

Consider a PV module with two parallel strings, each has 90 series-connected cells. The module rated open-circuit voltage is 45V and the rated short-circuit current is 7A under standard test condition (STC). The manufacturer's temperature coefficient for  $V_{oc}$  for individual cells is  $-2.2 \text{ mV}/^\circ\text{C}/\text{cell}$  and for  $I_{sc}$  is  $3.7 \text{ }\mu\text{A}/^\circ\text{C}/\text{cm}^2$ . The individual cell area is  $36 \text{ cm}^2$ . The ambient temperature is  $38^\circ\text{C}$ , the solar irradiance is  $750 \text{ W}/\text{m}^2$ , and temperature-rise coefficient is  $25^\circ\text{C}/\text{kW}/\text{m}^2$ .

Under these conditions, calculate

- 1) The expected open-circuit voltage
- 2) The expected short-circuit current
- 3) The expected maximum power output

The nameplate data for PV module CS6P-240M are shown below.

STC	CS6P-240M	CS6P-245M	C
Nominal Maximum Power ( $P_{max}$ )	240W	245W	
Optimum Operating Voltage ( $V_{mp}$ )	30.2V	30.3V	
Optimum Operating Current ( $I_{mp}$ )	7.95A	8.09A	
Open Circuit Voltage ( $V_{oc}$ )	37.3V	37.4V	
Short Circuit Current ( $I_{sc}$ )	8.46A	8.61A	
Module Efficiency	14.92%	15.23%	
Operating Temperature	-40°C~+85°C		
Maximum System Voltage	1000V (IEC) /600V (UL)		
Maximum Series Fuse Rating	15A		
Application Classification	Class A		
Power Tolerance	0 ~ +5W		

If the PV module operates under solar irradiance of  $800\text{W}/\text{m}^2$ , determine its:

- 1) Short-circuit current
- 2) Open-circuit voltage
- 3) Maximum power
- 4) Required load resistance to operate the module at the maximum power point

A solar company is to determine physical installation specification for two PV projects, one in Knoxville, TN and the other in Pomona, CA. They consider two options: a) To maximize the system annual energy production and b) To maximize energy production for summer.

What should the specification be? Present the results in Table 1.

**Table 1**

<b>Specification</b>	<b>Knoxville, TN</b>	<b>Pomona, CA</b>
<b>To maximize annual energy production</b>		
Array tilt angle		
azimuth angle		
Other criterion		
Other criterion		
<b>To maximize energy production in summer</b>		
Array tilt angle		
azimuth angle		
Other criterion		
Other criterion		