Abstract: A method for providing non-resonant zero-voltage switching in a switching power converter (42, 44). The switching power converter converts power from input power to output power during multiple periodic switching cycles. The switching power converter includes a switch (Qbu, Qbo) and an auxiliary capacitor (Cbu, Cbo) adapted for connecting in parallel with the switch (Qbu, Qbo), and an inductor (206) connectable to the auxiliary capacitor (Cbu, Cbo). The main switch (Q1, Q3) is on. A previously charged (or previously discharged) auxiliary capacitor (Cbu, Cbo) is connected across the main switch (Q1, Q3) with auxiliary switches (Qbu, Qbo, Qbu, Qbo). The main switch (Q1, Q3) is switched off with zero voltage while discharging/discharging the auxiliary capacitor (Cbu, Cbo) by providing a current path to the inductor (206). The auxiliary capacitor (Cbu, Cbo) is disconnected from the switch (Q1, Q3). The voltage of the auxiliary capacitor (Cbo, Cbu) is charged and discharged alternatively during subsequent switching cycles. The voltage of the auxiliary capacitor (Cbu, Cbo) stays substantially the same until the subsequent turn off of the main switch (Q1, Q3) during the next switching cycle with substantially no energy loss in the auxiliary capacitor (Cbu, Cbo).
AMENDED CLAIMS
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1. A method for providing non-resonant zero-voltage switching in a switching power converter
convening power from an input power to an output power during a plurality of periodic switching
cycles, said switching power converter including a main switch and an auxiliary capacitor adopted
for connecting in parallel with the main switch using a first auxiliary switch and a second auxiliary
switch, wherein the first auxiliary switch is disposed between the input power and the auxiliary
capacitor, wherein the second auxiliary switch is disposed between the auxiliary capacitor and an
inductor, the method comprising the steps of:

wherein the auxiliary capacitor is previously charged in a first switching cycle using the
first auxiliary switch when the main switch is on, connecting the auxiliary capacitor across the
main switch;

switching off the main switch at zero voltage while discharging the auxiliary capacitor by
providing a current path to the inductor using the second auxiliary switch;

disconnecting the auxiliary capacitor from the main switch using the second auxiliary
switch; and

charging and discharging alternatively the auxiliary capacitor during a plurality of switching
cycles, wherein the voltage of the auxiliary capacitor stays substantially the same until the
subsequent turn-off of the main switch during the next switching cycle with substantially no energy
loss in the auxiliary capacitor.

2. The method according to claim 1, wherein the main switch is selected from the group
consisting of: metal oxide semiconductor field effect (MOSFET), silicon controlled rectifier (SCR),
insulated gate bipolar junction transistor (IGRT), bipolar junction transistor (BJT), field effect
transistor (FET), junction field effect transistor (JFET), switching diode, electrical relay, reed relay,
solid state relay, insulated gate field effect transistor (IGFFT), diode for alternating current
(DIAC), and/or triode for alternating current TRIAC.

3. A switching converter adapted for converting an input power to an output power, the
switching converter including at least one stage selected from the group consisting of a buck stage
and a boost stage, said at least one stage comprising:

a main switch connecting an input voltage terminal to a first node;

a first auxiliary switch;
an auxiliary capacitor adapted for connection in parallel with said main switch using said first auxiliary switch, wherein the first auxiliary switch is disposed between the input power and the auxiliary capacitor, and

an inductor adapted for connecting to said first node, wherein said first node is connectible to said auxiliary capacitor by at least two current paths

4. The switching converter of claim 3, further comprising:

a second auxiliary switch disposed between the auxiliary capacitor and the inductor:

wherein the auxiliary capacitor is previously charged in a first switching cycle when the main switch is on, and the auxiliary capacitor is connected across the main switch using the first auxiliary switch;

wherein the main switch is switched off at zero voltage while discharging the auxiliary capacitor by providing a current path to the inductor using the second auxiliary switch;

wherein the auxiliary capacitor is disconnected from the main switch using the second auxiliary switch; and

wherein voltage of the auxiliary capacitor is charged and discharged alternatively during a plurality of switching cycles, wherein the voltage of the auxiliary capacitor stays substantially the same until the subsequent turn-off of the main switch during the next switching cycle with substantially no energy loss in the auxiliary capacitor

A switching converter comprising:

a plurality of main switches interconnected in a full bridge topology, said main switches including a first switch, a second switch, a third switch and a fourth switch, wherein a pair of input voltage terminals are attachable at a first node connecting said first and third switches and at a second node connecting said second and fourth switches, wherein a first output voltage terminal is operatively attached at a third node connecting said third and fourth switches and a second output voltage terminal is operatively attached at a fourth node connecting said first and second switches, and

a plurality of bidirectional switches interconnected in a full bridge topology, said bidirectional switches including a first bidirectional switch, a second bidirectional switch, a third bidirectional switch and a fourth bidirectional switch, wherein said third node connects said first and third bidirectional switches and said fourth node connects said second and fourth bidirectional switches; and
an auxiliary capacitor connected at one end at a node connecting said first and second bidirectional switches and at the other end at a node connecting said second and fourth bidirectional switches.

6. The switching converter according to claim 5, wherein the auxiliary capacitor is previously charged in a first switching cycle when at least one of the main switches is on, and the auxiliary capacitor is connected across the switch; wherein said at least one main switch is switched off at zero voltage while discharging the auxiliary capacitor by providing a current path to the inductor; wherein the auxiliary capacitor is disconnected from said at least one main switch; and wherein voltage of the auxiliary capacitor is charged and discharged alternatively during a plurality of switching cycles, wherein the voltage of the auxiliary capacitor stays substantially the same until the subsequent turn-off of said at least one main switch during the next switching cycle with substantially no energy loss in the auxiliary capacitor.

7. The switching converter according to claim 5, further comprising: a first inductor attachable between said first output voltage terminal and said third-node; and a second inductor attachable between said second output voltage terminal and said fourth node.

8. The switching converter according to claim 7, wherein said first and second inductor is a single split inductor.

9. The switching converter according to claim 7, wherein said first and second inductor is a single inductor connected in series to a transformer primary.

10. The switching converter according to claim 7, wherein during a second switching cycle, said auxiliary capacitor is discharged by providing at least one current path to at least one of said inductors; wherein energy stored within the auxiliary capacitor not dissipated by the switching converter.