# Modeling and Analysis of Parallel Boost Converter

Jyothi S K
Assistant Professor, Dept. of ECE
Nagarjuna College of Engineering and Technology
Bengaluru, India

Sreenivasulu K N
Assistant Professor, Dept. of ECE
Nagarjuna College of Engineering and Technology
Bengaluru, India

**Abstract:- Demand for Energy is ever increasing, mainly with the increase of populace and the appearance of more recent technology, strength want is already overwhelming. Therefore there may be a want to make use of strength resources. The major goal of this paper is to increase a mathematical modeling and to layout a excessive green Photovoltaic (PV) software with proposed parallel increase converter Improved technology for DC to DC converters has been implemented. "Simulation of the gadget built with the help of MATLAB/SIMULINK. State Space Modeling is performed for the parallel booster converter". This version is primarily based entirely on mathematical equations and is specified by an equal circuit that includes an MPPT supply from Photo Voltaic. In order to analyze the influence of temperature and insolation on the overall performance of the PV module, the MATLAB/PSPICE version of the PV module is advanced. This paintings is specifically advanced for the Photovoltaic (PV) software. MATLAB-primarily based totally modeling and simulation scheme that is appropriate for analyzing the I–V and P–V traits of a PV array below a no uniform insolation because of partial shading changed into proposed.**

*Keywords:- Solar energy; SPWM; Microinverter; Boost converter; Maximum Power Point Tracking, state space analysis.*

## I. INTRODUCTION

Solar energy is a renewable power supply that could update fossil gas established power sources. Sun energy rates according to kilowatt-hour, however, need to be aggressive with fossil gas power sources for that to happen. Sun panels are not very efficient at the moment; they have 12-20 efficiency to convert daylight into electric power. Due to various elements, along with the temperature of the sun panel and the conditions of cargo, the performance will drop similarly. In order to optimize the energy extracted from the sun panel, operating the panel at its most satisfying energy point is very important. In order to do this, it is important to design and enforce a method of fee control known as a Maximum Power Point Tracker In order to look at the effect of temperature and insolation on the overall performance of the PV module, the MATLAB version of the PV module [1-4] was created. MATLAB-a fully modeling and simulation framework based primarily that is suitable for the study of the I-V and P-V characteristics of a PV array below a non-uniform insolation due to partial shading[5] is proposed. Due to its many benefits, parallel dc to dc converters are prominently used. First, parallel dc-dc converters allow a reduction in the dimensions of additives, especially inductive ones. Pressure among individual converters is decreased by segmenting overall energy, which improves efficiency. This additionally ends in accelerated reliability and permits reconfiguration.

## II. PRINCIPLE AND OPERATION OF THE PARALLEL BOOST CONVERTER

PV panels generating low voltages are a problem in small PV systems, resolving this issue of a low voltage on the entry; with a conventional DC/DC Boost converter, the most efficient technique to achieve an elevation within the voltage stage is. It isn't feasible to attain an elevation of greater than three instances the voltage on the enter for the traditional enhance converter, because of balance and performance concerns [6]. This paintings recommend some other direction of motion located with inside the adjustment of the regular DC/DC Boost converter, that could accomplish a upward push share of 10 instances the estimation of the contribution, with the aid of using making no usage of galvanic transformer, and much less wide variety of additives that the proposition exhibited in past due proficient. The schematic diagram of this topology is offered with inside the Fig. which include changed Boost converters linked in parallel from the identical source. MPPT monitoring DC/DC Buck converter is hooked upin which the extracted voltage from renewable power is diminished and that voltage is fed to the parallel enhance converter. This new DC/DC converter proposition is prepared for undertaking a excessive elevation aspect with the aid of using connecting each outputs of voltage $V_{C1}$ and $V_{C2}$ in collection association with a unmarried load, if you want to deliver a excessive elevation share of maximum severe a 1:10 in comparison to the enter..
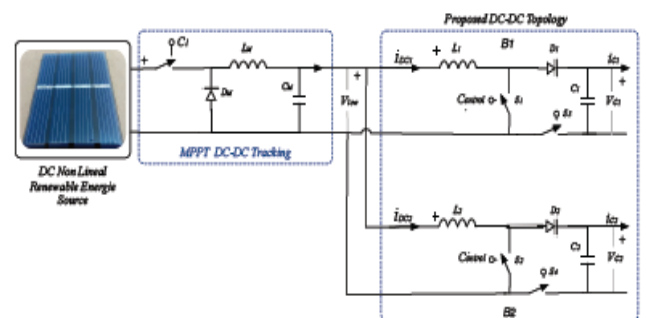


Fig.1. Proposed topology arrangement for multilevel converter

TABLE I. LOGIC STATES

| Mode | Converter B1 | Converter B2 | Output |
|---|---|---|---|
| 1 | B1(S1,S4) = 0 | B2(S2,S3) = 0 | Short circuit by Isolated Ground Lost |
| 2 | B1(S1,S4) = 1 | B2(S2,S3) = 0 | Allowed: High Voltage Gain |
| 3 | B1(S1,S4) = 0 | B2(S2,S3) = 1 | Allowed: High Voltage Gain |
| 4 | B1(S1,S4) = 1 | B2(S2,S3) = 1 | Allowed: High Voltage Gain |

As proven with inside the desk 1 there could be4distinctivecommon sense states. There could be distinctive viable states for every of the converter. First nation is stated to be "1" and the second one nation is "0".Logic values of switches S3 and S4 are stated to be the supplement of switches S1 and S2."As per the idea described above, if there exists two states "0" and "1" for the respective converters then it can be concluded that the match between the two modified boost converters will be having four different states. Table 1 defines this concept. In the switching state 2 the resulting circuit will be the one presented in the Fig.2.
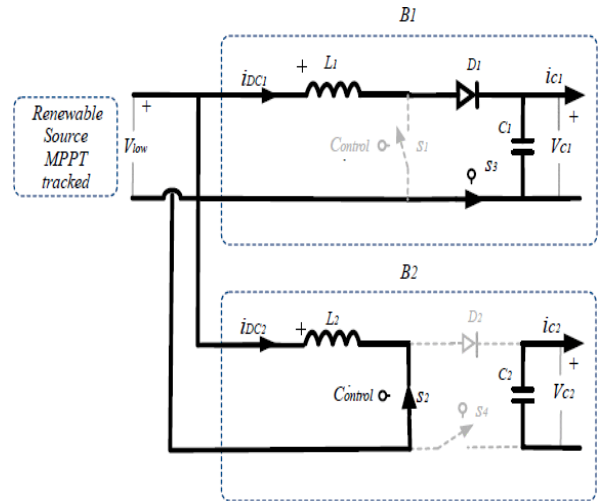


Fig.2.Switching state 2 of the proposed topology

In the switching country 2, inductor L1 as a way to shop it in a magnetic subject shape while the direct present day renewable power supply will offer power to the inductor and within side the period in-between the capacitor C1 of the B1 The voltage will be manipulated by the DC/DC converter to feed the load. The 2nd converter will exchange the power from the supply as a traditional raise converter will work with the growth of the energy put away within the exceeded substitute cycle.



Fig.3. Switching state 3 of the proposed topology

In the recompense state3 while S1 is"0"and S2 is "1" will take place the opposite conduct. The supply will alternate electricity to the inductor L2 so it may be placed away in a magnetic subject form. And moreover is moving relaxation of the electricity of the supply to the important converter B1 to steer practicable to feed the burden and moreover within side the intervening time to rate the capacitor C1 that within side the beyond cycle changed into released. To constitute this technique the following schematic circuit of this kingdom is exhibited within side the Fig.3. State while each converter B1 and B2 are in "1" kingdom, this kingdom is unique due to the fact the ensuing circuit will consist most effective of 3 elements, the supply giving electricity to the inductor L1 and L2 because of this that that in this kingdom of commutation is viable to keep all of the electricity furnished from the supply within side the inductors, making viable to obtain a excessive elevation ratio on case of overlapped obligation cycles.
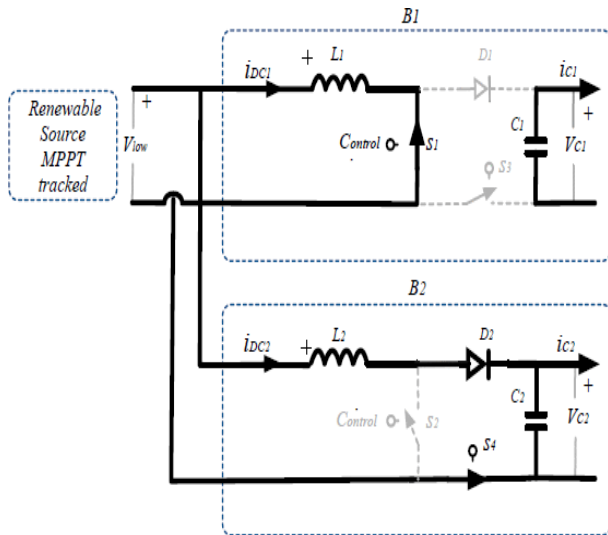
## III. MATLAB MODEL OF SOLAR PV MODULE

A sunlight based cell is the structure square of a sun oriented board. A photovoltaic module is shaped by interfacing numerous sun based cells in arrangement and equal. Thinking about just a solitary sun oriented cell; it very well may be demonstrated by using a current source, a diode and two resistors [7]. This model is known as a solitary diode model of sun oriented cell. The same circuit of PV module is appeared in Fig.4.
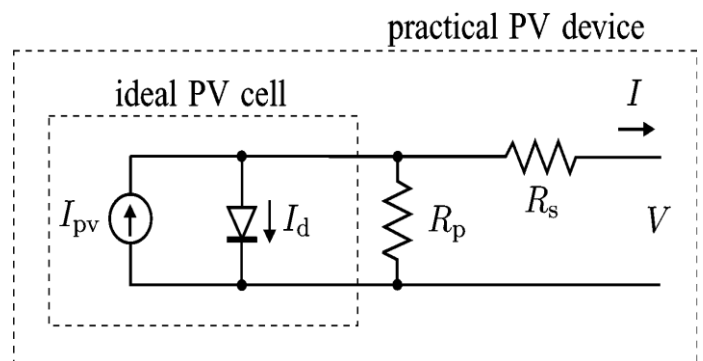


Fig.4. Single-diode model of the theoretical PV cell

Fig.4 shows the same circuit of an ideal PV cell. The essential condition from the hypothesis of semiconductors that numerically portrays the V-I normal for an ideal PV cell is

$$I = I_{pv,cell} - I_{0,cell}\left[exp\left(\frac{qv}{aKT}\right) - 1\right] \quad \text{----(1)}$$

Id is the Shockley diode condition, Io, cell is the opposite immersion or spillage flow of the diode, q is the electron charge (1.60217646 ?? 10^-19 C) where Ipv, cell is the current produced by the incident light (which is directly proportional to the Sun irradiation),*The Boltzmann constant (1.3806503 ?? 10^-23 J/K) is k, T (in Kelvin) is the p-n junction temperature, and an is the constant of diode ideality. The basic equation (1) of the elementary PV cell does not reflect a functional PV array's I-V characteristic [7].*For crystalline silicon (Si) cells, a single PV cell generates an output voltage of less than 1 V, around 0.6 V, so a number of PV cells are connected in series to store the desired output voltage. It is called a module when serial-connected cells are put in a frame. The majority of commercially available crystalline-Si PV modules have either 36 or 72 series-linked cells. The 36-cell module has a voltage that is appropriate for charging a 12 V battery, and the 72-cell module is suitable for charging a 24 V battery Practical arrays are composed of several connected PV cells and the addition of additional parameters to the basic equation is needed to observe the characteristics at the terminals of the PV array.

$$I = I_{pv} - I_0\left[exp\left(\frac{V + R_S I}{V_t a}\right) - 1\right] - \frac{V + R_S I}{R_P} \quad \text{------}$$
(2)

The thermal voltage of the exhibit with Ns cells associated in arrangement is Vt = NskT/q where Ipv and Io are the photovoltaic (PV) and immersion flows, separately, of the cluster. Parallel-connected cells increase the current and higher output voltages are given by cells connected in series. The PV and saturation currents can be represented as Ipv = Ipv, cell Np, Io = Io, cell Np if the array is comprised of Np parallel cell connections. In (2), Rs is the array's equivalent series resistance and Rp is the parallel resistance equivalent. This model will portray solar irradiance and changes in temperature that can occur commonly during the day. It is ideal for simulating realistic PV systems consisting of several PV modules, as it needs just a few parameters, such as the number of PV modules, the open-circuit voltage of the PV array and the short-circuit current.

## IV. STATE SPACE ANALYSIS

In control designing, a state-space portrayal as an assortment of info, yield and state factors associated by first-request differential conditions or contrast conditions is a numerical model of an actual framework. State factors are factors whose qualities change after some time in a way that depends on the qualities they have at some random time and furthermore depends on information factors' remotely forced qualities. The estimations of the yield factors rely upon the express factors' qualities.

A circle throughout an exchanging time span is characterized by the state space technique and this state space examination strategy gives a bunch of state numerical conditions to portray the circuit over a total cycle[8The acquired conditions are then arrived at the midpoint of over a range of progress. The geography is as a result when the semiconductor switch is ON and when the switch is OFF. A framework's State Space Equation can be composed as

The state space model specified for ON state((D / fs)).

For State 2:

$$\begin{bmatrix} \frac{diL_1}{dt} \\ \frac{dVc_1}{dt} \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & -\frac{1}{RC_1} \end{bmatrix} \begin{bmatrix} iL_1(t) \\ Vc_1(t) \end{bmatrix} + \begin{bmatrix} \frac{1}{L_1} \\ 0 \end{bmatrix} V_g(t) \quad (3)$$

$$Y = \begin{bmatrix} 0 & 1 \end{bmatrix} \begin{bmatrix} iL_1(t) \\ Vc_1(t) \end{bmatrix} + [0] V_g(t) \quad (4)$$

The state space model is obtained for the off state ((1-D)/fs) as follows:

$$\begin{bmatrix} \frac{diL_2}{dt} \\ \frac{dVc_2}{dt} \end{bmatrix} = \begin{bmatrix} 0 & -\frac{1}{L_2} \\ \frac{1}{C_2} & -\frac{1}{RC_2} \end{bmatrix} \begin{bmatrix} iL_2(t) \\ Vc_2(t) \end{bmatrix} + \begin{bmatrix} \frac{1}{L_2} \\ 0 \end{bmatrix} V_g(t) \quad (5)$$

$$y = \begin{bmatrix} 0 & 1 \end{bmatrix} \begin{bmatrix} iL_2(t) \\ Vc_2(t) \end{bmatrix} + [0] V_g(t) \quad (6)$$

The state space averaging model is given over one switching cycle by using the state space averaging technique:

FOR STATE 2: $S_1S_4 = 1$; $S_2S_3 = 0$

$$\begin{bmatrix} \frac{diL_1}{dt} \\ \frac{diL_2}{dt} \\ \frac{dVc_1}{dt} \\ \frac{dVc_2}{dt} \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{1}{L_2} \\ 0 & 0 & -\frac{1}{RC_1} & 0 \\ 0 & \frac{1}{C_2} & 0 & -\frac{1}{RC_2} \end{bmatrix} \begin{bmatrix} iL_1 \\ iL_2 \\ Vc_1 \\ Vc_2 \end{bmatrix} + \begin{bmatrix} \frac{1}{L_1} \\ \frac{1}{L_2} \\ 0 \\ 0 \end{bmatrix} V_g(t) \quad (7)$$

As demonstrated in Fig.3, when S1 is '0' and S2 is '1' in compensation state 3, the source trades fuel to the inductor of L2 so it very well may be placed as an attractive field. Furthermore, the excess energy of the source is passed to the B1 primary converter to influence the heap taking care of and, meanwhile, capacitor C1 released in the past cycle will be charged.

For State 3:
The State space model is specified by: during the ON interval ((D / fs)).

$$\begin{bmatrix} \frac{diL_1}{dt} \\ \frac{dVc_1}{dt} \end{bmatrix} = \begin{bmatrix} 0 & -\frac{1}{L_1} \\ \frac{1}{C_1} & -\frac{1}{RC_1} \end{bmatrix} \begin{bmatrix} iL_1(t) \\ Vc_1(t) \end{bmatrix} + \begin{bmatrix} \frac{1}{L_1} \\ 0 \end{bmatrix} V_g(t) \quad (8)$$

$$y = \begin{bmatrix} 0 & 1 \end{bmatrix} \begin{bmatrix} iL_1(t) \\ Vc_1(t) \end{bmatrix} + [0] V_g(t) \quad (9)$$

The state space model is obtained during the off interval $((1-D)/fs)$ as follows:

$$\begin{bmatrix} \frac{diL_2}{dt} \\ \frac{dVc_2}{dt} \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & -\frac{1}{RC_2} \end{bmatrix} \begin{bmatrix} iL_2(t) \\ Vc_2(t) \end{bmatrix} + \begin{bmatrix} \frac{1}{L_2} \\ 0 \end{bmatrix} V_g(t) \quad (10)$$

$$y = \begin{bmatrix} 0 & 1 \end{bmatrix} \begin{bmatrix} iL_2(t) \\ Vc_2(t) \end{bmatrix} + [0]\, V_g(t) \quad (11)$$

FOR STATE 3: $S_1S_4 = 0$ ; $S_2S_3 = 1$

$$\begin{bmatrix} \frac{diL_1}{dt} \\ \frac{diL2}{dt} \\ \frac{dvc1}{dt} \\ \frac{dvc2}{dt} \end{bmatrix} = \begin{bmatrix} 0 & 0 & -\frac{1}{L_1} & 0 \\ 0 & 0 & 0 & 0 \\ \frac{1}{C_1} & 0 & -\frac{1}{RC_1} & 0 \\ 0 & 0 & 0 & -\frac{1}{RC_2} \end{bmatrix} \begin{bmatrix} iL_1 \\ iL_2 \\ Vc_1 \\ Vc_2 \end{bmatrix} + \begin{bmatrix} \frac{1}{L_1} \\ \frac{1}{L_2} \\ 0 \\ 0 \end{bmatrix} V_g(t) \quad (12)$$

State space equation for a system can be written as
$\dot{\mathbf{x}} = Ax + Bu$
$y = cx$
Where
$\dot{\mathbf{x}}$ = derivative of state vector
y= output vector
u= input vector
A= system matrix
B= input matrix
C= output matrix
D= feed forward matrix

The equivalent system matrix is:

$A = A_1D + A_2(1-D)$

$$A = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{D}{L_2} \\ 0 & 0 & -\frac{D}{RC_1} & 0 \\ 0 & \frac{D}{C_2} & 0 & -\frac{D}{RC_2} \end{bmatrix} + \begin{bmatrix} 0 & 0 & \frac{D-1}{L_1} & 0 \\ 0 & 0 & 0 & 0 \\ \frac{1-D}{C_1} & 0 & \frac{D-1}{RC_1} & 0 \\ 0 & 0 & 0 & \frac{D-1}{RC_2} \end{bmatrix} \quad (13)$$

$$A = \begin{bmatrix} 0 & 0 & \frac{D-1}{L_1} & 0 \\ 0 & 0 & 0 & -\frac{D}{L_2} \\ \frac{1-D}{C_1} & 0 & -\frac{1}{RC_1} & 0 \\ 0 & \frac{D}{C_2} & 0 & -\frac{1}{RC_2} \end{bmatrix} \quad (14)$$

The input matrix will be:
$B = B_1D + B_2(1-D)$

$$B = \begin{bmatrix} \frac{D}{L_1} \\ \frac{D}{L_2} \\ 0 \\ 0 \end{bmatrix} + \begin{bmatrix} \frac{1-D}{L_1} \\ \frac{1-D}{L_2} \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} \frac{1}{L_1} \\ \frac{1}{L_2} \\ 0 \\ 0 \end{bmatrix} \quad (15)$$

The equation (12) & (13) defines the average action of the converter and smoothes the ripple transition inherent in the state variables efficiently. Note that the A and B matrices may be depending on the duty ratio, indicating that the equation of the average duty ratio may be non-linear. The ultimate aim, however, is to generate the equivalent of a linear circuit model. Generalized equation for n-phase will be,

$\dot{\mathbf{x}} = Ax + Bu$ = $\qquad\qquad$ (16)

$y = cx$ $\qquad$ (17)

Transfer function is obtained by taking Laplace transform of equation (14) & (15)

$SX(S) = AX(s) + BU(s)$ $\qquad$ (18)

$(SI-A)\, X(s) = B\, U(s)$ $\qquad$ (19)

$X(s) = (SI-A)^{-1} B\, U(s)$ $\qquad$ (20)

$Y = C\, (SI-A)^{-1} B\, U(s)$ $\qquad$ (21)

The transfer function for this system is given by
$G(s) = C(SI-A)^{-1} B$ $\qquad$ (22)

Where $(SI-A)^{-1} = \frac{1}{|SI-A|}$ adj(SI-A) $\qquad$ (23)

As defined in equation (21) to find Inverse of a matrix, determinant and adjoint of matrix is obtained as shown in (23) and(25)

$$SI-A = \begin{bmatrix} s & 0 & \frac{1-D}{L} & 0 \\ 0 & s & 0 & \frac{D}{L} \\ \frac{D-1}{C} & 0 & \frac{sRC+1}{RC} & 0 \\ 0 & 0 & 0 & \frac{sRC+1}{RC} \end{bmatrix} \quad (24)$$

By finding the determinant of SI-A, we get

$$|SI-A| = \frac{s(sRC+1)}{R^2C^2\,L}\,[s^2 RLC + sL + (D-1)^2 R] \quad (25)$$

Minor =

$$\begin{bmatrix} \frac{s(sRC+1)^2}{R^2C^2} & 0 & \frac{(1-D)(s^2RC+s)}{RC^2} & 0 \\ 0 & \frac{sRC+1}{RC^2}\left[\frac{s(sRC+1)L+(D-1)^2 R}{RL}\right] & 0 & 0 \\ \frac{(1-D)s(sRC+1)}{RLC} & 0 & \frac{s^2(sRC+1)}{RC} & 0 \\ 0 & 0 & 0 & \frac{s^2(sRC+1)L+(1-D)^2 sR}{RLC} \end{bmatrix}$$

(26)

Adjoint=

$$\begin{bmatrix} \frac{s(sRC+1)^2}{R^2C^2} & 0 & \frac{(1-D)s(sRC+1)}{RLC} & 0 \\ 0 & \frac{sRC+1}{RC^2}\left[\frac{s(sRC+1)L+(D-1)^2 R}{RL}\right] & 0 & 0 \\ \frac{(1-D)(s^2RC+s)}{RC^2} & 0 & \frac{s^2(sRC+1)}{RC} & 0 \\ 0 & 0 & 0 & \frac{s^2(sRC+1)L+(1-D)^2 sR}{RLC} \end{bmatrix}$$

(27)

Substituting Adjoint of matrix in Inverse formula , Inverse of a matrix is represented by

$$(SI-A)^{-1} = \frac{1}{|SI-A|} \ adj(SI-A) \quad (28)$$

$$= \frac{R^2 C^2 L}{s(sRC+1)(s^2RLC+sL+(D-1)^2R)}$$

$$\begin{bmatrix} \frac{s(sRC+1)^2}{R^2C^2} & 0 & \frac{(1-D)s(sRC+1)}{RLC} & 0 \\ 0 & \frac{sRC+1}{RC^2}\left[\frac{s(sRC+1)L+(D-1)^2 R}{RL}\right] & 0 & 0 \\ \frac{(1-D)(s^2RC+s)}{RC^2} & 0 & \frac{s^2(sRC+1)}{RC} & 0 \\ 0 & 0 & 0 & \frac{s^2(sRC+1)L+(D-1)^2sR}{RLC} \end{bmatrix}$$

(29)

Substituting $(SI-A)^{-1}$ in the equation (28), then the transfer function obtained is,

$$G(s) = C \ (SI-A)^{-1} \ B \quad (30)$$

where output matrix C= [0 0 1 1]

and input matrix B=
$\begin{bmatrix} \frac{1}{L1} \\ \frac{1}{L2} \\ 0 \\ 0 \end{bmatrix}$

$$=[ 0 \ 0 \ 1 \ 1] * \frac{R^2C^2L}{s(sRC+1)(s^2RLC+sL+(D-1)^2R)}$$

$$\begin{bmatrix} \frac{S(sRC+1)^2}{R^2C^2} & 0 & \frac{(1-D)s(sRC+1)}{RLC} & 0 \\ 0 & \frac{sRC+1}{RC^2}\left[\frac{s(sRC+1)L+(D-1)^2 R}{RL}\right] & 0 & 0 \\ \frac{(1-D)(s^2RC+s)}{RC^2} & 0 & \frac{s^2(sRC+1)}{RC} & 0 \\ 0 & 0 & 0 & \frac{s^2(sRC+1)L+(1-D)^2sR}{RLC} \end{bmatrix} \begin{bmatrix} 1/L1 \\ 1/L2 \\ 0 \\ 0 \end{bmatrix}$$

(31)

The transfer function for this system obtained is as follows:

$$G(s)= \frac{(1-D)R}{s^2RLC+sL+(D-1)^2R} \quad (32)$$

Move work is gotten from state space examination inferred [9-11].Bode plot and the progression reaction is determined by the circuit boundaries appeared in Table II.
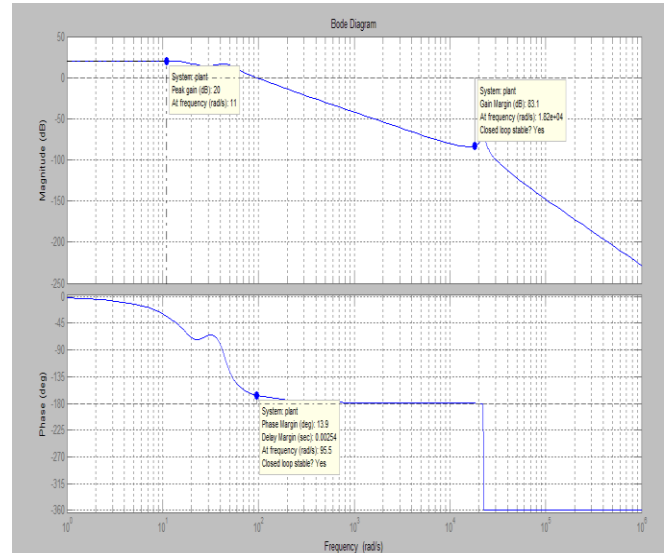


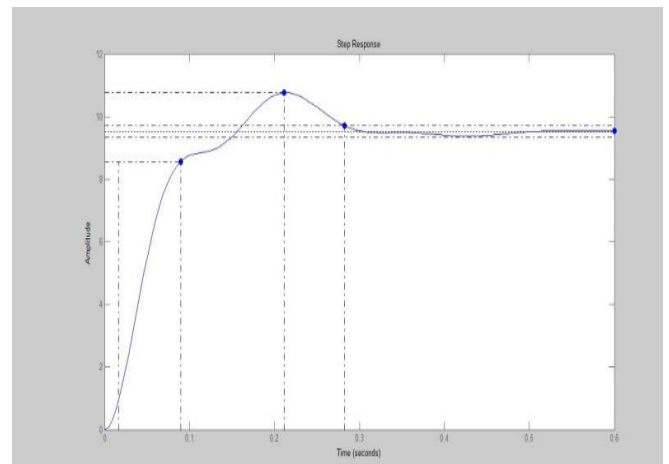Fig.5. Bode plot for the given transfer function



Fig.6. Step Response Plot for the transfer function

The system is found to be stable by the bode plot obtained, which is shown in Fig.6.The system is stable because it has an open-loop gain less than 1 when the phase is −180°.The gain margin is about 80dB.The phase margin is about 14°. Formal knowledge of a dynamic system's step response provides information about a system's stability and its ability to reach one stationary state when starting from another. Fig.7 shows the step response for the derived transfer function[12-14].

## V. RESULTS AND DISCUSSION

*A. Simulation Results For High Stepping*

Matlab Simulink is the product program utilized for the reenactment and the yield voltages are refered to down all through the capacitors. As demonstrated in Fig.7 recreation is performed for equal raise converter in Matlab Simulink. The circuit is recreated with Table II boundaries. Equal Boost converter has doable setups. Fig.8. recommends that yield voltage all through capacitor C1 and C2, and the expansion of voltages will supply a height of 400V.Output voltage of 250V is done with 70% of commitment cycle from the essential converter B1, and the 150V is done with

half of commitment cycle from the second one converter B2.Simulation Component Values is demonstrated in under. Table II.
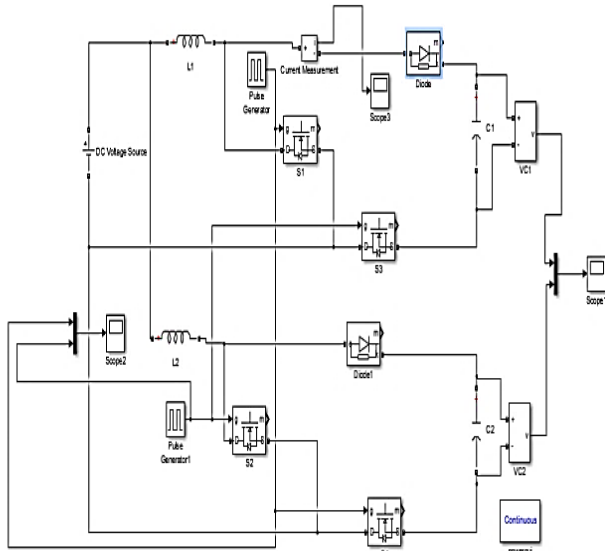


Fig.7. MATLAB/Simulink Model for Parallel Boost Converter

TABLE II. SIMULATION COMPONENT VALUES

| Components | Values |
|---|---|
| L1,L2 | 0.5 µH |
| C1,C2 | 1000µF |
| $R_L$ | 100Ω |
| $V_{LOW}$ | 40V |
| Duty Cycle1 | 70% |
| Duty Cycle2 | 50% |
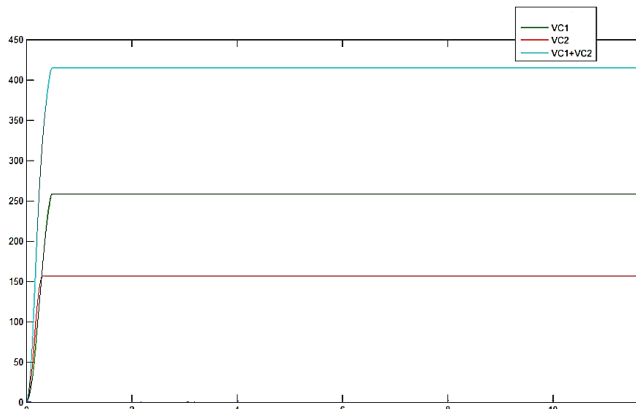


Fig.8. Voltage Vc1, Vc2,$V_{load}$for high output gain
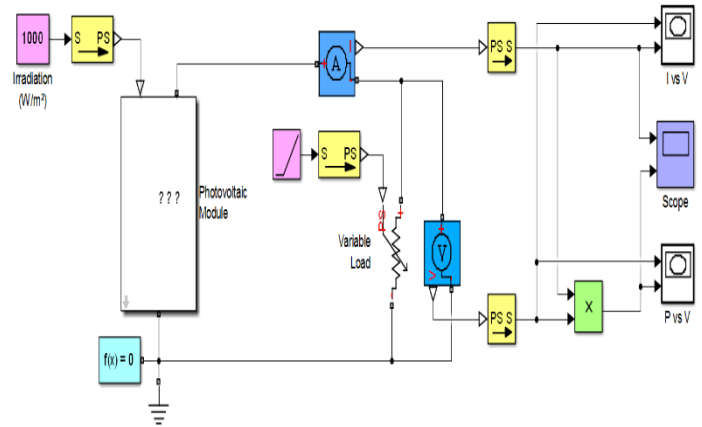


Fig.9. MATLAB Model for Single PV Module

TABLE III. PARAMETERS OF PV PANEL

| Parameter | Value |
|---|---|
| Power | 600 Watt |
| $V_{OC}$ | 64.2 V |
| $V_{PM}$ | 54.7 V |
| $I_{SC}$ | 5.96 A |
| $I_{PM}$ | 5.58 A |

Fig.9. depicts the MATLAB Model for Single PV Module. The temperature is steady for the planned PV framework. Be that as it may, the illumination is changed during the investigation. The light and temperature illustrations are portrayed in Fig.10.The irradiation applied to the implemented PV module is started at 1000 W/m².

TABLE IV. OUTPUT OF PV SYSTEM FOR CONSTANT T= 25CENTIGRADE

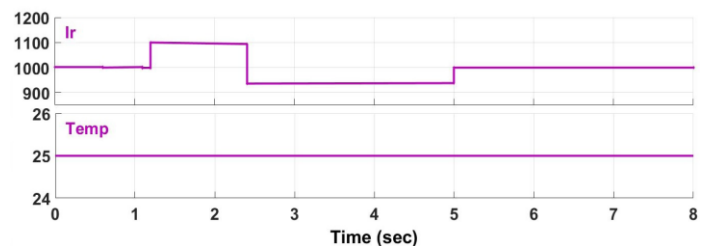| Solar Irradiance(W/m²) | PV Module Power(Watts) | Current(Amp) |
|---|---|---|
| 1000 | 200 | 6 |
| 750 | 150 | 4.5 |
| 500 | 100 | 3 |
| 250 | 50 | 1.5 |



Fig.10.Irradiation and temperature

The simulation results of I-Vcurve and P-Vcurve of PV model for different solar irradiation and constant temperature (T=25 $^0$C) are shown in Fig.11.
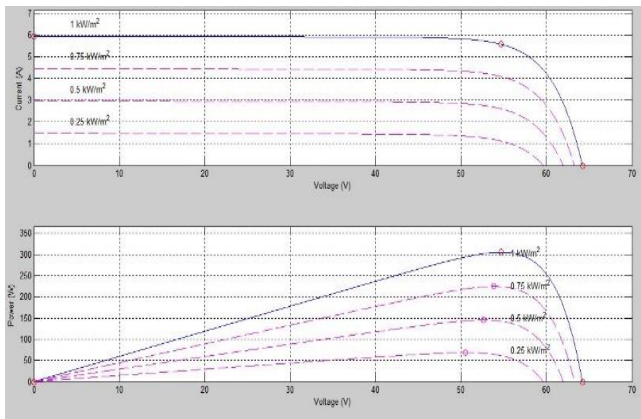


Fig.11. I-V Curve and P-V Curve for Different Solar Irradiance

In the course cell arrangement, the geography is utilized to take care of the voltage required of two full H extension of the staggered inverter. Yield Voltage across the heap acquired is 150V for the H-Bridge Inverter associated in arrangement to take care of a solitary burden Output Current across the inverter is 5A.



Fig.12.Output Voltage across the Load for the proposed arrangement



Fig.13.Output Current for the arrangement

In the course cell arrangement, the geography is utilized to take care of the voltage required of two full H extension of the staggered inverter. Yield Voltage across the heap acquired is 150V for the H-Bridge Inverter associated in arrangement to take care of a solitary burden Output Current across the inverter is 5A.
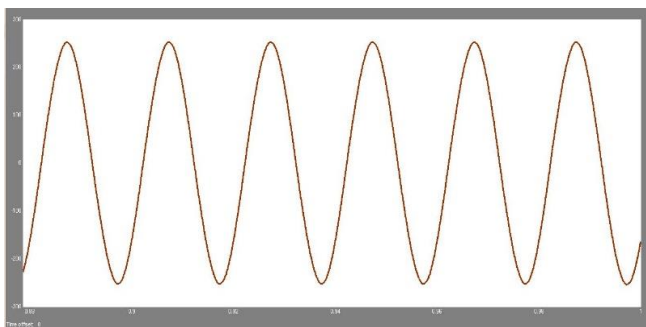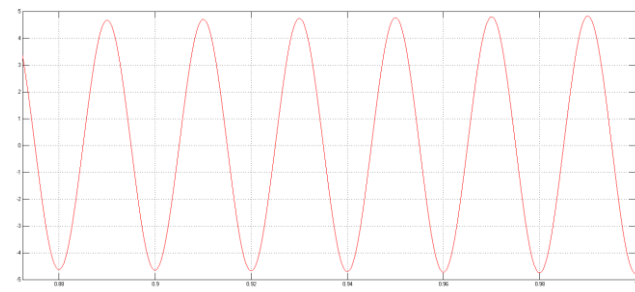
## IV. CONCLUSION

Introduced waveforms clarifies the Modeling and Analysis of a Parallel Boost miniature inverter for single-portion PV power device. The significant objective of this examinations changed into to improve the exhibition of the sun PV essentially based absolutely Parallel Boost converter and reduction the exchanging losses.State Space Analysis of Parallel Boost converter are characterized on this canvases. Numerical demonstrating is in like manner finished for the same.By the utilization of MATLAB Simulink programming program beneathneath diverse sun irradiance PV contraption with a negligible assortment of semiconductors and exorbitant effeciency is analysed.Output voltage gained is normal sine waveform regardless of the way that the sun irradiance will increment or diminishes.The experimental verification might beexecuted in destiny. As a destinypaintings, an in depthmethod to estimate the manipulate parameters may be investigated.

## REFERENCES

[1]. Walker, G, "Evaluating MPPT converter topologies using a MATLAB PV Model", J. Electr. Electron. Eng. vol. 21, no. 1, August 2001, pp. 49–56.

[2]. Hiren Patel and Vivek Agarwa, "MATLAB Based Modeling to Study the Effects of Partial Shading on PV Array Characteristics", IEEE transactions on energy conversion vol. 23, no.1, March 2008,pp .302-310.

[3]. H. H. C. Iu, C. K. Tse, V. Pjevalica and Y.M. Lai, "Analysis of Hopf Bifurcation in Parallel-Connected Boost Converters via Averaged Models" Department of Electronic and Information Engineering, Hong Kong Polytechnic University, Hong Kong 2012.

[4]. Gow, J.A., and Manning, C.D, "Development of a photovoltaic array model for use in power Electronics simulation studies", IEE Proc.- Electr. Power Appl., vol.146, No.2, March 1999,pp.193-200

[5]. Panwar, N.L., Kaushik, S.C. and Kothari, S., "Role of renewable energy sources in environmental protection: a review",. Renewable and Sustainable Energy Reviews, 15(3), 2011 pp 1513-1524.

[6]. Liu, X., Yang, P., Liu, Y.F. and Deng, J., "Modeling and simulation of Parallel Current Mode controlled boost converter". In Industrial Electronics and Applications, ICIEA 3rd IEEE Conference 2008, pp 2199-2204.

[7]. D. S. Bezerra and R. P. Torrico- Bascope, "A Non isolated DC–DC Boost Converter With High Voltage Gain and Balanced Output Voltage," IEEE Trans. Ind. Electron., vol. 61, no. 12, pp. 6739-6746, Dec. 2014.

[8]. Sarwar, A., Shahid, A., Hudaif, A., Gupta, U. and Wahab, M., "Generalized state-space model for an n-phase interleaved buckboost converter". In 2017 4th IEEE Uttar Pradesh section international conference on electrical, computer and electronics (UPCON) IEEE,2017, pp 62-67.

[9]. W. Y. Choi , J. S. Yoo , J. Y. Choi, Min-Kwon Yang and Hyoung-SupCho, "High efficiency step-up DC-DC converter for low-DC renewable energy sources," Power Electronics, Electrical Drives, Automation and Motion (SPEEDAM), 2012 International Symposium on, Sorrento, 2012, pp. 1417-1421

[10]. Liivik, E., Chub, A., Kosenko, R. and Vinnikov, D., June. "Low-cost Photovoltaic Microinverter with Ultra-wide MPPT voltage range",6th International Conference on Clean Electrical Power (ICCEP),2017, pp. 46-52.

[11]. Abdar, H.M., Chakraverty, A., Moore, D.H., Murray, J.M. and Loparo, K.A., "Design and implementation a specific grid-tie inverter for an Agent-based microgrid",IEEE Energytech, 2012,pp 1-6.

[12]. Nezamuddin, O., Crespo, J. and dos Santos, E.C., "Design of a highly efficient micro-inverter". IEEE 43rd Photovoltaic Specialists Conference (PVSC),2016, pp 3463-3468.

[13]. S.K. Changchien, T. J. Liang, J. F. Chen and L. S. Yang, "Novel High Step-Up DC–DC Converter for Fuel Cell Energy Conversion System," in *IEEE* Transactions on Industrial Electronics, vol. 57, no. 6, pp. 2007-2017, June 2010.

[14]. Mohan, N., Undeland, T.M. and Robbins, W.P., "Power Electronics- Converters, Applications and Design", New York, Wiley, pp 161-187.

[15]. Texas Instruments. Working with Boost Converters. *Application Report SNVA731* - June 2015

[16]. Yi, J.L.M., Naayagi, R.T. and Logenthiran, T., 2016, November "Modelling and Implementation of Single Phase Dual Stage Grid-tied Solar Power Inverter" IEEE Region 10 Conference (TENCON), 2016,pp.1879-1883.

[17]. Thomas, P., 2017, March. "Bidirectional dual inverter algorithm for grid tied micro grid systems", Third International Conference on Science Technology Engineering & Management (ICONSTEM), 2017, pp.526-529.

[18]. Das, Saurav, and Khosru M. Salim. "Design and implementation of one kilowatt capacity single phase grid tie photovoltaic inverter", International Conference on Electrical Engineering and Information & Communication Technology,IEEE,2014,pp 1-5.

[19]. https://en.wikipedia.org/wiki/Solar_micro-inverter.