

Connected smart lighting



Intelligent Mesh Based Lighting



Lighting with Power Over Ethernet



**More on PoE, Power Conversion
and Lighting**



More on Low Power Wireless



Intelligent mesh based lighting

Solutions for wireless mesh lighting

Highlights

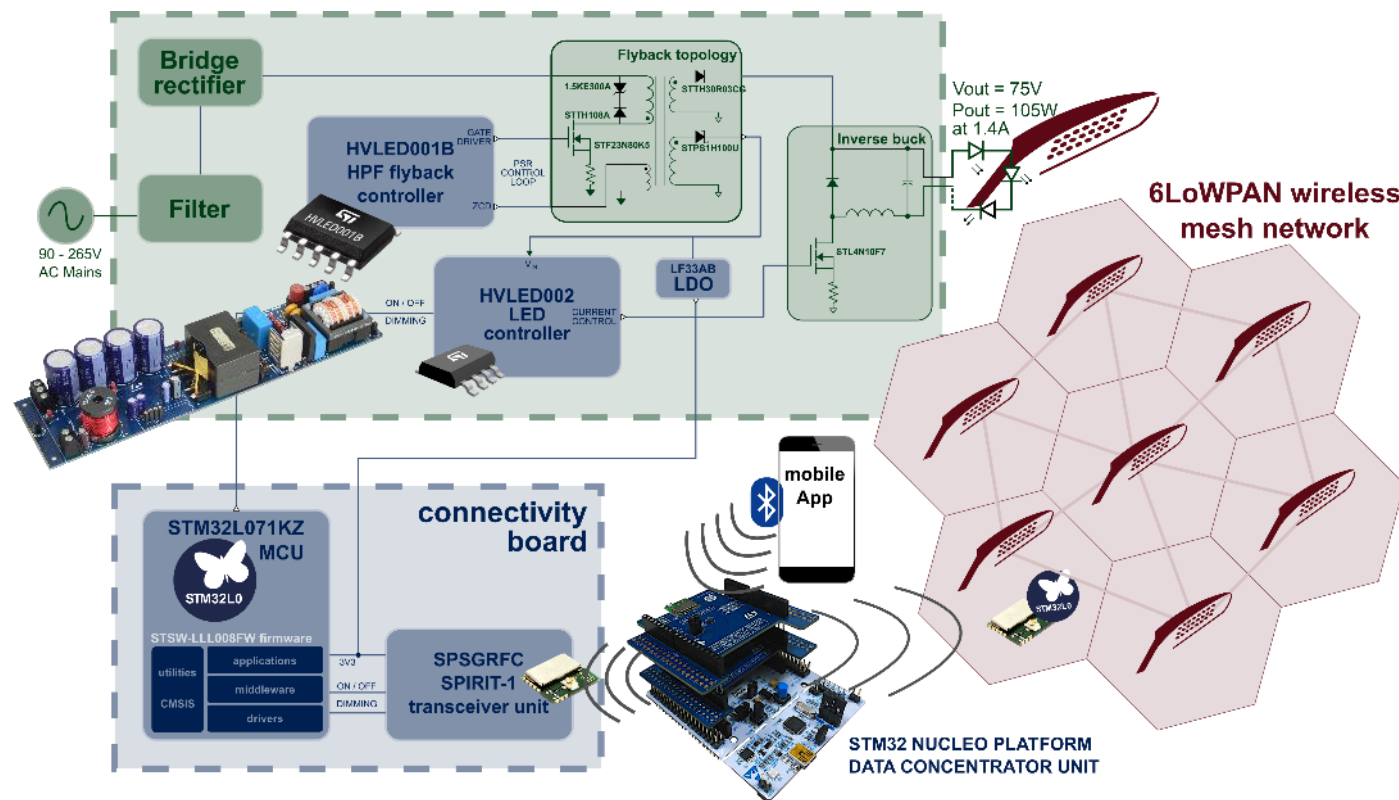
- Energy conversion with high power factor
- Precise constant current lighting control
- Long range sub-1GHz wireless connectivity



Solution for intelligent mesh lighting

HVLED + SPIRIT1 = complete mesh lighting solution

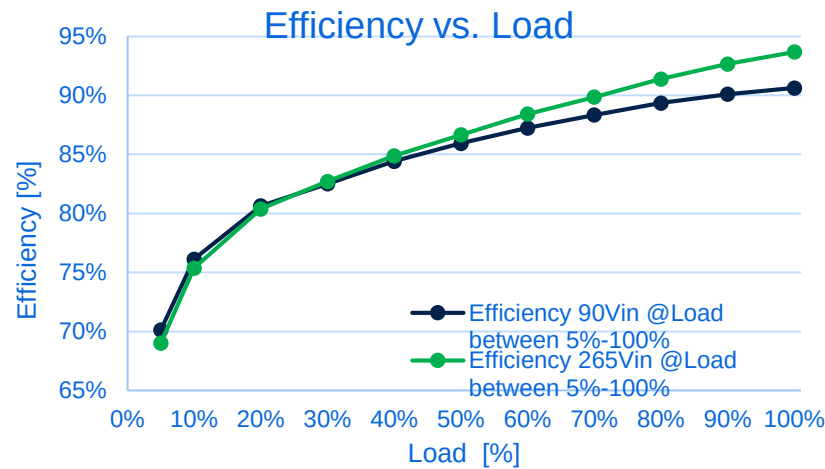
- High power factor front end AC/DC converter
 - HVLED001B for efficient AC/DC conversion
 - Low distortion conversion at high load (<15%)
 - Primary side regulation via fly-back topology
- Precise secondary side regulation
 - Regulated current via secondary step-down
 - HVLED002 provides constant current of 1.4A from 40-70Vout
 - 1% deep dimming capable
- 6LoWPAN wireless control with SPIRIT1
 - Sub-1GHz for remote monitoring and control
 - Controls dimming level of system
 - Android controllable



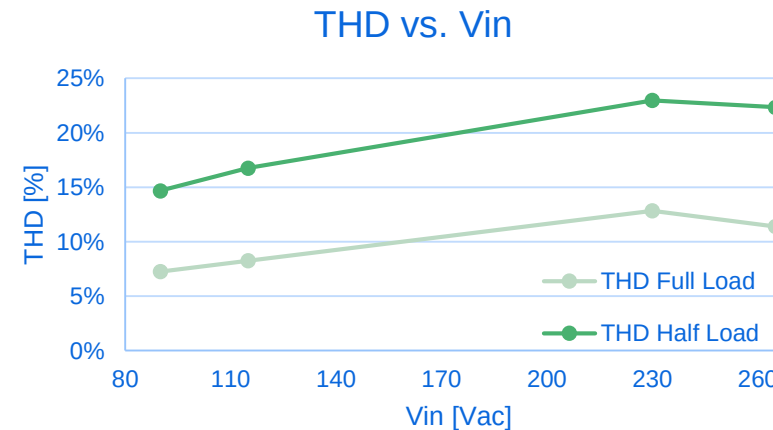
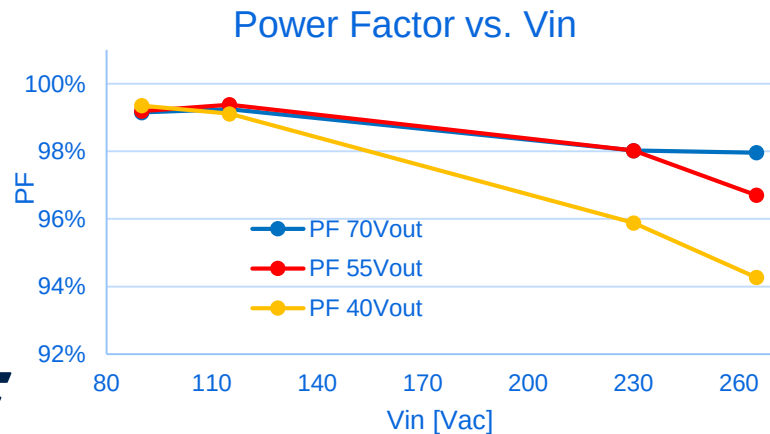


ST HVLED for efficient lighting

High Efficiency, High Power Factor and Low Distortion



STEVAL-LLL008P1





Long range Sub-1GHz wireless connectivity

Discrete and modular connectivity solutions for mesh lighting



150-174 MHz
300-348 MHz
387-470 MHz
779-956 MHz



SPRIT1

- RX: **9.2mA** / TX: **19.5mA** @ +11dBm
- Sleep/Stby: **850nA** / **600nA**
- Max.Out: **+16dBm**
- Sensitivity: **-120dBm**
- Mod: 2(G)FSK, OOK
- QFN20 4x4

Chip Antenna Option

SPSGRF-868
SPSGRF-915



Connector Option

SPSGRFC-433
SPSGRFC-868
SPSGRFC-915



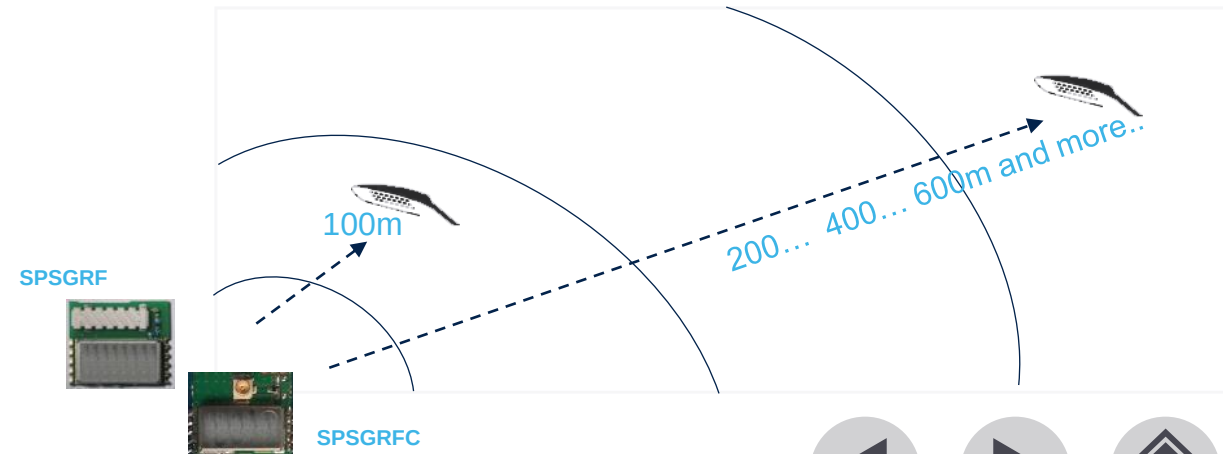
413-479 MHz
826-958 MHz

452-527 MHz
904-1055 MHz



S2-LP / S2-LPCB

- RX: **7 mA** / TX: **10mA** @ +10dBm
- Sleep/Stby: **600nA** / **350nA**
- Max.Out: **+16dBm**
- Sensitivity: **-124dBm**
- Mod: 2(G)FSK, 4(G)FSK, OOK/ASK
- QFN24 4x4



Lighting with Power over Ethernet

Highlights

- Feature packed smart lighting solution
- Fully integrated PoE PD platform
- High efficiency LED lighting
- Seamless low-energy Bluetooth



Fully featured PoE smart lighting solution

A family of products to enable intelligent lighting

- 71 W available power with IEEE 802.3bt standard
- Data and power in a single cable
- Monitor building usage
- Remote automation of intensity and temperature
- Simple and cheaper installation (below 60 SELV)



**Simple to
install**



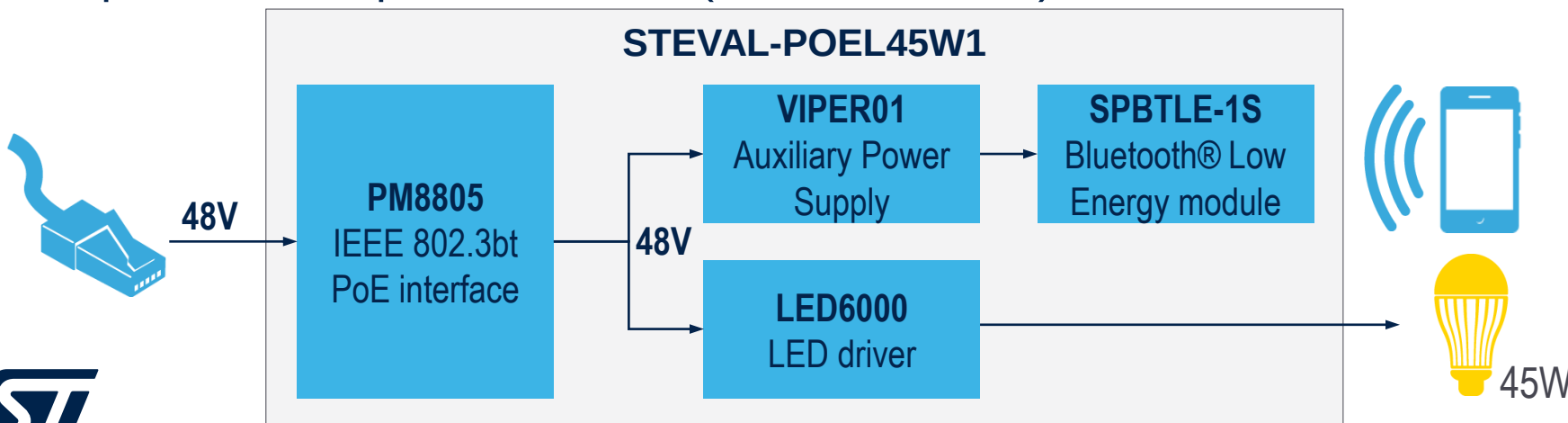
**Data &
Power**



**Remote
setting**

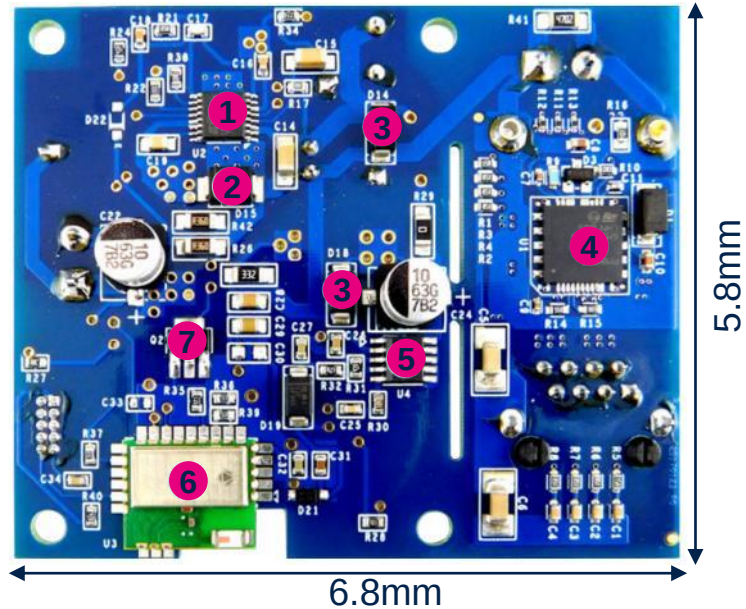


**Data
Gathering**



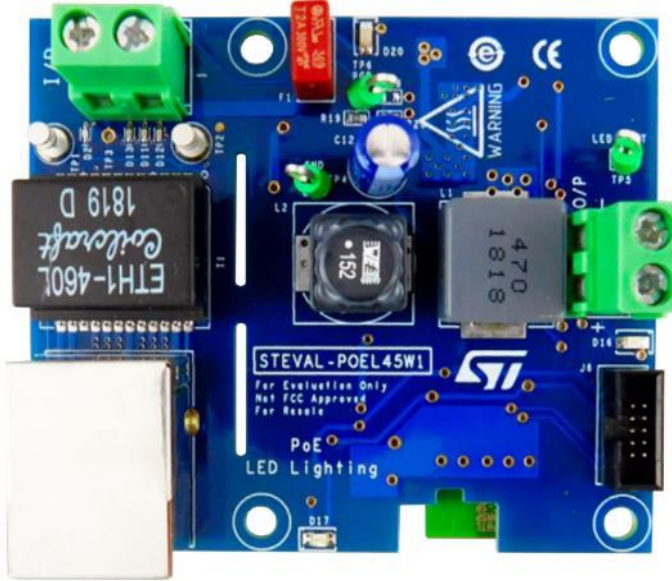


Compact 71W PoE lighting evaluation platform



STEVAL-POEL45W1

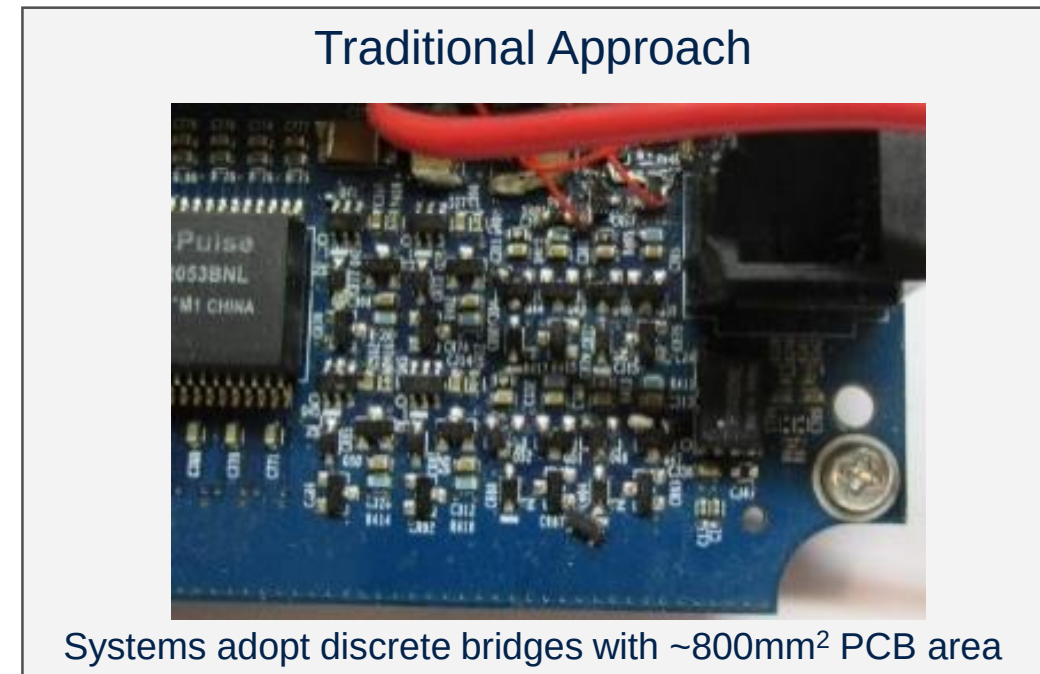
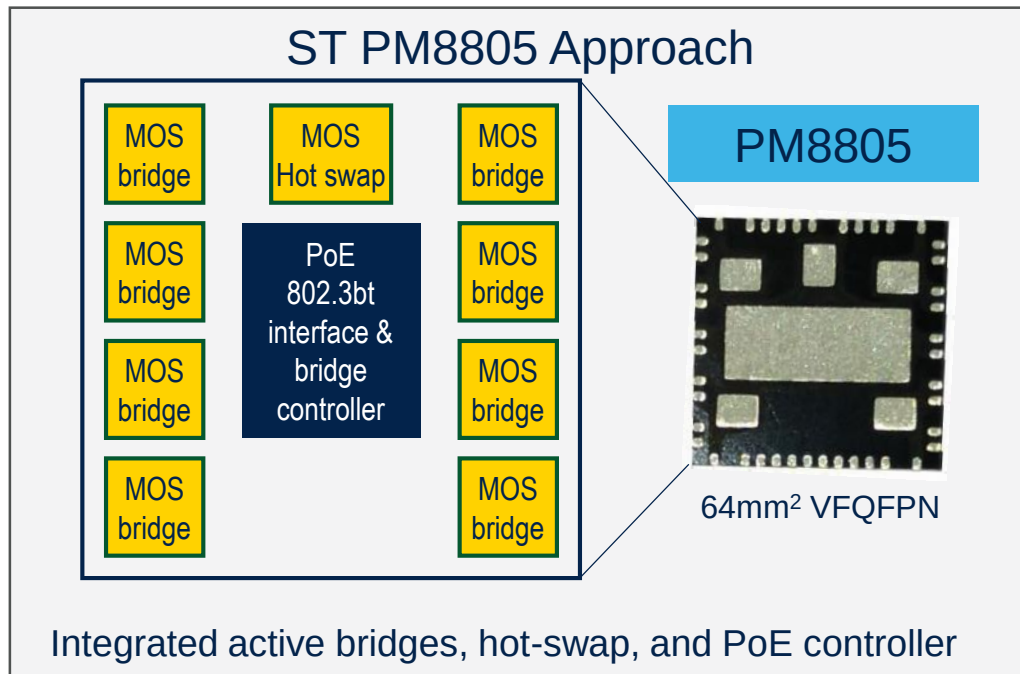
1. LED6000: Step down LED Driver
2. STPS3L60U: Shottkey rectifier
3. STTH102A: High speed diode
4. PM8805: Fully integrated PoE interface
5. VIPER012: Auxiliary power supply
6. SPBTLE-1S: Bluetooth Low Energy SoC
7. 2STF1360: Low voltage NPN





Smallest 802.3bt PoE-PD interface in the industry

Optimized PoE Solutions with PM8805



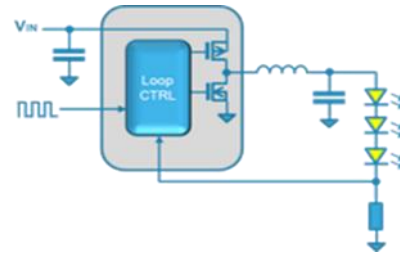
High efficiency lighting with LED6000

- Efficient and Accurate

- Low supply current (2mA quiescent, 10μA shutdown)
- Pulse skipping at light load
- Integrated dimming with $\pm 3\%$ output current accuracy

- Versatile

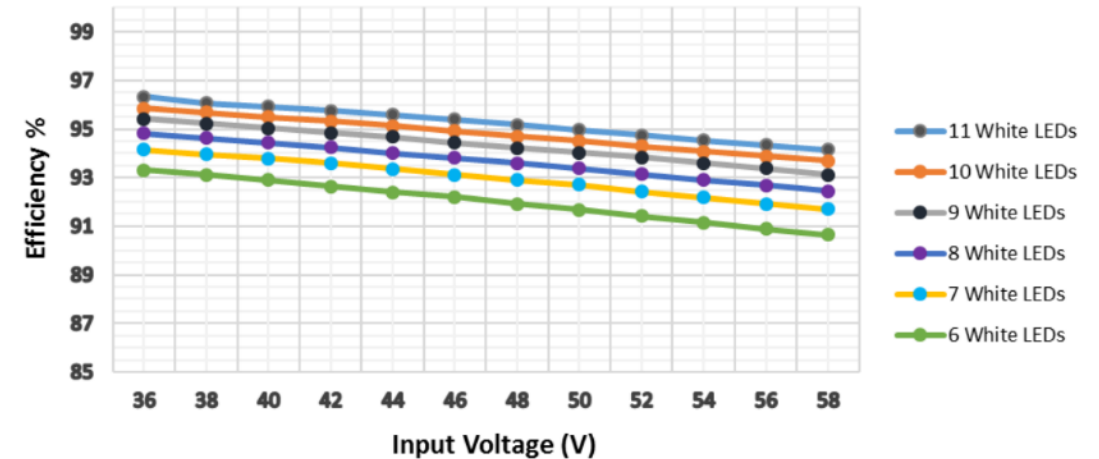
- Wide in input voltage: 4.5V to 61V
- High load current: 3A
- Multiple topology support
 - Buck
 - Floating Boost
 - Positive and inverting buck-boost



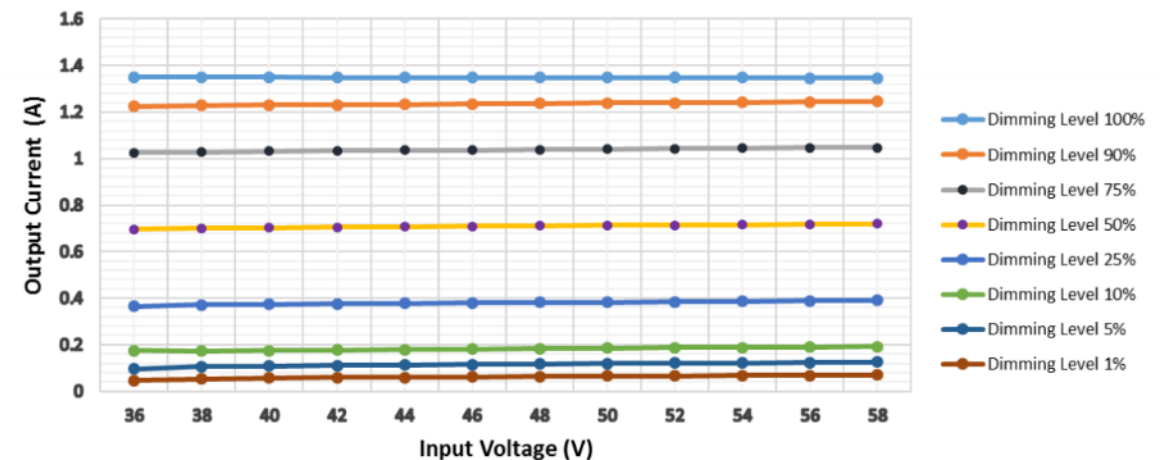
- Robust

- Over-current and short-circuit protection
- Thermal protection

LED6000 - Input Voltage vs Efficiency



Input Voltage vs Output Current





BlueNRG modules for connected lighting and beyond

BLE Modules allow fast Time to Market and Huge Cost Savings

- Modules are designed for time to market
 - - No RF expertise required: HW/SW Connectivity is a Black-Box in your Design!
 - - Fast Prototyping and HW Design
 - - Cost efficiency for volumes up to 150kpcs per year
- Modules are pre-certified
 - - Multi-Regional Certifications and SIG End-Product Certification allowing ~15K\$ cost saving
 - - Including HW Design and Certification, total cost saving up to 50~100K\$!
- Modules come with scalable offer
 - Cost vs. Features and Antenna type
 - Easy migration from legacy generation SPBTLE to new generation BlueNRG-M
 - Hardware pin-to-pin compatibility and same SW resources (BlueNRG-Navigator and SDK available as well)
 - Improved performances (immunity, output power) and 10 years longevity (do not take care of inner components availability)



More on PoE, power conversion and lighting

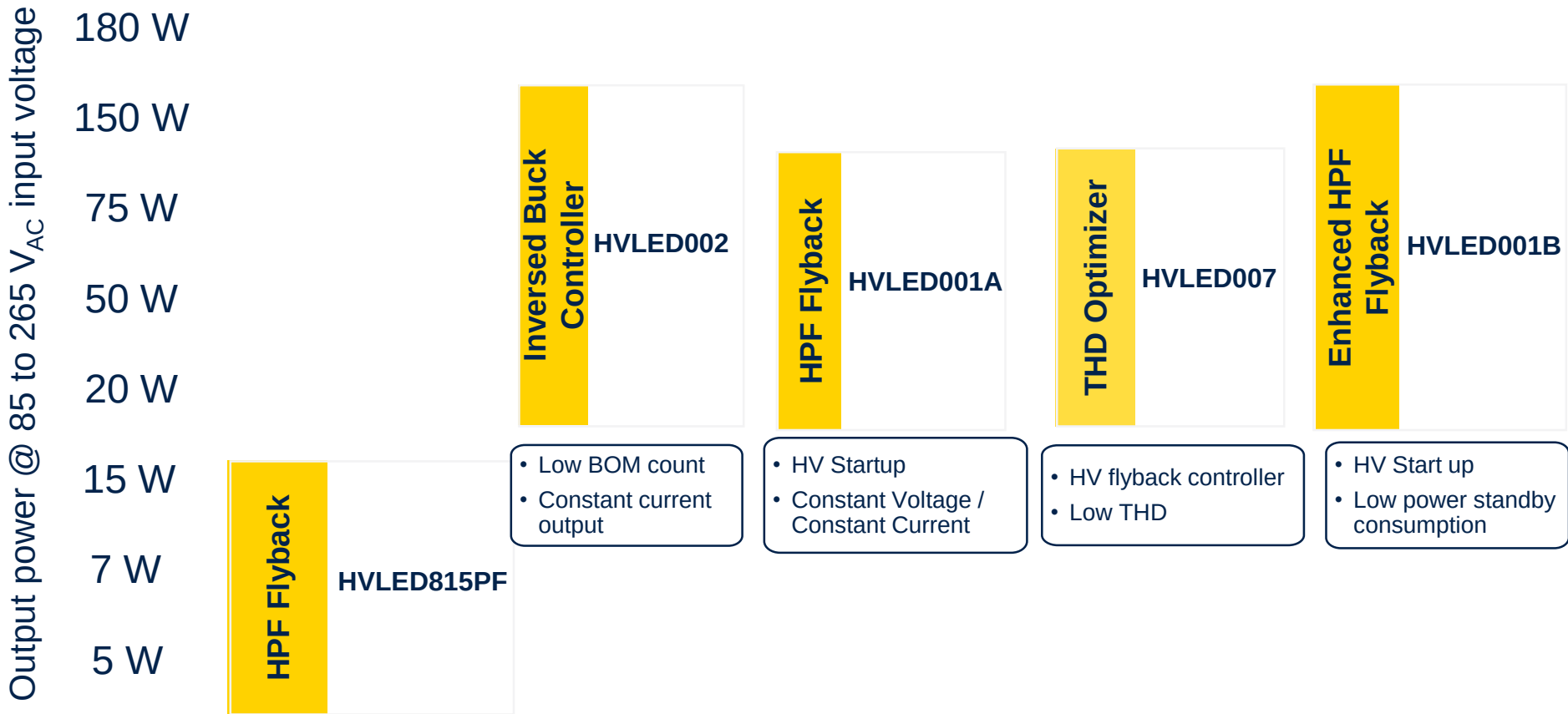
Highlights

- HVLED Offline LED Drivers
- Fully integrated PoE power delivery solutions
- DC/DC LED Drivers



HVLED for smart LED lighting

HVLED Product Family



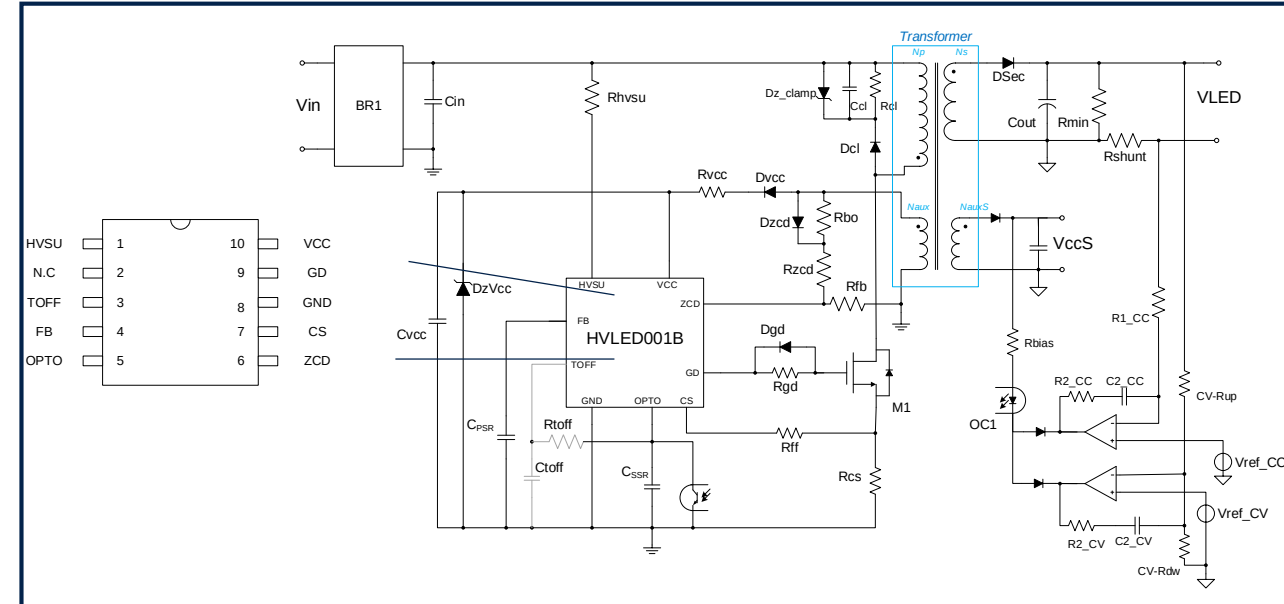


HVLED001B

Enhanced High Power Factor Flyback controller with CV primary-sensing and very low standby consumption

- KEY FEATURES:
 - 800V embedded HV start-up circuit.
 - Enhanced Valley skipping at medium-light load and adaptive burst-mode
 - Independent PSR and SSR control loops
 - Protections against Input UVP, OVP, Output OVP and OCP, Short and Open Circuit, FB disconnection, Transformer Saturation
 - Constant Voltage Loop with Primary Side Sensing
 - Variable Blanking time for higher efficiency and precision
 - Low Pnoload and Standby Power Consumption (<150mW)
- Product characteristic:
 - Quasi Resonant (QR) Flyback (Peak Current Mode)
 - SSOP10 package

- KEY BENEFITS:
 - Low BOM count, flexible and scalable solution with high efficiency performance, low EMI and low no load consumption



TARGET APPLICATIONS

SMPS between 20W and 150W





High performance current mode Inversed Buck for LED Driver

Key Features:

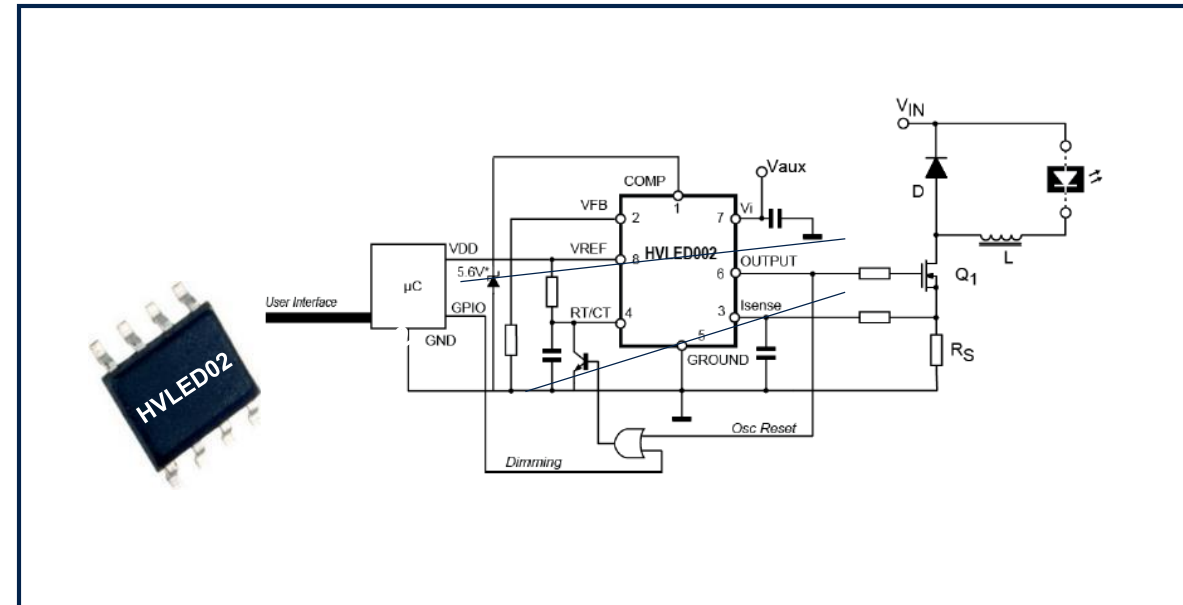
- High efficiency & LOW BOM cost with 250mV current sense reference
- Accurate constant current output ($\pm 2\%$ over Temperature)
- 5V V_{REF} for microcontroller supply ($\pm 2\%$ over Temperature)
- Easy PWM/0-10 dimming
- Wide V_{CC} range up to 30V

Product characteristic:

- SO8 package

Key Benefits:

- Low BOM count, dimming, accurate constant current output



TARGET APPLICATIONS

Secondary side step-down current regulator in multiple stage LED drivers





LED lighting ICs ecosystem

Datasheets

[HVLED001A](#)
[HVLED001B](#)
[HVLED002](#)
[HVLED007](#)
[HVLED805](#)
[HVLED815PF](#)
[STLUX285A](#)
[STLUX325A](#)
[STLUX383A](#)
[STLUX385A](#)

Design Resources

[Application Note \(8\)](#)
[Design Note \(1\)](#)
[User Manual \(1\)](#)
[Software Development Tools \(2\)](#)

Evaluation Tools

[EVALHVLED805](#)
HVLED805: 4.2 W isolated LED driver with primary side current regulation

[EVLHVLED007W35F](#)
35W LED driver with very low THD, based on HVLED007 Transition Mode Flyback controller

[EVLHVLED815W10A](#)
HVLED815: 10 W wide range non-isolated high power factor LED driver

[EVLHVLED815W10F](#)
HVLED815: 10 W wide range high power factor isolated LED driver

[EVLHVLED815W15](#)
HVLED815: 15 W European range high power factor LED driver

[EVLHVLED815W8CV](#)
HVLED815: 8W European range high power factor LED driver

[EVAL-PSR01B-35W](#)
35 W wide input range flyback converter using HVLED001B

[STEVAL-ILL037V1](#)
3.2 W LED power supply based on HVLED805

[STEVAL-ILL045V1](#)
9 W, A19 format Triac dimmable, high power factor, non-isolated LED driver HVLED815PF

[STEVAL-ILL055V1](#)
High-efficiency isolated offline LED drive with 11 W fixed output and high PF HVLED815PF

[STEVAL-ILL069V2](#)
35 W wide input range flyback converter using HVLED001A

[STEVAL-ILL070V4](#)
35 W dimmable single string LED driver using HVLED001A

[STEVAL-ILL074V1](#)
60 W wide input range flyback converter using HVLED001A

[STEVAL-ILL074V2](#)
60 W wide input range flyback converter using HVLED001A

[STEVAL-ILL076V2](#)
18 W wide input range ultra slim flyback converter using HVLED001A

[STEVAL-ILL080V1](#)
18 W tube replacement zero ripple LED driver using HVLED001A

[STEVAL-ILL082V1](#)
Smart home lighting based on HVLED815PF

[STEVAL-ILL083V1](#)
Smart home lighting based on HVLED815PF and SPBTLE-RF

[STEVAL-ILL085V1](#)
Wide input and wide output voltage LED driver HVLED001A

[STEVAL-ILL066V2](#)
100 W LED street lighting evaluation board using the STLUX385A digital controller

[STEVAL-ILL075V1](#)
STLUX385A evaluation board

Collaterals

[Flyer \(4\)](#)
[Brochures \(1\)](#)
[Magazine \(1\)](#)

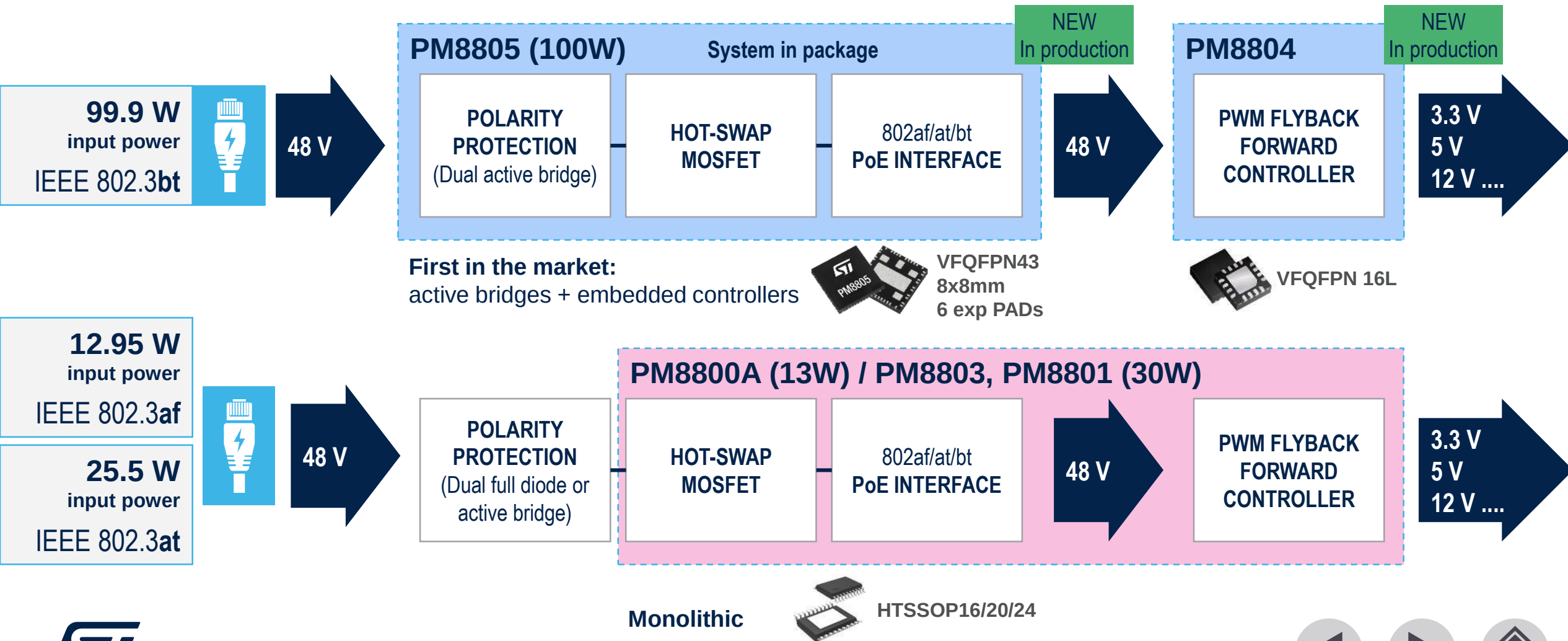


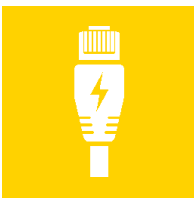
Videos





Integrated PoE solutions for powered devices

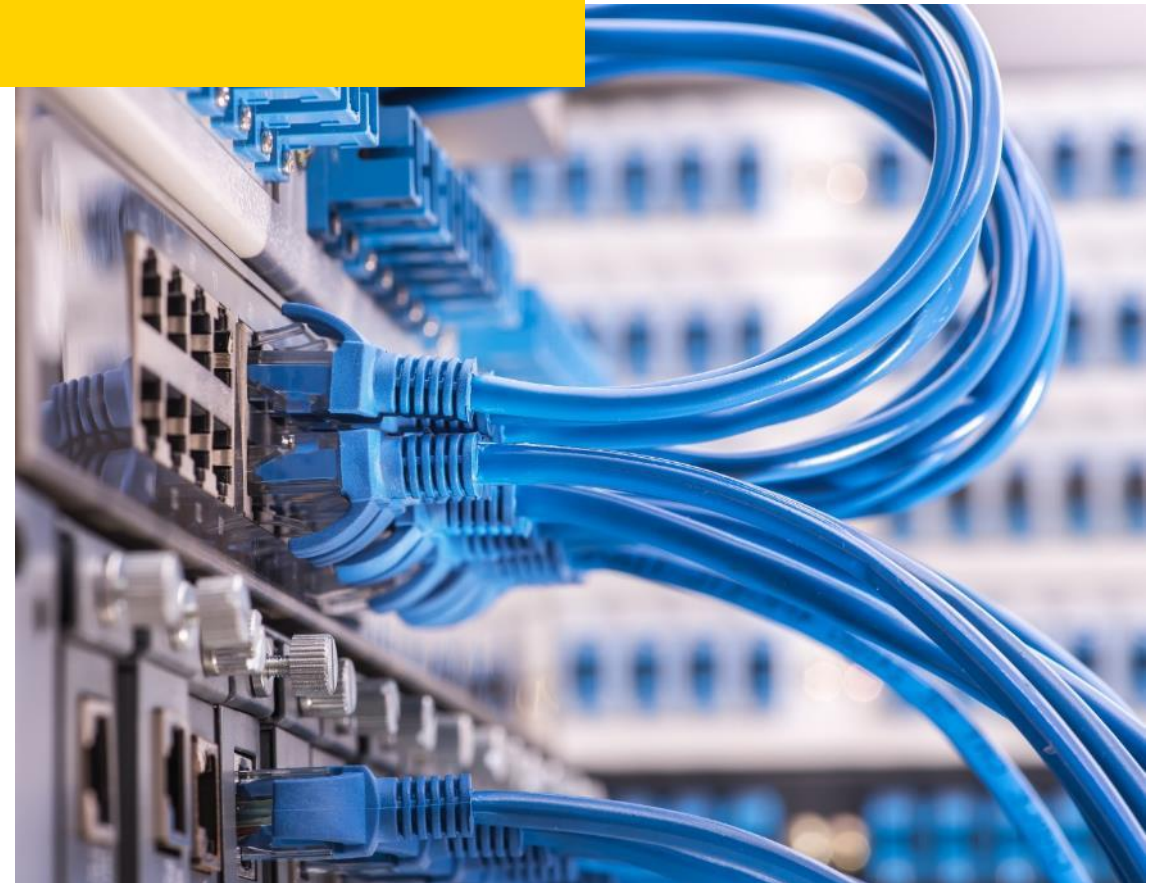




High integration with PM8805

PoE IEEE 802.3bt Interface – Power Devices

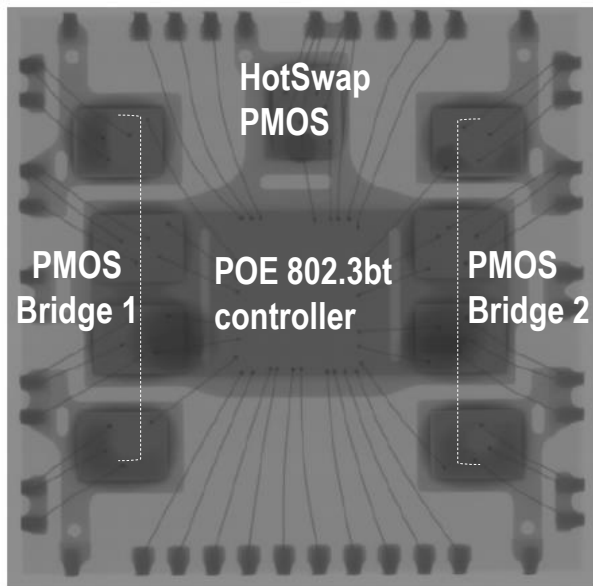
- Dual Active Bridge
 - 8 robust 100V N-channel MOSFETs with 150 mΩ MOSFET
 - Output indication of the activated bridge (T0/T1/T2)
- Hot-Swap MOSFET
 - Robust 100 V, 0.1 Ω high side N-ch
 - Embedded protections to operate inside SOA
- PoE Interface controller
 - Support 802.3af/at/bt
 - Support power level for Type 3(60 W) and Type 4 (99.9 W) PSE





PM8805

Very high integration versus competition



PM8805

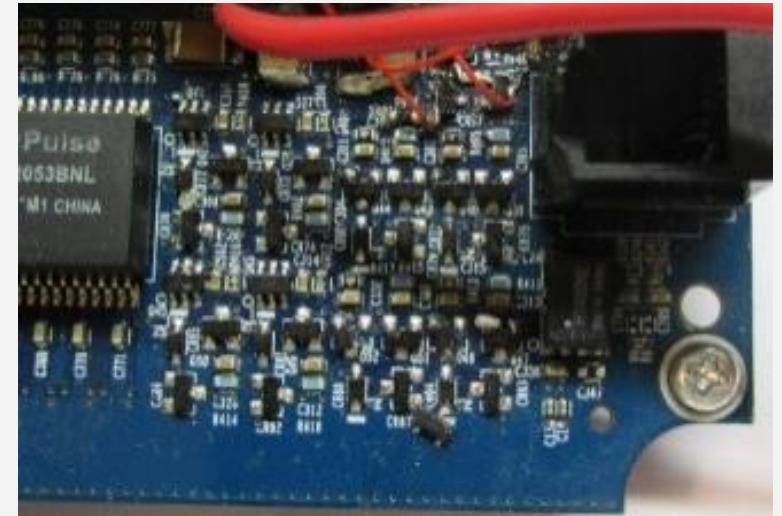
NEW
In production

43L VFQFPN 8.0x8.0
with 6 exposed PADs

Design Optimization

- Optimized exposed PADs for improved thermal resistance
- LV-HV creepage assured
- PCB area and BOM are drastically reduced (10x)

Competition

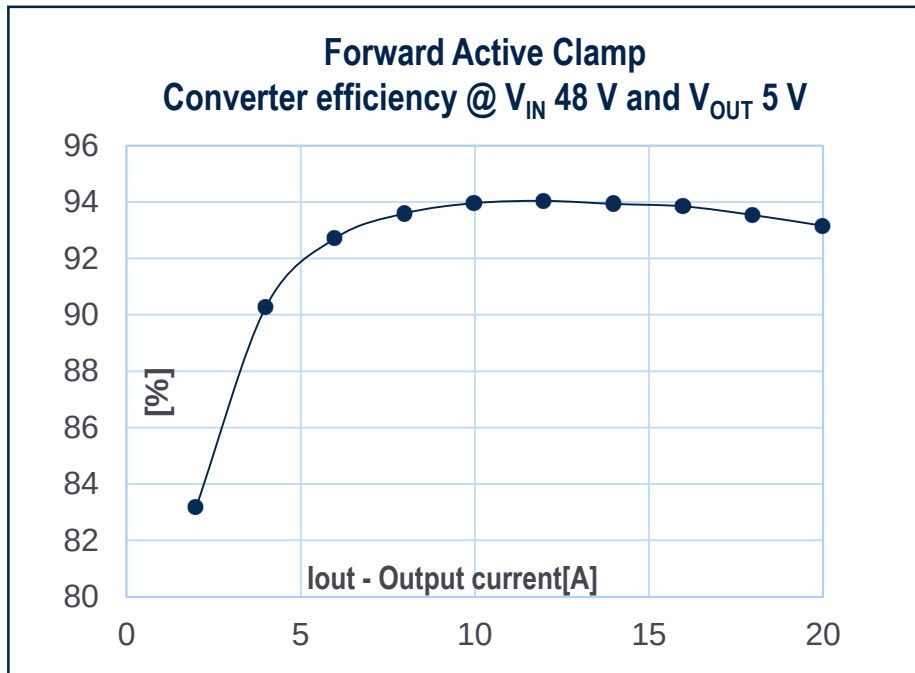


Competitors adopt discrete bridges with ~800mm² PCB area



PM8804

48 V PWM controller - Companion Chip for PM8805 PoE interface



Voltage converter for:

- POE Powered Devices
- Telecom/Server PSU

PWM current mode controller

- Cycle-by-cycle current limit
- Input voltage up to 75 V DC
- Opto-coupler connection
- Embedded start-up (20 mA)
- Slope compensation
- Programmable fixed frequency (up to 1 MHz)

Dual low side complementary gate drivers (1 A)

- Programmable dead time between GATE 1 & 2, 10 to 200 ns
- GATE2 optionally turned OFF for reduced consumption

Protections

- Delayed Over Load protection with automatic restart
- Feedback disconnection protection on VC pin
- Severe Over Current protection with latch after 4 events.
- Thermal Shutdown

Package

- VFQFPN 3.0x3.0x1.0 16L pitch 0.5



VFQFPN 16L



Full ecosystem of PoE PD evaluation kits

PoE 802.3bt class 5

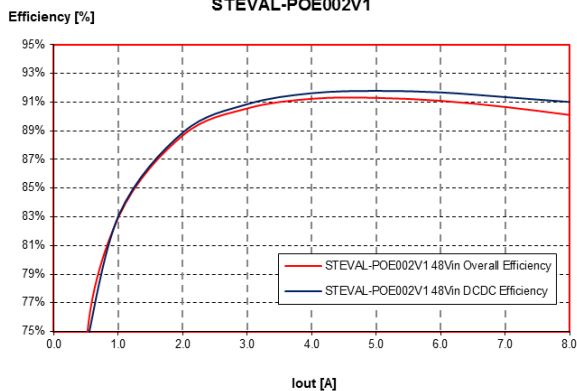
Fly-back

PM8805 + PM8804

5 V – 8 A (STEVAL-POE002V1, [AN5174](#))



STEVAL-POE002V1



PoE 802.3bt class 8

up to 100W Active Forward

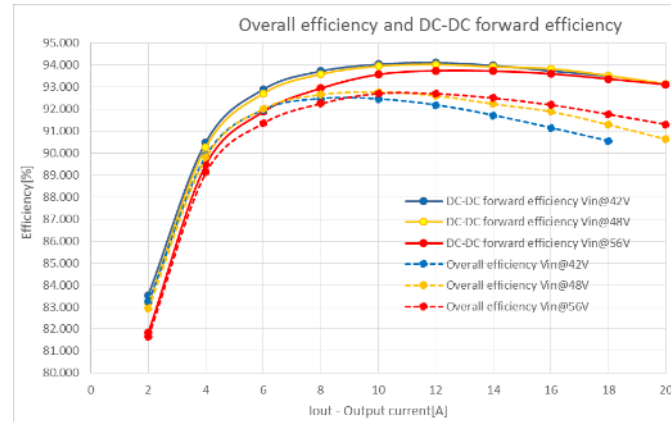
PM8805 + PM8804

3 output options:

- 12 V – 8 A (STEVAL-POE005V1, [AN5207](#))
- 5 V – 20 A (STEVAL-POE003V1, [AN5190](#), STEVAL-ISA204V1, PM8804, [DB3958](#))
- 3.3 V – 20 A (STEVAL-POE006V1, [AN5237](#))



5V 20A



PoE 802.3bt class 8

Small connector

PM8805

STEVAL-POE001V1, [DB3668](#)



PoE 802.3bt class 5

PoE Lighting

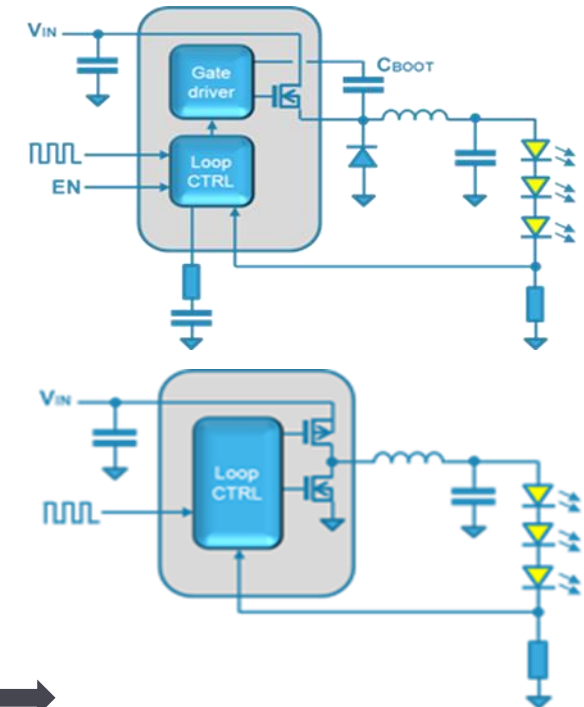
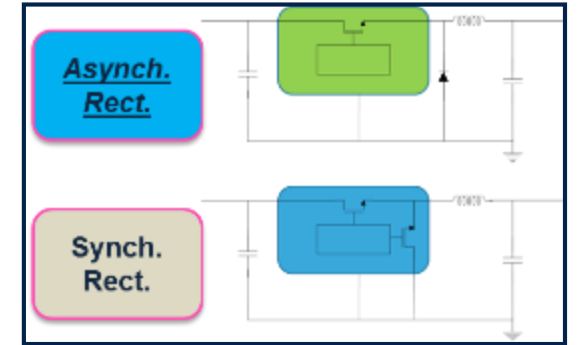
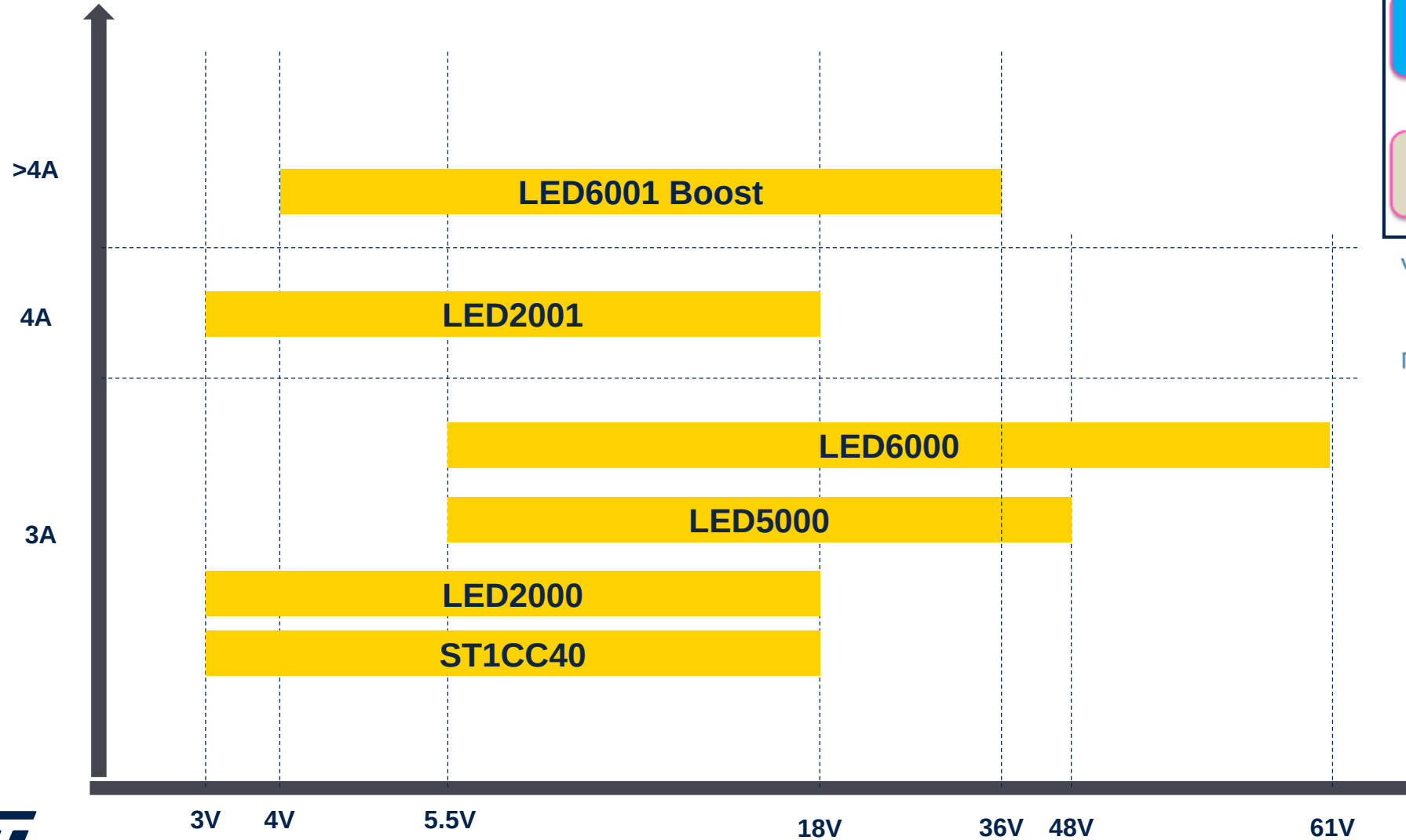
PM8805 + LED6000 + VIPER01 + SPBTLE-1S

STEVAL-POEL45W1
[DB3730](#)
[UM2545](#)
[ANDROID APP](#)
[FIRMWARE](#)





Single ROW LED drivers





Up to 61V DC-DC converters for LED

High Brightness
LED drivers



Halogen Light
Replacemnt



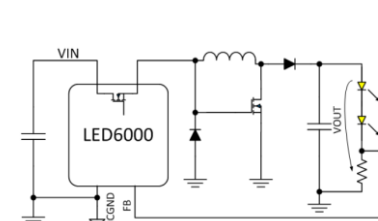
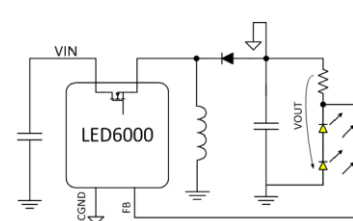
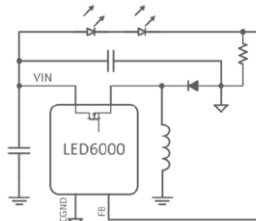
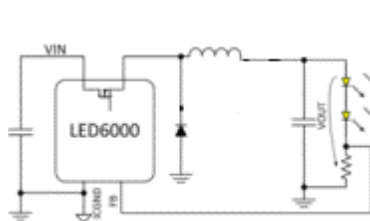
Street Lighting



Signage



Supporting multiple topologies: buck, floating boost, negative and positive buck-boost



LED driving with PWM dimming and $\pm 3\%$ output current accuracy

DCDC Converters up to 3A I_{OUT} (in buck) , MLCC compatible for lower cost BOM

LED5000

DCDC converter:

- Input voltage: 5.5V to 48V
- Switching frequency: 850kHz
- FB voltage 200mV
- **Inhibit** pin for zero consumption (1.6 μ A Typ.)



HSOP8

LED driving:

- PWM Dimming with deep resolution

LED6000

DCDC converter:

- Input voltage: 4.5V to 61V
- FB voltage 250mV
- **Pulse skipping** at light load
- **External synchronization for multi-device operation**

Additional programmability :

- Adj. switching frequency: 0.25-1.5MHz
- **Adj. peak current limit** from 0.85A up to 4.5A



HTSSOP16



3V - 18V converters for single row LED

Flash light



Spot lights



Emergency lights



Minimizing application size through smaller components and higher efficiency:

- Smaller & cheaper external component : 850 kHz fixed switching frequency & ceramic C_{OUT}
- Embedding compensation network & synchronous rectification switch
- **100 mV typ. current sense voltage drop** → lower dissipation on R_{SENSE}

Reliable and self protected application through:

- Internal current limiting, thermal shutdown, output short circuit protection
- Thermally enhanced HSOP8 for high current option

ST1CC40

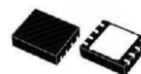
- **Inhibit** for low consumption (**6 μ A**)
- Output current: **up to 3A**



VFQFPN8 4x4

LED2000

- **PWM Dimming**
- Output current: **up to 3A**



VFQFPN8 4x4

LED2001

- **PWM Dimming**
- Output current: **up to 4A**



VFQFPN8 4x4



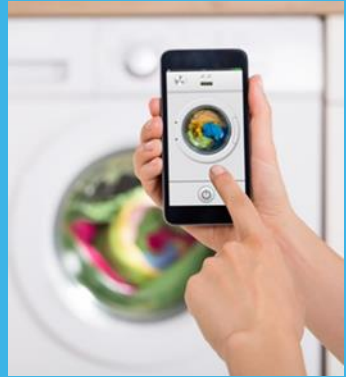
More on communication radios

Highlights

- Sub-1GHz Radio Integrated Circuits & Modules
- Low Energy Bluetooth



Low-power RF focus technologies



Wearable, Healthcare, Smart Appliances



- ☐ Security
- ☐ Interoperability
- ☐ BT SIG Standard



Toys, Gaming and Remote Controllers



- ☐ Open Radio
- ☐ Low latency
- ☐ High Throughput



Sensor networks, Home Appliances and Industrial



- ☐ Mesh topology
- ☐ Large scale
- ☐ BT SIG Standard



Asset Tracking and Sensor-to-Cloud



- ☐ Global and Reliable
- ☐ Geolocation
- ☐ Connectionless



Remote Metering and Energy Management



- ☐ European standard
- ☐ Star topology
- ☐ Master/slave



Sensor networks, home and industrial automation



- ☐ Mesh topology
- ☐ Large scale
- ☐ Installation Flexibility - IPv6



Low-power RF ecosystem

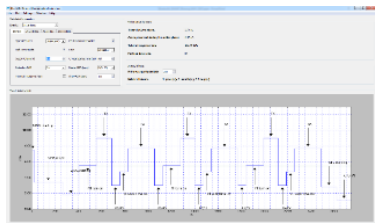
RF CHIPSET



EVALUATION KIT and DEVELOPMENT TOOLS



GRAPHICAL UI



RF Power Simulator



GUI PC application

SW DEVELOPMENT



BlueNRG/Spirit
NAVIGATOR

PROTOCOLS / SW IP



iOS/Android SDK



RF MODULES





Remote monitoring with Sub-1GHz radio



150-174 MHz
300-348 MHz
387-470 MHz
779-956 MHz



SPIRIT1

- RX: **9.2mA** / TX: **19.5mA** @ +11dBm
- Sleep/Stby: **850nA** / **600nA**
- Max.Out: **+16dBm**
- Sensitivity: **-120dBm**
- Mod: 2(G)FSK, OOK
- QFN20 4x4



413-479 MHz 452-527 MHz
826-958 MHz 904-1055 MHz



S2-LP / S2-LPCB

- RX: **7 mA** / TX: **10mA** @ +10dBm
- Sleep/Stby: **600nA** / **350nA**
- Max.Out: **+16dBm**
- Sensitivity: **-124dBm**
- Mod: 2(G)FSK, 4(G)FSK, OOK/ASK
- QFN24 4x4



Home and Building
automation

Smart Metering

Alarm Systems

Industrial Monitoring
and Control





SPIRIT modules portfolio

SPSGRF-868
SPSGRF-915



Based on
SPIRIT1



SPSGRFC-433
SPSGRFC-868
SPSGRFC-915

Antenna option

- Two carrier frequency versions: 868 MHz and 915 MHz
- Including high efficient chip antenna, filter and balun **BALF-SPI-01D3**
- CE/RED qualified [-868], FCC and IC modular approval certified [-915]

Connector option

- Three carrier frequency versions: 433 MHz, 868 MHz and 915 MHz
- Including U.FI. connector, filter and balun **BALF-SPI-01D3** [-868 & -915] or **BALF-SPI-02D3** [-433]
- CE/RED qualified [-433 & -868], FCC and IC modular approval certified [-915]

- Up to **+11.6 dBm** output power
- **-118 dBm** Rx sensitivity
- 4-wires **SPI interface** to external host
- Shutdown line
- 4 programmable GPIOs
- Included AES-128 security co-processor
- Modulation schemes: 2-FSK, GFSK, MSK, GMSK, OOK and ASK
- Packet format: **Basic**, **MBUS** and **STack**
- Forward Error Correction (FEC with interleaving)

- Low Duty Cycle (LDC) mode with automatic acknowledgement
- Embedded CSMA/CA protocol, based on listen-before-talk
- Automatic CRC handling
- Whitening and de-whitening of data
- **Small** form factor: 13.5 x 11.5 x 2 mm
- **Industrial** temperature range: -40 °C to +85 °C
- Power supply voltage from **1.8V to 3.6V**



BlueNRG-mesh brings smart-home to your fingertips

Easily connecting appliances and fixtures to iOS/Android



- Bluetooth **Mesh 1.0** certified **Profile Library** and **Bluetooth LE** stack
- **Two-layer security** (128-bit AES-CCM and 256-bit ECDH protocol)
- **Low-power** and **Friendship** supported
- Provisioned node **database transfer** among smartphones via Email and Cloud application
- **Embedded FW** and **Mobile SDK** to build both your Android and iOS Apps
- Reduces development costs and accelerates time-to-market

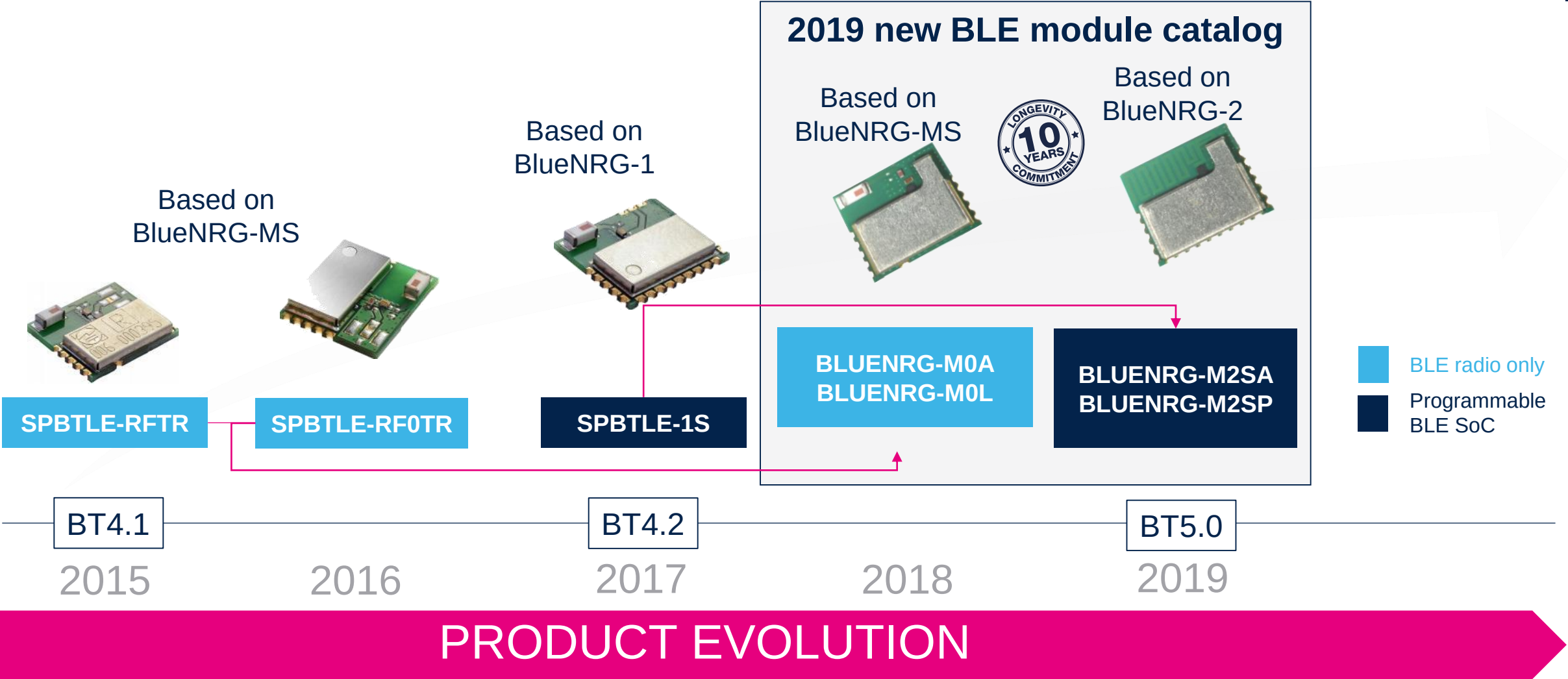


life.augmented





BlueNRG modules accelerate time to market





BlueNRG modules portfolio

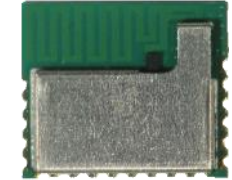
BlueNRG-M0L BlueNRG-M0A



BLE Radio

- Based on **BlueNRG-MS**
- Including high efficient chip antenna, filter and balun **BALF-NRG-01D3**
- BLE4.2 certification
- Up to **+6 dBm** output power
- 5-wires **SPI interface** to external host

BlueNRG-M2SA BlueNRG-M2SP



BLE SoC

- Based on **BlueNRG-2**
- Including high efficient chip antenna [-M2SA] or PCB antenna [-M2SP], filter and balun **BALF-NRG-02D3**
- BLE5.0 certification
- Up to **+5 dBm** [-M2SA] or **+7 dBm** [-M2SP] output power
- Extensive **peripheral set**

- **Bluetooth SIG End Product certification**
- CE/RED qualified, FCC/IC/TELEC modular approval certified
- **-85 dBm** Rx sensitivity

- **Small** form factor: 13.5 x 11.5 x 2 mm
- **Industrial** temperature range: -40 °C to +85 °C
- Power supply voltage from **1.7V to 3.6V**