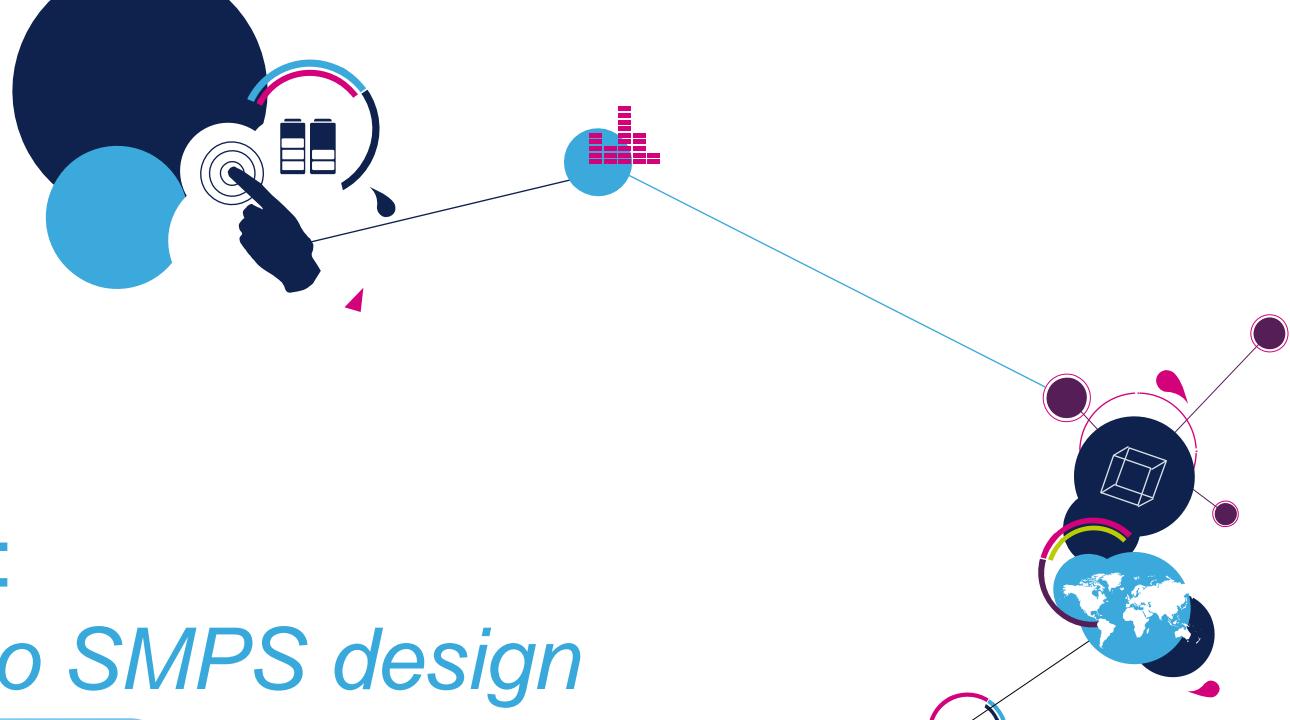


VIPer*6 family: *The fast lane to SMPS design*

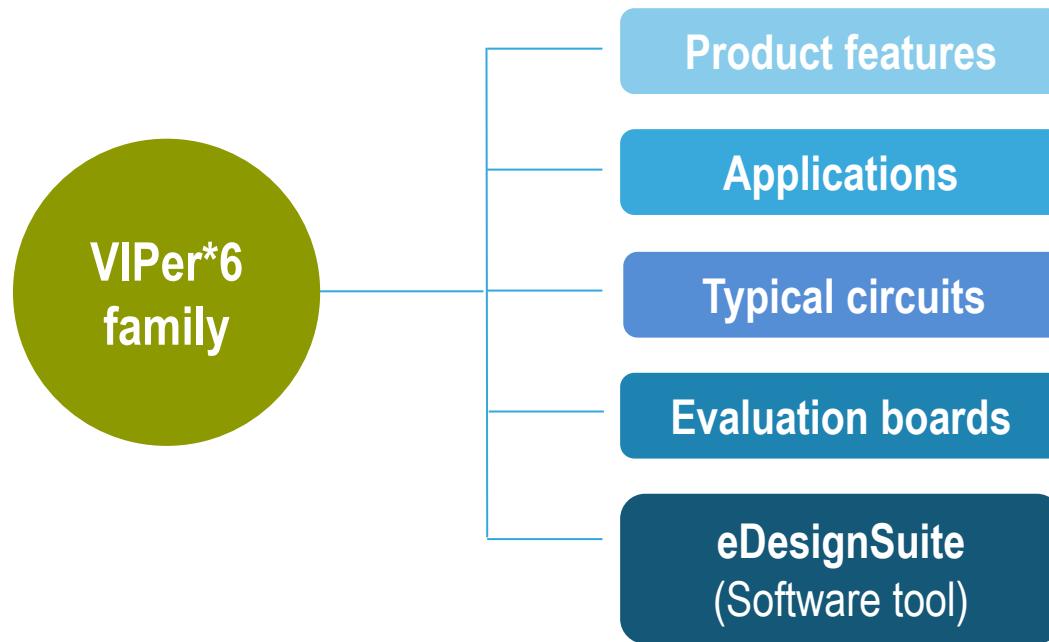


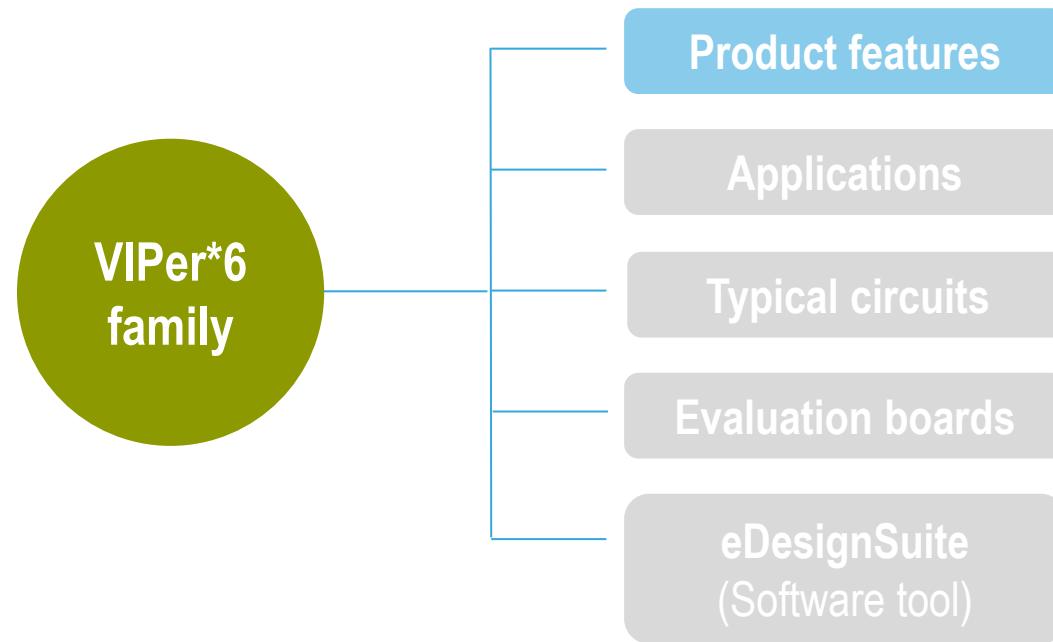
life.augmented



VIPer*6 family: content

2





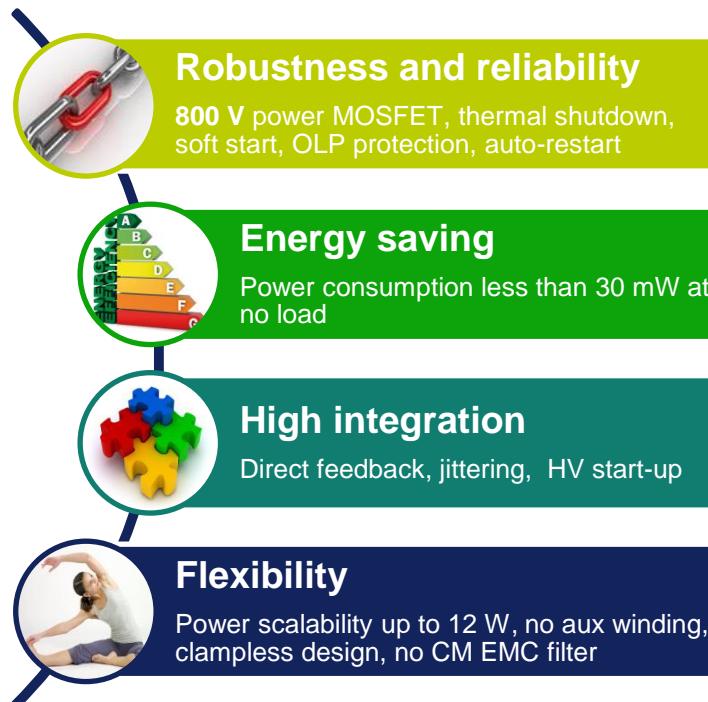
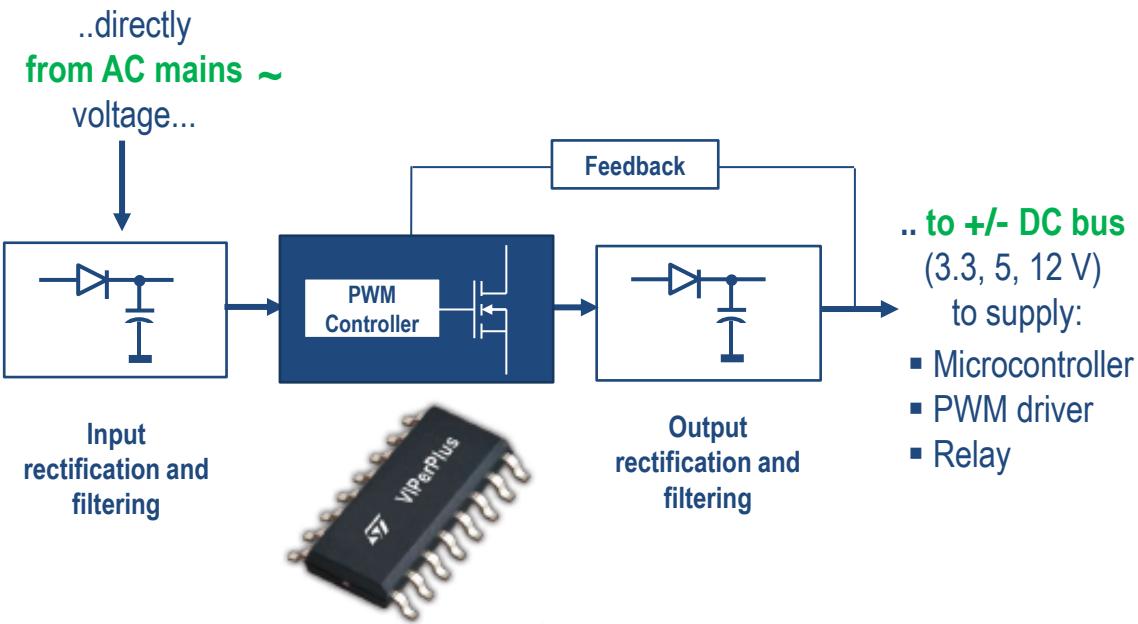
The fast lane to design switch mode power supplies

4



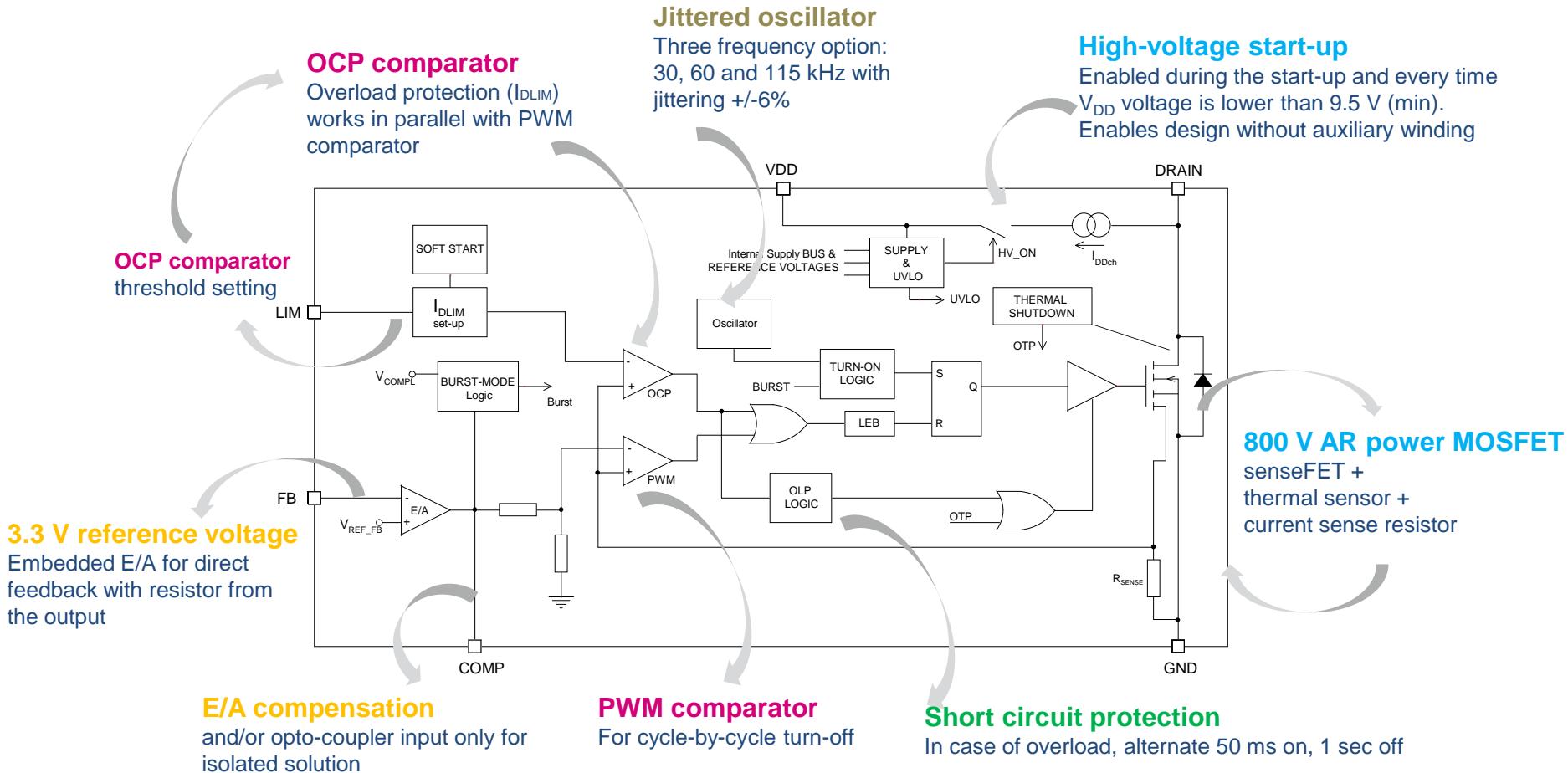
VIPerPlus – high-voltage converter

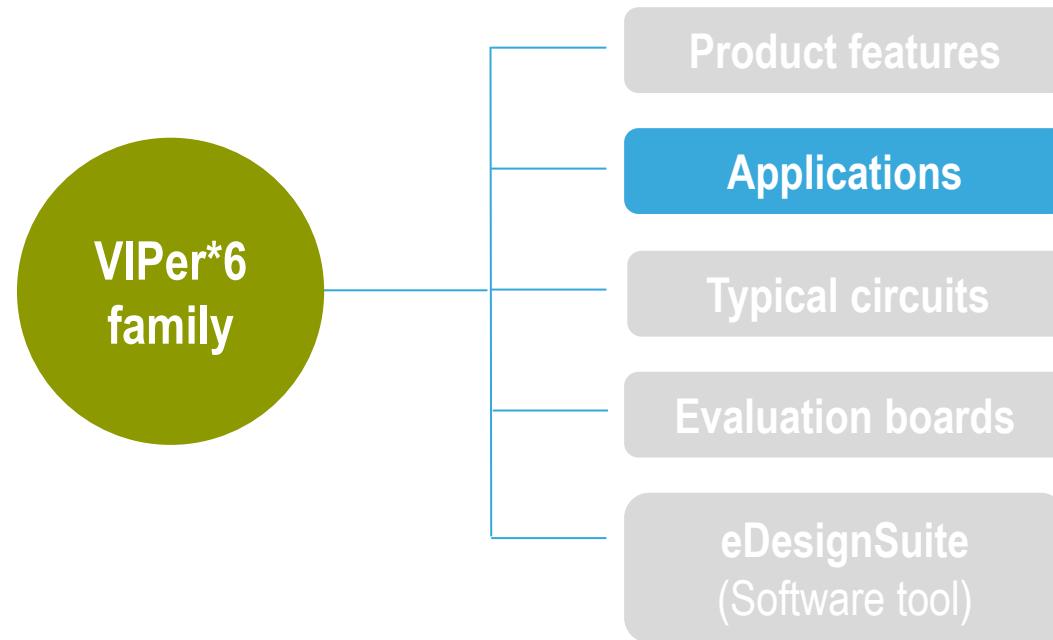
Advanced controller with embedded 800 V power MOSFET



VIPer*6 family: block diagram

5





VIPer*6 family

Fixed-frequency AC-DC converters

VIPer06, VIPer16, VIPerA16, VIPer26



Metering



Home
appliances



Home
automation



Lighting



Automotive

The best choice to power your microcontroller

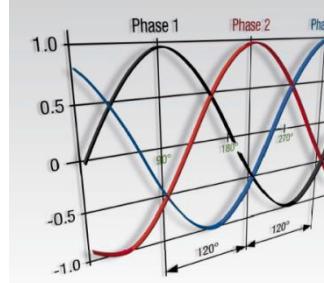


VIPer*6 for metering

 **VIPer*6**
in smart-energy
meters

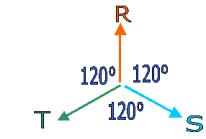
VIPer*6 based
AC-DC auxiliary power supply for

- microcontrollers
- transceivers
- metrology ICs

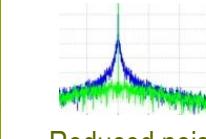


Aux SMPS
market needs

 **Non-isolated solution for**
single-phase meters



Isolated solution for
3-phase meters



Reduced noise
in the communication
band



Robustness



VIPer*6
key benefits and
supported topologies

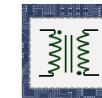


VIPer*6,
key benefits for the application

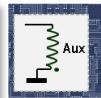
- 30 kHz switching frequency to reduce noise in the communication band (only VIPer06)
- 800 V breakdown
- Op amp available for primary regulation



Inductor based
topology
Buck



Flyback topology
Isolated
with primary regulation





VIPer*6 for home appliances

9



VIPer*6
in home
appliances

VIPer*6 based AC-DC auxiliary power supply for

- microcontrollers
- LEDs
- user interfaces
- motor driver ICs



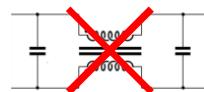
Small home appliances



Major appliances



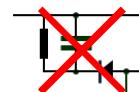
Aux SMPS
market
needs



Small EMI input filter



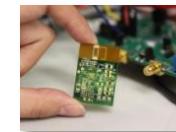
Power
scalability



Clampless



High
efficiency



Reduced size



Powering MCU
to drive Triac



VIPer*6
key benefits
and supported
topologies

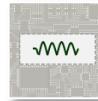


VIPer*6,
key benefits for
the application

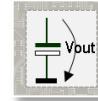
- Frequency jittering
- VIPer*6 pin-to-pin compatible
- 800 V breakdown
- Self supply
- Op amp available for primary regulation or direct feedback



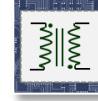
Inductor based
topologies



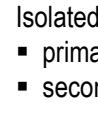
Buck
common neutral



Buck-boost
negative output,
common neutral

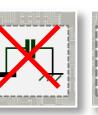
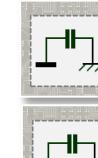


Smart flyback topologies



Isolated

- primary regulation
- secondary regulation



Non-isolated
direct feedback,
positive/negative output,
common neutral



VIPer*6 for home automation

10



VIPer*6
in home
automation

VIPer*6 based AC-DC auxiliary power supply for

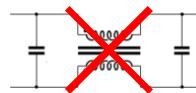
- microcontrollers
- transceivers
- sensors
- motor driver ICs



Aux SMPS
market needs



Low
standby power



Small EMI input filter



Reliability



Cost saving



Cap SMPS
replacement



Powering MCU
to drive Triac

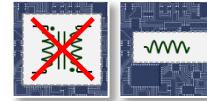


VIPer*6
key benefits
and supported topologies



VIPer*6,
key benefits for
the application

- 30 mW @ no load
- Frequency jittering
- 800 V breakdown
- Self supply
- Op amp available for direct feedback



Inductor based
topology
Buck



Smart flyback topologies
Non-isolated, direct feedback,
positive/negative output, common neutral



VIPer*6 for lighting

11



VIPer*6
in
street lighting

VIPer*6 based
AC-DC auxiliary power supply for

- microcontrollers
- transceivers
- lighting driver ICs



Aux SMPS
market
needs



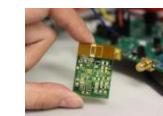
Low
standby power



Robustness



Cost saving



Reduced size



High
efficiency



VIPer*6
key benefits
and supported
topologies

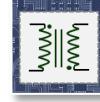


VIPer*6,
key benefits for
the application

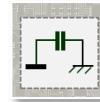
- 30 mW @ no load
- Operating temperature: -25 to +125 °C
- 800 V breakdown
- Self supply
- Op amp available for primary regulation



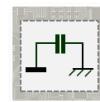
Inductor based
topology
Buck



Smart flyback
topologies



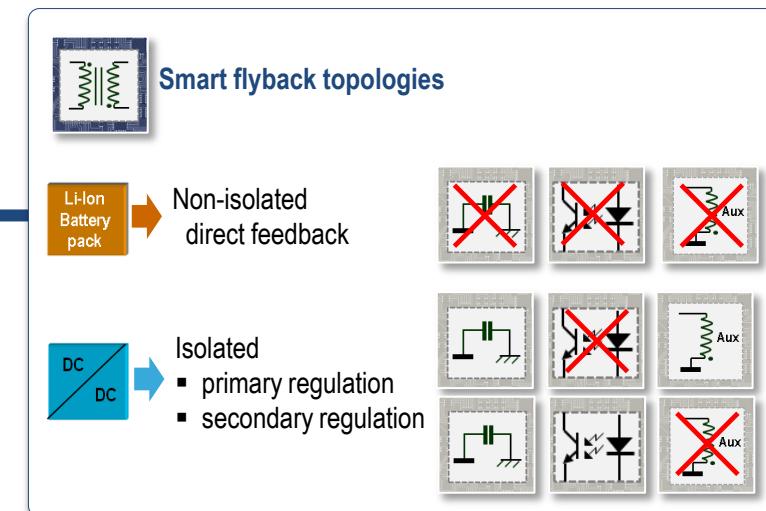
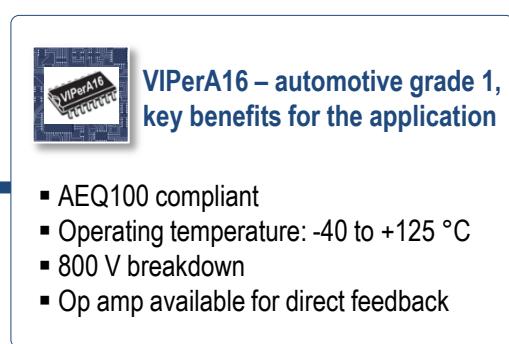
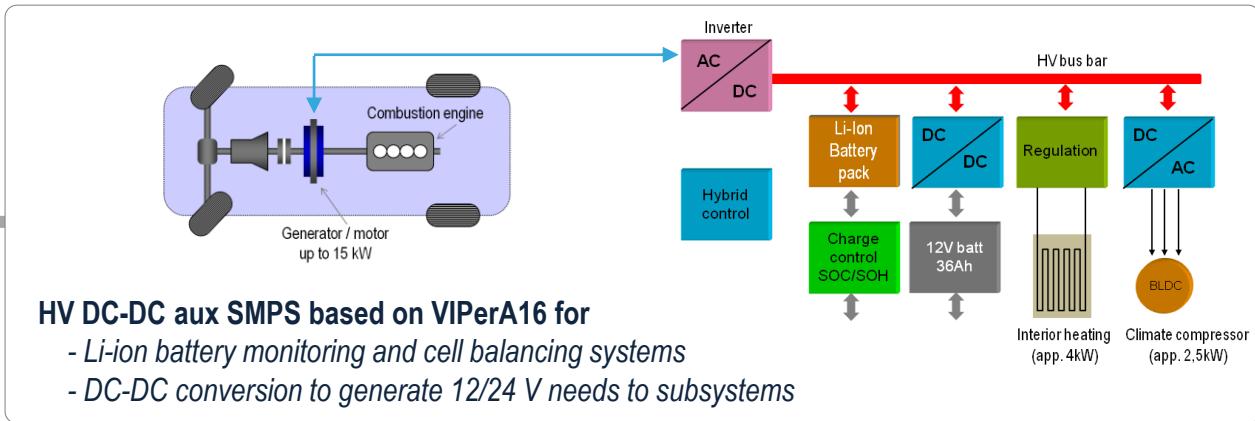
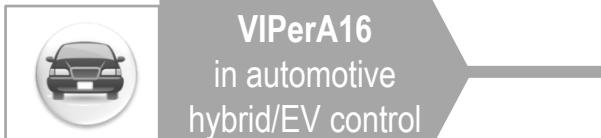
Isolated
with secondary regulation

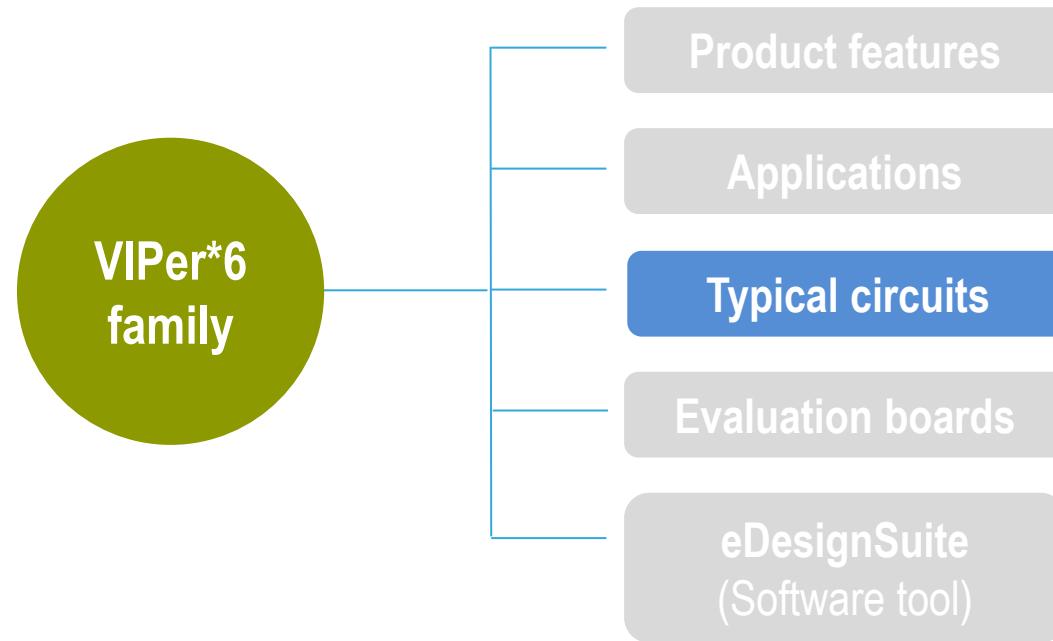


Isolated
with primary regulation



VIPerA16 for automotive

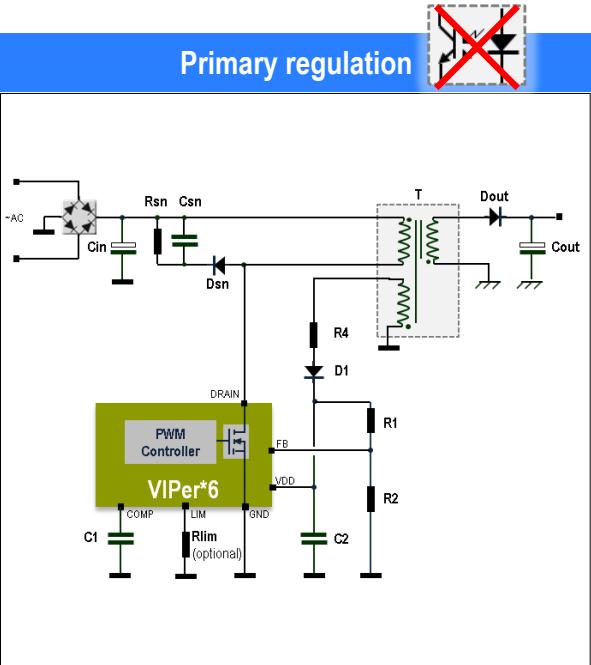




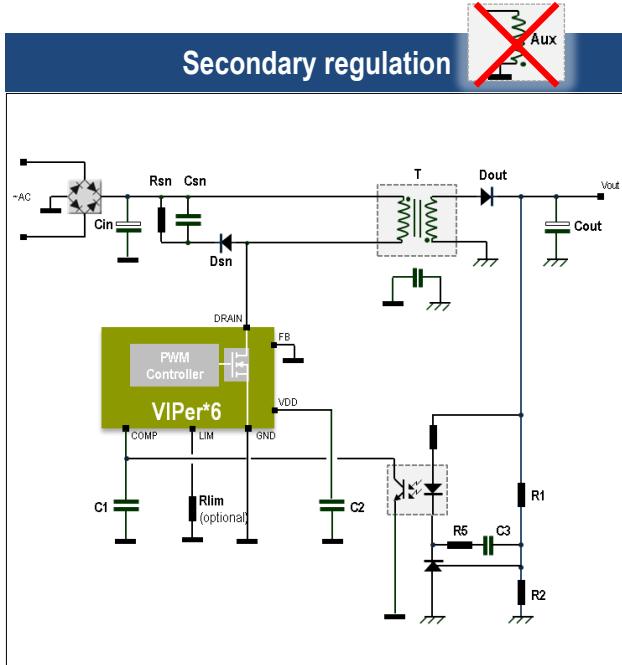
VIPer*6: isolated flyback

14

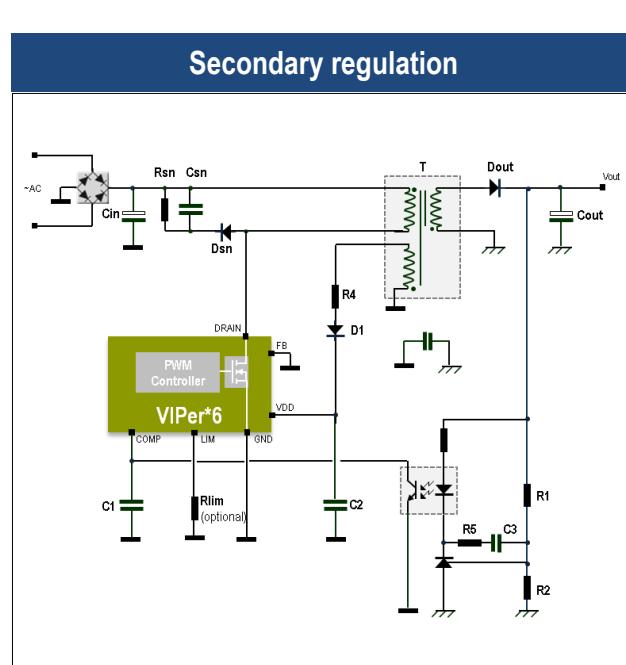
Primary regulation



Secondary regulation



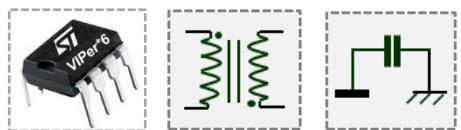
Secondary regulation



Perfect trade-off between
isolation, cost and output regulation

Standard topology without aux winding
(Viper self supply)

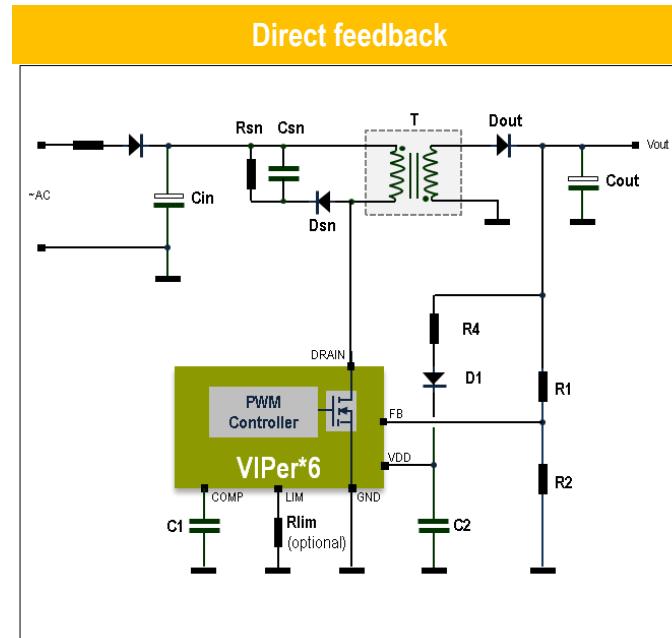
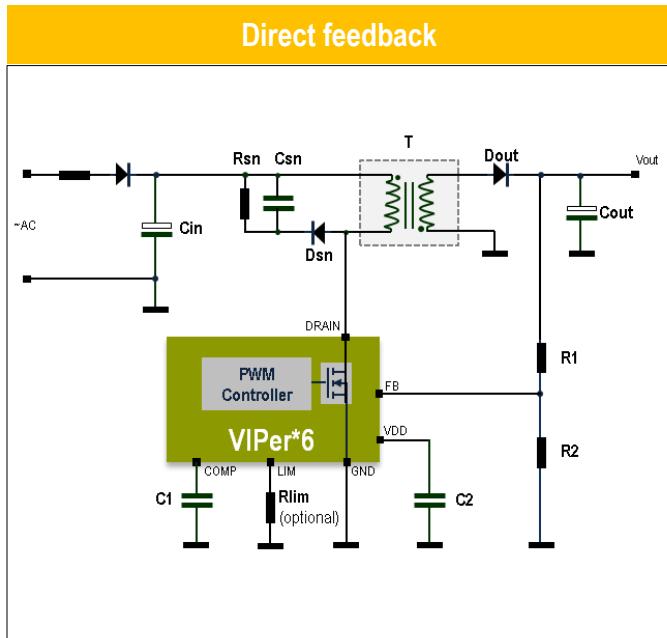
Standard topology
with the lowest standby consumption



Isolated auxiliary SMPS

VIPer*6: non-isolated flyback (1/2)

15

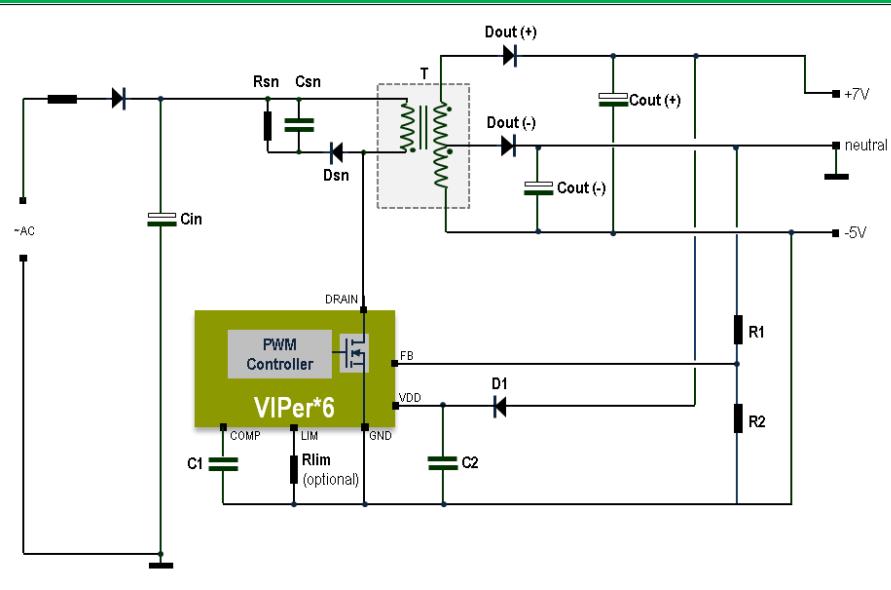


Non-isolated auxiliary SMPS

VIPer*6: non-isolated flyback (2/2)

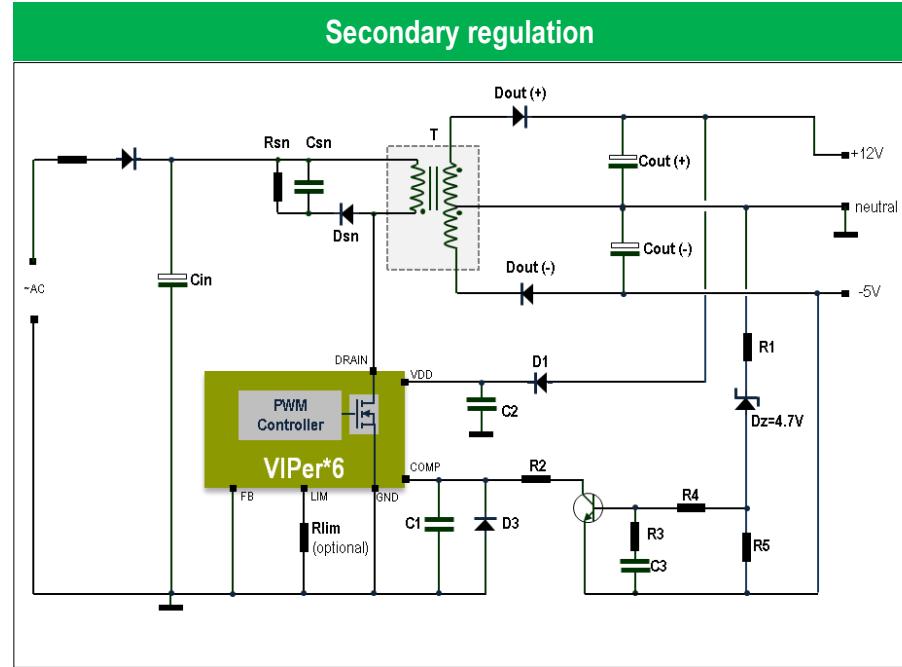
Configurations with positive and negative outputs

Direct feedback



+7 V and -5 V: outputs referred to neutral
with lowest standby consumption

Secondary regulation



+12 V and -5 V: outputs referred to neutral
with lowest standby consumption

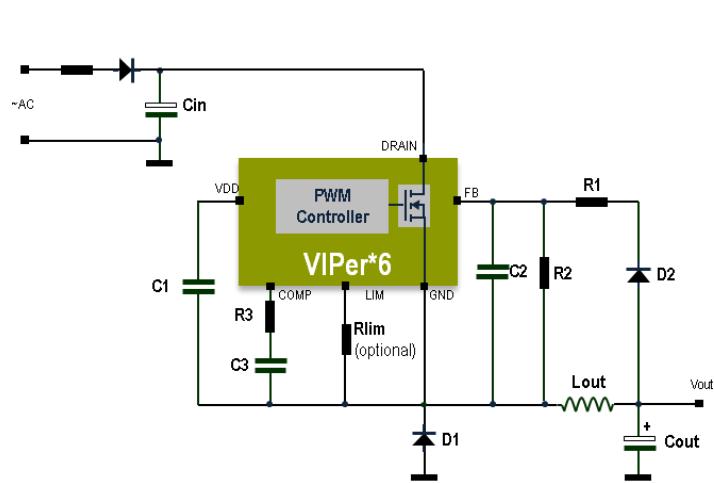


Non-isolated auxiliary SMPS

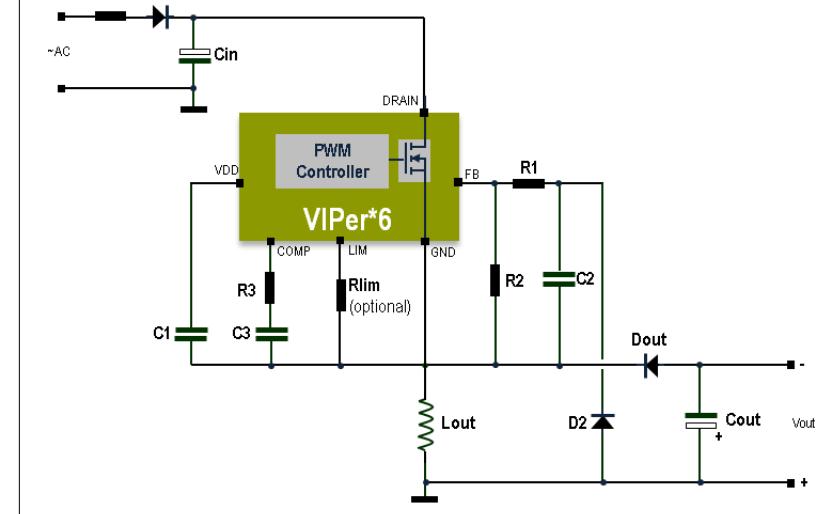
VIPer*6: inductor based topologies

17

Buck



Buck-boost with negative output

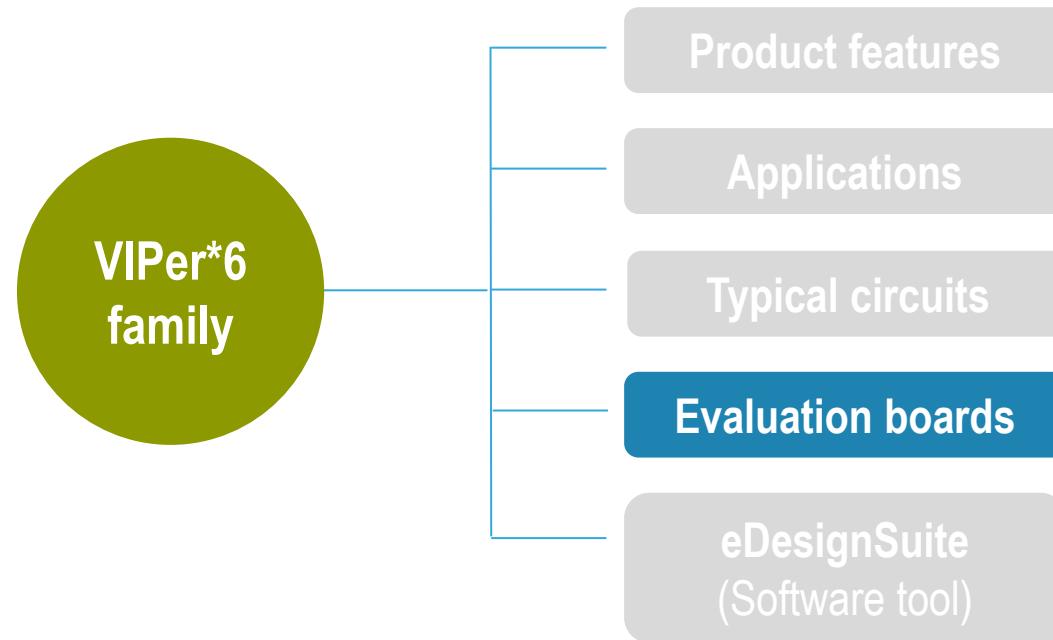


Simplicity and minimum size guaranteed

Powering an MCU to drive a Triac



Non-isolated auxiliary SMPS



VIPer*6 based solutions (1/3)

19

STEVAL-ISA130V1 (*)

1.7 W buck converter
based on VIPer06X
(output referred to neutral)



- V_{IN} = 90 to 265 Vac
- V_{OUT} = 12 V
- I_{OUT} = 140 mA
- Efficiency = 82.6% @ 85 Vac (full load)

[DN0009](#)

STEVAL-ISA115V1 (*)

1.8 W buck converter
based on VIPer06XN
(output referred to neutral)



- V_{IN} = 90 to 265 Vac
- V_{OUT} = 12 V
- I_{OUT} = 150 mA

[AN4260 \(*\)](#)

STEVAL-ISA010V1

1.8 W super wide range
buck converter
based on VIPer16LN
(dual outputs referred to neutral)



- V_{IN} = 85 to 500 Vac
- V_{OUT1} = 12 V
- V_{OUT2} = 5 V
- I_{OUTtot} = 150 mA
- Standby = 96 mW @ 230 Vac

[AN2872](#)

STEVAL-ISA096V1

2 W buck-boost converter
based on VIPer06XS
(negative output referred to neutral)



- V_{IN} = 85 to 264 Vac
- V_{OUT} = -12 V
- I_{OUT} = 150 mA
- Efficiency = 80% @ 230 Vac (full load)
- Standby < 30 mW @ 264 Vac

[UM1470](#)

Solutions up to 2 W

VIPer*6 based solutions (2/3)

20

STEVAL-ISA071V2

4 W non-isolated flyback converter
based on VIPer16L
(direct feedback, dual outputs
referred to neutral)



- V_{IN} = 85 to 264 Vac
- V_{OUT1} = +7 V
- I_{OUT1} = 160 mA
- V_{OUT2} = -5 V
- I_{OUT2} = 400 mA
- Standby = 35 mW @ 230 Vac

[UM0920](#)

STEVAL-ISA117V1 (*)

4.2 W isolated flyback converter
based on VIPer16LN
(secondary regulation)



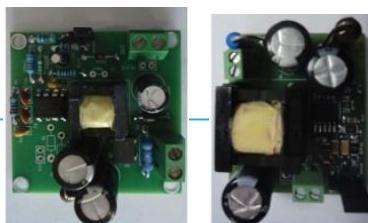
- V_{IN} = 90 to 265 Vac
- V_{OUT} = 12 V
- I_{OUT} = 350 mA

[AN4259 \(*\)](#)

STEVAL-ISA112V1

STEVAL-ISA113V1

4.2 W non-isolated flyback converter
based on VIPer06HN / VIPer06HS
(direct feedback)



- V_{IN} = 90 to 265 Vac
- V_{OUT} = 12 V
- I_{OUT} = 350 mA
- Efficiency 83% @ 115 V (full load)
- Standby < 28.5 mW @ 264 Vac

[AN4116](#),
[AN4164](#)

STEVAL-ISA118V1

4.5 W non-isolated flyback converter
based on VIPer16LN
(direct feedback)



- V_{IN} = 90 to 265 Vac
- V_{OUT} = 16 V
- I_{OUT} = 280 mA
- Efficiency > 81% @ 230 Vac (full load)

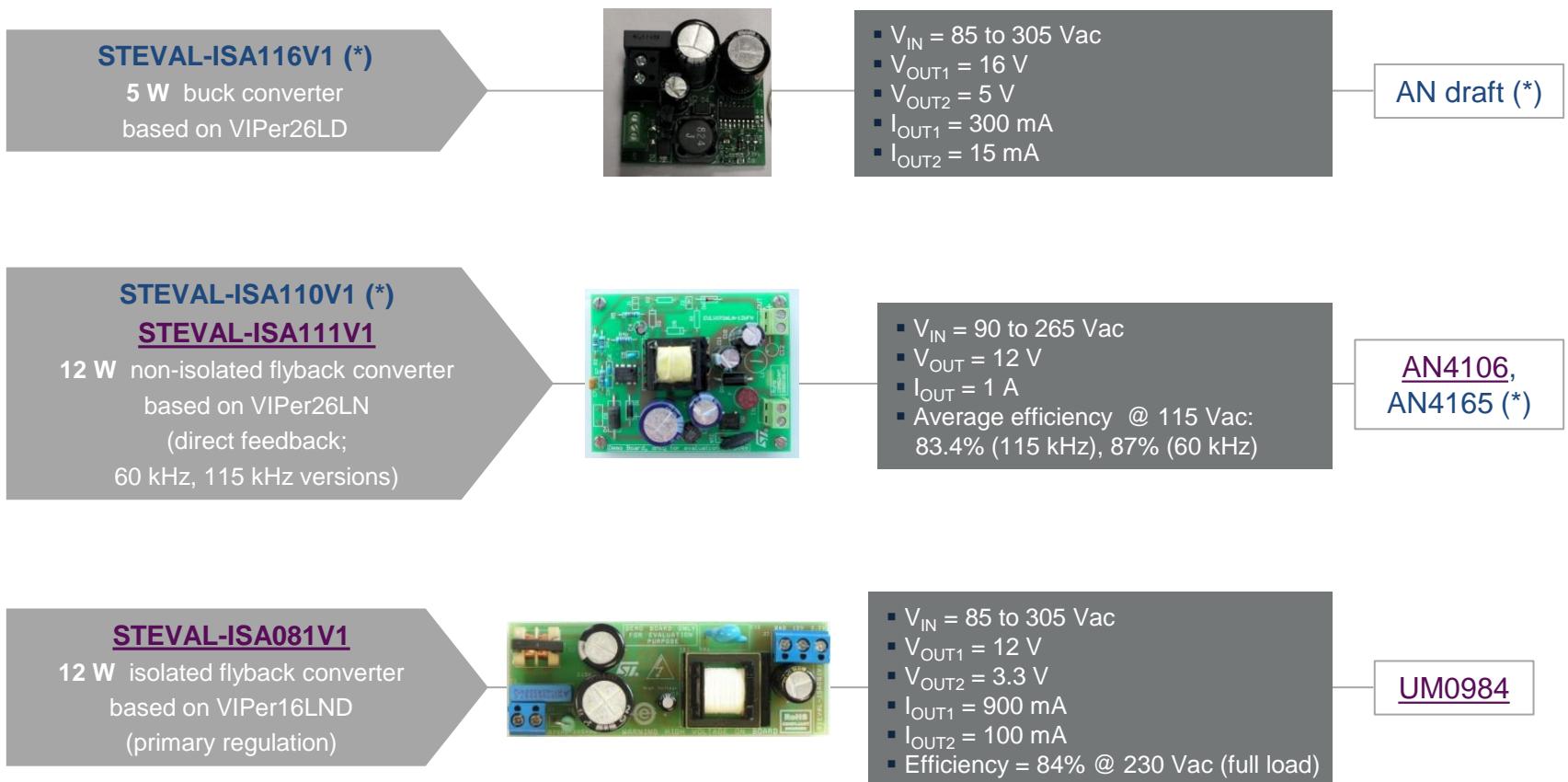
[AN3028](#)

Solutions up to 4.5 W

(*) Available on request

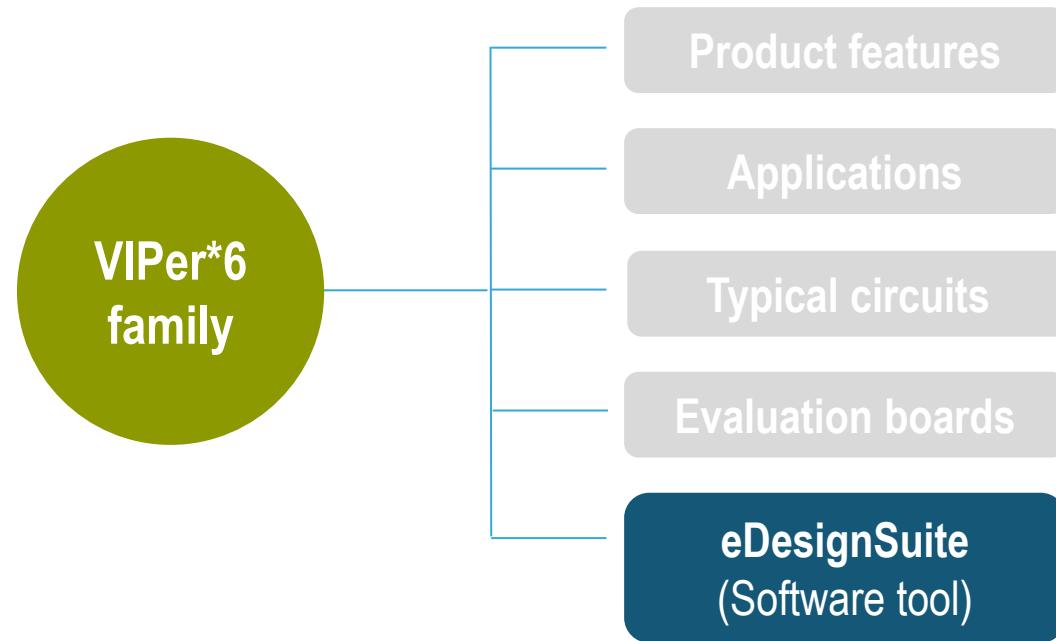
VIPer*6 based solutions (3/3)

21



Solutions up to 12 W

(*) Available on request



eDesignSuite enables VIPer*6 based design (1/2)

23

eDesignSuite

The smart tool to design your application



Login to
www.st.com/edesignsuite
(online registering is required)

or

Fill in
eDesignSuite widget
(visit VIPer*6 product pages
on www.st.com)

or

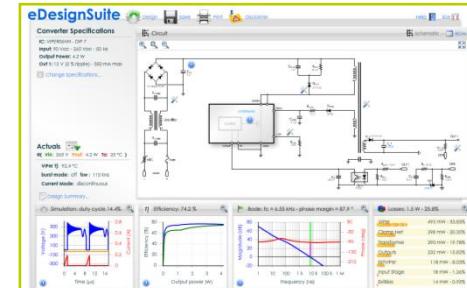
Open
eDesignSuite offline version
(ask your ST sales office to get it)



Choose Power Supply
application type
and create your design



Insert your I/O specifications and
select one of the proposed VIPer*6



The design is ready

1

2

3

4

A complete design in a few steps

www.st.com/edesign

eDesignSuite enables VIPer*6 based design (2/2)

24

The screenshot illustrates the eDesignSuite interface, divided into several sections:

- The specifications view:** A yellow dashed box on the left containing "Converter Specifications" for an IC: VIPER06HN - DIP 7, Input: 90 Vac - 265 Vac - 50 Hz, Output Power: 4.2 W, and Out 1: 12 V (2 % ripple) - 350 mA max. It also includes a "Change specifications..." button.
- The actuals view:** A pink dashed box below the specifications, showing "Actualls" for Vin: 265 V, Pout: 4.2 W, and Ta: 25°C. It also lists VIPer TJ: 92.4 °C, burst mode: off, fsw: 115 kHz, and Current Mode: discontinuous. A "Design Summary..." button is also present.
- A full set of analysis diagrams:** A blue dashed box at the bottom left containing four plots: 1) Simulation: duty cycle 14.4% showing Voltage (V) and Current (A) vs time (μs); 2) Efficiency: 74.2 % showing Efficiency (%) vs Output power (W); 3) Bode: fc = 6.55 kHz - phase margin = 87.9 ° showing Magnitude (dB) and Phase (deg) vs Frequency (Hz); 4) Losses: 1.5 W - 25.8% showing a table of component losses and their percentages.
- The design view:** The main central area showing a detailed schematic of a power converter circuit. The schematic includes a full-bridge rectifier, a line filter, a VIPER06HN IC, a flyback transformer, and various control and protection components. A blue dashed box highlights "A full set of commands" at the top of the schematic area. A green dashed box highlights "A fully interactive BOM" on the right. A yellow dashed box highlights "A fully annotated and interactive schematic" on the right.
- The user can customize the flyback transformer:** A green dashed box on the right side of the schematic area.

The design view

www.st.com/edesign

For more information

www.st.com/viper



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