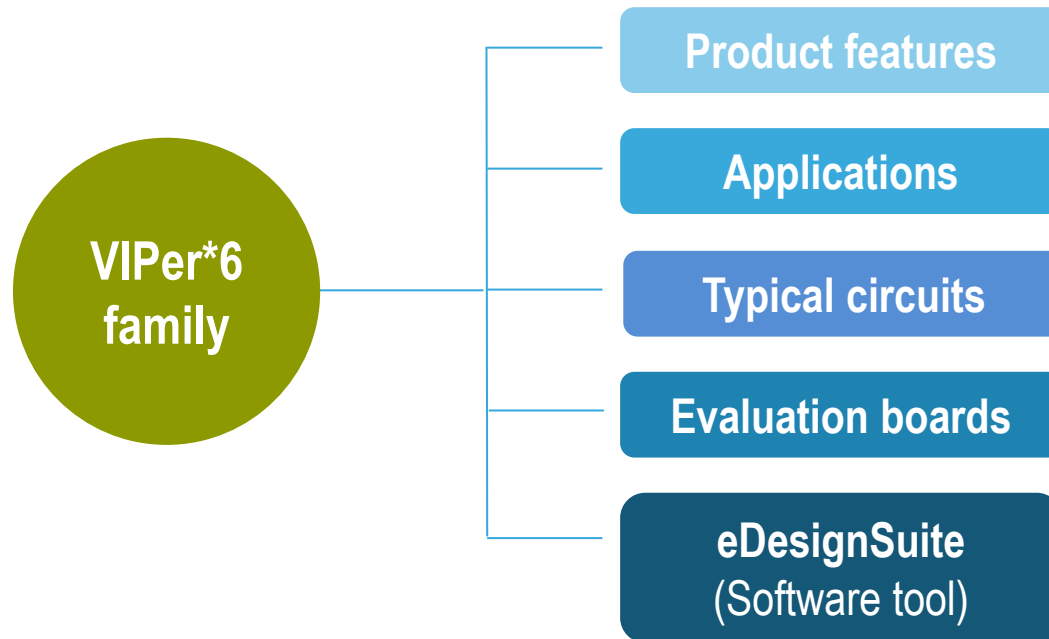


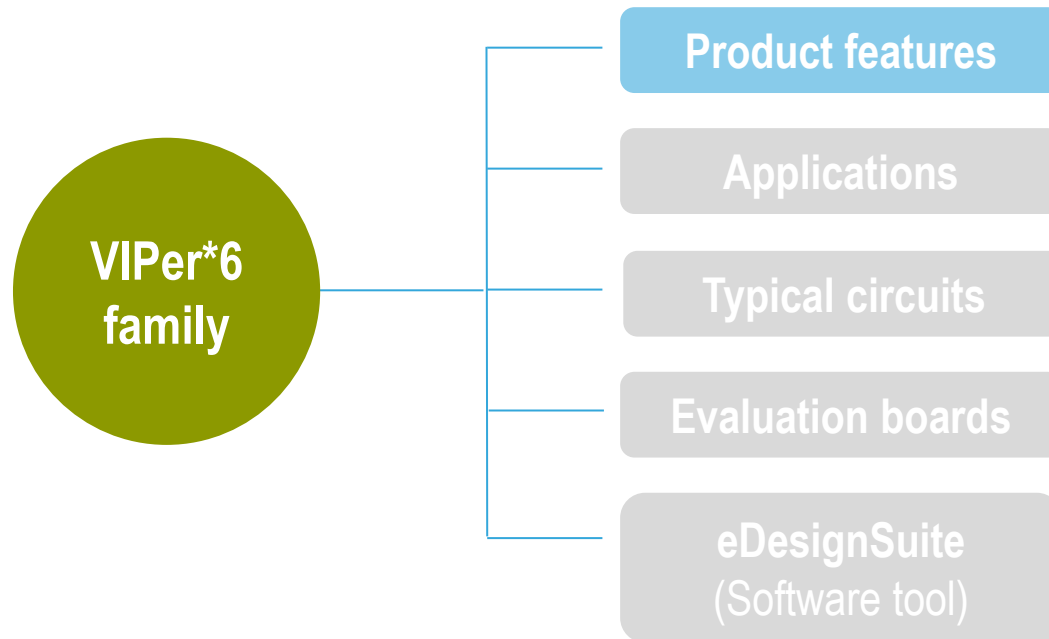
VIPer*6 family: *The fast lane to SMPS design*



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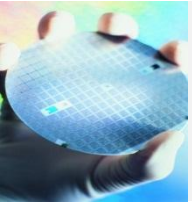
* is used as a wildcard character for related part number





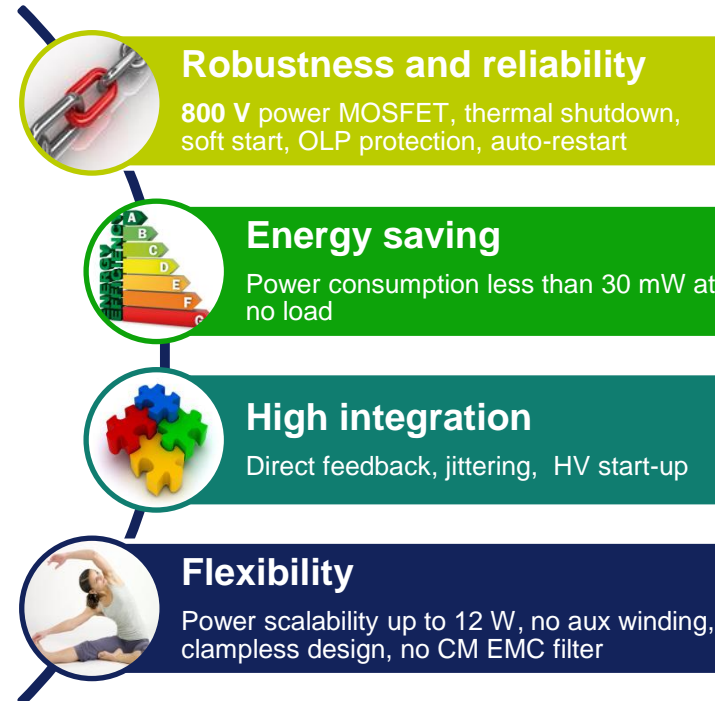
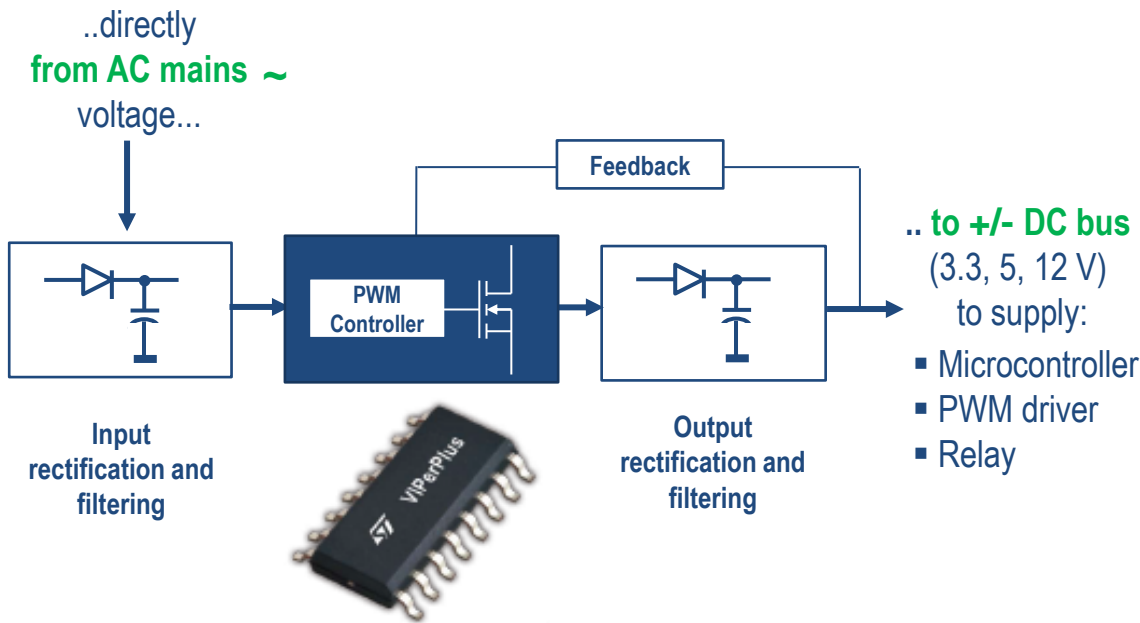
The fast lane to design switch mode power supplies

4



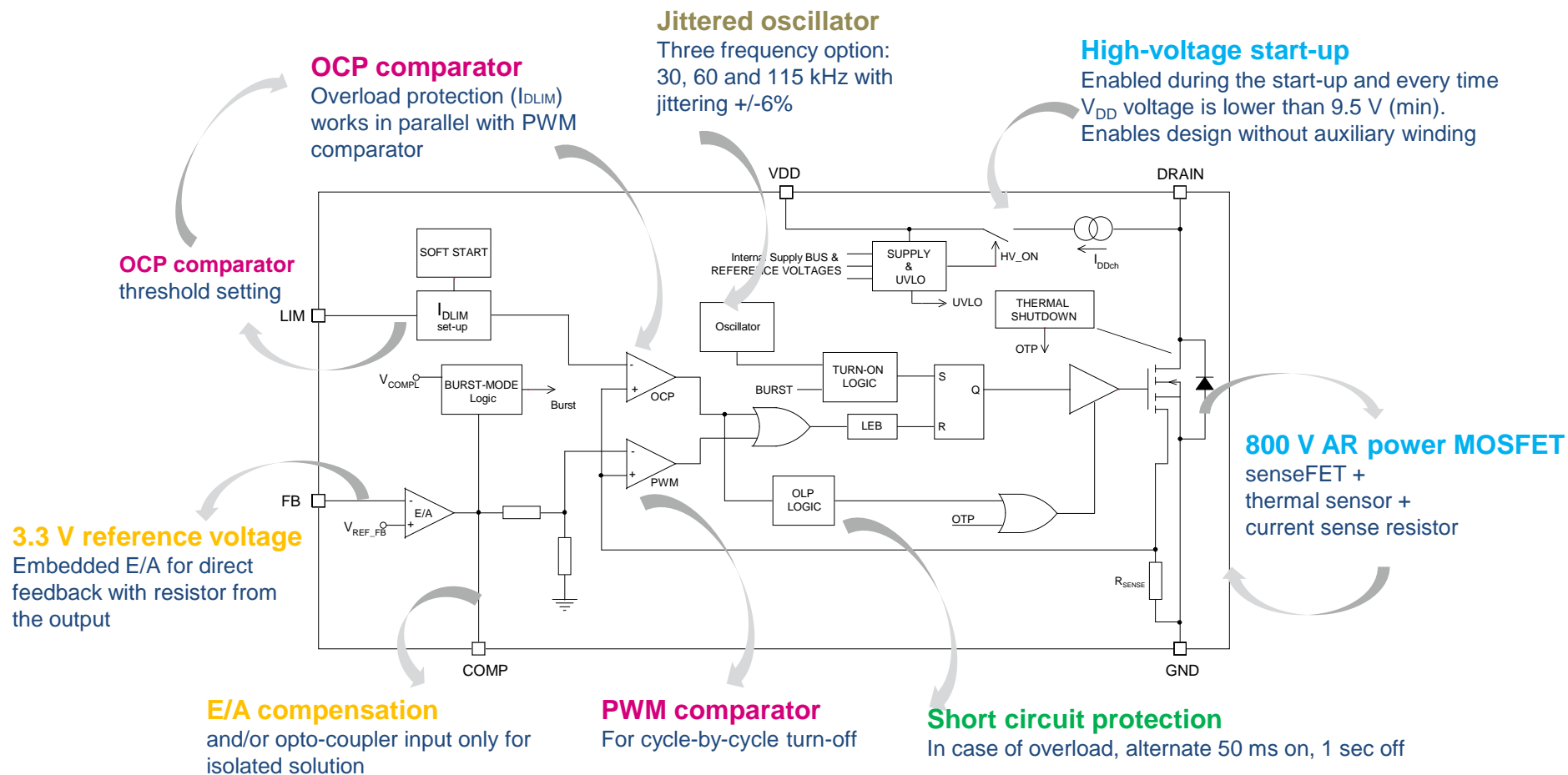
VIPerPlus – high-voltage converter

Advanced controller with embedded 800 V power MOSFET

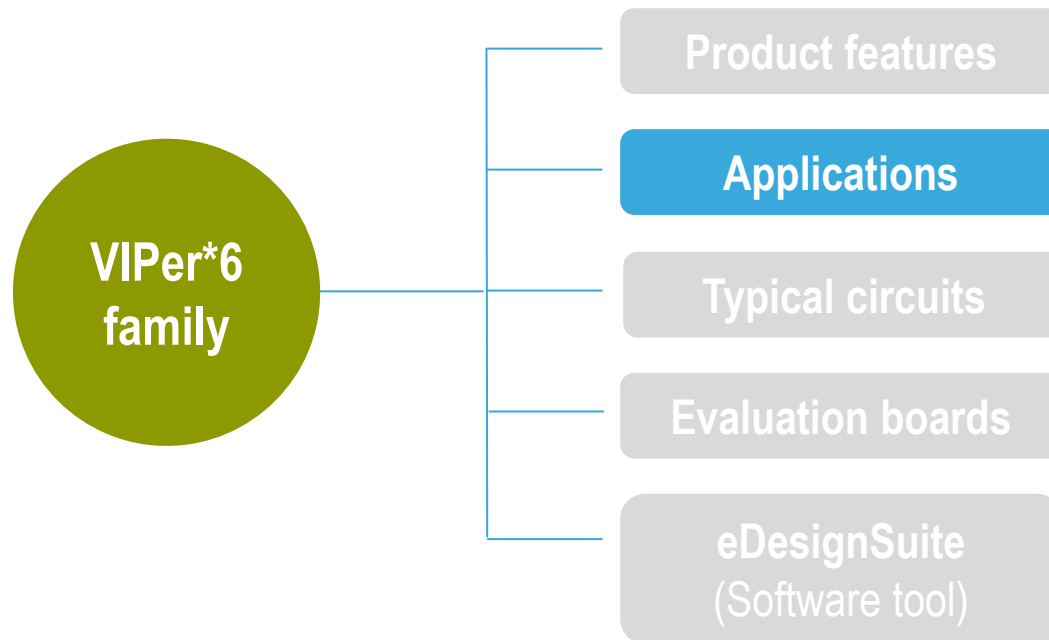


VIPer*6 family: block diagram

5



VIPer*6 family	VIPer06	VIPer16	VIPerA16	VIPer26
P_{OUT} @ 85 to 265 Vac	4 W	6 W	6 W	12 W



VIPer*6 family

Fixed-frequency AC-DC converters

VIPer06, VIPer16, VIPerA16, VIPer26



Metering



Home
appliances



Home
automation



Lighting



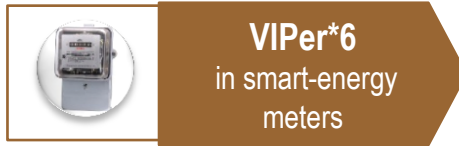
Automotive

The best choice to power your microcontroller



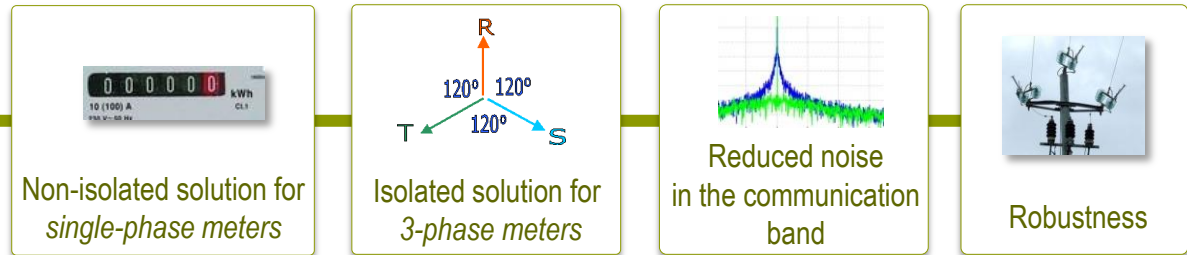
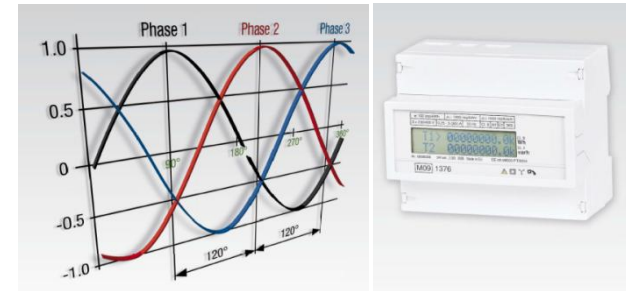
VIPer*6 for metering

8



VIPer*6 based AC-DC auxiliary power supply for

- microcontrollers
- transceivers
- metrology ICs

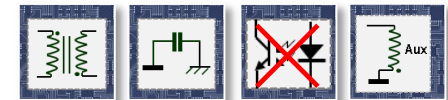


VIPer*6, key benefits for the application

- 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



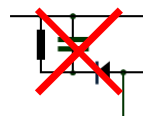
Aux SMPS
market
needs



Small EMI input filter



Power
scalability



Clampless



High
efficiency



Reduced size



Powering MCU
to drive Triac



VIPer*6,
key benefits for
the application

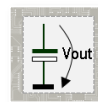
- Frequency jittering
- VIPer*6 pin-to-pin compatible
- 800 V breakdown
- Self supply
- Op amp available for primary regulation or direct feedback



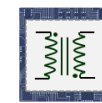
**Inductor based
topologies**



Buck
common neutral



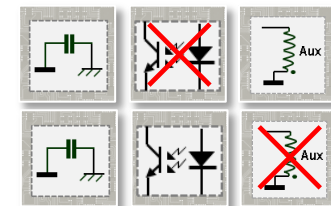
Buck-boost
negative output,
common neutral



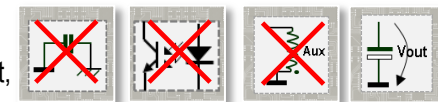
Smart flyback topologies

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

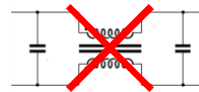
- microcontrollers
- transceivers
- sensors
- motor driver ICs



Aux SMPS
market needs



Low
standby power



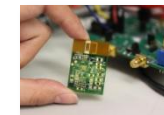
Small EMI input filter



Reliability



Cost saving



Cap SMPS
replacement

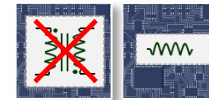


Powering MCU
to drive Triac

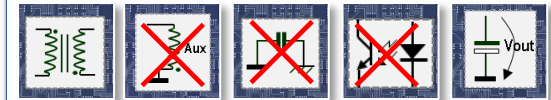


VIPer*6,
key benefits for
the application

- 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



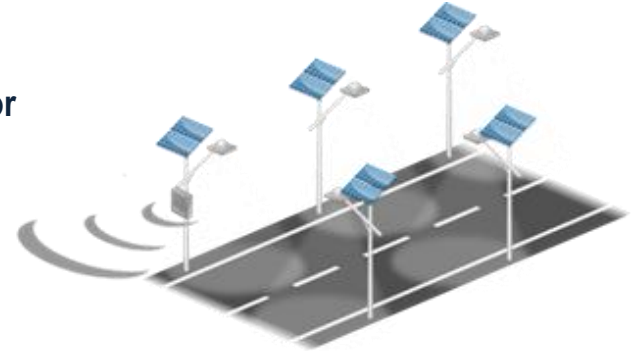
VIPer*6 for lighting

11

VIPer*6 in street lighting

VIPer*6 based AC-DC auxiliary power supply for

- microcontrollers
- transceivers
- lighting driver ICs



Aux SMPS market needs



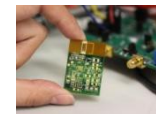
Low standby power



Robustness



Cost saving



Reduced size



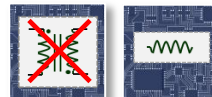
High efficiency

VIPer*6 key benefits and supported topologies

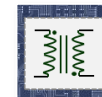


VIPer*6, key benefits for the application

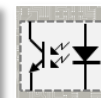
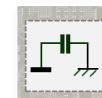
- 30 mW @ no load
- Operating temperature: -25 to +125 °C
- 800 V breakdown
- Self supply
- Op amp available for primary regulation



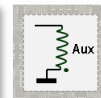
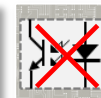
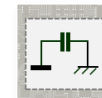
Inductor based topology
Buck



Smart flyback topologies



Isolated with secondary regulation



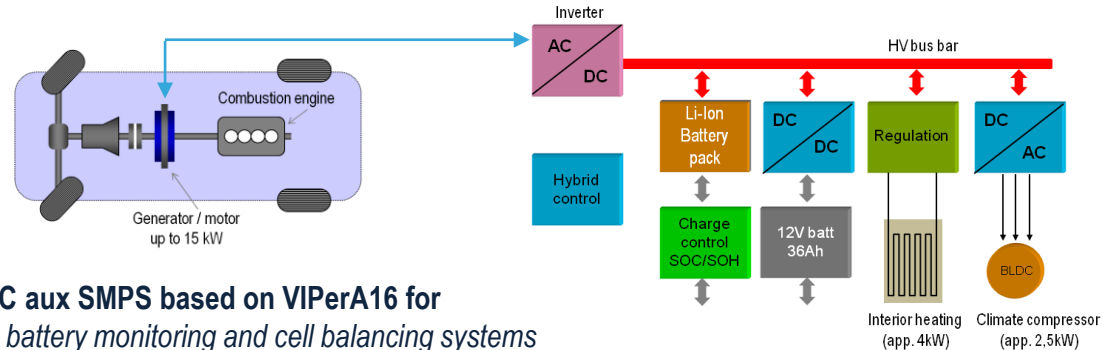
Isolated with primary regulation



VIPerA16 for automotive

12

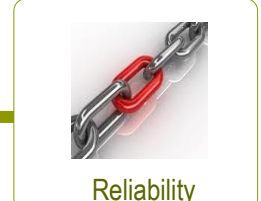
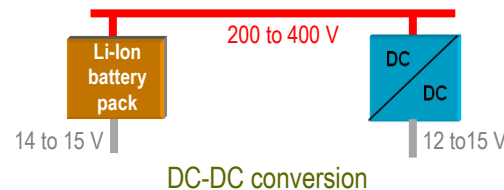
VIPerA16 in automotive hybrid/EV control



HV DC-DC aux SMPS based on VIPerA16 for

- Li-Ion battery monitoring and cell balancing systems
- DC-DC conversion to generate 12/24 V needs to subsystems

Aux SMPS market needs

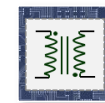


VIPerA16 Key benefits and supported topologies



VIPerA16 – automotive grade 1, key benefits for the application

- AEQ100 compliant
- Operating temperature: -40 to +125 °C
- 800 V breakdown
- Op amp available for direct feedback



Smart flyback topologies

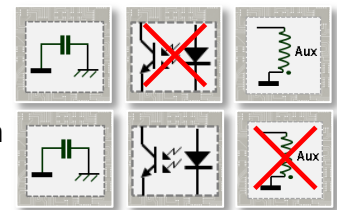


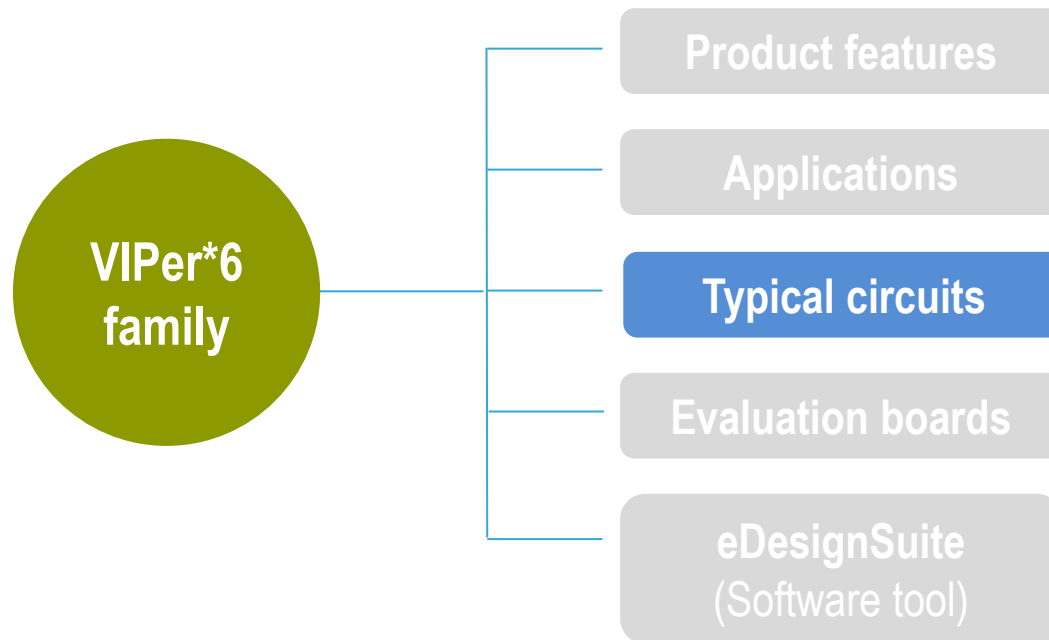
Non-isolated
direct feedback



Isolated

- primary regulation
- secondary regulation

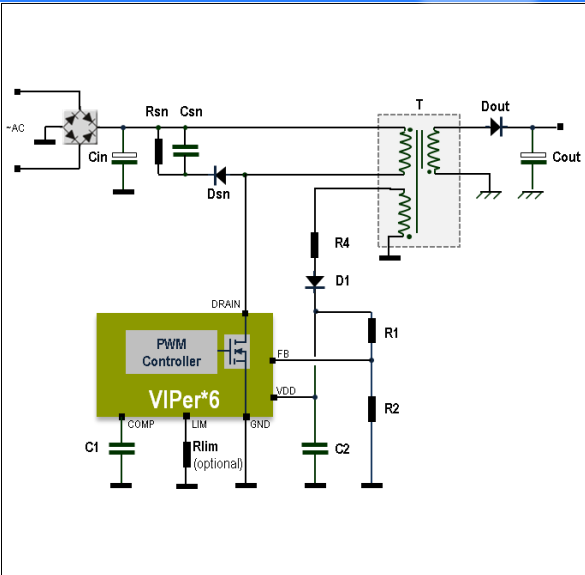




VIPer*6: isolated flyback

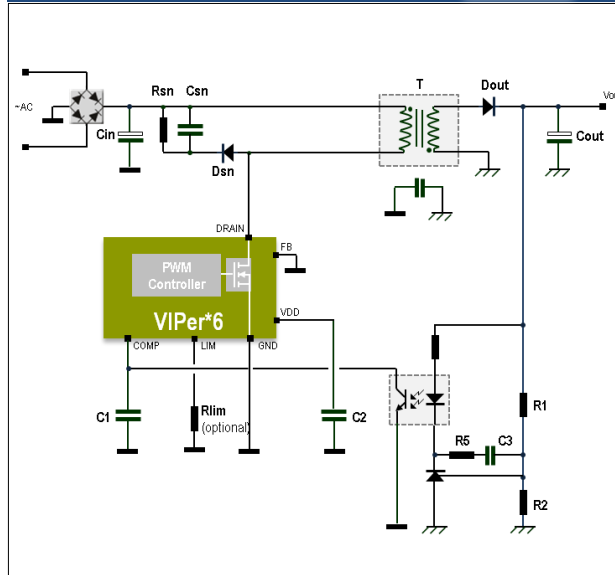
14

Primary regulation



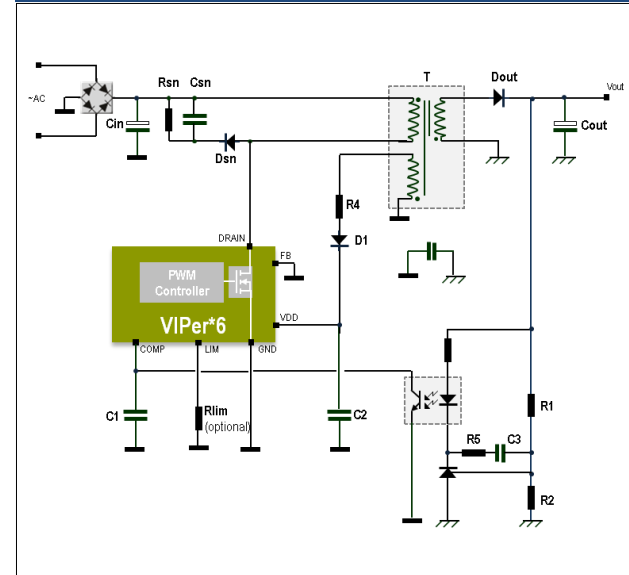
Perfect trade-off between isolation, cost and output regulation

Secondary regulation

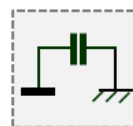


Standard topology without aux winding (VIPer self supply)

Secondary regulation



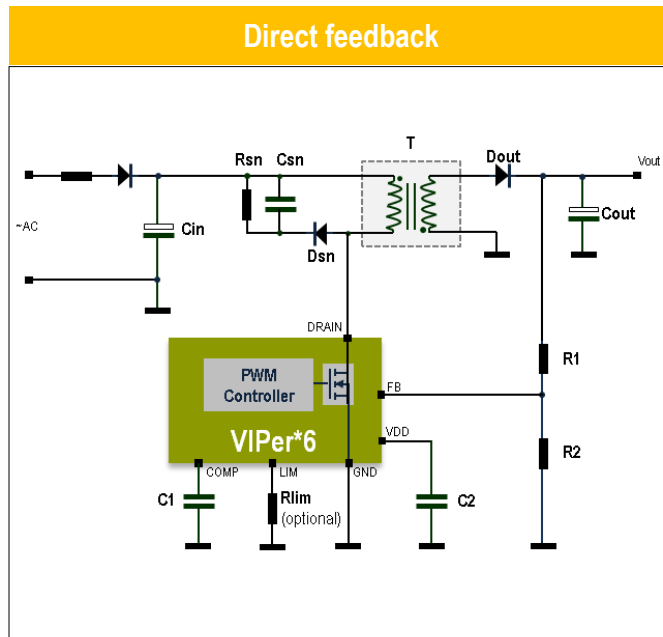
Standard topology with the lowest standby consumption



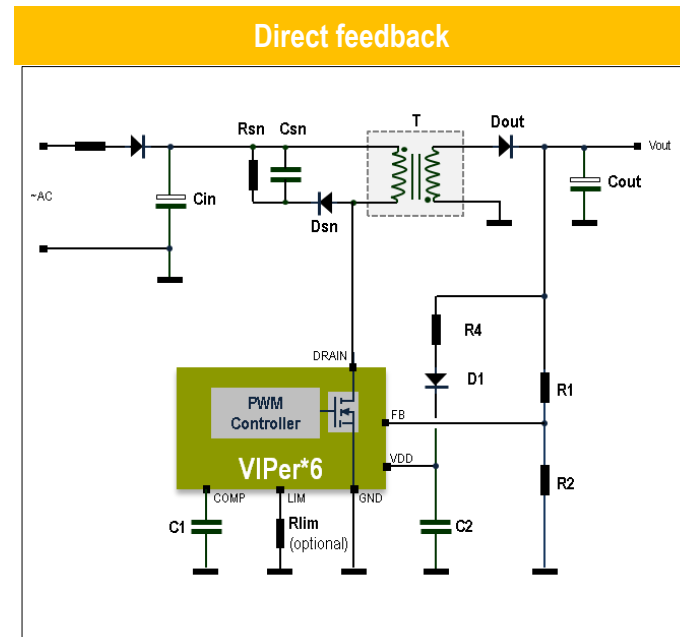
Isolated auxiliary SMPS

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

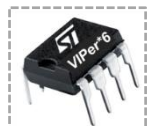
15



Minimal component count



Minimal component count
with the lowest standby consumption
($V_{OUT} \geq 12\text{ V}$)



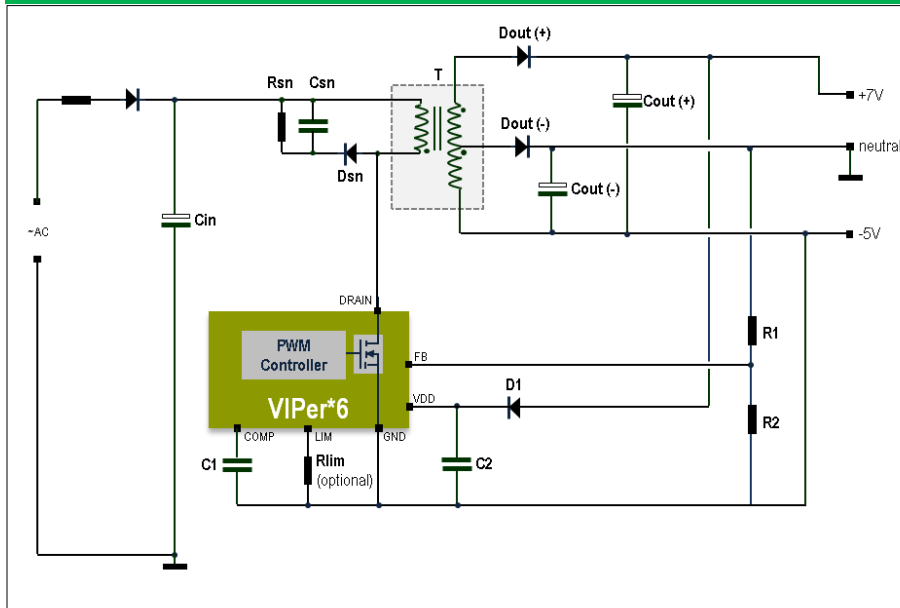
Non-isolated auxiliary SMPS

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

16

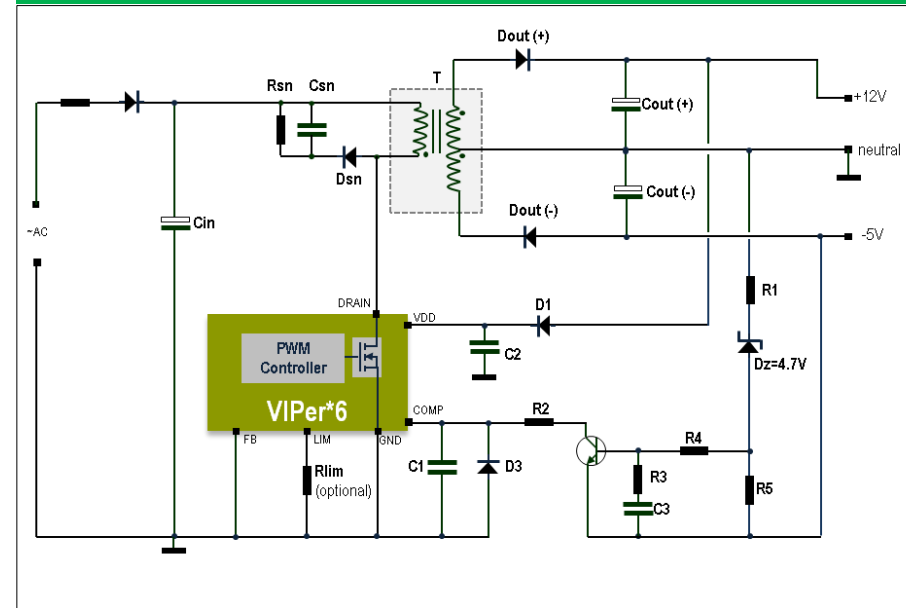
Configurations with positive and negative outputs

Direct feedback

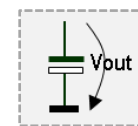


+7 V and -5 V: outputs referred to neutral with lowest standby consumption

Secondary regulation



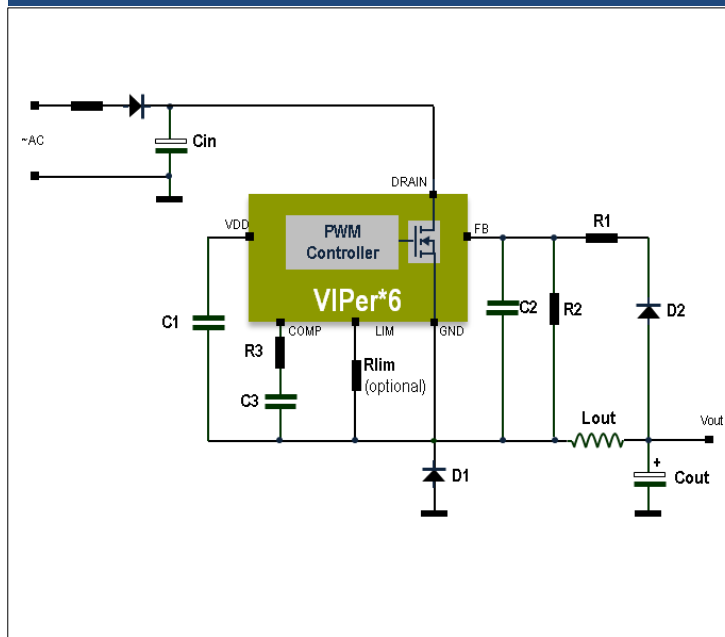
+12 V and -5 V: outputs referred to neutral with lowest standby consumption



VIPer*6: inductor based topologies

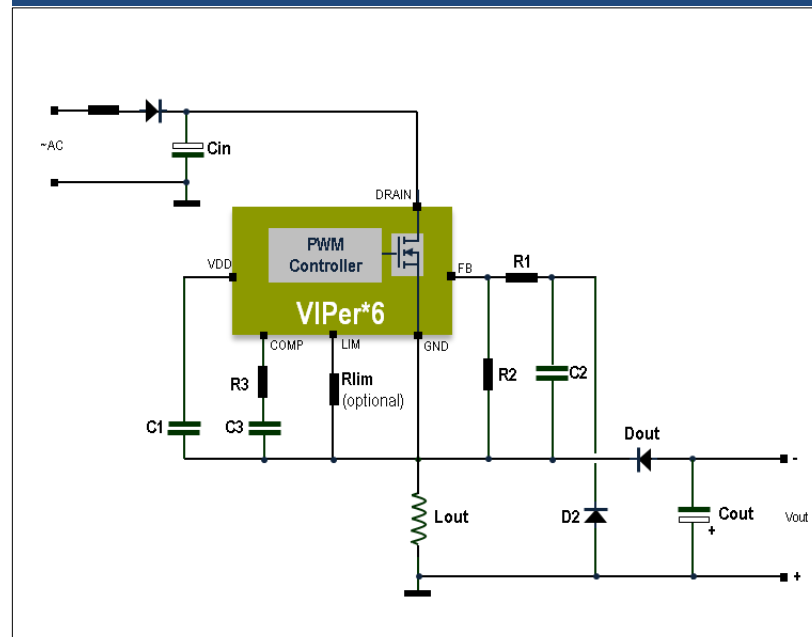
17

Buck

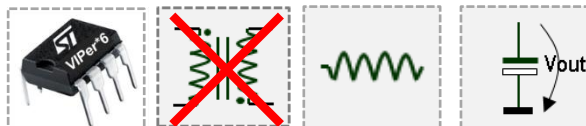


Simplicity and minimum size guaranteed

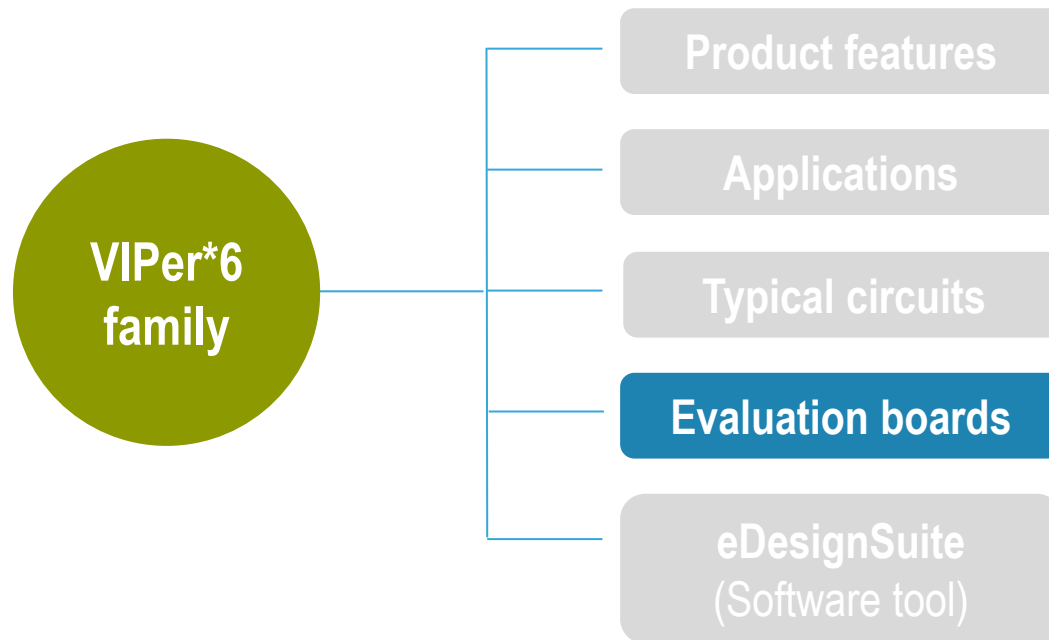
Buck-boost with negative output



Powering an MCU to drive a Triac

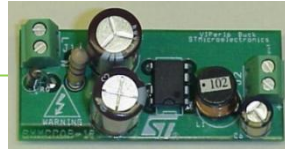


Non-isolated auxiliary SMPS



STEVAL-ISA130V1 (*)

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



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

[DN0009](#)

STEVAL-ISA115V1 (*)

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



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

[AN4260 \(*\)](#)

STEVAL-ISA010V1

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

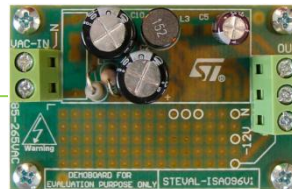


- $V_{IN} = 85 \text{ to } 500 \text{ Vac}$
- $V_{OUT1} = 12 \text{ V}$
- $V_{OUT2} = 5 \text{ V}$
- $I_{OUTtot} = 150 \text{ mA}$
- Standby= 96 mW @ 230 Vac

[AN2872](#)

STEVAL-ISA096V1

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



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

[UM1470](#)

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)



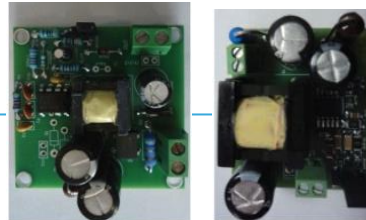
- $V_{IN} = 90$ to 265 Vac
- $V_{OUT} = 12$ V
- $I_{OUT} = 350$ mA

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)

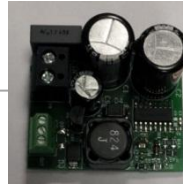


- $V_{IN} = 90$ to 265 Vac
- $V_{OUT} = 16$ V
- $I_{OUT} = 280$ mA
- Efficiency > 81% @ 230 Vac (full load)

AN3028

STEVAL-ISA116V1 (*)

5 W buck converter
based on VIPer26LD



- $V_{IN} = 85$ to 305 Vac
- $V_{OUT1} = 16$ V
- $V_{OUT2} = 5$ V
- $I_{OUT1} = 300$ mA
- $I_{OUT2} = 15$ mA

AN draft (*)

STEVAL-ISA110V1 (*)

STEVAL-ISA111V1
12 W non-isolated flyback converter
based on VIPer26LN
(direct feedback;
60 kHz, 115 kHz versions)



- $V_{IN} = 90$ to 265 Vac
- $V_{OUT} = 12$ V
- $I_{OUT} = 1$ A
- Average efficiency @ 115 Vac:
83.4% (115 kHz), 87% (60 kHz)

AN4106,
AN4165 (*)

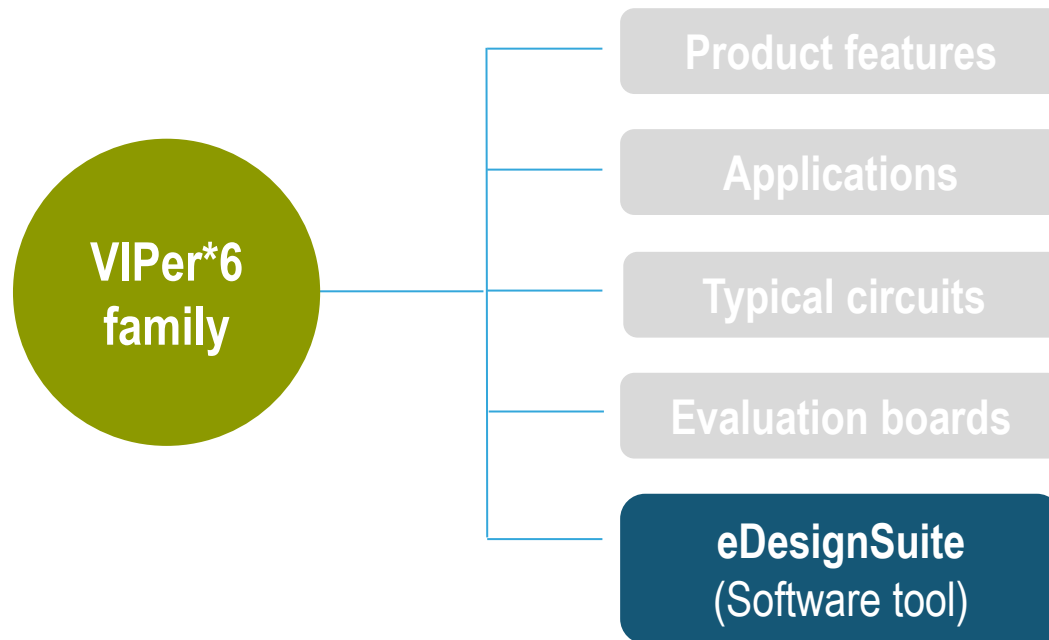
STEVAL-ISA081V1

12 W isolated flyback converter
based on VIPer16LND
(primary regulation)



- $V_{IN} = 85$ to 305 Vac
- $V_{OUT1} = 12$ V
- $V_{OUT2} = 3.3$ V
- $I_{OUT1} = 900$ mA
- $I_{OUT2} = 100$ mA
- Efficiency = 84% @ 230 Vac (full load)

UM0984



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

23

eDesignSuite

The smart tool to design your application

Power Supply
DC/DC - AC/DC



LED Lighting
DC/DC - AC/DC



Photovoltaic
DC/DC



Battery Charger
AC/DC



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

or

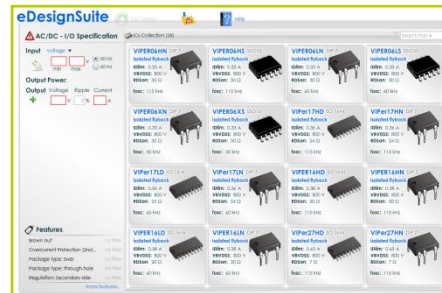
Fill in
eDesignSuite widget
(visit VIPer*6 product pages
on www.st.com)

or

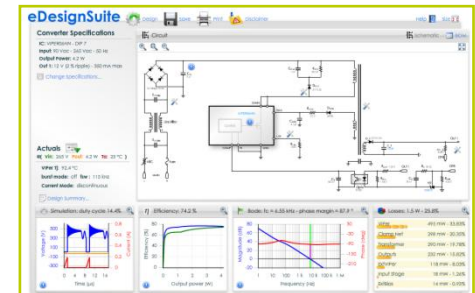
Open
eDesignSuite offline version
(ask your ST sales office to get it)



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 specifications view

Converter Specifications

IC: VIPER06HN - DIP 7
Input: 90 Vac - 265 Vac - 50 Hz
Output Power: 4.2 W
Out 1: 12 V (2 % ripple) - 350 mA max
[Change Specifications...](#)

Actuals

@ (Vin: 265 V Pout: 4.2 W Ta: 25 °C)
VIPer Tj: 92.4 °C
burst mode: off fsw: 115 kHz
Current Mode: discontinuous
[Design Summary...](#)

A full set of commands

Design Save Print Disclaimer

A fully interactive BOM

Schematic BOM

A fully annotated and interactive schematic

The user can customize the flyback transformer

The design view

Simulation: duty cycle 14.4%

η Efficiency: 74.2%

Bode: fc = 6.55 kHz - phase margin = 87.9 °

Losses: 1.5 W - 25.8%

A full set of analysis diagrams

Voltage (V) Current (A) Time (μs)

Efficiency (%) Output power (W)

Magnitude (dB) Phase (deg) Frequency (Hz)

Losses:

Component	Power (mW)	Efficiency (%)
VIPer	495	33.83%
Clamp Net	298	20.35%
Transformer	290	19.78%
Outputs	232	15.82%
ExtVIPer	118	8.03%
Input stage	18	1.26%
ExtBias	14	0.93%

For more information
www.st.com/viper



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