Systems Engineering

Solar Power

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iTIC http://itic.cat

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Solar cell types

- Polycrystalline
  - Typical outdoor applications
  - Sensitivity 500 nm to 1100 nm
  - Medium price
  - 13% power conversion efficiency
- Monocrystalline
  - Spectral sensitivity range 300 nm to 1100 nm
  - Usable for indoor and outdoor
  - Most expensive
  - Efficiency 15 to 22 %
- Amorphous
  - Spectral sensitivity range 300 nm to 600 nm
  - Indoor (solar calculators)
  - Efficiency 5 %

Source: IXYS

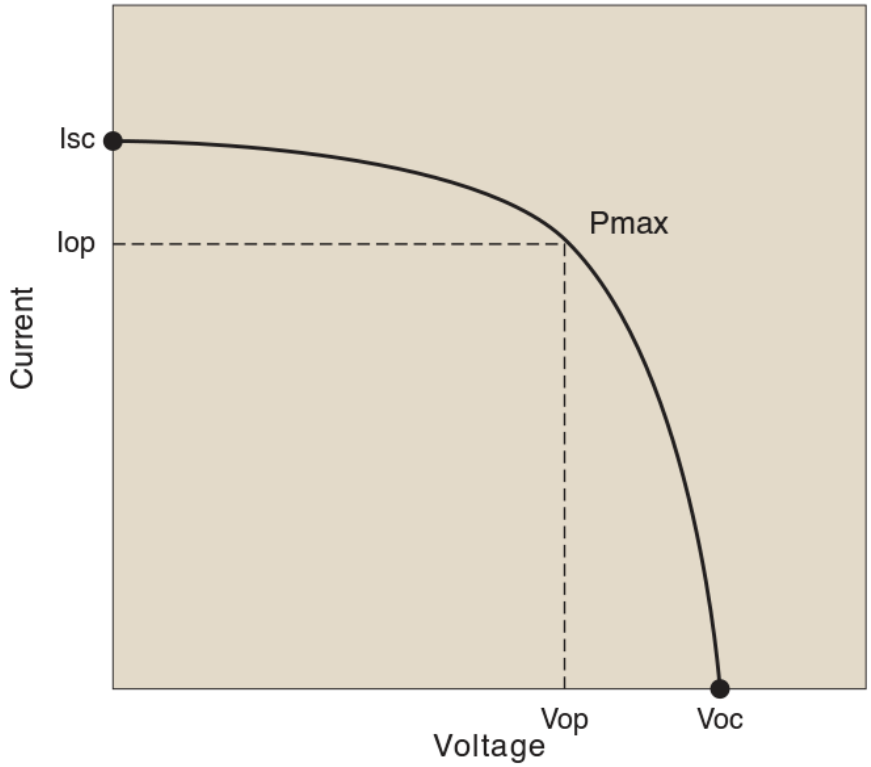
Typical light power densities

W/m^2	min	max
Bright sunlight	500	1000
Overcast sky	50	200
Department store	20	35
Grocery store	15	25
Meeting room	12	18
Office space	8	15
Warehouse	2	6

Power output from typical office space lighting (incandescent or halogen) : 100 times less than bright sunlight.
With fluorescent: 200 to 500 times less due to narrow spectrum.

i-v curve

- Maximum power point (control voltage) mppcv

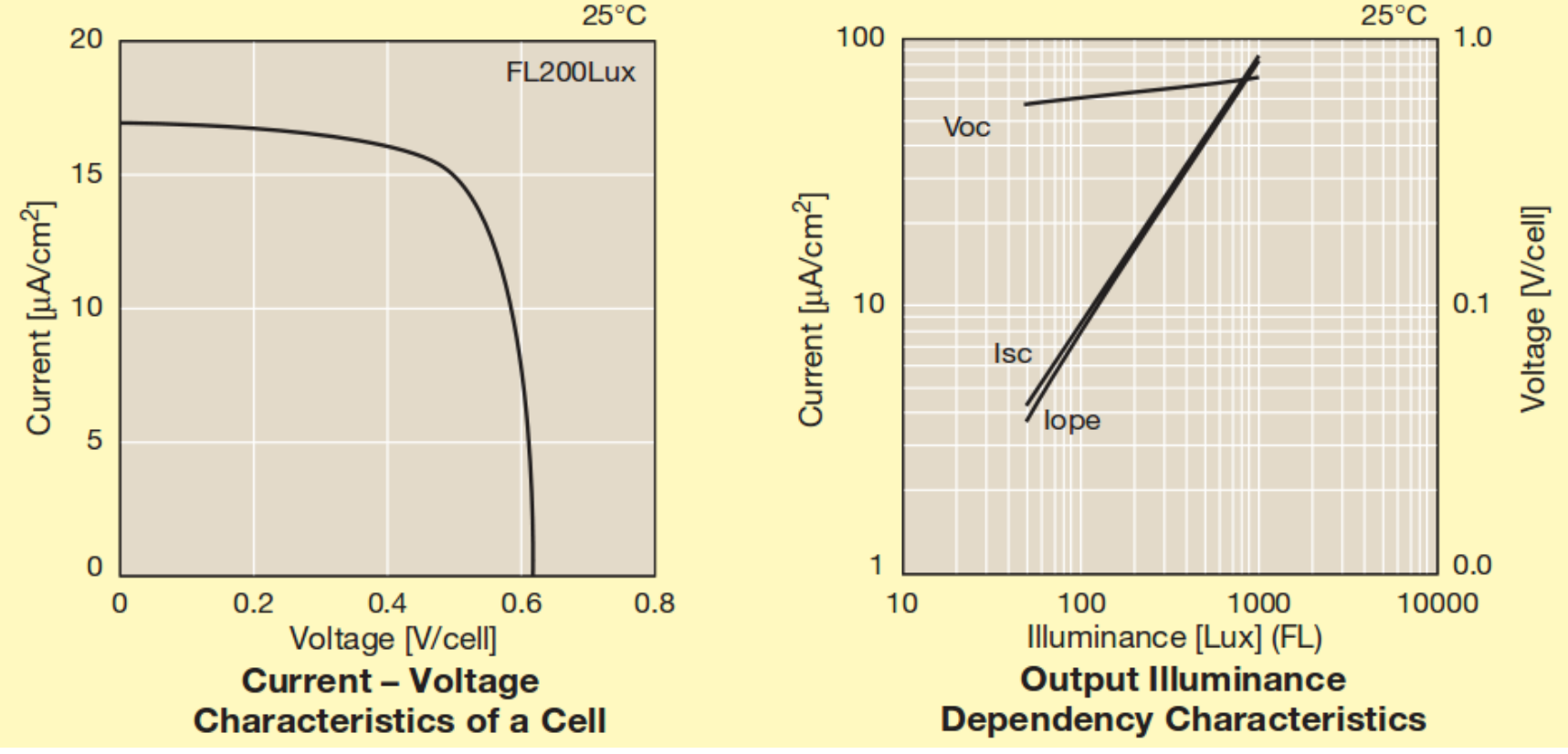


Voc : open-circuit voltage
Isc : short-circuit current
Vop : optimum operating voltage
Iop : optimum operating current
Pmax : maximum output

Current-Voltage Curve

Source: Sanyo Amorton

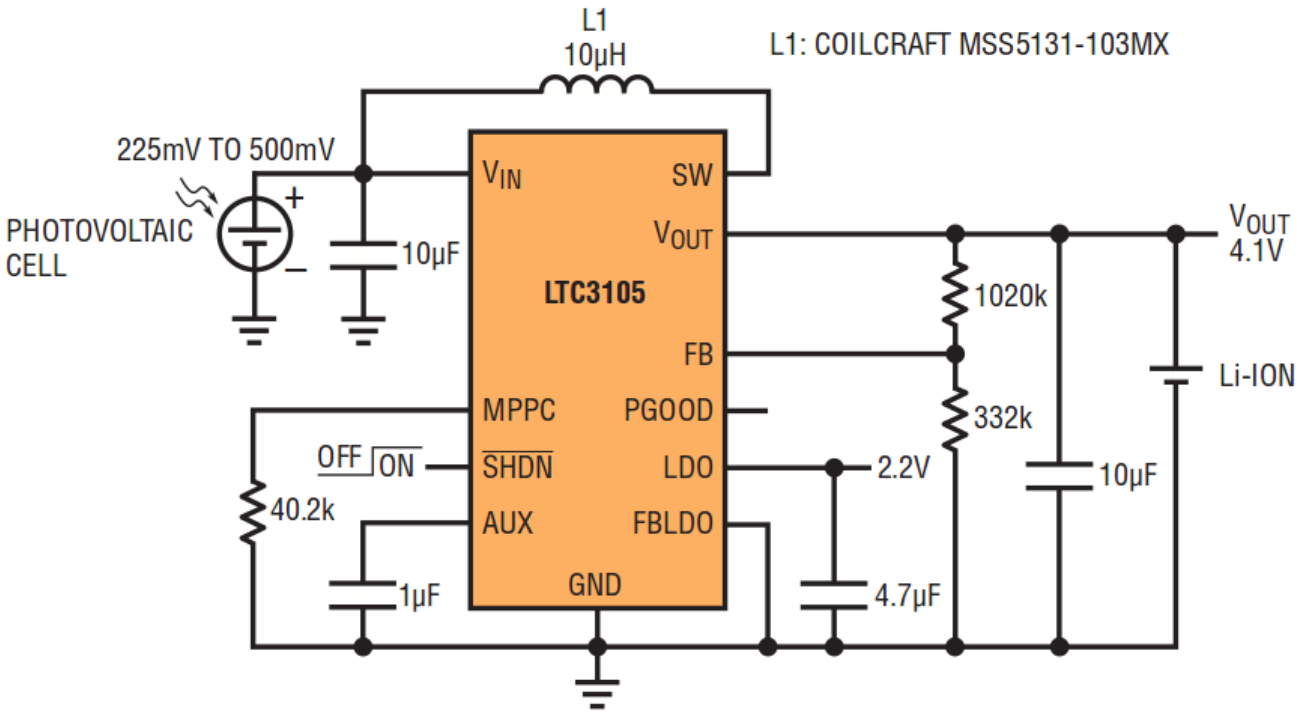
Indoor datasheet



Office lighting: 300 to 500 lux

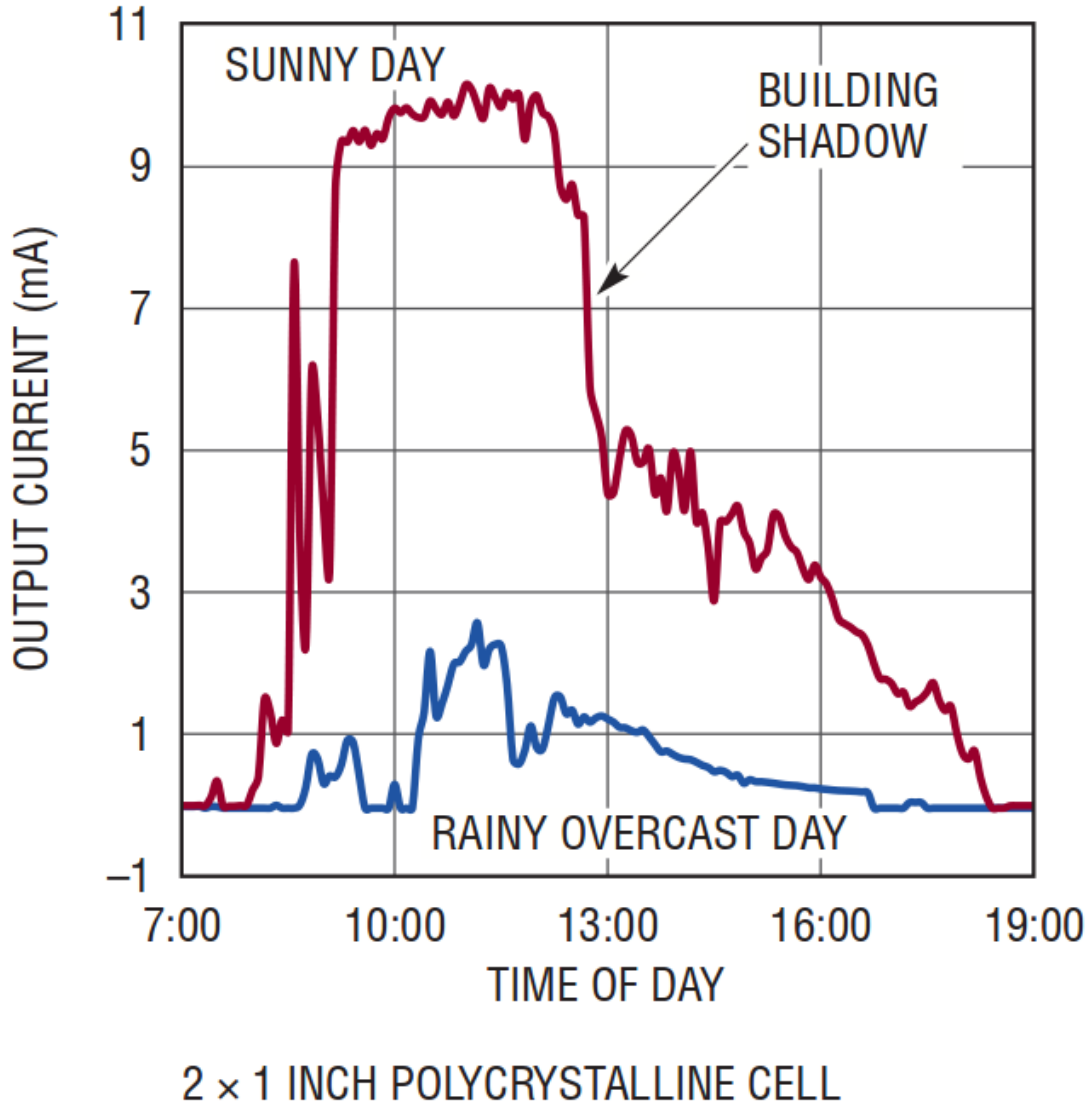
Source: Sanyo Amorton

Charging a Li-Ion battery



Source: Linear Technology

Charging profiles



Source: Linear Technology