Department of Electronics and Communication Engineering

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Bachelor of Technology

INTERNSHIP

EXPERIMENT, ANALYSIS AND CHARACTERISTIC OF BQ25570 MODULE

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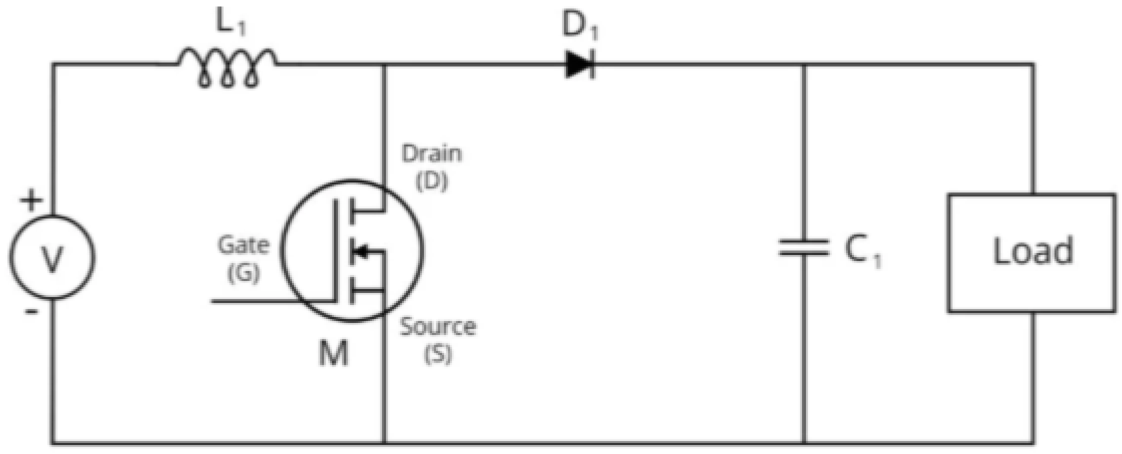
By :

SUHAS T M

MOHIT A

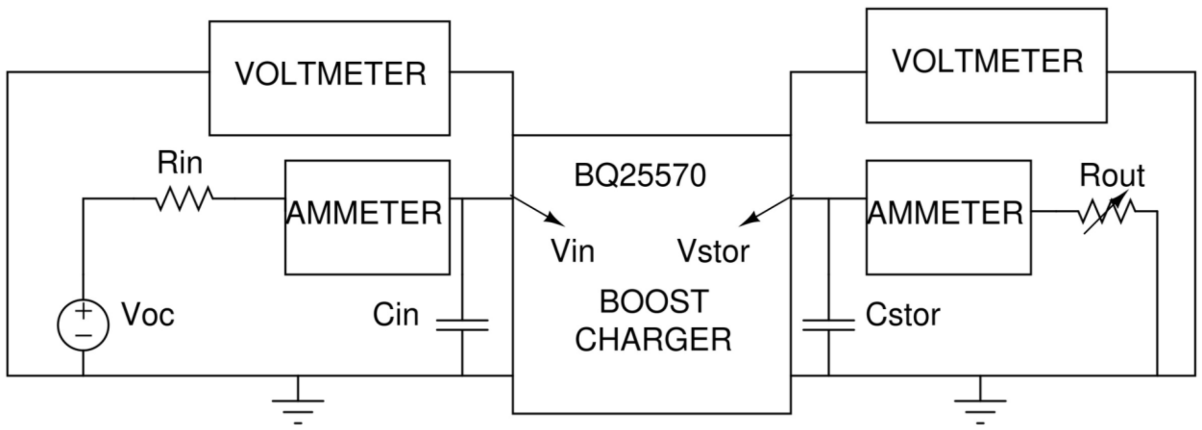
BOOST CHARGER:



The MOSFET here acts as a switch ,when it is ON, the current flows through the inductor to ground and now the inductors gain energy whereas the capacitor C1 gives energy to load . When the MOSFET is in off condition the inductor releases energy, this energy goes to load and C1.

The voltage across the load is higher than the input voltage because of the inductor's ability to release energy stored during the ON phase. The duty cycle of the switch (M) determines the output voltage. A higher duty cycle results in a greater voltage boost.

And whenever the load stops taking energy the voltage across the terminal becomes 4.17 V and no more power is taken in by the module.



INPUT READINGS

Voc(V)	Vin(V)	Iin(mA)	Rin(Ω)
3	1.36	26.54	61
3.5	1.53	31.95	61
4	1.68	37.68	61
4.5	1.78	44.7	61

OUTPUT READINGS

Vstor(V)	Iin(mA)	Rout(Ω)	Efficiency
3.95	8.3	470	90.8
3.98	11	360	89.5
3.9	14.32	270	88.2
3.7	18.8	192	87.4

Maximum Power Point Tracking:

The BQ25570 integrates Maximum Power Point Tracking(MPPT) to maximize the efficiency of energy extraction from energy-harvesting sources like solar panels. Maximum Power Point Tracking (MPPT) ensures that the input source like solar cell operates at its maximum power point (MPP) to extract the maximum possible energy.

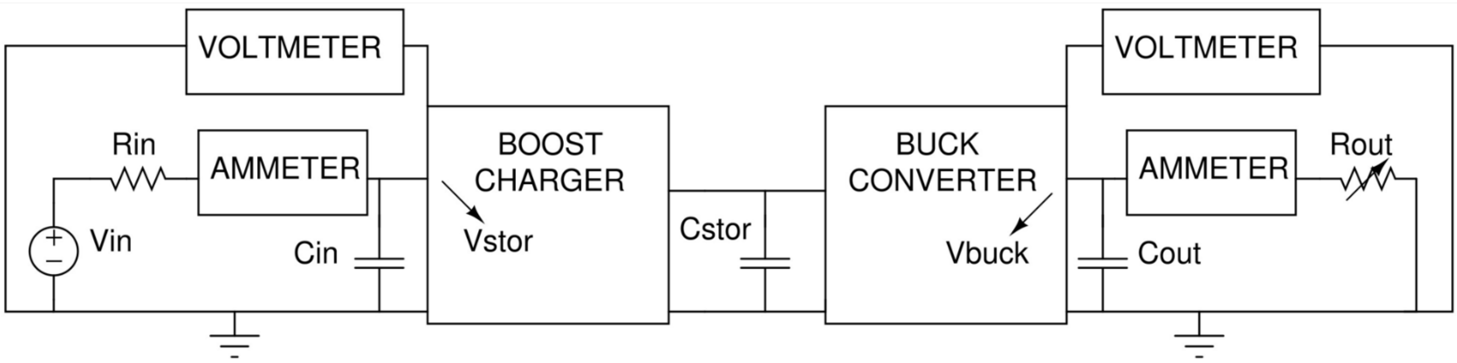
The BQ25570 uses a fractional open-circuit voltage (FOCV) method for MPPT .For every 16s the IC disconnects the input voltage to measure the open circuit voltage and it takes the sample of 50% or 80% of Voc according to the Voc_SAMP pin, and stores this voltage across Cref capacitor ,as the capacitor leaks current ,there might me slight change in MPPT .Hence it is recommended to use COG low leakage capacitor .

In our case the Vin is slightly less than Voc/2 , this might be because of the leakage happening in the Reference capacitor. The input impedance must be sufficiently low while testing such that that the load gets sufficient power supply and also while finding the efficiency of the boost charger make sure that the Vstor is less than 4.17 V because only then sufficient power is taken in by the module .We can clearly see that our Vstor is always less than 4.0 V.

BUCK CONVERTER:

The BQ25570 module integrates not only a boost converter for energy harvesting but also a buck converter to efficiently regulate and step down the voltage for powering low-power loads. The buck converter steps down the higher voltage stored in the output capacitor or battery to a regulated lower voltage for powering the load The output voltage of the buck converter can be set between 1.8 V and 2.5 V, adjustable using external resistors connected to the VOUT_SET pin. In our test cases the Buck converter maintains a voltage of 1.8 V and has an efficiency between 85% to 95% at higher input voltages.

The buck converter gets its energy from the storage element connected in Vstor . The buck converter ensures a steady and regulated output voltage even if the input voltage fluctuates. The lower the capacitor value, the larger the ripple will become and the larger the droop will be in the case of a transient response. For buck converter to operate properly, an inductor of appropriate value must be connected between LBUCK, pin16, and VOUT, pin 14.



INPUT READINGS

Vin(V)	Iin(mA)	Rin(Ω)
2.4	9.36	61
2.69	5.31	61
2.8	3.71	61
2.86	2.84	61
2.9	2.3	61
2.1	4.59	61

OUTPUT READINGS

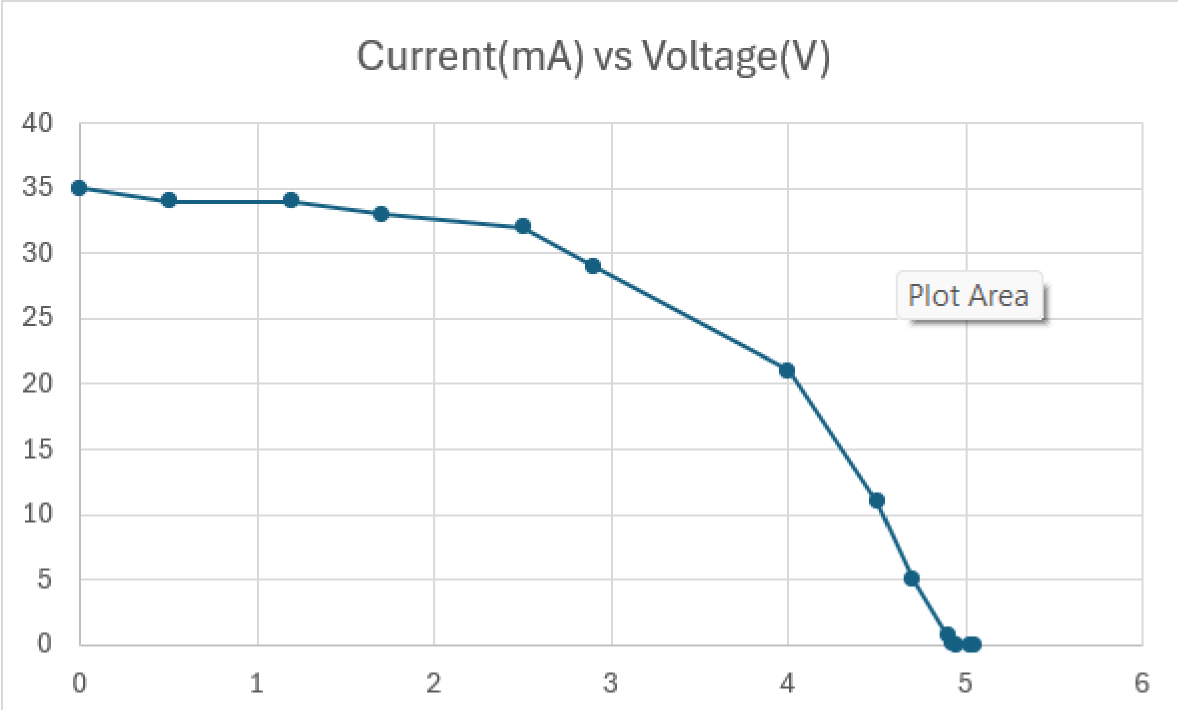
Vout(V)	Iout(mA)	Rout(Ω)	Efficiency
1.8	10.91	160	85.7
1.8	6.8	260	85.4
1.8	4.93	360	85.7
1.8	3.87	460	87.4
1.8	3.18	560	85.8
1.8	4.94	360	92.2

SOLAR CELL:

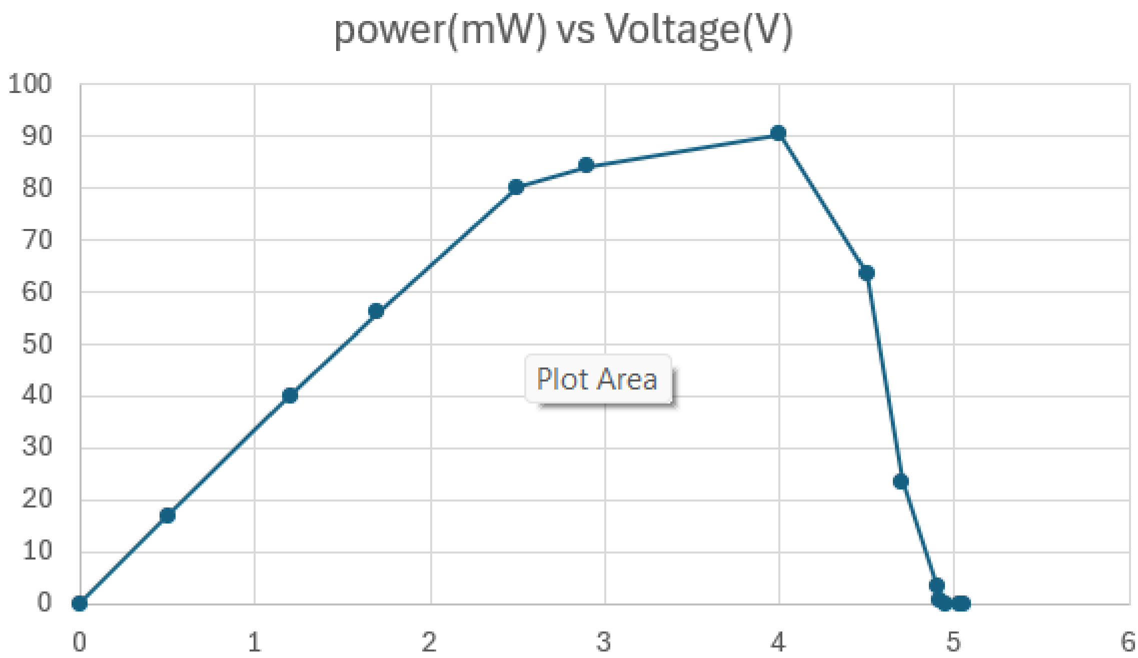
i)In presence of sun

voltage (V)	power(mW)
0	0
0.5	17
1.2	40
1.7	56.1
2.5	80
2.9	84.1
4	90.3
4.5	63.6
4.7	23.5
4.9	3.4
4.92	0.78
4.95	0.079
5.03	0.015
5.05	0.004

voltage (V)	current (mA)
0	35
0.5	34
1.2	34
1.7	33
2.5	32
2.9	29
4	21
4.5	11
4.7	5
4.9	0.7
4.92	0.16
4.95	0.016
5.03	0.003
5.05	0.0009



Current(mA) vs Voltage(V)
40
35
30
25
20
15
10
5
0
0
1
2
3
4
5
6
Plot Area

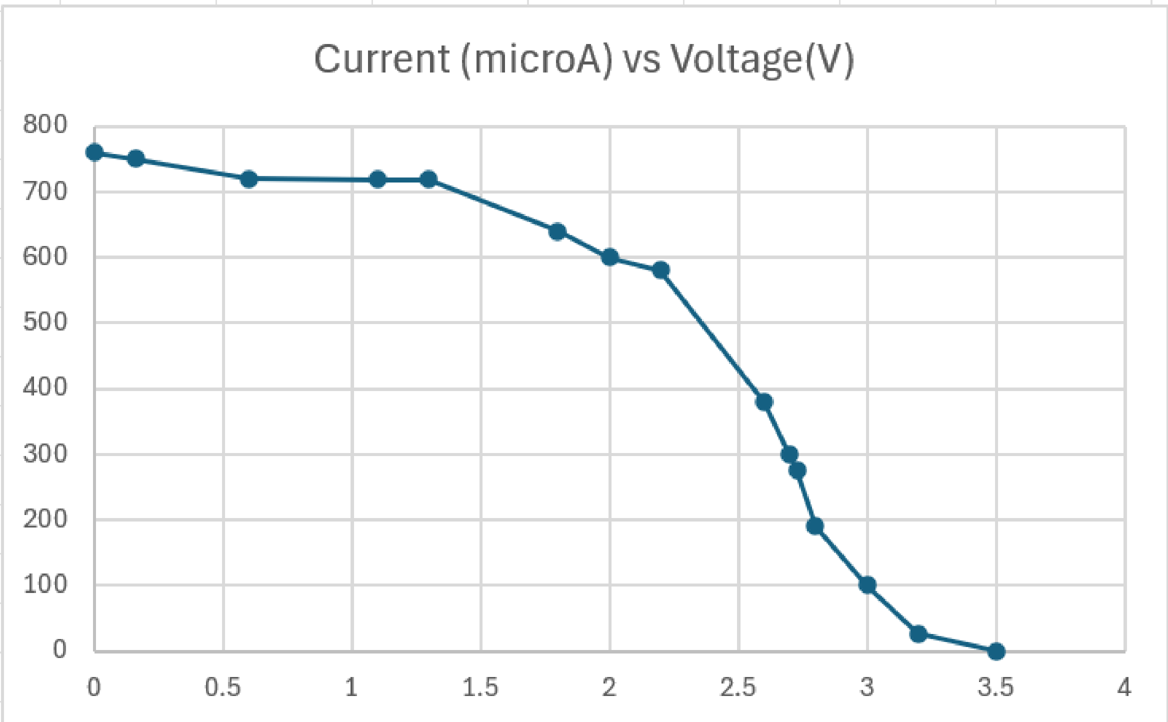


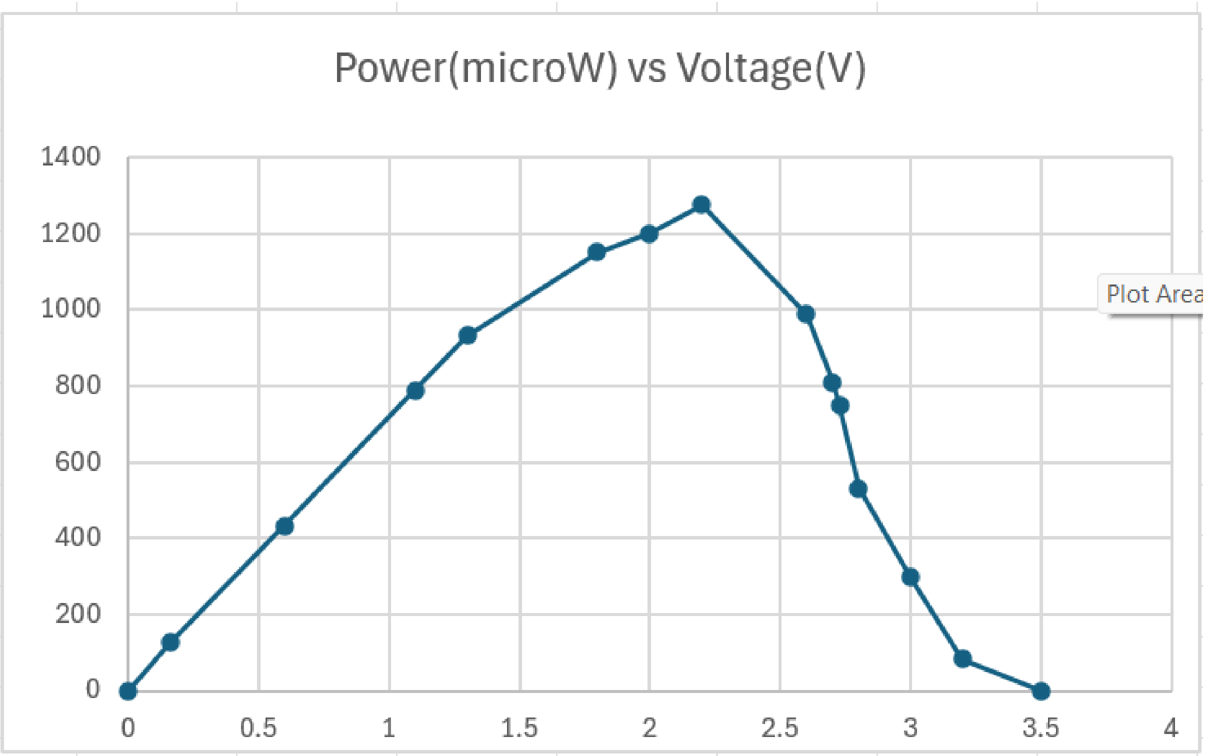
power(mW) vs Voltage(V)
100
90
80
70
60
50
40
30
20
10
0
0
1
2
3
4
5
6
Plot Area

ii)In absence of sun

Voltage (V)	Current (microA)
0	760
0.16	750
0.6	720
1.1	718
1.3	718
1.8	640
2	600
2.2	580
2.6	380
2.7	300
2.73	275
2.8	190
3	100
3.2	26
3.5	0

Voltage (V)	Power(microW)
0	0
0.16	126.5
0.6	432
1.1	789
1.3	933
1.8	1152
2	1200
2.2	1276
2.6	988
2.7	810
2.73	748
2.8	532
3	300
3.2	83.2
3.5	0




Power(microW) vs Voltage(V)
1400
1200
1000
800
600
400
200
0
0
0.5
1
1.5
2
2.5
3
3.5
4
Plot Area