djb microtech ltd

Technical Notes
Solar Cell

Associated Equipment

The following equipment from djb microtech can be used with the Solar Cell:

- Solar Motor L1-1020.00
- Smiley Green Man LED Board L1-1030.00
- Light Meter D3-1010.00
- Decade Resistance Unit A1-1010.00

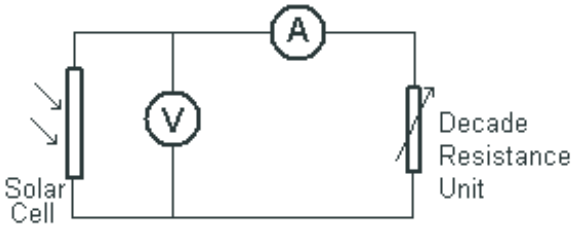
The mono-crystaline solar panel has a maximum rating of 4.4V, 90mA. It can be easily energised by a bright lamp or sunlight and can be operated in conjunction with our Solar Motor and Smiley Green Man LED Board.

Investigations

Listed below are the outlines of some possible investigations to try with your Solar Cell.

- Investigate how the output voltage varies with the area of cell exposed to the light.
- Use filters to investigate how the output voltage varies with colour/wavelength of light.
- Use a light meter and investigate how the output voltage varies with light intensity.
- Determine the optimum electrical load for maximum power transfer for a known light intensity.
- Determine how the maximum power varies with the light intensity when the electrical load is fixed.

Circuit for Power Investigations



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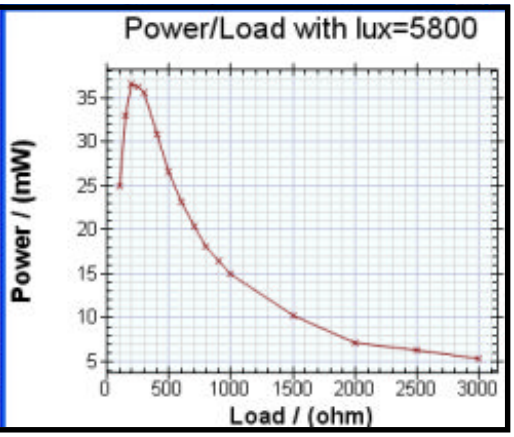
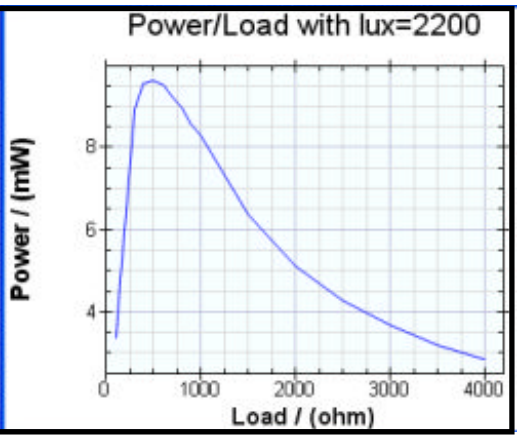
Results for Maximum Power Transfer

Load ohm R	Current mA I	Voltage V V	V/I Ohm (A) r	Power mW (A) P
100	15.9	1.57	98.7421	24.963
150	14.91	2.21	148.223	32.9511
200	13.62	2.69	197.504	36.6378
250	12.12	2.99	246.7	36.2388
300	10.96	3.24	295.62	35.5104
400	8.86	3.49	393.905	30.9214
500	7.35	3.62	492.517	26.607
600	6.26	3.7	591.054	23.162
700	5.44	3.75	689.338	20.4
800	4.78	3.78	790.795	18.0684



Maximum power graph with light level = 5800 lux

Load ohm R	Current mA I	Voltage V V	V/I Ohm (A) r	Power mW (A) P
100	5.83	0.577	98.9708	3.36391
150	5.69	0.844	148.33	4.80236
200	5.55	1.079	194.414	5.98845
300	5.08	1.76	346.457	8.9408
400	4.64	2.06	443.966	9.5584
500	4.42	2.18	493.213	9.6356
600	4.01	2.37	591.022	9.5037
700	3.67	2.52	686.649	9.2484
800	3.36	2.67	794.643	8.9712
900	3.11	2.76	887.46	8.5836



Maximum power graph with light level = 2200 lux

Graphs drawn using the ALBA Data Logging software - demo version available free from www.djb.co.uk

A challenge

Hunterston B nuclear power station has a maximum power output of 1288MW. If it was to be replaced by the solar cell that you have been using, how many solar cells would be required and what is the area that they would occupy? You can assume the following:

the average daily light intensity is 6,000 lux - averaged over 24 hours.

the cells are packed side by side with no space between them.

To get started you will need to take a lamp and adjust its height so that the light intensity at bench level is 6,000 lux. Now find the maximum power output.

The Technical Notes are available as a coloured pdf in the Teachers section of our website.