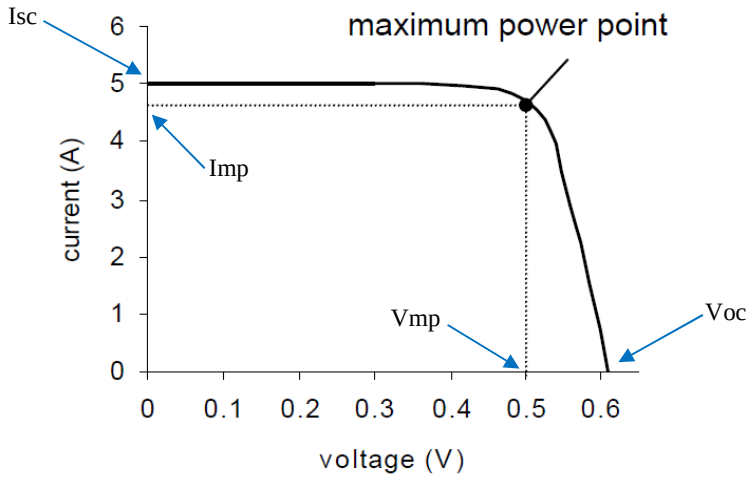
Regulator and solar charge current sizing

Abbreviations:
I = current
Imp = maximum power point current
Isc = short circuit current
V = voltage
Vmp = maximum power point voltage
Voc = open circuit voltage

When selecting a solar regulator, it must be capable of handling the maximum charge current available from your solar panels. Most solar designers use something between the solar panels' Imp and Isc to size their regulators. Some designers just use the Isc rating specified on the back of their solar panels.

If you look at the electrical characteristic I-V curve of a solar cell below (a 12V nominal panel would typically be made up of 36 of these cells), the Isc will never be reached in a real life system charging a battery because V=0 at this point and therefore power=0. There is no useful power and it therefore seems unrealistic to size the regulator for Isc. You would be wise though, to expect Imp +10~20 % for cases where solar radiation >1000W/m^2.



We use the Imp of the solar panels to size the maximum solar charge current for the regulators. Plasmatronics PL and Dingo regulators have a built-in current limit so there is a small margin to play with. 10% extra is no problems for the regulator. For example, the PL20 is designed to limit the current at 20A maximum and even has a temperature sensor onboard that will also reduce the charge current if the regulator gets too hot, so it's very robust.

Example
Note: This can be scaled up for larger system voltages.
Vmp for a 12V nominal panel is about 17V.
4x 80W panels connected in parallel = 320W
Power divided by Vmp = Imp.
320W/17V = 19A.
So a PL20 or a Dingo 20/20 (which handles 20A maximum charge current) would be the most suitable regulator for this system.