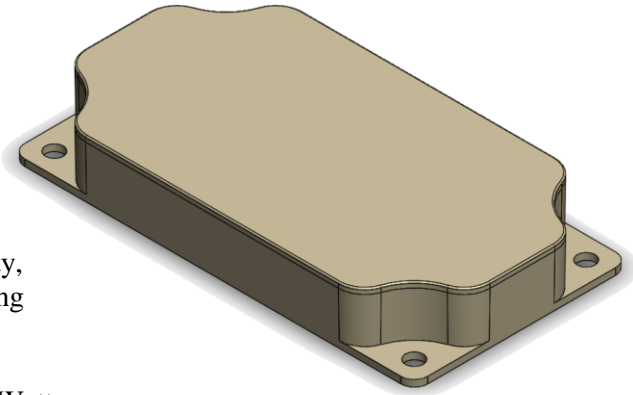


Rugged MPPT Solar Energy Harvester

Features

- 500W+ Power Capabilities
- Maximum Power Point Tracking
 - Up to 30% more power
- Universal Charging Algorithm
 - User selectable battery voltage
- Fully Ruggedized Design
- Fully Protected, including Reverse Polarity, Over Temperature, Active Current Limiting
- MIL-810G & MIL-461E Compliant
- 12V-48V Solar Panel or DC Input
 - No Minimum/Maximum Solar Panel Wattage
 - Opportunity charging from field power sources
- Polarized input plug to connect to solar panel or DC source
- Available extension input cable for use with other solar panels or DC sources
- Available “Y” adapter, to parallel multiple solar panels for maximum charge speed
- Emergency regulated 14.4V/28.8V Aux output when there is no battery connected
- Rugged low profile magnesium enclosure
- Direct vehicle mounting holes
- No parasitic loss on the battery when connected, allowing the device to be permanently installed on a vehicle



Supported batteries	Chemistry
12V (16.8V), 24V (33.6V)	Li-Ion
12V (14.4V), 24V (28.8V)	LiFePO4
12V (14.1V), 28.8V (28.2V)	VRLA, Gel Lead Acid
12V (14.4V), 28.8V (28.2V)	Flooded Lead Acid
Custom	Custom

Description

The Rugged Solar Energy Harvester is a portable solar battery charger capable of charging a wide array of typical rechargeable batteries. The charger features advanced digital control, which enables high efficiency, maximum power point tracking (MPPT) of the solar panel, and value-added features such a regulated emergency voltage output when no battery is connected. The charger is able to operate from any solar panel configuration with $V_{\text{open circuit}} < 60\text{V}$. The charger can be operated as a portable device or chassis mounted, and the only wiring needed is the connection to the solar panel or DC source using a polarized SAE plug. The advanced charge controller minimizes charge time by utilizing proprietary digital control algorithms and power conversion technology, while monitoring critical parameters to ensure safety and reliability. The implementation of high-speed MPPT delivers maximum charging current, even in low light or poor weather conditions. The simple LED interface informs the user of the charging status and if there are any faults. The LED indicators are disabled by default for reduced light signature, and are enabled using the rugged chassis mount buttons.



Absolute Maximum Ratings

	Parameters	Max.	Units
V _{in}	Input Voltage	65	V
V _{batt} / V _{aux} (3)	Battery / Auxiliary Output Voltage	40	V
I _{batt}	Battery Charging Current	20	A
T _A	Ambient Operating Temperature	60	°C
T _{STG}	Storage Temperature	85	°C

Table 1: Absolute Maximum Ratings

Recommended Operating Conditions

	Parameters	Min.	Typ.	Max.	Units	Conditions
V _{in}	PV Panel Voltage	12	25	60	V	T _{panel} =25°C
	DC Input Voltage	9	-	60	V	
V _{batt}	Battery Voltage	10	-	36	V	
I _{batt}	Battery Charging Current (Total)	0	-	20	A	
P _i	Input Power	-	-	520	W	There is no PV panel size limit
P _{batt}	Battery Charging Power	0	-	500	W	
I _s	Self Consumption	-	0.8	-	W	V _{in} =20V ⁽⁵⁾
		-	1.2	-		V _{in} =40V ⁽⁵⁾
		-	0	-		V _{bat} =25V, No V _{in} ⁽²⁾
η	Efficiency: Input to Battery	-	97.5	-	%	V _{in} =20V, V _{batt} =25V, I _o =16A
		-	97.2	-		V _{in} =40V, V _{batt} =25V, I _o =16A
		-	96.8	-		V _{in} =40V, V _{batt} =25V, I _o =20A ⁽¹⁾
T _A	Ambient Operating Temperature	- 30	-	60	°C	
T _{STG}	Storage Temperature	- 50	-	85	°C	
T _{LIM}	Internal Temperature Limiting Protection	-	110	-	°C	Battery charge power automatically reduces to maintain temperature limit ⁽⁴⁾

Table 2: Electrical Characteristics

Notes:

- (1) Charging a battery with the rated maximum charging current
- (2) Total self consumption current taken from battery without input power
- (3) Auxiliary output is currently only enabled for Li-Ion chemistry batteries
- (4) External case temperature can become very hot in certain high load conditions, use caution when handling
- (5) No battery connected, the unit is running to supply 14.4V/28.8V on the output



LED Status Information

Fault	Status	Meaning	Action to take
Red	Green		
Off	Off	Ready to connect	Connect battery
		Charging	-
Off	Blinking ⁽²⁾	Charging, battery is 85% full ⁽¹⁾	Optional: Disconnect battery and connect a lower charged battery. In the time it takes to charge the last 15%, the first 50% of an empty battery could be charged. ⁽¹⁾
Off	On	Finished charging	Disconnect battery if desired
On/ Blinking	-	Fault, converter not running	Check connections, make sure that operation of converter is within the maximum ratings
		Output is disabled	The unit has been disabled because of over-current or over-temperature

Table 3: LED status information

Notes:

⁽¹⁾ Only applies when charging Li-Ion

⁽²⁾ Blinking speed changes based on charging current: ~ (0.5 to 20) blinks/sec for a total charge current of (0 to 20) A

Solar Maximum Power Point Tracking

The MPPT Solar Charger uses an advanced proprietary solar charge control algorithm which is capable of extracting the maximum possible energy from the solar source, and charging Li-Ion, LiFePO₄, Lead Acid, and custom advanced batteries at the fastest possible rate. ApeCOR's universal MPPT algorithm is patented, and is the only solar charge algorithm in the world capable of MPPT fast-charging nickel based batteries. The digital control algorithms are extremely tolerant of solar variation, and can operate down to only 5W of input power. The algorithms will not be disrupted by fluctuations of solar energy, or even if the charge cycle persists through the night.

Dimensions and Weight

	Parameters	Typ.	Units
L	Length	190.5	mm
		7.5	inch
W	Width	101.6	mm
		4.0	inch
H	Height	27.4	mm
		1.08	inch
W	Weight	0.68	kg
		1.5	lbs

Table 4: Unit Dimensions and Weight

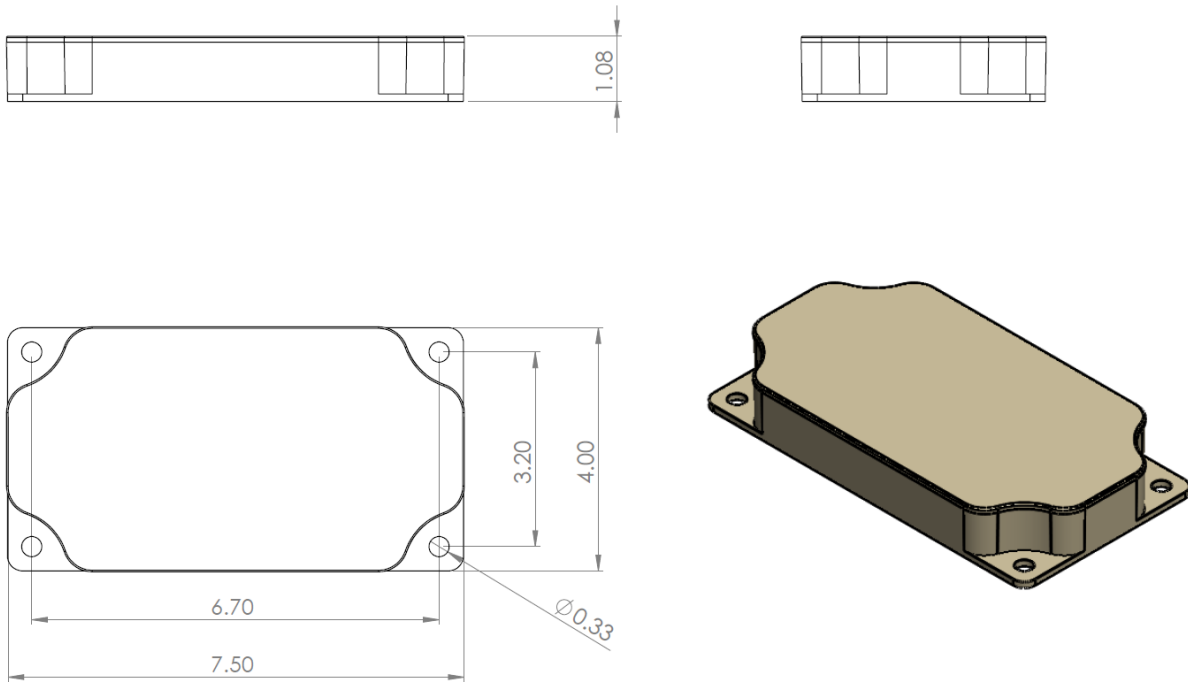


Figure 1: Unit Dimensions (inches)



Recommended Sources

Use only “12V” or “24V” PV Arrays, you can use 2+ in parallel with “Y” connector, for improved charge speed.

Solar Panels - Global Solar Energy, Inc.

- P3 - 124W/12V, P3-124W/24V - Optimal
- P3 - 62W/12V, P3 - 62W/24V
- P3 - 30W/12V, P3 - 30W/24V

Other Solar Panels

- Open circuit voltage must be less than 60V
- Maximum power point voltage should be greater than 12V for optimal operation.
- There is no wattage restriction, but the unit will not be able to utilize more than 500W

DC Sources

- 12 - 60V DC, 500W minimum power capability



Warranty Statement

The Solar Charger is warranted to be free from defects in material and workmanship for a period of TWO (2) years from the date of shipment to the original end user. ApECOR will, at its option, repair or replace any such defective products.

Claim Procedure

- Before requesting warranty service, check the User Manual to be certain that there is a problem with the controller. Contact ApECOR to request Returned Material Authorization (RMA). Return the defective product to your authorized ApECOR distributor with shipping charges prepaid. Provide proof of date and place of purchase.
- To obtain service under this warranty, the returned products must include the model, serial number and detailed reason for the failure, the module type, solar panel size, type of batteries. This information is critical to a rapid disposition of your warranty claim.
- ApECOR will pay the return shipping charges if the repairs are covered by the warranty.

Warranty Exclusions and Limitations

This warranty does not apply under the following conditions:

- Damage by accident, negligence, abuse or improper use.
- PV, source, or load conditions exceeding the ratings of the product.
- Unauthorized product modification or attempted repair.
- Damage occurring during shipment.

THE WARRANTY AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHERS, EXPRESS OR IMPLIED. APECOR SPECIFICALLY DISCLAIMS ANY AND ALL IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

No ApECOR distributor, agent or employee is authorized to make any modification or extension to this warranty.

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