

eShark HD-PLC LON Evaluation Kit



Order Code: P.HK001

Powered by

MegaChips

MLKHN1501 HD-PLC silicon



Easylon LON software stack

HD-PLC is a well-established standard to distribute Ethernet and RS485 using power line cabling or others like twisted pair, coax and more. It is based on IEEE 1901 standard, extended by ITU G.9905 for multi hopping.

ISO/IEC 14908-8 defines the LON protocol using HD-PLC and makes this type of LON communication open and vendor independent.

The LON HD-PLC evaluation kit comes with all the necessary hard- and software to make your first steps in developing LON applications for HD-PLC.

MegaChips is a provider for HD-PLC compliant silicon. Gesytec provides since a long time a full LON compliant software stack. Both technologies combined make a new hardware and software solution for LON, independent of other technology providers.

With the LON HD-PLC EVK, a pre-development of HD-PLC LON nodes becomes easy and effective.

Hardware

- 2 Evaluation Kits
- 2 break out boards
- ST Link v2 USB debugger

Tools provided

- Megachips BCPM suite
- EPOS XIF2Code generator
- EPOS API for Cortex M0
- EasyLON IP driver for ISO/IEC 14908-8
- EasyLON Analyzer license

Tools needed

- STM32 C-compiler and IDE e.g. **Atollic TrueSTUDIO**
- LON installation tool, e.g. **LonMaker for Windows**

Pinout 26 pin connector

#	Row-A	Row-B	Comment
1	DAC_OUT1	DAC_OUT2	analog out
2	ADC_IN6	ADC_IN7	analog in
3	GND-A	VCC-A	analog supply
4	PB0	PB1	digital
5	PB2	PB3	digital
6	PB4	PB5	digital
7	PB6	PB7	digital
8	PB8	PB9	digital
9	PB10	PB11	digital
10	GND	VCC	digital supply
11	SWDIO	SWCLK	ARM Debug
12	GND	Reset	ARM Debug
13	UART5_TX	UART5_RX	diagnostics

Providing a new CPU board for the standard MegaChips Dolphin EVK extends the kit for digital, analog and communication I/O. A Cortex M0 host CPU, connected to the HD-PLC CPU enables users implement their own application without interfering with the HD-PLC and LON stack, running on the HD-PLC CPU itself.

By using the EPOS® LON stack, the LON HD-PLC EVK acts as a standard LON device. It can be managed by standard LON tools as LonMaker for Windows from Echelon or any other 3rd party software.

With the EPOS® XIF2Code generator the LON device interface can be designed easy and a C framework for the host CPU is exported. Using the EPOS API for the host CPU the user just adds the code to operate the IO. For diagnostics a separate UART is available and a ST-Link debugger can be connected.

The EVK comes with a license for the EasyLON® IP driver for ISO/IEC 14908-8, to connect a Windows PC to the LON HD-PLC EVK, using its Ethernet port. Other HD-PLC devices, running a LON application can be accessed over HD-PLC too.

Using the EasyLON® IP driver enables standard LON tools to run all operations on the application that runs on the LON-HD-PCL EVK.

EasyLON and EPOS are registered trademarks of Gesytec GmbH. Echelon, LonWorks, LON, LonTalk, LonMaker and Neuron are registered trademarks of Echelon Corporation. HD-PLC or HD-PLC® is a registered trademark or trademark of Panasonic Corporation in Japan and in other countries. ST and the ST logo are trademarks of ST. Other names may be trademarks of their respective owners

IEEE1901 Compliant High-Speed Power Line Communication

Delivers bi-directional, IP based, high-speed communication over existing AC/DC power lines, as well as COAX and twisted pair wiring, where wider bandwidths, robustness, long-range, support for larger number of nodes, and highly secure network is required.

The MLKHN1501 from MegaChips combines the Physical (PHY), Media-Access-Control (MAC), 128Mb/256Mb RAM, and a fully integrated Analog-Front-End (AFE) with high precision A/D, D/A data converters and programmable gain amplifiers (PGA)



in a single compact package. The modem is based on an Orthogonal Frequency Division Multiplexing (OFDM), using advanced Forward-Error-Correction (FEC) techniques to allow the most robust data communication over channels with high implosive noise such as the harsh AC power lines.

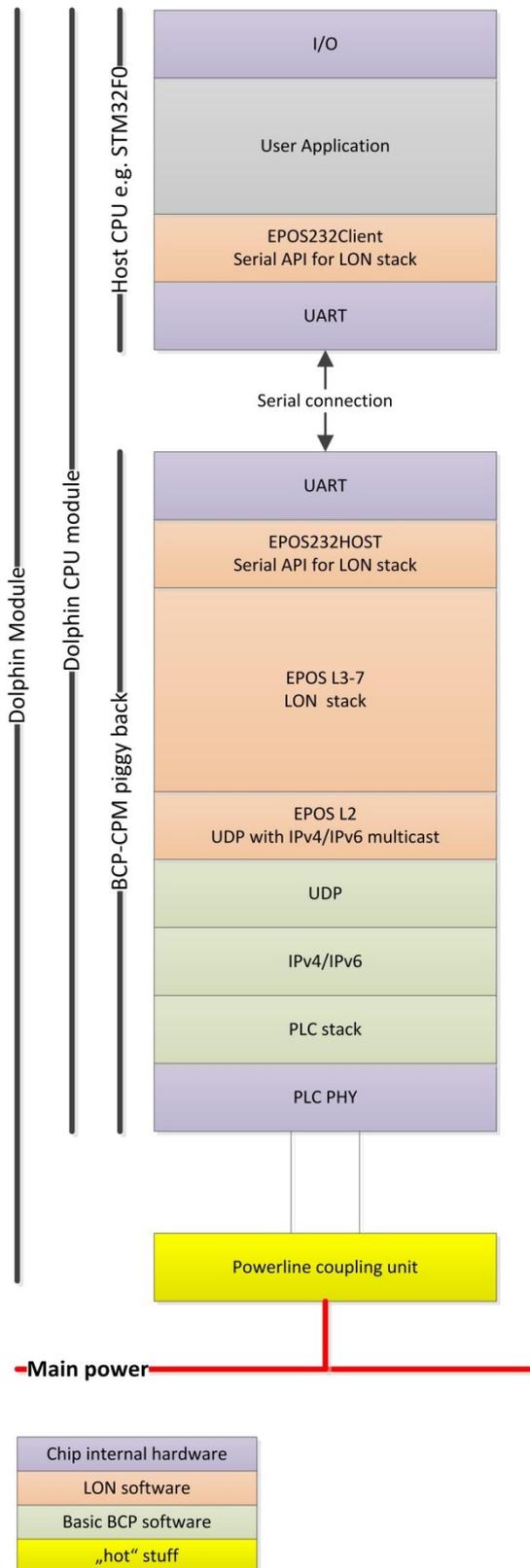
Featuring free-topology and plug and play functionality, HD-PLC makes it simple to build any network in the shortest time.

Security is provided by a 128-bit AES encryption engine meeting today's Internet-of-Things (IoT) requirements.

PHY speed	240 Mbps
Max. number of nodes	1,024
Max. number of hops	10
Throughput (without hopping)	90 Mbps
Throughput (multi-hop)	10 Mbps
Latency	20 ms
Message throughput	> 200 p/s
Encryption	AES128
Security	Black and whitelisting of devices
Physical layers supported	Power line, twisted pair, COAX, Ethernet cabling and others

HD-PLC performance

EPOS®: The LON protocol stack for MegaChips HD-PLC



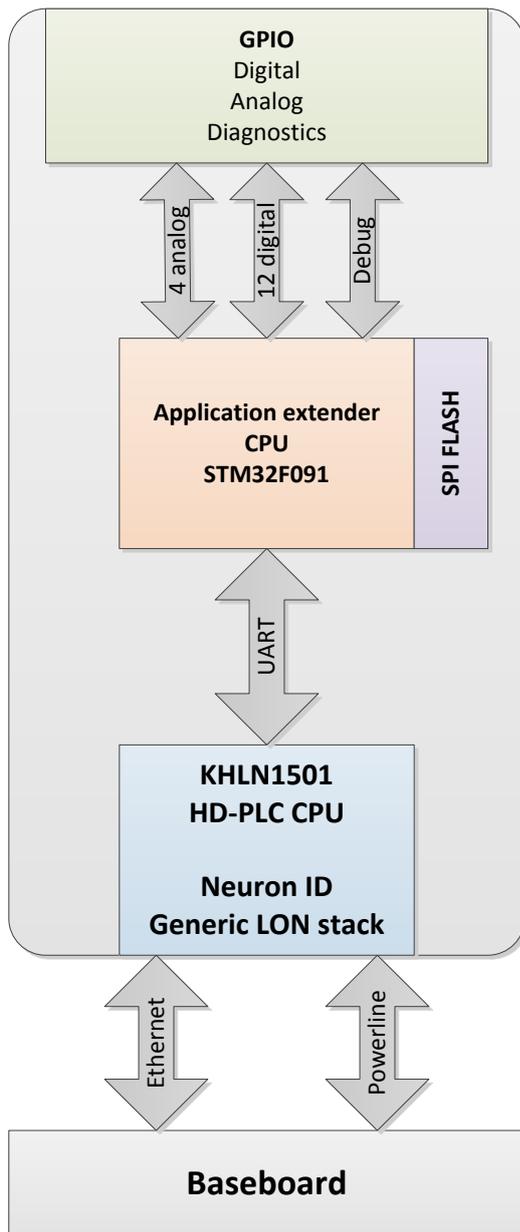
With **EPOS®** an HD-PLC CPU becomes a full featured LON device, being fully compliant with ISO/IEC 14908 international standard. **EPOS®**, the **Easylon® Protocol Stack** from Gesytec is a proven in various applications and devices since 10 years.

HD-PLC LON is using IP based communication. Using IPv4 or IPv6 multicasting, LON messages are encapsulated in UDP messages. The new ISO/IEC 14908-8 standard makes HD-PLC a standard LON physical channel like the well-known TP/FT-10 for twisted pair or the old and slow powerline PLT-10.

To simplify development and to ensure resilience of your product, the HD-PLC CPU is running a generic **EPOS®** LON stack which is remote controlled by a UART connection.

The HD-PLC CPU is accompanied by a tiny and low-cost host CPU, in this case a Cortex M0, which is running the users application and driving the I/O. This gives the users the opportunity to choose a host CPU with exactly matching I/O, memory and performance features, reflecting the need for optimum pricing.

Separating the complex LON and HD-PLC stacks from the user application environment in the host CPU and connecting both worlds using a simple UART connection protects the software running in the HD-PLC CPU from unexpected influences. On the other hand the application in the host CPU is not affected by any complex algorithms, needed for the LON or HD-PLC communication. Furthermore resource requirements for the host CPU become low, allowing running the application in a bare metal environment.



The LON Evaluation Kit was designed to give the end user as much options as possible to test with various digital, analog and communication models.

It comes with a preloaded EPOS® LON stack on the HD-PLC CPU, additionally equipped with a unique Neuron ID. A service push button and LED are implemented. Furthermore a status LED for the application extender CPU is present.

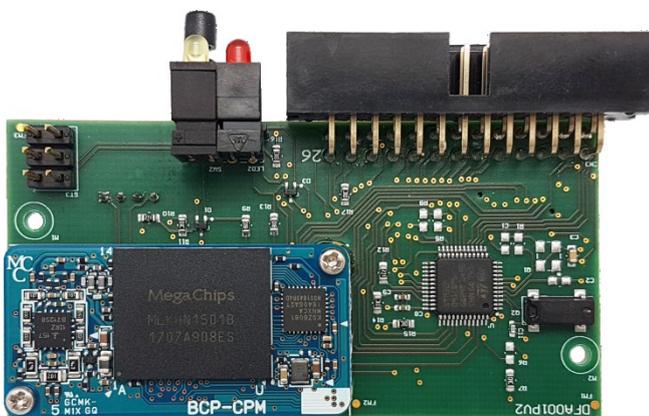
A STM32F901 CPU, running at 48 MHz, having 32 Kbyte SRAM and 256 Kbyte is used for the application extender CPU. Flexible IO is accessible on a 26 pin double row header for a ribbon cable. A break out board is provided.

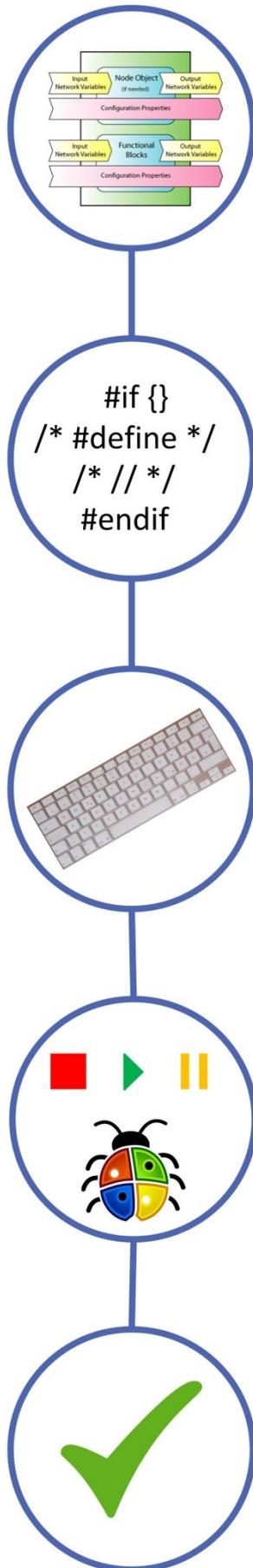
STs IO mapping allows using digital inputs and outputs, alternatively serial communication protocols like **UART**, **I2C**, **SPI** and **CAN** can be defined. Two analog inputs and outputs can be used.

Diagnostic features are provided by the connection for the ST-Link debugger and with a separate UART just to use standard `printf(...)` notifications.



The LON HD-PLC EVK is not designed to run in end users applications. It is for development and lab usage only. Especially take care on the high voltage connection. Don't open the enclosure, when it is under operation. Please refer to the LON HD-PLC EVK documentation for safety rules.





Define Device Interface

► EPOS® XIF-Generator to define

- Program ID
- Network variables
- Functional Blocks
- Self-Documentation

Generate C-frame

► EPOS® XIF-Generator export to C

- Generates C framework
- Definitions for network variables and functional blocks
- Callback events

Make your application

► do the application specific stuff

- Use IDE
- Add handling I/O
- Connect I/O with network variables
- Callback events

Download and Debug

► Make it to run

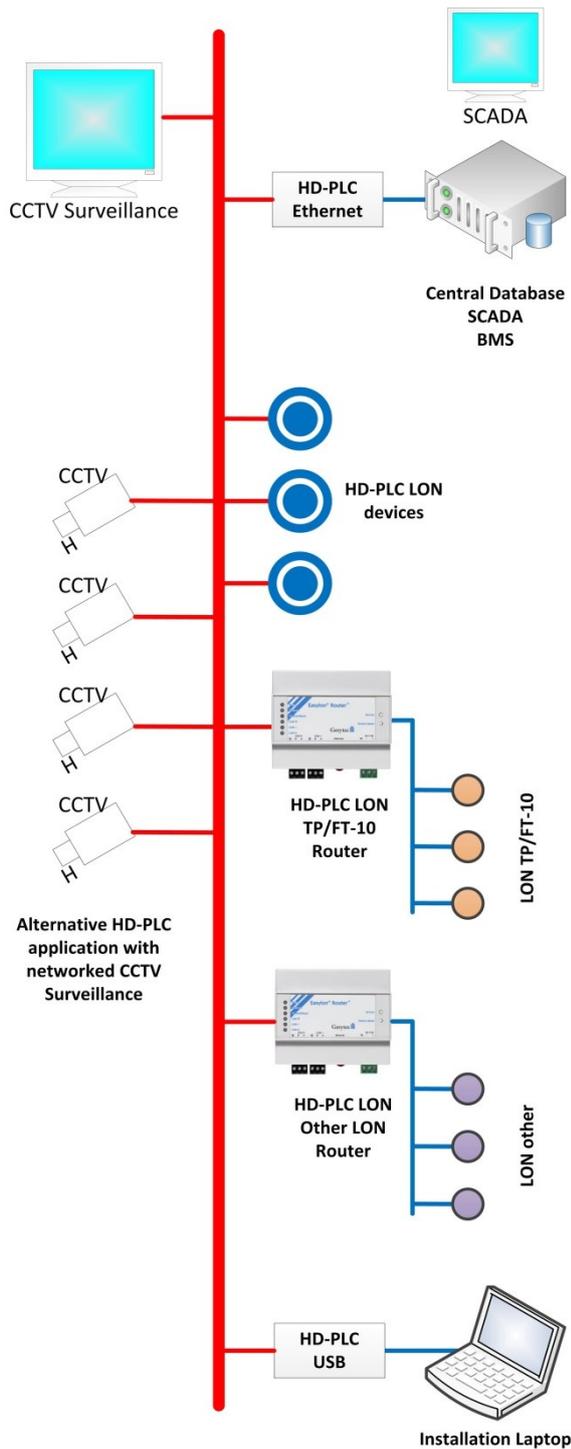
- Use ST-Link debugger
- download
- fix bugs
- test

Set it free

► Make a Release

- final version
- source control
- release to production

HD-PLC network sample



On the right side the drawing shows a typical LON building automation scenario.

There are **HD-PLC LON nodes** directly attached to the main power line, acting as a standard LON device like any other known LON devices up to now.

Connected with a **HD-PLC/Ethernet adapter** there is a server, running the central LON network database, the LNS server. As clients for the LNS database SCADA and BMS are connected. Yet another client might be LonMaker for Windows as installation and maintenance software.

Of course existing standard LON components can be connected. Using an **Easylon® Router Plus for HD-PLC** from Gesytec allows translation from HD-PLC LON to other LonWorks channels like the twisted pair TP/FT-10 or other physical layers for LON. HD-PLC substitutes the existing LON/IP backbones, using separated Ethernet cabling by utilizing the already existing power distribution of a building. HD-PLC save cabling cost and improves reliability of the backbone, because the backbone becomes independent of additional IT equipment as Ethernet switches.

Further infrastructure devices of a HD-PLC adaptor are phase couplers and range extenders, being available as off the shelf devices from Gesytec and various other suppliers.

HD-PLC allows sharing the media with multiple applications.

The drawing shows on the left side a standard CCTV surveillance application with HD-PLC CCTV-IP cameras, using main power to supply the cameras and transferring the video frames over IP to a central surveillance station.

Easylon® - The number 1 for LON interfaces

With our own and independent LON technology Easylon®, we provide the highest performance solutions with longest product cycles.

Reliable expertise

Our qualified and enthusiastic team members stand for excellent aftersales services for many years. Components and spare parts are available in the long term.

Long lasting trust

Our customers appreciate our excellent support, delivery reliability and flexibility and of course, our technical know-how.

Gesytec world-wide

We work with up-to-date technology and are always on the cutting edge of the latest technological developments. Borders and languages are not a barrier for us, we deliver to all continents. We achieve this with our dedicated and competent team. We are proud of the diversity and skills of our employees.

Video: build faster LON Networks

