

## MICROCONTROLLER BASED ELECTRONIC CIRCUIT BREAKER

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**Abstract** -Modern culture is highly depend on sensitive electronic equipment. Due to increasing population, power crisis are increasing. This will give rise to overload condition. The power supply when overloaded is automatic operated using electronic circuit breaker. Three different types of load are sensed by three CT's. For the operation it uses embedded C language with PIC microcontroller. Traditional circuit breaker depends on thermal bimetal lever trip mechanism which is slow this drawback is overcome in electronic circuit breaker. Current and voltage value is compared with preset value.GSM is used for communication with the end user. This will help in maintaining the condition.

**Key Words:**MOSFET, Microcontroller, Relay ,CT.

### 1.INTRODUCTION

In this project overload condition is minimized in electrical system. It leads to failure of various electronic sensitive equipment. This method has preset current and voltage value, beyond which tripping action take place. Due to overload equipment may get burn. PIC microcontroller with three relays are used to trip the circuit LCD is used to display various voltage and current value as well as circuit breakers status. The total load current is measured under healthy condition. This value is inserted in microcontroller. Industrial instruments or home appliances failures have many causes and one of the main causes is over load. The primary of the distribution transformer or any other transformer is designed to operate at certain specific current, if that current flowing through that instrument is more than the rated current, then immediately the System may burn because of over load, through this project we are going to protect the system from over load condition. In this project work

for generating high current or over load current more loads are applied to the circuit; so that the current will be increased. Whenever the over current is drawn by load the circuit will be tripped. To trip the circuit we are using three relays which will be controlled through PIC microcontroller. When over load occurred the relay will trip the total circuit. And it will be monitored on the LCD. LCD displays are used to display the status of circuit breaker. For protection from over current condition first we have to measure the total load current. Here we are using CT for measuring the load current and the output of CT is given to ADC for converting analog output of CT into digital data. Hence ADC output is given for monitoring purpose. When current increases behind certain limit then we are going to trip the load by using relay. In this project we are using three different types of load. We are going to increase the load by increasing the number of loads ON. When we ON more loads it causes over load condition and microcontroller will detect that and it will trip the total load by using relays through MOSFET which acts as switching circuit.

### 2. EXPLANATION

The main power supply will be given to the load through CT and step down transformer. The 230 volt AC supply will be Step down to 12v by using step down transformer this 12V AC supply will be converted in DC by using bridge rectifier and it will be regulate up to 5V by using 7805 regulator for working of microcontroller. Capacitor filters are used to remove any ripples present in the DC voltage. The current flowing through the load is sensed by CT and output of CT is analog form. It will be given to ADC pin of PIC microcontroller for converting analog to digital form. The current sense the load current according to preset inbuilt value in the microcontroller.if the current

sense is less than preset inbuilt value will be reset. As we increase the load, if the current drawn is more then relay will be ON and it energies the relay. LCD should be used to indicate the real status of three different load. GSM system is used interface between the trip status and consumers. the message will be given to the interfacing media according to coding system. the microcontroller is programmed in embedded C language in MP LAB software. An LCD interfacing program is also in built in microcontroller. If any abnormalities occurs it will be displayed on LCD.

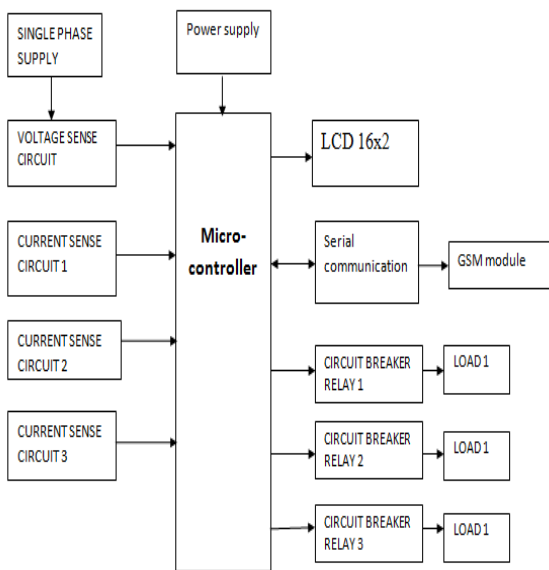


Fig -1: Block diagram of proposed system

The AC supply to the load is thus cut off from the load and the load is tripped. Once the circuit is tripped it must be reset for further use using reset button as shown in Fig.1. In either case, the microcontroller is programmed so as to show the status of the output on the LCD interfaced to it. In case of normal operation microcontroller will pin will receive 5v dc from regulator and accordingly displays the status on the LCD. In case of any abnormalities, the microcontroller pin. doesn't receive the 5V input signal and the related status is accordingly displayed on the LCD.

Table -1: Trip Action Table

Voltage (V)	Current (mA)	TRIP ACTION
230	50	NOT OPERATED
230	75	NOT OPERATED
230	100	OPERATED
230	120	OPERATED

20-pin QFN

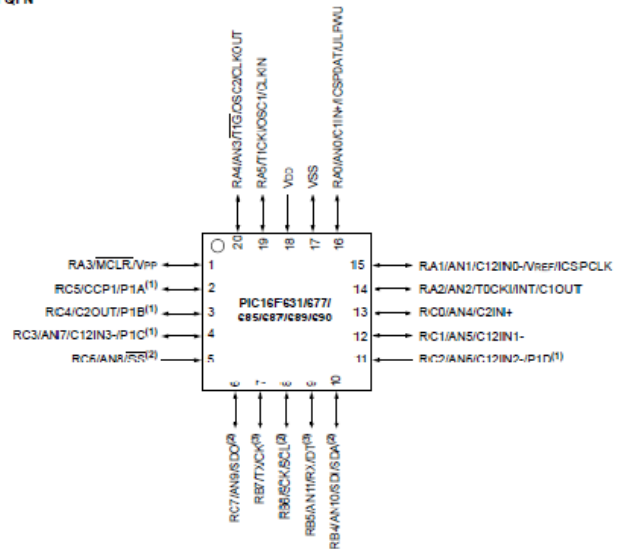


Fig -2: Pin diagram of PIC Microcontroller

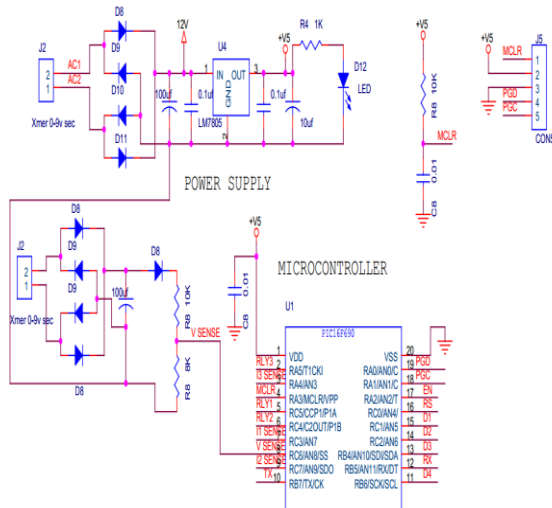
During this implementation an 8 bit peripheral interfaced controller microcontroller is used with following specifications as shown in Fig.2.

Precision Internal Oscillator:

- Factory calibrated to  $\pm 1\%$
- 8 MHz to 32kHz i
- Software tuneable
- Two-Speed Start-up mode
- Crystal fail detect for critical applications
- Clock mode switching during operation for power savings
- Power-Saving Sleep mode
- Wide operating voltage range (2.0V-5.5V)
- Industrial and Extended Temperature range
- Power-on Reset (POR)
- Power-up Timer (PWRTE) and Oscillator Start-up Timer (OST)
- Brown-out Reset (BOR) with software control option
- Enhanced low-current Watchdog Timer (WDT) with on-chip oscillator (software selectable nominal 268 seconds with full prescaler) with software enable
- Multiplexed Master Clear/Input pin
- Programmable code protection
- High Endurance Flash/EEPROM cell:
  - 100,000 write Flash endurance
  - 1,000,000 write EEPROM endurance
- Flash/Data EEPROM retention: > 40 years
- Enhanced USART module:
  - Supports RS-485, RS-232 and LIN 2.0
  - Auto-Baud Detect
  - Auto-wake-up on Start bit

**Low-Power Features:**

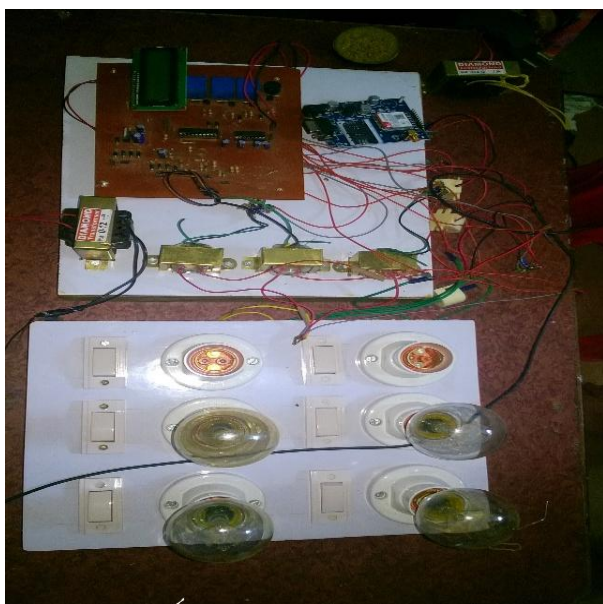
- Standby Current:  
- 50 nA @ 2.0V, typical
- Operating Current:  
- 11µA @ 32 kHz, 2.0V, typical  
- 220µA @ 4 MHz, 2.0V, typical



**Fig -3:** System design circuit

**3. HARDWARE IMPLEMENTATION**

The fig.4 shows the hardware implementation of ultra fast acting electronic circuit breaker using microcontroller.



**Fig -3:**Hardware Implementation

**4. CONCLUSION**

Now a days, safety and less power equipment plays vital role in market. To avoid electrical damages we use the fast responding circuit breaker because of it's great sensitivity and accuracy. this system is designed for instantaneous breaking if any fault occurs in electrical system due to load variation or any abnormal causes. this system has more scope compare to MCB with longer breaking time.

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