1 of 1,000 Efficient Solutions on SDG#7 Affordable and Clean Energy



FLEXWAVE



High Efficient PV Energy Harvesting Solution

Build a Sustainable & Smart World under the Sun.

FLEXWAVE CO., LTD.

www.flexwave.com.tw

<u>Advantages</u>

Waveguide Encapsulation

 Thanks to the waveguide technology, FLEXWAVE gives the PV module a talent of collecting diffusing light, which helps PV can absorb more photon and produce >25% more power.

Optimized Power Manager

• Up to 95% efficiency from PV to battery of the optimized MPPT solar charger, which can provide a 30% better performance than the tradition solution.







We Produce 75% More Power!



Proof of Wide-angle collection

Submission accepted by EU PVSEC 2023

Artificial lamp (A/TL84/D65/U30/CWF)

Performance Evaluation of AR Encapsulated Mono-Si PV Module under Indoor Lighting Simulator by Using RTOS Method



Using different height masks to evaluate the contribution of scattering rays under the diffusing condition of Indoor Lighting Simulator.

I-V Light Source	Voc (V)	lsc (μA)	Pmax (µW)	PCE (%)
А	2.18	4971.4	8173.2	59.47
TL84	1.80	533.9	635.7	20.94
D65	1.89	798.5	1024.8	8.12
U30	1.80	509.9	609.2	20.06
CWF	1.81	538.3	648.3	21.35

X The results were tested by the Photovoltaics Calibration Laboratory of ITRI.



The contribution of 88.3-90° incidence blocked by low mask is about 8%.



The contribution of 81.6-90" incidence blocked by high mask is about 16%.



Standard Products

Arc-Solar Box

The Iron-man Suit design for outdoor IoTs.



Meet Carbon Negative in 1 Month under sunshine!

SolarImpulse Foundation #beyond	Flood Alarm	Water quality	Smart Agri.
LUUU	Leakage	Mini	Wildfire
solutions	sensing	Gateway	sensing
	Railway	Bridge	TH
	sensing	sensing	sensing
ANALYST'S CHOICE global >> sources	CE		etc. P67

Model Name	Arc-solar Box	Arc-Solar Box P
Size (L×W×H)	166x86x40 or 166x86x55 mm	187×147×75 or 187×147×55 mm
PV	P_{max} = 1.25W V _{oc} =2.6V and I _{sc} = 640mA	P_{max} = 3.05W V_{oc} =3.9V and I_{sc} = 1,040mA
Electrical Specifications	Embedded MPPT charger for single charging voltage. (Standard = 4.2V) <u>Output Voltage:</u> Standard - V _{bat} , 5V (max. 1A) Optional – 3.3V, 9V (max. 450mA), 12V Connector: Molex/JST 1.25mm pitch Optional function of battery level control Output off @ V _{bat} =2.8V, and restart @ V	rechargeable battery with adjustable (max. 300mA)
Daily Power ^a	Sunny : 5,000 mWh (3.7V / 1,350mAh) Cloudy : 450 mWh (3.7V / 120 mAh)	Sunny : 12,000 mWh (3.7V / 3,240mAh) Cloudy : 1,000 mWh (3.7V / 270 mAh)
CO ₂ Reduce ^b	35.14 kg / year	84.36 kg / year

a: The daily power was measured at Hsinchu, TW, the data will be different under various condition. The sun intensity of a Sunny day is 1,000W/m², a Cloudy day is around 100W/m².

b: Energy harvester can reduce the replacement of battery, and the carbon footprint of one AA Alkaline battery (3,000mWh; 1.5V/2,000mAh) is 0.107kg.





Build a Reservoir for your distributed devices



Solar-Navi

The World's Smallest Never-End GPS Tracker

Specification				
L×W×H (mm)	58x48x26	Weight (g)	87	
Communication	LTE Cat M1: 700 (Bd12, Bd13, Bd28, Bd85), 800 (Bd18, Bd19, Bd20 Bd26, Bd27), 850(Bd5), 900 (Bd8), AWS-3 (Bd66), AWS (Bd4), 1800 (Bd3), 1900 (Bd2, Bd25), 2100 (Bd1)			
Working Condition	1.Position A2.Logging in3.Temperate	.ccuracy = avg. 5r nterval=15 mins, 9 ure: (-10) ~ 60°C	n under open sky. l6 GPS positions/day.	
Power System	 PV: P_{max}² manage s Battery at rechargea Battery he and restar Remarkab harvester. (3.7V/297 tracker for sun irradia 	=330mW, with ei ystem. capacity: 3.7V ble battery. alth control: syste t at 3.6V. ble battery lifet The daily p mAh) in a sunny 2 days, and avai ation.	mbedded MPPT power / 1,800mAh Li-ion em off when $V_{bat} \leq 3.0V$, ime with PV energy power is ~1,100mWh , which can support the lable for 12 days without	
Optional	 Motion ala Smaller si 	arm. ze for a longer loç	gging interval.	
арр	 Available Battery lev 	for iOS & Android vel monitoring.		

Solar Powered GNSS tracker with Cat. M communication and AGPS support.

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	本地時間	续度	短度	傳旨時間	速度	定位方式	精確定(m)	電量(%)
1	2022-07-25 00:11:34	24.7187031	121.1185368	0	0	GPS	0	0,70,0,0
2	2022-07-25 00:26:54	24.7186333	121.1185283	920	0	GPS	0	0,70,0,0
	31-21-00-32 70-2200	24.7186548	121.11853	921	0	GPS	0	0.70.0.0
3	2022-07-23 00.42.13							
4	2022-07-25 00:57:34	24.7186916	121.1185583	919	0	GPS	0	0,70,0,0
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Micro-EH Test Kit Quick Evaluation of Your Applications

Micro-EH 330

Micro-EH 880



Model Name	Micro-EH 330	Micro-EH 880			
Size (L×W×H)	58×48×12 mm	130×48×12 mm			
PV	$P_{max} = 330$ mW V _{oc} =2.6V and I _{sc} = 169mA	$P_{max} = 880 mW$ $V_{oc}=2.6V$ and $I_{sc}=450 mA$			
	Embedded MPPT charger for single rechargeable battery with adjustable charging voltage. (Standard = 4.2V)				
Electrical Specifications	Standard - V_{bat} ; Optional – 5V (max. 1A) Battery level control: Output off @ V_{bat} =3.0V, and restart @ V_{bat} =3.6V.				
Daily Power	Outdoor ^a Sunny: 1,100 mWh (3.7V / 297mAh) Cloudy : 105 mWh (3.7V / 28 mAh)	Outdoor ^a Sunny :2,850 mWh (3.7V / 770mAh) Cloudy : 280 mWh (3.7V / 28 mAh)			
	Indoor⁵ 8hrs under 800 lux T5 lamp ÷ 1.9mWh (3.7V / 0.5mAh)	Indoor [♭] 8hrs under 800 lux T5 lamp ÷ 4.9mWh (3.7V / 1.3mAh)			

a : The sun intensity of a Sunny day is 1,000W/m², a Cloudy day is around 100W/m².

 \boldsymbol{b} : The power intensity of 800 lux artificial lamp is about 1 $W/m^2.$

Efficient Solutions in both Indoor & Outdoor!

Design-in Solution

Harvest Photons in 3 steps!

1. Elucidate the electric specification of your device.

Including the power consumption and operating voltage.

2. Define the Energy Harvester.

Including the working condition of you device and available size of PV.

3. Design Confirmed and Kick-off.

The prototype will be started with the confirmed drawing.

Prototype Delivered in 8 weeks!



Ready Items for you

Select a set and Put in.

Just need to remain a space for PV. Optical Cover Device Case 0.3~2 mm PV Array 3~4 mm

Waveguide PV Module						
#	Α	В	С	D	E	F
Array size	39×54 mm	42.5×125 mm	62.5×117 mm	106×106 mm	122.7×144.7 mm	296×296 mm
P _{max} @ 1 Sun	330 mW	880 mW	1250 mW	2100 mW	3050 mW	16W

MPPT Power Manager					
#	1	2	3	4	
Model	SPUB103	SPUB203	SPAW300	SPUB251	
Size	20.07×20.95 mm	20.2×28.1 mm	40×40 mm	22×38 mm	
Power	50µW –	2W – 240W			
MPPT Charger	Standard: 4.2V for Li-ion. Adjustable for Li-Fe, Ni-MH or supercaps.			Standard:12V. Adjustable for 4.2, 8.4, 24V	
Output	 V_{bat} with max. current of 200mA. Battery level control: V_{bat} =3.0V off / 3.6V on. 	 V_{bat}, 5V Battery level control: V_{bat} =3.0V off / 3.6V on. 	 V_{bat}, 5/9/12V, 3.3V (optional) (Optional) Battery level control: V_{bat} =2.8V off / 3.6V on. 	V _{bat}	









Reference Design					
Operating Conditions	Items	Applications			
Indoor	A1, A2, B1, B2, C1, C2, D1, D2, E1, E2	BLE, Sigfox, LoRa, Zigbee etc.			
Window-side	A1, A2, B1, B2	BLE, Sigfox, LoRa, Zigbee etc.			
Outdoor	A1, A2, B3, C3, D3, E3, F4	BLE, Sigfox, LoRa, Zigbee, NB-IoT, Cat M, 4G-LTE etc.			

%Note%

1. The design should depend on the power consumption of system and the intensity of light.

2. The power intensity of artificial lamps will be difference due to the different spectrums even under a similar illumination.

It's Time To Decarbonize!

Mission

Delivering superior solutions to make wireless AIoT devices sustainable.

Vision

Dedicating to the integration of AIoT and green energy. Creating sustainable environment in the

smart future.

For More Information: <u>www.flexwave.com.tw</u> Contact us: <u>service@flexwave.com.tw</u> Follow us: <u>https://www.linkedin.com/company/flexwave-co-ltd/</u>

