

Critical Conduction Mode FA5695N

Power supply design example : 390V/200W

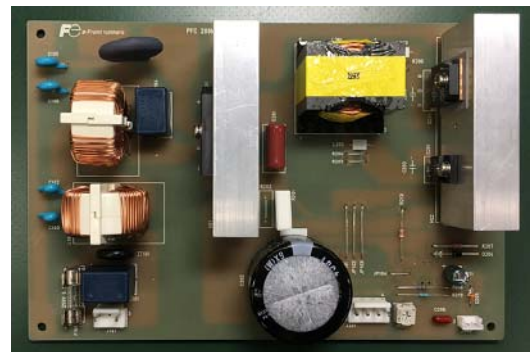
Reference Design

1. Overview

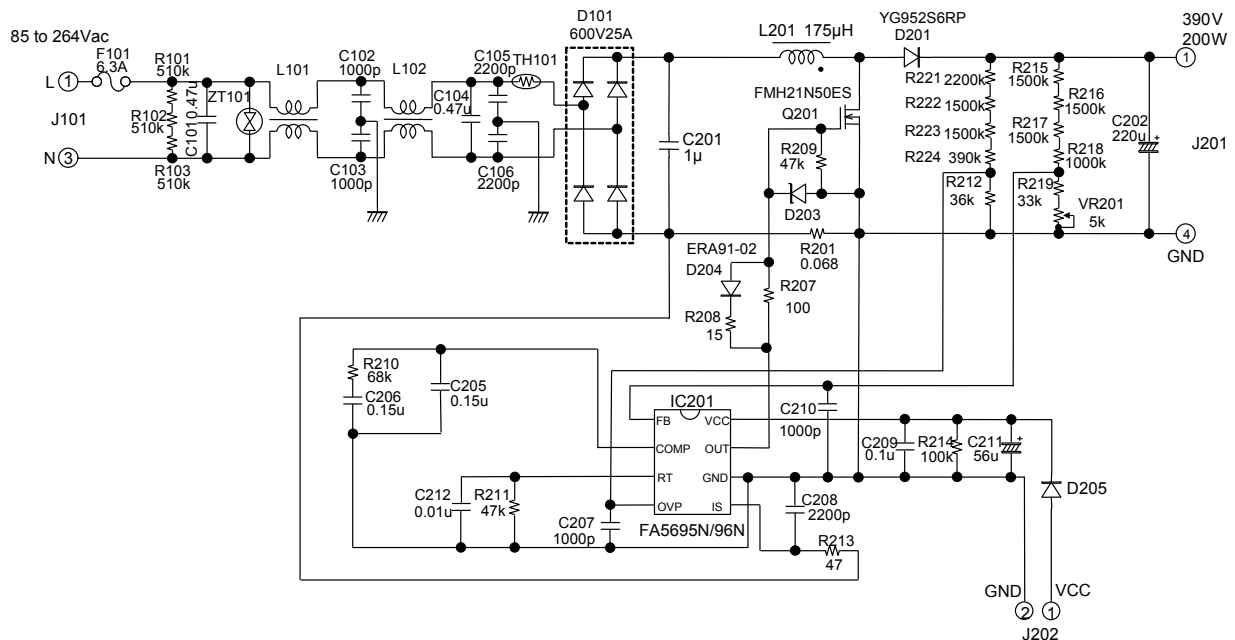
This document describes the design example of PFC circuit using critical conduction mode power-factor correction IC FA5695N series. The input is universal (85Vac to 264Vac) and the output is 200W.

2. Features

- Low standby power due to no input voltage detection resistors
- High-precision over current protection : $0.6V \pm 5\%$
- Improved power efficiency at light load due to maximum frequency limitation
- No audible noise at start-up
- Soft-startup and soft-OVP functions
- Low current consumption by CMOS process
Start-up:80uA(max.), Operating:2mA(typ.)
- Drive circuit for power MOSFET
Output peak current,source1A / sink1A
- Protects the output electrolytic capacitor by the double OVP function, even if a fault happen in the output detection.
- Open/short protection at feedback (FB) pin
- Under voltage lockout
FA5695N: 13V ON / 9V OFF, FA5696N: 9.6V ON / 9V OFF
- Restart timer
- Standby function

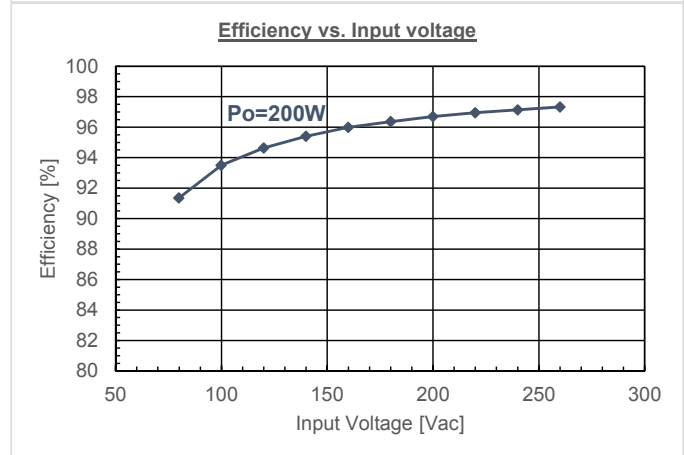
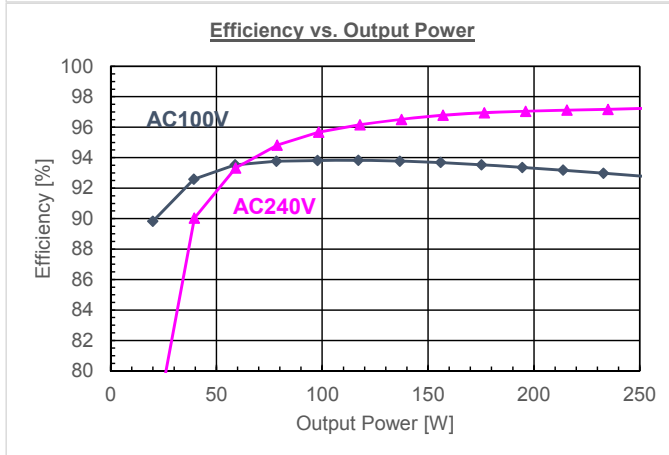
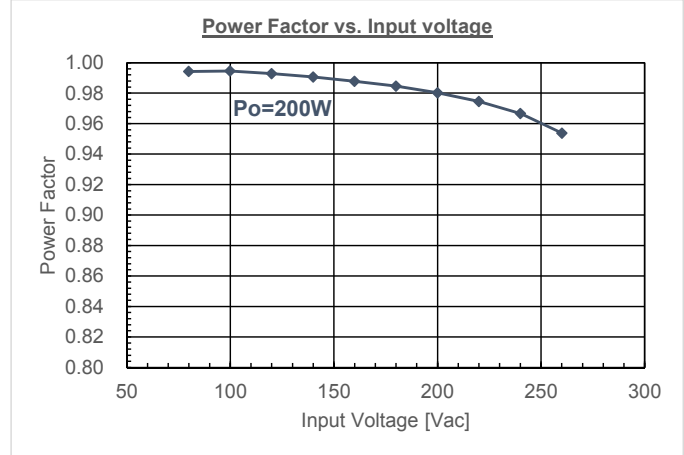
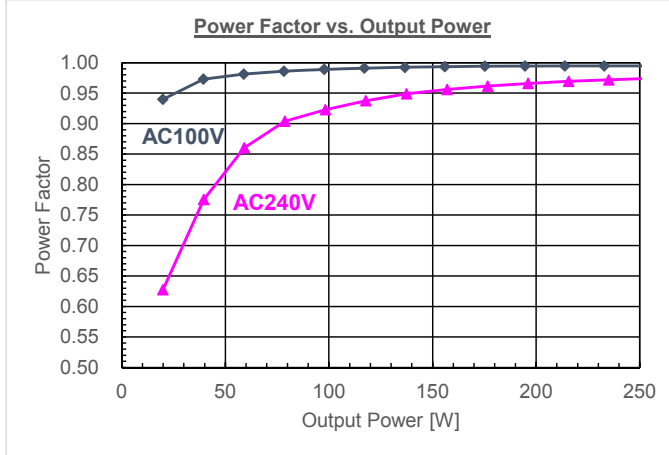
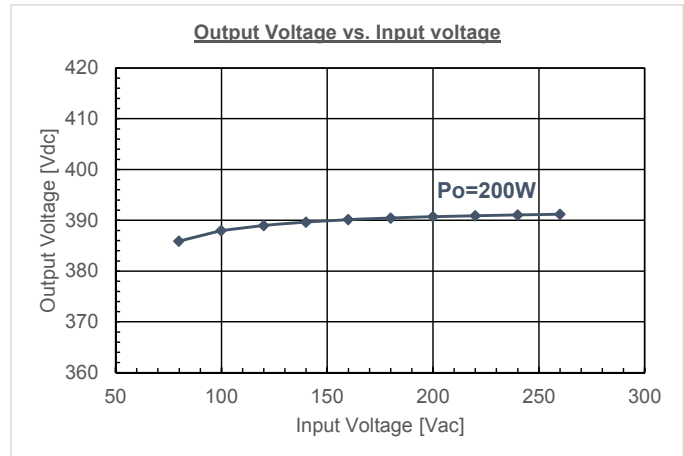
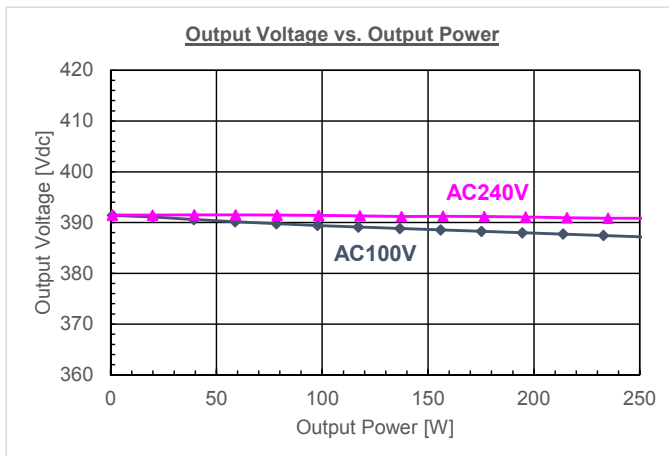


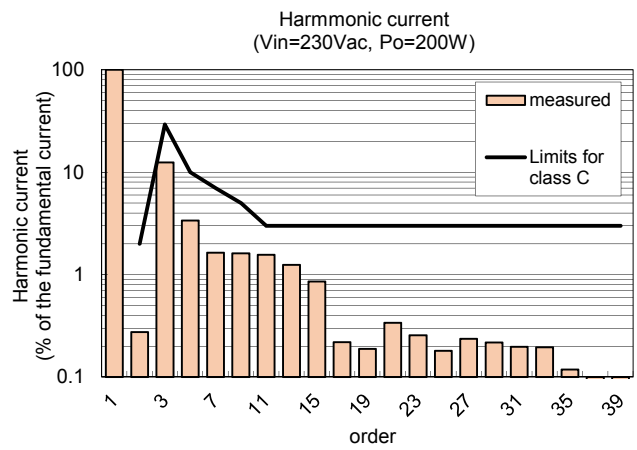
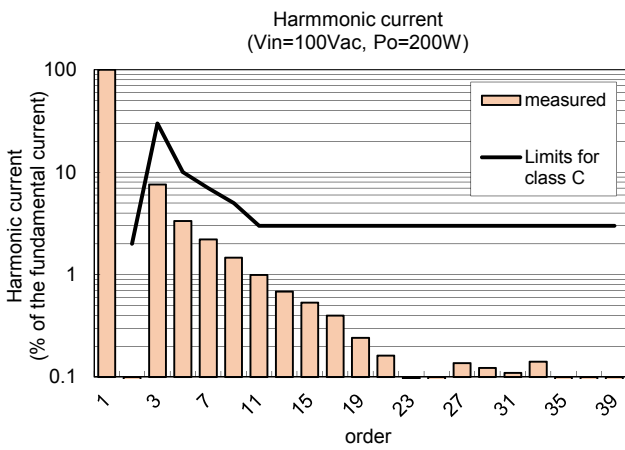
3. Application circuit



4. Specifications of the power supply

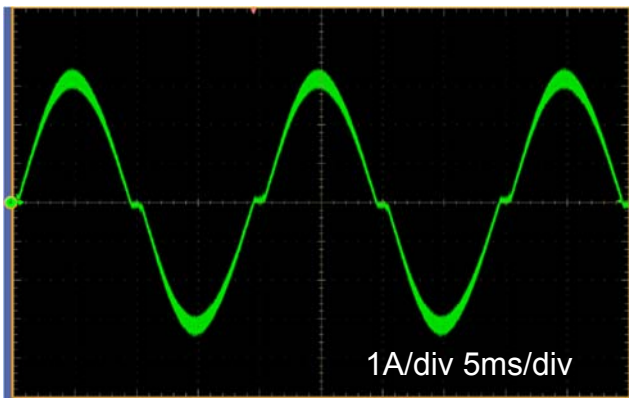
| Item | Value | Unit |
|---------------------|--|------|
| Input voltage | 85 to 264 | Vac |
| Output voltage | 390 | Vdc |
| Output power | 200 | W |
| Protection function | Overcurrent limiting of power MOSFET Overvoltage limiting Open/Short protection at FB pin Soft Start function | |

5. Characteristics


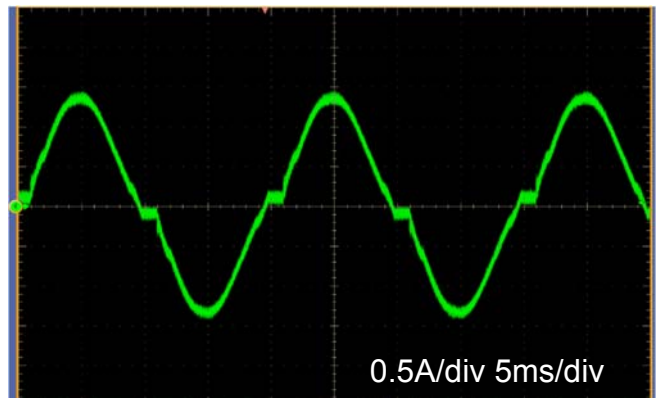


6. Operation waveform (AC input current)

100Vac Po=200W



240Vac Po=200W



FA5695N Reference Design
9. Bill of material

| Component | Item | Value | Part. No | Maker | Note |
|----------------------------------|--------------------------|---------------|-------------------|------------|---------|
| IC201 | PFC IC | | FA5695N/96N | Fuji | |
| Q201 | MOSFET | | FMH21N50ES | Fuji | |
| D101 | Bridge Diode | 600V/25A | D25SB60 | SHINDENGEN | |
| D201 | Diode | | YG952S6RP | Fuji | |
| D203 | Zenner Diode | 27V 0.2W | | | |
| D204 | Diode | | ERA91-002 | Fuji | |
| D205 | Diode | | 1SS244 | ROHM | |
| L101,L102 | Inductor | 15mH 4A | | | |
| L201 | Inductor | Lp=175uH | | | PQ32/30 |
| C101 | Film capacitor | AC275V,0.47uF | LE474-M | OKAYA | |
| C102,C103 | Ceramic capacitor | AC250V,1000pF | DE1E3KX102MA4BL01 | MURATA | |
| C104 | Film capacitor | AC275V,0.47uF | LE474-M | OKAYA | |
| C105,C106 | Ceramic capacitor | AC250V,2200pF | DE1E3KX222MA4BL01 | MURATA | |
| C201 | Film capacitor | 630V, 1uF | | | |
| C202 | Electrolytic capacitor | 450V, 270uF | | | |
| C205,C206 | Ceramic capacitor | 50V, 0.15uF | | | |
| C207,C210 | Ceramic capacitor | 50V, 1000pF | | | |
| C208 | Ceramic capacitor | 50V, 2200pF | | | |
| C209 | Ceramic capacitor | 50V, 0.1uF | | | |
| C211 | Electrolytic capacitor | 50V, 56uF | | | |
| C212 | Ceramic capacitor | 50V, 0.01uF | | | |
| R101,R102, R103 | Resister | 1/8W, 510kΩ | | | |
| R201 | Resister | 3W, 0.068Ω | | | |
| R207 | Resister | 1/4W, 100Ω | | | |
| R208 | Resister | 1/4W, 15Ω | | | |
| R209,R211 | Resister | 1/8W, 47kΩ | | | |
| R210 | Resister | 1/8W, 68kΩ | | | |
| R212 | Resister | 1/8W, 36kΩ | | | |
| R213 | Resister | 1/8W, 47Ω | | | |
| R214 | Resister | 1/8W, 100kΩ | | | |
| R215,R216, R217,R222, R223 | Resister | 1/8W, 1.5MΩ | | | |
| R218 | Resister | 1/8W, 1MΩ | | | |
| R219 | Resister | 1/8W, 33kΩ | | | |
| R221 | Resister | 1/8W, 2.2MΩ | | | |
| R224 | Resister | 1/8W, 390kΩ | | | |
| VR201 | Variable Resistor | 5kΩ | | | |
| F101 | Fuse | AC250V 6.3A | | | |
| ZT101 | Transient/Surge Absorber | SVR471D10 | | | |
| TH101 | Thermistor | 3D-22 | | | |
| J101 | Connector | B2P3-VH | | JST | |
| J201 | Connector | B4P-VH | | JST | |
| J202 | Connector | B2B-EH | | JST | |

Notice

1. The contents of this note (Product Specification, Characteristics, Data, Materials, and Structure etc.) were prepared in Mar, 2019. The contents will subject to change without notice due to product specification change or some other reasons. In case of using the products stated in this document, the latest product specification shall be provided and the data shall be checked.
2. The application examples in this note show the typical examples of using Fuji products and this note shall neither assure to enforce the industrial property including some other rights nor grant the license.
3. Fuji Electric Co., Ltd. is always enhancing the product quality and reliability. However, semiconductor products may get out of order in a certain probability. Measures for ensuring safety, such as redundant design, spreading fire protection design, malfunction protection design shall be taken, so that Fuji Electric semiconductor product may not cause physical injury, property damage by fire and social damage as a result.
4. Products described in this note are manufactured and intended to be used in the following electronic devices and electric devices in which ordinary reliability is required:
 - Computer - OA equipment - Communication equipment (Pin) - Measuring equipment
 - Machine tool - Audio Visual equipment - Home appliance - Personal equipment
 - Industrial robot etc.
5. Customers who are going to use our products in the following high reliable equipments shall contact us surely and obtain our consent in advance. In case when our products are used in the following equipment, suitable measures for keeping safety such as a back-up-system for malfunction of the equipment shall be taken even if Fuji Electric semiconductor products break down:
 - Transportation equipment (in-vehicle, in-ship etc.) - Communication equipment for trunk line
 - Traffic signal equipment - Gas leak detector and gas shutoff equipment
 - Disaster prevention/Security equipment - Various equipment for the safety.
6. Products described in this note shall not be used in the following equipments that require extremely high reliability:
 - Space equipment - Aircraft equipment - Atomic energy control equipment
 - Undersea communication equipment - Medical equipment.
7. When reprinting or copying all or a part of this note, our company's acceptance in writing shall be obtained.
8. If obscure parts are found in the contents of this note, contact Fuji Electric Co., Ltd. or a sales agent before using our products. Fuji Electric Co., Ltd. and its sales agents shall not be liable for any damage that is caused by a customer who does not follow the instructions in this cautionary statement.

- The contents will subject to change without notice due to product specification change etc.
- Application examples and component in this sheet is for the purpose of assisting in the design. Therefore, This sheet has not been made in consideration of the margin.
- Before using, Please design in consideration of the parts variation and use condition.