

## **PFC Buck AC/DC: List of changes from v0 to v2**

1. Add CM filter consisting of two Y-capacitors (C1 and C2, 10nF each, Farnell Ref: 2987312/2677052/2440265), and a CM choke (L4, 2x6.8mH, Farnell Ref: 1219097).
2. Add varistor (RV1, Farnell Ref: 1004356) at input.
3. Change fuse FH1 from large TH to small SMD 3812 (1A, 250Vac, 0.18 $\Omega$ , Farnell Ref: 3013724).
4. Remove inrush-current limiting NTC thermistor (RT1), as buck topology allows soft-start.
5. Use correct symbols for L1, L2, and L3 in the DM filter.
6. Change damping resistor (R1) from through hole to SMD 1206.
7. Add discharge resistors (3x3M $\Omega$ ) across 1uF DM filter capacitor; Change 1uF capacitor from 1kV to 630V rated (Farnell Ref: 1781894).
8. Change current sense resistor from single 0.1 $\Omega$  resistor (2W SMD) to two 0.22 $\Omega$  resistors (1206, 2x250mW) in parallel. The standard 1206 resistors are easier to source than the special SMD one (2W). Expected dissipation in sense resistor is 200mW for 230Vac and 400mW for 115Vac.
9. Change gate drive resistors from 10 $\Omega$  to 4.7 $\Omega$  (charging) and 4.7 $\Omega$  + ES1D diode (discharge).
10. Modify RC snubber to have 6 instead of 1 resistor (to handle up to 1.2W power dissipation). However, keep the snubbing capacitor unpopulated, as the snubber is not necessarily required.
11. Change freewheeling diode from FFPF10UP60STU (Si ultrafast) to STPSC10H065DI (SiC Schottky). Use two Schottky diodes in parallel for lower conduction loss option.
12. Change PFC inductor from COTS to custom (4 parallel power windings + one auxiliary bias winding) in order to lower loss.
13. Add separate generic heatsinks (HS1 and HS2) for power MOSFET (T1) and Schottky diodes (D3, D4).
14. Change DC link capacitors from 3x680uF (40mm height) to 4x470uF (26.5mm height) + 2x4.7uF (2220).
15. Change soft-start resistor from 100k $\Omega$  to 1M $\Omega$ .
16. Change IC1 decoupling capacitor from 2.2uF to 4.7uF.
17. Change slope compensation resistor from 2.2k $\Omega$  to 220 $\Omega$ .
18. Change PWM controller (IC1) from MIC38HC45YM to TL2843BDR-8.
19. Change oscillator frequency setting network ( $R_T$ ,  $C_T$ ) from 5.6k $\Omega$ , 1.5nF to 15k $\Omega$ , 1nF (to ensure 100kHz switching frequency with changed PWM controller).
20. Change type-2 compensation resistor from 5k $\Omega$  to 5.1k $\Omega$ .
21. Add extra PBT connector for AC input during testing.
22. Add bootstrap bias and auxiliary bias circuits, and jumper to select internal versus external Vcc.
23. Add protective TVS diode (12V) on Vcc rail.

## **Possible further improvements (withheld for further investigation)**

1. Use correct symbol for power MOSFET (IPA80R280P7).
2. Use correct symbol and footprint for custom heatsinks (HS1 and HS2).
3. Use correct symbol and footprint for custom PFC inductor.