150W 12V-90V Input, 170V DC / 120Vrms Pure Sine Wave Output Power Inverter

Inrush Limiter

The inrush limiter limits the peak current into the input and output capacitor after power is first applied.

This limiter along with the delay in the boost circuit results in the output being up within two seconds of the first application of power.

Boost Converter

The boost converter has a maximum duty cucle of 95% and a maximum current of 14A.

The COMP pin has to be manually tuned for best response. 10nF as tried initially, but the response was too slow to handle the 120 Hz pulsing of the sine wave output. 1nF works acceptably up to 150W.
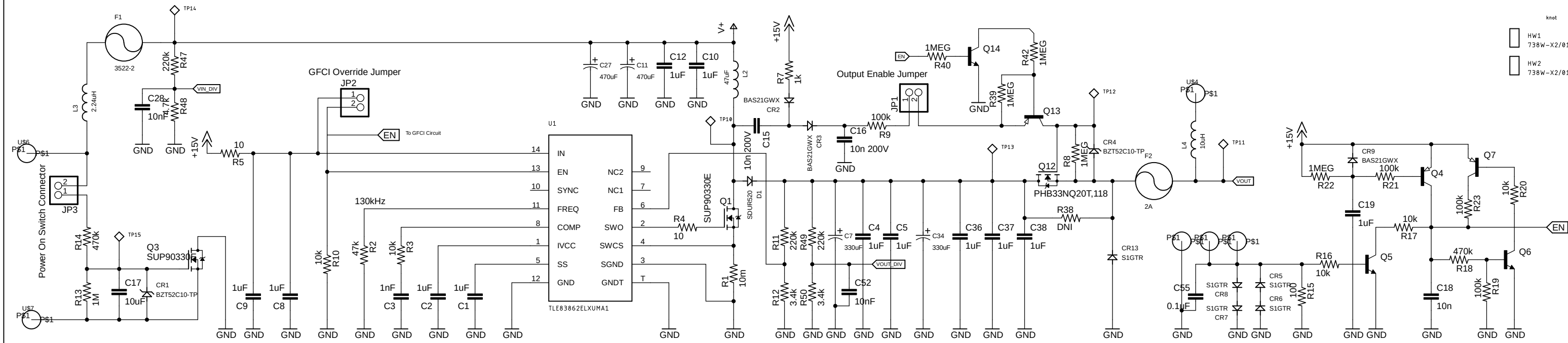
Output Switch Charge Pump

The N-channel output MOSFET requires a drive voltage above the output rail. This voltage is generated by a simple charge pump operating off of the switched node.

Output Switch

The Output switch allows power to be immedietly removed as soon as a GFCI fault is detected. It also disconnects the output as soon as power to the inverter is lost or or the output enable jumper is removed.

Ground Fault Current Interrupter

The GFCI circuits deasserts the enable signal in the event of a ground fault detection and then latches in the off state until power is removed and reapplied.

12V Buck / 12V Linear Regulator
Install Only One

The boost converter alone does not draw much power, but the gate drivers for the H-bridge do.
On boards with only the DC boost circuit, the linear regulator circuit can be installed.
On boards with the full bridge inverter, the buck converter can be installed to increase efficiency.

MCU Linear Regulator

3.3V regulator for MCU

USB input

BOOT selection

STM32F103

Programming problems required PB15 to be used for LB and PA10 to be used for HB.
This was accomplished by shorting PB14 to PB15 with solder and shorting PA9 to PA10 after the chip was programmed.

Pure Sine Full Bridge

Dead time inserting half bridge drivers used to prevent crossconduction

---

Inrush Limiter components: F1 3522-2, R47 220k, R48 4.7k, C28 10nF, L3 2.24uH, R5 10, R14 470k, Q3 SUP90330, R13 1M, C17 10uF, CR1 BZT52C10-TP, U56, U57, JP3 Power On Switch Connector, TP14, TP15, VIN_DIV

Boost Converter: GFCI Override Jumper JP2, U1 TLE83862ELXUMA1, pins: 14 IN, 13 EN, 10 SYNC, 11 FREQ, 8 COMP, 1 IVCC, 5 SS, 12 GND, 9 NC2, 7 NC1, 6 FB, 2 SWO, 4 SWCS, 3 SGND, T GNDT. 130kHz. R10 10k, R2 47k, R3 10k, C3 1nF, C2 1uF, C1 1uF, C9 1uF, C8 1uF. C27 470uF, C11 470uF, C12 1uF, C10 1uF, L2 470uF. Q1 SUP90330E, D1 SDUR520, R4 10, R1 10m, TP10. C15 10n 200V. R11 220k, R49 220k, C7 330uF, C4 1uF, C5 1uF, C34 330uF, C36 1uF, C37 1uF, C38 1uF, R12 3.4k, R50 3.4k, C52 10nF, VOUT_DIV. EN To GFCI Circuit.

Output Switch Charge Pump: +15V, R7 1k, CR2 BAS21GWX, CR3 BAS21GWX, C16 10n 200V, R9 100k. Q14, Q13, R40 1MEG, R42 1MEG, R39 1MEG, R8 1MEG, Output Enable Jumper JP1, EN, TP12, TP13.

Output Switch: Q12 PHB33NQ20T,118, CR4 BZT52C10-TP, F2 2A, L4 10uH, R38 DNI, CR13 S1GTR, VOUT, TP11.

Ground Fault Current Interrupter: knot, HW1 738W-X2/01, HW2 738W-X2/01, +15V, CR9 BAS21GWX, Q7, Q4, R22 1MEG, R21 100k, R20 10k, R23 100k, C19 1uF, R17 10k, Q5, Q6, R16 10k, R18 470k, R19 100k, C18 10n, R15 100, CR5 S1GTR, CR6 S1GTR, CR7 S1GTR, CR8 S1GTR, C55 0.1uF, EN.

12V Buck / 12V Linear Regulator: U5 LM5008, pins: 8 VIN, 7 VCC, 6 RON, 5 FB, 1 SW, BST, RCL, RTN. R35 300k, R36 300k, C49 0.1uF 250V, C48 1uF 25V, L1 100uH, C45 2, D5, R33 2, R32 47k, R34 12k, C46 2.2uF 25V, C47 2.2uF 25V, TP1, TP2. Q2 ZXTN4004KTC, R6 10k, R37 10, D2 12V CR12 BAS21GWX, C13 1uF, C14 1uF, Q15, R51 10k, IND. JP7, JP8, JP9. C39 1uF, C41 1uF, C43 1uF, C44 1uF, C29 0.1uF, C35 0.1uF, C42 0.1uF, C51 0.1uF, TP4 TP5 TP6 TP7.

MCU Linear Regulator: J1 1003352B-N3212LF, R41 10, R43 10, USB_DM, USB_DP, R52 1.5k, JP5, CR14 BAS21GWX, U7 AP2114 (IN OUT GND), C40 1uF, C6 1uF, JP4, R44 10k, R45 10k, BOOT0, BOOT1, JP6, STM_RX, STM_TX, HB.

STM32F103: U6 STM32F103C8T6TR. Pins left: 24*3 VDD, 9 VDD_A, 1 VBATT, 10 PA0, 11 PA1, 12 PA2, 13 PA3, 14 PA4, 15 PA5, 16 PA6, 17 PA7, 29 PA8, 30 PA9, 31 PA10, 32 PA11, 33 PA12, 38 PA15, 2 PC13, 3 PC14, 4 PC15, 23*3 GND, 8 GND_A. Pins right: 5 OSCIN, 6 OSCOUT, 44 BOOT0, 20 PB2/BOOT1, 34 SWIO, 37 SWCLK, 7 NRST, 18 PB0, 19 PB1, 39 PB3, 40 PB4, 41 PB5, 42 PB6, 43 PB7, 45 PB8, 46 PB9, 21 PB10, 22 PB11, 25 PB12, 26 PB13, 27 PB14, 28 PB15. X1 8MHz, C24 18pF, C23 18pF, X2 32.768kHz, C25 9pF, C26 9pF, R46 1k, C50 0.1uF, R56 1k, R55 1k, R57 1k, R58 1k, VIN_DIV, VOUT_DIV, IND, HA, HB, STM_RX, USB_DM, USB_DP, LA, LB, +3V3, IO, CLK.

Pure Sine Full Bridge: U3, U4 (VCC VB, HIN HO, LIN VSW, GND LO). CR10 BAS21GWX, CR11 BAS21GWX, Q8 SUP90330E, Q9 SUP90330E, Q10 SUP90330E, Q11 SUP90330E, R24 10, R25 10, R26 10, R27 10, R28 0R, R30 0R, R29 0R, R31 0R, C20 0.1uF, C21 0.1uF, C31 0.22uF, C33 0.22uF, C30 0.22uF, C32 0.22uF, L6 1mH, C22 1uF, C53 DNI, C54 DNI, R53 DNI, R54 DNI, VOUT, TP3, TP8, TP9, U10, U2, U8.