BAYES SOFT SWITCHING INTERLEAVED TECHNIQUE FOR HIGH POWER DC-DC BOOST CONVERTER

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ABSTRACT

DC/DC converter combines conventional pulse-width-modulation and soft commutation to promote circuit performance. Phase shedding is preferred method for improving light load efficiency of higher power application in DC/DC converter. Power for the boost converter is obtained from any DC sources that include batteries, solar panels, rectifiers, DC generators and so on. However, the major challenge encountered is the poor transient behavior of system immediately after phase shedding. To improve the efficiency interleaved soft switching and interleaved converter with built-in transformer have already been designed by applying interleaved soft switching multilevel DC-DC converter algorithm. However, to improve the efficiency of dc-dc converter in high current and high power application, a framework called, Bayes Soft Switching Interleaved Boost Converter (BSS-IBC) is introduced. The Bayes Soft Switching Interleaved Boost Converter (BSS-IBC) framework maintains steady state transient behavior and therefore improves the efficiency in high current and high power DC-DC booster application. The soft switching introduces a secondary layer switch to the dc-dc boost converter, comprising of inductor and capacitor. Naive Bayes classifiers are then used to identify the required number of parameters (power, voltage and current ripple) linear in the secondary layer soft switching. Finally, the maximum-likelihood training is conducted by evaluating a closed-form expression for achieving high output power with reduced ripple effects on the current and voltage gains in the proposed dc-dc converter. The performance of BSS-IBC is compared with traditional soft switching interleaved boost converter in terms of output power, ripple effects, switching time, gain ratio, voltage and current settings.

Keywords: Multilevel boost converter, Voltage multiplier cell, Winding-cross-coupled inductors, Bayes Soft Switching Interleaved Boost Converter.

1. Introduction

Different methods and techniques are developed by several researchers on soft switching interleaved boost converter to obtain high output power with reduced ripple effects. Interleaved soft switching multilevel boost converter [1], combined multilevel boost converter and interleaved boost converters. By applying multilevel boost converter, high voltage gain was obtained from simple composition. However, multilevel dc-dc boost converter was based on inductor which required a higher duty ratio to gain high output voltage.
In order to obtain high output voltage High Step-Up Interleaved Converter with Built-In Transformer Voltage Multiplier Cells for Sustainable Energy Applications algorithm [2] was proposed. The algorithm included a voltage multiplier cell that consisted of built-in transformer windings, diodes and small capacitors. However, Winding-cross-coupled inductors were considered to be more complex and difficult to design, which in turn increased the circuit complexity and reduced the efficiency. To improve the efficiency 4-Phase Interleaved Boost Converter with IC Controller for Distributed Photovoltaic Systems algorithm [3] was proposed. Here, Integrated circuit (IC) embedding power MOS switches performed the converter control section and MPPT algorithm. However, MPPT currents associated to a module was permanently unbalanced for different reasons and at the same time smaller inductor had lower parasitic resistance and capacitance.

CCM and DCM Operation of the Integrated- Magnetic Interleaved Two-phase Boost Converter algorithm [4] was proposed to improve the overall efficiency of converter. However, boost converter was considered to be critical to increase poorly-regulated voltage fuel-cell. Another method called zero-current switching [5] reduced the commutation losses with the application of insulated gate bipolar transistor. Dc-Dc converter was designed using coupling with inductor and simulation was conducted with the aid of PSIM algorithm [6], to boost voltage level that in turn improved the efficiency measures. But, all these methods were complex to be implemented and the cost incurred was also high due to the use of coupled inductor technique. Variation tolerant phase technique was applied in [7] which provided better performance improvement in terms of power factor.

Another method called Pulse Width Modulation was designed in [8] aiming at improving the power. Though power was improved, but it was performed at the cost of time. An integrated Zero-Voltage-Switching Pulse-Width-Modulation [9] helped in improving the switch losses at an early stage. Novel soft switching interleaved boost converter as proposed in [10] using boost converter unit and auxiliary inductor. The operation of the circuit resulted in higher efficiency. However, it was not easy to analyze and also the circuit was too complex to be implemented. A new phase shedding scheme [11] using continuous conduction mode was introduced with the objective of improving the output voltage stability.

An interleaved soft switching boost converter for a Photovoltaic Power Conditioning System (PV-PCS) with high efficiency was proposed in [12]. 2phase interleaved boost converter was introduced to improve the efficiency of converter. However, due to switching losses, soft switching interleaved boost converter topology was not efficient in improving the output voltage.

Multilevel Dc-Dc boost converter significantly reduced the loss and reduced the ripple by introducing novel high efficiency multilevel dc-dc boost converter in [13]. But efficiency was achieved at the cost of loss reduction and also it used high voltage switching devices which do not resulted in attractive solution. A high power dc-dc boost converter was adopted to obtain output voltage by implementing interleaved dc-dc boost converter for fuel applications in [14]. Here the converter also reduced the fuel ripple current. But, it included only low duty cycle operation. These resulted in loss and also the interleaved boost converter became insufficient.

Soft switching as proposed in [15] used Soft-switching inverter-fed single-phase collector motor drive to obtain significant reductions in power loss and reduced the current flow to the power switches. This was improved by using voltage regulator. But the liner model did not show better results on single phase interleaves boost converter. In order to obtain significant output voltage and power levels, soft switching interleaved boost converter for high step-up and high power applications algorithm was introduced in [16] [17]. The converter included a series and parallel connection and was also more flexible. However, boost converter attained high output voltage by applying the switches in converter.

A soft switched model [18] using zero current and zero voltage switches were introduced to minimize the penalty due to reduced switching losses. A Dc-Dc multiplier boost converter in [19] and their performance analysis [20] with respect to duty ratio of switches were measured with the aid of Maximum Power Point Tracking algorithm. In order to overcome the issues of
high output power and high efficiency of the system with reduces in switching losses, Bayes soft switching interleaved boost converter on high power Dc-to-Dc boost converter is proposed. Here naive Bayes classifier is used for attaining high output power with reduced ripple effect. Finally output of the converter is measured with high output power.

2. Design of Bayes Soft Switching Interleaved Boost Converter

The interleaved-boost converter when coupled to a voltage-doubler circuit, results in higher voltage gain comparatively higher than the conventional boost topology. At the same time, the interleaved-boost converter provided with low-voltage stress across switches, the output capacitors has a good balance in voltage and the operation of magnetic components performs with double of switching frequency. These characteristics make the interleaved-boost converter fit in for many applications.

Some of the applications include requirements of higher voltage, energy required in the form of renewable source and applications that demand for uninterrupted power scenarios. The soft-switching interleaved boost converter consists of two components. They include an auxiliary inductor and elementary boost conversion units with two shunts. This soft-switching interleaved boost converter turn on both the active power switches at zero voltage. This as a result reduces the loss occurring during switching and in turn results in the efficiency in conversion.

In this work, a Bayes soft switching interleaved boost converter is introduced aiming at improving the efficiency of dc-dc converter in high current and high power application. Fig 1 given below shows the block diagram of Bayes soft switching interleaved boost converter. With the introduction of Bayes soft switching interleaved boost converter, the dc to dc converter obtains high output power with reduced ripple effects.

![Fig1 Block diagram of Bayes Soft Switching Interleaved Boost Converter](image)

As shown in fig the proposed framework Bayes Soft Switching Interleaved Boost Converter (BSS-IBC) consists of three main components. The three main components included are Dc-to-Dc converter, Soft switch interleaved boost converter and Naïve Bayes classifier.

2.1. Dc-to-Dc converter

The Dc-to-Dc converter in BSS-IBC framework also referred to as step-up converter is a power converter whose output voltage is greater than its input voltage. The design of DC-to-DC converter is made in such a way that it includes a class of switched-mode power supply (SMPS). The BSS-IBC framework SMPS consists of two semiconductors namely a diode and a transistor and a single energy storage element called as the capacitor, inductor, or includes both the capacitor and inductor. At the same time, in the BSS-IBC framework in order to reduce the output voltage ripple, filters made up of capacitors are added to the output of the converter.
Fig 2 given above shows the block diagram of Dc-to-Dc boost converter. As shown in fig2, the operations are carried out in two stages namely, switch on and switch off conditions. The energy stored in the inductor is measured in a significant manner using the switch on and switch off conditions.

In Dc-to-Dc Boost Converter, when the switch is closed (i.e. switch off), then the current flows through the inductor in clockwise direction and the energy is stored in the inductor by generating a magnetic field. The polarity of the inductor is positive on left side. On the other hand, when the Dc-to-Dc Boost Converter is in off stage, when the switch is opened (i.e. switch on), the impedance is higher, and as a result, the current is reduced. The magnetic field maintains the current flow towards the load. Thus the polarity of the inductor is reversed (i.e. the polarity of the inductor is negative on the left side. As a result inductor and diode are said to be in series resulting in a higher voltage to charge the capacitor.

As the converter operates in steady-state conditions (i.e. switch on and switch off), the amount of energy stored in each of its components is said to be same at the initial and completion stage of a commutation cycle. Therefore, the energy stored in the inductor is obtained by evaluating the mathematical formulation as given below.

\[ E = \frac{1}{2} L I^2 \]  

From (1), the energy stored in the inductor is represented as ‘E’, whereas ‘L’ indicates the inductor value with load current value denoted as ‘I^2’ respectively.

2.2. Soft Switching Interleaved Boost Converter

The second component used in the design of BSS-IBC framework is the soft switching interleaved boost converter. The soft switching interleaved boost converter provides high voltage gain and efficiency in addition to multilevel Dc-to-Dc boost converter and interleaved boost converter. High step up Dc-to-Dc boost converter is based on switched capacitor which is used for low power application.

On the other hand, the Soft Switching Interleaved Boost Converter is applied for achieving high efficiency and it is more preferable when power attains is high state. The high voltage gain in Soft Switching Interleaved Boost Converter is obtained through efficient coupling with the inductor.

For improving the efficiency of Dc-to-Dc converter in high current and high power application, the Soft Switching Interleaved Boost Converter in BSS-IBC framework introduces a secondary layer switch to the dc-dc boost converter, comprising of inductor and capacitor.
Fig 3 shows the block diagram of soft switching interleaved boost converter. From fig 3, $V_i$ and $V_o$ are the input and output voltages respectively whereas the capacitors are denoted as $C_2, C_2, C_3$ and diodes are denoted as $D_2, D_2, D_2$. Finally, the measure of voltage across the capacitor in BSS-IBC framework is represented as $V_{c1}, V_{c2}$ and $V_{c3}$ with the resistive load denoted as $R_L$.

By assuming the capacitor ripple value as a constant factor for each duty cycle, the value of high output voltage gain $\Delta V_{out}$ is measured using the mathematical evaluation as given below.

$$\Delta V_{out} = \frac{I_{out(max)} \times (1 - D_{min})}{f_s \times C_{out}} \quad (2)$$

From (2), high output voltage gain is obtained using the maximum of output load current $I_{out}$ and minimum duty cycle $D_{min}$ respectively. The minimum duty cycle ratio is measured as given below.

$$D_{min} = \frac{\frac{V_{out} + V_d - V_{in(Min)}}{V_{out} + V_d - V_{in}}}{V_{out}} \quad (3)$$

From (3), the minimum duty cycle ratio $D_{min}$ is obtained using the minimum input voltage $V_{in(Min)}$, nominal output voltage $V_{out}$ and typical input voltage $V_{in}$ respectively.

2.3 Bayes Soft Switching Interleaved Boost Converter

The Bayes Soft Switching Interleaved Boost Converter in BSS-IBC framework is used to identify the required number of parameters (power, voltage and current ripple) linear in the secondary layer soft switching. The parameters like power, voltage and current ripple are subjected to evaluation through high power Dc-to-Dc converter application with BSS-IBC for better trained converter.

Several tasks including promotion of circuit performance, photovoltaic applications, and high current and high power applications can be viewed as classification. Naïve Bayes Classification involves the process of predicting unknown output values (power, voltage and current ripple), using known input values (input voltage, absolute output voltage). In order to perform Naïve Bayes Classification, the relationship between the input variables and the output variables should be predicted in an efficient manner. This classification model involves BSS-IBC framework using data where both the input variables and the output variables are present.

Let us consider that $P = \{V_1, V_2, V_3, ..., V_n, CL\}$ consists of random variables, where $V_1, V_2, V_3, ..., V_n$ represents the attribute variables with $CL$ representing the class variable ranging from $cl_1, cl_2, cl_3, ..., cl_n$ respectively. The Naïve Bayes Classification with the first set
of unknown output values (power, voltage and current ripple), using known input values (input voltage, absolute output voltage) is then formulated as given below

\[ Prob (V_1 = v_1 | V_2 = v_2, \ldots, V_n = v_n, CL = c) \times Prob (V_1 = v_1 | CL = c) \]

Similarly for the second set of unknown output values, the formulation is as given below

\[ Prob (V_2 = v_2 | V_2 = v_2, \ldots, V_n = v_n, CL = c) \times Prob (V_2 = v_2 | CL = c) \]

In the BSS-IBC framework, let us assume that for each ‘\( V_i \)' that its outcome (power, voltage and current ripple) is independent of the outcome of all other ‘\( V_j \)', from a given class variable ‘\( CL \)', then the likelihood is formulated as given below.

\[ Prob'(V_j = v_j \cup CL = c) = \frac{\text{sum}(V_j = v_j \cup CL = c)}{\text{sum}(CL = c)} \]

From (6), maximum likelihood training estimates is obtained. The maximum-likelihood training is conducted by evaluating a closed-form expression which takes linear time for achieving high output power with reduced ripple effects on the current and voltage gains in the proposed Dc-to-Dc converter and therefore reduces the time complexity.

### 2.3.1 Algorithm for Naïve Bayes Soft Switching Classifier

An algorithm for efficient classification for high current and high power application using Naïve Bayes Soft Switching Classifier is explained. Based on the Naïve Bayes Soft Switching Classifier (NBSSC) algorithm, the output voltage of boost converter is increased with reduced ripple effects. The algorithmic description for NBSSC is explained below.

**Algorithm for Naïve Bayes Soft Switching Classifier**

1. **Initialize**: Input voltage ‘\( V_m \)’, inductor ‘\( L \)’, load current ‘\( I_0 \)’, output load current ‘\( I_{out} \)’, minimum duty cycle ‘\( D_{min} \)’, nominal output voltage ‘\( V_{out} \)’, typical input voltage ‘\( V_{in} \)’.
2. **Output**: Output voltage power measured ‘\( V_{out} \)’.
3. **with reduced ripple effects**

   **Step 1**: Begin
   **Step 2**: For each input voltage ‘\( V_m \)’
   **Step 3**: Measure the energy stored in inductor using (1)
   **Step 4**: Measure output voltage gain using (2)
   **Step 5**: Evaluate minimum duty cycle ratio using (3)
   **Step 6**: Apply Naïve Bayes Classifier using (6)
   **Step 7**: Measure maximum likelihood using (6)
   **Step 8**: End for
   **Step 9**: End

**Fig4 Naïve Bayes Soft Switching Classifier Algorithm**

Fig4 given above shows the algorithmic description of Naïve Bayes Soft Switching Classifier with output voltage power measured with reduced ripple effects. Initially, soft switching interleaved boost converter is applied with input voltage. The Interleaved boost converter consists of parameters namely inductor and capacitor coupled with each other. Here inductor and capacitor is coupled with boost converter and it produces high voltage gain. Naïve Bayes classifier consists of the parameter which is used to measure the current and voltage value
with reduced ripple effects. The output of boost converter and separate dc supply is provided for naïve Bayes classifier to obtain the final output voltage.

4. Experimental Evaluation

In order to achieve high output power with reduced ripple effects on the current and voltage gains, the proposed BSS-IBC framework is implemented in MATLAB platform. There are three modes converter implemented in MATLAB. The model consists of output voltage and inductor current which is in the system. Interleaved boost converter consists of parameter namely inductance, capacitance and internal resistance.

The performance of proposed BSS-IBC framework is compared with the existing Interleaved Soft Switching Multilevel Boost Converter (ISS-MBC) [1] and 4 phase interleaved boost converter (4phase-IBC) [3] in terms of o/p power, ripple effects, switching time, gain ratio, voltage and current settings. Under ideal condition, the output voltage of the converter is measured using [1] as mentioned below.

\[ V_{out} = N \times V_c \]  

\[ V_{out} = \left( \frac{N}{1-D} \right) \times V_{in} \]  

From (7) and (8), the output and input voltages are represented by ‘\( V_{out} \)’ and ‘\( V_{in} \)’ with switch-on duty ratio denoted by ‘\( D \)’ for the switch ‘\( S \)’ with ‘\( V_c \)’ being the converter’s voltage. On the other hand, the information gain ratio of the proposed BSS-IBC framework is calculated by the ratio of information gain \( IG \) to the intrinsic value \( IV \). Therefore, the information gain ratio for BSS-IBC framework is evaluated as given below.

\[ IGR = \frac{IG}{IV} \]  

From (9), the information gain ratio ‘\( IGR \)’ is measured in an extensive manner. The switching time is the most essential in the proposed framework that helps to measure the switching losses in device in an extensive manner. Switching time is measured on the basis of the total time taken by the boost converter and end time of the converter.

5. Performance Analysis of Bayes Soft Switching Interleaved Boost Converter (BSS-IBC)

The performance analysis of Bayes Soft Switching Interleaved Boost Converter (BSS-IBC) framework is carried out using MATLAB for various simulation settings. Maximum-likelihood training is conducted by evaluating a closed-form expression which takes linear time for achieving high output power with reduced ripple effects on the current and voltage gains in the proposed dc-dc converter. It is compared with existing interleaved soft switching multilevel boost converter (ISS-MBC) and 4 phase interleaved boost converter (4phase-IBC). The performance is evaluated according to the following metrics.

5.1. Measure of converter power output

The output power for the interleaved boost converter using Bayes soft switching is measured based on input voltage and current. Converter power output is given by the product of input voltage and input current. The converter power output is measured in terms of watts. An input is provided with dc supply and the inverter converts the dc input into an ac output power. The mathematical evaluation for converter power output is given as below.

\[ \text{Inverter power output (watts)} = V_{in} \times I_{in} \]  

The inverter power output evaluated using the three methods are as given below.

| Output Power (using ISS-MBC) | 5 (V) x 16 (mA) = 80 Watts |
| Output Power (using 4phase-IBC) | 5 (V) x 19 (mA) = 95 Watts |
| Output Power (using BSS-IBC framework) | 5 (V) x 26 (mA) = 130 Watts |
In table 1, the experimental evaluation of power output is measured according to input voltage and current. It is measured in terms of watts. The table given below compares the power output with existing works ISS-MBC [1] and 4 phase-IBS [3].

<table>
<thead>
<tr>
<th>Input voltage (V)</th>
<th>Existing ISS-MBC</th>
<th>Existing 4phase-IBC</th>
<th>Proposed BSS-IBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>80</td>
<td>95</td>
<td>130</td>
</tr>
<tr>
<td>10</td>
<td>95</td>
<td>120</td>
<td>145</td>
</tr>
<tr>
<td>15</td>
<td>110</td>
<td>140</td>
<td>160</td>
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<tr>
<td>20</td>
<td>125</td>
<td>155</td>
<td>170</td>
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<tr>
<td>25</td>
<td>130</td>
<td>175</td>
<td>200</td>
</tr>
<tr>
<td>30</td>
<td>145</td>
<td>190</td>
<td>210</td>
</tr>
<tr>
<td>35</td>
<td>150</td>
<td>205</td>
<td>225</td>
</tr>
</tbody>
</table>

Fig5 given above shows the measure of power output with respect to the varied input voltage provided in table 1. From the figure, we can observe that the interleaved boost converter power output is improved using BSS-IBC framework when compared to two other two existing methods namely Interleaved Soft Switching Multilevel Boost Converter (ISS-MBC) [1] and 4 phase interleaved boost converter (4phase-IBC) [3]. This improvement in the power output is due to the application of soft switching that extensively introduces a secondary layer switch to the DC-to-DC boost converter. This in turn results in the improvement of power output using the BSS-IBC framework by 32% when compared to ISS-MBC [1] and improved by 18% when compared with 4phase-IBC [3].

5.2. Measure of Ripple effect

The mathematical evaluation of ripple effect is given below and is measured in terms of percentage (%).

\[
\text{Ripple effect (\%)} = \frac{\text{RMS value of ripple voltage}}{\text{absolute value of output voltage}} \times 100
\] (11)

The ripple effect obtained using the three methods is as given below.

<table>
<thead>
<tr>
<th>Ripple effect (using ISS-MBC)</th>
<th>(4.5(V) / 10(V)) *100 (=) 42%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ripple effect (using 4phase-IBC)</td>
<td>(4.2(V) / 10(V)) *100 (=) 42%</td>
</tr>
<tr>
<td>Ripple effect (using BSS-IBC)</td>
<td>(3.8(V) / 10(V)) *100 (=) 38%</td>
</tr>
</tbody>
</table>

Table 2 given below describes the result of ripple effect with respect to the absolute output voltage and rms value of ripple voltage and is measured in terms percentage (%). The resultant ripple effect is measured using the three methods ISS-MBC, 4phase-IBC and BSS-IBC framework respectively.
### Table 2 Tabulation for Ripple effect

<table>
<thead>
<tr>
<th>Absolute output voltage (V)</th>
<th>Ripple effect (%)</th>
<th>Existing ISS-MBC</th>
<th>Existing 4phase-IBC</th>
<th>Proposed BSS-IBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>45</td>
<td>42</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>47</td>
<td>44</td>
<td>41</td>
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<td>50</td>
<td>54</td>
<td>51</td>
<td>48</td>
<td></td>
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<tr>
<td>60</td>
<td>57</td>
<td>54</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>61</td>
<td>57</td>
<td>53</td>
<td></td>
</tr>
</tbody>
</table>

![Fig 6](image)

**Fig 6 Measure of ripple effect with respect to absolute output voltage**

Fig 6 given above shows the measure of ripple effect with varying absolute output voltage in the range of 10 V to 70 V recorded from the Table 2. From the fig it is evident that the ripple effect in interleaved boost converter is reduced in proposed BSS-IBC framework when compared to the two other existing methods namely Interleaved Soft Switching Multilevel Boost Converter (ISS-MBC) [1] and 4 phase interleaved boost converter (4phase-IBC) [3]. This is because by applying maximum likelihood training using the Naïve Bayes classifier a closed-form expression is used which extensively takes linear time on the current and voltage gains in the proposed Dc-to-Dc converter. As a result, reduced ripple effects is achieved using BSS-IBC framework by 15% when compared to ISS-MBC [1] and decreases by 9% when compared to 4phase-IBC respectively [3].

### 5.3 Measure of switching time

Switching time of the interleaved boost converter is based on time and frequency of the output and is measured in terms of millisecond (ms). Switching time is inversely proportional to the frequency.

\[
\text{Switching time (ms)} = \text{Time taken by converter} - \text{end time}
\]  

(12)

The switching time evaluated using the three methods is as given below.

- Switching time (using ISS-MBC) = 10(ms) - 5.8(ms) = 4.2ms
- Switching time (using 4phase-IBC) = 10(ms) - 6.4(ms) = 3.6ms
- Switching time (using BSS-IBC) = 10(ms) - 6.8(ms) = 3.2ms

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Table 3 Tabulation for switching time

<table>
<thead>
<tr>
<th>Input voltage (V)</th>
<th>Switching time (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing ISS-MBC</td>
</tr>
<tr>
<td>10</td>
<td>4.2</td>
</tr>
<tr>
<td>20</td>
<td>4.6</td>
</tr>
<tr>
<td>30</td>
<td>4.9</td>
</tr>
<tr>
<td>40</td>
<td>5.8</td>
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<tr>
<td>50</td>
<td>5.6</td>
</tr>
<tr>
<td>60</td>
<td>6.5</td>
</tr>
<tr>
<td>70</td>
<td>6.8</td>
</tr>
</tbody>
</table>

Table 3 given above, describes the result of switching time with respect to the input voltage and end time of the converter. It is measured in terms milliseconds (ms). The comparison results are performed using the three methods, ISS-MBC, 4phase-IBC and the proposed BSS-IBC framework.

6. Conclusion

In this work, a Bayes Soft Switching Interleaved Boost Converter (BSS-IBC) framework is proposed on Dc-to-Dc boost converter with the objective of maintaining steady state transient behavior and improving efficiency in high current and high power DC-DC booster application. The Soft Switching Interleaved Boost Converter in BSS-IBC framework introduces a secondary layer switch to the Dc-to-Dc boost converter, consisting of inductor and capacitor. To the secondary layer switch, Naive Bayes classifiers are applied to identify the required number of parameters in a linear fashion. With the classified parameters, Maximum-likelihood training is conducted by evaluating a closed-form expression for achieving high output power with reduced ripple effects on the current and voltage gains. Finally by applying naïve Bayes classifiers output on dc converter, high output voltage with reduced ripple effect is obtained. The output voltage is improved by 24 % and ripple effect is reduced by 12 %. In our experimental results the soft switching interleaved boost converter shows better performance than the state-of-the-art-works over the parameters, such as o/p power, ripple effects, switching time, gain ratio, voltage and current settings.
REFERENCES


