

Bill of Materials

Bill of materials broken down by base package and optional solar and EPM add-on modules. Base package total cost is 271.37 USD, solar add-on cost is an additional 34.59 USD, and EPM add-on cost is an additional 32.66 USD.

Table 1: Base package bill of materials.

Designator	Component	Number of units	Cost per unit [USD]	Total cost [USD]	Source of materials	Material type
Arduino Nano	Arduino Nano	1	20.70	20.70	Arduino	Semiconductor
Micro SD card module	UMLIFE Micro SD SDHC TF card adaptor reader module with SPI interface	1	1.00	1.00	UMLIFE	Other
nRF24L01+	NRF24L01+ 2.4GHz Wireless RF Transceiver Module	1	1.30	1.30	Makerfire	Semiconductor
DS3231 real-time clock	DS3231M+	1	7.69	7.69	Maxim Integrated	Semiconductor
BME280 environmental sensor	BME280	1	15.00	15.00	Onyehn	Semiconductor
INA219 current sensor	INA219BIDR	1	2.53	2.53	Texas Instruments	Semiconductor
Electro-permanent magnet	OPENGRAB EPM V3 R5C	1	159.99	159.99	Nicadrone	Other
Ultrasonic sensor	HC-SR04	1	5.95	5.95	Osepp Electronics	Other
2s 7.4V LiPo battery	Socokin 7.4V 2S Lipo Battery 60C 1500mAh with Deans T Plug	1	12.00	12.00	Socokin	Other
CR-1025 3V Li+ coin cell	CR-1025/BN	1	1.06	1.06	Panasonic-BSG	Other
RTC coin cell holder	BK-870	1	0.46	0.46	MPD	Other
Main PCB	Main board	1	8.23	8.23	See repository	Other
Daughter PCB	Daughter board	1	4.13	4.13	See repository	Other

Micro SD card	Gigastone 8GB 10-Pack Micro SD Card, Full HD Video 80MB/s Micro SDHC Class 10	1	3.00	3.00	Gigastone	Other
Workable fixatif	Krylon clear workable fixatif aerosol spray	1	11.86	11.86	Krylon	Other
Slide switch	SS-12D07-VG 4 NS GA PA	1	0.53	0.53	C&K	Other
LED	L314ED	1	0.20	0.20	American Opto Plus LED	Semiconductor
PNP transistor	BCP51-16-TP	1	0.43	0.43	Micro Commercial Co	Semiconductor
NPN Transistor	BCP54	1	0.36	0.36	onsemi	Semiconductor
Resistors	RES SMD (100, 1k, 4.7k) OHM 1% 1/4W 1206	7	0.10	0.70	Digikey	Semiconductor
Shunt resistor	ERJ-8BSJR10V RES 0.1 OHM 5% 1/2W 1206	1	0.40	0.40	Panasonic	Semiconductor
Capacitors	C1206S104K5RACAUTO 0.1 μ F 10% 50V Ceramic Capacitor X7R 1206 (3216 Metric)	4	0.42	1.68	Kemet	Semiconductor
5V regulator	MIC5239-5.0YS-TR	2	3.25	6.50	Microchip Technology	Semiconductor
4" PVC pipe	Schedule 40 Clear Pipe, Non-threaded,	1	2.21	2.21	Grainger	Polymer
Dean's connector	PRT-11864	1	0.81	0.81	Sparkfun Electronics	Other
Female HC-SR04 connector	SSA-104-W-T	1	0.72	0.72	Samtec	Other
Female magnet connector	SSA-103-W-G	1	0.90	0.90	Samtec	Other
Female daughter board connector	PPPC071LGBN-RC	1	0.72	0.72	Sullins Connector Solutions	Other
Male daughter board connector	0022284070	1	0.31	0.31	Molex	Other

Table 2: Solar add-on module bill of materials.

Designator	Component	Number of units	Cost per unit [USD]	Total cost [USD]	Source of materials	Material type
Solar panels	SM500K12L Monocrystalline Solar Cell 132.3 mW 8.29 V	6	5.71	34.26	ANYSOLAR Ltd	Other
Female solar connector	PPPC021LFBN-RC	1	0.33	0.33	Sullins Connector Solutions	Other

Table 3: EPM add-on module bill of materials.

Designator	Component	Number of units	Cost per unit [USD]	Total cost [USD]	Source of materials	Material type
Arduino UNO	Arduino UNO	1	21.90	21.90	Arduino	Semiconductor
RF controller PCB	RF controller	1	7.85	7.85	See repository	Other
Rotary potentiometer	PDB12-H4251-103BF	1	1.02	1.02	Bourns Inc	Other
Button switch	Gikfun 6x6x4.3mm TACT Switch Push Button	3	0.13	0.39	Gikfun	Other
LED	L314ED	4	0.20	0.80	American Opto Plus LED	Semiconductor
Resistors	RES SMD (100, 1k) OHM 1% 1/4W 1206	7	0.10	0.70	Digikey	Semiconductor