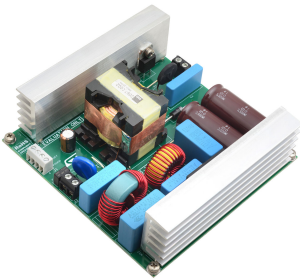


Low-THD 350W CCM-PFC pre-regulator based on L4986



Features

- Universal input voltage range: 90 to 265 Vac, 45 to 65 Hz
- Regulated output voltage: 400 Vdc
- Rated output power: 350 W
- Total Harmonic Distortion (THD): <6% at full load and <10% down to 15% load
- Power Good output/input signals
- Switching frequency: 65 kHz
- Efficiency peak: 97.8 %
- Mains harmonics: meets EN61000-3-2 Class-D and JEITA-MITI Class-D
- EMI: according to EN55022 Class-B

Description

The [EVL4986-350W](#) evaluation board, based on the new L4986 continuous conduction mode power factor controller, implements a 350 W wide-range input PFC pre-regulator.

It is suitable for all SMPS from 150 W to several kW and is compliant with IEC61000-3-2 and JEITA-MITI standards.

Thanks to the embedded 800 V high voltage start-up circuitry (that includes also the X-capacitor discharger) and the new patented control method; the main features of this design are the minimal component counts, the simple and easy design and very low input current distortion (THD) in all operating conditions.

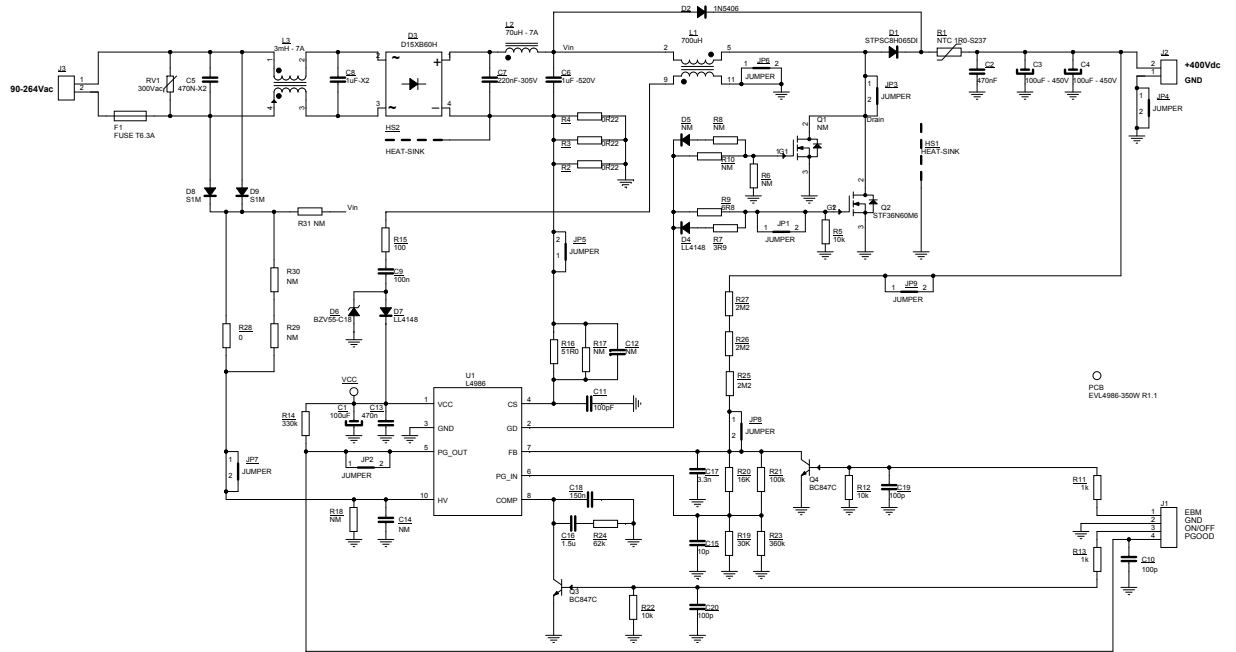
Power Good output signal PG_OUT with adjustable comparator input PG_IN for monitoring the PFC output voltage provides design flexibility.

Product status link

[EVL4986-350W](#)

1 Evaluation board schematic

Figure 1. EVL4986-350W evaluation board schematic



2 PCB connectors

Table 1. EVL4986-350W evaluation board connectors

| Schematic reference | Description |
|---------------------|--|
| J1 | Input/output signal: 1. EBM (external burst-mode input) 2. GND (signal ground) 3. ON/OFF (enable/disable input) 4. PGOOD (Power good output) |
| J2 | DC regulated output voltage |
| J3 | AC input voltage |

3 Bill of material

Table 2. EVL4986-350W evaluation board BOM

| Sch. Ref. | Part no. | Case | Description | Supplier |
|-----------|------------------|-------------------|--|---------------------|
| C1 | 100uF | Rad. 8X11.5 mm | Electrolytic capacitor, 105°C - 50 V | |
| C2 | 470nF | 6X26.5 mm | Film capacitor, 630 V - B32673P6474K000 | Epcos |
| C3 | 100uF | Rad. 18X40 mm | Electrolytic capacitor, 105°C - 450 V - EKXG451ELL101MM40S | United Chemicon |
| C4 | 100uF | Rad. 18X40 mm | Electrolytic capacitor, 105°C - 450 V - EKXG451ELL101MM40S | United Chemicon |
| C5 | 470nF | 8.5X26.5 mm | Film capacitor, X2 - B32923C3474M000 | Epcos |
| C6 | 1uF | 10.5X26.5 mm | Film capacitor, 520 V - B32673Z5105 | Epcos |
| C7 | 220nF | 7.5X26.5 mm | Film capacitor, 305 V - B32933A3224 | Epcos |
| C8 | 1uF | 11X26.5 mm | Film capacitor, X2 - B32923C3105 | Epcos |
| C9 | 100nF | SMD 1206 | Ceramic capacitor, 100 V | |
| C10 | 100pF | SMD 0805 | Ceramic capacitor, X7R - 25 V | |
| C11 | 100pF | SMD 0805 | Ceramic capacitor, X7R - 25 V | |
| C12 | NM | SMD 0805 | | |
| C13 | 470nF | SMD 1206 | Ceramic capacitor, X7R - 50 V | |
| C14 | NM | SMD 1206 | | |
| C15 | 10pF | SMD 0805 | Ceramic capacitor, X7R - 25 V | |
| C16 | 1.5uF | SMD 0805 | Ceramic capacitor, X7R - 25 V | |
| C17 | 3.3nF | SMD 0805 | Ceramic capacitor, COG - 25 V | |
| C18 | 150nF | SMD 0805 | Ceramic capacitor, X7R - 25 V | |
| C19 | 100pF | SMD 0805 | Ceramic capacitor, X7R - 25 V | |
| C20 | 100pF | SMD 0805 | Ceramic capacitor, X7R - 25 V | |
| D1 | STPSC8H065DI | TO-220AC Ins. | Schottky diode, 8 A/650 V SiC | ST Microelectronics |
| D2 | 1N5406 | DO-201 | Rectifier diode | |
| D3 | D15XB60H | DWG | Bridge rectifier, 600 V-15 A | Shindengen |
| D4 | LL4148 | MINIMELF | Signal diode | |
| D5 | NM | MINIMELF | | |
| D6 | BZV55-C18 | MINIMELF | Zener diode, 18 V - 5% | |
| D7 | LL4148 | MINIMELF | Signal diode | |
| D8 | S1M | SMA | Diode rectifier, 1000 V-1 A | |
| D9 | S1M | SMA | Diode rectifier, 1000 V-1 A | |
| F1 | 6.3A | 4x8.5 mm P5.08 mm | Fuse, 392/TE5 - Time delay | Littlefuse |
| HS2 | HEATSINK | DWG | Heatsink for D3 | Tecnoal |
| HS1 | HEATSINK | DWG | Heatsink for Q1, Q2 & D1 | Tecnoal |
| J1 | Signal connector | SIP 4P p3.5 | PCB screw terminal - 4 | Lumberg |
| J2 | Power connector | SIP 2P p5.08 | PCB screw terminal - 2 | Weidmuller |
| J3 | Power connector | SIP 2P p5.08 | PCB screw terminal - 2 | Weidmuller |
| JP1 | Shorted | Wire | Isolated wire jumper | - |

| Sch. Ref. | Part no. | Case | Description | Supplier |
|-----------|------------|-------------------|---|---------------------|
| JP2 | Shorted | Wire | Isolated wire jumper | |
| JP3 | Shorted | Wire | Isolated wire jumper | |
| JP4 | Shorted | Wire | Isolated wire jumper | |
| JP5 | Shorted | Wire | Isolated wire jumper | |
| JP6 | Shorted | Wire | Isolated wire jumper | |
| JP7 | Shorted | Wire | Isolated wire jumper | |
| JP8 | Shorted | Wire | Isolated wire jumper | |
| JP9 | Shorted | Wire | Isolated wire jumper | |
| L1 | 700uH | DWG | PFC inductor - 2097.0002 | Magnetica |
| L2 | 70uH - 7A | DWG | DM Inductor - 1119.0013 | Magnetica |
| L3 | 3mH - 7A | DWG | EMI filter inductor - 1606.0007 | Magnetica |
| Q1 | NM | TO-220FP | | |
| Q2 | STF36N60M6 | TO-220FP | N-CHANNEL Power MOSFET | ST Microelectronics |
| Q1a | NM | TO-247 | | |
| Q2a | NM | TO-247 | | |
| Q3 | BC847C | SOT23 | BJT - NPN transistor | |
| Q4 | BC847C | SOT23 | BJT - NPN transistor | |
| RV1 | 300Vac | Rad. 15x5 p7.5 mm | Metal Oxide Varistor, 300 V - B72214S0301K101 | Epcos |
| R1 | 1R0 | Rad. 15x7 p7.5 mm | NTC resistor, B57237S0109M000 | Epcos |
| R2 | 0R22 | PTH | Metal film resistor, 1 W - 5% | Koa Speer |
| R3 | 0R22 | PTH | Metal film resistor, 1 W - 5% | Koa Speer |
| R4 | 0R22 | PTH | Metal film resistor, 1 W - 5% | Koa Speer |
| R5 | 10K | SMD 0805 | Resistor, 1/8 W - 5% | |
| R6 | NM | SMD 0805 | | |
| R7 | 3R9 | SMD 0805 | Resistor, 1/8 W - 5% | |
| R8 | NM | SMD 0805 | | |
| R9 | 6R8 | SMD 0805 | Resistor, 1/8 W - 5% | |
| R10 | NM | SMD 0805 | | |
| R11 | 1k | SMD 0805 | Resistor, 1/8 W - 5% | |
| R12 | 10K | SMD 0805 | Resistor, 1/8 W - 5% | |
| R13 | 1k | SMD 0805 | Resistor, 1/8 W - 5% | |
| R14 | 330k | SMD 0805 | Resistor, 1/8 W - 5% | |
| R15 | 100 | SMD 1206 | Resistor, 1/8 W - 5% | |
| R16 | 51R0 | SMD 0805 | Resistor, 1/8 W - 1% | |
| R17 | NM | SMD 0805 | | |
| R18 | NM | SMD 1206 | | |
| R19 | 30k | SMD 0805 | Resistor, 1/8 W - 1% | |
| R20 | 16k | SMD 0805 | Resistor, 1/8 W - 1% | |
| R21 | 100k | SMD 0805 | Resistor, 1/8 W - 1% | |
| R22 | 10K | SMD 0805 | Resistor, 1/8 W - 5% | |

| Sch. Ref. | Part no. | Case | Description | Supplier |
|-----------|----------------------|----------|-----------------------|---------------------|
| R23 | 360k | SMD 0805 | Resistor, 1/8 W - 1% | |
| R24 | 62k | SMD 0805 | Resistor, 1/8 W - 1% | |
| R25 | 2M2 | SMD 1206 | Resistor, 1/8 W - 1% | |
| R26 | 2M2 | SMD 1206 | Resistor, 1/8 W - 1% | |
| R27 | 2M2 | SMD 1206 | Resistor, 1/8 W - 1% | |
| R28 | 0 | SMD 1206 | Resistor, 1/8W - 5% | |
| R29 | NM | SMD 1206 | | |
| R30 | NM | SMD 1206 | | |
| R31 | NM | SMD 1206 | | |
| VCC | Test point | | Strip contact - 1 | Samtec |
| U1 | L4986A | SSOP10 | CCM PFC controller | ST Microelectronics |
| Z1 | EVL4986-350W R1.1 | | Printed circuit board | |

Revision history

Table 3. Document revision history

| Date | Version | Changes |
|-------------|---------|---|
| 13-Sep-2021 | 1 | Initial release. |
| 28-Sep-2023 | 2 | Updated Table 2 (D1 part number). |

Contents

| | | |
|----------|---|-----------|
| 1 | Evaluation board schematic | 2 |
| 2 | PCB connectors | 3 |
| 3 | Bill of material | 4 |
| | Revision history | 7 |
| | Contents | 8 |
| | List of tables | 9 |
| | List of figures | 10 |



List of tables

| | | |
|-----------------|--|---|
| Table 1. | EVL4986-350W evaluation board connectors | 3 |
| Table 2. | EVL4986-350W evaluation board BOM. | 4 |
| Table 3. | Document revision history | 7 |

List of figures

Figure 1. EVL4986-350W evaluation board schematic. 2

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