VIPer*6 family:

The fast lane to SMPS design

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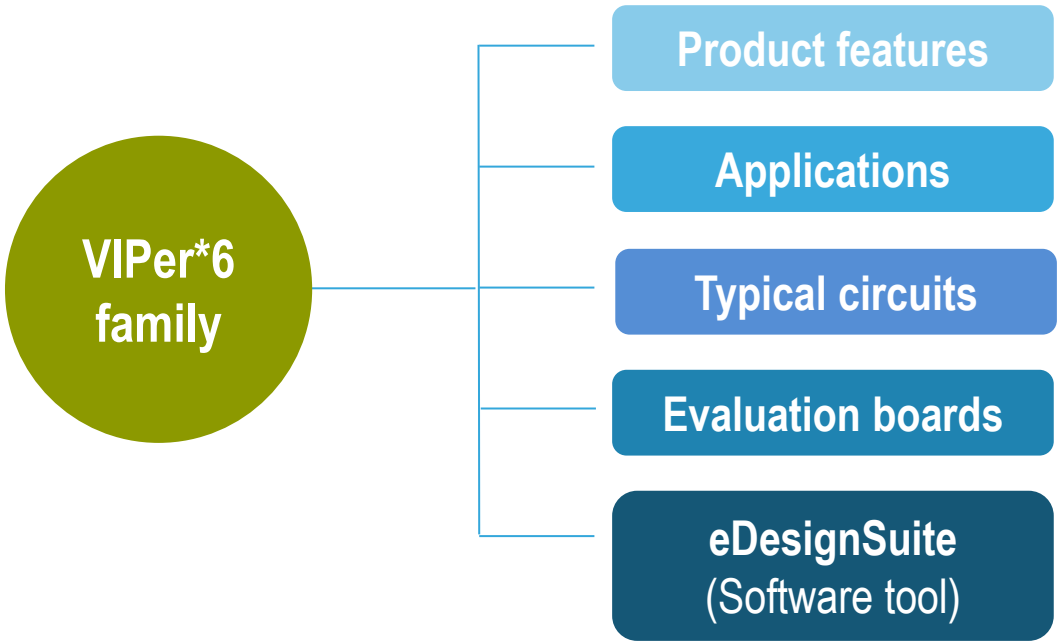
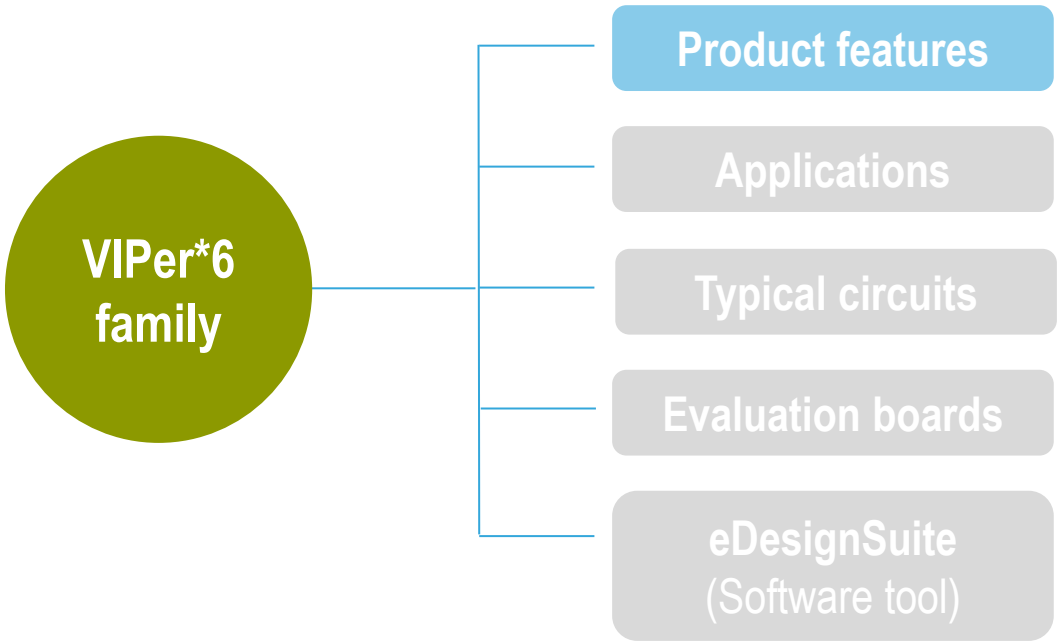
** is used as a wildcard character for related part number*

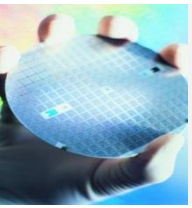
VIPer*6 family: content



VIPer*6 family



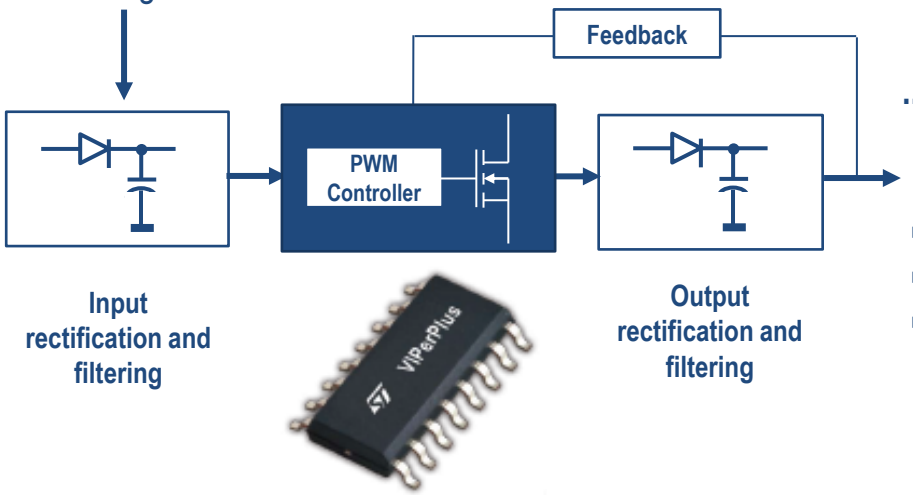
The fast lane to design switch mode power supplies



VIPerPlus – high-voltage converter

Advanced controller with embedded 800 V power MOSFET

..directly
from AC mains ~
voltage...



.. to +/- DC bus
(3.3, 5, 12 V)
to supply:

- Microcontroller
- PWM driver
- Relay

Robustness and reliability

800 V power MOSFET, thermal shutdown, soft start, OLP protection, auto-restart

Energy saving

Power consumption less than 30 mW at no load

High integration

Direct feedback, jittering, HV start-up

Flexibility

Power scalability up to 12 W, no aux winding, clampless design, no CM EMC filter

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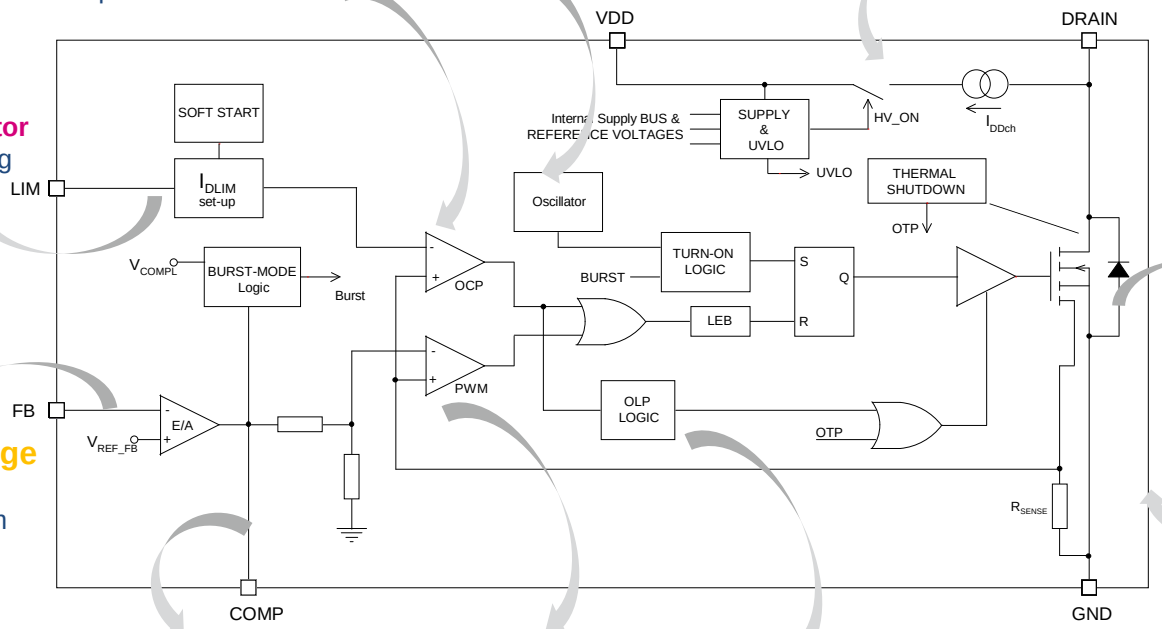
VIPer*6 family: block diagram

Jittered oscillator
Three frequency option: 30, 60 and 115 kHz with jittering +/-6%

OCP comparator
Overload protection (I_{DLIM}) works in parallel with PWM comparator

High-voltage start-up
Enabled during the start-up and every time V_{DD} voltage is lower than 9.5 V (min). Enables design without auxiliary winding

OCP comparator
threshold setting



800 V AR power MOSFET
senseFET +
thermal sensor +
current sense resistor

3.3 V reference voltage
Embedded E/A for direct feedback with resistor from the output

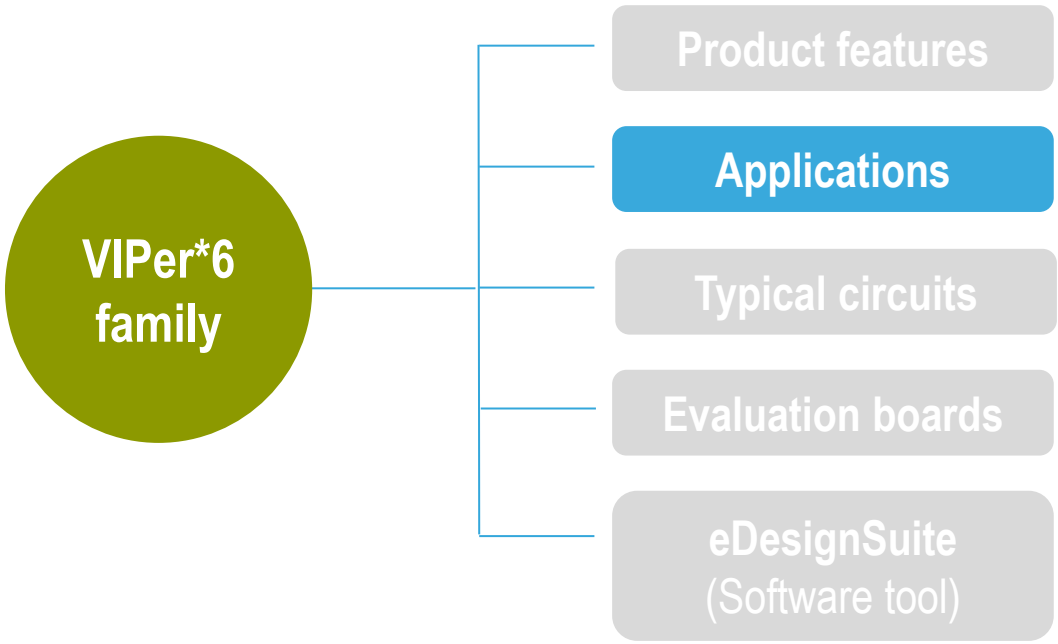
E/A compensation
and/or opto-coupler input only for isolated solution

PWM comparator
For cycle-by-cycle turn-off

Short circuit protection
In case of overload, alternate 50 ms on, 1 sec off

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

VIPer*6 family



VIPer*6 in applications

VIPer*6 family

Fixed-frequency AC-DC converters

VIPer06, VIPer16, VIPerA16, VIPer26

Metering

Home appliances

Home automation

Lighting

Automotive

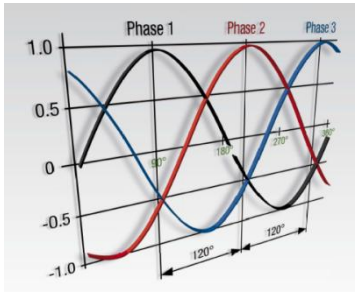
The best choice to power your microcontroller

VIPer*6 for metering

VIPer*6
in smart-energy meters

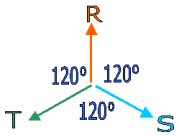
VIPer*6 based
AC-DC auxiliary power supply for

- microcontrollers
- transceivers
- metrology ICs

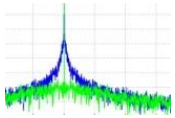


Aux SMPS
market needs

Non-isolated solution for *single-phase meters*



Isolated solution for *3-phase meters*



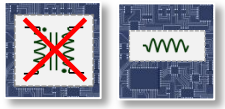
Reduced noise in the communication band

Robustness

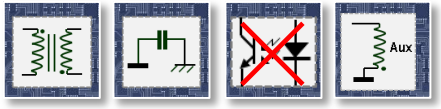
VIPer*6
key benefits and supported topologies

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

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VIPer*6 for home appliances

VIPer*6 in home appliances

VIPer*6 based
AC-DC auxiliary power supply for

- microcontrollers
- LEDs
- user interfaces
- motor driver ICs

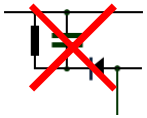
Small home appliances

Major appliances

Aux SMPS market needs

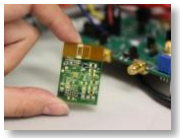
Small EMI input filter

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

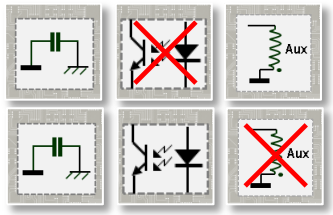
Inductor based topologies

Buck
common neutral

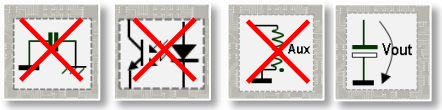
Buck-boost
negative output, common neutral

Smart flyback topologies

Isolated
- primary regulation
- secondary regulation



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



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VIPer*6 for home automation

VIPer*6 in home automation

VIPer*6 based AC-DC auxiliary power supply for

- microcontrollers
- transceivers
- sensors
- motor driver ICs

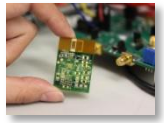
Aux SMPS market needs

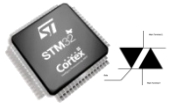
Low standby power

Small EMI input filter

Reliability

Cost saving

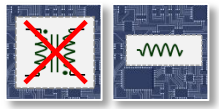

Cap SMPS replacement


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

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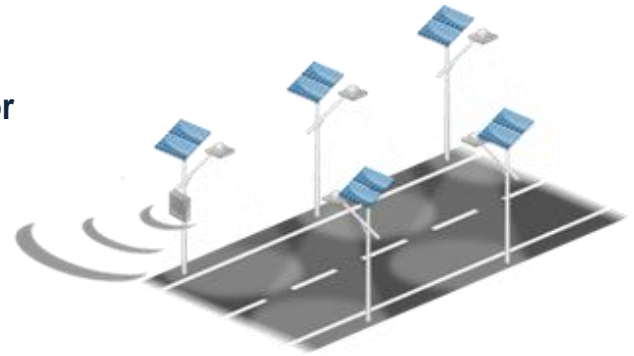
VIPer*6 for lighting

VIPer*6
in
street lighting

VIPer*6 based
AC-DC auxiliary power supply for

- microcontrollers
- transceivers
- lighting driver ICs

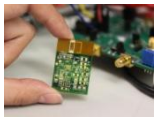


Aux SMPS
market
needs

Low
standby power

Robustness

Cost saving



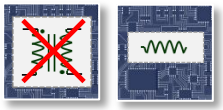
Reduced size

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

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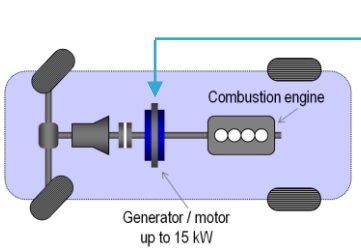
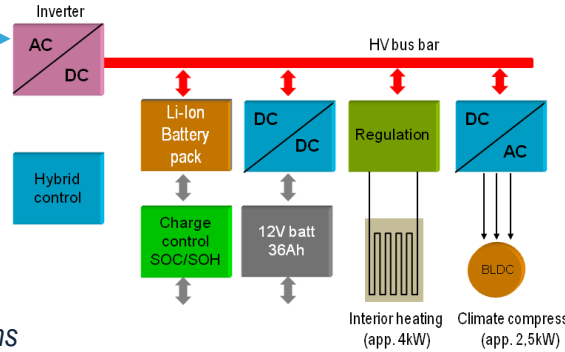
VIPerA16 for automotive

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

DC-DC conversion

Strong thermal robustness

Reliability

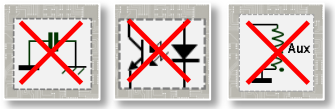
VIPerA16 Key benefits and supported topologies

VIPerA16 – automotive grade 1, key benefits for the application

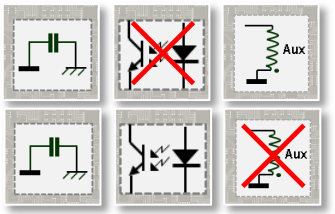
- AEQ100 compliant
- Operating temperature: -40 to +125 °C
- 800 V breakdown
- Op amp available for direct feedback

Smart flyback topologies

Li-Ion Battery pack → Non-isolated direct feedback



DC DC → Isolated
- primary regulation
- secondary regulation



Contact your ST office for further information on VIPerA16

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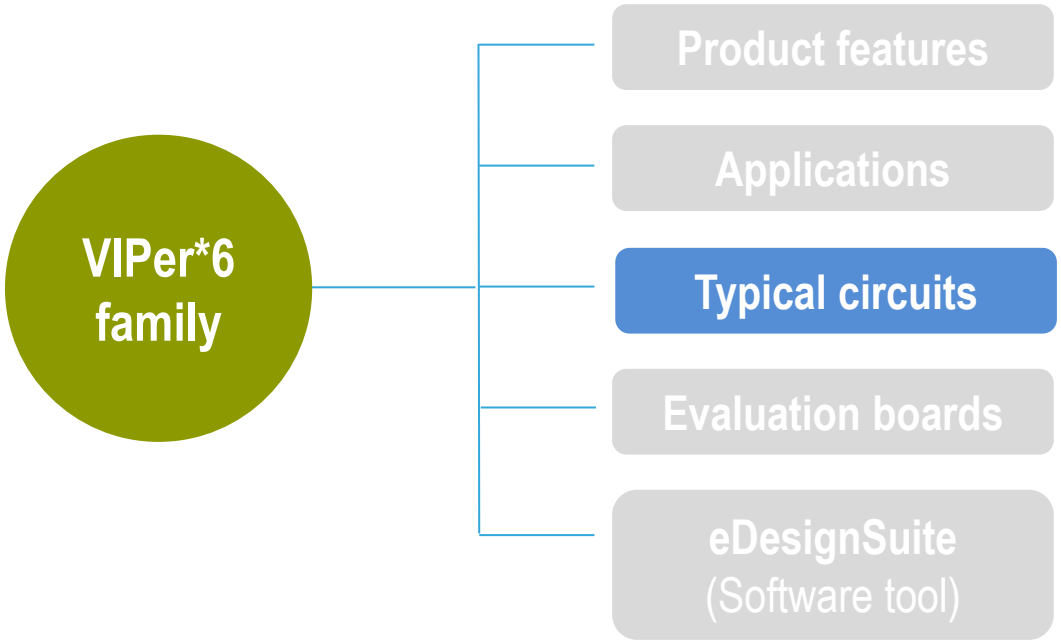
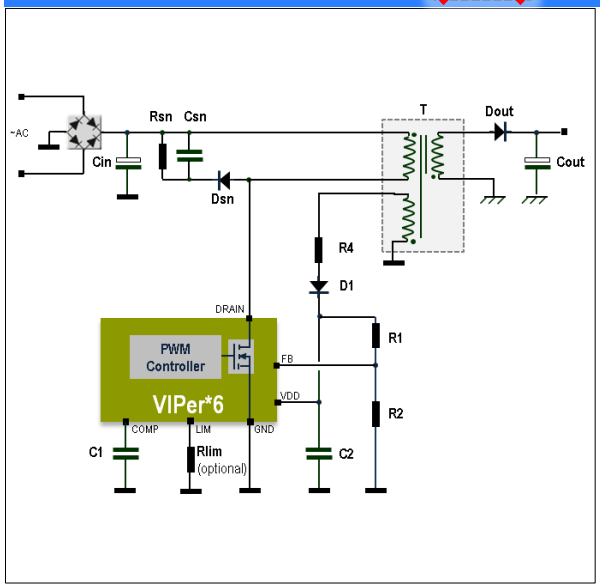
VIPer*6 family



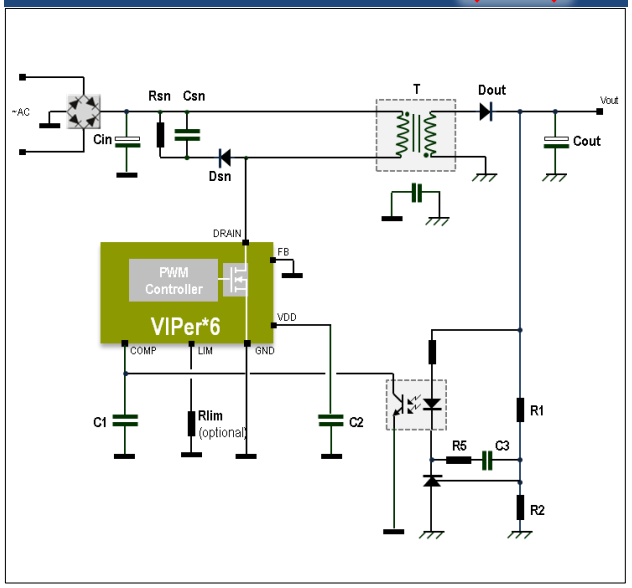
VIPer*6: isolated flyback

Primary regulation



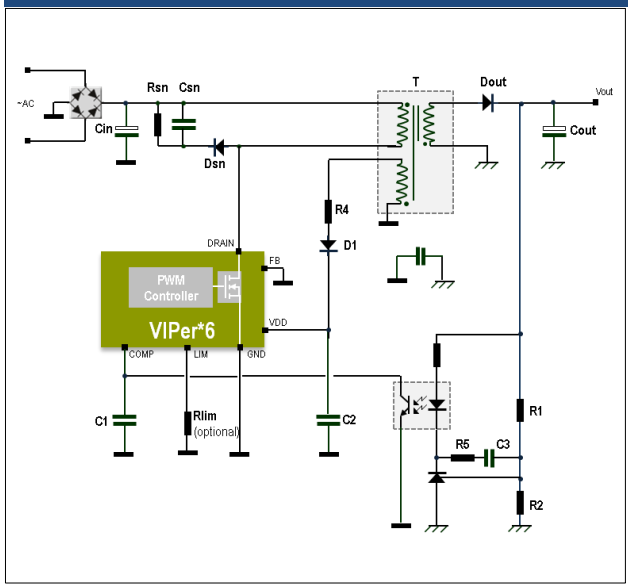
Perfect trade-off between isolation, cost and output regulation

Secondary regulation

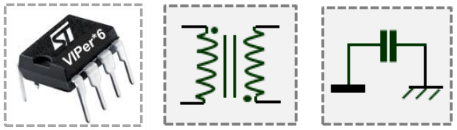


Standard topology without aux winding (VIPer self supply)

Secondary regulation



Standard topology with the lowest standby consumption



Isolated auxiliary SMPS

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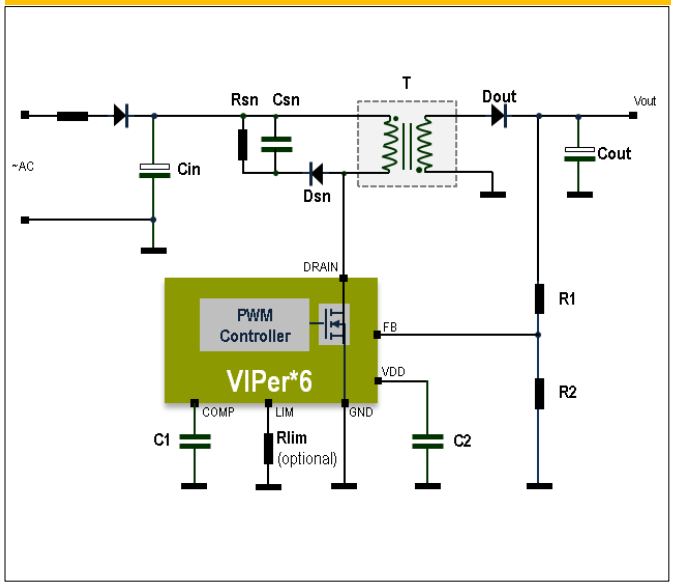
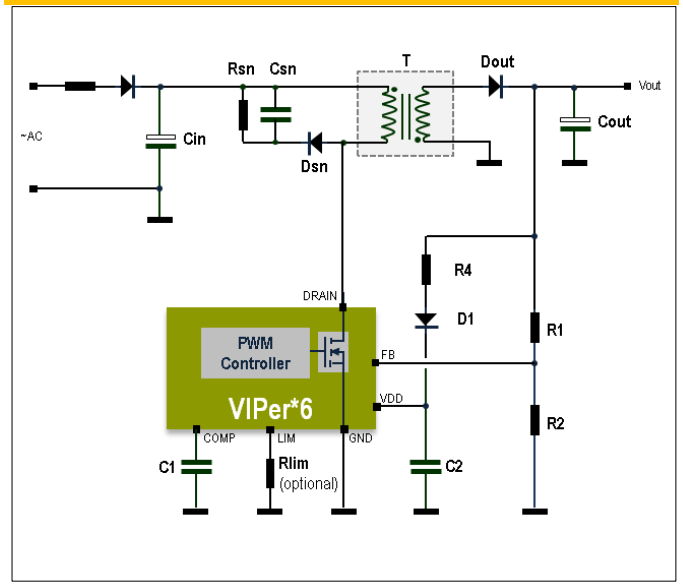
VIPer*6: non-isolated flyback(1/2)

Direct feedback



Minimal component count

Direct feedback



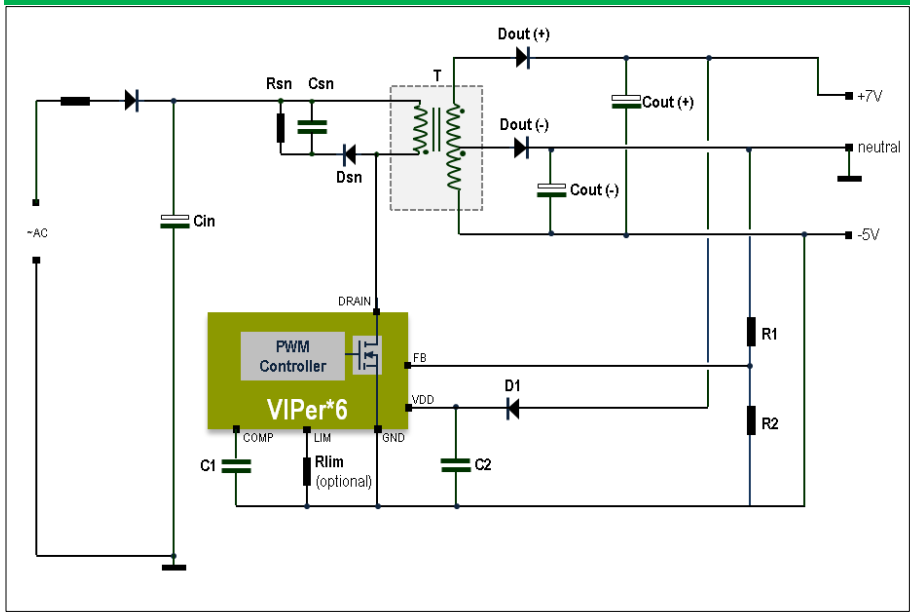
Minimal component count
with the lowest standby consumption
(V_{OUT} ≥ 12 V)

Non-isolated auxiliary SMPS

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

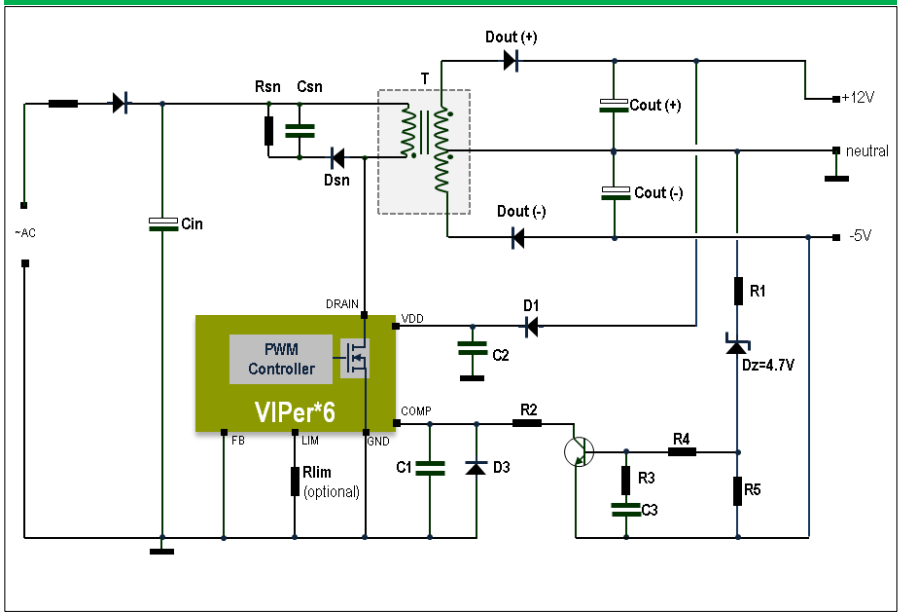
Configurations with positive and negative outputs

Direct feedback



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

Secondary regulation

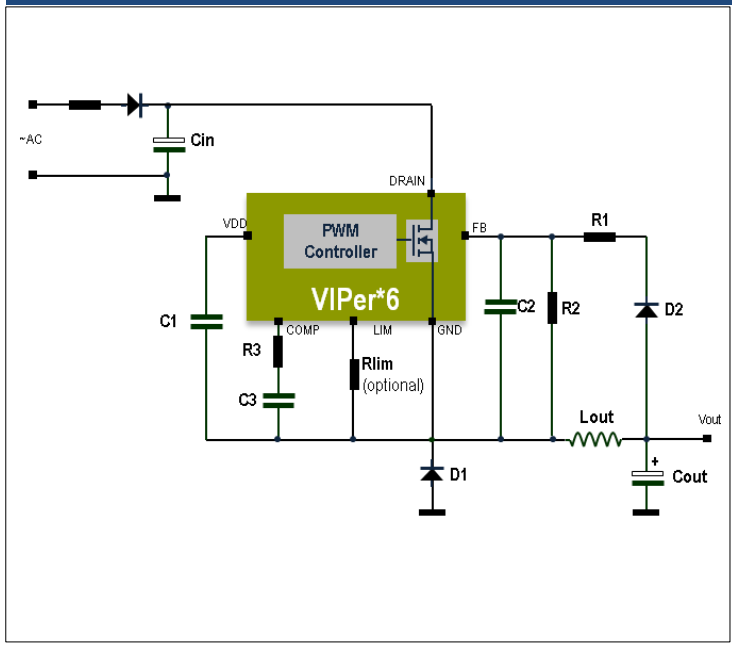


+12 V and -5 V: outputs referred to neutral with lowest standby consumption

Non-isolated auxiliary SMPS

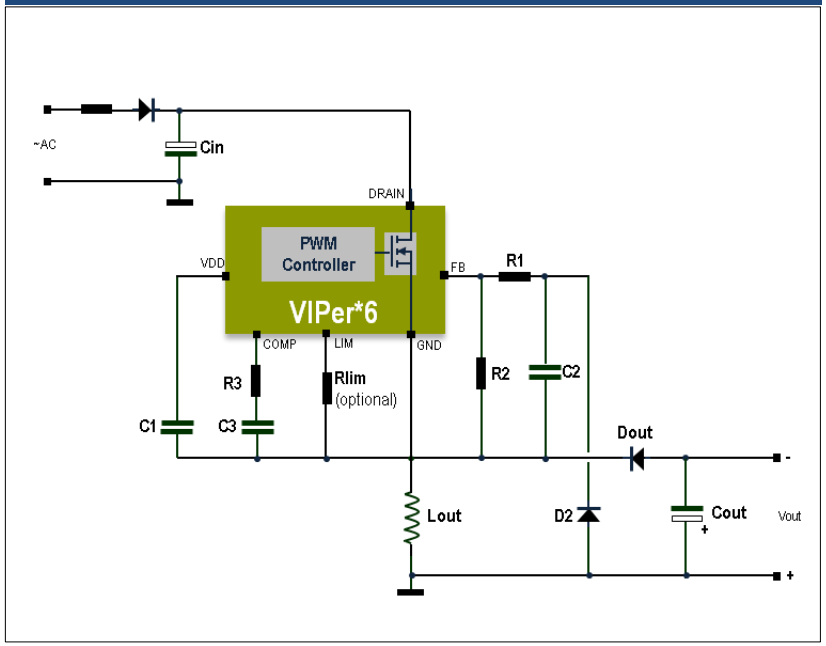
VIPer*6: inductor based topologies

Buck



Simplicity and minimum size guaranteed

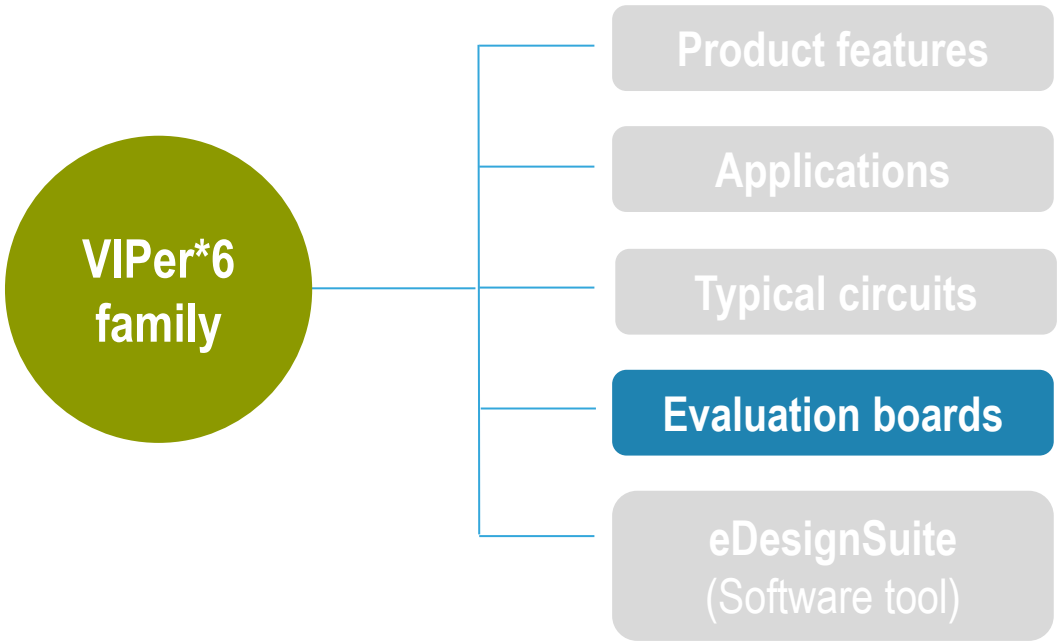
Buck-boost with negative output



Powering an MCU to drive a Triac

Non-isolated auxiliary SMPS

VIPer*6 family



VIPer*6 based solutions(1/3)

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

(*) Available on request

VIPer*6 based solutions(2/3)

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

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(*) Available on request

VIPer*6 based solutions(3/3)

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)

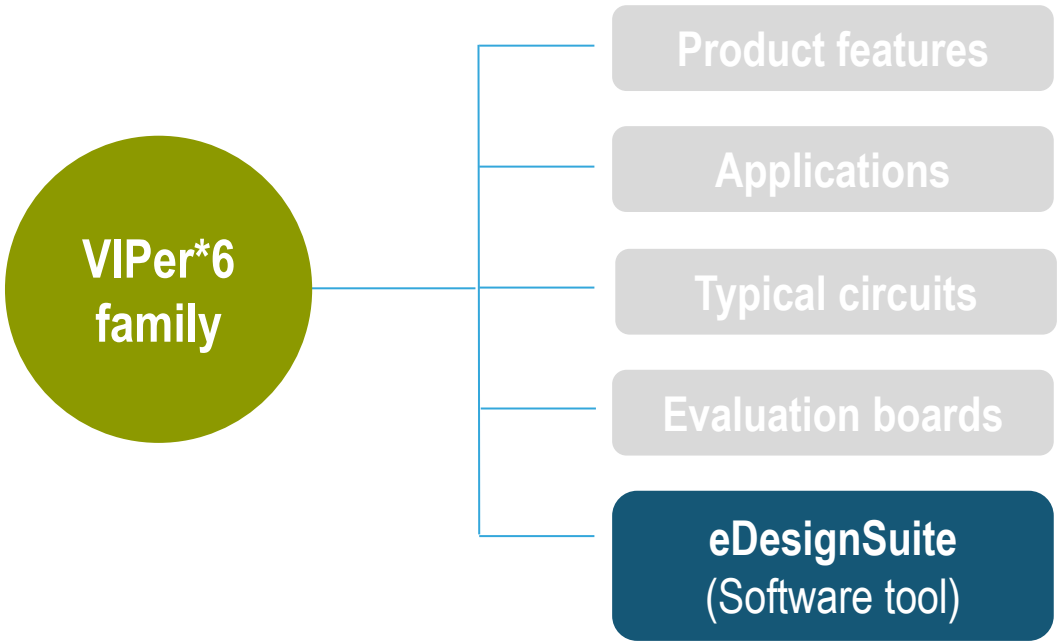
- V_{IN} = 85 to 305 Vac
- V_{OUT1} = 12 V
- V_{OUT2} = 3.3 V
- I_{OUT1} = 900 mA
- I_{OUT2} = 100 mA
- Efficiency = 84% @ 230 Vac (full load)

UM0984

Solutions up to 12 W

(*) Available on request

VIPer*6 family



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

eDesignSuite
The smart tool to design your application

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

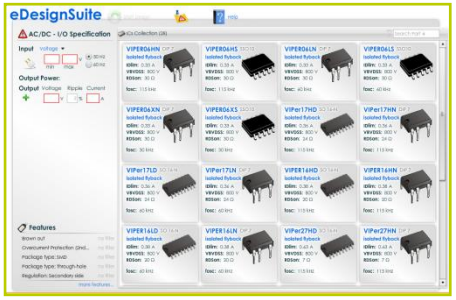
or

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

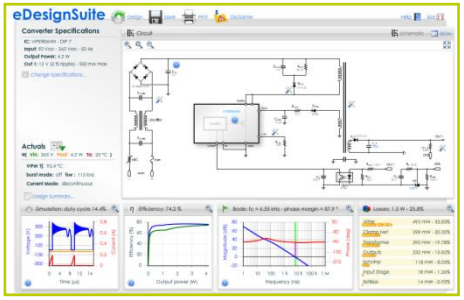
or

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

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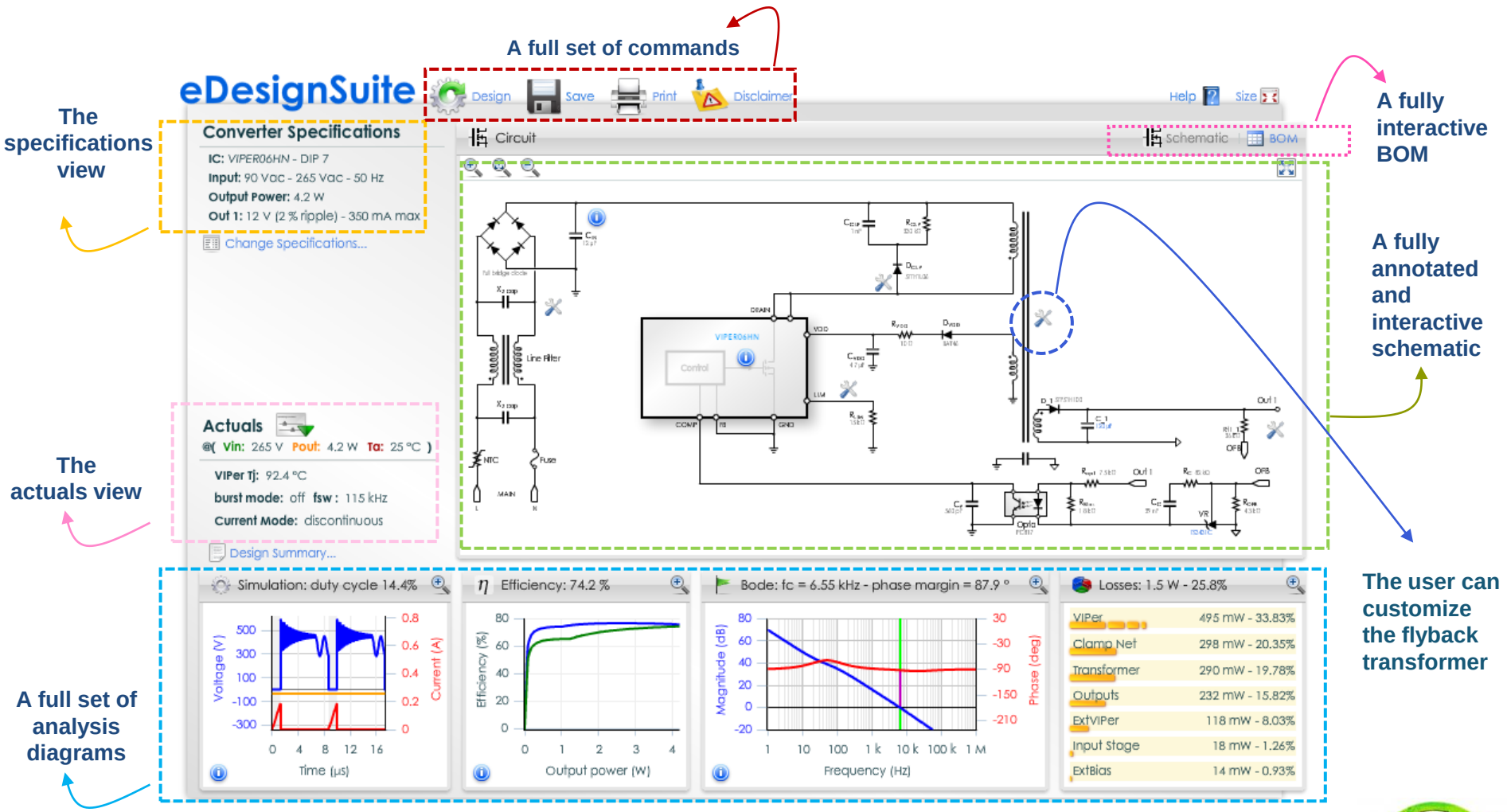
eDesignSuite enables VIPer*6 based design (2/2)



The design view

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100% FREE

For more information

www.st.com/viper

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