Matter at any temperature emits particles of light known as photons. Incandescent lightbulbs leverage this phenomenon: a tungsten filament is heated and glows to provide light. According to a model well-known by physicists, the temperature of the heated body follows a spectrum determined bywhich energy the majority of the emitted photons take. Light from the sun roughly obeys this same spectrum.  
 Semiconductors, which are used in solar cells, are characterized by a property known as a bandgap. The bandgap is used to measure the amount of energy required to conduct electricity through the semiconductor. If the bandgap is too big, many of the photons striking the solar cell will be lost. If the bandgap is too small, an unacceptable portion of the photon energy striking the solar cell will be converted to heat. The shape of this spectrum is key to determining how best to design a solar cell.  
The efficiency of a solar cell is determined by balancing all the energy entering and leaving the device. The spectrum of photons emitted from a semiconductor is similar to the well-known spectrum of a tungsten filament or the sun, but is truncated at energies less than the bandgap. Physicists have known for decades that the semiconductor thermal photon spectrum is smaller than that of the sun or a filament?, but few have written a rigorous mathematical equation determining the spectrum. In this paper, I derive a simple mathematical equation of the photon spectrum for a semiconductor. This expression can be used to calculate the number of thermal photons emitted from a semiconductor and the energy carried away by thermal photons, among other things. The equation I derive can be implemented using straightforward algorithms that can be quickly and accurately computed using a normal computer or laptop. I check the equation and algorithms by comparing their output to well-known, past results of solar cells.