

# Bill of Materials for PCB-based IV Swinger 2

PV type                      Relay  
Type                              Type

**PV module                      SSR**

| Description  | Quantity | Name(s)           | Unit Price | Total Price    | Purchase From | Notes  |
|--|----------|-------------------|------------|----------------|---------------|--|
| On-PCB parts   |          |                   |            |                |               |  |
| 10-pin stackable female header                             | 1        | A1                |            |                |               | Purchased as a kit of all four. Note, however, that A4 is not needed at all, and A1 can be 8-pin instead of 10-pin (pins 9 and 10 are not used). Digi-Key PN: 1568-1413-ND |
| 8-pin stackable female header                              | 2        | A2, A3            | \$1.50     | \$1.50         | Digi-Key      |  |
| 6-pin stackable female header                              | 0        | A4                |            |                |               |  |
| 1000µF 100V capacitors                                     | 2        | C1, C2            | \$3.77     | \$7.54         | Digi-Key      | Digi-Key PN: 1572-1313-ND  |
| 0.1µF capacitor  | 2        | C3, C6            | \$0.26     | \$0.52         | Digi-Key      | Op amp and ADC Vdd filter. Digi-Key PN: BC2665CT-ND  |
| 2.2nF (2200 pF) capacitor                                  | 2        | C4, C5            | \$0.38     | \$0.76         | Digi-Key      | Voltmeter and ammeter op amp circuits. Digi-Key PN: 399-4166-ND  |
| 4-pin female header  | 1        | FH                | \$0.47     | \$0.47         | Digi-Key      | Extra +5V and GND for temperature and irradiance sensors. Can be omitted if no plans for those (or can be added later). Digi-Key PN: S7037-ND                              |
| 2-pin screw-terminal block                                 | 1        | J1                | \$0.99     | \$0.99         | Digi-Key      | Digi-Key PN: A97996-ND   |
| 8-pin DIP socket (optional)                                | 2        | MCP3202, TLV2462  | \$0.45     | \$0.90         | Digi-Key      | IC sockets. Recommended so ICs can be replaced more easily. Digi-Key PN: 1212-1003-ND  |
| ADC - MCP3202  | 1        | MCP3202           | \$3.77     | \$3.77         | Digi-Key      | Digi-Key PN: MCP3202-BI/P-ND   |
| Op amp - TLV2462   | 1        | TLV2462           | \$2.82     | \$2.82         | Digi-Key      | Ammeter. Digi-Key PN: 296-1892-5-ND  |
| 150kΩ resistor - 1/4W                                      | 1        | R1                | \$0.01     | \$0.01         | Amazon        | Voltmeter - divider  |
| 7.5kΩ resistor - 1/4W                                      | 1        | R2                | \$0.01     | \$0.01         | Amazon        | Voltmeter - divider  |
| 1kΩ resistor - 1/4W  | 3        | R3, R4, R5        | \$0.01     | \$0.02         | Amazon        | Voltmeter and ammeter op amp circuits, relay input   |
| 22kΩ resistor - 1/4W                                       | 1        | R5                | \$0.01     | \$0.01         | Amazon        | Arduino output pull-ups  |
| 180Ω resistor - 1/4W                                       | 3        | R6, R7, R8        | \$0.01     | \$0.02         | Amazon        | SSR pull up/downs  |
| 75kΩ resistor - 1/4W                                       | 1        | RF                | \$0.01     | \$0.01         | Amazon        | Ammeter - op amp circuit   |
| Not present in module version                              | 0        | RF1               | \$0.01     | \$0.00         | Amazon        | Ammeter - op amp circuit   |
| 47Ω 5W resistor  | 1        | RB                | \$0.78     | \$0.78         | Digi-Key      | Bleed resistor. Needs to be able to handle 6.4J pulse energy (for 80V Voc; less for lower Voc: 0.5 * 0.002F * Voc^2). Digi-Key PN: PPC5W47.0CT-ND                          |
| 0.005Ω shunt resistor                                      | 1        | SHUNT             | \$3.04     | \$3.04         | Digi-Key      | Ammeter. Digi-Key PN: 13FR005E-ND  |
| Not present in module version                              | 0        | JP                | \$0.13     | \$0.00         | Digi-Key      | Low current jumper header. Digi-Key PN: 732-5315-ND  |
| Not present in module version                              | 0        | JP                | \$0.10     | \$0.00         | Digi-Key      | Low current jumper. Digi-Key PN: S9337-ND  |
| Not present in module version                              | 0        | OFF=LO_CUR        | \$0.91     | \$0.00         | Digi-Key      | Alternate to jumper. Digi-Key PN: 732-3831-5-ND  |
| CPC1718J   | 3        | SSR1, SSR2, SSR3  | \$7.00     | \$21.00        | Digi-Key      | Solid State Relays (SSRs). Digi-Key PN: CLA315-ND  |
| Not present in EMR or SSR version                          | 0        | FET1, FET2, FET3  | \$1.23     | \$0.00         | Digi-Key      | Field Effect Transistors (FETs). Digi-Key PN: IRF540NPBF-ND  |
| Not present in EMR or SSR version                          | 0        | CPC1596           | \$2.78     | \$0.00         | Digi-Key      | Gate driver for FET1. Digi-Key PN: 212-CPC1596G-ND   |
| 15SQ100 Schottky bypass diode (100V)                       | 1        | D1, D4            | \$0.84     | \$0.84         | Digi-Key      | Reverse connection bypass diode. Connect between pads D1 and D4. Digi-Key PN: 1655-1355-1-ND   |
| Off-PCB parts  |          |                   |            |                |               |  |
| Arduino Uno clone  | 1        | Arduino           | \$14.99    | \$14.99        | Amazon        | Elegoo UNO R3 Board ATmega328P ATMEGA16U2 with USB Cable Compatible With Arduino UNO R3  |
| Donation to arduino.cc                                     | 1        | Donation          | \$5.00     | \$5.00         | arduino.cc    |  |
| Binding posts  | 1        | Binding posts     | \$4.09     | \$4.09         | Digi-Key      | Digi-Key PN: 501-1713-ND   |
| Not present in SSR or FET version                          | 0        | EMR               | \$1.80     | \$0.00         | Amazon        | 5V 1 Channel Relay Shield Module Optocoupler For PIC AVR DSP ARM Arduino TE213   |
| 18ga solid wire or zip cord                                | 1        | Load circuit wire | \$2.94     | \$2.94         | Amazon        | For load circuit wires: MC-4 to binding posts, binding posts to PCB. Scrap appliance cord is fine. Just want a heavier duty than hookup wire.                              |
| Cable ring connectors                                      | 2        | Cable rings       | \$0.21     | \$0.42         | Digi-Key      | Binding post internal connections. Digi-Key PN: 277-11154-ND   |
| Not present in SSR or FET version                          | 0        | Jumpers           | \$0.07     | \$0.00         | Amazon        | Relay to stack connector wires. GenBasic 80 Piece Male to Female Solderless Ribbon Dupont Jumper Wires (4 and 8 Inch) for Breadboard Prototyping                           |
| Enclosure  |          |                   |            |                |               |  |
| Ultra Pro Baseball Clear Square Holder                     | 1        | Case              | \$5.99     | \$5.99         | Amazon        | Price goes up in baseball season   |
| M3 15mm body, 6mm thread nylon male-female standoff spacer | 4        | Standoffs         | \$0.24     | \$0.95         | Amazon        | uxcell 50pcs M3 15+6mm Male Female Thread Nylon Hex Standoff Spacer Screws PCB Pillar Black (also available from Digi-Key or eBay)   |
| M3 screws (1/4 inch)                                       | 4        | Screws            | \$0.07     | \$0.26         | Amazon        | StarTech PC Mounting Computer Screws M3 x 1/4-Inches Long Standoff - 50 Pack SCREW3 (also available from Digi-Key or eBay)   |
| M3 nuts  | 4        | Nuts              | \$0.06     | \$0.25         | Amazon        | Shapenty 100PCS 3mm Small Stainless Steel Female Thread Hex Screw Nut Fastener Tool, M3 (also available from Digi-Key or eBay)   |
| MC-4 connector (male/female pair)                          | 1        | MC-4              | \$4.99     | \$4.99         | Amazon        | JYFT Solar Panel Cable Connectors Male/Female IP67 30A 1000V DC (1Pair)  |
| Bias Battery   |          |                   |            |                |               |  |
| Not present in module version                              | 0        |                   | \$3.14     | \$0.00         | Digi-Key      | Digi-Key PN: BH2DL-ND  |
| Not present in module version                              | 0        |                   | \$7.98     | \$0.00         | Amazon        | Or at grocery store, Target, etc.  |
| <b>Total</b>   |          |                   |            | <b>\$84.89</b> |               |  |

Amazon wish list: <http://a.co/gWW20Gs>

Digi-Key cart: <https://www.digikey.com/short/87v1995h>

Digi-Key/Mouser CSV: [https://raw.githubusercontent.com/csatt/IV\\_Swinger/master/PCB/BOM/DigiKeyMouser/ssr\\_mod\\_DigiKey\\_Mouser.csv](https://raw.githubusercontent.com/csatt/IV_Swinger/master/PCB/BOM/DigiKeyMouser/ssr_mod_DigiKey_Mouser.csv)

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