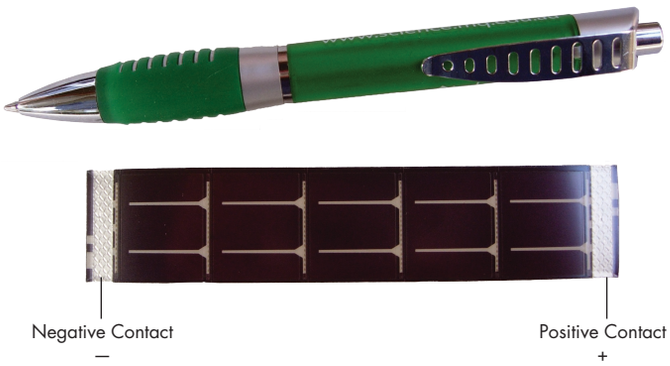
Thin Film Solar Cell (Model ET325)



- Ideal for teaching solar energy production
- Thin film amorphous silicon construction
- Up to 75 mW of power under full illumination
- Ultra light weight
- Flexible

Description

A flexible, thin film, amorphous silicon, solar cell with a nominal 3 V, 25 mA output under full load and illumination.

Usage

The solar cell can be used with sunlight, or artificial light. A desk lamp positioned at different heights above the cell can be a convenient way to alter illumination intensity. Alternatively horticultural shade cloth can be used to produce 25%, 50% etc., illumination levels.

Use a sharp knife to remove a small piece of the clear plastic coating that is on top of the silvered contacts to ensure good electrical contact. A soldering iron can also be used to melt the plastic, see http://www.youtube.com/watch?v=aqUhs9wQYsI

Connect in series for a bigger voltage, or in parallel for a larger current. However avoid connecting many solar cells in series as dangerous voltages can be achieved.

Multimeter Experiments

When using a multimeter students should note that full voltage is normally attained even under low light conditions, whereas current is strongly dependent on illumination intensity.

Connection of loads of known resistances and determination of voltage and current can be used to determine 'iV' curves. However this is much more easily accomplished by use of a potentiostat system (below) to scan across a range of potentials.

Potentiostat Experiments

A typical series of measurements is to:

- determine the open circuit potential V_{OC} (equivalent to maximum voltage, V_{max});
- determine short circuit current, I_{SC} (equivalent to maximum current, i_{max});
- ramp the potential from zero to V_{max} and prepare a graph of current, i vs potential (voltage), V;
- multiply the i and V signals to get the work signal;
- determine i and V at maximum work, and calculate the optimal load (load ie equivalent to resistance = V/i); and then
- repeat at different illumination levels.

The point of maximum work is the most efficient place at which to draw off energy from a solar cell for a given illumination level.

Battery Charging

When used to recharge batteries it is very important to take into account the polarity of the solar cell! The positive and negative ends of the solar cell are shown in the picture. As an extra safety measure, confirm the polarity (+, –) of the solar cell by connecting it to a digital voltmeter. The positive end of the cell connects to the positive end of the battery. The negative end of the cell should be connected to the negative end of the battery.

To prevent the solar cell draining the battery in unlit conditions connect a diode (eg 1N5817) in series.

A minimum wire size of 24 gauge is recommended when charging batteries.

WARNING! Do not connect a *charged* battery backwards (ie with reverse polarity) to the solar cell. This will destroy the solar cell and short circuit the battery and may cause it to explode! Do *not* attempt to recharge alkaline or other single use batteries.

Specifications

Output, typical	3 V, 25 mA, 75 mW
Short circuit current, I_{SC}	~40 mA (in sunlight)
Open circuit potential, V_{OC}	~4.1 V (in sunlight)
Peak quantum efficiency:	510 – 580 nm
Dimensions (w x l):	25 x 114 mm (1.0 x 4.5")
Thickness:	0.22 mm (0.008")
Mass:	0.8 g (0.03 oz)
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