

Automatic Single Phase to Three Phase Converter

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Abstract

Most of the rural region does not have the include right of passage to three phase electric power on a discerning expense. It intended for this improvement is toward develop a single phase to three phase converter with the expectation of single phase electric capacity to three phase control. Phase remodel hardware arrangements three phase control beginning a single phase establishment to control inductive, resistive and capacitive stacks through isolated remuneration in overabundance of whichever alive converter gear. The expectation of embryonic this wander is to figure three phase control realistic cost-viably. There involve not been each major logical progressions animal finished in cultivating locale while contrast in transit with previous area. The three-Phase supply structure is at display available all inclusive, aside from potentially in different rustic regions where scarcely a single or two phase supply is realistic.

Keywords: Single to three phase conversion, PIC microcontroller, MOSFET Drivers, Three phase Inverter

I. INTRODUCTION

A roomy blend of commercial notwithstanding fabricating electrical supplies requires three-phase control. Electric utilities don't set up three-phase control as a worry of agenda since it expense widely other than single-phase system. In the meantime observing that an option toward accommodation introduced in the three-phase, spinning point converters, stationary converters and phase changing over variable frequency drives (VFD) included. These are mainly utilized for a considerable length of time toward produce three-phase control from a single-phase source. Erection of three-phase electrical cables canister cost as much as Rs 20,000 for each mile and save contain an amount of unwanted biological effects. Indeed, even when three-phase lines are close-by, the cost of instrument is noteworthy.

In view of unsurprising power interest for the three-phase application, the adequacy could charge the supporter intended for the consumption of establishment. Proceeding with month to month extra charges intended for the arrangement as normal. Phase converters contain already utilized utility three-phase control was inaccessible, or where the power request did not approve the cost of convenience three-phase instrument. Deal engine being caused by voltage and current inconsistency, sounds that sully the power lattice and harm gear, or the absence of capacity is to work keen mechanical assembly or numerous heaps are in a moment a portion of the burden with the expectation of constrained utilization of phase converters.

II. METHODOLOGY

A. Transformer

The potential transformer will advance down the power supply voltage (0-230V) to (0-6V) level. At that point the auxiliary of the potential transformer will be associated with the exactness rectifier, which is developed with the assistance of op-amp. The upsides of utilizing exactness rectifier are it will give crest voltage yield as DC; rest of the circuits will give just RMS yield.

B. Bridge rectifier

At the point when four diodes are associated as appeared in figure, the circuit is called as scaffold rectifier. The contribution to the circuit is connected to the askew inverse corners of the system, and the yield is taken from the staying two corners. Give us a chance to expect that the transformer is working appropriately and there is a positive potential, at point A and a negative potential at point B. the positive potential at point A will forward predisposition D3 and invert inclination D4. The negative potential at point B will forward inclination D1 and turn around D2. Starting at now D3 and D1 are forward uneven and will empower current stream to experience them; D4 and D2 are modify uneven and will square current stream.

The path for current stream is from point B through D1, up through RL, through D3, through the helper of the transformer back to point B. thusly is appeared by the solid bolts. Waveforms (1) and (2) can be seen crosswise over D1 and D3. One-half cycle later, the extremity over the optional of the transformer switched, it forward predisposition D2 and D4 and turn around inclination D1 and D3. Current stream will now be from point A through D4, up through RL, through D2, through the optional of T1, and back to point A. This way is demonstrated by the broken bolts. Waveforms (3) and (4) can be seen crosswise over D2 and D4. The present move through RL is dependably a similar way. In coursing through RL this current builds up a voltage comparing to that

indicated waveform (5). Since current moves through the heap (RL) amid both half cycles of the connected voltage, this extension rectifier is a full-wave rectifier.

One favorable position of a scaffold rectifier over a customary full-wave rectifier is that with a given transformer the extension rectifier delivers a voltage yield that is about twice that of the ordinary full-wave circuit. The most extreme voltage that shows up over the heap resistor is almost yet never surpasses 500 v0lts, as consequence of the little voltage drop over the diode. In the extension rectifier appeared in see B, the most extreme voltage that can be amended is the full optional voltage, which is 1000 volts. Subsequently, the pinnacle yield voltage over the heap resistor is almost 1000 volts. With the two circuits utilizing a similar transformer, the scaffold rectifier circuit delivers a higher yield voltage than the regular full-wave rectifier circuit.

C. IC Voltage Regulators

Voltage controllers contain a class of generally utilized ICs. Controller IC units contain the hardware for reference source, comparator speaker, control gadget, and over-burden security all in a single IC. IC units give direction of either a settled positive voltage, a settled negative voltage, or a customizably set voltage. The controllers can be chosen for task with stack streams from many mille amperes to several amperes, relating to control evaluations from mille watts to many watts.

A settled three-terminal voltage controller has an unregulated dc input voltage, V_i , connected to one information terminal, a directed dc yield voltage, V_o , from a moment terminal, with the third terminal associated with ground.

The arrangement 78 controllers give settled positive managed voltages from 5 to 24 volts. So also, the arrangement 79 controllers give settled negative directed voltages from 5 to 24 volts.

D. PIC 16F877

PIC 16F877 is a distinct amongst the most progressive microcontroller from Microchip. This controller is broadly utilized for exploratory and present day applications due to its low cost, extensive variety of utilizations, high caliber, and simplicity of accessibility. It is perfect for applications, for example, machine control applications, estimation gadgets, ponder reason, et cetera. The PIC 16F877 highlights every one of the segments which present day microcontrollers typically have.

1) General Features

- High execution RISC CPU.
- ONLY 35 basic word directions.
- All single cycle guidelines with the exception of program branches which are two cycles.
- Operating speed: clock input (200MHz), direction cycle (200nS).
- Up to 368×8bit of RAM (information memory), 256×8 of EEPROM (information memory), 8k×14 of blaze memory.
- Pin out perfect to PIC 16C74B, PIC 16C76, PIC 16C77.
- Eight level profound equipment stack.
- Interrupt capacity (up to 14 sources).
- Different kinds of tending to modes (immediate, Indirect, relative tending to modes).
- Power on Reset (POR).
- Power-Up Timer (PWRT) and oscillator start-up clock.
- Low control rapid CMOS streak/EEPROM.
- Fully static plan.
- Wide working voltage run (2.0 – 5.56)volts.
- High sink/source current (25mA).
- Commercial, mechanical and expanded temperature ranges.
- Low control utilization (<0.6mA common @3v-4MHz, 20μA average @3v-32MHz and <1 A run of the mill standby).

PIC16F877 chip is accessible in various kinds of bundles. As indicated by the sort of uses and use, these bundles are separated. The stick charts of a PIC16F877 contribute distinctive bundles is appeared in the figure 1.

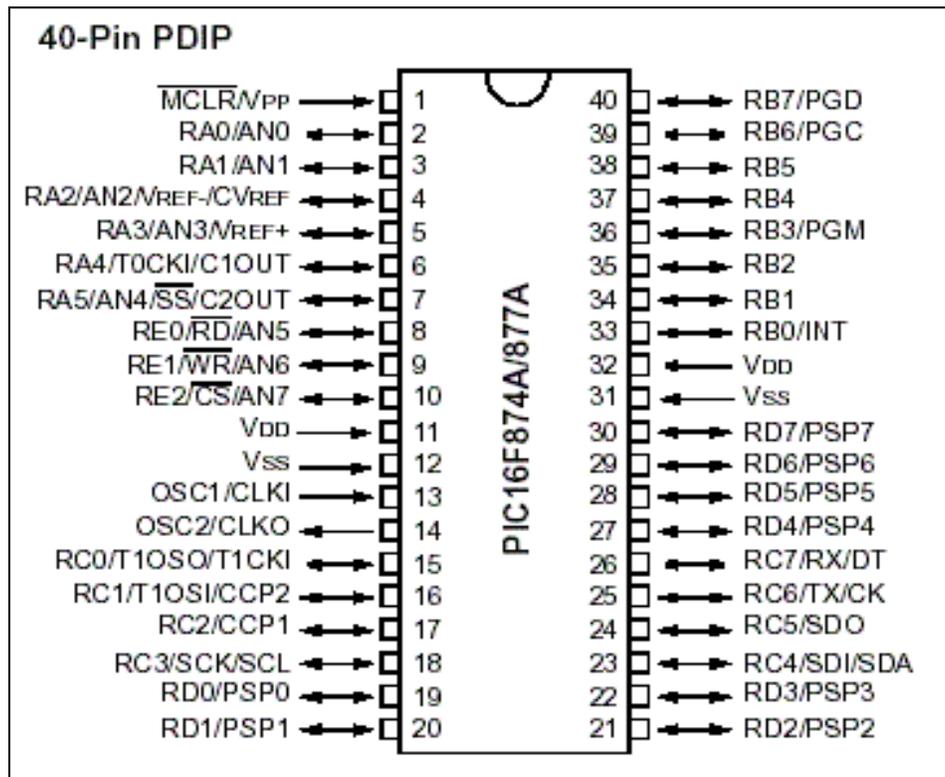


Fig. 1: Pin diagram of PIC16F877

III. MOSFETS

The switch to be utilized here is a Metal Oxide Semiconductor Field Effect Transistor, or MOSFET. MOSFETs come in two polarities called N and P channel. The one to be utilized here is a N channel gadget. A schematic portrayal and a photo demonstrating the stick assignments is underneath (the sunflower is never included). Notice that the Drain is likewise associated with the metal tab, making it important to protect the MOSFET when utilizing a warmth sink: figure 2 shows the symbol and pin configuration of IRF540N

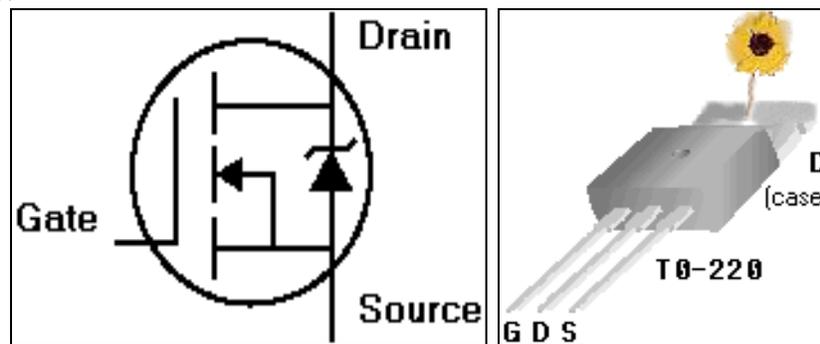


Fig. 2: MOSFET IRF540N

An improved mode N channel MOSFET is turned on by making the entryway more positive than the source. What is upgraded is the conductivity amongst source and deplete. The unit of conductivity is the mho, which is just ohm spelled in reverse. The IRF3708 utilized here will turn on if the entryway is around 2 volts more positive than the source. The door isn't physically associated with whatever is left of the gadget. It impacts the gadget by the way that it is on one side of a thin encasing, and works by methods for the forced field impact. Actually, the separator is thin to the point that it can be cracked by static voltages as frail as that from a bit of plastic. Incredible care ought to be taken when working with a MOSFET. The leads are some of the time shorted with a bit of wire or conductive froth when delivered. The shorting material ought not be evacuated until the last minute when introducing the gadget. Likewise, ensure you are grounded or have at any rate contacted ground before contacting a MOSFET. Figure 3 shows the driver circuit for IRF540N.

A. Mosfet Driver Section

The mosfet driver section is consists of

- Optocoupler section
- Current boosting section
- Power section

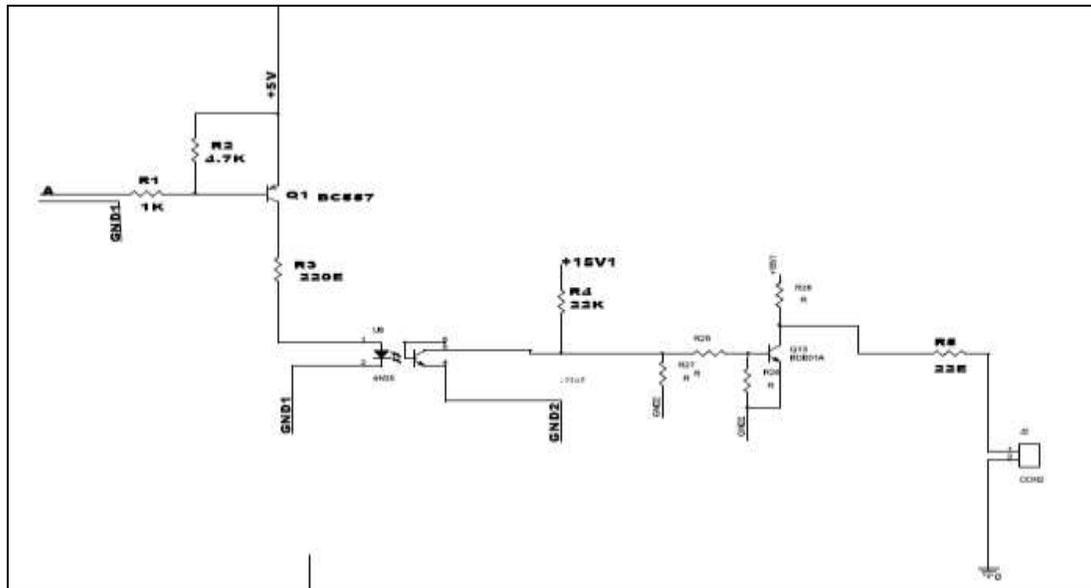


Fig. 3: MOSFET Driver Circuit

B. Opto Coupler Section

In gadgets, an opto-isolator (or optical isolator, optocoupler, photocoupler, or photoMOS) is a gadget that uses a short optical transmission way to exchange a flag between components of a circuit normally a transmitter and a recipient, while keeping them electrically segregated since the flag goes from an electrical flag to an optical flag back to an electrical flag, electrical contact along the way is broken. Figure 4 shows internal schematic diagram of optocoupler.

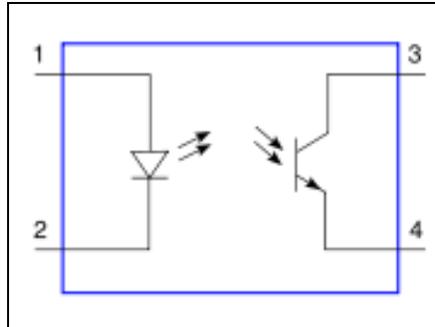


Fig. 4: Schematic diagram with an LED and phototransistor

A typical execution includes a LED and a phototransistor, isolated with the goal that light may traverse a hindrance yet electrical current may not. At the point when an electrical flag is connected to the contribution of the opto-isolator, its LED lights, its light sensor at that point initiates, and a comparing electrical flag is produced at the yield. Dissimilar to a transformer, the opto-isolator takes into consideration DC coupling and by and large gives critical insurance from genuine overvoltage conditions in a single circuit influencing the other.

With a photodiode as the locator, the yield current is corresponding to the measure of occurrence light provided by the producer. The diode can be utilized as a part of a photovoltaic mode or a photoconductive mode. In photovoltaic mode, the diode demonstrations like a present source in parallel with a forward-one-sided diode. The yield current and voltage are reliant on the heap impedance and light power. In photoconductive mode, the diode is associated with a supply voltage, and the extent of the current led is specifically corresponding to the power of light.

An opto-isolator can likewise be built utilizing a little brilliant light instead of the LED; such a gadget, in light of the fact that the light has a much slower reaction time than a LED, will sift through commotion or half-wave control in the info flag. In this manner, it will likewise sift through any sound or higher-frequency motions in the info. It has the further disservice, obviously, (a mind-boggling inconvenience in many applications) that glowing lights have limited life expectancies. Along these lines, such an unpredictable gadget is off to a great degree restricted handiness, reasonable just for applications, for example, science ventures. The optical way might be air or a dielectric waveguide. The transmitting and getting components of an optical isolator might be contained inside a single minimized module, for mounting, for instance, on a circuit board; for this situation, the module is regularly

called an opto coupler or opto-isolator. The photograph sensor might be a photocell, phototransistor, or an optically activated SCR or Triac. Once in a while, this gadget will thus work a power hand-off or contactor.

C. Power Supplies

The present section presents the task of intensity supply circuits assembled utilizing channels, rectifiers, and after that voltage controllers. Beginning with an air conditioner voltage, an enduring dc voltage is acquired by correcting the air conditioner voltage, at that point separating to a dc level, lastly, managing to get a coveted settled dc voltage. The control is normally acquired from an IC voltage controller unit, which takes a dc voltage and gives a to some degree bring down dc voltage, which continues as before regardless of whether the info dc voltage fluctuates, or the yield stack associated with the dc voltage changes.

A square outline containing the parts of a common power supply and the voltage at different focuses in the unit is appeared in fig 5.1. The air conditioner voltage, ordinarily 120 V RMS, is associated with a transformer, which steps that air conditioner voltage down to the level for the coveted dc yield. A diode rectifier at that point gives a full-wave amended voltage that is at first separated by a basic capacitor channel to deliver a dc voltage. This subsequent dc voltage ordinarily has some swell or air conditioning voltage variety. A controller circuit can utilize this dc contribution to give a dc voltage that has substantially less swell voltage as well as continues as before dc esteem regardless of whether the information dc voltage fluctuates to some degree, or the heap associated with the yield dc voltage changes. This voltage direction is typically gotten utilizing one of various famous voltage controller IC units. Figure 4 shows the block diagram of power supply unit and Figure 5 shows circuit diagram for power supply unit to generate +5v,+12v.

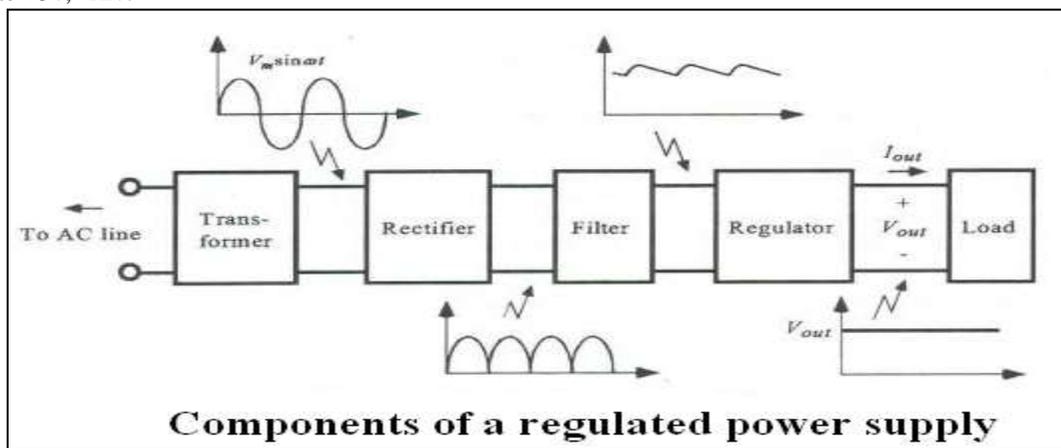


Fig. 5 Power supply block diagram

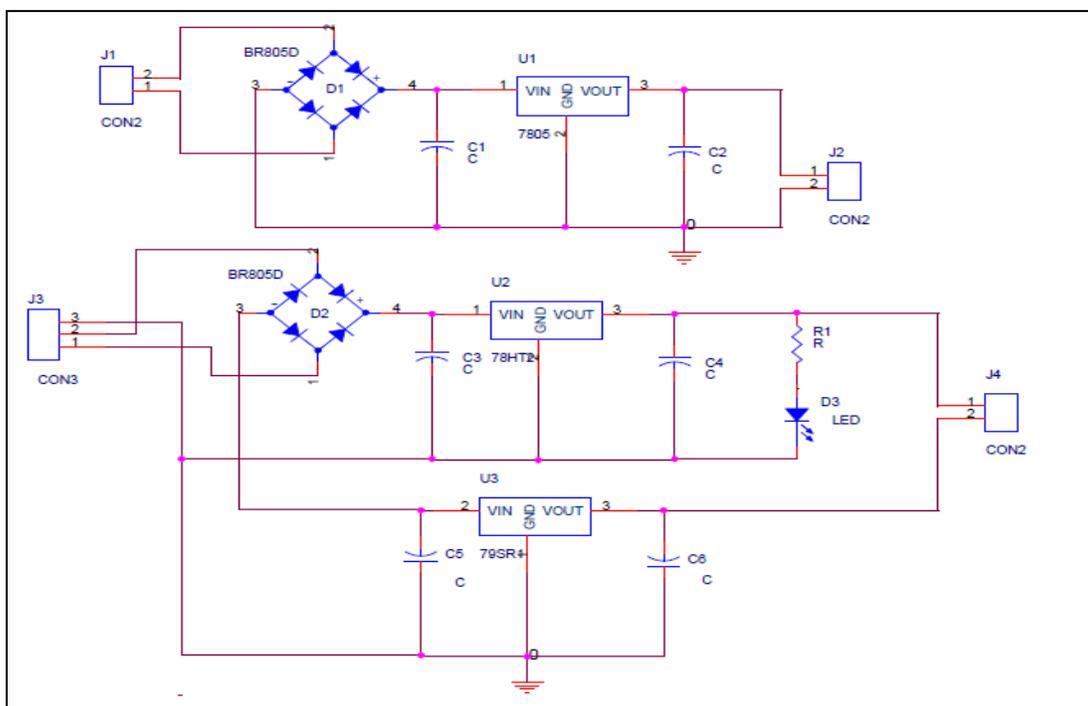


Fig. 6: Circuit diagram of (+12V& -12V) supply

D. Circuit Diagram

Figure 7 represents the complete circuit diagram for three phase converter and figure 8 represent the inverter segment of the proposed system.

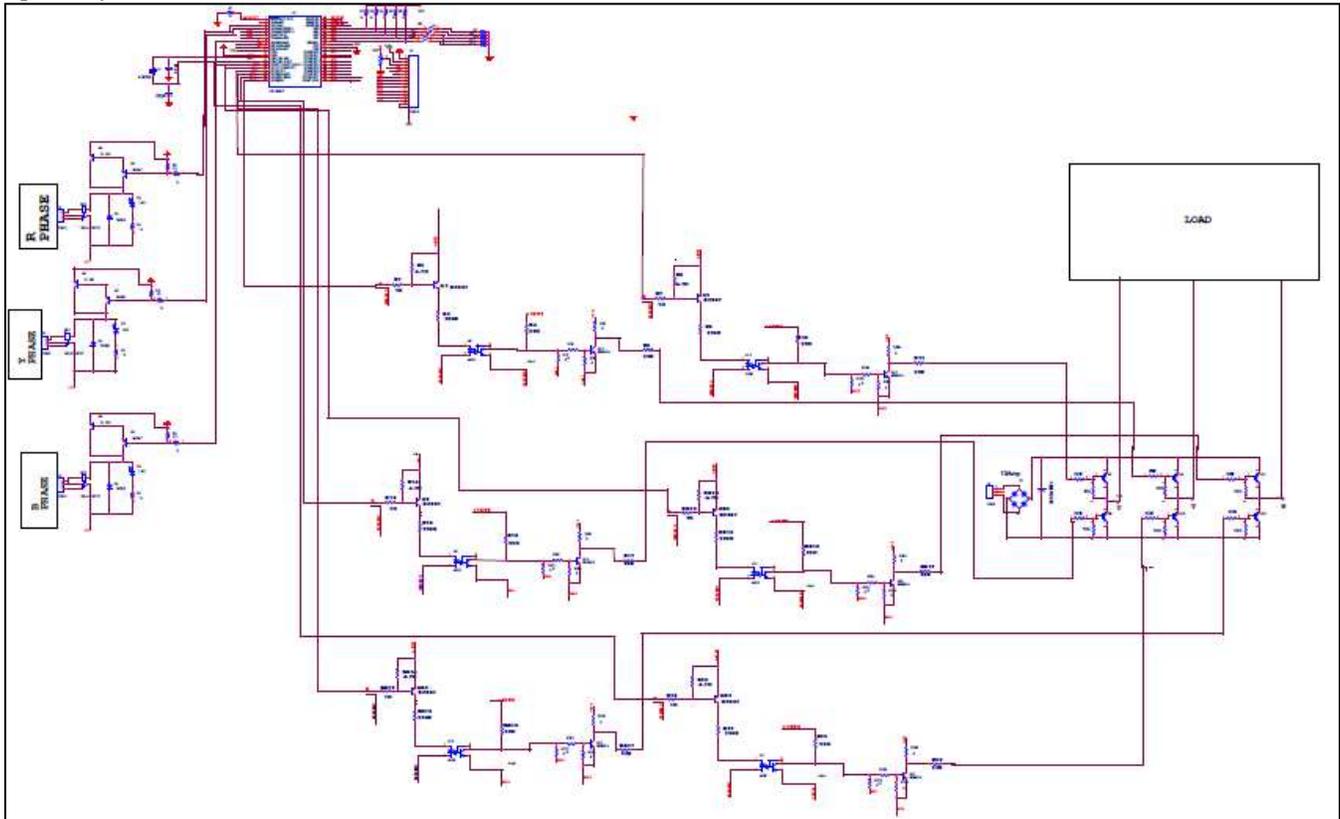


Fig. 7: Complete Circuit diagram for Phase converter

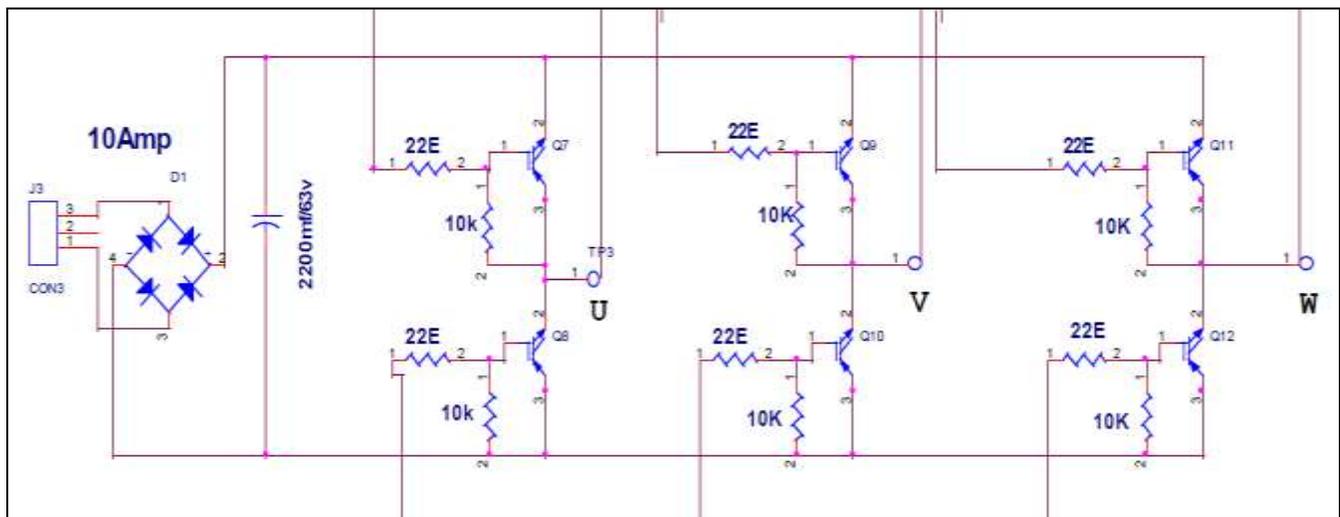


Fig. 8: inverter to generate three phase output

IV. CONCLUSIONS

In our improvement we include developed single phase to three phase converter to hasten a three phase acceptance engine (1HP). This converter have the capacity to work where the comfort of three phase control be locked in or where electrical vitality stipulate did not give clarification expected for the charge of accommodation three phase system. It is germane for development, powerful structures, minute degree industry, carpports and workshops. In rural territories just 4 to 6 long stretches of 3-phase supply which survive not acceptable to hose the glade appropriately. In like manner, this give single phase to three phase adjustment.

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