

Generation of High DC Voltage Pulse Using Capacitor's

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ABSTRACT: The main Objective of this paper is to represent a concept of Generation of High voltage DC pulses using a capacitor's and electronic component arrangement arrangement, Due to Advancement in Electronic component the Designed circuit will be cost effective and efficient. This circuit will provide benefits to full fill the requirement of industry of high voltage pulses for small duration of time also, it will provide the security to existing transmission system from instant loading. which is to be demand of modern industry that demand will be fulfilled by using simple power electronics component. The system is employed within the process of generation of in Kv's for real time testing to be administered on electrical appliance insulation effectiveness to be put up on power carriers [8].

KEYWORDS: MOSFET, Capacitors, Transistor's etc.

I. INTRODUCTION

The Generation/ Requirement of high DC voltage pulses for small duration of time is unique requirement of number of industries. The similarities between this system diverge in their construction and performance characteristics as function of their application [1].

This project/circuit help to increase certain amount of voltage level by arranging the electronic component and capacitors on PCB. This circuit also help to decrease the switching losses in circuitry. It's a type of electrical circuit whose purpose is to generate a high voltage pulse by a number of capacitors that are charged in parallel and then connected in series by spark gap switches. The high DC voltage pulse generation circuit first invented by Erwin Otto Marx in 1924 whose purpose is to generate a high voltage pulse.

It is extensively use for simulation the effect of lightning during high voltage and aviation equipment testing. Now a days in each industry there are lots of machineries in working condition. For each machinery there is separate voltage supply for each one. Some machineries required pulse of high DC voltage for specific duration of time for their operation [6]. In such a case the supply will not be interrupted for their continuous operation otherwise production of industry will be interrupted. The defence weapons also required for firing purpose high voltage pulse for short duration of time. This circuitry is used to provide high-voltage pulses for the testing of insulation of electrical apparatus such as large two power transformers or insulators used for supporting power transmission lines. Due to use of high solid-state devices, a high voltage automatically lead to high current because of the highvoltage is applied only for the short time. Solid state switches will not heat up excessively.

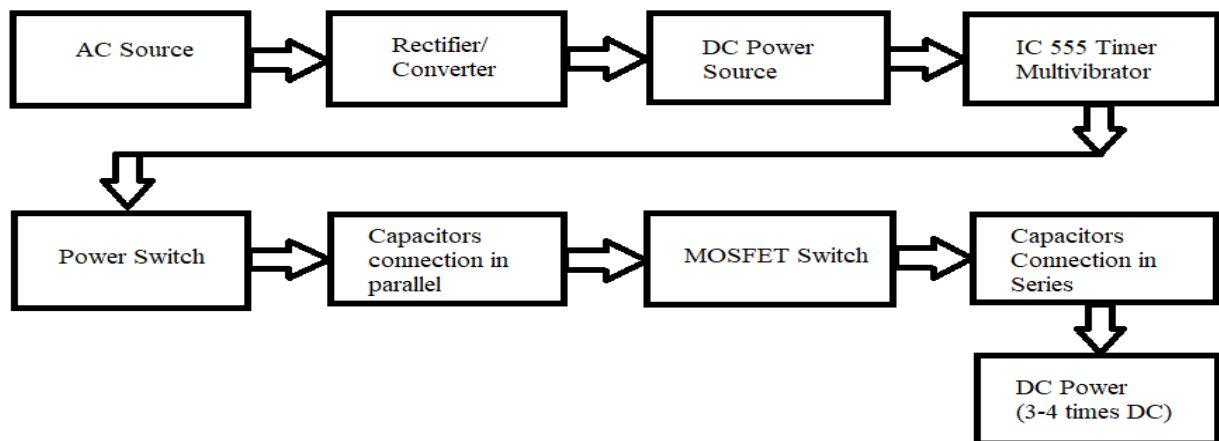
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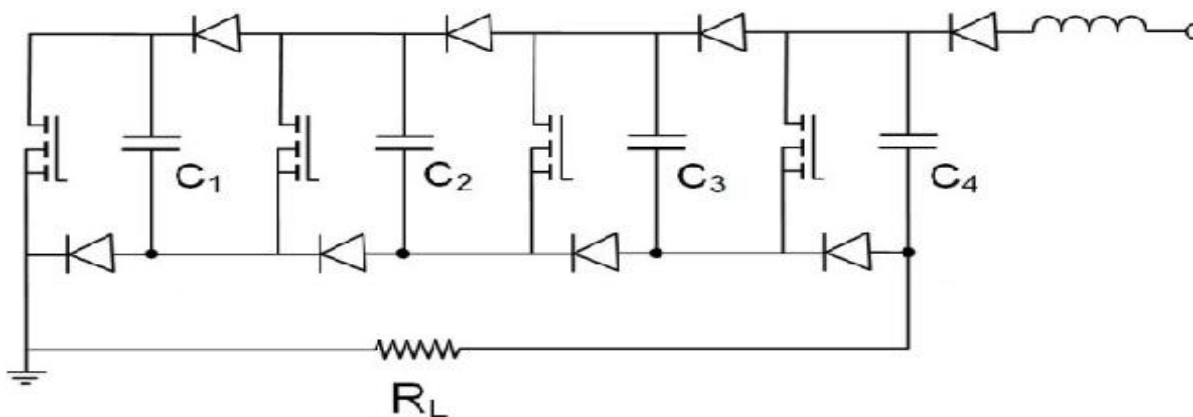
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II. BLOCK DIAGRAM



This block diagram is designed to generate the high voltage DC pulse, using that circuitry and this circuitry made by using the MOSFET, capacitor, transistor. In that circuitry the high DC pulse is generated using the number of capacitors [7]. The capacitors are connected in parallel to charge up itself during on time and then is connected in series using MOSFET switch to generate the high voltage. The generated high voltage is approximately 3 to 4 times applied DC voltage.

III. POWER CIRCUIT DIAGRAM



The basic concept behind the design of the circuit is the charge the capacitors in parallel and Discharge in series. The circuit consist of a N number of modules where each module consists of N number of sub modules. Then each module consists of a set of two registers and capacitors. That circuit are mainly work as a high voltage impulse for testing when the voltage levels required higher than the required supply voltage for short duration of time. The MOSFET are used as a triggering device for the capacitor at the time of discharging for unit time. which can trigger the capacitor and arrange it in series for getting the respective output [10].

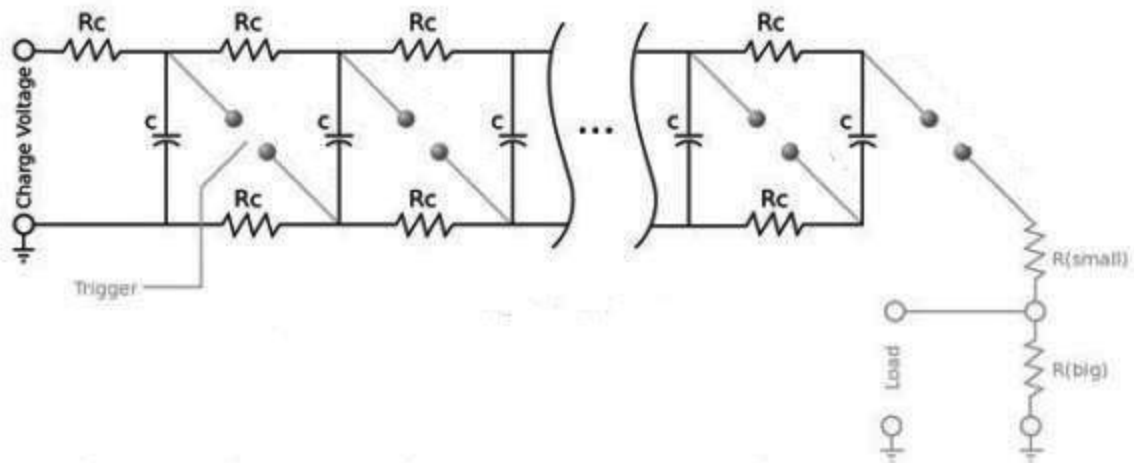
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A. Charging and Discharging:
Charging:



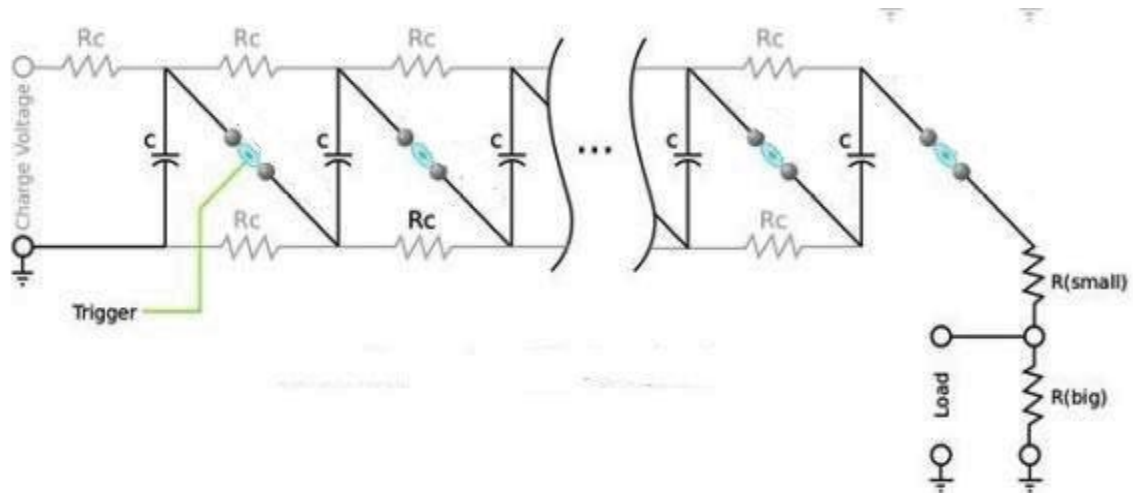
Charging of capacitor in parallel

At the time of charging operation, the circuit act as open circuit for the charging of the capacitors. The MOSFET are use as switches that having the Breakdown voltage higher than the nominal voltage. that MOSFET are trigger by the external devices / Optoisolators when the capacitors are charge [4].

During the charging of the capacitor the time taken by the capacitors for charging can be calculated by eqn(1). That equation decides the triggering time for the MOSFET.

$$T = 3 \cdot R \cdot (C_1 \cdot C_2) / (C_1 + C_2) \text{ ----- (1)}$$

Discharging:



Discharging of capacitor in series

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During the time of discharging of capacitors all capacitors are connected in series so the output voltage is more than the input supply.

The time taken for discharging (fall time/tail time) is given by the time taken to achieve 50% of peak value during discharging that occurs through the parallel combination of the circuit capacitance, load capacitance and the series combination of Resistors [4].

$$T_t = 0.7 \times (R_f + R_t) \times (C_1 + C_2) \text{ ----- (2)}$$

To generate the output pulses at the first MOSFET trigger effectively. When placing the first two series applying a 2volt placing the first two capacitors there in series then applying voltage of the second MOSFET consequently. The second stage output is added the third capacitor to stack and the process continuous to break down all the gaps. the Last MOSFET is connected to the output of the series of capacitors to load the circuit.

IV. WORKING MODEL



In the working model having an overvoltage or under voltage alert system. We are using one step down transformer from 230v 50hz to 12v. One bridge rectifier and voltage regulator of 7812 so that +12v can be obtained for the operation of the circuit. Here we are using two 555 timers. The system consists of 4 different stages such all is formed up from two diodes, one MOSFET along side one capacitor.

Diodes are utilized in capacitor charging at each stage and MOSFET is employed as a switch to avoid power losses. The capacitors are charged in parallely during the ON time using 555 timers. The capacitors are brought in a series using MOSFET switches during the discharging time.

At the end the number of capacitors used in series sums up the total voltage to approximately 3.2 times voltage supplied. Our project provides a compact and easy system from a DC supply of 12 V to get an approximately (36 – 39) Volts.

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V. CONCLUSION

This paper mainly based on providing high DC voltage pulses to industry for its optimum operation. This circuitry will support the industry for their requirement of high voltage (3-4 times of regular supply) pulses for their optimum operation. The system gives an output X multiple of stages. The number of MOSFETS used comes to a decision the wide variety of times the voltage needs to be increased. In this examine we have got used four stages in hardware and therefore the circuit multiplies the enter voltage effectively.

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