If you have a simple circuit that drive high power 12V LED with current limiting resistor 3.3ohm and need to drive them with 80C liPo (lithium Polymer) batteries that have 5200mAh charge, assume that girls stay inside the box of shame for about 5 hours. How many batteries are connected in parallel to light up the LED for more than 5 hours
• Assume all batteries have equal voltage
• Assume the LED is ideal (deal with it as a short circuit in forward bias)
• The current limiting resistor is a high-power resistor.
• Battery

To calculate the number of batteries needed to light up the LED for more than 5 hours, we need to consider the power consumption of the LED circuit and the capacity of the LiPo batteries.

First, let's determine the power consumption of the LED circuit

$P = V*I$
$I = V/R$

$I = 12V / 3.3$ ohms $≈ 3.64A$

Now, let's calculate the energy consumption of the LED circuit per hour:

Energy $= P*T$

Since the time is given as 5 hours, the energy consumption would be:

Energy $= P*5$

Next, we need to determine the capacity of the LiPo batteries required to power the LED circuit for more than 5 hours

Number of batteries = Energy / Battery capacity

Number of batteries = (P * 5) / 5.2A

Number of batteries = (3.64A * 5) / 5.2A ≈ 3.51

Since the number of batteries must be a whole number therefore we need at least 4 Batteries

<u>But if we consider battery discharge</u>

LiPo batteries have a nominal voltage of around 3.7V but the voltage decrease to 3V because of the voltage cutoff so the voltage = 3V

So the circut current consmption is =3.64A

Discharge Current = Discharge Rate * Capacity = 80 * 5200mAh =416A

now lets calculate the runtime of the battery

Runtime = Battery capacity / (Discharge Current + current consmption)= 5200mAh / (416A + 3.64A)=5200mAh / 419.64A ≈ 12.39 hours

so we will only need 1 battery