated communication speed for P2P networks and stable long-distance telecommunications, while achieving improved drive capacity during direct drive, particularly suited for expanded applications in DC power supply systems.

PLC Technology Hurdles	PLC Modem IC Solutions
High noise immunity and robust communication performance	Utilizes OFDM modulation method
Faster, longer distance communication	Maximum transmission speed: 1Mbps Long-distance communication: over 1km
Easy PLC communication	P2P (Peer-to-Peer) network method
Compact size	QFN-40pin, 6mm

Table 1: R9A06G061 Resolves PLC Technology Issues

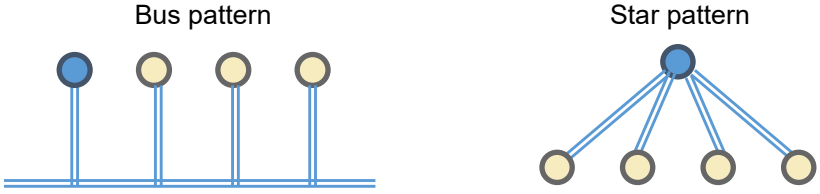

Figure 1: P2P Network Topology

Benefits of Incorporating R9A06G061 PLC Solutions

Achieving reductions in both initial and running costs of IT system operations is a major challenge for infrastructure operators. Intelligent buildings require establishment of networks necessitating massive wiring for power, controls, information, and transmission, which in turn calls for more efficient labor for initial construction and maintenance work. Despite advances in the landscape, disaster readiness, environmental, and other aspects of urban infrastructure work above and below ground, work efficiency is decreasing, and operational errors are on the rise. This underscores the heightened need for physical networks along with an optimal means for operational management. This brings us to PLC technology and the variety of lifestyle environments in which we find power lines. As PLC technology facilitates a co-transmission of power and data, it eliminates the need to install new dedicated lines. It also represents an effective means of communication in areas not served by wireless technology. The R9A06G061 PLC solution lowers the implementation hurdle even further.

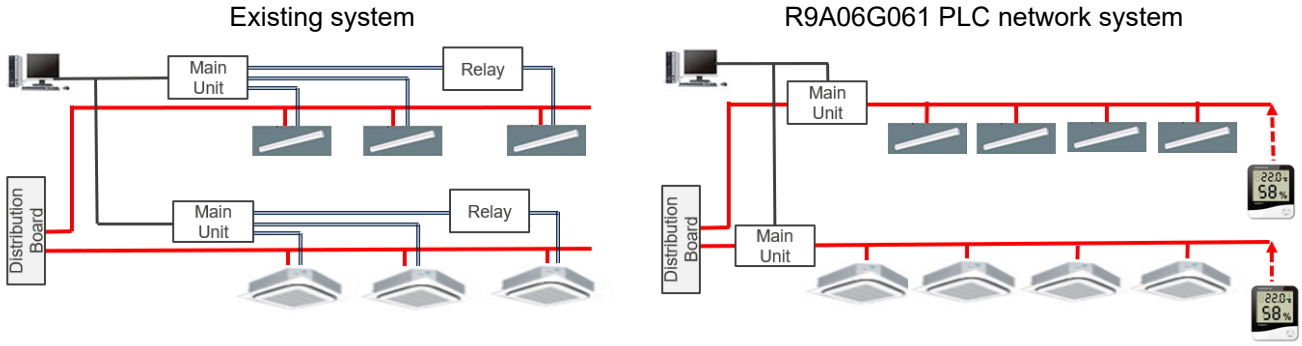

Figure 2: Application Example of R906G061 PLC Solutions

Construction Work Issues	R9A06G061 Solution Approach
• Construction work optimization • Reductions in initial costs • Reductions in maintenance costs • Ensuring work safety • Reducing operational errors	• Reduction in system cost through fewer dedicated lines • Simplified construction through compact modularizing • Simplified device supplementation • Integrated complementary network with wireless communication • Support tools for module development

Table 2: Effects of Incorporating R9A06G061 PLC Solutions

Support Tools for Communication Module Development

The emergence of smart homes, buildings, and factories, and the advancement of smart communities are yielding rapidly increasing calls for cost reductions; meanwhile, measures are needed to reduce development time, without sacrificing high standards. It takes time to compare new and existing technologies and to conduct verification and evaluation. A myriad of tools are needed to resolve these issues and overcome obstacles to incorporate new technologies.

- **R9A06G061 Evaluation Kit**
  The R9A06G061 Evaluation Kit assesses R9A06G061 performance and enables effortless software development and system evaluation. The kit serves both AC and DC power line communication, easing the burden on the developer while providing improved efficiency.

AC-PLC Evaluation Kit

DC-PLC Evaluation Kit

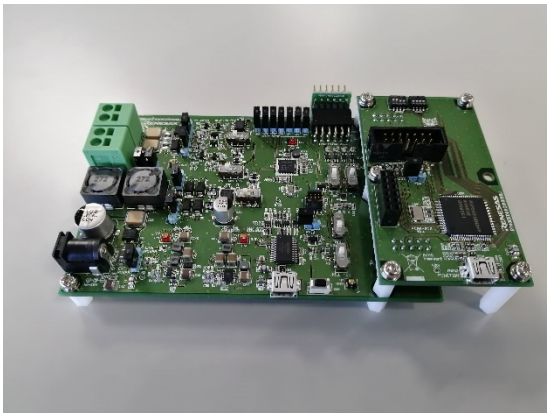

Figure 3: R9A06G061 Evaluation Kit

- **SimpleMAC GUI**

  This GUI runs on the R9A06G061 evaluation board, enabling performance evaluation of the PLC system by targeting P2P communication benchmarks and allowing the setting of transmission/reception parameters that control the MAC/PHY layer. Its main functions include sending and receiving data and confirming receive frame information, ensuring the user receives all essential communication information. This tool also facilitates monitoring of the status and quality of power line communications for virtual sites and field testing. Using the evaluation log storage function allows the customer to efficiently perform error analysis, ultimately improving overall evaluation efficiency.

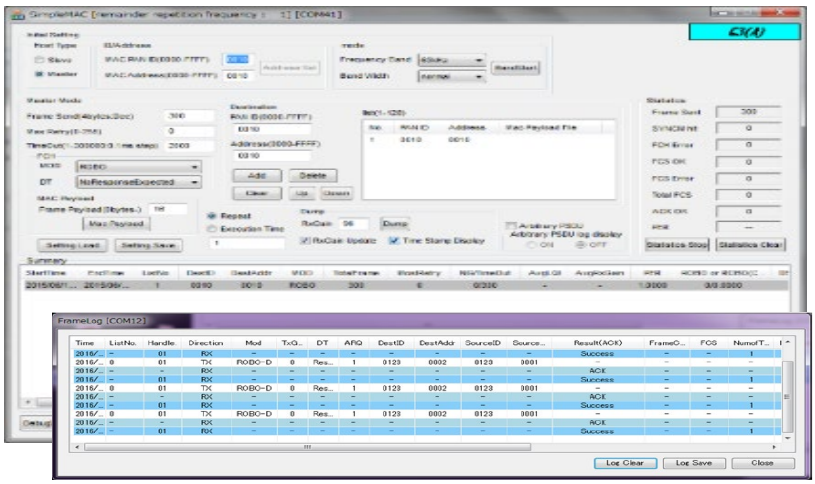

Figure 4: Image of SimpleMAC GUI

- **R9A06G061 Communication Module Design Guide**

  The compact design of communication modules must ensure easy and cost-effective integration into devices, and is increasingly expected to serve as an effective method of reducing operational risks. To help alleviate such design concerns, the R9A06G061 comes with a hardware design guide for compact PLC modularization, supporting a reduced number of prototypes, rapid system verification and speedy market launch.

Figure 5. R9A06G061 DC Communication Module (3.8cm x 2.8cm)

Documentation Available on the Renesas Website

Summary

The R906G061 is an optimal PLC communication modem enabling power monitoring and power network control for a variety of devices used in homes, buildings, plants, and transit systems. Boasting high-speed, long-distance communication and a compact design, the modem accommodates a variety of development environments to ease client verification hurdles, reduce system costs, and improve development efficiency. Above all, it means rapid market launch for end products. The R9A06G061 PLC modem LSI is the ideal product to support the power line communications that contribute to the strengthening of our communications infrastructure.

Related Information

- R9A06G061: High Speed Narrow Band Power Line Communication Modem IC
- Power Line Communication (PLC) Solution
- RTK0EE0009D01001BJ: DC Line Evaluation Board
- RTK0EE0009D02001BJ: AC Line Evaluation Board

Revision History

Rev.	Date	Description
1.0	Nov. 24, 2021	Initial release

IMPORTANT NOTICE AND DISCLAIMER

(Rev.1.0 Mar 2020)

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