

Electronic Circuit Breaker

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Abstract - Electronic circuit breaker are designed to cut off the power supply when ever overload or short circuit occur. Traditional circuit breaker like MCB based is on thermal bimetal lever trip mechanism. MCB is very slow and the trip time varies according to the Percentage of overload.

The concept of electronic circuit breaker came into focus when the traditional circuit breakers such as MCBs take longer time to trip. This project is displaying fast tripping mechanism as against the slow one like MCB.

In this project current is sensed by current transformer and then compared with a preset value present in microcontroller to generate an output for opto-coupler that drives a triac to trip the load within microsecond. Tripping is extremely fast and overcomes the limitation of the thermal type in overload condition

Key Words: Microcontroller, Current Transformer (CT), opto-coupler, triac etc.

1. INTRODUCTION

It is the switch which automatically turns off when current flowing through it passes the maximum limit. This is mainly design to protect against over current and over temperature. Whenever the over current is drawn by the load the circuit will be tripped. To trip the circuit we are using one relay which will be controlled through microcontroller. For the protection from over current condition first we have to measuring the total load current. In this CT for measuring the total load current and the output of CT is ADC for converting analog output of CT into digital data.

When current increases behind the certain limit then we are going to trip the load by using triac.

2. Explanation:

The main power supply is given directly to load through CT (current transformer) and the step down transformer. Supply voltage 230v is step down to 12v and supplied to regulate supply unit which consist of bridge rectifier to convert ac to dc and passed through 7805 Regulator to get 5v supply for working microcontroller.

Capacitor filter is used to remove the ripple to get pure constant dc voltage.

The current passing to the load is sensed by current transformer and output of CT will be in analog form is given to the ADC pin of microcontroller for converting the analog output to digital data. The current sensed is compared with the inbuilt comparator of microcontroller which as pre-set reference value. If the current sensed is less than the pre-set value then opto-coupler will be in OFF state and the relay will not opto-coupler the supply to load. As we increase the load current drawn is more so if the current is increase than pre-set value than opto-coupler will turn ON and trigger the triac.

In this project opto-coupler is used to protect the microcontroller from AC supply. If the AC current back flow in the circuit opto-coupler isolate microcontroller from the AC supply. The LED used as an indicator is properly biased and it glows. The AC supply to the load is cut off from the load and the load is trip. Once the circuit is tripped it must be reset for further use using reset button.

2.1 Microcontrollers:

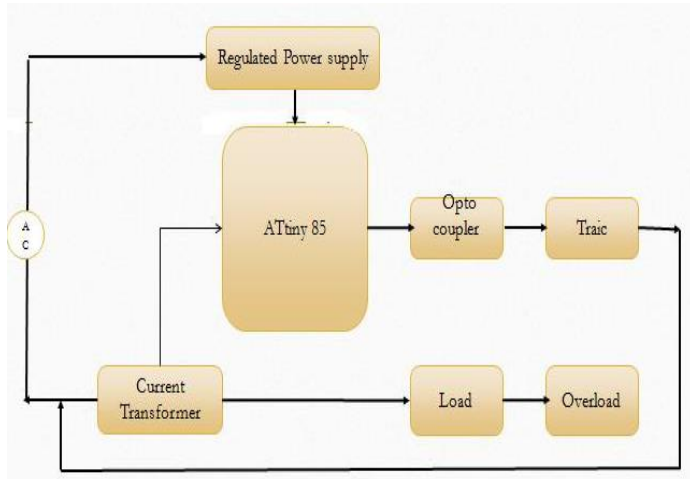
The ATiny85 is a low power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture executing powerful instruction in a single clock. The ATiny85 achieves throughputs 1MIPS per MHz allowing power consumption versus processing speed.

- High Performance, Low Power AVR 8-Bit Microcontroller
- 8K Bytes of In-System Programmable Program Memory Flash
- 512 Bytes In-System Programmable EEPROM
- 512 Bytes Internal SRAM
- On-chip Analog Comparator
- Industrial Temperature Range

2.3 MOC3041:

The MOC3041 devices consist of gallium arsenide Infrared emitting diodes optically coupled to a monolithic silicon detector performing the function of a Zero Voltage Crossing bilateral triac driver as

- Simplifies Logic Control of 115 Vac Power
- Zero Voltage Crossing
- $\frac{dv}{dt}$ of 2000 V/ μ s Typical, 1000 V/ μ s Guaranteed



Fig, Block Diagram Of Electronic Mcb

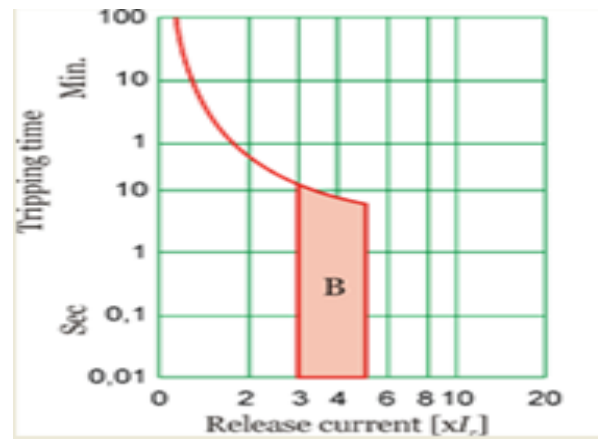


Chart-1: B type tripping characteristics

2.4 MOC3041-800C:

Planar passivated high commutation three quadrant triac plastic package intended for use in circuits where high static and dynamic dV/dt and high dI/dt can occur.

- Simplifies Logic Control of 115 Vac Power
- Zero Voltage Crossing
- $\frac{dv}{dt}$ of 2000 V/ms Typical, 1000 V/ms Guarantee
- Reverse voltage 6 volts

Table -1: Tripping current for rating 1A and 5A

Rating	Non tripping Current(mA)	Tripping current(mA)	Voltage(V)
1A	1.13	1.45	230
5A	5.65	7.25	230

Surge currents in domestic installations are generally low, so that a Type B device is adequate. For example Inrush currents associated with one or two fluorescent fittings or the compressor motor in a refrigerator/freezer are unlikely to cause unwanted tripping.

3. CONCLUSIONS

To avoid the electrical failure fast responding circuit with multiple rating .Accuracy in fault detection and cut off time and also smooth the operation compared to conventional type.

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