

20 OCT 15; Roderick.

LAYING OUT FLASHER SECTION OF PTC. CHANGING POSITIVE POWER FROM MOTOR-POS TO MAIN-OUT. EASIER LAYOUT. ONLY DIFFERENCE IS A FEW mR OF CURRENT SENSOR.

TO DO: ✓ ADD COPPER POURS FOR HEAT SINKS

✓ CHECK VIA SIZES - LARGE VIAS FOR POWER

✓ CHECK TRACE WIDTHS 30 MIL WHEN POSSIBLE.

BOARD LOGO? DATE, REV, NAME

26 OCT 15. ALL PARTS PLACED AND ROUTED AS OF LAST NIGHT.

PUT THIS IN COPPER ON FRONT: BOARD NAME - SOLAR BIKE POWER
TRANSFER CONTROLLER
MY CONTACT INFO

~~REVISION INFO ON B.~~

REV# 1.0

DATE

ON BACK, IN SILKSCREEN, FEATURE LIST:

- MAXIMUM POWER POINT TRACKING
- SYNCHRONOUS RECTIFICATION
- MAGNETIC SUPER CAPACITOR BALANCING

28 OCT 15. SOME CHINESE VENDOR SAYS SILKSCREEN MINIMUM LINE 6 MIL. CHANGED SETTING IN TECHNOLOGY FILE FOR PCB, UNDER LINE STYLES.

30 OCT 15. FOUND NON-FATAL ISSUES WITH LAYOUT.

- 1) LONE VIA OUTSIDE BOARD OUTLINE. MUST HAVE BEEN A LEFTOVER. THAT'S WHAT MADE DESIGN LOOK SMALL ON ZOOM TO FIT.
- 2) L1 REFERENCE SOMEHOW ON DOCUMENTATION LAYER, NOT SILKSCREEN.
- 3) A FEW REF DESIGNATORS ADJUSTED FOR BETTER ALIGN.
- 4) SILKSCREEN TEXT & LINE WIDTH 5 mil IN SOME CASES. ADJUSTED → IN DESIGN TECH SETTINGS TO 7 mil MIN.

28 OCT 2015; Roderick.

LOOKING FOR PCB QUOTE, 68.41 in^2

BOARD SIZE 8.85" X 7.73" (225 mm X 194 mm)

SMALLEST HOLE 24 MIL (0.6 mm)

NARROWEST TRACE / SPACE 10 MIL / 10 MIL (0.25 mm)

MIN SILKSCREEN LINE 8 MIL (0.2 mm)

2 SIDED BOARD, FR4, $\frac{1}{16}$ " THICK (62 MIL, 1.6 mm)

→ 2-OZ (70 μm) COPPER

NO STENCIL

TOP & BOTTOM SOLDER MASK

" " " SILKSCREEN

HASL FINISH, LEAD OK

TURNAROUND TIME UNIMPORTANT

LOTS OF DRILL BACKOFF ERRORS - WILL
MFG BACK OFF TRACES?

PCBWAY.COM - CHINA - QTY 5 - \$92 + \$24 SHIP. 4 DAY FAB +

30 DAY SHIP. COULD GO DHL 4 DAY FOR \$7 MORE.

-+ HAD LEAD FREE CHEAPER, ~~\$74~~ \$24 - NO, THAT WAS 1oz COPPER

PCBUNIVERSE.COM - QTY 5 - \$259, 3 - \$240, 1 - \$225

WASHINGTON - 10 DAY FAB

ITEAD.CO - THROUGH SET CHOICES, CANNOT GET BOARD
LARGER THAN 20x20 CM, LEAD FREE MORE EXPENSIVE,

10 BOARDS MINIMUM THROUGH "SMALL BATCH" - \$121.75

OSHPARK.COM - CAN'T DO 2oz COPPER, PLUS WOULD NEED
ORDER OF 10 BOARDS - \$684.

FUSHPCB.COM - TAH TUSE, MUST CREATE ACCOUNT TO GET
QUOTE.

SPCB.COM - SUITE 8A HANGZHOU, CHINA. LOOKS SAME
AS PCBWAY. PRICE SLIGHTLY HIGHER

ELECTPCB - REGISTRATION REQ'D

PCBWING.COM - DEFECTIVE OUTSIDE SCREEN.

QTY 5, \$144 TOPPING + \$325 FOR BOARDS.

STELKA CIRCUITS - SUNNYVALE - MUST REGISTER

SUNSTONE CIRCUITS - 65-168 SQ IN BOARD, SOLDERMASK,
SILKSCREEN, QTY 2 = \$403 + SHIP

TIPCB.CA - QTY 5 \$217 + SHIP.

STORE.FAYAKEACIRCUITS.COM - NO 2oz. \$553 / 2 BOARDS ANY
WAY

PCB-POOL.COM - 5 BOARDS \$2500 EVENS.

PCBCART.COM - 5 BOARDS \$251

HTCIRCUITS.COM - EMAIL QUOTE ONLY

30 OCT 15; Roderick

ERNIEM AT ALLABOUTCIRCUITS.COM SUGGESTED RUNNING THE GERBERS THROUGH FREEDFM.COM, A SERVICE OF 4PCB.COM IT FOUND ONE MINOR FLAW - SOLDERMASK TOO SMALL ON ONE VIA. I HAD TO HIGHLY MAGNIFY TO SEE IT. THERE WAS A TINY TRACE STUB HIDING IN THE VIA. RE-DID THE CONNECTION, AND NO MORE WARNINGS.

AAC FORUM ALSO GENERALLY AGREES THAT FAB HOUSES ARE NOT GOING TO ALTER GERBERS IN MOST CASES, AND WILL TELL YOU IF THEY DO (UNLIKELY, IT WOULD SLOW THINGS WHILE WAITING FOR PERMISSION).

31 OCT 15. AT 11AM, SENT GERBERS TO PCBWAY.COM FOR FAB. AWAITING APPROVAL.

31 NOV 15. 8:29P AT SOME TIME IN THE PAST COUPLE HOURS, PCBWAY REVIEWED MY ORDER AND IT BECAME ELIGIBLE FOR PAYMENT. CHECKED AT 5:30, AND IT WAS NOT READY, YET. ONLY PAYMENT IS THROUGH PAYPAL. PAID ALMOST IMMEDIATELY. STATUS IS UN CEREMONIOUSLY UPDATED TO FABRICATION. I SEE NOW THAT THEY SENT ME AN EMAIL AT 7:36P SAYING THAT THE DESIGN HAD PASSED THEIR AUDIT.

11-3 8:39P MANUFACTURE INSTRUCTION (COMPLETED) - MUST BE CHINA TIME
11-3 9:15P BOARD CUTTING
11-4 3:26A DRILL
3:26A PLATED HOLES
5:15 A CIRCUIT (PROBABLY MEANS APPLYING MASK
7:05A ETCH COMPLETE NOTE: NO EMAIL NOTICE OF PROGRESS
8:28A AOI (AUTOMATED OPTICAL INSPECTION)
10:48A SOLDER MASK
5:01P SILKSCREEN DONE
11-5 2:12A SURFACE TREATMENT (HASL)
4:26A DOUBLE DRILLING
4:26A ROUTING (NONE FOR MY BOARD)
6:29A TESTING
6:59A PACKAGE
9:06A DELIVERY READY

02 NOV 2015;
Roderick.

BLANK FAB ORDERED. PARTS STILL NEEDED:

- ✓ CHASSIS - PREFERABLY DIE CAST, WATERPROOF HAMMOND 1558 WH
DK: 44.18 M: 44.17
- ✓ 4mm TRIMMER - IF USING TOP ADJUST
- ✓ BA99 - CHECK TO SEE IF HAVE 11 DK: 124 M: 10.64/10
- ✓ BCAP0050 - NEED 22 MORE - Mouser BEST PRICE
- ✓ 1206 10µF - HAVE ENOUGH? NEED 14 DK: 354 M: 18.6/10
- ✓ FRFB4110 - NEED SPARE? OR FPDF045H10A? DK: 5.18 M: 4.82
3.88/10
- ✓ MIC 4452 - VERIFY HAVE SOIC PART
- ✓ 20 PIN PICAXE SOCKET
- ✓ ACS723 - INPUT ONE @ 20A? - DIKEY BEST PRICE \$5.27 ea.
- ✓ HEICO M3207 CABLE MOUNT DK: N/A M: 1.02

~~SPDT SWITCH~~ got at FLEA MKT - \$1 NEW

- ✓ MINI-DIN RECEPTACLE 161-381/6E
- ✓ LM317 ADJUT DK: .75, 10/9658 M: .75 10/58.3
- ✓ HEAT SINK CLIPS?

✓ 22µF 1210 DK: 424 16V M: 18.9/10 1206 23.3/10 16V 1206 HAVE PLENTY

✓ SYNC RECT ~~OR~~ FETS FDD86326

✓ 1µF 1206 - MAYBE HAVE A REEL? HAVE 2.2µF/25V

CSD19506KCS - 2.2mΩ, 120nC 80V

CSD19536KCS - 2.5mΩ, 118nC, 100V
19505 2.9mΩ, 76nC

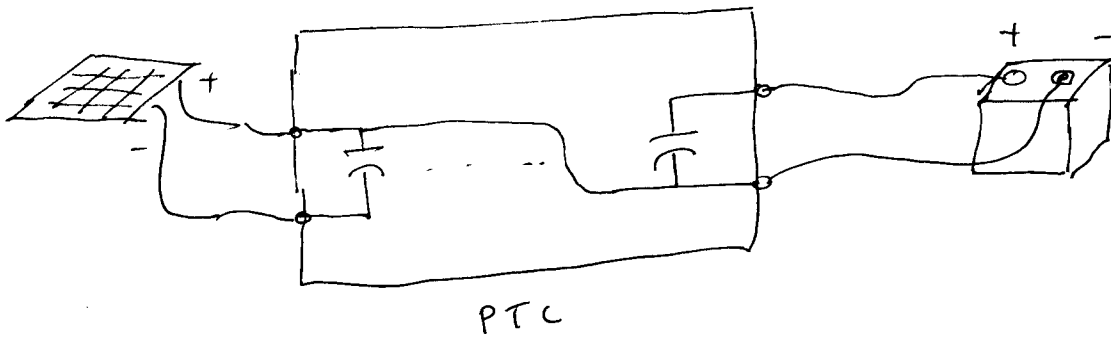
FDP045H10A 3.8mΩ 57nC

CSD19501 6.2mΩ 38nC

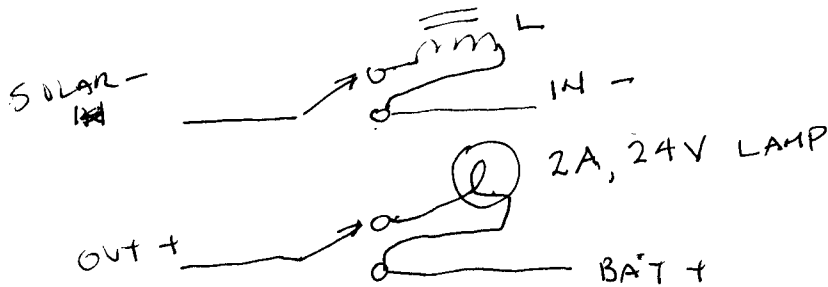
FDPF085H10F 8.565mΩ MAX 31nC 100V PLASTIC PACK

TWO ISSUES OF INRUSH CURRENT,

1. NO BLOCKING DIODE ON OUTPUT, SO UPON INITIAL CONNECTION IF THERE IS EXTERNAL BATTERY, IT WILL BE SHORTED ACROSS THE SUPERCAPS.
2. UPON INITIAL CONNECTION TO SOLAR PANEL, WILL NEED TO CHARGE INPUT CAPACITORS



INPUT SIDE IS NOT A HUGE DEAL - SOLAR PANEL INHERENTLY LIMITED TO ABOUT 10 AMPS, AND INPUT CAPS CAN WITHSTAND SURGE, OUTPUT SIDE IS PROBLEM. EFFECTIVELY ABOUT 8 FARADS ACROSS A LEAD-ACID BATTERY.



STEP VOLTAGE APPLIED TO IDEAL LC
 CURRENT AMPLITUDE = $\frac{V}{\sqrt{L/C}}$

SUPPOSE WANT CURRENT = 5A MAX.

$$\frac{24V}{\sqrt{\frac{L}{2000\mu F}}} = 5 \quad 5 \approx \sqrt{\frac{L}{2000\mu F}}$$

$$25 \times 2000 \times 10^{-6} = L$$

SOLAR PANEL LIMITED TO 10A, ANYWAY

$L \approx 500 \text{ mH}$
 NEVER MIND INPUT, CAN COVER PANEL TO REDUCE SURGE CURRENT.

NEW CROP OF TRANSISTORS FROM TEXAS INST - CSD SERIES -
LOW GATE CHARGE. R_{DS} NOT AS IMPORTANT AS FAST
SWITCHING.

OLD STANDBY FPDF085 NIOF HAS NICE PLASTIC CASE,
INSULATED ALREADY. $8.5 m\Omega$ MAX, Q_g 40nC MAX

→ CSP19503 KCS 80V, $9.2 m\Omega$ MAX, Q_g 36nC MAX

→ FPDF08FNIOF