SCR and Controller based three phase voltage control

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ABSTRACT

In our day to day life we are using a lot many devices to satisfy our needs or to make our life easy and happy. Every device has a power supply, to work . And for the better functioning of the device it is necessary that the supply should be good without interuption. That is, it should provide a constant which is not only AC but also DC voltage. But this is impossible always. Due to many reasons there is a voltage fluctuation in the supply. This fluctuations in the supply voltage may cause the device to damage or make it work in an undesired way, which no one would desire.So the best alternative is to regulate the supply voltage. This is what we have tried to achieve here. Our project is using controller and SCR voltage control of three phase system.This project we provide the load with a constant supply voltage of 230 V AC., in spite of any variation or changes in the input voltage. The voltage regulation is achieved by SCR by controlling the firing angle to it so precisely that the load receives a constant supply. The voltage across the load is stepped down and provided to Analog to Digital Control. ADC will produce a digital signal corresponding to the input analog signal.

Keyword: - Power Supply , Zero Crossing Detector, SCR Bridge Circuit, and Potential Divider

1. INTRODUCTION

In our day to day life we use a lot many devices to satisfy our needs or to make our life comfortable and luxurious. Every device needs a power supply to work on. And for the optimum functioning of the device it is necessary that the supply should be reliable. That is, it should provide a constant voltage. But this is not always possible. There are many reasons due to which there is a fluctuation (changes in supply or sudden changes in the supply voltage). This change in the supply voltage may cause the device to damage or make it work in an undesired way, which no one will desire.Hence the best alternative is to regulate the supply voltage. This is what we have tried to achieve here. Our project is supply voltage regulation, using a controller and SCR. Silicon Controlled Rectifiers also called Thyristors controller, employing novel technology, which is designed to provide a price effective solution for applications that require power, current or voltage regulation with some power factor correction and a smoother process control. Traditional phase-angle control causes lots of harmonic current distortion on the main power

supply. This in turn creates voltage distortion which affects power quality. There is no simple accessory available for reducing this problem.

1.1 Component Specifications

Series of fixed-voltage integrated-circuit voltage regulators was designed for a wide range of applications. In this application it include on-card regulation for elimination of noise and distribution problems associated with regulation of single point. Each of these regulators as it is a three phase supply can deliver up to 1.5 A of output current. The internal current-limiting and thermal-shutdown features of these regulators essentially make them immune to overload. In addition to this the use of fixed-voltage regulators, these devices can be used with external components output voltages and currents can be adjusted.

1.2 Specification of MC7815

These are the voltage regulators which are monolithic integrated circuits designed as fixedvoltage regulators for a wide variety of applications including local, oncard regulation. These regulators are capable of the following internal current limiting, thermal shutdown, and safearea compensation. With adequate heat sinking they can deliver output currents in excess of 1.0 A. Although designed firstly as a fixed voltage regulator, they can be used with external components to obtain adjustable voltages and Output Current in Excess of 1.0 A

1.3 Specification of L7915

The L7900 series of three-terminal negative regulators is available in TO-220, TO-220FP, TO-3 and D2PAK packages and several fixed output voltages,it is useful in wide range of applications. These regulators can provide local on-card regulation, eliminating the distribution problems associated with single point regulation; furthermore, having the same voltage option as the L7800 positive standard series, they are particularly suited for split or dividing or distributing power supplies. If adequate heat sinking was provided, it can deliver over 1.5A output current. Although designed primarily as fixed voltage regulators, these devices can be used to obtain adjustable voltages and currents with external components.

2. PIN Diagram

XTAL1 is used as input and XTAL2 is used as output, for an inverting amplifier. The pins can be configured for use as an on-chip oscillator. To drive the device from an external clock source, XTAL1 should be driven while XTAL2 is left unconnected. Minimum and maximum high and low times can e be observed.This device is designed to operate using 6 clock periods per machine cycle, 6 clock mode. (This yields performance equivalent to twice that of standard 80C51 family devices). It may be optionally configured on commercially-available EPROM programming equipment to operate at 12 clocks per machine cycle, 12 clock mode. Once 12 clock mode has been configured, it cannot be changed back to 6 clock mode.

Fig -1 PIN Diagram

2.1 Reset

A reset is set by holding the RST pin high for two machine cycles (12 oscillator periods in 6 clock mode, or 24 oscillator periods in 12 clock mode), while the oscillator is operating. To ensure a good power-on reset, the RST pin must be high long enough to allow the oscillator time to start up (normally a few milliseconds) plus two machine cycles. At power-on, the voltage on VCC and RST must be in operation at the same time for a proper start-up. Ports 1, 2, and 3 will asynchronously be driven to their reset condition when a voltage above VIH1 (min.) is applied to RESET. The value on the EA pin is latched when RST is reasserted and has a further effect.

2.2 Features

- Sensitive Gate Allows Triggering by Microcontrollers and Other Logic Circuits
- Blocking Voltage to 600 V
- ON State Current Rating of 0.8 Amperes RMS at 80°C
- High Surge Current Capability − 10 A
- Minimum and Maximum Values of IGT, VGT and IH Specified for Ease of
- Design
- Immunity to dV/dt − 20 V/sec Minimum at 110°C
- Glass-Passivated Surface for Reliability and Uniformity

Fig -2 Symbol

3. Analog to Digital Converter

The 8-bit A/D converter uses successive approximation type as the conversion technique. The converter has some features a high impedance chopper stabilized comparator, a 256R voltage divider with analog switch tree and a successive approximation register. The 8-channel multiplexer can directly access any of 8-single-ended analog signals. The device eliminates the need for external zero and full scale adjustments. Interfacing to microprocessors is provided easy and simply by the latched and decoded multiplexer address inputs and latched TTL TRI-STATEÉ outputs. The design of the ADC0808 has been optimized by incorporating the most desirable aspects of several

Analog to Digital conversion techniques. The ADC0808 offers high speed, high accuracy, minimal temperature dependence, excellent long-term accuracy and repeatability, and consumes minimal power.
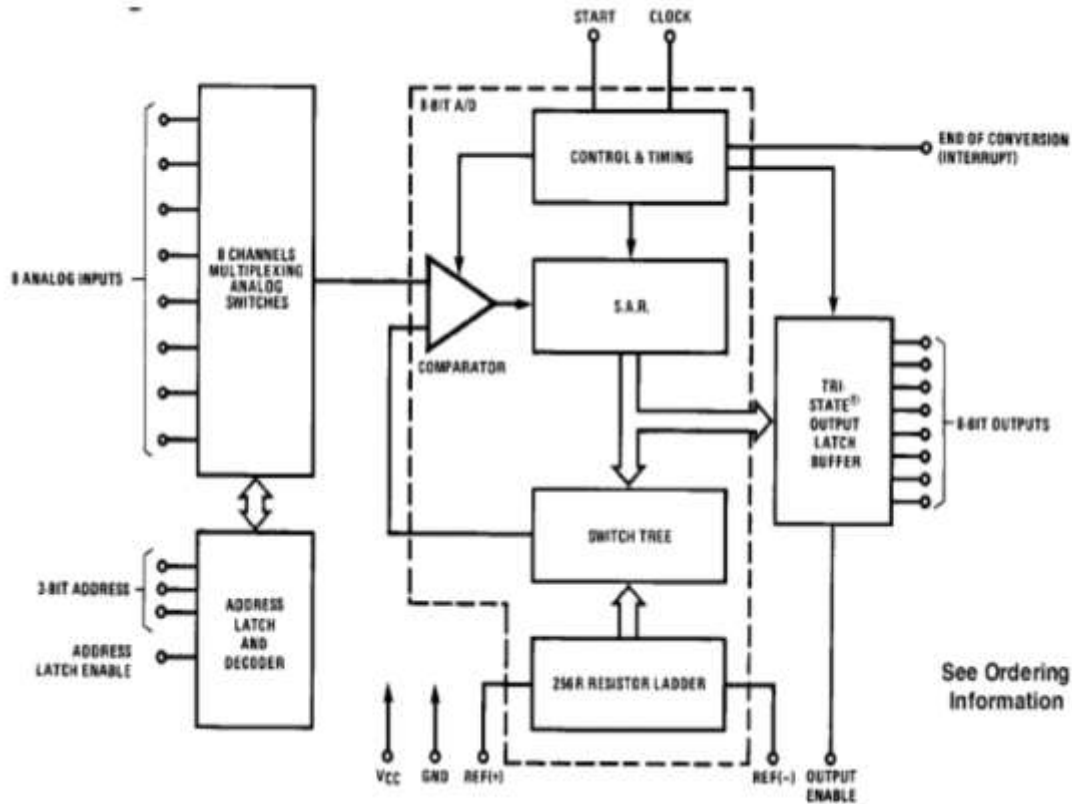

Chart -2: Block Diagram

3.1 Key Specifications
- Resolution 8 Bits
- Total Unadjusted Error g(/2 LSB and g1 LSB
- Single Supply 5 VDC
- Low Power 15 mW
- Conversion Time 100 ms.

PNPN devices designed for high volume, line-powered consumer applications such as relay and lamp drivers, small motor controls, gate drivers for larger thyristors, and sensing and detection circuits. Supplied in an inexpensive plastic TO-226AA package which is readily adaptable for use in automatic insertion equipment.

4. CONCLUSIONS
Hereby we have designed a device that is capable of detecting the fluctuations in the input mains supply.
We designed hardware for voltage regulation by using SCR Bridge, which senses fluctuations in the single phase voltage supply across the load and nullifies it.
        Hence our device is capable of regulating the single phase mains supply to a constant dc supply across the load, irrespective of any changes in the supply, hence providing protection to the load device from getting damaged due to sudden variations in the mains.

6. REFERENCES

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