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Soft- Switching High Static Gain Modified SEPIC Converter

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ABSTRACT: An isolated high voltage gain single-ended primary-inductor converter (SEPIC) is provided in this study. lesser voltage stress on the switches , noninverting output voltage , excellent competence, and high voltage gain are all advantages of the suggested converter. The new converter also has a constant input current, making it suited for renewable energy and fuel cell applications. Furthermore, substantial voltage gain is obtained without the use of a transformer or connected inductor, ensuring that the switches do not experience voltage overshoot during the turn-off operation. Because of this effect, lesser voltage rating switches can be used with fewer conduction losses, and no additional clamping circuit is required. This work proposes a simple soft-switching topology that is suited for various Modified SEPIC converter designs while lowering switching losses and diode reverse recovery current. The converter output is converted to the grid using a single phase inverter.

KEYWORDS:PV Pannel , MPPT, SEPIC Converter, PWM Inverter, Grid

I. INTRODUCTION

As of late, miniature sources like batteries, power modules and PV track down broad application on account of appropriated age. The voltage got fromthese miniature sources is exceptionally low. Series association of the PV sources experiences the downside of halfway overshadowing, module jumble and high dc voltage cabling. Under fractional concealing condition, most extreme power which is accessible with the singular modules can't be removed. In addition, customary MPPT calculations might reach to the nearby maxima point of the P-V quality of the series associated PVAs of late, miniature sources like batteries, energy units and PV track down broad application on account of conveyed age. The voltage acquired from these miniature sources is extremely low. Series association of the PV sources experiences the disadvantage of incomplete overshadowing, module befuddle and high dc voltage cabling. Under incomplete concealing condition, greatest power which is accessible with the singular modules can't be removed. Additionally, ordinary MPPT calculations might reach to the nearby maxima point of the P-V quality of the series associated PV. Numerous geographies of high addition converters for DC-DC transformation is introduced by the analysts in the writing. The impediment of the geographies of high addition converter utilizing the strategy for voltage lift and technique for exchanged capacitor are the presence of high current through the principle switch during transient circumstances. These outcome in significant conduction misfortunes. The most well known strategy for getting the high addition is the utilization of disengaged converter geographies likes forward, half scaffold, push-pull, full extension, Flyback and so forth In any case, the issue with these converters is the presence of countless parts which makes the framework significant expense and less productive .Consequently, the test to the scientists in this field is to keep up with high change proficiency for this high addition converter in a conservative construction. On account of the nonisolated converters additionally, high increase can be accomplished with the assistance of extremely high obligation cycle. However, this outcomes in the issue of diode invert recuperation. Regular Flyback converters are extremely basic in structure and hypothetically, exceptionally high any worth of move forward change proportion can be acquired by changing the quantity of turns of the optional contrasted with the essential. In any case, in useful situations, because of the different parasitic present in the circuit, the voltage gain is restricted and effectiveness likewise drops down to a high worth of obligation cycle. However, the transformer present in the Flyback converter acts more like an inductor. Henceforth because of the limit of the attractive, customary Flyback converters are not an alluring decision if there should arise an occurrence of tolerably high power applications (power handling stage for a 250W PV board). Subsequently, the analysts favor the utilization of interleaved Flyback converter structures for this sort of uses. Yet, the interleaved Flyback converter requires the utilization of two switches and the driver hardware related with them In addition, a few additional gadgets would be expected to plan the dynamic or inactive snubber for spillage energy the board for these systems.This paper proposes a secluded form of a Sepic converter. The proposed circuit can be associated close to the miniature sources to produce the high voltage extent expected at the contribution of a voltage source inverter for network associated frameworks.

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II. PROPOSED TOPOLOGY

This paper proposes a disconnected variant of a Sepic converter whose two results are associated in series to get high voltage change proportion. In addition, in situations where the separation between the information and the result isn't fundamental, info can likewise be added to this series associated converter results to move a piece of the complete result power prerequisite straightforwardly from the information. Accordingly the converter needs to deal with less power and the general effectiveness of the power change can be moved along. The inverter geography utilized in this framework gives single stage modifying activity to the utility matrix.

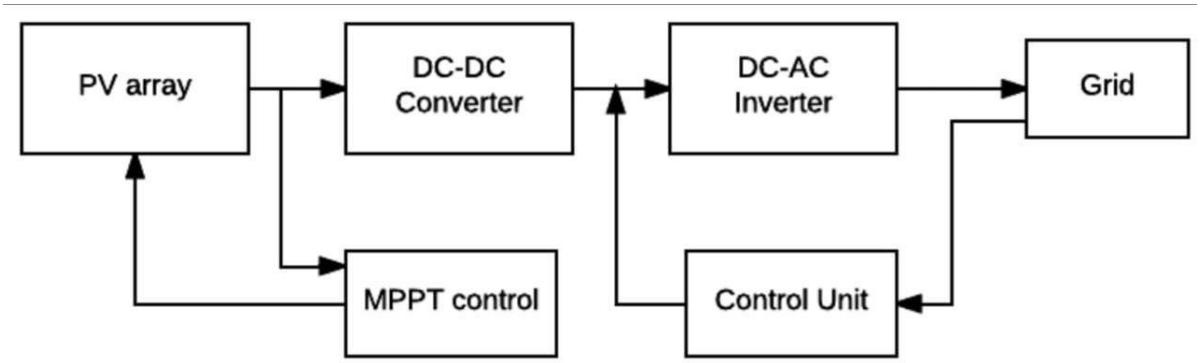

Fig 2.1 Block diagram

Analysis of steady-state behaviour of modified SEPIC high gain converter: All the elements are taken as ideal for simplifying the analysis. The capacitor voltages are determined by using a volt second law on the passive devices (L1, L2, L3 and LO)

(1) $VC1 = 2DVg /1 – D$

(2) $VC2 = D\ Vg /1 − D$

(3) $VC3 = Vg /1 − D$

(4) $VCb1 = VCb2 = [1 + D]Vg /[1− D] ^2$

The voltage, VO of the MSHG converter is,

(5) $VO = 2VCb1D + VCb1(1 − D)$

(6) $GV = VO /Vg = (1 + D /1 − D)^2$

Equation (6) presents the voltage conversion ratio of the MSHG topology with N = 1, where N = number of voltage expander cells

(7) $GV−EVEN = VO /Vg = [1 + D][(N + 1) − D] /[1 − D]^2$

(8)$GV−ODD = VO/ Vg = [1 + D][(N + D] /[1 − D]^2$

Equations (7) and (8) give the voltage conversion ratio of derived topology for even and odd numbers of gain expander cell, respectively.

Graph content:

1.The figure shows that the solar input Voltage and Current based on the irradiance on it. It will be used for further processing of the system.

2. The isolated SEPIC converter output voltage shown in the figure shows that the gained voltage levels of the input signal.

3. The final stage of the system which is the single phase inverter output.

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Solar panels have a nonlinear voltage-current characteristic, with a distinct maximum power point (MPP), which depends on the environmental factors, such as temperature and irradiation. In order to continuously harvest maximum power from the solar panels, they have to operate at their MPP despite the inevitable changes in the environment. This is why the controllers of all solar power electronic converters employ some method for maximum power point tracking (MPPT).The maximum power point tracking system used in the proposed system used to acquiring maximum power from the solar panel and used to provide triggering pulses for the converter switches.

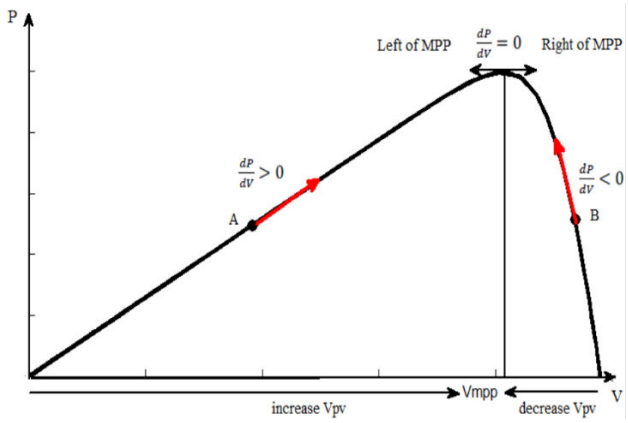

Fig 2.2 MPPT for efficient power tracking

III. IMPLEMENTATION OF HIGH STATIC GAIN MODIFIED SEPICCONVERTER

The circuit arrangement of the determined geography is displayed previously. It comprises of two switches (S1 and S2), four inductors (L1, L2, L3 and LO), five capacitors (C1, C2, C3, Cb1, Cb2 and CO) and four diodes (D1, D2, Db1 and Db2). Voltage gain expander (diode-capacitor) cell is added to build the static addition of the converter . The extra component of this helping cell, it decreases the greatest switch voltage stress.

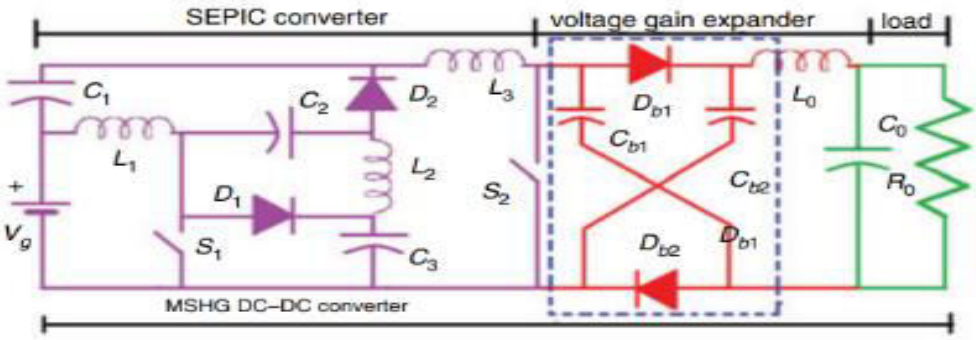

Fig 3.1 Circuit diagram

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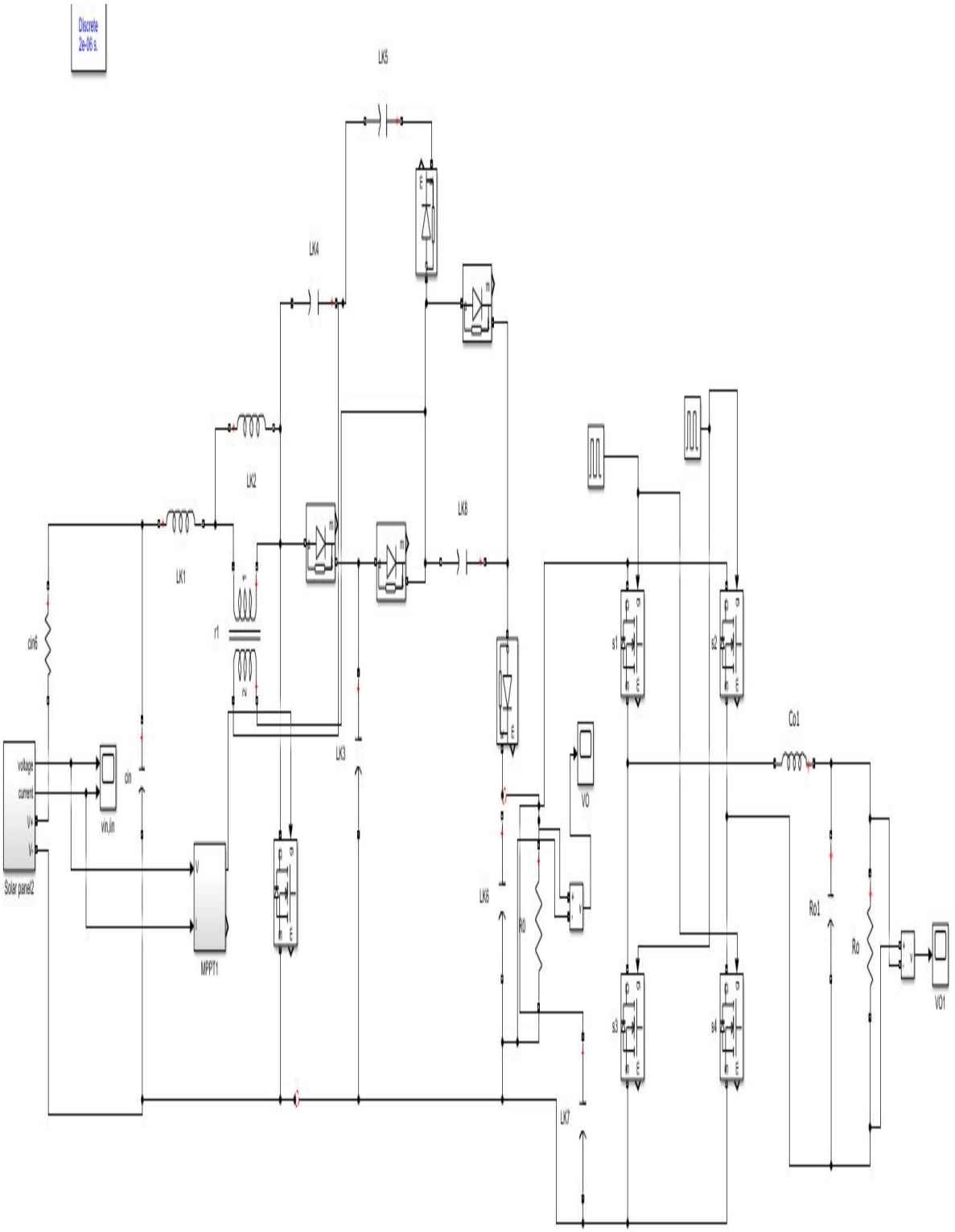

Fig 3.2 Simulation diagram

Mode I: The switches (S1 and S2) lead in this mode. Every one of the diodes (D1, D2, Db1 and Db2) are converse one-sided in this stage as given in Fig. 3a. Inductor L1 is charged by the voltage, Vg. Inductors L2 and L3 are charged by

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the voltages, VC2 and VC3. The voltage across the inductor Lo is the distinction of capacitor voltage in the voltage gain expander cell and result voltage. .

Mode II: All the diodes are forward one-sided with switches in the nonconducting state. In this stage, the energies put away in the inductors are released to the capacitors.Both the diode D1 and D2 being turned around one-sided, the power course through the heap is kept up with through the release of the C1 and C2 through the load obstruction all in series. The put away power in the attractive centers increments quadratically with time. Switch current is the summation of the two charging flows.

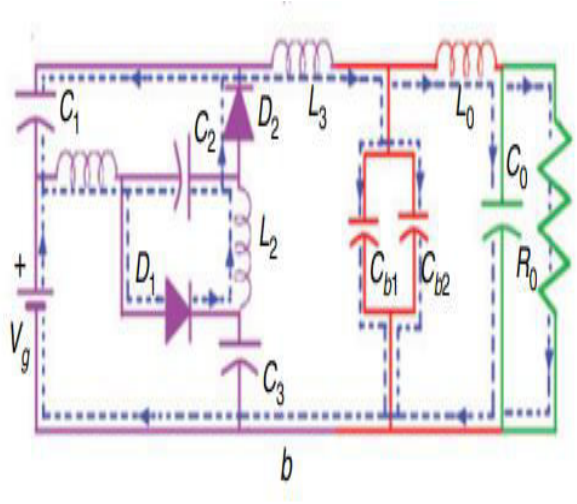

Fig 3.3 MODE 1

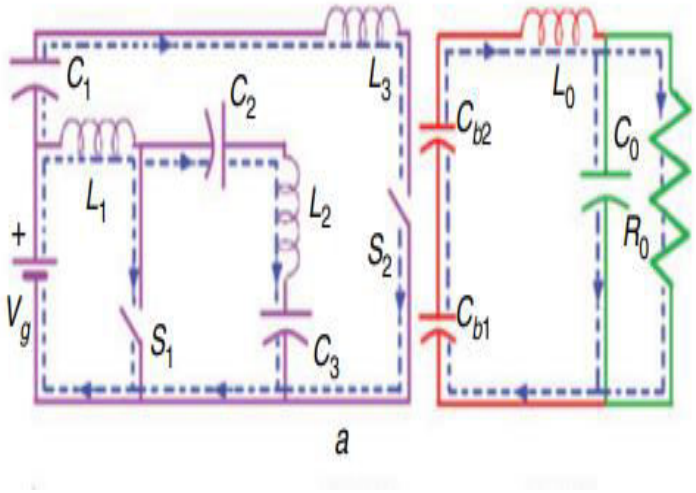

Fig 3.4 MODE 2

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Fig 3.5 Separated SEPIC converter of Proposed System

The single stage inverter is utilized to change over theSEPIC converters yieldas to be changed to the lattice.

IV. RESULTS AND DISCUSSION

Simulink, created by MathWorks, is a graphical programming climate for displaying, mimicking and breaking down multidomain dynamical frameworks. Its necessary point of interaction is a graphical square charting apparatus and an flexibleagreement of square libraries . It offers rigid coordination with the rest of the MATLAB weather and can either drive MATLAB or beprearranged from it. Simulink is broadly utilized in programmed control and advanced signal handling for multidomain recreation and Model-Based Design.

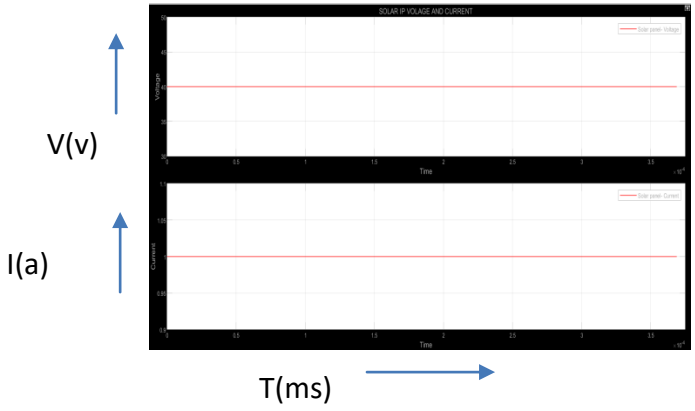

Fig 4.1 Solar input voltage and current

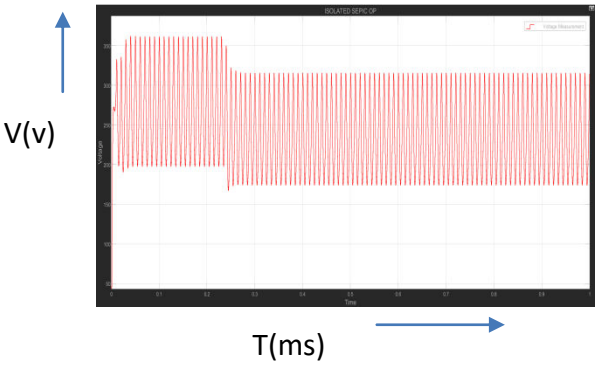

Fig 4.2 Isolated sepic output

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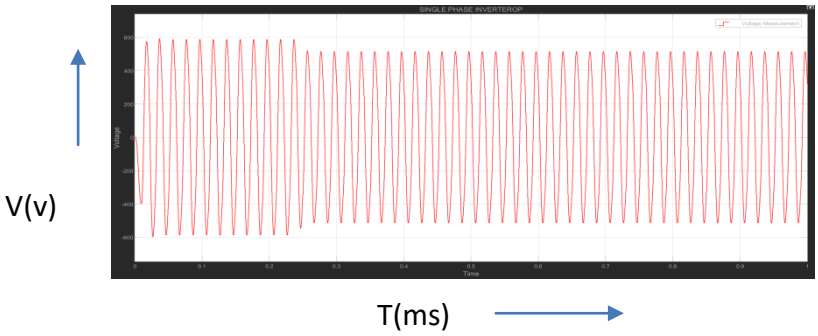

Fig 4.3 Single phase inverter output

V. CONCLUSION

Adjusted Isolated SEPIC dc-dc converter is introduced in this document. The consideration of a helper switch can guarantee the delicate exchanging activity in totally yield power range. The proposed procedure can be stretched out to others extremely high static addition designs and ac-dc applications in view of the Modified SEPIC converter.The proposed converter enjoys many benefits like nonstop information current, exceptionally high voltage gain, noninverting yield voltage, and straightforward control framework. Additionally, the extremely high voltage gain was accomplished without utilizing any transformers and coupled inductors. Subsequently, there was no voltage pass across the switches and no bracing circuit was required. This impact diminishes the conduction misfortunes by utilizing lower voltage switches and permits more minimal plan.

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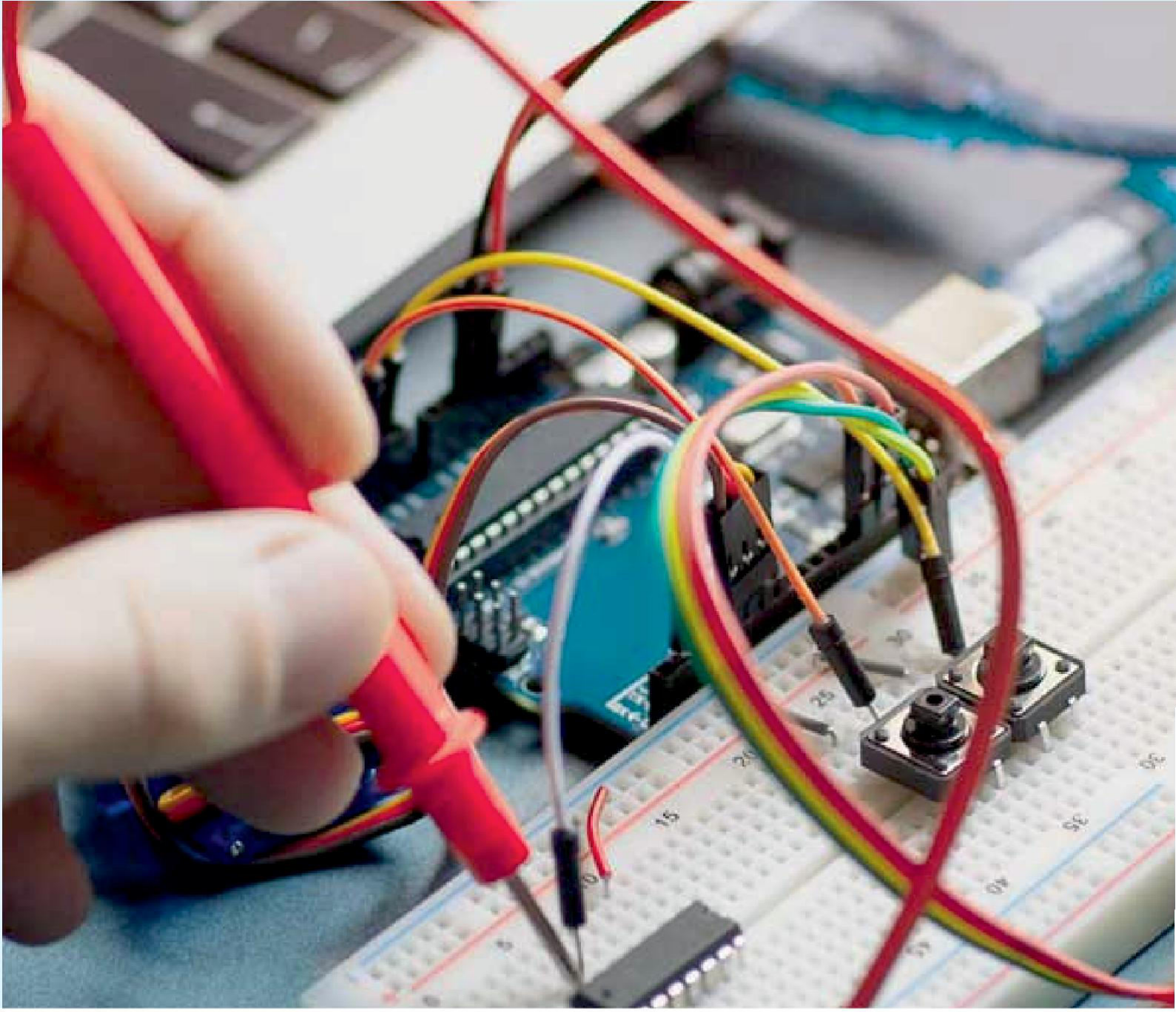

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