

## InnoSwitch-CH Output Power Table

Product	85-265 VAC	
	Adapter	Peak or Open Frame
INN20x3K	12 W	15 W
INN20x4K	15 W	20 W
INN20x5K	20 W	25 W

## InnoSwitch-EP Output Power Table

Product	230 VAC ± 15 %	85-265 VAC
	Peak or Open Frame	Peak or Open Frame
INN2603K	24 W	15 W
INN2604K	27 W	20 W
INN2605K	35 W	25 W

## InnoSwitch-CE Power Table

Product	85-265 VAC	
	Adapter (40 °C amb.)	Peak or Open Frame
INN21X3K	12 W	15 W
INN21X4K	15 W	20 W
INN21X5K	20 W	25 W

## InnoSwitch-CP Power Table

Product	230 VAC ± 15 %	85-265 VAC
	Adapter	Peak or Open Frame
INN2214K	15 W	20 W
INN2215K	22 W	22 W

## InnoSwitch-EP (900 V) Power Table

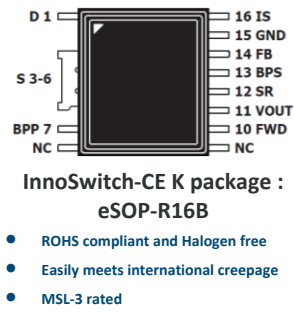
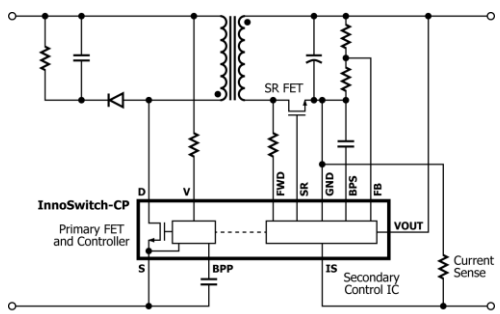
Product	230 VAC ± 15 %	85-265 VAC
	Peak or Open Frame	Peak or Open Frame
INN2904K	27 W	20 W

## Part Families and Power Rating

- Inno-CH** : Chargers and high voltage Quick Charge (QC)
- Inno-EP** : Appliance, industrial auxiliary power, server standby
- Inno-CP** : Rapid Charging – QC 2.0, QC 3.0 and USB-PD
- Inno-CE** : Appliances, STB, general adapter, - Systems that see surge/spikes
- Inno-EP (900 V)**: Meter, Ind. high operating voltage, need to stay on in line surges/swells

## Applications

## InnoSwitch Cheat Sheet (Apps) V1.0



Family	Part Number	Current Profile	O/P Current	O/P Power	MOSFET	Input UV/OV
CH	20XX	Constant Current	Fixed (2A)	25 W	650 V	No
EP	26XX	Constant Current	External Resistor	35 W	725 V	Yes
CP	22XX	Constant Power	External Resistor	22 W	650 V	Yes
CE	21XX	Constant Current	External Resistor	25 W	650 V	Yes
EP	2904	Constant Current	External Resistor	25 W	900 V	Yes

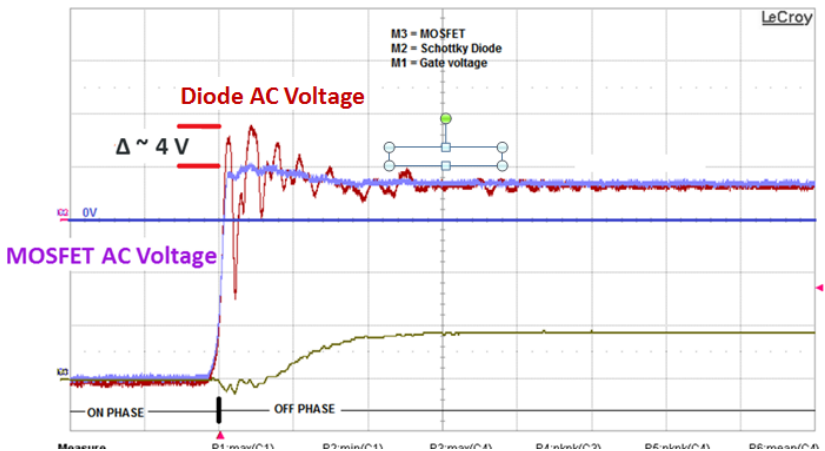
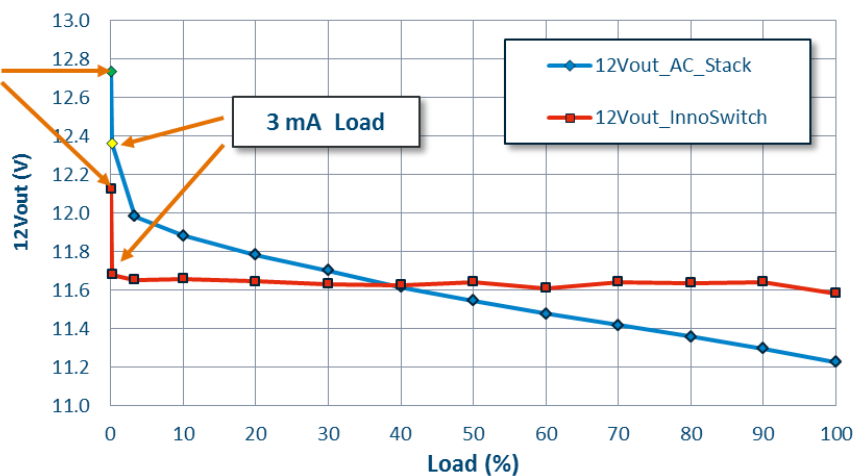
## InnoSwitch Family Features/Differentiation

Step	Description	PI Xls used?
1	Enter variables into PI Xls spreadsheet	Yes
2	Enter InnoSwitch-CH variables	Yes
3	Enter bias winding variables	Yes
4	Confirm transformer core and bobbin selection	Yes
5	Iterate transformer design and generate initial design	Yes
6	Use PI Transformer Designer to create a transformer build document	Yes
7	Select circuit components based on the spreadsheet	Yes
8	Select Bias Winding Components based on the spreadsheet	Yes
9	Select primary clamp components	No
10	Select SR-FET and secondary snubber	No
11	Build and test a prototype of the power supply	No
12	Use the test result to refine the design using the PI Xls spreadsheet	Yes

- Primary bypass pin capacitor value determines current limit level for primary-side controller**
  - 1 uF INC - increased current limit
  - 0.1 uF STD - standard current limit
  - 10 uF RED - reduced current limit

		B <sub>M</sub>	L <sub>g</sub>	CMA
L	↑	-	-	↑
NS	↑	↓	↑	↓
Core size	↑	↓	↑	↑
↑ = Value increases ↓ = Value decreases - = N/A				

## Design Rules



12 V Output regulation (zero load on 5V Main output)

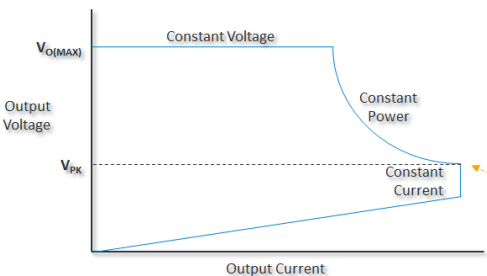
Diodes have larger shift (not compensated) as load increases (Blue slope)

Also the ring on the diode is high – causing higher output at no-load due to peak-charging of the output capacitors.

## Synchronous Rectification Much Better than Diodes for Cross-Regulation

### Constant Power is the best solution

- Always delivers maximum power without over-design of the driver



- As load voltage drops**
    - Output current increases
    - Linear change (no steps)
  - Best user of charger power**
    - Least over-design
    - Most cost-effective
  - Best power delivery to load**
    - Constant power at any load
    - Ideal for small voltage steps
- V<sub>PK</sub> : Constant Power Threshold**  
Limited by InnoSwitch maximum power handling capability at 3.0 A (QC 3.0 limit)
- V<sub>PK</sub> > 5.35 V for INN2214
  - V<sub>PK</sub> > 6.35 V for INN2215

### BOM cost of PSR, but delivers performance of SSR

- Very fast transient, even though <10 mW no load
- Smaller output capacitor

### Accurate CV/CC

- Independent of transformer variations

### Lowest component count

- Improves manufacturing yield

### Very reliable SR controller

- Low-cost MOSFET rather than Schottky solution
  - 2-3% better efficiency
- High-voltage output without extra components
  - FORWARD pin rated to 150 V

### Easily meets DOE 6/CoC V5 regulations

### Low RMS current delivered in auto-restart (protection) mode

- Prevents damage in case of a short in a micro-USB output connector

## Inno-CP has Constant Power for QC3.0 and USB PD

## PIV Checklist

### Reliable synchronous rectification increases efficiency

- Integrated primary MOSFET and SR-FET drive
  - Eliminates risk of cross-conduction
  - Reduced dead-time increases efficiency
- Charger efficiency typically 2-3 % higher than for diode rectification
- No-load consumption for typical designs less than 10 mW at 230 VAC



Underwriters  
Laboratories



High Efficiency and < 10 mW no-load

High Efficiency and < 10 mW no-load