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# eDesignSuite

## The smart way to design your application



**IMS Systems Lab & Technical Marketing**



April 08<sup>th</sup>, 2013



Overview

Main features

Supported applications






Overview

Main features

Supported applications



# The application types supported



STMicroelectronics **eDesignSuite** is a smart simulator tool that greatly simplifies the task of engineers working on various application types

## eDesignSuite

The smart way to design your application

**Power Supply**  
DC/DC - AC/DC



**LED Lighting**  
DC/DC - AC/DC



**Photovoltaic**  
DC/DC



**Battery Charger**  
DC/DC - AC/DC



# Connecting to eDesignSuite



**Quick link**  
<https://myst.com/analogsimulator/>

**Dedicated page on ST website**  
[www.st.com/edesignsuite](http://www.st.com/edesignsuite)

**Login**

Sign in to access either my.st.com or STPartner.  
If you have any issue logging in, please contact us

**User ID (email address):**

Save my user ID

**Password:**

**LOGIN**

---

New user? **Register**      Forgot your password? **Retrieve password**

**Application pages on ST website**  
Widget tailored for the selected application

**Product pages on ST website**  
Widget tailored for the selected IC or IC class

eDesignSuite

**LED DC/DC**

**LED AC/DC**

Input: Voltage presets

Volt. Min [V]  Volt. Max [V]

LED custom

Vf [V]  If [A]  Rf [Ω]

LEDs in the string:

Output: Voltage Current Power

**START DESIGN**

eDesignSuite

**SMPS AC/DC**

**SMPS AC/DC**

Input: Voltage presets

Volt. Min [V]  Volt. Max [V]

Output

Output Power:

Voltage [V]  Current [A]

**START DESIGN**



# A complete design in a few steps

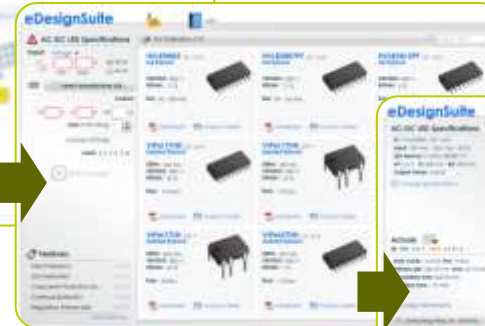
Click on quick link  
<https://myst.com/analogsimulator/>

or

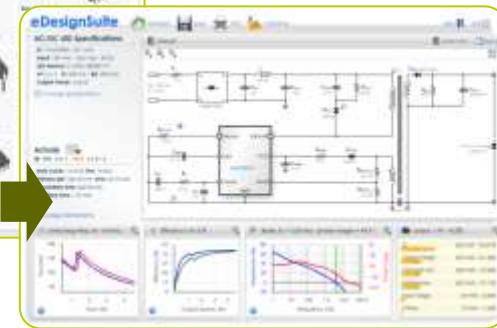
Open  
**eDesignSuite off-line version**  
(ask to ST sales office)



Choose an application type and create your design

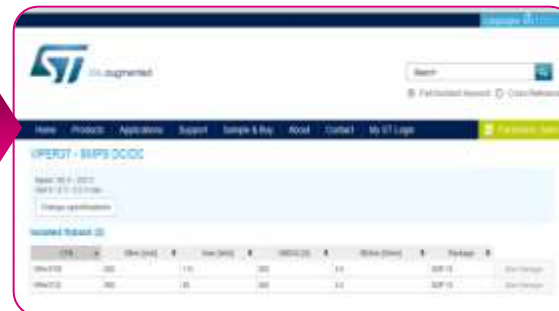


Insert your I/O specifications and select one of the proposed IC driver

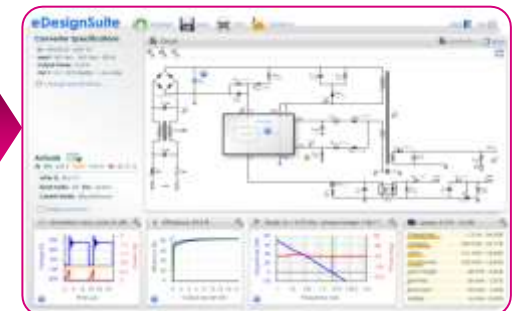


The design is ready!

Insert your I/O specifications in  
**eDesignSuite Widget**  
on product/application pages  
of ST web site



Select one of the proposed IC driver



The design is ready!

# Helps to select the optimal IC for your needs

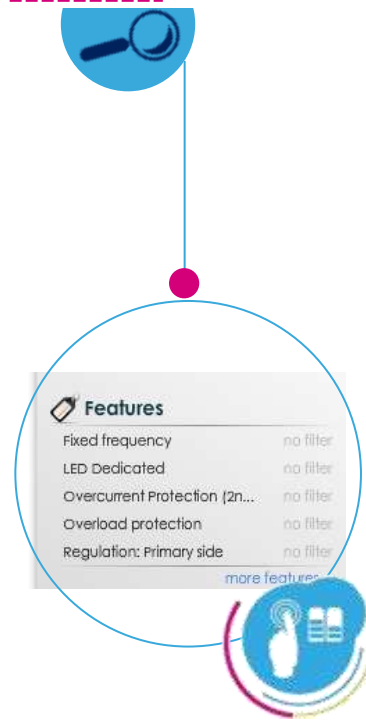
1

By inserting I/O specifications, the tool suggests you the right ICs



2

You can select, among the suggested ICs, only the ones with specific features



3

More ICs features available



4

Start the design simulation with the filtered ICs





# What's in the design view?



## eDesignSuite

Redesign Save Print Disclaimer

Help Size

**Converter Specifications**

IC: VIPER06HN - DIP 7  
 Input: 185 Vac - 265 Vac - 50 Hz  
 Output Power: 2.4 W  
 Out 1: 12 V (2 % ripple) - 200 mA max

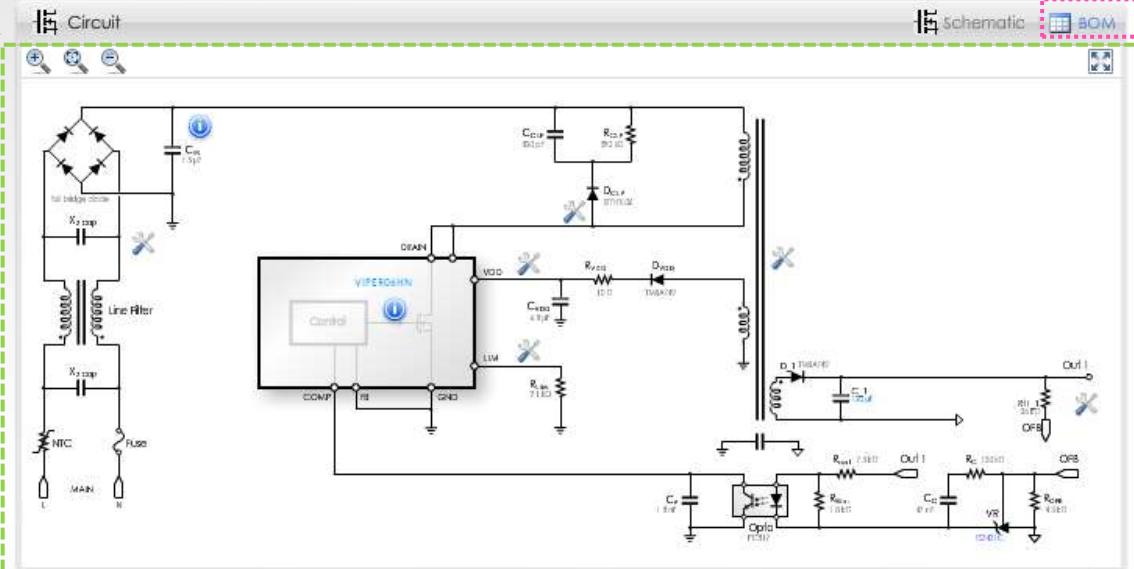
Change Specifications...

**Actuals**

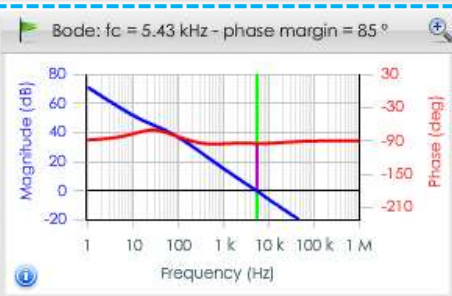
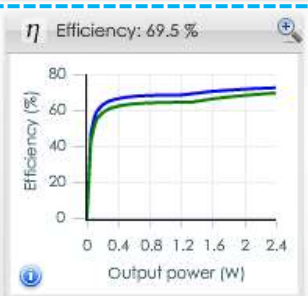
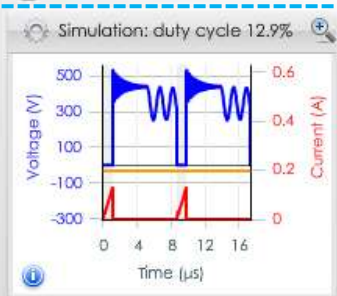
@( Vin: 265 V Pout: 2.4 W Ta: 25 °C )

VIper Tj: 75.8 °C  
 burst mode: off fsw : 115 kHz  
 Current Mode: discontinuous

Design Summary...



Schematic BOM



Losses: 1.1 W - 30.5%

VIPer	351 mW - 33.29%
Outputs	213 mW - 20.24%
Clamp Net	177 mW - 16.75%
Transformer	176 mW - 16.66%
ExtVIPer	111 mW - 10.55%
ExtBias	14 mW - 1.37%
Input Stage	12 mW - 1.14%

A full set of commands

A fully and interactive BOM

A fully annotated and interactive schematic

The specifications view

The actuals view

A full set of analysis diagrams







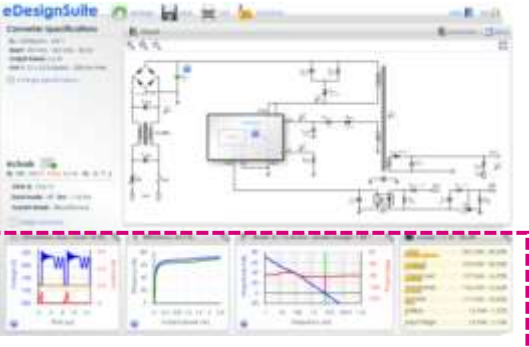
Overview

Main features

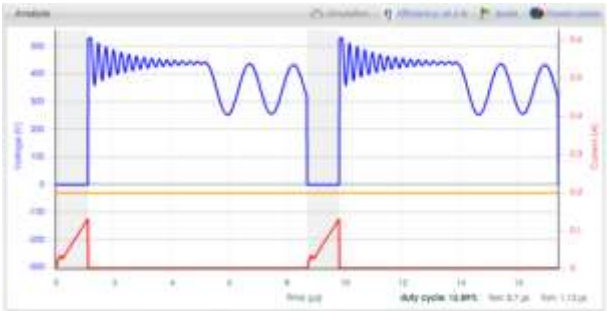
Supported applications



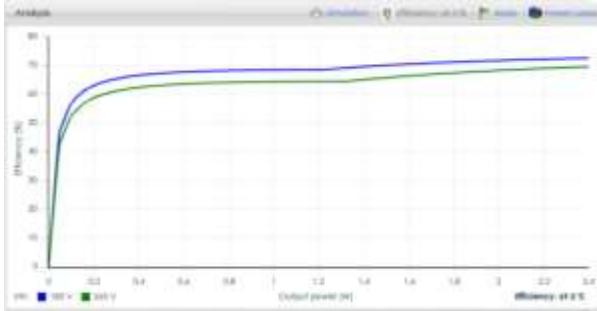
# Evaluate the performance of your design



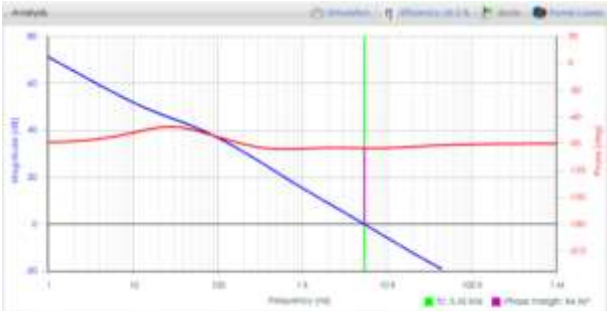
● Waveforms simulator



● Efficiency



● Bode plots



● Loss distribution



**SIMULATIONS**  
 The tool simulates major voltage and current waveforms, efficiency analysis, displays bode and power losses



# Complete and interactive schematic

The screenshot displays the eDesignSuite software interface. At the top left, the 'Converter Specifications' panel lists: IC: VIPER65HN - DIP 7, Input: 185 VAC - 265 Vac - 50 Hz, Output Power: 2.4 W, and Out 1: 12 V (2 % ripple) - 200 mA max. Below this, the 'Actuals' section shows: Vin: 265 V, Pout: 2.4 W, Ta: 25 °C, VIPer Tj: 75.8 °C, burst mode: off, fsw: 115 kHz, and Current Mode: discontinuous. A 'Design Summary' button is highlighted with a red dashed box. The central area shows a detailed schematic of a power converter circuit with various components like MOSFETs, diodes, capacitors, and a transformer. A magnifying glass icon is positioned above the schematic. At the bottom, there are four panels: a simulation plot of Voltage (V) and Current (A) vs Time (µs) with a duty cycle of 12.9%; an Efficiency plot showing 69.5% efficiency vs Output power (W); a Bode plot for f<sub>c</sub> = 5.43 kHz - phase margin = 85°; and a Losses table.

Component	Power (mW)	Efficiency (%)
VIPer	351 mW	33.29%
Output	213 mW	20.24%
Clamp Net	177 mW	16.75%
Transformer	176 mW	16.66%
ExtVIPer	111 mW	10.55%
Extbias	14 mW	1.37%
Input Stage	12 mW	1.14%

**INTERACTIVE SCHEMATIC**  
 The user can refine sections of the schematic (clammer net, transformer, passive components, compensation net, MOSFETs, diodes, etc)

● Design report ready to print

● Design summary

● Bill of material



**A COMPLETE OFFER OF AUXILIARY COMMANDS**

# Flyback specs and MOSFET selection

### Flyback Parameters Specifications

Primary Reflected Voltage: 150 V from 60 V to 200 V  
 MOSFET drain node stray capacitance: 64 pF from 40 pF to 400 pF  
 Primary inductance: 4339 µH max. 4339 µH  
 Transformer leakage inductance: 43.39 µH typ. 1% Lp  
 IC self supply voltage: 12 V ≥ 12 V

Switching Frequency range: from 30 kHz to 120 kHz

#### Switching Frequency

#### Transformer Currents

Legend for Transformer Currents:  
 - Ipri peak (max: 651 mA) - Red  
 - Ipri rms (max: 208 mA) - Blue  
 - Isec rms (max: 2.85 A) - Green  
 - @Vin 230 Vac - Green

### MOSFET and Clamper Selection

MOSFET: STP9NK70ZFP

	Actuals	Required
Drain-Source Breakdown Voltage	700 V	≥ 687 V
Current Rating	7.5 A	≥ 2 A
Losses	≤ 326.42 mW	

#### MOSFET Losses detail

- total (max: 326 mW)
- conduction (max: 88 mW)
- transition (max: 121 mW)
- capacitive (max: 150 mW)

#### Clamper Net

Net type: Transil based

Transil (DZclp): 1.5KE250A

	Actuals	Required
Breakdown reverse Voltage	250 V	141 to 255 V
Clamper Net losses	≤ 600 mW	

The complete setting of Flyback parameters in your hands

Evaluate the performance of selected MOSFETs

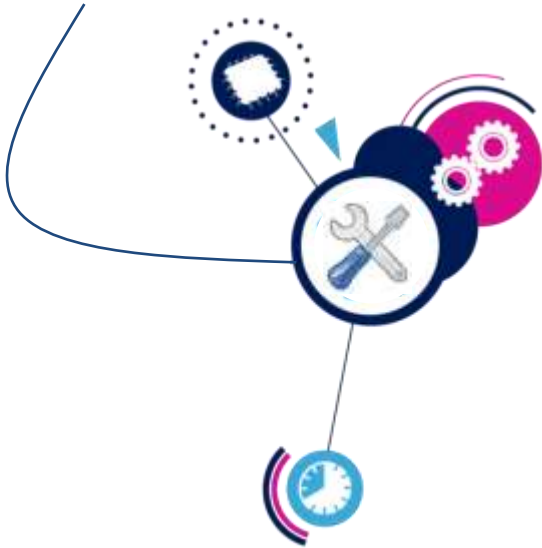


# The transformer design

## TRANSFORMER

You can change the proposed specifications for the transformer based on your needs

- Core type
- Turn layers of the windings
- Paralleled wires for each winding
- Wire type



**Transformer Design** Help ?

Core Type: EE10 Vertical		Actuals	Required
Area Product		148 mm <sup>4</sup>	≥ 16 mm <sup>4</sup>
Losses		≤ 184 mW	

Winding	Turns Layers	Paralleled	Wire Type eq. Cu section [mm <sup>2</sup> ]	fill factor	Losses
Primary	<input type="text" value="110"/> ≥ 106 3 Layers	<input type="text" value="1"/>	Solid_G2 0.14 mm 0.015 (≥ 0.008)	28 %	≤ 7 mW
Secondary	<input type="text" value="15"/> 3 Layers	<input type="text" value="3"/>	TiW 0.2 mm 0.031 (≥ 0.027)	65 %	≤ 14 mW
Auxiliary	<input type="text" value="15"/> 1 Layer		Solid_G2 0.053 mm 0.002 (≥ 0.002)	4 %	≤ 1 mW

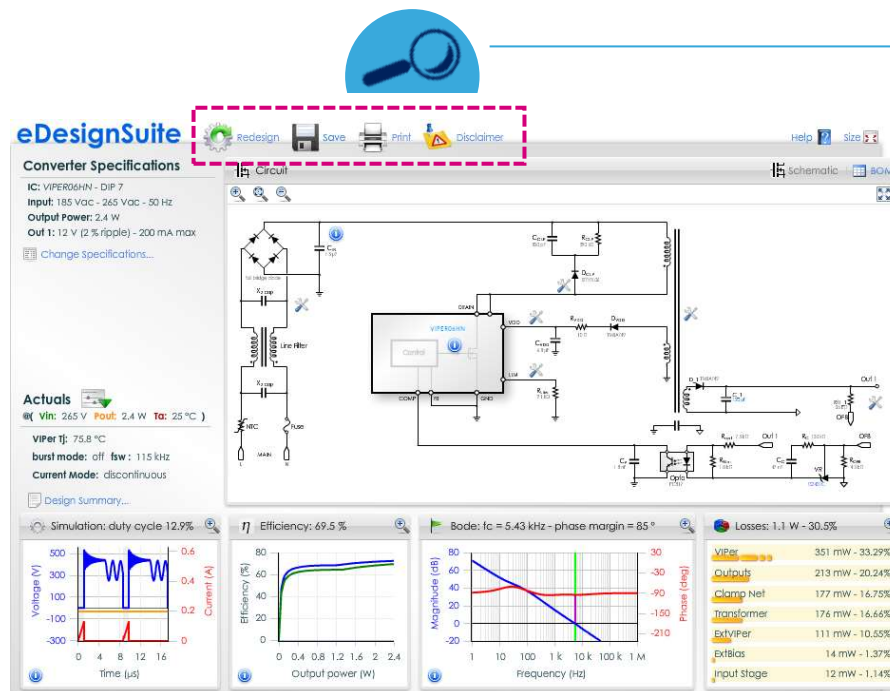
  

**Results**

Primary inductance: 2.94 mH  
leakage inductance: 88.2 μH  
Np/Ns: 7.333 (Best Ratio: 7.308)  
Reflected Voltage: 95 V (Required : 95 V)  
Vaux: 12.2 V (Required : 12.5 V)

total Aw fill factor: 96.46 %  
maximum magnetic flux density: 307 mT  
required gap length: 0.06 mm (AL : 243 nH/N<sup>2</sup>)  
Transformer total losses: 204 mW

# Your design gets portable and exportable



## Save

Save your project on ST server, you can open it from any machine: your design gets portable!



## Export to Pspice

Create a Pspice netlist in order to perform a simulation of the design in the Cadence Orcad platform





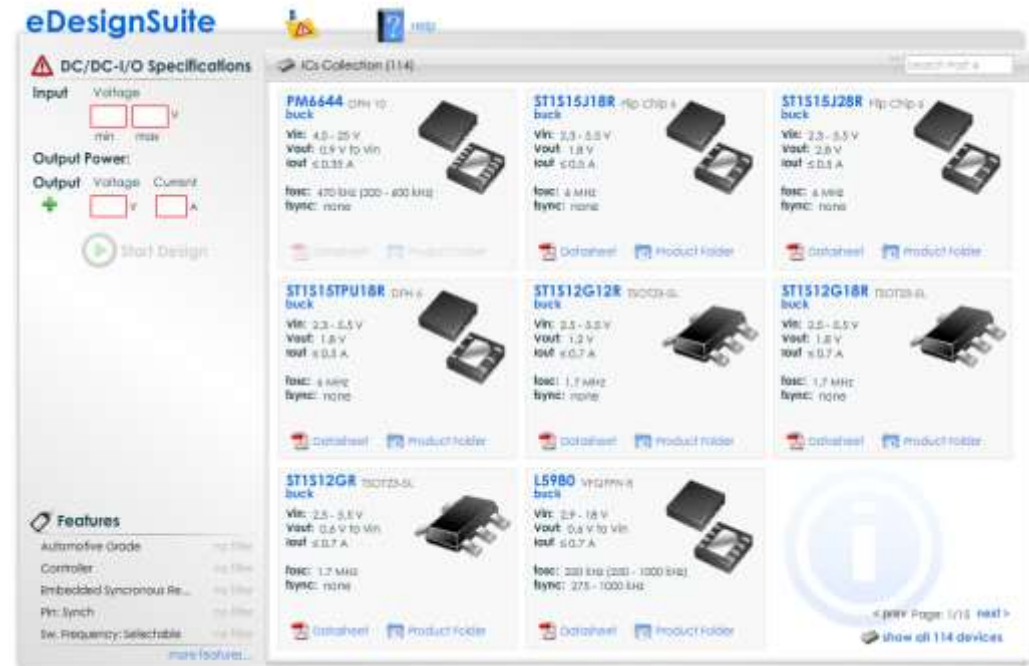
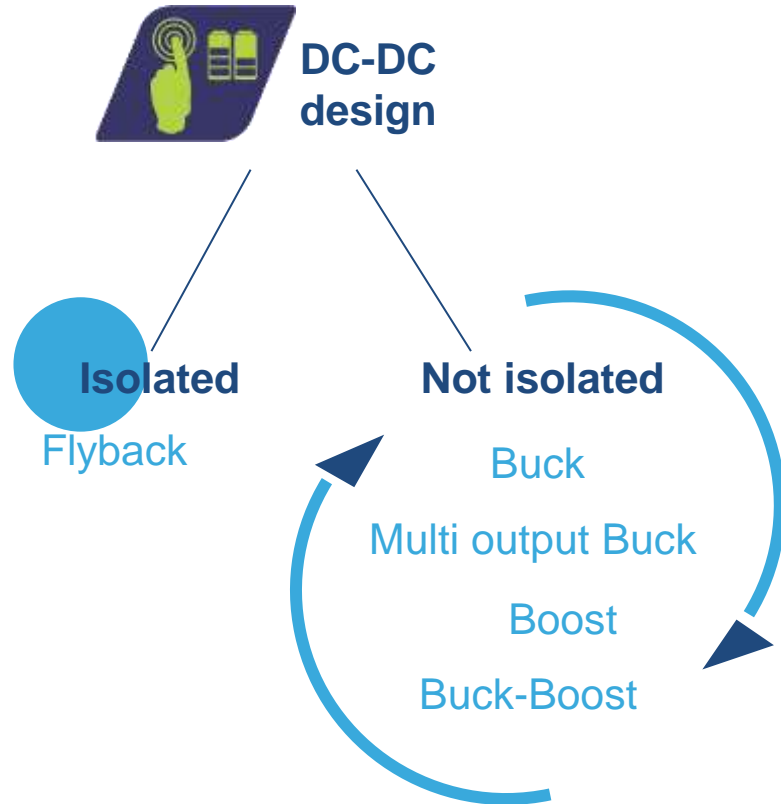
Overview

Main features

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# Power Supply DC-DC application type



More than 100 ICs to design a DC-DC converter

# Power Supply AC-DC application type



AC-DC design

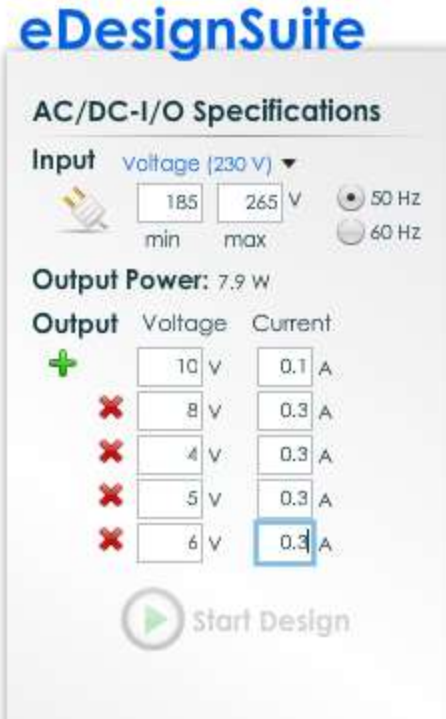
Not isolated

Isolated

Buck  
FF Flyback

FF Flyback

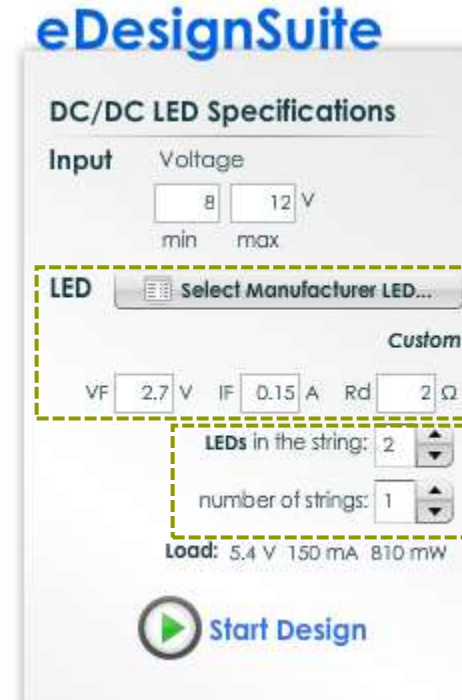
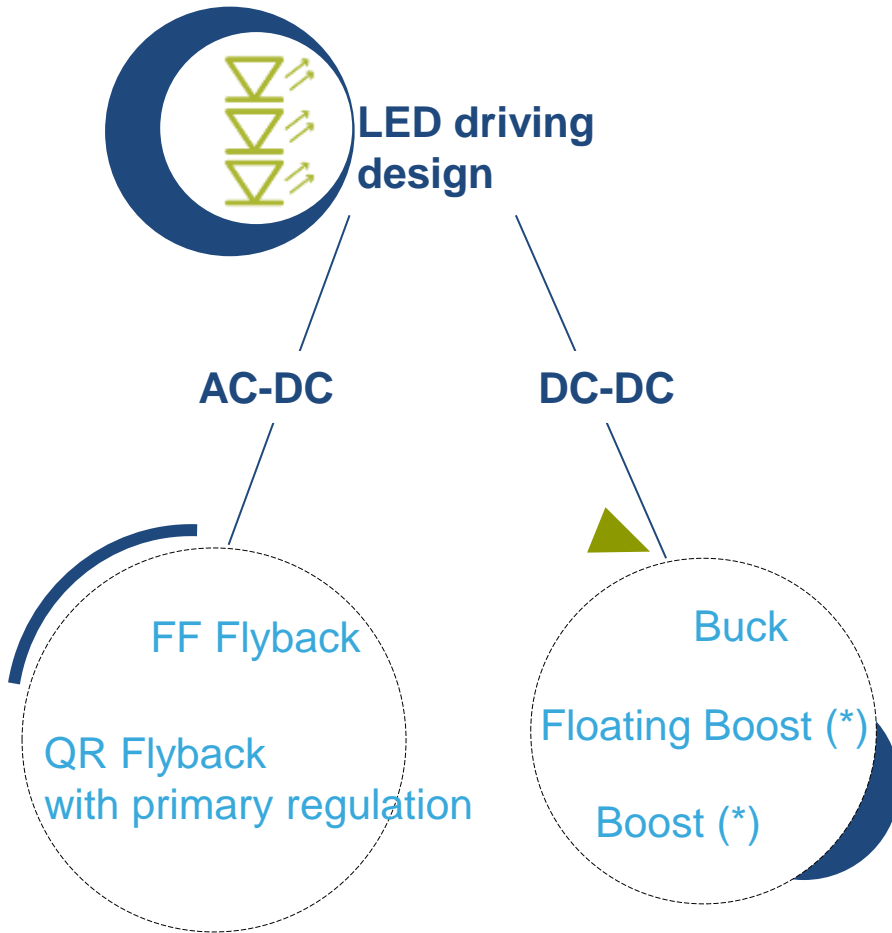
QR Flyback  
with and without  
primary regulation



**MULTI-OUTPUT DESIGN**

The tool is able to manage until 5 outputs!

# LED driving application type



Select LEDs from a list of manufacturers or insert customer parameters

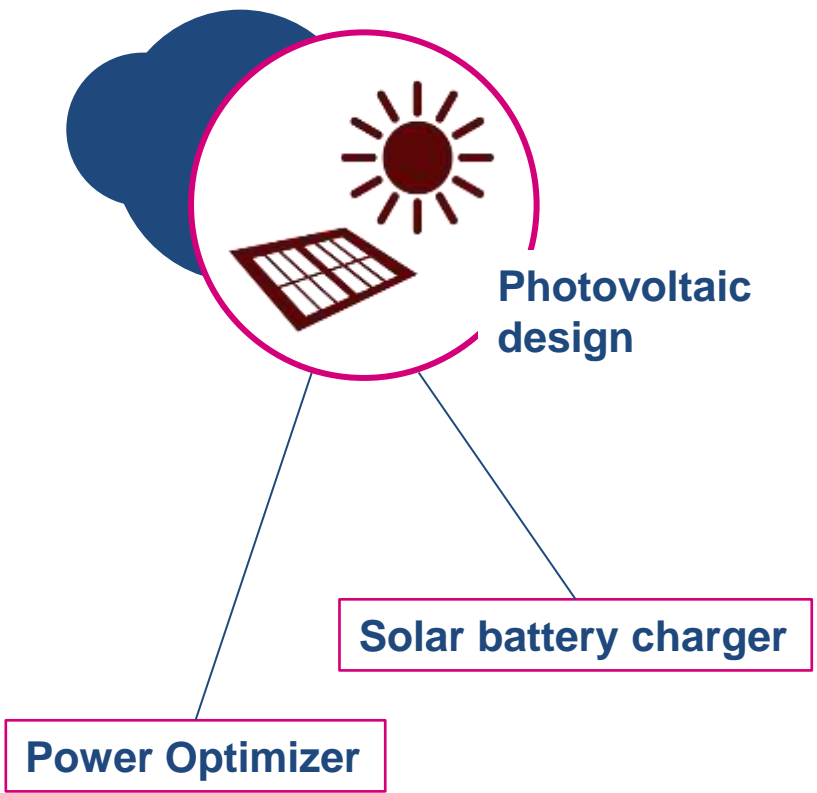
Insert the number of LEDs in the string and fix the number of strings



Supporting ICs for general illumination, consumer and vehicle lighting

(\*) Coming soon

# Photovoltaic application type



**Photovoltaic - IO Specification**

**Input: Panel Specification**

Vmp:  V    Voc:  V

Imp:  A    Isc:  A

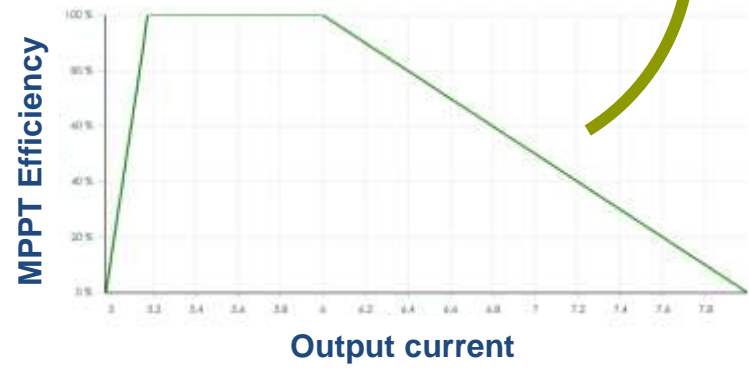
Vin Ripple:  %

**Output:**

Voltage:  V    Ripple:  %    Current:  A

Ok    Cancel

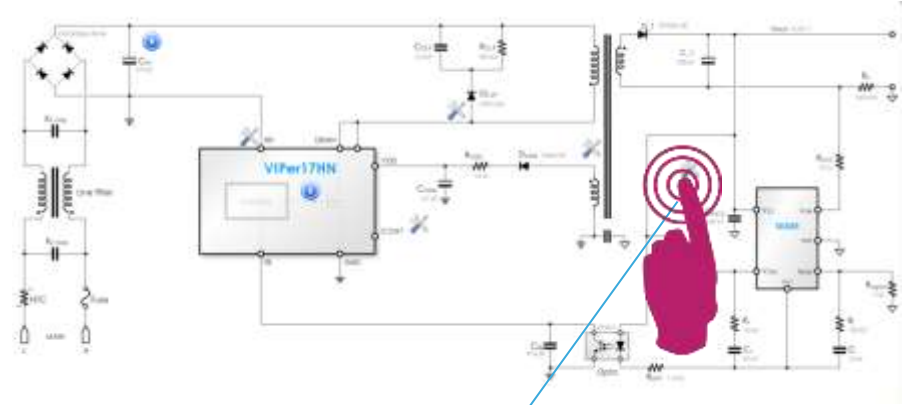
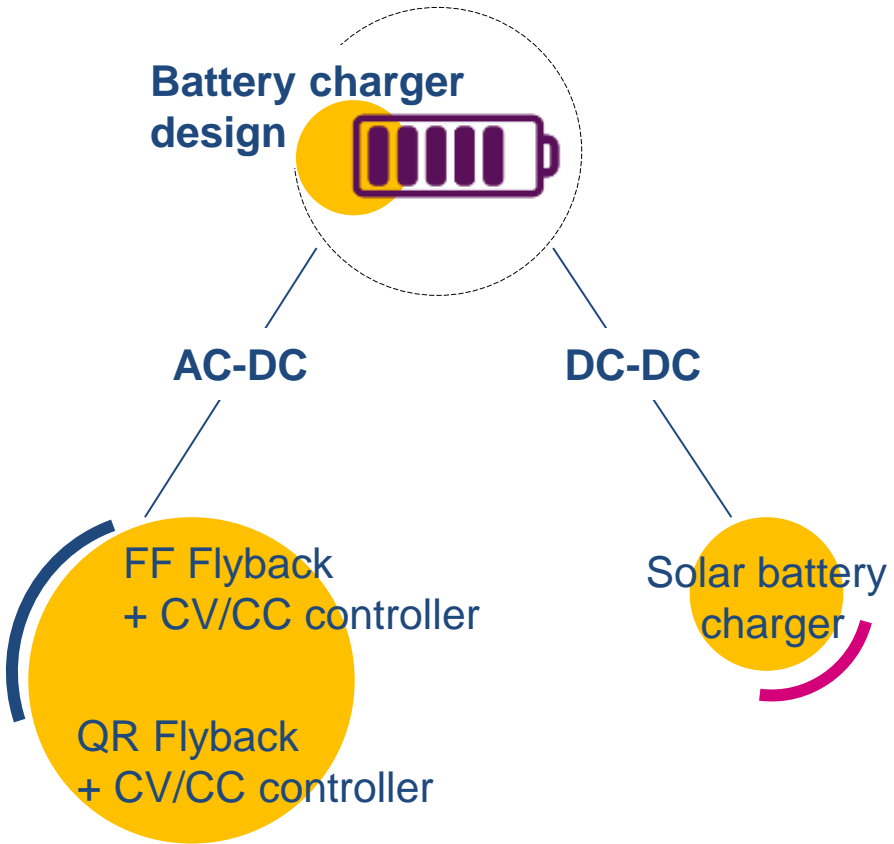
Insert I/O specification and start your design!



From the PV panel to your solar application with embedded **MPPT** (max power point tracking)



# Battery charger application type



Tight voltage and current regulation for wide range of applications





<http://www.emcu.it/Analogica/STMAalogWebSiteSupport.html>



For more information

[www.st.com/edesignsuite](http://www.st.com/edesignsuite)

