Dye-Sensitized Solar Cell Power Module Engineering Sample

User's Guide

● Keep this guide with care for future reference.

● The contents of this manual are subject to change without notice for the purpose of improving product performance.
● We have made every effort to ensure that the contents of this manual are correct, but if you have any questions, errors, omissions, incorrect pages or missing pages, please contact us.
● This product is not intended to be installed into medical devices, nuclear power equipment, aerospace equipment, transportation equipment, or other equipment related to human life or equipment or systems that require high reliability. Fujikura does not have any responsibility for personal injury or social damage caused by using this product for these purposes.
● The illustrations used in this manual may differ from the actual product in detail.

User's Guide
FDSC-EZFDDALL04
4th Edition
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Fujikura Ltd.

Safety precautions

This section includes instructions that must be observed to prevent harm to people and damage to property.

■This section categorizes and describes the degree of harm and damage caused by incorrect use of this product.

⚠ WARNING	Improper handling by ignoring this indication may result in d eath or serious injury.
⚠ CAUTION	Improper handling by ignoring this indication may result in personal injury or property damage.

■The following graphic symbols indicate what you must observe.

This symbol indicates a Don't.

This symbol indicates a Must Do.

⚠ WARNING

Do not let this product come in contact with flammable gas, flammable liquid, or organic solvent

Do not use this product where it may contact with these. It may cause a failure or fire.

Do not let this product come in contact with acid gas, corrosive gas, or corrosive liquid

Do not use this product where it may come in contact with these substances. Do not use this product where the air contains a lot of salt. It may cause a failure or fire.

Do not apply external force to this product

Do not drop this product. Do not apply strong force, impact or pressure to this product. Using this product in that state may cause fire or electric shock.

Stop using this product immediately if the lead tip or the terminal get wet

Continuing to use this product may result in a fire or electric shock.

Do not touch this product with wet hands

It may cause malfunction or electric shock.

Do not disassemble or modify this product

It may cause a fire or electric shock.

Check the polarity carefully before using this product

Do not mistake the polarity of the output lead when connecting to an electronic circuit. It may cause a malfunction or fire.

Do not supply electric power to this product externally. Do not use this product in a strong magnetic field, electric field or radiation environment

It may cause a fire or electric shock.

Stop using this product immediately and dispose of it if it is damaged

Continuing to use this product may result in a fire ore electric shock.

Discard the product properly according to the sorting method specified by each local government

Do not short connectors

It may cause a fire or electric shock.

Use only 3 V devices

Other working voltage may cause a fire or electric shock.

Do not short the positive terminal and the negative terminal of the Lithium Ion Capacitor

It may cause a failure by electrolyte leakage, heat, smoke, explosion, or fire as that is charged before shipment.

Do not let conductive material touch terminals of the Lithium Ion Capacitor or mounted parts on the board

It may cause an electric shock, burn, or injury. It may cause a failure by electrolyte leakage, heat, smoke, explosion, or fire.

Do not drop this product. Don't apply strong impact or vibration to this product

It may cause an electric shock, burn, or injury. It may cause a failure by electrolyte leakage, heat, smoke, explosion, or fire.

Do not put the circuit board on conductive surface

It may cause an electric shock, burn, or injury. It may cause a failure by electrolyte leakage, heat, smoke, explosion, or fire by electric short circuit.

⚠ CAUTION

Do not use or store this product at high temperatures. Do not let it touch hot objects

Storing in a place where the temperature is out of specification for the storage conditions may cause a malfunction of this product. In addition, when radiant heat is received from an external heat source, the surface temperature and internal temperature may rise above the ambient temperature.

Do not use or store in places where the temperature changes suddenly

Do not use or store in a place where condensation may occur due to sudden temperature changes. It may cause a failure, fire, or electric shock.

Use and store in a dust-free place

Do not use or store in a dusty or sandy place. It may cause a failure, fire, or electric shock.

Do not touch the port

Do not touch the port during connecting or disconnecting. It may cause an electric shock.

Do not damage the lead wire

A damaged wire may cause a failure, fire, or electric shock.

Do not touch the tip of the lead wire and the terminal

It may cause an electric shock.

Do not touch with bare hands when damaged

In case of this product being damaged, stop using it immediately. Since a glass substrate is used, and if the product is used as it is, the damaged parts or debris may cause injury or damage to the human body. Also, since this product contains electrolyte, if it leaks, touching it may cause skin irritation. Be careful not to touch it with bare hands. In case the electrolyte gets into your eyes or mouth, immediately rinse with water or lukewarm water and seek medical advice.

Do not place in an unstable place

Dropping it may cause injury.

Do not push with strong force. Do not install with strong force

This may cause damage such as breakage of the glass substrate, resulting in injury.

Charge the LIC by following this guide

Charging the LIC by another method may cause a fire or electric shock.

Do not overload

It is recommended to add a protection circuit if necessary.

Do not repeat rapid charge and discharge. Do not apply ripple current

This may increase internal resistance or reduce the LIC capacity.

Do not touch the port during connecting or disconnecting

It may cause an electric shock.

Do not apply static electricity

It may damage the IC on the circuit board. Handle the circuit board with sufficient measures against static electricity.

Features

This power module consists of a high efficiency DC/DC converter, a lithium ion capacitor (LIC), and a dye-sensitized solar cell (DSSC). A constant voltage output of about 3 V is available even without lighting. You can evaluate whether it is possible to replace existing batteries with dye-sensitized solar cells without designing complex circuits.

Package contents

・Power module ×1

-Dye-sensitized solar cell（DSSC） standard module panel
(Shape and dimensions vary by model number)

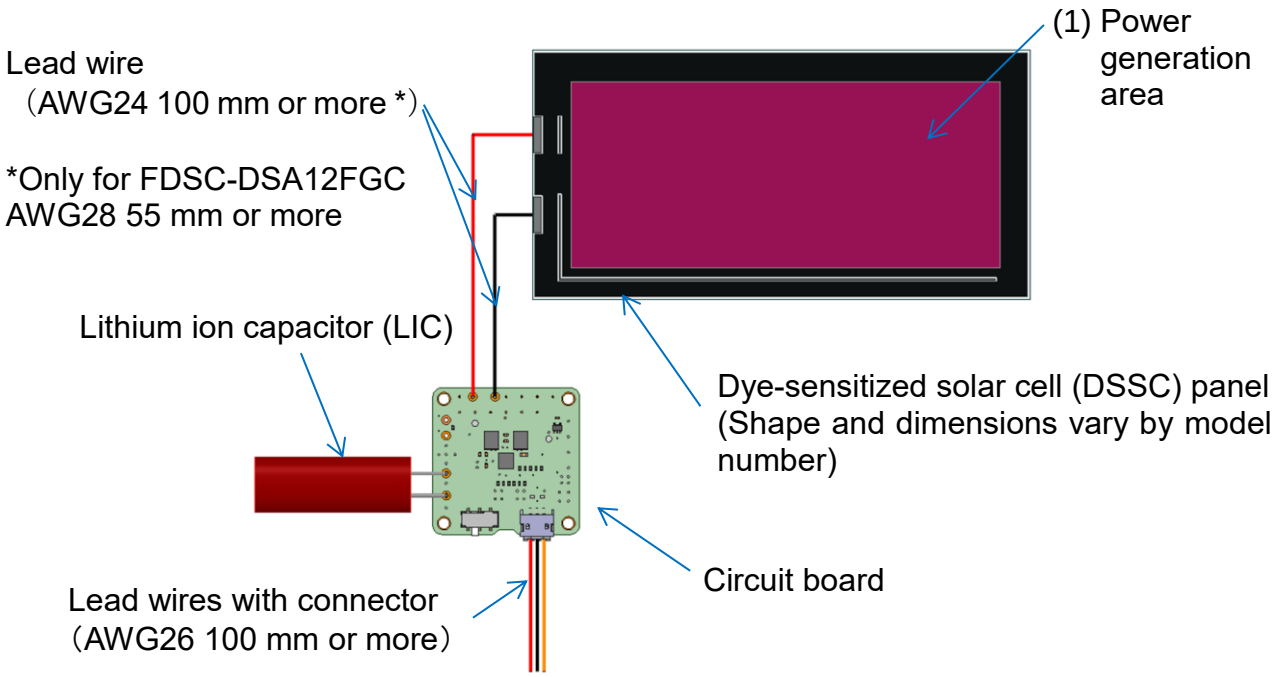
- Circuit board with lithium ion capacitor (LIC)

・Lead wires with connector ×1

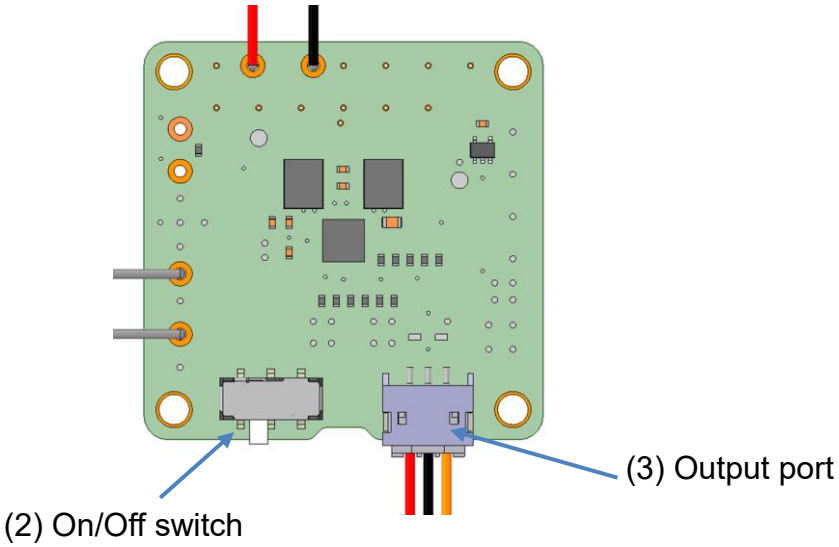
Name of each part

○**DSSC panel has a protective film attached to the surface. Please peel it off before use.**

○**Since the lead wire is thin, it is easy to break. Please handle with care**



Overall view



Circuit board

Name of each part

Number	Name	Function
(1)	Power generation area	Electricity is generated when the dark purple part is exposed to light.
(2)	ON/OFF switch	Turn on and off the circuit board.
(3)	Output port	The connector with three lead wires: red, black, and orange, will be connected. The meaning of each color is shown below. Red : 3V output Black : ground Orange : direct output from LIC for voltage monitoring purpose* When the LIC voltage drops to 3 V, the over-discharge protection function works. * Conductor may not be exposed at the tip of orange lead wire to avoid contact with other wires. Please remove the insulation before use. ⚠Caution ● Orange lead wire is connected to the positive electrode of the LIC. Don't short. Don't pull out more current than specified. ● Insulate the tip of unused lead wire.

How to use

○This module employs Taiyo Yuden LIC1235RS3R8406. Before use, please read and understand its manual well.

https://www.yuden.co.jp/productdata/manual/en/lithosion_ug01_en.pdf

How to assembly

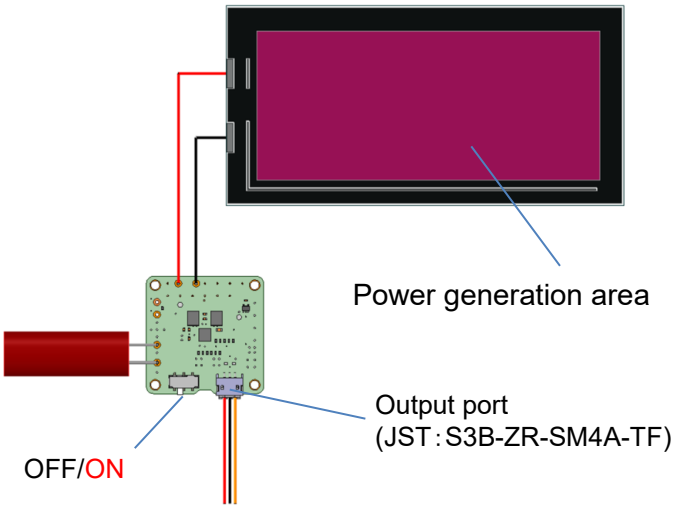
（1）Connect the red and black lead wire to your device.

（2）Insert the connector into the port of the circuit board.

（3）Turn on the ON/OFF switch.

If the red lead wire shows a voltage less than 3 V before connecting to the device, LIC charging may be inadequate. In that case, please charge the LIC according to the charging method described later. When the LIC is charged over than 3.3 V, 3 V output will start. Voltage between orange and black lead wire shows the voltage of LIC

（4）Please keep the power generation area exposed to light.



⚠ Maximum output is DC3.0±0.2 V / 100 mA (typ)
Maximum inrush current is 185 mA (typ).
When power supply doesn't start, check the LIC voltage by the orange lead wire. If that is inadequate, charge the LIC according to the charging method described later.

⚠ LIC is charged before shipment. Do not short the positive terminal and the negative terminal of the LIC. It may cause an electric shock, burn, injury, and malfunction.

How to charge LIC

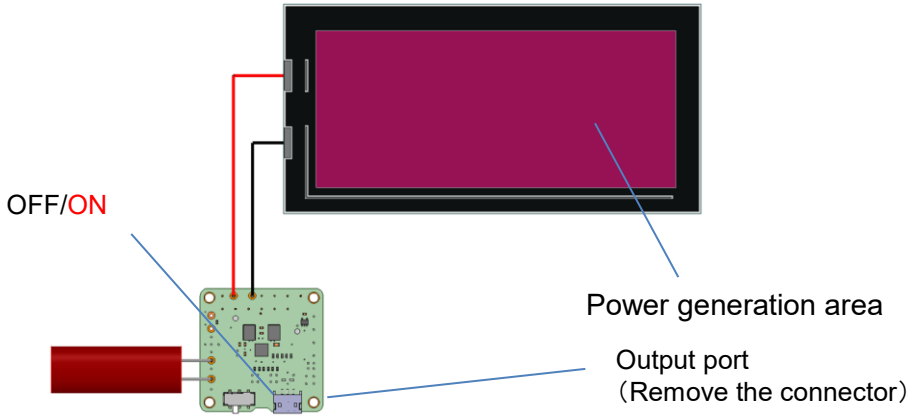
When LIC charge is inadequate, charge by DSSC.

（1）Remove the connector from the port.

（2）Turn on the ON/OFF switch.

（3）Keep the power generation area exposed to light.

NOTE) Charging time can be reduced under bright area, for example under a fluorescent light (2,000～5,000 lx).



⚠ Make sure that the entire power generation area is exposed to light as much as possible so that it can be charged efficiently.

⚠ Do not charge the LIC other than the above method. It may cause an electric shock, burn, or injury. It may cause a failure by electrolyte leakage, heat, smoke, explosion, or fire.

⚠ Charge the LIC by this method when overdischarged. Estimated time to re-output is as follows. It depends on model number.

200 lx : 50～70 hours (FDSC-DSA4FGC)

2,000 lx : 4～6 hours (FDSC-DSA4FGC)

5,000 lx : 2～3 hours (FDSC-DSA4FGC)

How to storage

（1）Turn off the ON/OFF switch.

（2）Remove the connector from the port.

（3）Please keep away from places with high temperature and humidity.

（4）For long-term storage, charge the LIC once every six months. It may be overdischarged due to leakage current.

⚠ Be sure to follow the storage method as the characteristics may change such as capacity reduction.

⚠ Make sure that the terminals do not short during storage.