

SmartPower Enabled Non-Flickering APFC Controller For LED Lighting

Overview:

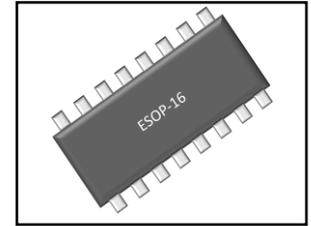
UR4205C is a high-voltage Integrated Circuit(IC) for driving LED lamps in general mains lighting applications. It is a single stage of boost or non-isolated flyback controller with Active Power Factor Correction (APFC) feature.

With several unique technologies, the main benefits of this IC include:

1. High power factor, Low THD with Zero LED output current ripple, allow a wide LED power range
2. Single stage of Switching Power topology for small PCB footprint
3. Integrated high voltage SmartPower allows fast startup
4. Single winding inductor for low cost, No bias winding needed
5. Rich protection provides high reliability
6. Low electronic Bill of Material (BOM)

The IC works as boundary conduction mode converters, typically in boost or flyback configuration. High-efficiency switch mode boost controller drives an external power FET with Quasi-Resonant operation.

The IC can apply to compact mains connected, LED lamps for single or universal mains voltages, including 100V (AC), 120V (AC), 230V (AC) and 90~305V (AC). External components determine the power level. The power level ranges from 2W to over 40W.



Features:

1. PF>0.95, THD<10%
2. Ultra-high conversion efficiency up to 96%
3. Flickering Free, Zero ripple
4. Tight mass production current tolerance at $\pm 3\%$ in mass production
5. Quick startup <500ms
6. Excellent line/load regulation
7. Rich Built-in Protections:
 - VDD UnderVoltage Lockout (UVLO)
 - Leading-Edge Blanking (LEB)
 - PowerFET's cycle by cycle Current limit
 - Internal Over Temperature Protection (OTP)
 - LED short/open protection
 - LDO over power limit
 - LED over current protection
 - Boost output over voltage protection
 - Easy external temperature protection with a single NTC resistor

Typical Application:

1. LED lighting.
2. Down light, Tube lamp, PAR lamp, Bulb etc.

A small size, THD<10%, 18W input (420V/40mA load) T8 tube's performance is as below.

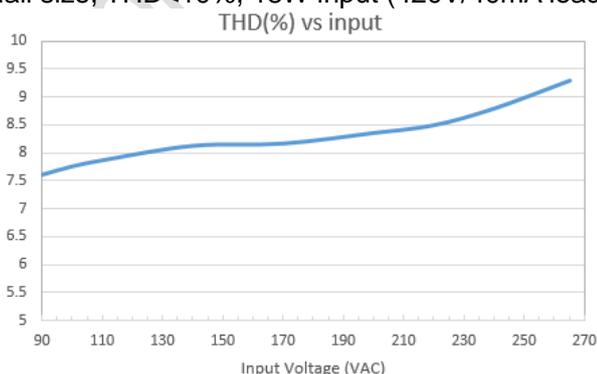


Fig.1 THD(%) vs. input voltage

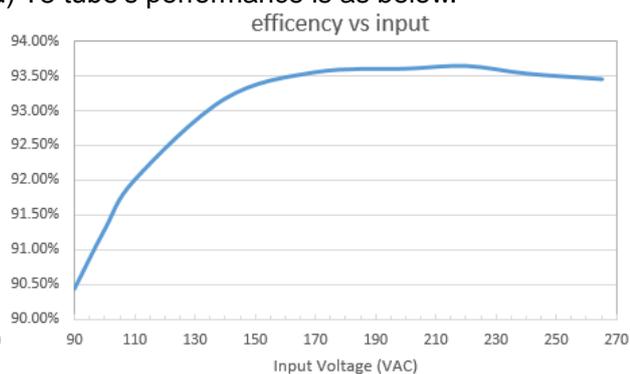


Fig.2 Efficiency vs. input voltage

UR4205C

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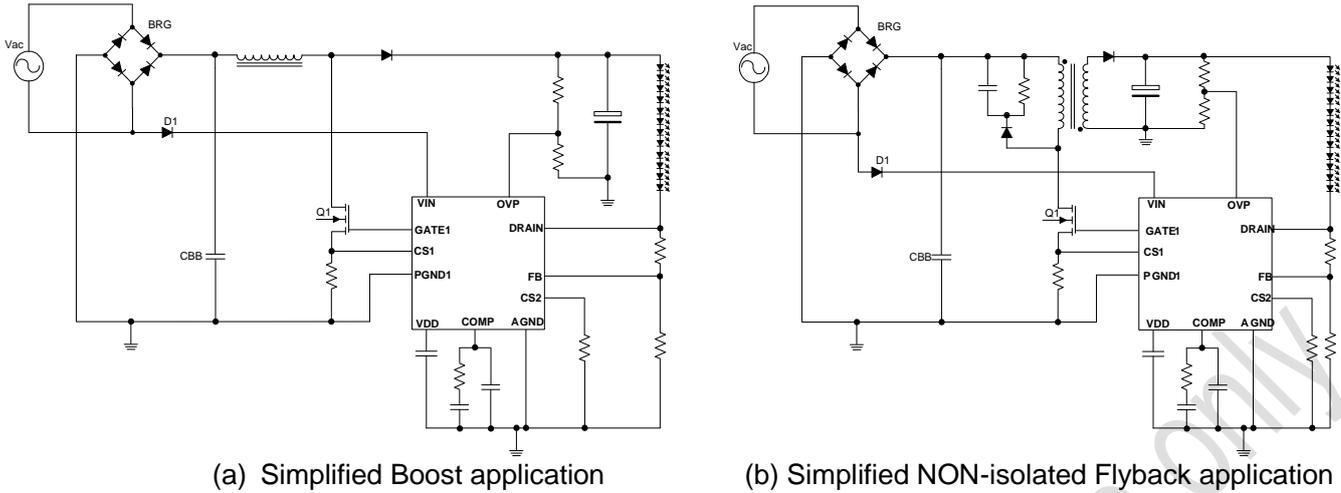
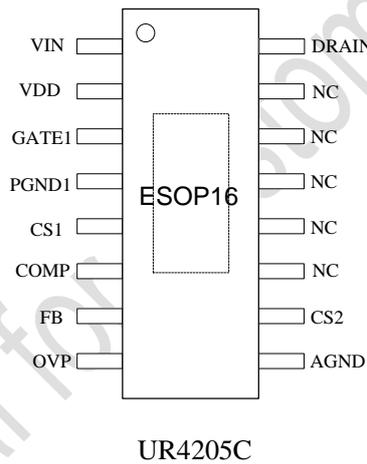


Fig.3 UR4205C's typical application diagrams used as BOOST and Flyback topology

Pin Description:



Device	Pin Count	Package	Junction Temperature
UR4205C	16	ESOP-16	-40°C - +150°C

Pin	Symbol	Description
1	VIN	Power input, connected to main AC source through a diode.
2	VDD	Power, this pin provides bias power for the IC during startup and steady state operation.
3	GATE1	Gate switch for boost transistor, connected to a MOSFET's gate.
4	PGND1	Power ground for boost stage.
5	CS1	Current sense for boost transistor, used for cycle-by-cycle peak current limit.
6	COMP	Compensation network, Output of the error amplifier. Connect TYPEII compensation network to this pin t to make the converter's loop stable.
7	FB	Boost stage output voltage feedback, used to set boost output voltage.
8	OVP	Boost output over voltage protection pin, programmed by resistor divider.
9	AGND	Analog ground.