

## DESCRIPTION

The EVHFC0310-S-00A is an evaluation board for the HFC0310. It is configured to provide a regulated 12V output at up to 0.6A load current, and 6V output at up to 0.1A load current from a 85V<sub>AC</sub> - 420V<sub>AC</sub> input.

HFC0310 uses peak current mode to provide excellent transient response and ease loop compensation. When the output power falls below a given level, the controller enters burst mode to lower the stand-by power consumption.

An external capacitor connected between the FSET pin and GND programs the HFC0310 switching frequency. Otherwise, the HFC0310 uses a frequency shaping function that greatly reduces the noise level, and reduces the cost of the EMI filter.

## ELECTRICAL SPECIFICATION

| Parameter       | Symbol            | Value    | Units           |
|-----------------|-------------------|----------|-----------------|
| Input voltage   | V <sub>IN</sub>   | 85 – 420 | V <sub>AC</sub> |
| Output1 voltage | V <sub>OUT1</sub> | 12       | V               |
| Output1 current | I <sub>OUT1</sub> | 0.6      | A               |
| Output2 voltage | V <sub>OUT2</sub> | 6        | V               |
| Output2 current | I <sub>OUT2</sub> | 0.1      | A               |

## FEATURES

- Programmable switching frequency up to 600kHz
- Frequency shaping ( $\pm 3.5\%$ )
- Current-mode operation
- Very low start-up current (12 $\mu$ A)
- Very low standby power consumption via active-burst mode
- Internal 350ns leading-edge blanking
- Built-in 3ms soft-start function
- Internal slope compensation
- Built-in PRO pin pull-up (>3.25V) auto-restart function

## APPLICATIONS

- Power Meters
- Switching Mode Power Supplies
- AC/DC Adapters, Switching Chargers

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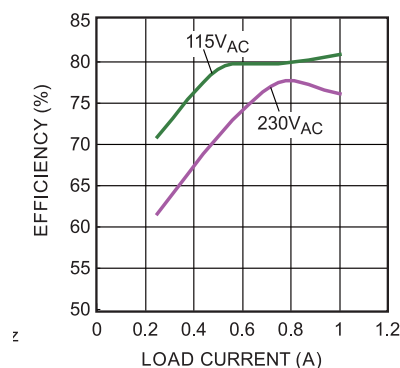
## EVHFC0310-S-00A EVALUATION BOARD



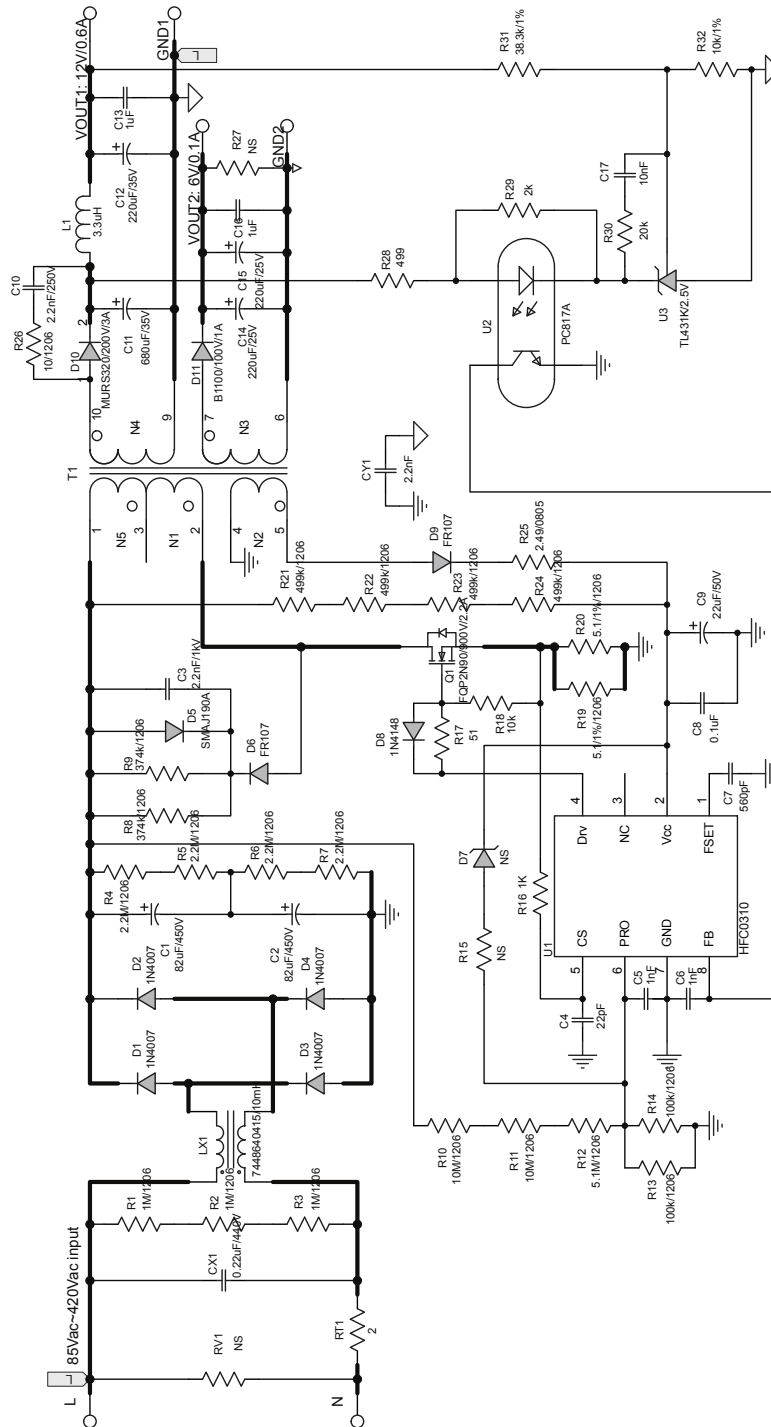
(L x W x H) 103mm x 52mm x 35mm

| Board Number    | MPS IC Number |
|-----------------|---------------|
| EVHFC0310-S-00A | HFC0310       |

Efficiency



## EVALUATION BOARD SCHEMATIC



## EVHFC0310-S-00A BILL OF MATERIALS

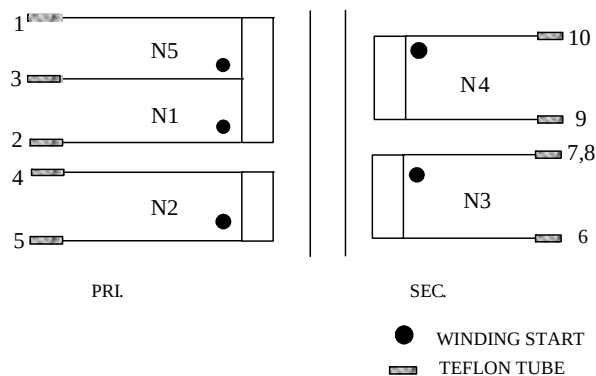
| Qty | Ref               | Value  | Description            | Package | Manufacturer | Manufacturer P/N   |
|-----|-------------------|--------|------------------------|---------|--------------|--------------------|
| 2   | C1,C2             | 82μF   | Electrolytic Cap, 450V | DIP     | Jianghai     | CD266-450V82uF     |
| 1   | C3                | 2.2nF  | Film Cap, 1kV          | DIP     | Any          | Any                |
| 1   | C4                | 22pF   | Ceramic Cap, 50V, C0G  | 0603    | Murata       | GRM1885C1H220JA01  |
| 2   | C5,C6             | 1nF    | Ceramic Cap, 50V, X7R  | 0603    | TDK          | C1608X7R1H102K     |
| 1   | C7                | 560pF  | Ceramic Cap, 50V, C0G  | 0603    | TDK          | C1608C0G1H561K     |
| 1   | C8                | 0.1μF  | Ceramic Cap, 50V, X7R  | 0603    | Murata       | GRM188R71H104KA93D |
| 1   | C9                | 22μF   | Electrolytic Cap, 50V  | DIP     | Jianghai     | CD281L-50V22       |
| 1   | C10               | 2.2nF  | Ceramic Cap, 250V, X7R | 0805    | TDK          | C2012X7R2E222K     |
| 1   | C11               | 680μF  | Electrolytic Cap, 35V  | DIP     | Jianghai     | CD287-35V680       |
| 1   | C12               | 220μF  | Electrolytic Cap, 35V  | DIP     | Jianghai     | CD287-35V220       |
| 2   | C13,C16           | 1μF    | Ceramic Cap, 50V, X7R  | 0805    | TDK          | C2012X7R1E105K     |
| 2   | C14,C15           | 220μF  | Electrolytic Cap, 25V  | DIP     | Panasonic    | 220uF/25V          |
| 1   | C17               | 10nF   | Ceramic Cap, 50V, X7R  | 0603    | Murata       | GRM188R71H103KA01D |
| 1   | CX1               | 0.22μF | Film Cap, 440Vac, X1   | DIP     | Faratronic   | MKP65-224K         |
| 1   | CY1               | 2.2nF  | Film Cap, 4000V, Y1    | DIP     | Hongke       | JN12E222MY02N      |
| 3   | R1,R2,R3          | 1MΩ    | Film Res., 1%          | 1206    | Yageo        | RC1206FR-071ML     |
| 4   | R4,R5,R6, R7      | 2.2MΩ  | Film Res., 5%          | 1206    | Any          | Any                |
| 2   | R8,R9             | 374kΩ  | Film Res., 1%          | 1206    | Yageo        | RC1206FR-07374KL   |
| 2   | R10,R11           | 10MΩ   | Film Res., 1%          | 1206    | Royalohm     | 1206F1005T5E       |
| 1   | R12               | 5.1MΩ  | Film Res., 5%          | 1206    | Yageo        | RI1206L515JT       |
| 2   | R13,R14           | 100kΩ  | Film Res., 5%          | 1206    | Yageo        | RM12JTN104         |
| 1   | R15               | NS     |                        |         |              |                    |
| 1   | R16               | 1kΩ    | Resistor, 1%           | DIP     | Any          | Any                |
| 1   | R17               | 51Ω    | Film Res., 1%          | 0603    | Yageo        | RC0603FR-0751RL    |
| 2   | R18,R32           | 10kΩ   | Film Res., 1%          | 0603    | Yageo        | RC0603FR-0710KL    |
| 2   | R19,R20           | 5.1Ω   | Film Res., 1%          | 1206    | Yageo        | RC1206FR-075R1L    |
| 4   | R21,R22, R23, R24 | 499k   | Film Res., 1%          | 1206    | Royalohm     | RC1206FR-07499KL   |
| 1   | R25               | 2.49Ω  | Film Res., 1%          | 0805    | Yageo        | RC0805FR-072R49L   |

# EVHFC0310-S-00A BILL OF MATERIALS *(continued)*

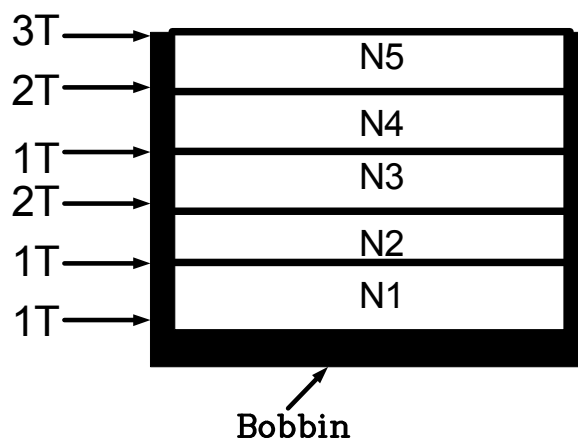
| Qty | Ref             | Value     | Description                                                                | Package | Manufacturer        | Manufacturer P/N |
|-----|-----------------|-----------|----------------------------------------------------------------------------|---------|---------------------|------------------|
| 1   | R26             | 10Ω       | Film Res., 5%                                                              | 1206    | Yageo               | RC1206JR-0710R   |
| 1   | R27             | NS        |                                                                            |         |                     |                  |
| 1   | R28             | 499Ω      | Film Res., 1%                                                              | 0603    | Yageo               | RC0603FR-07499RL |
| 1   | R29             | 2kΩ       | Film Res., 1%                                                              | 0603    | Yageo               | RC0603FR-072KL   |
| 1   | R30             | 20kΩ      | Film Res., 1%                                                              | 0603    | Yageo               | RC0603FR-0720KL  |
| 1   | R31             | 38.3kΩ    | Film Res., 1%                                                              | 0603    | Yageo               | RC0603FR-0738K3L |
| 4   | D1,D2,<br>D3,D4 | 1N4007    | Diode, 1A/1000V                                                            | DO41    | Diodes              | 1N4007           |
| 1   | D5              | SMAJ190A  | Diode, 1mA/190V                                                            | SMA     | Brightking          | SMAJ190A         |
| 2   | D6,D9           | FR107     | Diode, 1A/1000V                                                            | DO41    | Diodes              | FR107            |
| 1   | D7              | NS        |                                                                            |         |                     |                  |
| 1   | D8              | 1N4148    | Diode, 0.2A/75V                                                            | SOD323  | Diodes              | IN4148           |
| 1   | D10             | MURS320T3 | Diode, 3A/200V                                                             | SMC     | ON<br>Semiconductor | MURS320T3        |
| 1   | D11             | B1100     | Diode, 1A/100V                                                             | SMA     | Diodes              | B1100-13-F       |
| 1   | Q1              | FQP2N90   | N-Channel<br>Mosfet,2.2A/900V                                              | TO220   | Fairchild           | FQP2N90          |
| 1   | RT1             | 2Ω        | NTC Res;                                                                   | DIP     | Xingshun            | 2D2-10           |
| 1   | L1              | 3.3μH     | Inductor, 2.66A                                                            | DIP     | TOKO                | 8RHB2#822LY3R3M  |
| 1   | LX1             | 10mH      | Common filter                                                              | DIP     | Würth               | 7448640415       |
| 1   | T1              |           | EF20,<br>Primary Inductance:<br>2.5mH,<br>N1:N2:N3:N4:N5=46:<br>12:12:6:46 | DIP     | Any                 | Any              |
| 1   | RV1             | NS        |                                                                            |         |                     |                  |
| 1   | U1              | HFC0310   | HFC0310GS                                                                  | SOIC8   | MPS                 | HFC0310GS        |
| 1   | U2              | PC817A    | Opto-coupler                                                               | DIP     | Sharp               | PC817A           |
| 1   | U3              | TL431K    | Shunt Regulator 2.5V                                                       | SOT-23  | TI                  | TL431K           |

# TRANSFORMER STRUCTURE

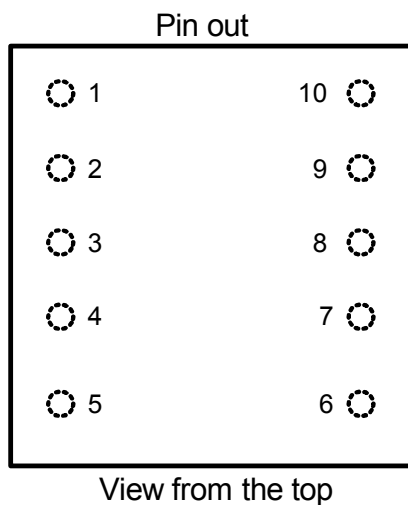
Electrical Diagram



Winding Diagram



Pin Definition of Bobbin



**Table 1—Electrical Characteristic**

| Parameter          | Condition      | Value             |
|--------------------|----------------|-------------------|
| Primary Inductance | Lp(2-1)        | 2.5mH±5%          |
| Core               | /              | EF20              |
| Bobbin             | /              | EF20              |
| Core Material      | /              | PC40or equivalent |
| Turn Ratio         | N1:N2:N3:N4:N5 | 46:12:12:6:46     |

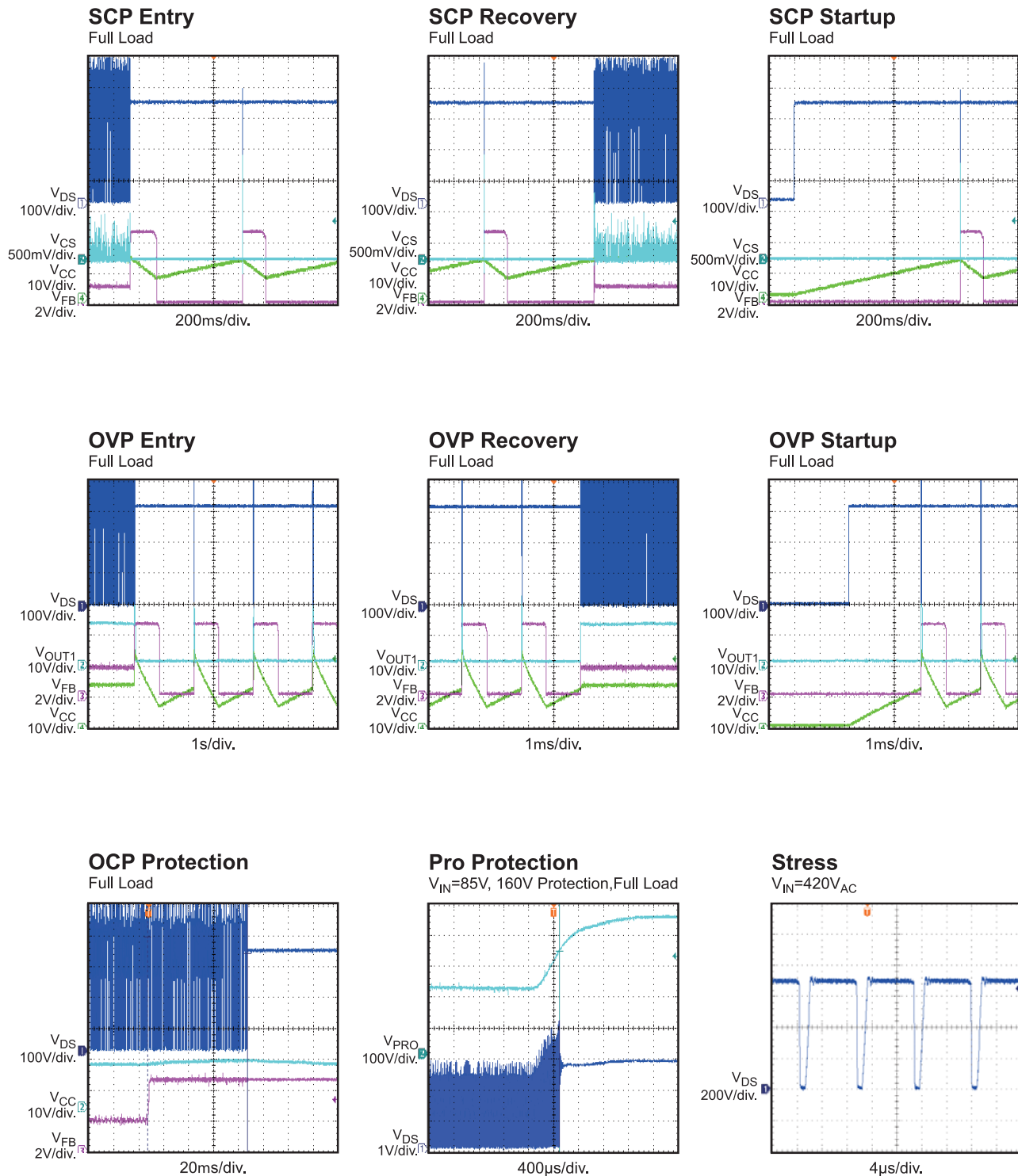
**Table 2—Winding Specification**

| Tape Turns | Winding No. | Margin Tapes | Start&End | Wire Diameter (mm) | Turns |
|------------|-------------|--------------|-----------|--------------------|-------|
| 1          | N1          | 2mm          | 2→3       | 0.2×1              | 46    |
| 2          | N2          | 2mm          | 5→4       | 0.2×1              | 12    |
| 1          | N3          | /            | 7,8→6     | 0.5T.I.W.×1        | 12    |
| 2          | N4          | /            | 10→9      | 0.29T.I.W.×1       | 6     |
| 3          | N5          | 2mm          | 3→1       | 0.2×1              | 46    |

## EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.

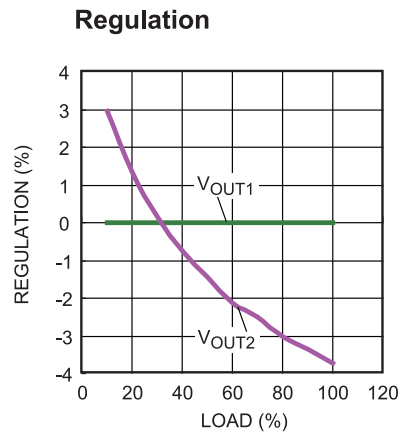
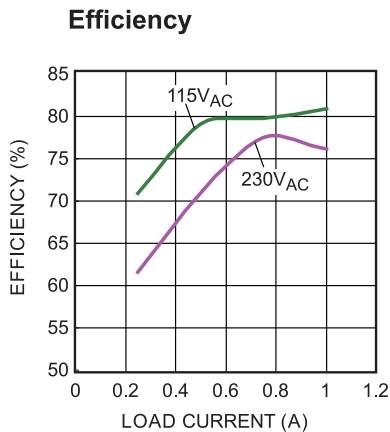
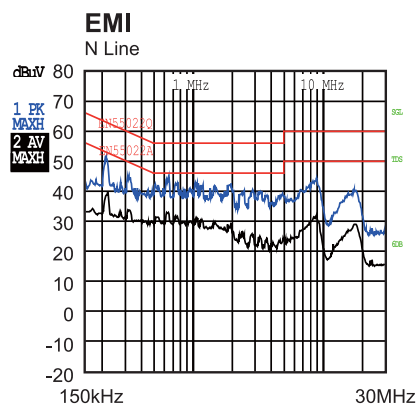
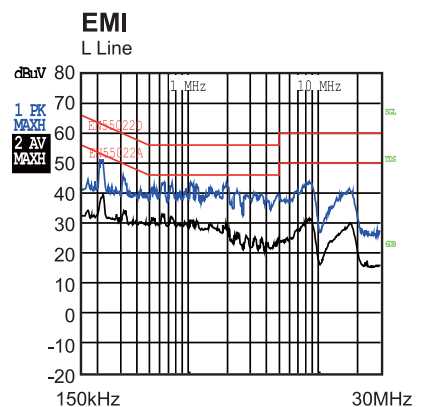
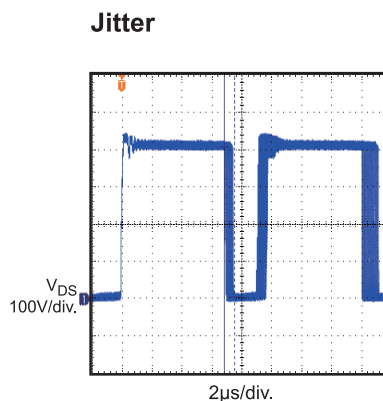
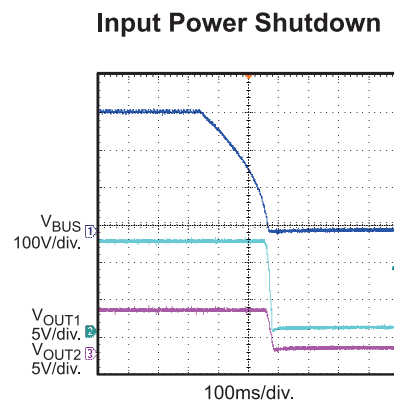
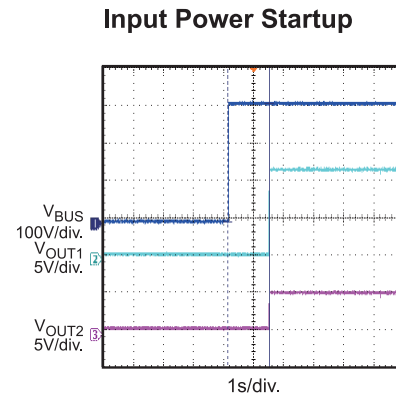
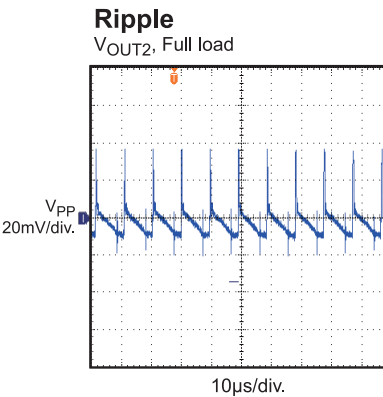
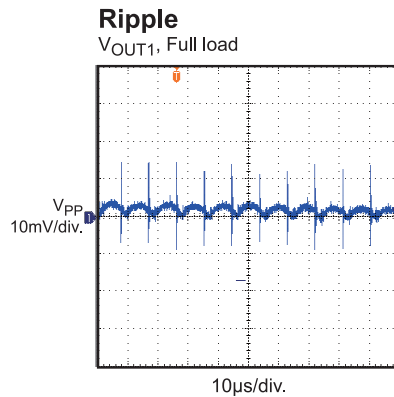
$V_{IN} = 230V_{AC}$ ,  $V_{OUT1} = 12V/0.6A$ ,  $V_{OUT2} = 6V/0.1A$ ,  $T_A = 25^{\circ}C$ , unless otherwise noted.



## EVB TEST RESULTS (continued)

Performance waveforms are tested on the evaluation board.

$V_{IN} = 230V_{AC}$ ,  $V_{OUT1} = 12V/0.6A$ ,  $V_{OUT2} = 6V/0.1A$ ,  $T_A = 25^{\circ}C$ , unless otherwise noted.





## PRINTED CIRCUIT BOARD LAYOUT

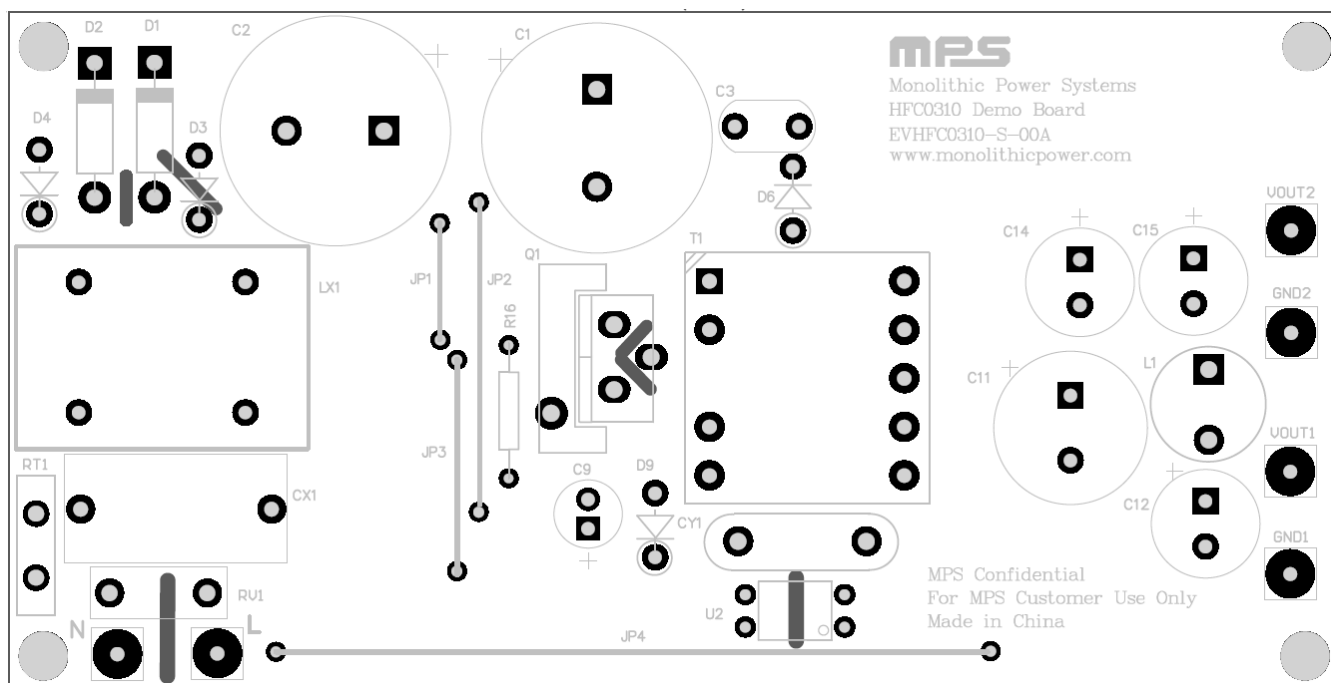


Figure 1—Top Layer

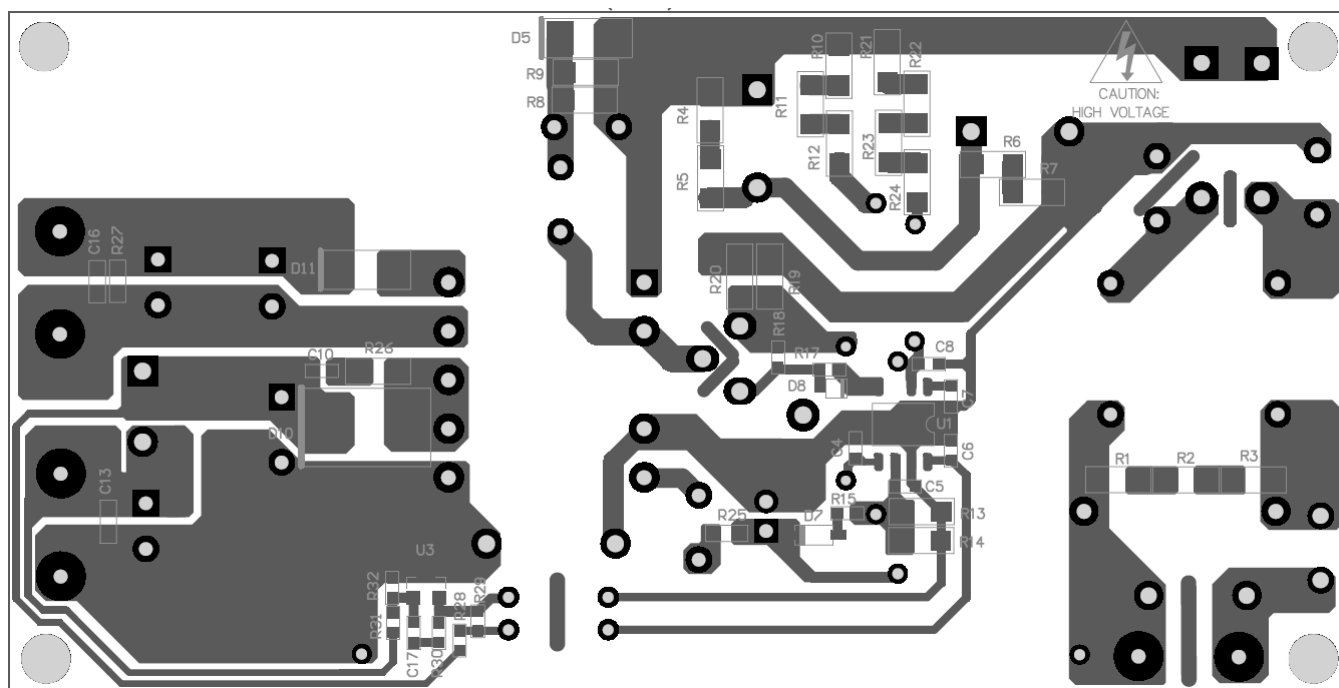


Figure 2—Bottom Layer

## QUICK START GUIDE

1. Preset Power Supply to  $85V_{AC} \leq V_{IN} \leq 420V_{AC}$ .
2. Turn Power Supply off.
3. Connect Power Supply terminals to Line and Neutral
4. Connect Load to  $V_{OUT1}$  and GND1,  $V_{OUT2}$  and GND2
5. Turn Power Supply on. The board will automatically startup.

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