

PowerSwitch/SmartCharger

BILL OF MATERIALS

Revision 0.1 8/24/2020 G. Gibby

0.2 8/26/2020 G. Gibby

0.3 8/27/2020 G. Gibby – corrected trimmer resistance

No.	Description Digikey URL	Qty Req	Price Each	SubTotal
1	Printed Circuit Board Submit gerber files (zipped) to manufacturer of choice; e.g. pcbway.com http://qsl.net/nf4rc/2020/TopSilk.zip	1	Approx \$5	5.00
2	Arduino Nano I purchase them three at a time for \$13.99 https://www.amazon.com/gp/product/B07G99NNXL		\$4.00	4.00
3	2x16 backlighted LCD Display One example: https://www.amazon.com/gp/product/B071Y6JX3H You may easily be able to find this cheaper on Amazon or on Ebay	1	\$6.49	6.49
4	U2 5V 3 terminal regulator Pack of 10 for \$14.31 https://www.amazon.com/gp/product/B00CHTNE9Q You can find them individually elsewhere	1	\$2.00	2.00
5	U5 MCP6002 op amp Digikey: https://www.digikey.com/product-detail/en/microchip-technology/MCP6002-I-P/MCP6002-I-P-ND/500875 Amazon: pack of 6 for \$8.00 https://www.amazon.com/MCP6002-I-DIP-8-Bandwidth-Product-Low-Power/dp/B071FNFHPZ You may wish to socket this part.	0.33	1	0.33
6	Q1, Q2, Q3 P-channel MOSFET 60V 120A SQP90P06-07L_GE3 5.6 milli-ohm Rds-on @ 10V https://www.digikey.com/product-detail/en/vishay-siliconix/SQP90P06-07L_GE3/SQP90P06-07L_GE3-ND/9861092	\$2.86	3	8.58

	<p>NOTE: For currents up to 10A, an alternate plastic coated MOSFET can be used with no heatsink or minimal heatsink; this MOSFET has built in zener diode protection of the gate junction. It should not be used if currents will ever exceed 10A. However this may be a suitable design for systems driving smaller transceivers. Because of the plastic coating, this MOSFET is more difficult to significantly heatsink but is inherently insulated. The pinout and other characteristics are compatible. BMS3003: https://www.digikey.com/product-detail/en/on-semiconductor/BMS3003-1E/BMS3003-1EOS-ND/4847552</p>			
7	<p>Q4, Q5 2N3904 thru-hole NPN transistor https://www.digikey.com/product-detail/en/micro-commercial-co/2N3904-AP/2N3904-APCT-ND/950591</p>	0.17		0.34
8	<p>R1 1 Mohm 1/8W resistor https://www.digikey.com/product-detail/en/stackpole-electronics-inc/CF18JT1M00/CF18JT1M00CT-ND/2022814</p>	0.10	1	0.10
9	<p>R2, R4 10K 1% precision 1/8W resistor https://www.digikey.com/product-detail/en/stackpole-electronics-inc/RNF18FTD10K0/RNF18FTD10K0CT-ND/2022666</p>	2	0.10	0.20
10	<p>R3, R5 3.3K 1% precision 1/8W resistor</p> <p>Use available 3.01K 1% resistor for 10c each: https://www.digikey.com/product-detail/en/stackpole-electronics-inc/RNF18FTD3K01/RNF18FTD3K01CT-ND/9770219</p> <p>Minor change in code required –</p>	2	0.20	0.40
11	<p>R6, R8, R16, 10K ohm 1/4W trimmer potentiometer https://www.digikey.com/product-detail/en/bourns-inc/3306W-1-103/3306W-103-ND/84781</p>	3	0.43	1.29
12	<p>R9, R10 100 ohm 1/8W resistor (board incorrectly marked 470 ohm) https://www.digikey.com/product-detail/en/stackpole-electronics-inc/CF18JT100R/CF18JT100RCT-ND/2022718</p>	2	0.10	0.20
13	<p>R7, R11, R21 510K 1/8W resistor https://www.digikey.com/product-detail/en/stackpole-</p>	3	0.10	0.30

	electronics-inc/CF18JT510K/CF18JT510KCT-ND/2022807			
14	R12, R13 10K 1/8W resistor https://www.digikey.com/product-detail/en/stackpole-electronics-inc/CF18JT10K0/CF18JT10K0CT-ND/2022766	0.10	2	0.20
15	R14 220 ohm 1/4W resistor https://www.digikey.com/product-detail/en/stackpole-electronics-inc/CF12JT220R/CF12JT220RCT-ND/1830471	0.10	1	0.10
16	R15, R17, R25, R26 10Kohm 1/8W resistor https://www.digikey.com/product-detail/en/stackpole-electronics-inc/CF18JT10K0/CF18JT10K0CT-ND/2022766	0.10	4	0.40
17	R18, R20 4.7Kohm 1/4W resistor https://www.digikey.com/product-detail/en/stackpole-electronics-inc/CF14JT4K70/CF14JT4K70CT-ND/1830366	0.10	2	0.20
18	R22 2.2K 1/4W resistor (supplies T measurement diode) https://www.digikey.com/product-detail/en/stackpole-electronics-inc/CF14JT2K20/CF14JT2K20CT-ND/1830358	0.10	1	0.10
19	D1 GREEN LED (AC supply LED) Kit of 150 various LED's for \$4.00 https://www.amazon.com/Mixse-Emitting-Assorted-Arduino-Electronics/dp/B07C65Z9Z6	0.25		0.25
20	D2 RED LED (battery led)	0.25		0.25
21	D7, D6 TVS unidirectional diode 16V SA16A https://www.digikey.com/product-detail/en/littelfuse-inc/SA16A/SA16ALFCT-ND/407677	0.41	2	0.82
22	D3, D8, D9, 1N4007 diode https://www.digikey.com/product-detail/en/micro-commercial-co/1N4007-TP/1N4007-TPMSCT-ND/773694	0.12	3	0.36
23	C1, C2, C3 C5 C6, 0.1 uf ceramic capacitor 50V https://www.digikey.com/product-detail/en/kemet/C315C104M5U5TA7303/399-9859-1-ND/3726100	0.23	5	1.15
24	C7, C8 Electrolytic 22uF 25V https://www.digikey.com/product-detail/en/panasonic-electronic-components/ECA-1EM220I/P19523CT-ND/6109421	0.21	2	0.42
	APPROXIMATE TOTAL FOR BASE KIT			\$33.48
25	ADDITIONAL RESISTOR not indicated on board version 2.0 Add R30 1200 ohm ¼ W resistor in parallel with D7 (from AC			

	+PWR input to ground) https://www.digikey.com/product-detail/en/stackpole-electronics-inc/CF14JT1K20/CF14JT1K20CT-ND/1830352 This provides a modest load on the AC based supply and avoids that voltage “floating” when the AC supply is not producing voltage.			
16	WIRE – suggest #16 marine tinned stranded wire, black and red. May require #14 if currents > 15A expected			
17	PowerPole Connectors suggested			
18	Standoffs			
19	Heatsinks for MOSFETS appropriate to power level planned For 20+ amps, suggest individual heatsinks on each or large heatsink. For example: 5 individual 1” x4” heatsinks https://www.amazon.com/gp/product/B07D9ZTTN2 One large heatsink for \$11 https://www.amazon.com/dp/B07T82N99K/ref=dp_cerb_1 For 10A or less something much simpler may be successful: https://www.amazon.com/gp/product/B07PGVZ7CJ			
20	Silicone insulator assemblies with insulating bushing, screw & nut to mount MOSFETS to heatsinks. (If not already purchased) Kit of 10 for \$5.49 https://www.amazon.com/gp/product/B00KR4KFH2	3.00		
	<u>OPTIONAL RELAY for Battery Connection</u> (This bill of material section is incomplete)			
O1	Q8 BMS3003 P channel MOSFET (does not require heatsink) https://www.digikey.com/product-detail/en/on-semiconductor/BMS3003-1E/BMS3003-1EOS-ND/4847552 This MOSFET is plastic coated and easy to work with due to internal zener protection. Alternate: IRF4905 https://www.digikey.com/product-detail/en/infineon-technologies/AUIRF4905/AUIRF4905-ND/2605480	3.71	1 (opt)	
O2	Q6 2N3904 NPN thru-hole transistor			

O3	D4 1N4007 diode			
O4	R24 10K 1/8 W thru-hole resistor			
O5	RELAY – suggest 30A contacts 5V coil			
	<u>OPTIONAL RELAY FOR AC POWER Connection</u>			
OO1	Q7 IRF4905 P channel MOSFET (does not require heatsink)			
OO2	D5 1N4007 Diode			
OO3	Relay – suggest 30A contacts, 5V coil			