



life.augmented

ST8500 training

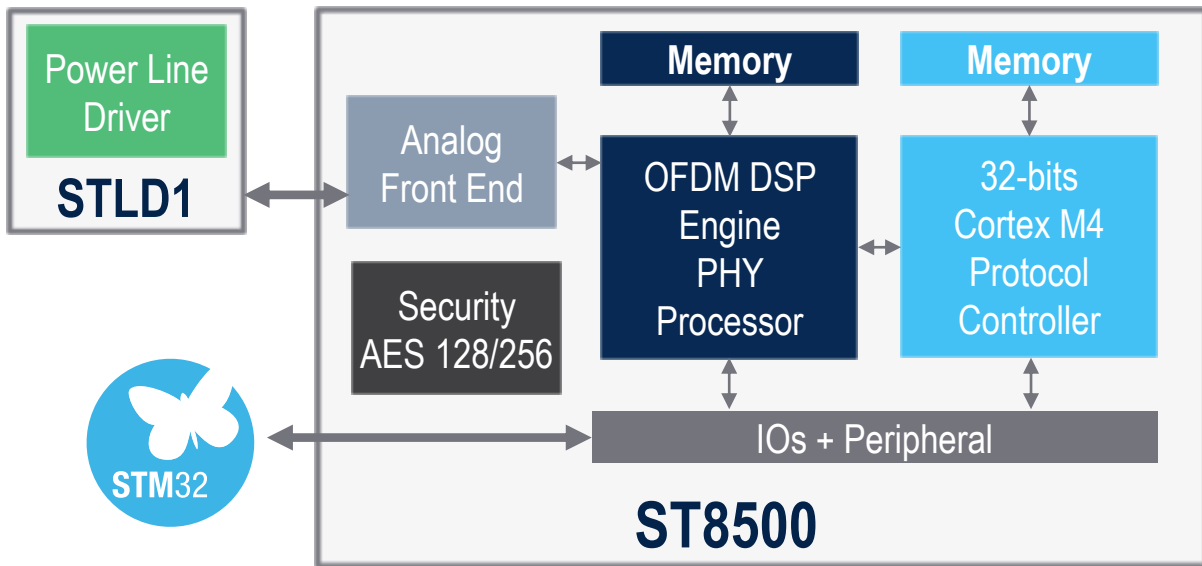
- ST8500 platform overview
- Hybrid PLC&RF technology
- ST8500 development ecosystem
- EVALKITST8500-1 overview
- EVLKST8500GH868 / 915 overview
- ST8500 evaluation - Quick Start
 - G3-PLC Evaluation Package content
 - G3-PLC Graphical User Interface
 - Node tree and G3LIB configuration
 - G3-PLC PHY Layer mode
 - G3-PLC IPv6 Layer mode

ST PLC state-of-the-art solution: ST8500 platform



ST PLC state-of-the-art solution: **ST8500 + STLD1**

Programmable, ultra-low power and compact PLC solution



KEY APPLICATIONS

Powerline communication for remote management

- Smart Metering / Smart Grid
- Smart Home & Smart Building
- Smart City, Smart Street lighting
- Smart Infrastructure, Smart Railways
- Industrial IoT



Certified Turn-key Multi-Standard PLC protocols

- Programmable, certified protocol standards: G3-PLC, PRIME...
- OFDM robust modulations with sophisticated correction coding
- Full 500 kHz band coverage for increased performance & reliability
- 6LoWPAN and IPv6 supported

Secure, robust and modular system architecture

- ST8500 AES 128/256-bit engine for secure data encryption and anti-tampering
- Broad range of STM32 external host controllers for any application
- Low distortion, high current capability **STLD1** Power Line Driver with up to 36 V p-p, 1.5 A rms output for robust communication even in high attenuating, low impedance network

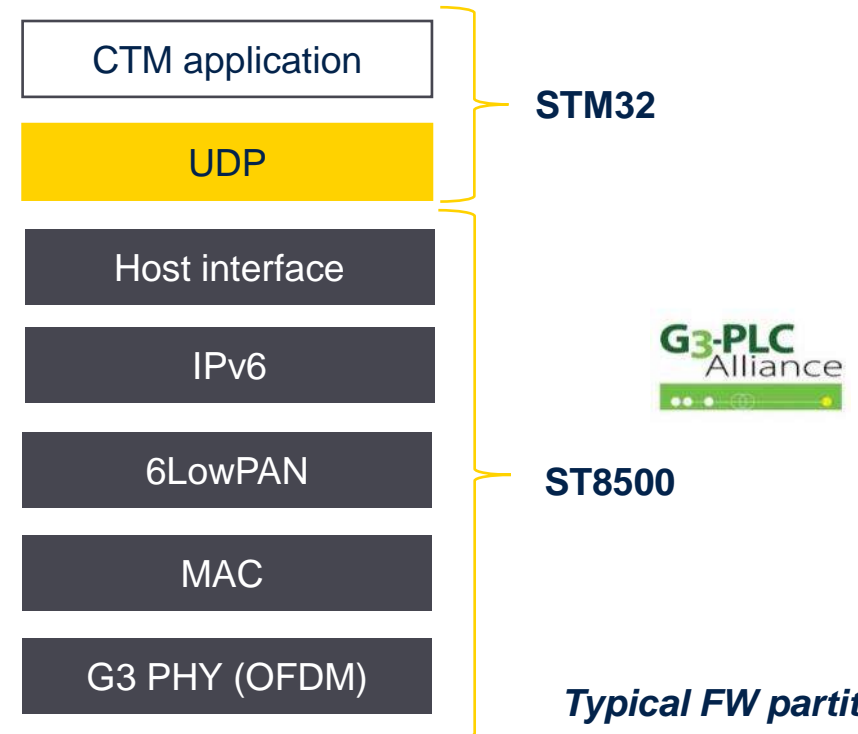
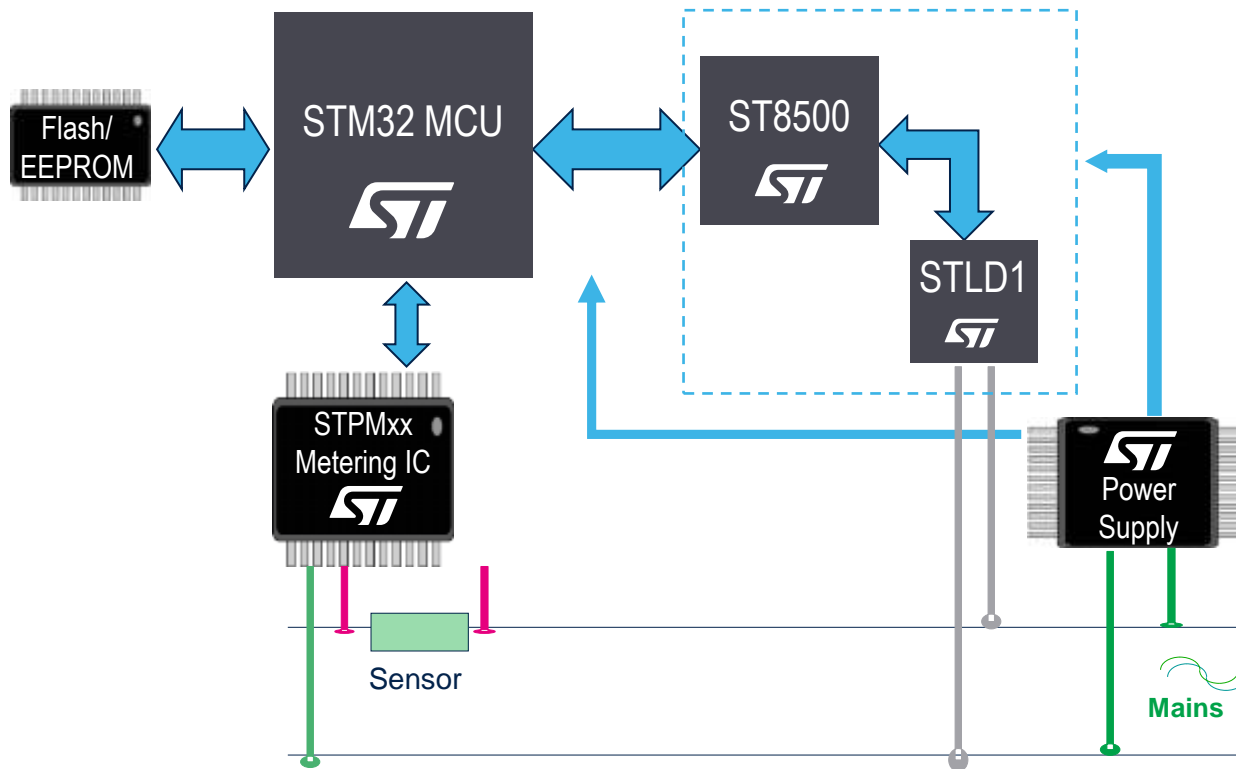
Low-power and compact solution

- Lowest Power Consumption in RX mode: 100 mW typ
- QFN 7x7 mm package for PCB optimization
- Extended Industrial temperature -40°C to 105°C

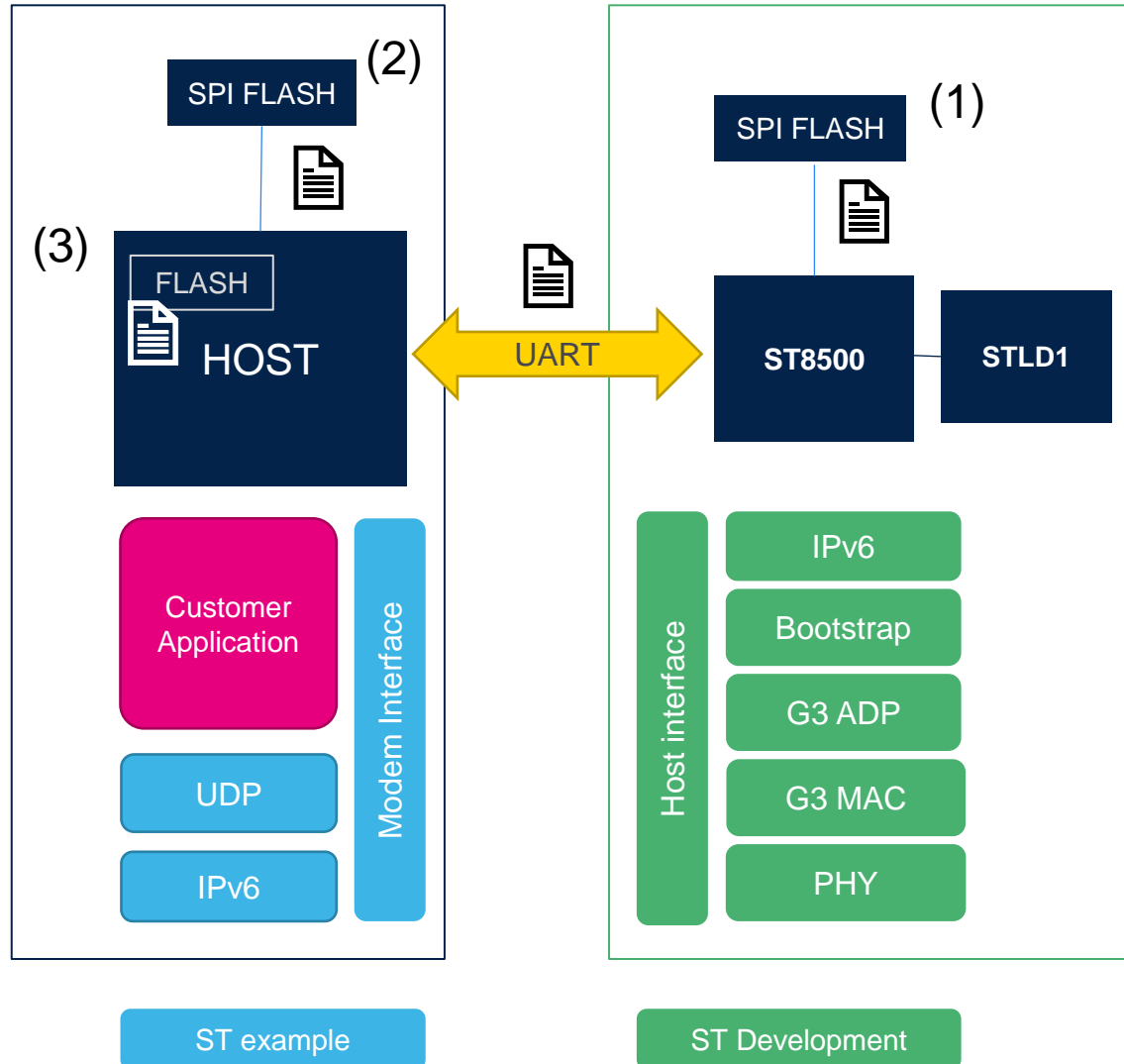
ST8500 in a typical Smart Energy application

Benefits from ST modular architecture:

- Full flexibility, separated functional domains
- Best-in class components for each function
- Consolidated, ready to go BoM
- Certified, multi-million field proven / deployed PLC solution



ST8500 : Host / modem G3-PLC FW partitioning



- ST8500 is RAM based (code + data) → PE and RTE images shall be loaded at boot time
- ST8500 images (up to 350 kB) can be stored in:
 - (1) SPI FLASH connected to ST8500
 - (2) SPI FLASH connected to STM32
 - (3) Host controller internal FLASH
- Boot time (typ) vs image download mode:
 - ST8500 SPI FLASH (case 1) → <1 sec
 - UART (case 2,3) → 5 sec @ 920 kbps
- ST8500 G3 starts by default in ADP (6LoWPAN) mode
 - It can be configured by API
- Flexible UDP/IP implementation:
 - on ST8500 side
 - on STM32 side

Typical host MCU configuration for ST8500



Host MCU resources:

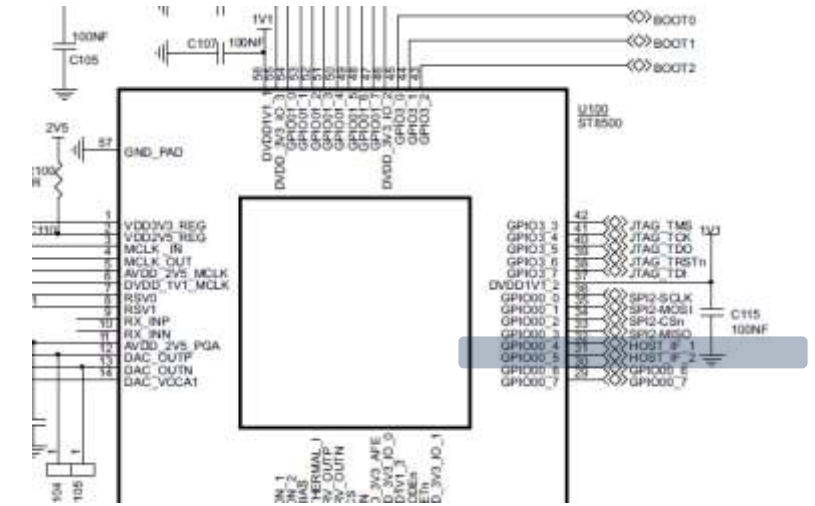
- ❑ 3x GPIOs
- ❑ 1x UART (+1 optional UART TX for debug trace)
- ❑ UDP application example:
 - ❑ ~95 KB Flash
 - ❑ ~36 KB Ram

ST8500 Boot modes

Table 2. Boot modes

| Boot2 | Boot1 | Boot0 | Boot ID | Boot mode |
|-------|-------|-------|---------|--|
| 0 | 0 | 0 | 0x0 | Boot from UART host interface |
| 0 | 0 | 1 | 0x1 | Boot from SPI host interface |
| 0 | 1 | 0 | 0x2 | Boot from SPI external Flash (large configuration) |
| 0 | 1 | 1 | 0x3 | Boot from SPI external Flash (small configuration) |
| 1 | 0 | 0 | 0x4 | Reserved |
| 1 | 0 | 1 | 0x5 | Reserved |
| 1 | 1 | 0 | 0x6 | Reserved |
| 1 | 1 | 1 | 0x7 | Reserved |

UART Host Interface: Request/Confirm & Indication



- Both the modem and the host controller can send messages asynchronously on UART
- Handshake is guaranteed by
 - Confirm message to Host controller in case the Request message is received and processed normally
 - Error message to Host controller in case the Request message was not correctly received

UART Host Interface: G3-PLC

- No HW handshake, 2 wire UART between Host and ST8500
- Baud rates from 9600 bps to 921 kbps:
 - During download, set at 921 kbps
 - During on-field operations, set at 230 kbps

Table 4. Host Interface Command Messages Formats

| Request Message Format | | | | | | | | | | | |
|---------------------------------------|------|---------------|---------|----------------|---------|-----------------------|------------------|----------------------|----------------------|-----------|---------|
| Synchro Field | | Control Field | | Security Field | | Message Payload Field | | | | Check | |
| 0x16 | 0x16 | CMD_ID | MSG_LEN | SEC_MODE | COUNTER | MSG ₀ | ... | MSG _{LEN-1} | TAG | CRC | |
| 2 Bytes | | 1 Byte | 2 Bytes | 1 Byte | 4 Bytes | MSG_LEN Bytes | | | 0/8 Bytes | 2 Bytes | |
| Confirm and Indication Message Format | | | | | | | | | | | |
| Synchro Field | | Control Field | | Security Field | | Message Payload Field | | | | Check | |
| 0x16 | 0x16 | CMD_ID | MSG_LEN | SEC_MODE | COUNTER | Error Code | MSG ₁ | ... | MSG _{LEN-1} | TAG | CRC |
| 2 Bytes | | 1 Byte | 2 Bytes | 1 Byte | 4 Bytes | 1 Byte | MSG_LEN-1 Bytes | | | 0/8 Bytes | 2 Bytes |

• Reference

- The commands of Host Interface (HI) for G3-PLC is described into
ST-G3-PLC_Solutions_AN.pdf

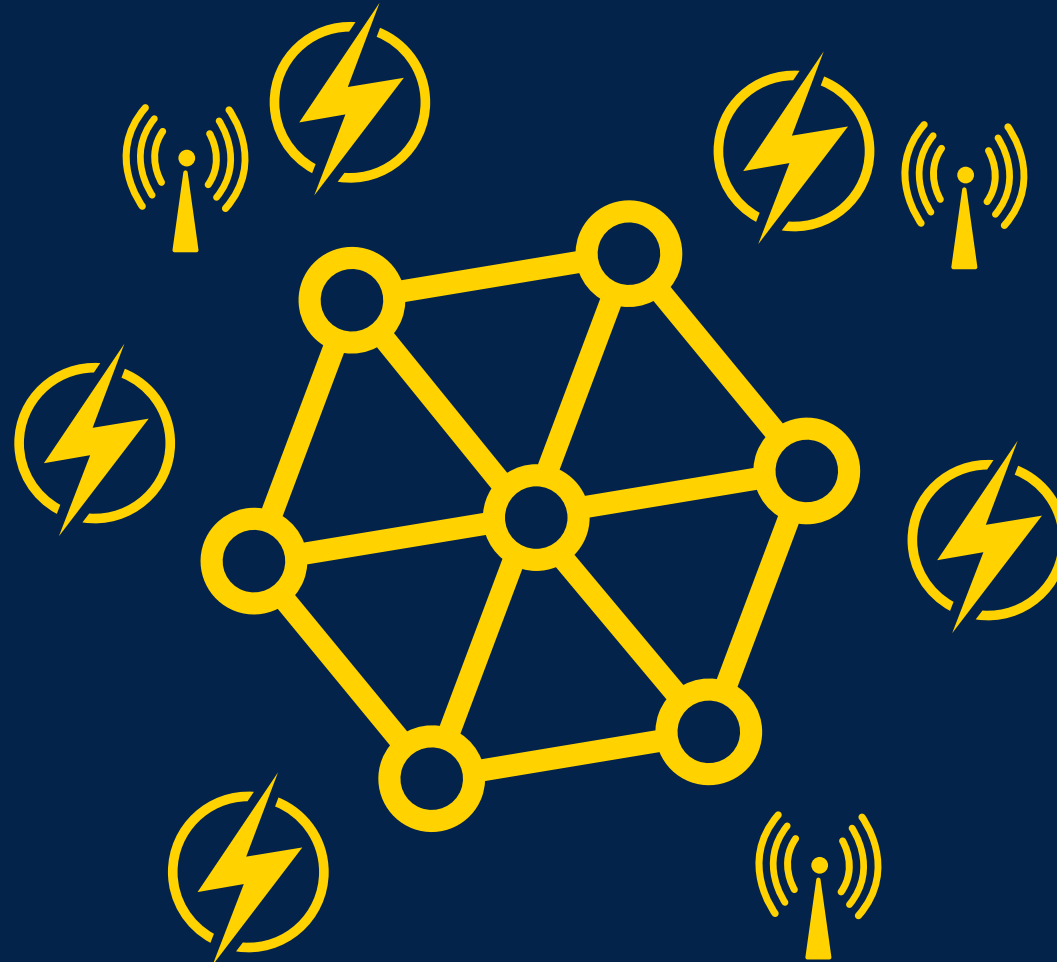


ST8500 + STLD1 power consumption

- Current measured in TX and RX by power domain
 - Overall power is given without taking into account the DC-DC efficiency

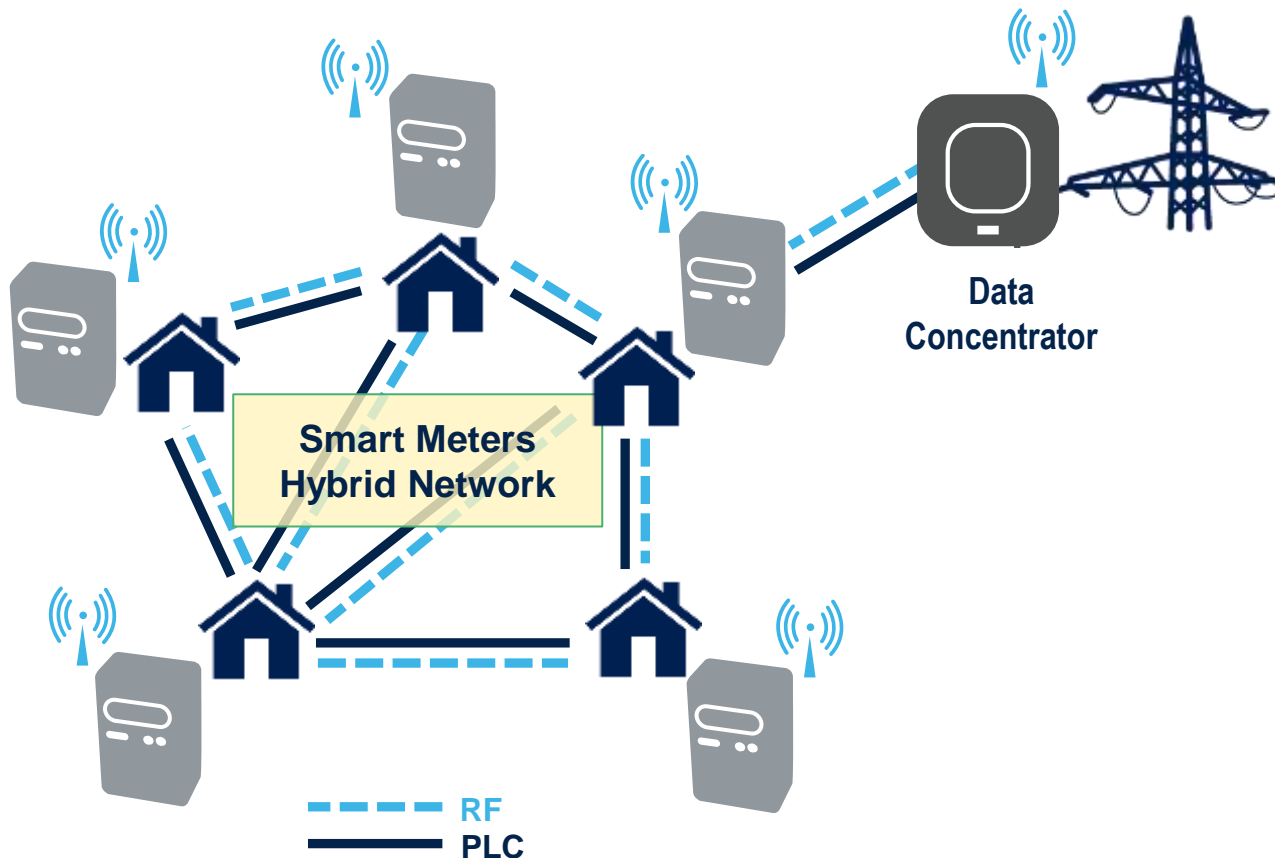
| Mode | ST8500 by power domain | | | | STLD1 |
|------|------------------------|-------|------|--------|-----------------------------|
| | +1V1 | +2V5 | +3V3 | Total | +15V |
| TX | 45 mA | 18 mA | 8 mA | 121 mW | 40 mA + (load dependent) |
| RX | 46 mA | 10 mA | 6 mA | 96 mW | 1 mA |

Hybrid PLC+RF technology evolution



New hybrid PLC+RF technology

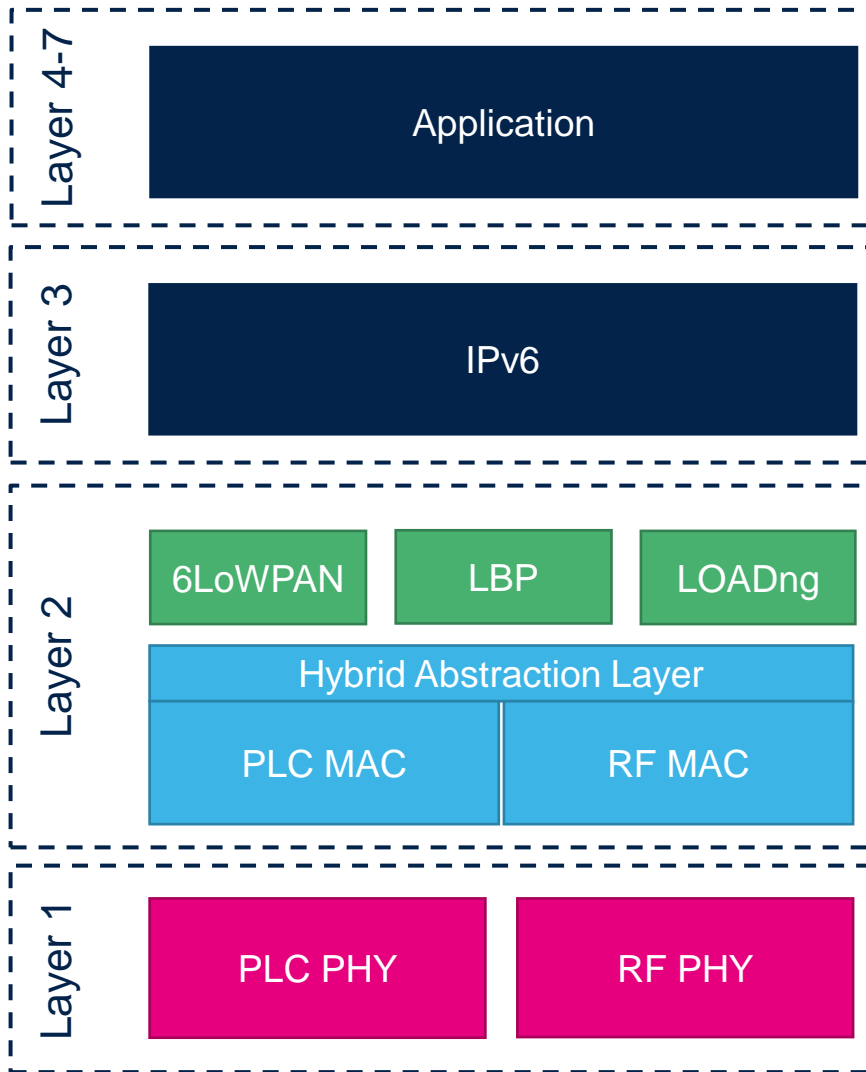
Expanding PLC capabilities



- Challenging network topologies
 - Rural area networks
 - MV/LV transformer bypass
 - Particularly harsh noise/impedance conditions
- Need to extend to other Smart Grid services (e.g. DER)
- Solution: **fully hybrid** PLC + RF Network
 - Each node has PLC and RF connectivity
 - The route is built with a **hop-by-hop automatic selection** of the best between PLC and RF media (dynamically adjusted)
- Boosting Key Performance Indicators to **100%**



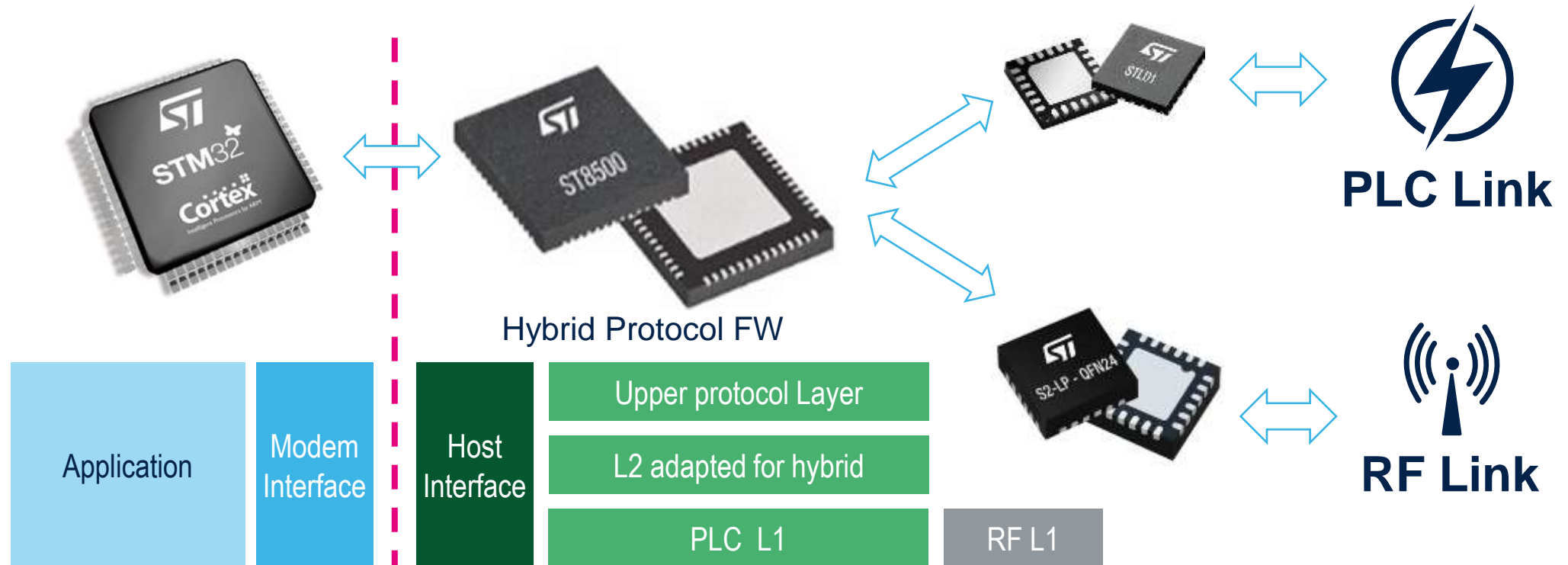
Hybrid PLC + RF technology: Optimal standard-based integration



- G3-PLC technology first to adopt this standard-based fully-integrated hybrid approach
 - G3-PLC already based on IEEE 802.15.4-2007
- **Layer 1** extension: added FSK RF PHY from IEEE 802.15.4-2015/17
- **Layer 2** integration:
 - 2 separate MAC Layers (CSMA, ACK, ...)
 - Hybrid Abstraction Layer to deal with common lower layer procedures
 - Hop-by-hop PLC or RF media selection
- **Status:**
 - Specification and interoperability process completed
 - Certification process available from end 2020
- For more info, visit <https://g3-plc.com/what-is-g3-plc/g3-plc-hybrid-plcrf/>

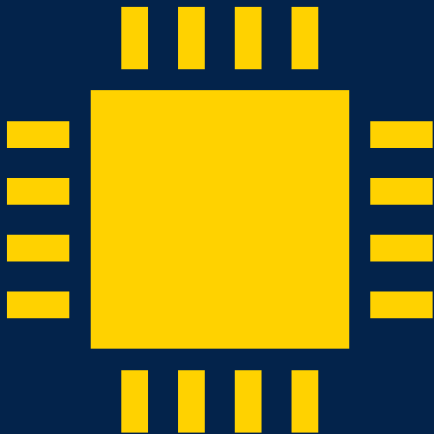


ST8500 + S2-LP hybrid PLC-RF turn-key solution



- ST8500 as PLC modem and PLC-RF Hybrid protocol processor
- Turn-key firmware for ST8500 automatic selection of RF Sub-GHz link or PLC link depending on network quality conditions
- Based on 6LoWPAN and IPv6
- Modular solution leveraging on whatever STM32 application host

ST8500 development ecosystem

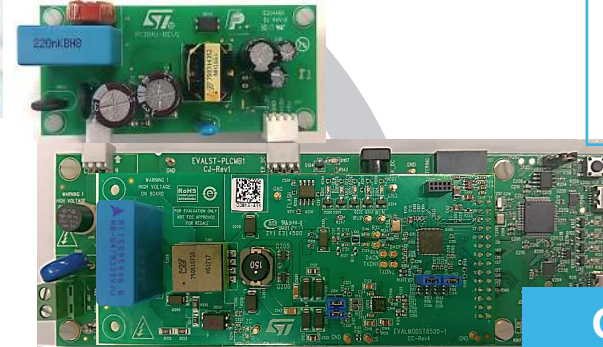




Evaluation boards

- **EVALKITST8500-1**
 - ✓ Ready-to-use, full-performance PLC node for AC applications
- **EVLKST8500GH868 / 915**
 - ✓ Modular development kit for hybrid PLC+RF solutions based on NUCLEO

New!



Design Resources

- Documentation available:
 - ✓ Datasheets
 - ✓ Schematics
 - ✓ BoM
 - ✓ PCB layout
 - ✓ Design Guides

G3-PLC Protocol FW packages

- **G3-PLC** single binary CEN A/B/FCC + Device/Coordinator
- **Hybrid G3-PLC** with RF expansion
- G3-PLC Application Note
- Graphical User Interface
- STM32 driver

New!



PRIME PLC Protocol FW packages

- **PRIME 1.3.6 and 1.4 (Service Node and Base Node)**
- PRIME Application Note
- Graphical User Interface

Application-specific SW packages

- **ST8500 SmartSolar FW** (dual mode SUNSPEC + nPSK)
- Windows PC test tool (command line)
- User Manuals

New!

G3-PLC SW Package for non-metering applications

- Package to address non-metering connectivity solutions
- Downloadable from st.com:
 - ✓ **STSW-SGKITGUI**: GUI for PC
 - ✓ **STSW-ST8500G3**: G3-PLC images and STM32 FW



EVALKITST8500-1 overview



EVALKITST8500-1: modularity

- Full-performance PLC connectivity module
 - Enable CENELEC/FCC band selection thru FW control (patented automatic HW tuning)
- Module approach for easy and future-proof evaluation
 - ST8500 UART host connection to the STM32 mother board, with USB-UART conversion for PC access
 - Additional module interface for future development of HW add-ons



VIPER26H Power Supply module

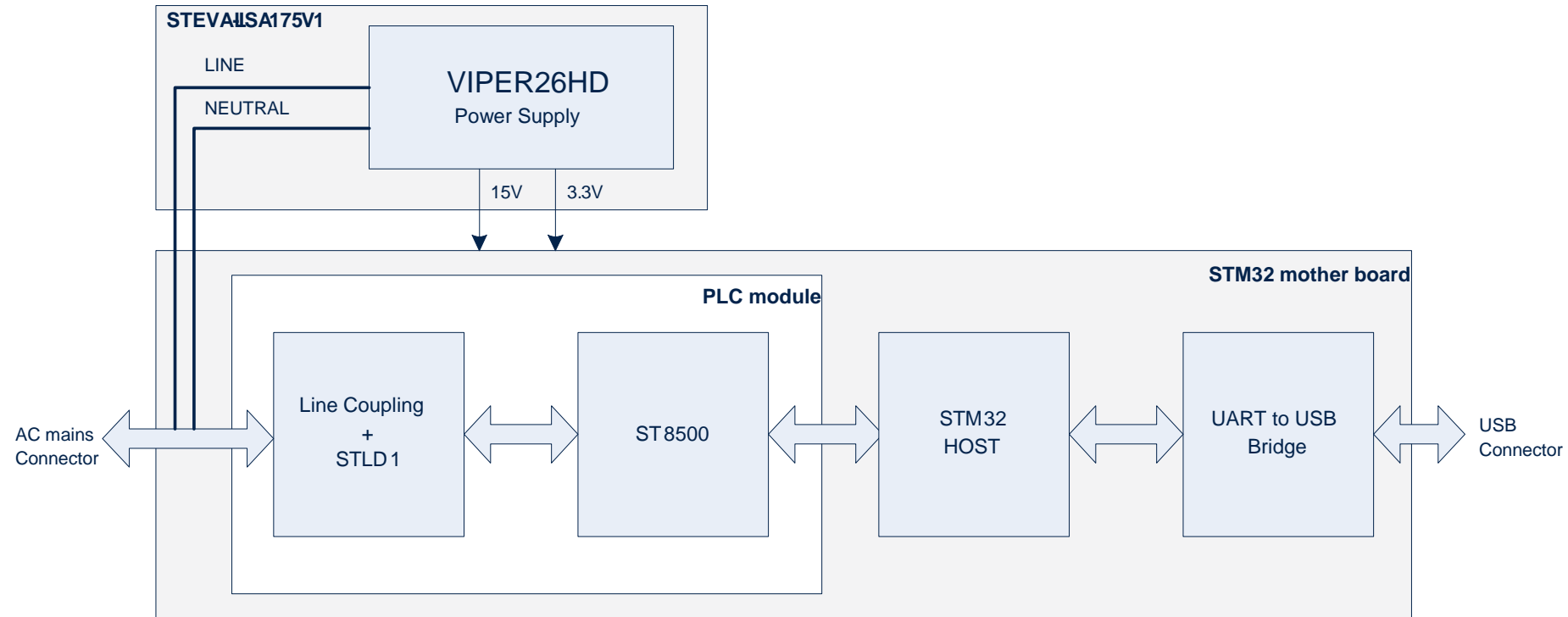


ST8500 Eval Mother board



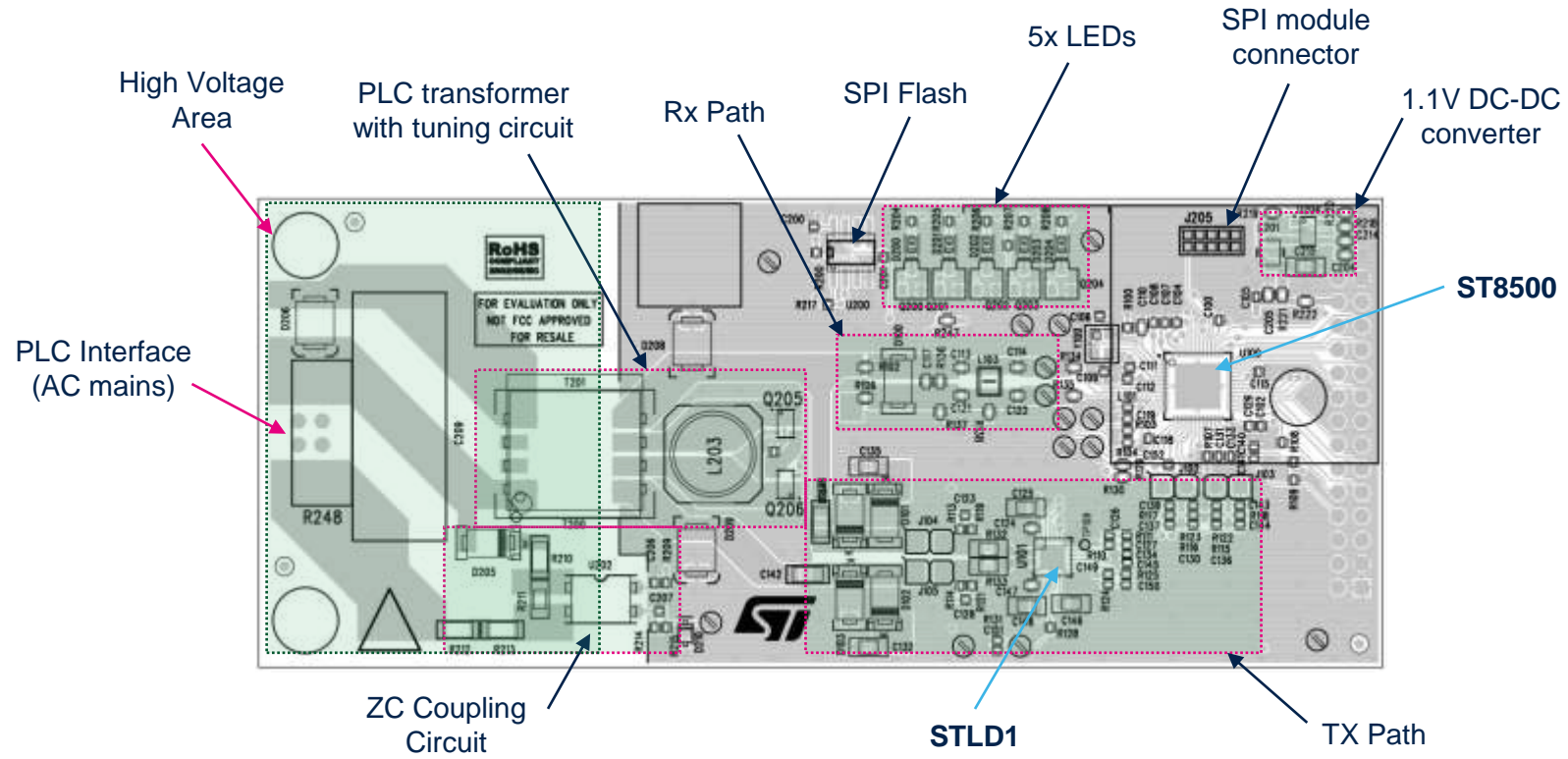
ST8500 Eval Module

Block diagram

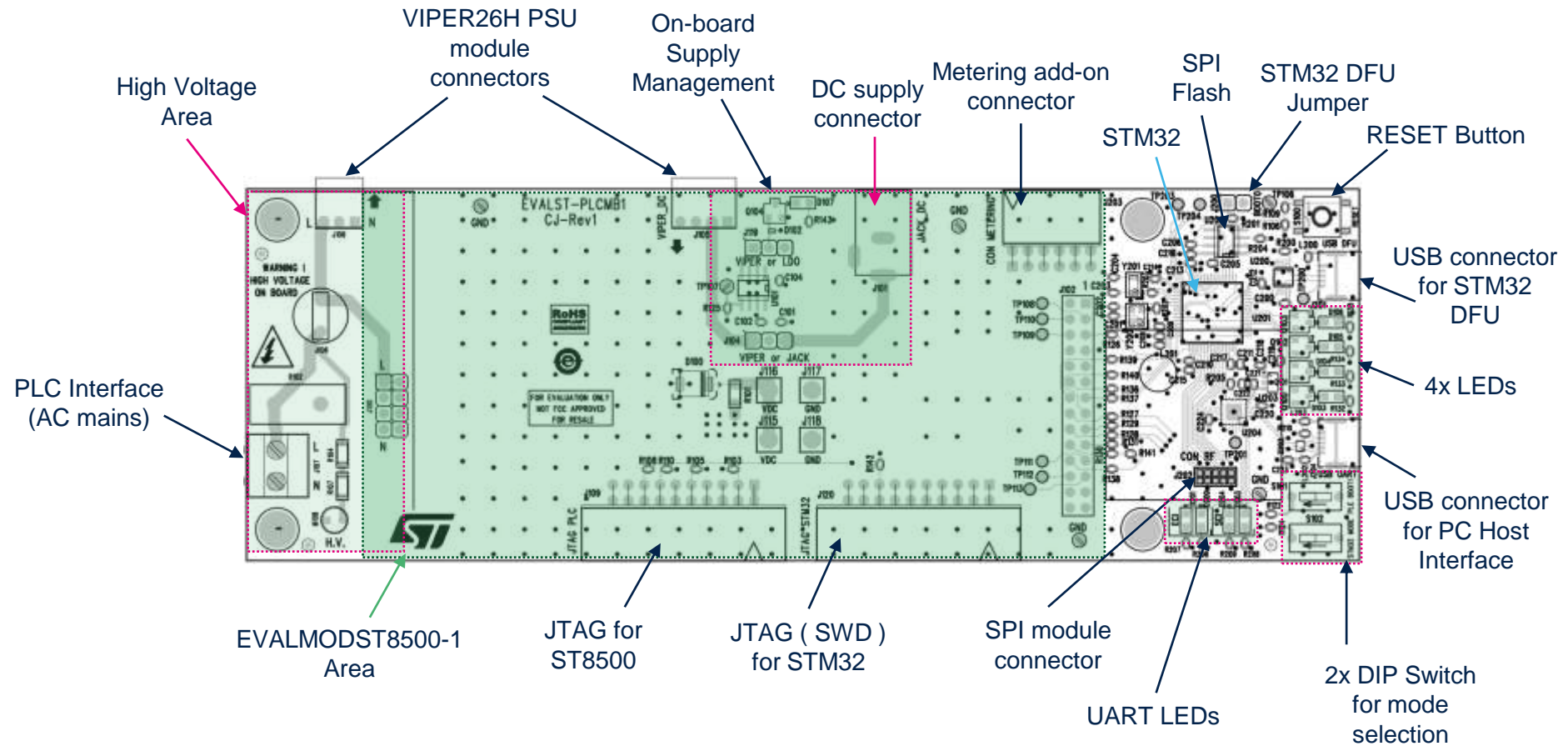


- For development purpose, the EVALKITST8500-1 allows to:
 - Use external DC Supply – no AC mains needed
 - Enable ARM Cortex debug capability for STM32 and ST8500 (for internal use only) through external JTAG probe
 - Enable GPIO for debug purpose (available on connector)

EVALMODST8500-1 description

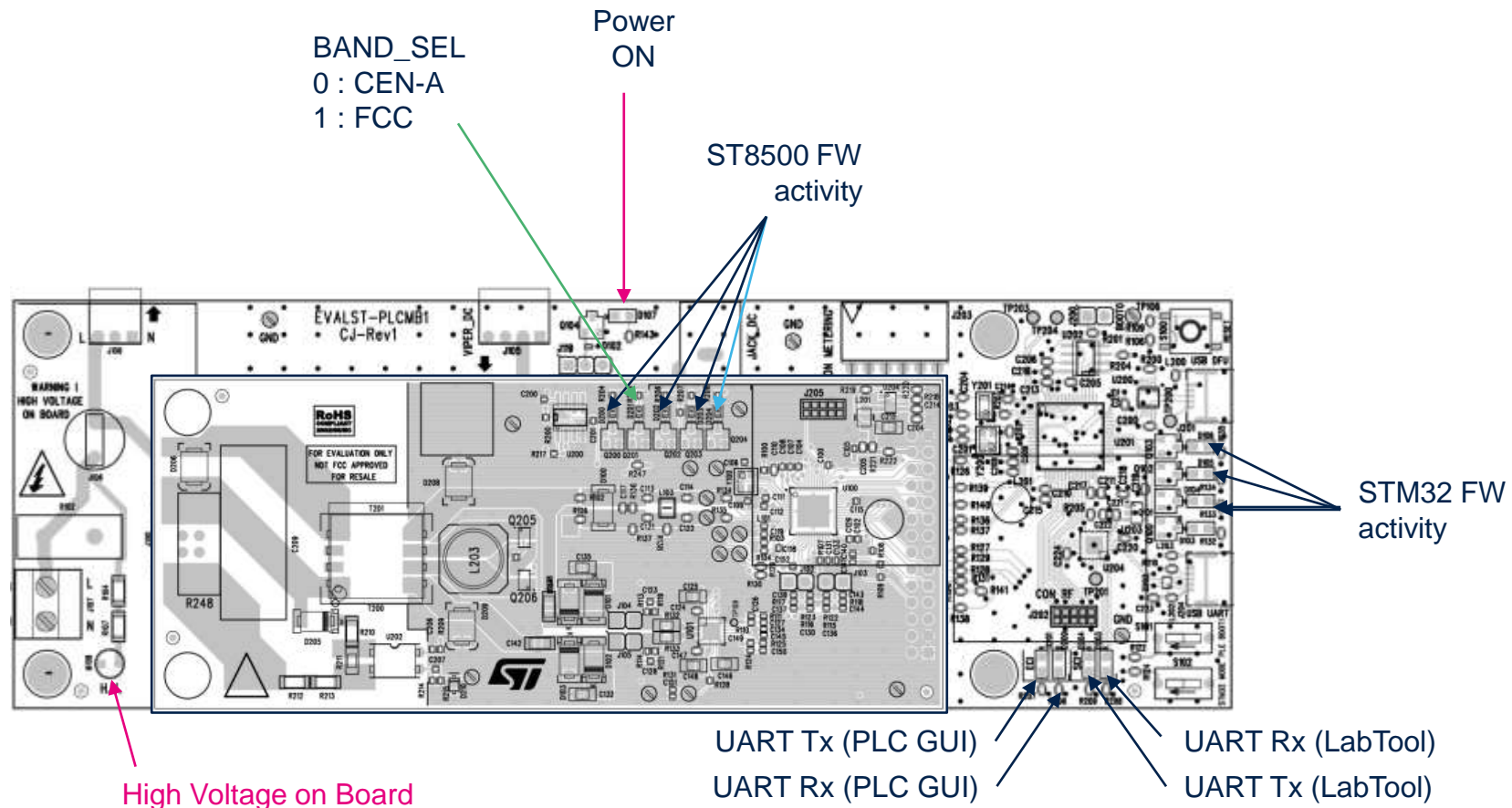


EVALST-PLCMB1 description

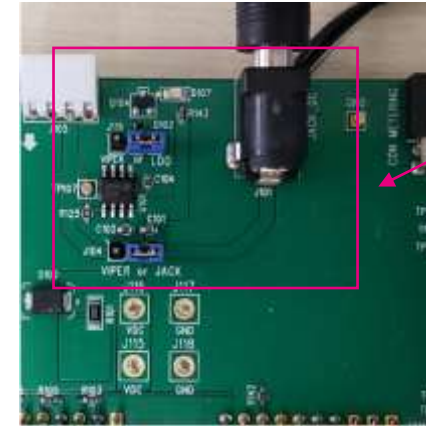
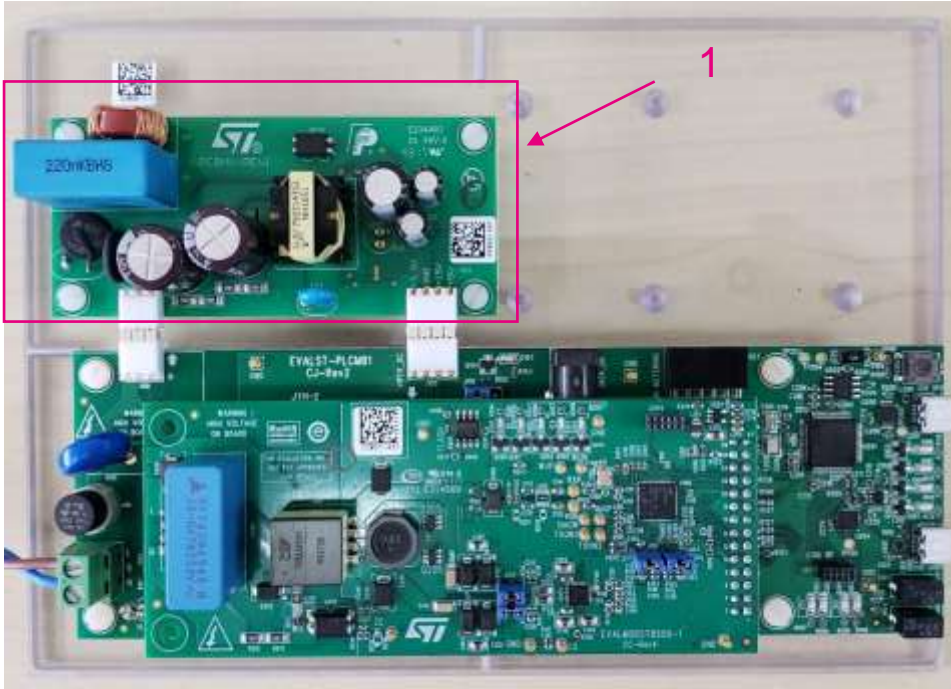


EVALKITST8500-1: LEDs

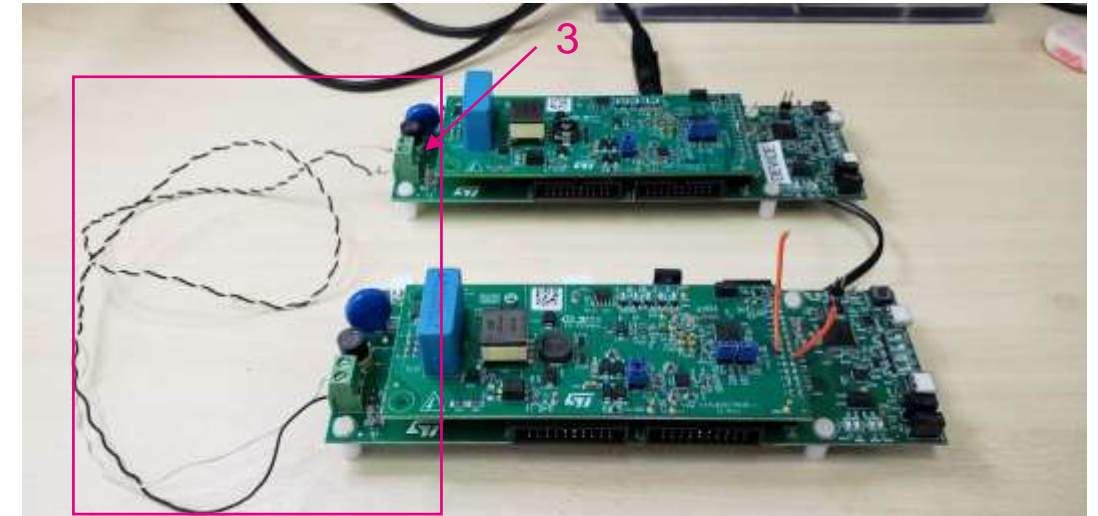
- After power-up and ST8500 boot, here is the mapping of the LEDs:



EVALKITST8500-1: DC operation



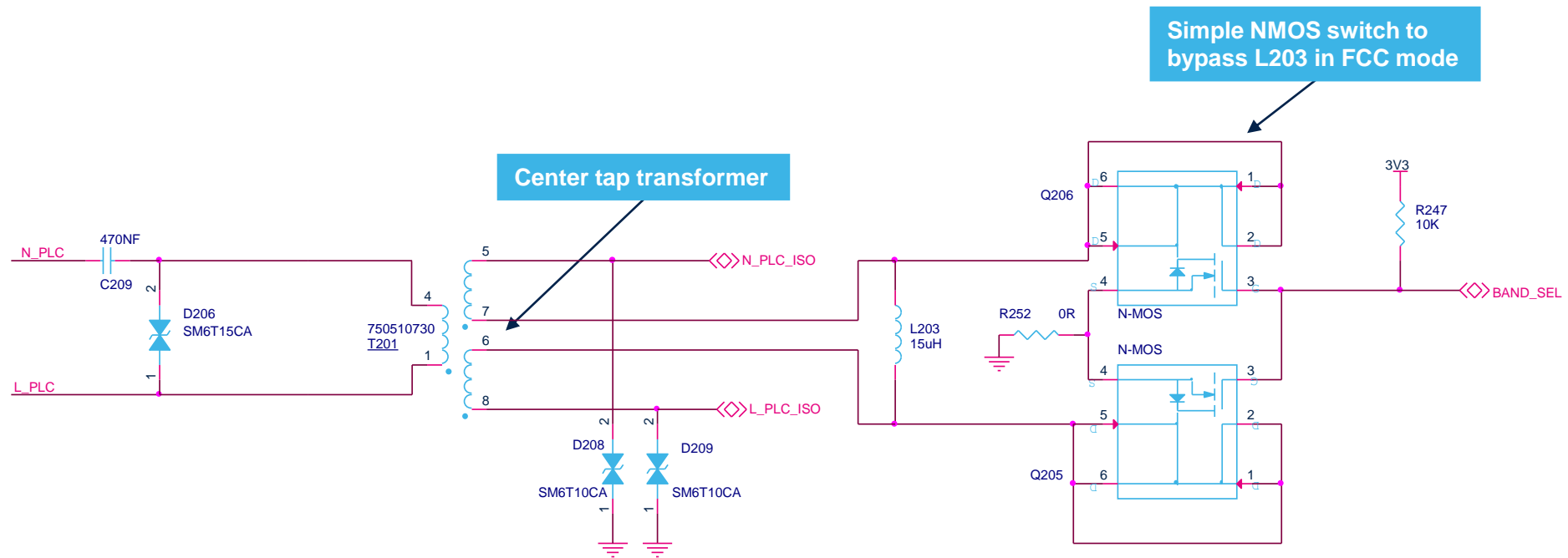
- (1) Remove the power supply board
- (2) Change J119 to LDO and J104 to JACK position and then connect to a 12V~15V DC power supply
- (3) Connect J107 connector to the DC bus



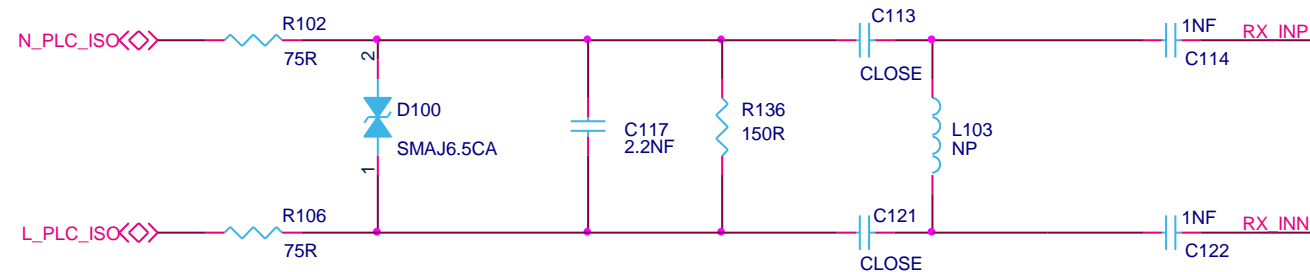
EVALKITST8500-1

HW design and EMC compliance

- ST patented solution for automatic CEN A – FCC tuning

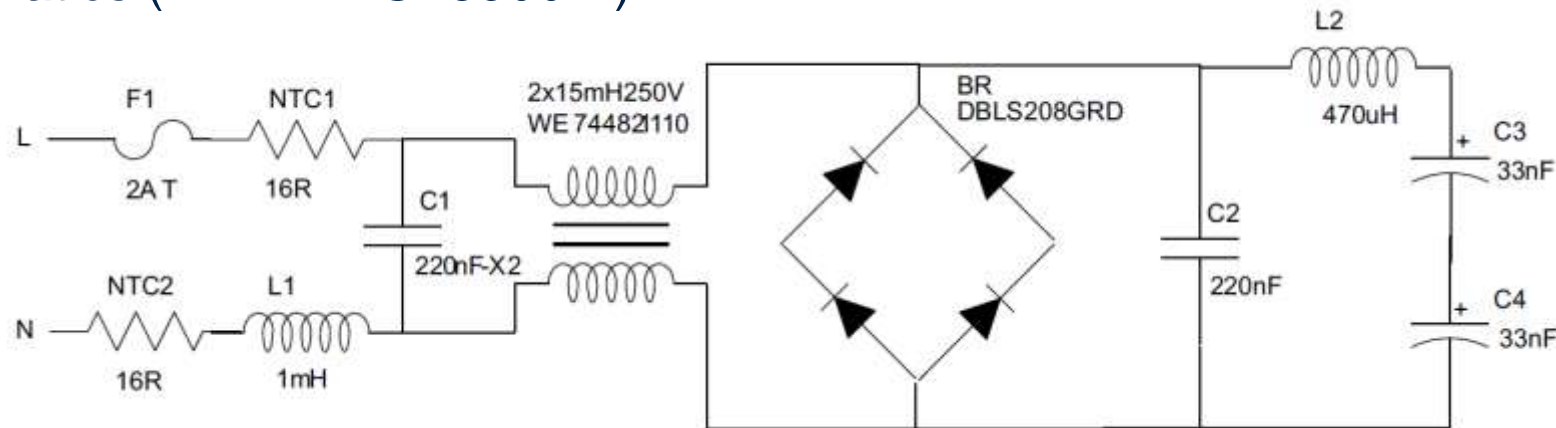


- Large CEN A to FCC frequency response
- Very low BOM solution
- -6 dB to match TX (up to 30 Vp-p) and RX (max 15 Vp-p) dynamic range



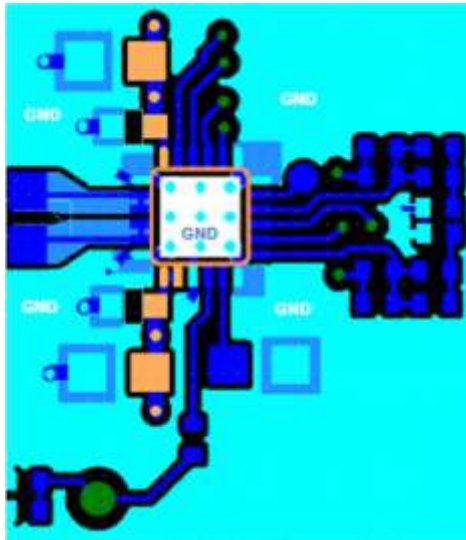
Power supply requirements for PLC performance

- Power budget:
 - VCC target value = 15 V dc
 - 0.7 A dc minimum current required on VCC for STLD1 to drive 2 Ω line impedance
 - 3V3 + 1V1 power budget: < 200 mW
 - Minimum power budget = $(15 \text{ V} * 0.7 \text{ A} * 50\% \text{ duty cycle}) + 0.2 = 5.5 \text{ W}$
- EMI filter design:
 - L-C differential noise filtering + CM choke as first stage
 - Target: minimize noise injected to the power line + increase input impedance
 - Typical schematics (EVALKITST8500-1):

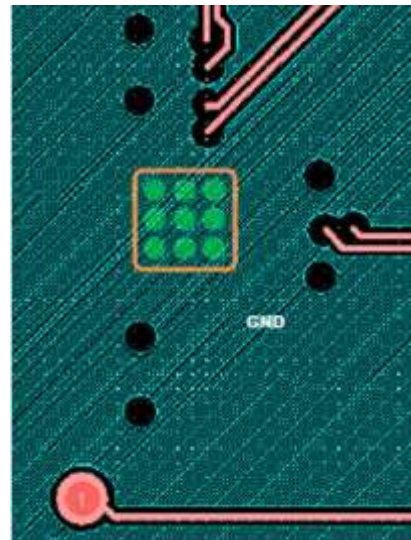


PCB guidelines

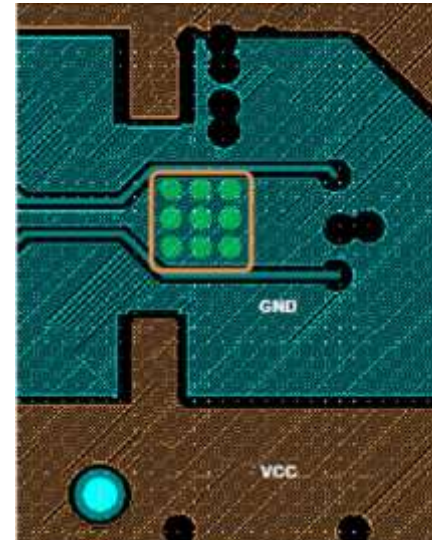
- See AN5120 + EVALKITST8500-1 package on [st.com/powerline](https://www.st.com/powerline) for full details
- Key points:
 - Good RF shielding by GND planes (below and between tracks) + short tracks to optimize EMC/EMI
 - Design for STLD1 thermal performance:
 - TOP: thermal pad with 3x3 via array
 - INNER: fill with GND the area below the device – NO cutting traces below the STLD1 thermal pad
 - BOTTOM: large GND area extending to the border of the PCB with possibly no cutting traces + via encroaching for best thermal pad soldering



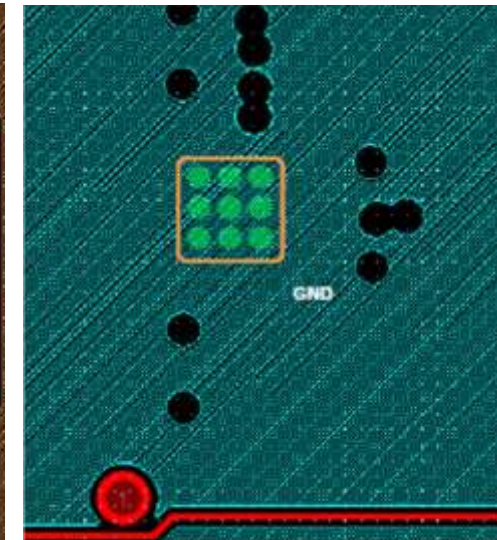
TOP



INNER1 (GND)



INNER2 (POWER)



BOTTOM

- EN50065 compliance tests PASSED by EVALKITST8500-1

| Type | Basic standard | Test | Result |
|--|----------------------|---|--------------------------|
| PLC transmission: conducted measurement | EN 50065-1 | Bandwidth measurements | PASS ⁽¹⁾ |
| | EN 50065-1 | Maximum output levels | PASS ⁽¹⁾ |
| Conducted disturbance measurements | EN 50065-1, EN 55022 | Conducted emissions (9 kHz - 30 MHz) | PASS ^{(1), (2)} |
| Radiated disturbance measurements | EN 50065-1, EN 55022 | Radiated emissions (30 MHz - 1 GHz) | PASS ⁽²⁾ |
| Radiated immunity | EN 61000-4-3 | RF radiated fields immunity test (80 - 1000 MHz, 10 V/m) | PASS |
| | EN 61000-4-8 | Magnetic 50 Hz field immunity test (100 A/m, 300 A/m) | PASS |
| Contact/radiated immunity | EN 61000-4-2 | Electro-static discharges immunity test (8 kV contact and air mode) | PASS ⁽³⁾ |
| Conducted immunity | EN 61000-4-6 | RF conducted signals immunity test (150 kHz - 80 MHz, 10 V rms) | PASS ⁽³⁾ |
| | EN 50065-2-3 | Narrow-band signals immunity test (95 kHz - 150 kHz; 150 kHz - 30 MHz) | PASS ⁽³⁾ |
| | EN 61000-4-4 | Fast transients immunity test (2 kV, 5 kHz) | PASS ⁽³⁾ |
| | EN 61000-4-5 | Surge immunity test (4 kV, common mode and differential mode) | PASS ⁽³⁾ |
| | EN 61000-4-11 | Power voltage dips and interruptions (30% - 10 ms; 60% - 100 ms; 100% - 5 s) | PASS ⁽³⁾ |
| Input impedance measurement | EN50065-7 | RX impedance | PASS ^{(1), (2)} |
| | | TX impedance | PASS ⁽¹⁾ |

1. Related to the specific PLC protocol implementation.
2. Results impacted by the VIPer26H power supply module.
3. In case of non-metering applications, communicating outside the CENELEC A band, please refer to the immunity requirements listed in the EN50065-2-1 document, which may set lower limits for some tests.



tecnalia Engineering Solutions

Test Report
No. B41-18-BH-11

ENAC
N° 41248

Tests and activities marked with (*) are not covered by the accreditation of ENAC

Tests according to PE.EES-10-E

| | |
|--------------------|--|
| TEST SAMPLE | PRIME 1.4 COMMUNICATION BOARD |
| MODEL | EVALKITST8500-1 |
| MANUFACTURER | STMicroelectronics S.r.l. |
| APPLICANT | STMicroelectronics S.r.l. Via C. Olivetti, 2, Agrate Brianza 20854 (MB) - ITALY |
| DATES OF RECEPTION | 10/01/2018 (sample 1 and 2) |
| DATES OF TEST | From 10/01/2018 to 10/20/2018 |
| DATE OF ISSUE | 11/05/2018 |

Technical Responsible

[Signature]

Álvaro Hernández

tec LABORATORIO DE INVESTIGACIÓN Y DESARROLLO

* This report makes reference only to the sample identified by the test and the test who conditions in which tests were performed.
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TEST REPORT NO. B41-18-BH-11

PAGE: 1/10

EVALKITST8500-1

G3-PLC PHY performance

EVALKITST8500-1: G3-PLC CEN-A PHY performance summary

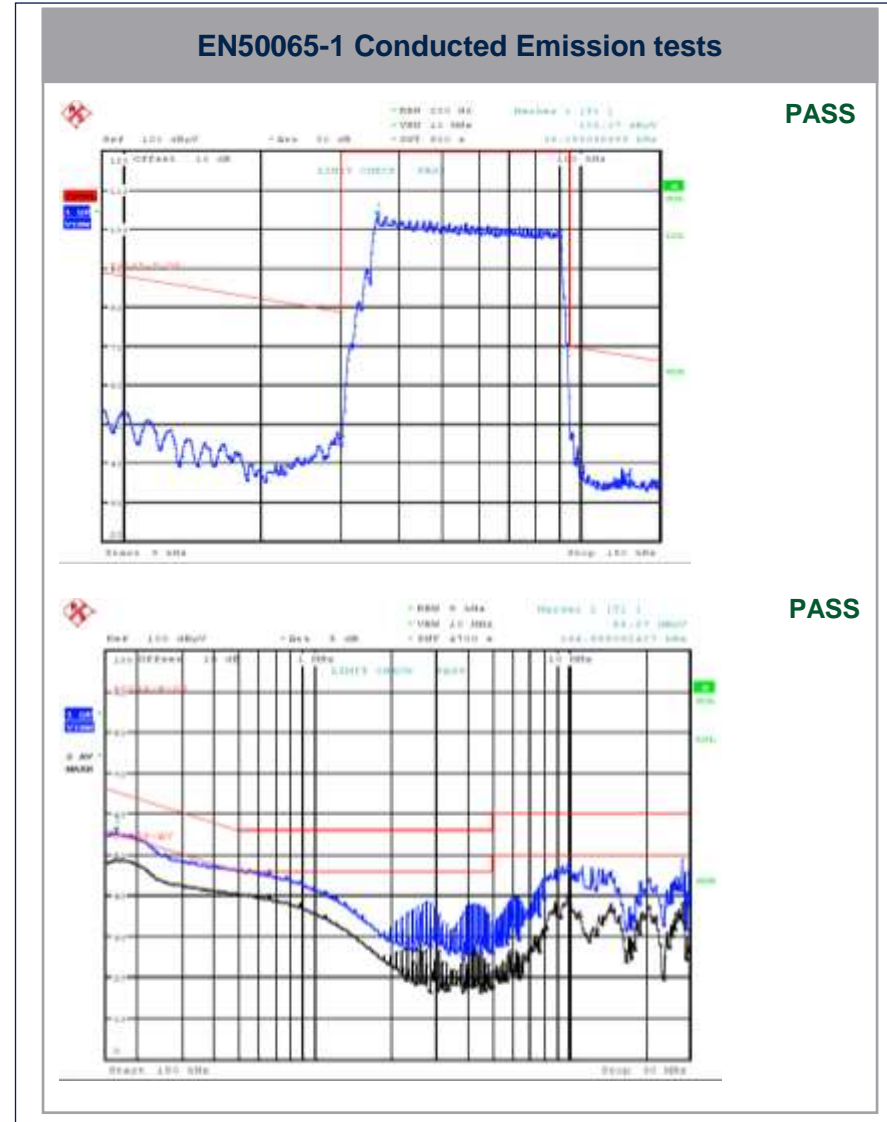
| TX Power (differential RMS-AVG) | |
|------------------------------------|-----------------|
| EN50065 LISN | 2 Ω LISN |
| 129* dB μ V | 122* dB μ V |

* = value measured on LISN RF port + 6 dB

| Power consumption | | |
|-------------------|--------|--------|
| Supply rail | RX | TX |
| 3V3 + 1V1 | 140 mW | 170 mW |
| VCC = 15 V | 15 mW | 600 mW |

| Sensitivity and data rates | | |
|----------------------------|---------------------------------|-------------------------------------|
| Modulation | Sensitivity (dB μ V rms) | PHY Data rate (kbps), IFS < CIFS |
| CROBO | 24 | 4.8 |
| DROBO | 25 | 5.2 |
| CBPSK | 27 | 17.1 |
| DBPSK | 30 | 18.5 |
| CQPSK | 30 | 27.6 |
| DQPSK | 33 | 30.5 |
| C8PSK | 34 | 35.2 |
| D8PSK | 40 | 38.4 |

| G3 PHY Performance | |
|--------------------------------------|--|
| Performance tests PASS in LAN lab | <div> <div>100%</div> <div> <div></div> <div></div> </div> <div> <div>PASS</div> <div>FAIL</div> </div> </div> |



EVALKITST8500-1: G3-PLC CEN-B PHY performance summary

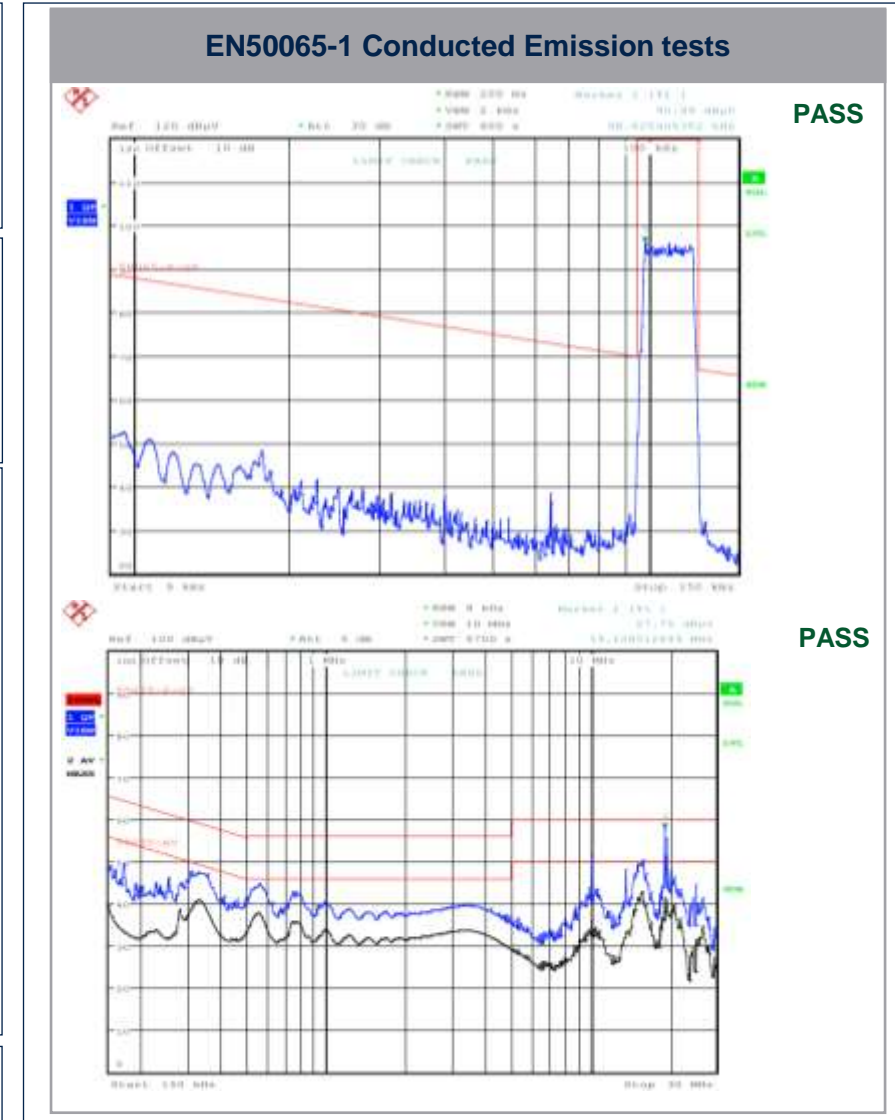
| TX Power (differential RMS-AVG) | |
|------------------------------------|-----------------|
| EN50065 LISN | 2 Ω LISN |
| 126* dB μ V | 122* dB μ V |

* = value measured on LISN RF port + 6 dB

| Power consumption | | |
|-------------------|--------|--------|
| Supply rail | RX | TX |
| 3V3 + 1V1 | 140 mW | 170 mW |
| VCC = 10 V | 10 mW | 400 mW |

| Sensitivity and data rates | | |
|----------------------------|---------------------------------|-------------------------------------|
| Modulation | Sensitivity (dB μ V rms) | PHY Data rate (kbps), IFS < CIFS |
| CROBO | 20 | 1.7 |
| DROBO | 21 | 2 |
| CBPSK | 23 | 7.5 |
| DBPSK | 26 | 8.8 |
| CQPSK | 26 | 13.5 |
| DQPSK | 30 | 15.2 |
| C8PSK | 31 | 18.1 |
| D8PSK | 34 | 19.9 |

| G3 PHY Performance | |
|--------------------------------------|--|
| Performance tests PASS in LAN lab | <div> <div>100%</div> <div> <div></div> <div></div> </div> </div> <div> <div>PASS</div> <div>FAIL</div> </div> |





EVALKITST8500-1: G3-PLC FCC PHY performance summary

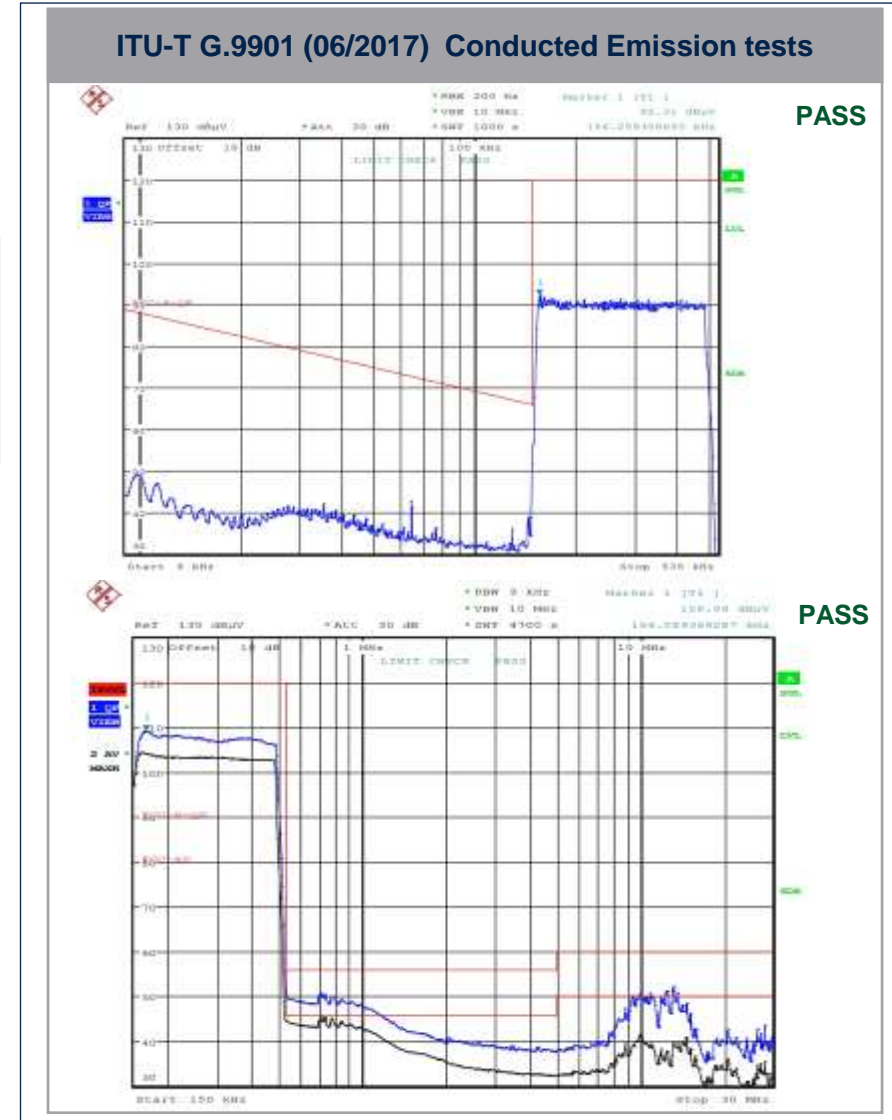
| TX Power (differential RMS-AVG) | |
|------------------------------------|-----------------|
| EN50065 LISN | 2 Ω LISN |
| 127* dB μ V | 120* dB μ V |

* = value measured on LISN RF port + 6 dB

| Power consumption | | |
|-------------------|--------|--------|
| Supply rail | RX | TX |
| 3V3 + 1V1 | 160 mW | 190 mW |
| VCC = 15 V | 15 mW | 600 mW |

| Sensitivity and data rates | | |
|----------------------------|---------------------------------|-------------------------------------|
| Modulation | Sensitivity (dB μ V rms) | PHY Data rate (kbps), IFS < CIFS |
| CROBO | 30 | 31.3 |
| DROBO | 33 | 33.9 |
| CBPSK | 35 | 103 |
| DBPSK | 38 | 112 |
| CQPSK | 38 | 171 |
| DQPSK | 42 | 180 |
| C8PSK | 42 | 211 |
| D8PSK | 45 | 225 |

| G3 PHY Performance | |
|--------------------------------------|--|
| Performance tests PASS in LAN lab | <div> <div>100%</div> <div> <div></div> <div></div> </div> </div> <div> <div>PASS</div> <div>FAIL</div> </div> |





EVALKITST8500-1: power dissipation of STLD1 line driver

- Maximum power dissipation that the Line Driver can sustain without Over-Temperature Protection intervention
- Measured with G3-PLC at PHY level vs. TX duty cycle and coupling configuration

| Line coupling Configuration | R_load | TX duty cycle | Max Signal level @ R_load | Average Line Driver dissipation | Zth_JA estimated |
|-----------------------------|------------|---------------|---------------------------|---------------------------------|------------------|
| Single Ended | 2 Ω | 50% | 1 V rms | 1.8 W | 26 °C/W |
| | | 99.5% | 1 V rms | 3.6 W | |
| Differential | | 50% | 1.5 V rms | 4.5 W | |
| | | 99.5% | 0.5 V rms | 3.7 W | |

EVLKST8500GH868 / 915 **overview**





EVLKST8500GH868 / 915

Connectivity development kit for multiple applications

- ❑ Hybrid PLC&RF connectivity development kit based on ST market-proven and widely used connectivity chipsets ST8500, STLD1 and S2-LP
- ❑ For various PLC (35-500 kHz) and RF (868-915 MHz) frequency bands
- ❑ Modular design with PLC, RF and MCU modules for easy scalability thanks to the STM32 Open Development Environment



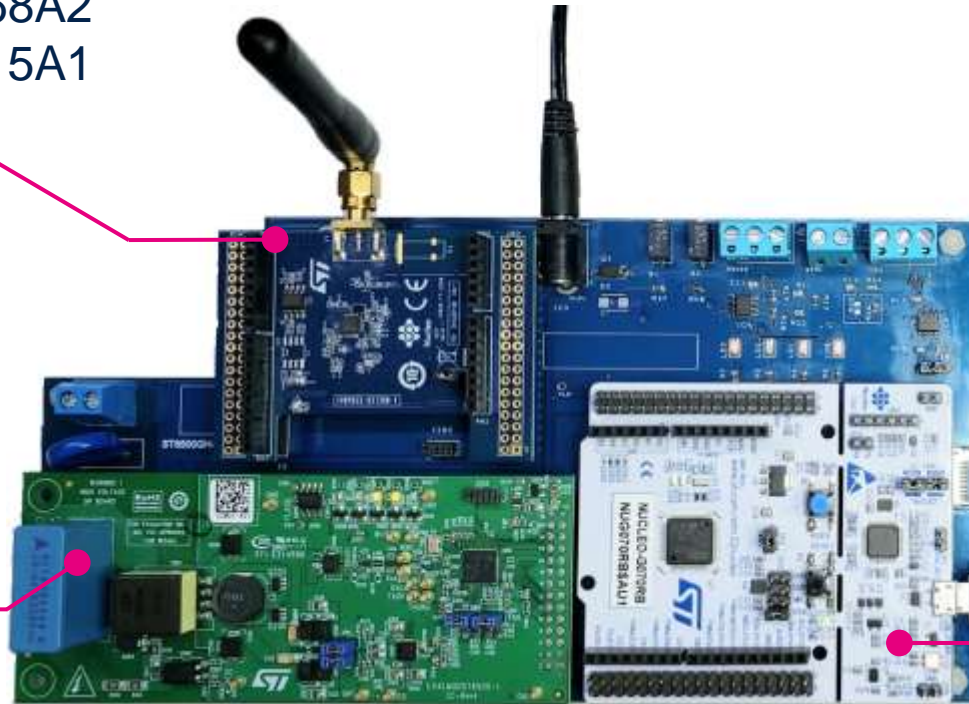
| Order code | Description |
|-----------------|------------------|
| EVLKST8500GH868 | Development kit |
| EVLKST8500GH915 | Development kit |
| STSW-ST8500GH | Software package |

www.st.com/powerline

Features and Scalability

- ☐ X-NUCLEO-S2868A2
- ☐ X-NUCLEO-S2915A1

- ☐ ST8500 Module

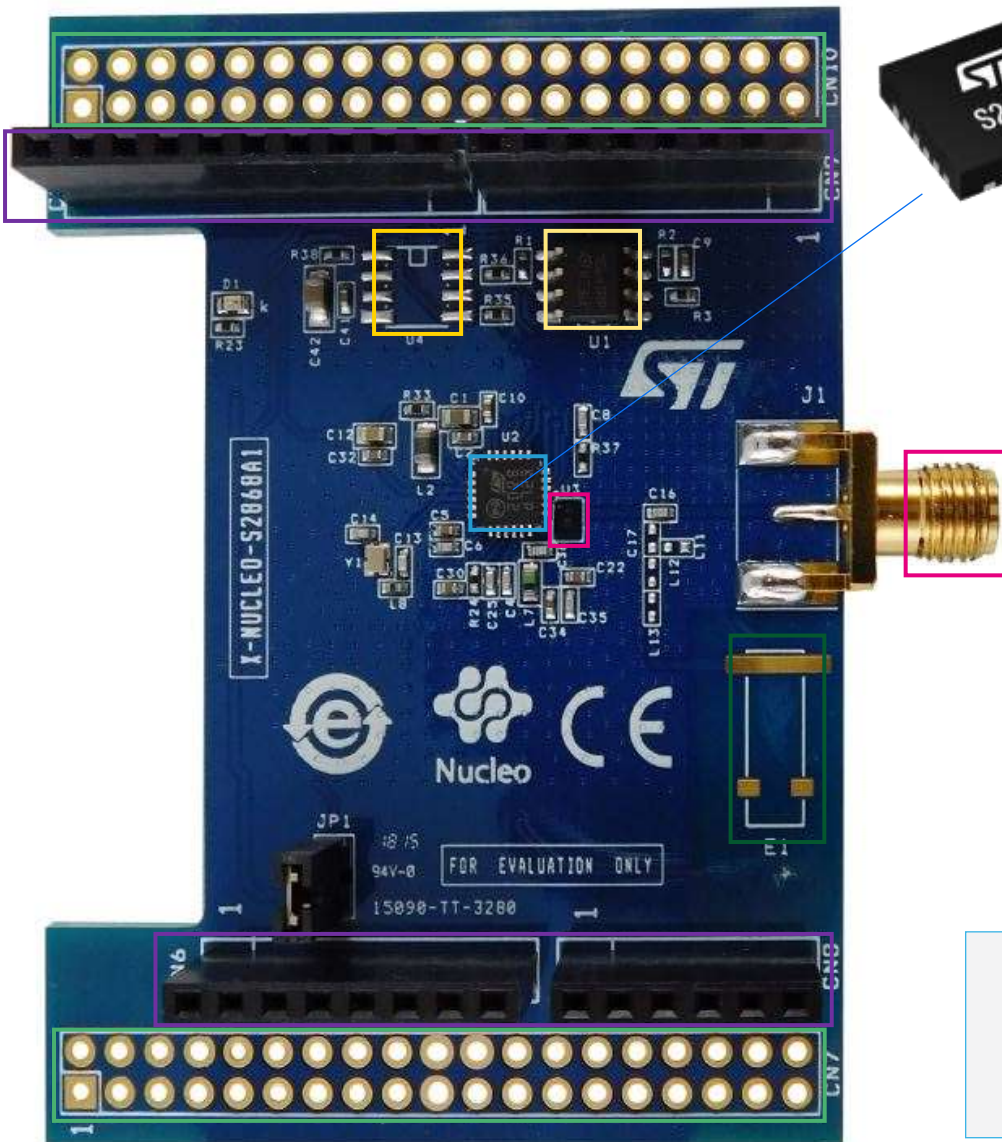


Features:

- ☐ RS485 interface
- ☐ CAN* interface
- ☐ SD Card connector for data logging
- ☐ SPI Flash for firmware storage
- ☐ ST8500 Boot Mode selection through S2
- ☐ STM32 Mode selection through S1

- ☐ NUCLEO-G070RB









S2-LP: X-NUCLEO-S2868A2/915A1



X-NUCLEO HARDWARE:

- X-NUCLEO-S2868A2 (868 MHz)
- X-NUCLEO-S2915A1/STEVAL-FKI915V1 (915 MHz w/ PA)

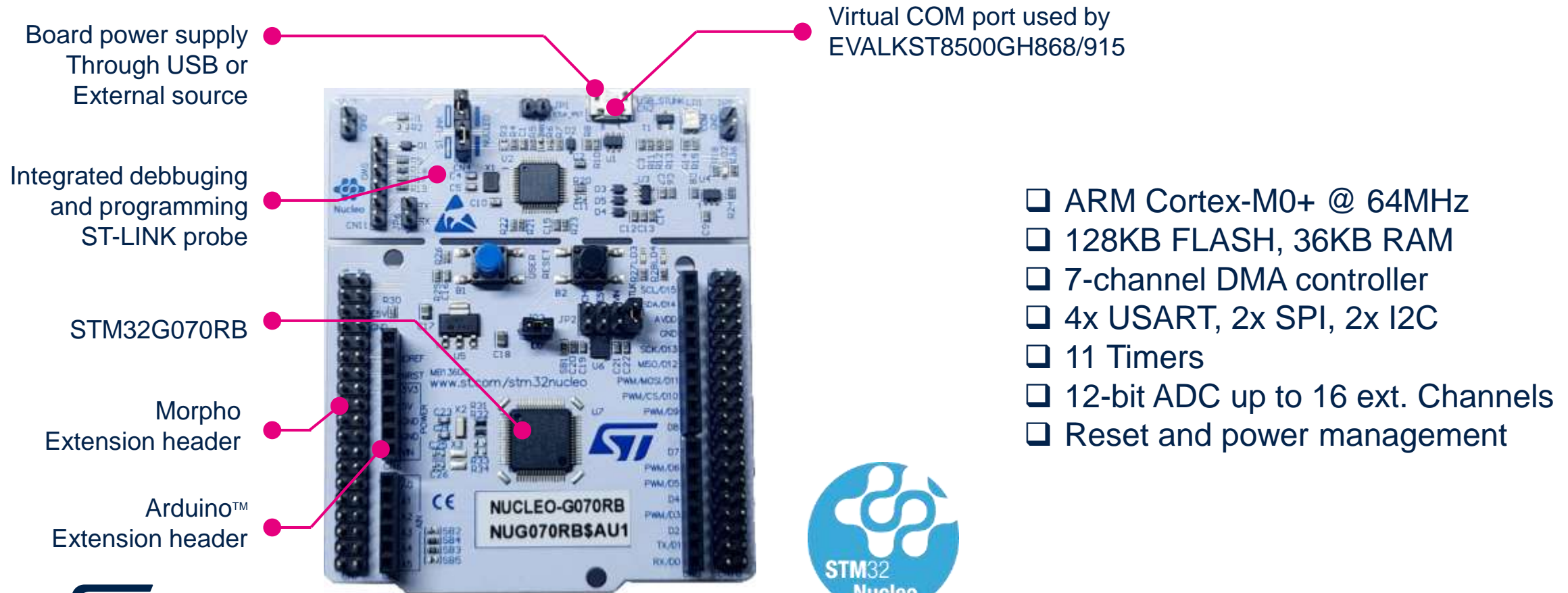


| | | |
|--|---|---|
|  S2-LPQTR |  M95640 |  ST Morpho connector (opt) |
|  BALF-SPI2-01D3 |  STSAFE-A100 (opt) |  Arduino UNO R3 connector |
|  SMA antenna |  SMD antenna (opt) | |



NUCLEO-G070RB

STM32 NUCLEO Development Boards





- [illegible]



ST8500 Hybrid Platform

42

Order Codes

- A complete and scalable platform:

| Order code | Description | Package |
|------------|--------------------------|--------------------|
| ST8500TR | Programmable Modem + AFE | VFQFPN 56 7x7x1 mm |
| STLD1TR | Line Driver | QFN-24L 4x4x1 mm |
| S2-LPQTR | Sub-GHz RF transceiver | QFN-24L 4x4x1 mm |

- Further information and full design support available at:

www.st.com/powerline

www.st.com/spirit



ST8500 evaluation - quick start

ST8500 G3-PLC evaluation package

| | | |
|------------------------------|--------------------|-------------|
| G3_Docs_v12C135FE_4.4.0 | 2/11/2019 10:43 AM | File folder |
| G3_GUI_v12C135FE_4.4.0 | 2/11/2019 10:43 AM | File folder |
| G3_Images_v12C135FE_4.4.0 | 2/11/2019 10:43 AM | File folder |
| G3_Trace_xml_v12C135FE_4.4.0 | 2/11/2019 10:43 AM | File folder |

| Name | Date modified | Type | Size |
|-------------------------------|--------------------|--------------------|----------|
| ST8500_G3-PLC_ReleaseNote.pdf | 12/21/2018 8:50 AM | Adobe Acrobat D... | 832 KB |
| ST-G3-PLC_Solutions_AN.pdf | 12/21/2018 8:56 AM | Adobe Acrobat D... | 4,136 KB |

| Name | Date modified | Type | Size |
|---|--------------------|-----------------------|----------|
| crypto.dll | 12/21/2018 5:49 AM | Application extens... | 2,260 KB |
| log4net.dll | 12/21/2018 5:49 AM | Application extens... | 256 KB |
| Plugin.Common.dll | 12/21/2018 5:49 AM | Application extens... | 112 KB |
| Plugin.Service.Common.dll | 12/21/2018 5:49 AM | Application extens... | 9 KB |
| RibbonControlsLibrary.dll | 12/21/2018 5:49 AM | Application extens... | 341 KB |
| ST_G3.Plugin.dll | 12/21/2018 5:49 AM | Application extens... | 389 KB |
| ST_G3.Plugin.Tools.dll | 12/21/2018 5:49 AM | Application extens... | 21 KB |
| ST_G3.Service.NodeInterface.dll | 12/21/2018 5:49 AM | Application extens... | 335 KB |
| ST_G3.Service.Sniffer.dll | 12/21/2018 5:49 AM | Application extens... | 38 KB |
| ST-PowerLine.log4net.config | 12/21/2018 5:49 AM | XML Configuratio... | 6 KB |
| StPowerLineGui.exe | 12/21/2018 5:49 AM | Application | 321 KB |
| Telerik.Windows.Controls.Data.dll | 12/21/2018 5:49 AM | Application extens... | 642 KB |
| Telerik.Windows.Controls.DataVisualizati... | 12/21/2018 5:49 AM | Application extens... | 1,509 KB |
| Telerik.Windows.Controls.dll | 12/21/2018 5:49 AM | Application extens... | 2,727 KB |
| Telerik.Windows.Controls.Docking.dll | 12/21/2018 5:49 AM | Application extens... | 654 KB |
| Telerik.Windows.Controls.Gauge.dll | 12/21/2018 5:49 AM | Application extens... | 906 KB |
| Telerik.Windows.Controls.GridView.dll | 12/21/2018 5:49 AM | Application extens... | 2,344 KB |
| Telerik.Windows.Controls.Input.dll | 12/21/2018 5:49 AM | Application extens... | 1,224 KB |
| Telerik.Windows.Controls.Navigation.dll | 12/21/2018 5:49 AM | Application extens... | 2,622 KB |
| Telerik.Windows.Controls.RibbonBar.dll | 12/21/2018 5:49 AM | Application extens... | 1,412 KB |
| Telerik.Windows.Controls.RibbonView.dll | 12/21/2018 5:49 AM | Application extens... | 1,265 KB |
| Telerik.Windows.Data.dll | 12/21/2018 5:49 AM | Application extens... | 431 KB |
| Utility.dll | 12/21/2018 5:49 AM | Application extens... | 26 KB |

| Name | Date modified | Type | Size |
|--------------------------------------|--------------------|-----------------|--------|
| ST8500_G3_v12C135FE_4.4.0.bin | 12/21/2018 8:49 AM | BIN File | 162 KB |
| ST8500_G3_v12C135FE_4.4.0.img | 12/21/2018 8:49 AM | Disc Image File | 163 KB |
| STARCOM_G3_RT_FW_r1_0rc1_BA_key0.img | 12/21/2018 8:49 AM | Disc Image File | 118 KB |

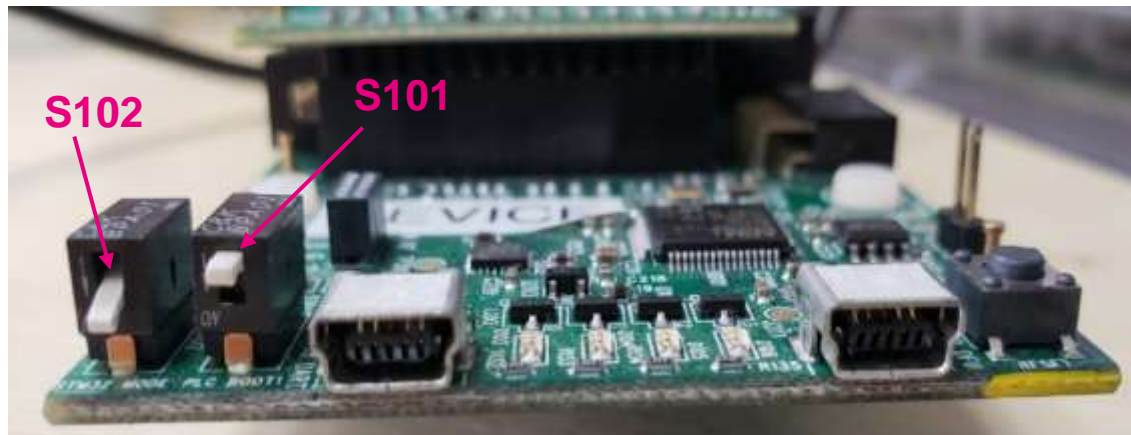
| Name | Date modified | Type |
|--------------|--------------------|-------------|
| trace_parser | 12/21/2018 8:56 AM | File folder |
| trace_xml | 12/21/2018 8:56 AM | File folder |

Platform mode configuration

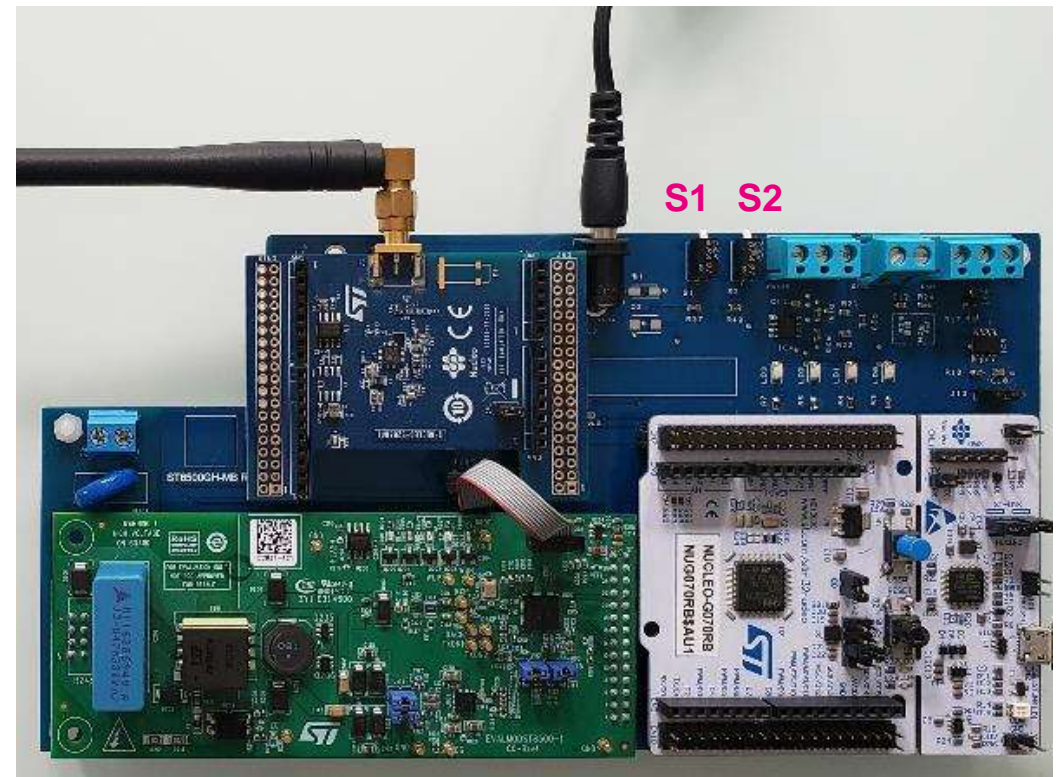
| STM32 Boot mode | EVALKITST8500-1 | EVLKST8500GH868 / 915 |
|-----------------------------|------------------|-----------------------|
| Normal mode (MCU host) | S102 up | S1 up |
| Pass-through mode (PC host) | S102 down | S1 down |

| ST8500 Boot mode | EVALKITST8500-1 | EVLKST8500GH868 / 915 |
|-----------------------------------|-----------------|-----------------------|
| Boot from UART host interface | S101 up | S2 up |
| Boot from ST8500 module SPI FLASH | S101 down | S2 down |

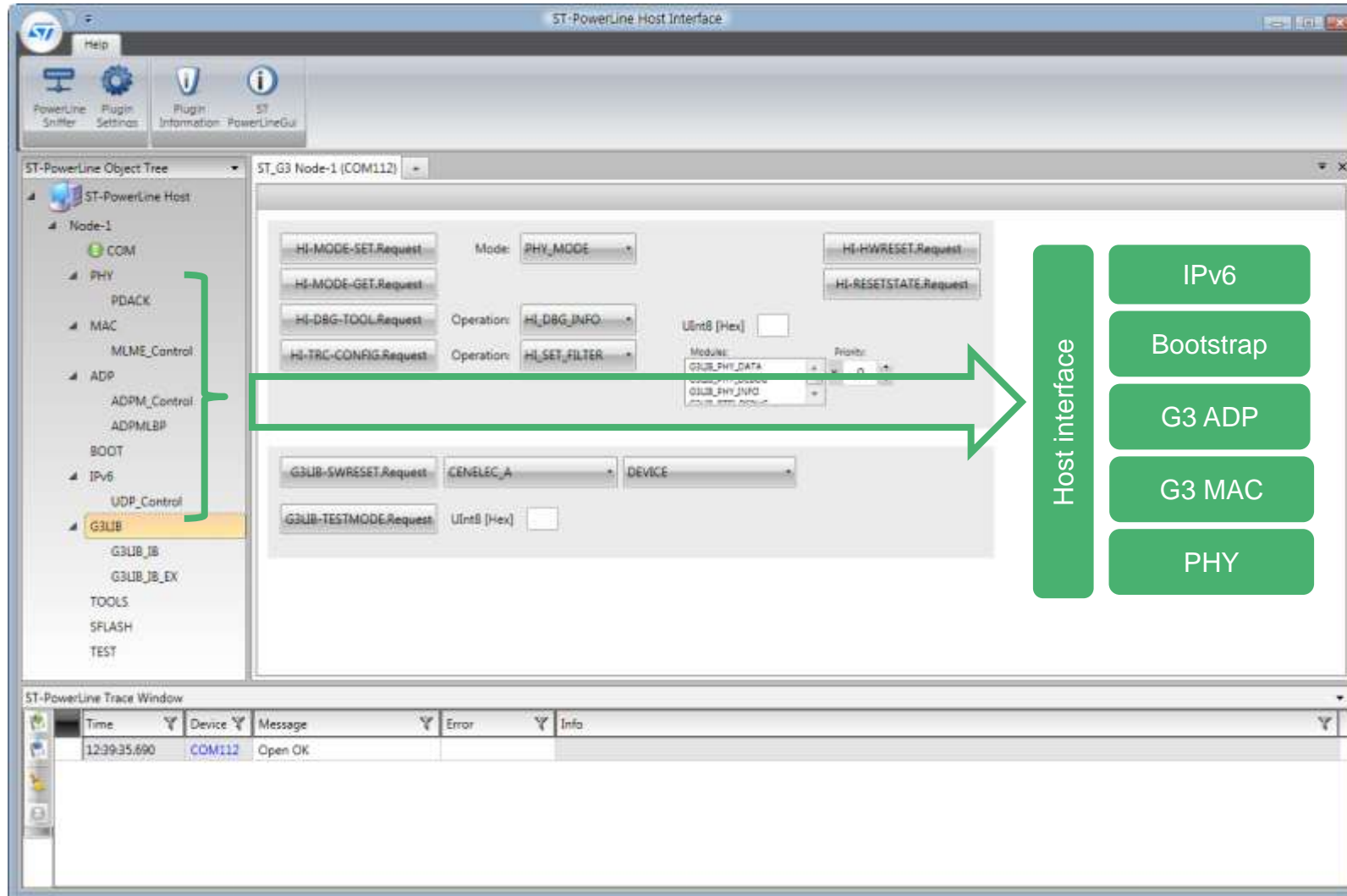
EVALKITST8500-1



EVLKST8500GH868 / 915



G3-PLC GUI: Navigate the node tree



- Explore Node tree:
 - Configuration of the G3 library
 - Read/Write attributes of G3 protocol
- Send/Receive data:
 - PHY layer
 - MAC layer
 - ADP layer
 - IPv6 layer
- Update SPI FLASH
- Power Line Sniffer feature
- Trace window

Physical layer

Communication setup steps

1. Open G3 GUI
2. Add two new nodes
3. Open Standard COM port for both nodes
4. Configure TX node
5. Configure RX node
6. Start reception
7. Start transmission
8. View statistics

G3 GUI – UART connection

The screenshot displays the ST-PowerLine Host Interface software. The interface includes a menu bar with 'Help', a toolbar with 'PowerLine Sniffer', 'Plugin Settings', 'Plugin Information', and 'ST PowerLineGui', and a main workspace. On the left, the 'ST-PowerLine Object Tree' shows a hierarchy for 'Node-1' and 'Node-2', with 'COM' highlighted under 'Node-1'. The main workspace shows the configuration for 'ST_G3 Node-1 (COM26)'. A dialog box titled 'ST G3-PLC Platform Serial Port' is open, showing the 'Port' dropdown set to 'COM26: Silicon Labs Dual CP2105 USB to UART Bridge: Enhanced COM Port (COM26)', the 'Baud' rate set to '115200', and the 'Hi-Sec Key' as 'AB10341145111BC3C12DE8FF11142204'. The 'Open' button is highlighted. The 'ST-PowerLine Trace Window' at the bottom shows a log of events, including 'Open OK' for 'COM40' and 'COM26'.

1. Add new node

2. Select Standard COM Port

3. Open COM Port

| Time | Device | Message | Error | Info |
|--------------|--------|---------|-------|------|
| 17:40:11.711 | COM40 | Open OK | | |
| 17:40:09.155 | COM26 | Open OK | | |

Note: you need to create 2 nodes for communication test

G3 GUI – node initialization

ST-PowerLine Host Interface

TX node

1

2

ST-PowerLine Object Tree

- ST-PowerLine Host
 - Node-1
 - COM
 - PHY
 - MAC
 - ADP
 - BOOT
 - IPv6
 - G3LIB**
 - TOOLS
 - SFLASH
 - TEST
 - Node-2
 - COM
 - PHY

ST_G3 Node-1 (COM26) ST_G3 Node-2 (COM40) +

HI-MODE-SET.Request Mode: PHY_MODE HI-HWRESET.Request

HI-MODE-GET.Request

HI-DBG-TOOL.Request Operation: HI_DBG_INFO UInt8 [Hex]

HI-TRC-CONFIG.Request Operation: HI_SET_FILTER

Modules: G3LIB_PHY_DATA G3LIB_PHY_DEBUG G3LIB_PHY_INFO G3LIB_STL_DEBUG Priority: 0 Save To Sflash:

G3LIB-SWRESET.Request CENELEC_A DEVICE

G3LIB-TESTMODE.Request UInt8 [Hex]

ST-PowerLine Trace Window

| | Time | Device | Message | Error | Info |
|--|--------------|--------|----------------------------|---------|--|
| | 17:42:11.926 | COM26 | <-- G3LIB-SWRESET.Confirm | SUCCESS | Status: G3_SUCCESS |
| | 17:42:11.889 | COM26 | --> G3LIB-SWRESET.Request | | ProtocolVersion: CENELEC A, DeviceType: DEVICE |
| | 17:42:10.021 | COM26 | <-- HOSTIF-MODESET.Confirm | SUCCESS | |
| | 17:42:10.002 | COM26 | --> HOSTIF-MODESET.Request | | PHY_MODE |
| | 17:40:11.711 | COM40 | Open OK | | |
| | 17:40:09.155 | COM26 | Open OK | | |

G3 GUI – TX settings

TX node

TX node: select TX state

Modulation type

Modulation scheme

TX Power (HEX)

Edit packet size, then click on Generate Random

ST-PowerLine Host Interface

ST-PowerLine Object Tree

- ST-PowerLine Host
 - Node-1
 - COM
 - PHY**
 - MAC
 - ADP
 - BOOT
 - IPv6

ST_G3 Node-1 (COM26) ST_G3 Node-2 (COM40) +

PD_DATA.Request

PLMESET_TRX_STATE.Request(RX) PLMESET_TRX_STATE.Request(TX)

Type: Hex Ascii

Length: 0x0080 0128

Random Max Size: 128

Generate Random

ToneMap[2] 23 22 21 20 19 18 17 16 0x00

ToneMap[1] 15 14 13 12 11 10 9 8 0x00

ToneMap[0] 7 6 5 4 3 2 1 0 0x3f

Mod Type: ROBO

Mod Scheme: Differential

DT: NO_RESP

RS Blocks: ONE_RS_BLOCK

TXPower: x 20

ST-PowerLine Trace Window

| Time | Device | Message | Error | Info |
|--------------|--------|-------------------------------|---------|--|
| 17:47:21.646 | COM26 | <-- G3PHY-DATA.Confirm | SUCCESS | Data sent with status: G3_SUCCESS |
| 17:47:21.442 | COM26 | --> G3PHY-DATA.Request | | TxPower: 0x20 - ModType: ROBO - ModScheme: Differential - ToneMap [Hex]: 00 00 3F - Payload [Hex]: ED B0 4A 09 4C 14 3C F6 34 93 71 2: |
| 17:47:17.393 | COM26 | <-- G3PHY-SETTRXSTATE.Confirm | SUCCESS | Result: G3_SUCCESS |
| 17:47:17.390 | COM26 | --> G3PHY-SETTRXSTATE.Reques | | TRX_STATE: TXON_RXOFF |

G3 GUI: TX output power measurements

The screenshot displays the ST-PowerLine Host Interface GUI. The main window is titled "TX node". On the left, the "ST-PowerLine Object Tree" shows a hierarchy: ST-PowerLine Host > Node-1 > COM > PHY (highlighted with a red box). The main panel shows configuration for "ST_G3 Node-1 (COM26)".

Key configuration elements include:

- PD_DATA.Request** button.
- PLMESET_TRX_STATE.Request(RX)** and **PLMESET_TRX_STATE.Request(TX)** buttons.
- Type:** Hex (selected), Ascii.
- Length:** 0x0080, 0128.
- Random Max Size:** 128, with a **Generate Random** button.
- Mod Type:** ROBO.
- Mod Scheme:** Differential.
- DT:** NO_RESP.
- RS Blocks:** ONE_RS_BLOCK.
- TXPower:** x 20.
- ToneMap[2]**, **ToneMap[1]**, and **ToneMap[0]** sections with checkboxes and values (0x00, 0x3f).
- NumPkts** (UInt32 [Hex]): 00000064.
- Delay** (UInt32 [Hex]): 00000064.
- HI_TEST_DR_TX** dropdown menu.
- PHY-DATA-RATE.Request** and **PHY-TEST-GET.Request** buttons.
- PHY-DATA-RATE.Stop** button.

Annotations with arrows point to specific fields:

- Inter-packet delay [ms] in HEX format (0x64 = 100)** points to the Delay field.
- Packet number in HEX format (0x64 = 100)** points to the NumPkts field.
- TX mode** points to the HI_TEST_DR_TX dropdown.
- Start transmission** points to the PHY-DATA-RATE.Request button.
- Set parameters** points to the Mod Type, Mod Scheme, DT, and RS Blocks dropdowns.

G3 GUI – RX setting

The screenshot displays the ST-PowerLine Host Interface GUI. The main window is titled "ST-PowerLine Host Interface" and features a menu bar with "Help". Below the menu bar is a toolbar with icons for "PowerLine Sniffer", "Plugin Settings", "Plugin Information", and "ST PowerLineGui". The central area is divided into two panes. The left pane, titled "ST-PowerLine Object Tree", shows a hierarchical tree of objects: PHY, MAC, ADP (highlighted in yellow), BOOT, IPv6, G3LIB, TOOLS, SFLASH, and TEST. Under "Node-2", the "COM" object is expanded, and "PHY" is highlighted with a red box. The right pane, titled "ST_G3 Node-1 (COM26) ST_G3 Node-2 (COM40) +", displays the configuration for the selected "PHY" object. A callout box labeled "RX node: select RX state" points to the "PLMESET_TRX_STATE.Request(RX)" button. The configuration area includes fields for "PD_DATA.Request", "Type" (Hex/Ascii), "Length" (0x0000/0000), "Random Max Size" (494), and a "Generate Random" button. It also features three "ToneMap" sections (ToneMap[2], ToneMap[1], and ToneMap[0]) with checkboxes and "S/C" buttons. At the bottom, there are fields for "NumPkts" and "Delay" (both set to 00000000), a "HI_TEST_DR_RX" dropdown, and buttons for "PHY-DATA-RATE.Request", "PHY-TEST-GET.Request", and "PHY-DATA-RATE.Stop". The bottom of the window shows the "ST-PowerLine Trace Window" with a table of messages.

| Time | Device | Message | Error | Info |
|--------------|--------|-------------------------------|---------|-----------------------|
| 17:52:07.151 | COM40 | <-- G3PHY-SETTRXSTATE.Confirm | SUCCESS | Result: G3_SUCCESS |
| 17:52:07.147 | COM40 | --> G3PHY-SETTRXSTATE.Request | | TRX_STATE: TXOFF_RXON |

G3 GUI – RX start

ST-PowerLine Host Interface

RX node

ST-PowerLine Object Tree

- PHY
- MAC
- ADP
- BOOT
- IPv6
- G3LIB
- TOOLS
- SFLASH
- TEST
- Node-2
 - COM
 - PHY**
 - MAC
 - ADP
 - BOOT
 - IPv6
 - G3LIB
 - TOOLS
 - SFLASH
 - TEST

ST_G3 Node-1 (COM26) ST_G3 Node-2 (COM40) +

PD_DATA.Request PLMESET_TRX_STATE.Request(RX) PLMESET_TRX_STATE.Request(TX)

Type: **Hex** Ascii Length: 0x0000 0000 Random Max Size: 494 ☐ Generate Random

Mod Type: ROBO Mod Scheme: Differential DT: NO_RESP RS Blocks: ONE_RS_BLOCK TXPower: x 20

ToneMap[2] 23 22 21 20 19 18 17 16 S C 0x00
ToneMap[1] 15 14 13 12 11 10 9 8 S C 0x00
ToneMap[0] 7 6 5 4 3 2 1 0 S C 0x3f

NumPkts UInt32 [Hex] 00000000 Delay UInt32 [Hex] 00000000 HI_TEST_DR_RX PHY-DATA-RATE.Request PHY-TEST-GET.Request PHY-DATA-RATE.Stop

ST-PowerLine Trace Window

| Time | Device | Message | Error | Info |
|--------------|--------|-------------------------------|---------|------|
| 17:53:34.359 | COM40 | <-- HOSTIF-TESTSET.Confirm | SUCCESS | |
| 17:53:34.351 | COM40 | --> HOSTIF-TESTSET.Request | | |
| 17:52:07.151 | COM40 | <-- G3PHY-SETTRXSTATE.Confirm | SUCCESS | |
| 17:52:07.147 | COM40 | --> G3PHY-SETTRXSTATE.Reques | | |

RX test mode Start RX test

G3 GUI: TX start

The screenshot displays the ST-PowerLine Host Interface GUI. The main window is titled "TX node". On the left, the "ST-PowerLine Object Tree" shows a hierarchy: ST-PowerLine Host > Node-1 > COM > PHY (highlighted with a red box). The main panel shows configuration for "ST_G3 Node-1 (COM26)".

Key configuration areas include:

- PD_DATA.Request**: Type (Hex/Ascii), Length (0x0080/0128), Random Max Size (128), and a **Generate Random** button.
- PLMESET_TRX_STATE.Request(RX)** and **PLMESET_TRX_STATE.Request(TX)** buttons.
- Mod Type**: ROBO (dropdown).
- Mod Scheme**: Differential (dropdown).
- DT**: NO_RESP (dropdown).
- RS Blocks**: ONE_RS_BLOCK (dropdown).
- TXPower**: 20 (dropdown).
- ToneMap**: Three sets of checkboxes for ToneMap[2], ToneMap[1], and ToneMap[0].
- NumPkts**: UInt32 [Hex] 00000064.
- Delay**: UInt32 [Hex] 00000064.
- HI_TEST_DR_TX** dropdown menu.
- PHY-DATA-RATE.Request** and **PHY-DATA-RATE.Stop** buttons.
- PHY-TEST-GET.Request** button.

Annotations with arrows point to specific fields:

- Inter-packet delay [ms] in HEX format (0x64 = 100)** points to the Delay field.
- Packet number in HEX format (0x64 = 100)** points to the NumPkts field.
- TX mode** points to the HI_TEST_DR_TX dropdown.
- Start transmission** points to the PHY-DATA-RATE.Request button.
- Set parameters** points to the Mod Type, Mod Scheme, DT, RS Blocks, and TXPower dropdowns.

G3 GUI – TX statistics

Once the transmission has finished, you can see the statistics related to TX packets

The screenshot displays the ST-PowerLine Host Interface GUI. The main window is titled "TX node". On the left, the "ST-PowerLine Object Tree" shows a hierarchy of components: PHY, MAC, ADP, BOOT, IPv6, G3LIB, TOOLS, SFLASH, TEST, and Node-2. Under Node-2, the "COM" component is selected, and its "PHY" sub-component is highlighted with a red box. The main configuration area shows settings for "ST_G3 Node-1 (COM26)" and "ST_G3 Node-2 (COM40)". The "PD_DATA.Request" section displays a hex string and a length of 0x0080. The "PLMESET_TRX_STATE.Request(RX)" and "PLMESET_TRX_STATE.Request(TX)" sections show various configuration parameters like Mod Type (ROBO), Mod Scheme (Differential), DT (NO_RESP), RS Blocks (ONE_RS_BLOCK), and TXPower (20). The "PHY-TEST-GET.Request" button is highlighted with a blue box and labeled "Get TX statistics". The "ST-PowerLine Trace Window" at the bottom shows a list of messages. A green box highlights the "100 transmitted packets" statistic in the trace window.

ST-PowerLine Host Interface

TX node

ST-PowerLine Object Tree

- PHY
- MAC
- ADP
- BOOT
- IPv6
- G3LIB
- TOOLS
- SFLASH
- TEST
- Node-2
 - COM
 - PHY
 - MAC
 - ADP
 - BOOT
 - IPv6
 - G3LIB
 - TOOLS
 - SFLASH
 - TEST

ST_G3 Node-1 (COM26) ST_G3 Node-2 (COM40)

PD_DATA.Request

Type: Hex Ascii

Length: 0x0080

Random Max Size: 128

Generate Random

PLMESET_TRX_STATE.Request(RX)

PLMESET_TRX_STATE.Request(TX)

Mod Type: ROBO

Mod Scheme: Differential

DT: NO_RESP

RS Blocks: ONE_RS_BLOCK

TXPower: 20

ToneMap[2]

ToneMap[1]

ToneMap[0]

NumPkts: 00000064

Delay: 00000064

HI_TEST_DR_TX

PHY-DATA-RATE.Request

PHY-DATA-RATE.Stop

PHY-TEST-GET.Request

Get TX statistics

ST-PowerLine Trace Window

| Time | Device | Message | Error | Info |
|--------------|--------|----------------------------|---------|---|
| 17:55:39.311 | COM26 | <-- HOSTIF-TESTGET.Confirm | SUCCESS | TestType: HI_TEST_DATARATE - NbPackets: 0x00000064 100 - NbBytes: 0x00003200 12800 - Duration: 0x00006F62 28514 - Rate[kbit/sec]: 3.5 |
| 17:55:39.305 | COM26 | --> HOSTIF-TESTGET.Request | | |
| 17:55:21.452 | COM40 | <-- G3PHY-DATA.Indication | SUCCESS | ModType: ROBO - ModScheme: Differential - Lqi: 0xED - PayloadLen: 128 - Payload: 000000004C143CF6349371230FF5995C4F08ED01F733E0 |
| 17:55:21.167 | COM40 | <-- G3PHY-DATA.Indication | SUCCESS | ModType: ROBO - ModScheme: Differential - Lqi: 0xED - PayloadLen: 128 - Payload: 010000004C143CF6349371230FF5995C4F08ED01F733E0 |
| 17:55:20.889 | COM40 | <-- G3PHY-DATA.Indication | SUCCESS | ModType: ROBO - ModScheme: Differential - Lqi: 0xED - PayloadLen: 128 - Payload: 020000004C143CF6349371230FF5995C4F08ED01F733E0 |
| 17:55:20.606 | COM40 | <-- G3PHY-DATA.Indication | SUCCESS | ModType: ROBO - ModScheme: Differential - Lqi: 0xED - PayloadLen: 128 - Payload: 030000004C143CF6349371230FF5995C4F08ED01F733E0 |

100 transmitted packets

G3 GUI – RX statistics

Once the transmission has finished, you can see the statistics related to RX packets

The screenshot displays the ST-PowerLine Host Interface GUI. The main window is titled "RX node". On the left, the "ST-PowerLine Object Tree" shows a hierarchy of components: PHY, MAC, ADP, BOOT, IPv6, G3LIB, TOOLS, SFLASH, TEST, and Node-2. Under Node-2, the "COM" component is selected, and the "PHY" sub-component is highlighted with a red box. The main panel shows various configuration options for the RX node, including "PD_DATA.Request", "PLMESET_TRX_STATE.Request(RX)", and "PLMESET_TRX_STATE.Request(TX)". The "Type" is set to "Hex", and the "Length" is 0x0000. The "Random Max Size" is 494. The "Mod Type" is "ROBO", "Mod Scheme" is "Differential", "DT" is "NO_RESP", and "RS Blocks" is "ONE_RS_BLOCK". The "TXPower" is 20. The "ToneMap" section shows three maps: ToneMap[2], ToneMap[1], and ToneMap[0]. The "NumPkts" is 00000000, and the "Delay" is 00000000. The "HI_TEST_DR_RX" dropdown is set to "PHY-TEST-GET.Request", which is highlighted with a red box. A callout box with the text "Get RX statistics" points to this button. The bottom section shows the "ST-PowerLine Trace Window" with a table of messages. The table has columns for Time, Device, Message, Error, and Info. The messages show a sequence of events: 17:57:58.639, COM40, <-- HOSTIF-TESTGET.Confirm, SUCCESS, TestType: HI_TEST_DATARATE - NbPackets: 0x00000064 100 - NbBytes: 0x00003200 12800 - Duration: 0x00006E45 28229 - Rate[kbit/sec]: 3.5; 17:57:58.634, COM40, --> HOSTIF-TESTGET.Request; 17:55:39.311, COM26, <-- HOSTIF-TESTGET.Confirm, SUCCESS, TestType: HI_TEST_DATARATE - NbPackets: 0x00000064 100 - NbBytes: 0x00003200 12800 - Duration: 0x00006F62 28514 - Rate[kbit/sec]: 3.5; 17:55:39.305, COM26, --> HOSTIF-TESTGET.Request; 17:55:21.452, COM40, <-- G3PHY-DATA.Indication, SUCCESS, ModTvoe. A green box with the text "100 received packets" points to the "NbPackets" field in the first message.

| Time | Device | Message | Error | Info |
|--------------|--------|----------------------------|---------|---|
| 17:57:58.639 | COM40 | <-- HOSTIF-TESTGET.Confirm | SUCCESS | TestType: HI_TEST_DATARATE - NbPackets: 0x00000064 100 - NbBytes: 0x00003200 12800 - Duration: 0x00006E45 28229 - Rate[kbit/sec]: 3.5 |
| 17:57:58.634 | COM40 | --> HOSTIF-TESTGET.Request | | |
| 17:55:39.311 | COM26 | <-- HOSTIF-TESTGET.Confirm | SUCCESS | TestType: HI_TEST_DATARATE - NbPackets: 0x00000064 100 - NbBytes: 0x00003200 12800 - Duration: 0x00006F62 28514 - Rate[kbit/sec]: 3.5 |
| 17:55:39.305 | COM26 | --> HOSTIF-TESTGET.Request | | |
| 17:55:21.452 | COM40 | <-- G3PHY-DATA.Indication | SUCCESS | ModTvoe |

IPv6 layer

Communication setup steps

1. Open G3 GUI
2. Add two new nodes
3. Open Standard COM port for both nodes
4. Set one node as COORD (COM11 in this example) and the other as DEVICE (COM9 in this example), in IPv6 boot mode. Note that it's necessary to configure the Coordinator first
5. Get MAC short address for both COORD and DEVICE
6. Configure UDP unicast connection for both COORD and DEVICE
7. Start communication from COORD to DEVICE
8. Start communication from DEVICE to COORD

IPv6 boot mode configuration: Coordinator

ST-PowerLine Object Tree

- COM
- PHY
- PDACK
- MAC
- ADP
- BOOT
- IPv6
- UDP_Control
- G3LIB**
- G3LIB_IB
- G3LIB_IB_EX
- TOOLS
- SFLASH
- TEST

ST_G3 Node-1 (COM11) ST_G3 Node-2 (COM9) +

HI-MODE-SET.Request Mode: IPV6_BOOT_MOI

HI-MODE-GET.Request

HI-DBG-TOOL.Request Operation: HI_DBG_INFO

HI-TRC-CONFIG.Request Operation: HI_SET_FILTER

HI-HWRESET.Request

HI-RESETSTATE.Request

UInt8 [Hex]

Modules: G3LIB_PHY_DATA, G3LIB_PHY_DEBUG, G3LIB_PHY_INFO, G3LIB_PHY_DEBUG

Priority: 0

Save To Sflash: []

G3LIB-SWRESET.Request CENELEC_A COORD

G3LIB-TESTMODE.Request UInt8 [Hex]

| | | | | |
|--------------|-------|------------------------------|---------|---|
| 13:05:13.431 | COM11 | <-- G3BOOT-SRV-START.Confirm | SUCCESS | Status: G3_SUCCESS |
| 13:04:53.374 | COM11 | <-- G3LIB-SWRESET.Confirm | SUCCESS | Status: G3_SUCCESS |
| 13:04:51.958 | COM11 | --> G3LIB-SWRESET.Request | | ProtocolVersion: CENELEC A, DeviceType: COORD |
| 13:04:40.381 | COM11 | <-- HOSTIF-MODESET.Confirm | SUCCESS | |
| 13:04:40.349 | COM11 | --> HOSTIF-MODESET.Request | | IPV6_BOOT_MODE |

IPv6 boot mode configuration: Device

| | | | | |
|--------------|-------|-------------------------------|---------|---|
| 13:07:44.847 | COM9 | <-- G3BOOT-DEV-START.Confirm | SUCCESS | Status: G3_SUCCESS - NetworkAddress: 0x0002 - PANId: 0x781D |
| 13:07:44.743 | COM11 | <-- G3BOOT-SRV-JOIN.Indicatio | SUCCESS | ExtendedAddress: 0x0080E1FFFE4BA618 - ShortAddress: 0x0002 |
| 13:07:43.391 | COM11 | <-- G3BOOT-SRV-GETPSK.Indica | SUCCESS | ExtendedAddress: 0x0080E1FFFE4BA618 - IdP: 0x0080E1FFFE4BA618 |
| 13:07:39.977 | COM9 | <-- G3BOOT-DEV-PANSORT.Indi | SUCCESS | PANCount: 1 |
| 13:07:19.919 | COM9 | <-- G3LIB-SWRESET.Confirm | SUCCESS | Status: G3_SUCCESS |
| 13:07:19.891 | COM9 | --> G3LIB-SWRESET.Request | | ProtocolVersion: CENELEC A, DeviceType: DEVICE |
| 13:07:14.690 | COM9 | <-- HOSTIF-MODESET.Confirm | SUCCESS | |
| 13:07:14.676 | COM9 | --> HOSTIF-MODESET.Request | | IPV6_BOOT_MODE |

MAC short address: Coordinator

ST-PowerLine Object Tree

- MAC
- ADP
- BOOT
- IPv6
- G3LIB
 - G3LIB_IB**
 - G3LIB_IB_EX
- TOOLS

ST-G3 Node-1 (COM11) ST-G3 Node-2 (COM9) +

G3LIB-GET.Request macShortAddress Index: 0x 0000 ☐ MultipleEntries G3LIB-GETAll.Request

G3LIB-SET.Request adpActiveKeyIndex Value: 0x 0000 G3LIB Start Logging

UInt8 [Hex] G3LIB Load Config

Select macShortAddress, then click on G3LIB-GET.Request

ST-PowerLine Trace Window

| | Time | Device | Message | Error | Info |
|--|--------------|--------|-----------------------|---------|---|
| | 14:10:42.123 | COM11 | <-- G3LIB-GET.Confirm | SUCCESS | Status: G3_SUCCESS - AttributeName: macShortAddress - Index: 0x0000 - Value: 0x0000 |
| | 14:10:42.115 | COM11 | --> G3LIB-GET.Request | | ID: 0x00000053 macShortAddress - Index: 0x0000 |

Coordinator MAC
short address

MAC short address: Device

ST-PowerLine Object Tree

- PHY
- MAC
- ADP
- BOOT
- IPv6
- G3LIB
 - G3LIB_IB**
 - G3LIB_IB_EX

ST-G3 Node-1 (COM11) ST-G3 Node-2 (COM9) +

G3LIB-GET.Request macShortAddress Index: 0x 0000 ☐ MultipleEntries G3LIB-GETAll.Request

G3LIB-SET.Request adpActiveKeyIndex Value: 0x 0002 G3LIB Start Logging

UInt8 [Hex] G3LIB Load Config

Select macShortAddress, then click on G3LIB-GET.Request

ST-PowerLine Trace Window

| | Time | Device | Message | Error | Info |
|---|--------------|--------|-----------------------|---------|---|
| + | 14:12:29.065 | COM9 | <-- G3LIB-GET.Confirm | SUCCESS | Status: G3_SUCCESS - AttributeName: macShortAddress - Index: 0x0000 - Value: 0x0002 |
| + | 14:12:29.060 | COM9 | --> G3LIB-GET.Request | | ID: 0x00000053 macShortAddress - Index: 0x0000 |
| + | 14:10:42.123 | COM11 | <-- G3LIB-GET.Confirm | SUCCESS | Status: G3_SUCCESS - AttributeName: macShortAddress - Index: 0x0000 - Value: 0x0000 |

Device MAC short address

Unicast connection settings: Coordinator

The screenshot displays the ST-PowerLine GUI interface. On the left is the 'ST-PowerLine Object Tree' with a sidebar containing 'MAC', 'ADP', 'BOOT', 'IPv6', 'UDP_Control', 'G3LIB', 'G3LIB_IB', 'G3LIB_IB_EX', 'TOOLS' (highlighted with a pink box), 'SFLASH', and 'TEST'. The main area shows two tabs: 'ST_G3 Node-1 (COM11)' and 'ST_G3 Node-2 (COM9)'. The 'IPv6 Packet Generator' section is active, showing settings for 'Source Address' and 'Destination Address'. Both are set to 'Type: LINK_LOCAL_UNICAST_ADDRESS'. The 'Source Address' section includes 'macPanId: UInt16 [Hex]' (781D), 'macShortAddress: UInt16 [Hex]' (0000), and 'Interface ID: UInt64 [Hex]' (781D00FFFE000000). A box labeled 'Coordinator' points to the 'macShortAddress' field. Below these fields is a text box containing the remote address: 'FE80000000000000781D00FFFE000000'. The 'Destination Address' section includes 'macPanId: UInt16 [Hex]' (781D), 'macShortAddress: UInt16 [Hex]' (0002), and 'Interface ID: UInt64 [Hex]' (781D00FFFE000002). A box labeled 'Device' points to the 'macShortAddress' field. Below these fields is a text box containing the remote address: 'FE80000000000000781D00FFFE000002'.

| Field | Coordinator (Node-1) | Device (Node-2) |
|-------------------------------|----------------------------------|----------------------------------|
| Type | LINK_LOCAL_UNICAST_ADDRESS | LINK_LOCAL_UNICAST_ADDRESS |
| macPanId: UInt16 [Hex] | 781D | 781D |
| macShortAddress: UInt16 [Hex] | 0000 | 0002 |
| Interface ID: UInt64 [Hex] | 781D00FFFE000000 | 781D00FFFE000002 |
| Remote Address | FE80000000000000781D00FFFE000000 | FE80000000000000781D00FFFE000002 |

Remote Address for Device, to be copied into the related UDP_Control menu (Node-2)

Remote Address for Coordinator, to be copied into the related UDP_Control menu (Node-1)

UDP settings: Coordinator

ST-PowerLine Object Tree

- ST-PowerLine Host
 - Node-1
 - COM
 - PHY
 - MAC
 - ADP
 - BOOT
 - IPv6
 - UDP_Control
 - G3LIB

ST_G3 Node-1 (COM11) ST_G3 Node-2 (COM9) +

1 Set parameters

2 Click on UDP-CONN-SET.Request

UDP-CONN-SET.Request

ConnID: 1

RemoteAddress UInt128 [Hex]: FE80000000000000781D00FFFE000002

RemotePort UInt16 [Hex]: 2222

LocalPort UInt16 [Hex]: 1111

UDP-CONN-GET.Request

ConnID: 0

ST-PowerLine Trace Window

| | Time | Device | Message | Error | Info |
|--|--------------|--------|----------------------------|---------|--|
| | 14:23:05.261 | COM11 | <-- G3UDP-CONNECTION-SET.C | SUCCESS | Status: G3_SUCCESS |
| | 14:23:05.256 | COM11 | --> G3UDP-CONNECTION-SET.R | | ConnId: 1 RemoteAddress: 0xFE80000000000000781D00FFFE000002 RemotePort: 0x2222 LocalPort: 0x1111 |

UDP settings: Device

ST-PowerLine Object Tree

- ST-PowerLine Host
 - Node-1
 - COM
 - PHY
 - MAC
 - ADP
 - BOOT
 - IPv6
 - UDP_Control
 - G3LIB

ST-PowerLine Trace Window

| | Time | Device | Message | Error | Info |
|---|--------------|--------|----------------------------|---------|--|
| + | 14:24:36.566 | COM9 | <-- G3UDP-CONNECTION-SET.C | SUCCESS | Status: G3_SUCCESS |
| + | 14:24:36.560 | COM9 | --> G3UDP-CONNECTION-SET.R | | ConnId: 2 RemoteAddress: 0xFE80000000000000781D00FFFE000000 RemotePort: 0x1111 LocalPort: 0x2222 |
| + | 14:23:05.261 | COM11 | <-- G3UDP-CONNECTION-SET.C | SUCCESS | Status: G3_SUCCESS |
| + | 14:23:05.256 | COM11 | --> G3UDP-CONNECTION-SET.R | | ConnId: 1 RemoteAddress: 0xFE80000000000000781D00FFFE000002 RemotePort: 0x2222 LocalPort: 0x1111 |

Coordinator vs Device

ST-PowerLine Object Tree

- ST-PowerLine Host
 - Node-1
 - COM
 - PHY
 - MAC
 - ADP
 - BOOT
 - IPv6
 - UDP_Control

ST_G3 Node-1 (COM11) ST_G3 Node-2 (COM9) +

3

DATA.Request

UDP

UDP_NORMAL_ID

DestAddress UInt128 [Hex] 00000000000000000000000000000000

Type: Hex Ascii

Length: 0x04B0 1200

Random Max Size: 1200

Generate Random

1

Same as RemotePort

Handle UInt8 [Hex] 00

DestPort UInt16 [Hex] 2222

ConnID 1

Set parameters

2

Edit packet size, then click on Generate Random

ST-PowerLine Trace Window

| | Time | Device | Message | Error | Info |
|--|--------------|--------|---------------------------|---------|--|
| | 14:25:30.869 | COM9 | <-- G3UDP-DATA.Indication | SUCCESS | SrcAddr: FE80000000000000781D00FFFE000000 - SrcPort: 1111 - DstAddr: FE80000000000000781D00FFFE000002 - DstPort: 2222 - Data: |
| | 14:25:30.724 | COM11 | <-- G3UDP-DATA.Confirm | SUCCESS | Status: G3_SUCCESS Handle: 00 |
| | 14:25:30.116 | COM11 | --> G3UDP-DATA.Request | | Data 0x6646D49CB22919F781F147E9654926E3B203C083CF0CD34F4238ABDB762D07921D906D5549C6A6CE4B07299DAA188CB1E164ED05B449C75A73845A7A7E3D8154E9B5CCD5DCD199EC5CF237C8E335A429ACF9FA113F02DDD3C813E1C46C2C4F0E86D5B3F44CB7D510CB01A8C212FE773DE030CD84426F14E7D8F80CC9EFD47F2FA229420D82AFDDF524EA453D591BC1CA9CA4E43C5ECBCB16C0CB1C54AB0C20F682781FE8BC69BA3052D8605729D78EBD36412D4AEF43D0D75D2B4DB693894918CA4FBBE0FBD90D32E9B4E9866B74ECE83D5F1D69DFD5063FA7488B901B039DC98E478DDA1CADC15D34FA613B594A6BE83E6479336BE038F4487C38B24D7D17E51620F723E612CC909DC03 |

G3UDP Data Confirm to Coordinator (COM11) and G3 UDP Data Indication on Device (COM9)

Device vs Coordinator

The screenshot displays the ST-PowerLine GUI interface. The top toolbar includes icons for PowerLine Sniffer, Plugin Settings, Plugin Information, and ST PowerLineGui. The main window is divided into two panes. The left pane, titled 'ST-PowerLine Object Tree', shows a hierarchical view of the protocol stack: COM, PHY, MAC, ADP, BOOT, IPv6 (highlighted with a pink box), UDP_Control, G3LIB, G3LIB_IB, and G3LIB_IB_EX. The right pane shows the configuration for 'ST_G3 Node-1 (COM11)' and 'ST_G3 Node-2 (COM9)'. The configuration fields are as follows:

- DATA.Request**: A button labeled '3' with an arrow pointing to it.
- UDP**: A dropdown menu with an arrow pointing to it.
- UDP_NORMAL_ID**: A dropdown menu with an arrow pointing to it.
- DestAddress**: A text field containing 'FE80000000000000781D00FFFE000000'.
- Type**: A dropdown menu set to 'Hex'.
- Length**: A text field containing '0x04B0' and '1200'.
- Random Max Size**: A text field containing '1200'.
- Generate Random**: A button.
- Handle**: A text field containing '00'.
- DestPort**: A text field containing '1111'.
- ConnID**: A text field containing '2'.

Annotations and callouts:

- 1**: A box labeled 'Same as RemotePort' with an arrow pointing to the DestPort field.
- 2**: A box labeled 'Edit packet size, then click on Generate Random' with an arrow pointing to the Length field.
- 3**: A box labeled 'Set parameters' with an arrow pointing to the DATA.Request button.

The bottom pane, titled 'ST-PowerLine Trace Window', shows a table of network events:

| Time | Device | Message | Error | Info |
|--------------|--------|---------------------------|---------|---|
| 14:30:48.795 | COM11 | <-- G3UDP-DATA.Indication | SUCCESS | SrcAddr: FE80000000000000781D00FFFE000002 - SrcPort: 2222 - DstAddr: FE80000000000000781D00FFFE000000 - DstPort: 1111 - Data: |
| 14:30:48.691 | COM9 | <-- G3UDP-DATA.Confirm | SUCCESS | Status: G3_SUCCESS Handle: 00 |
| 14:30:48.073 | COM9 | --> G3UDP-DATA.Request | | Data 0x53A37D47CD143911361BDA44465B33CC0C6D96D1ACA5152A4B1A652CD298F308BBF3BA1A48BC21BEB813F330ABC8C2774F5 |

G3UDP Data Confirm to Device (COM9) and G3 UDP Data Indication on Coordinator (COM11)

Thank you