FINGERPRINT BASED IGNITION SYSTEM

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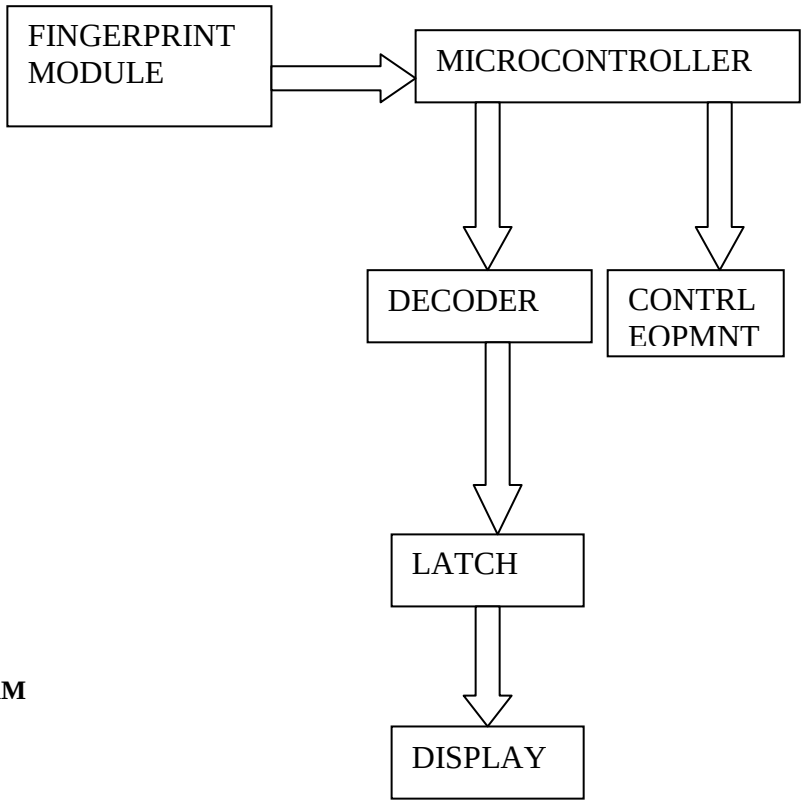
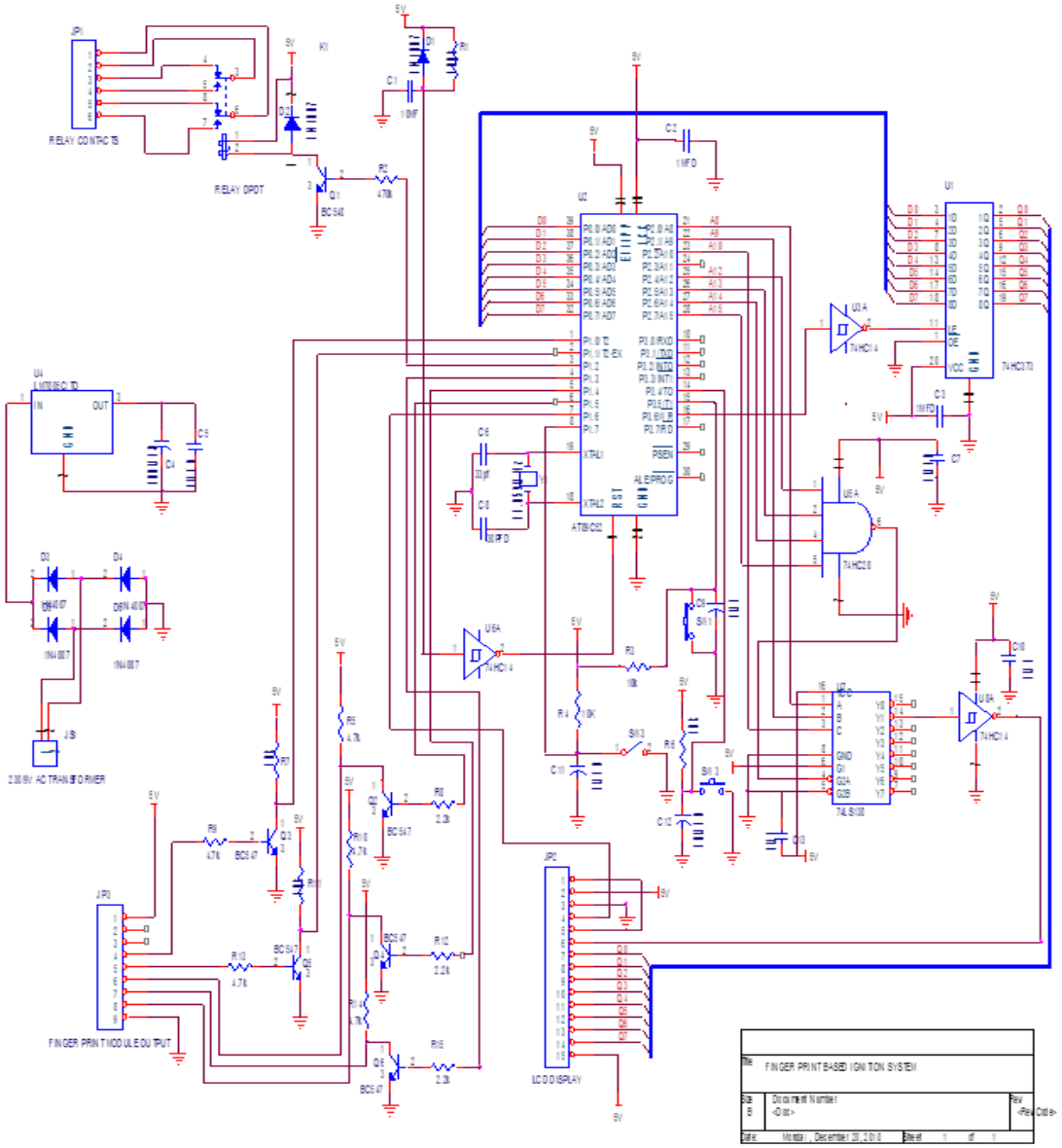
Abstract
Human identification is field very significant and which has undergone rapid changes with time. An important and very reliable human identification method is fingerprint identification. Fingerprint of every person is unique. So this helps in identifying a person or in improving security of a system.
Finger print of a person is 'read' by a special type of sensor. Finger print sensor can be interfaced with a microcontroller. Through keypad we can add new user and delete the existing user, also identify the user by selecting corresponding option through keypad.
In this paper we use a fingerprint module to read once identity to start the equipment. For this we use a microcontroller to enable the ignition system if the matching between scanned data and the already existing data is correct. Comparison is done inside the fingerprint module itself and its output is given to microcontroller. Result is displayed in a LCD display whether the user is authorised or not.
The sensor used is FIM 3030 by NITGEN. Microcontroller used is AT89c52. AT89c52 is a low power, high power CMOS 8 bit microcontroller. It consists of 32 I/O lines. The other main components are the decoder and the latch. The decoder used is DM74LS138 where as the latch used is 74HC373.

Keywords: Sensor, relay, FIM, latch, decoder, LCD.

BLOCK DIAGRAM



CIRCUIT DIAGRAM



Working

The fingerprint module used here is FIM 3030HV. When a person places his finger on the module, it scans his fingerprint and if he is the first user the module assigns him as master. If another user wants to use this module then he will be regarded as slave.

If a person wants to start the vehicle he has to scan his fingerprint and if the scanned image matches with the one stored in fingerprint module memory then the module give a high signal on its fourth pin, ie the module indicates a success. Otherwise a high signal will be present on the fifth pin of fingerprint module, ie it indicates a failure (user does not exist).

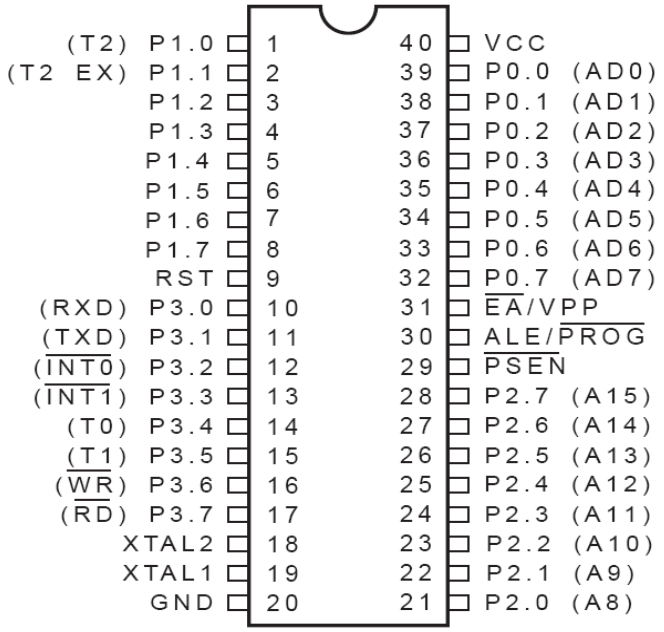
When a high on fourth pin is observed, it will cause microcontroller to activate the ignition circuit.

When a high on fifth pin is observed, that is a failure so microcontroller will not activate the ignition circuit.

When a success is observed, a LCD display will show that the matching is correct and if it is failure then incorrect matching will be observed on the LCD display.

MAIN COMPONENTS OF THE CIRCUIT
MICROCONTROLLER

AT89C52



Description

A microcontroller is a complete microprocessor system built on a single IC. Microcontrollers were developed to meet a need for microprocessors to be put into low cost products. Building a complete microprocessor system on a single chip substantially reduces the cost of building simple products, which use the microprocessor's power to implement their function, because the microprocessor is a natural way to implement many products. This means the idea of using a microprocessor for low cost products comes up often.
The microcontroller contains full implementation of a standard MICROPROCESSOR, ROM, RAM, I/0, CLOCK, TIMERS, and also SERIAL PORTS. Microcontroller also called "system on a chip" or "single chip microprocessor system" or "computer on a chip".

A microcontroller is a Computer-On-A-Chip, or, if you prefer, a single-chip computer. Micro suggests that the device is small, and controller tells you that the device' might be used to control objects, processes, or events. Another term to describe a microcontroller is embedded controller, because the microcontroller and its support circuits are often built into, or embedded in, the devices they control.

The AT89C52 is a low power, high performance CMOS 8 bit microcomputer with 8kB of flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel’s high density non-volatile memory technology and is compatible with the industry standard 80C51 and 80C52 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile a 8 bit CPU with flash on a monolithic chip, the Atmel AT89C52 is a powerful microcomputer which provides a highly flexible and cost effective solution to many embedded control applications.

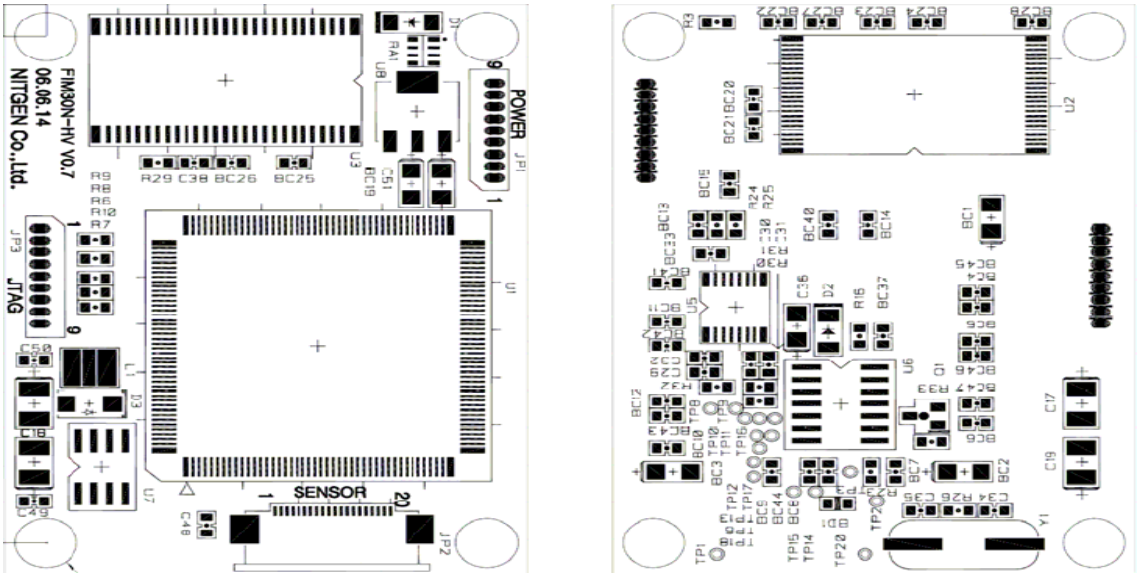
Port 0
Port 0 is an 8-bit open drain bidirectional I/O port. As an output port, each pin can sink eight TTL inputs.

Port 1
Port 1 is an 8-bit bidirectional I/O port with internal pullups. The Port 1 output buffers can sink/source four TTL inputs.

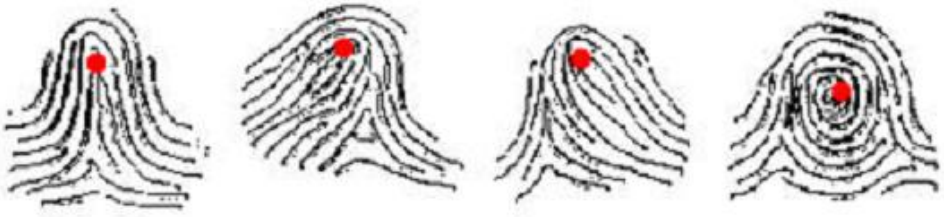
Port 2
Port 2 is an 8-bit bidirectional I/O port with internal pullups. The Port 2 output buffers can sink/source four TTL inputs.

Port 3
Port 3 is an 8-bit bidirectional I/O port with internal pullups. The Port 3 output buffers can sink/source four TTL input

FINGERPRINT MODULE
FIM 3030HV



When a user places their finger on NITGEN's Fingerprint Recognition Device (FRD) for the first time, the fingerprint is scanned and a 3-D fingerprint image is captured. All fingerprints contain a number of unique physical characteristics called minutiae, which includes certain visible aspects of fingerprints such as ridges, ridge endings, and bifurcation (forking) of ridges. Most of the minutiae are found in the core points of fingerprints, and the core points themselves are found near the centre of the fingerprint on the fleshy pad. Figure shows the positions of core points within fingerprints.



The user is enrolled, or registered, in the database after a special minutiae-based algorithm extracts key minutiae points from the live image at the time of acquisition and converts the data into a unique mathematical template comparable to a 60-digit password. This unique template is then encrypted and stored – it is important to note that no actual image of the fingerprint is stored, only the minutiae-based template. The next time a new fingerprint image for an individual is scanned by the FRD, another template is created and the two templates are compared to verify the user's identity.

Operations performed by fim 3030hv

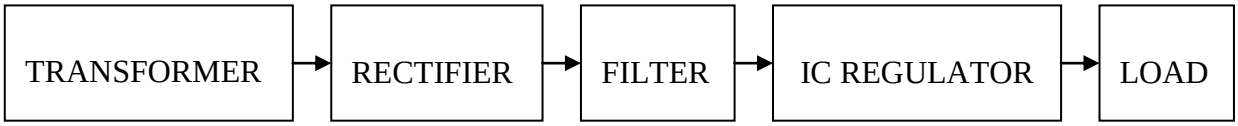
VERIFICATION- This command is used to verify user with the ID number. If the host request user verification with the number, the device checks if the ID number exists in user DB. If the ID number exists in user DB, the device scans fingerprint image through the sensor module. After internal processing, matching results is returned to the host.
IDENTIFICATION- the command is used to verify user with the ID number, the device scans the fingerprint image through the sensor module. The device searches DB for user matched with input fingerprint. If there exists the matched user, the device returns that user ID number to the host. Otherwise the device returns failed result.
INSTANT MATCHING- This command is used to match template data with input fingerprint. If the host requests instant matching with template data, the device matches those with fingerprint scanned through sensor module, and return result to the host.
GET TEMPLATE- The device returns template data get from the image scanned through sensor.
CANCEL- The device cancels current processing task such as verification, Identification and so on and returns result caused by cancel to a host.
INSTANT VERIFICATION -This command is used to verify user with the ID and the fingerprint data. It is similar to Verification except that Instant verification gets fingerprint data from host instead of the sensor module.

ENROLL FP1 -This command is used to add new user. The host requests enrolment of user with the ID number. The device checks if the ID number exists in DB. If the same ID number does not exist, the device gets the first fingerprint image through sensor module and returns the success of the first step. Then, the host requests another image capture. A device gets the second fingerprint image, save the new user to DB, and returns the success of the second step. This command is available only in 'Master Mode'. This command will be obsolete, Instead, use 'Register FP' command.
DELETE FP -This command is used to delete user. The host requests the deletion of user with the ID number. The device checks if the ID number exists in DB. And if the same ID number exists, the device deletes the user from DB, and returns results to the host. This command is available only in 'Master Mode'.

Power supply

The ac voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation.
A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

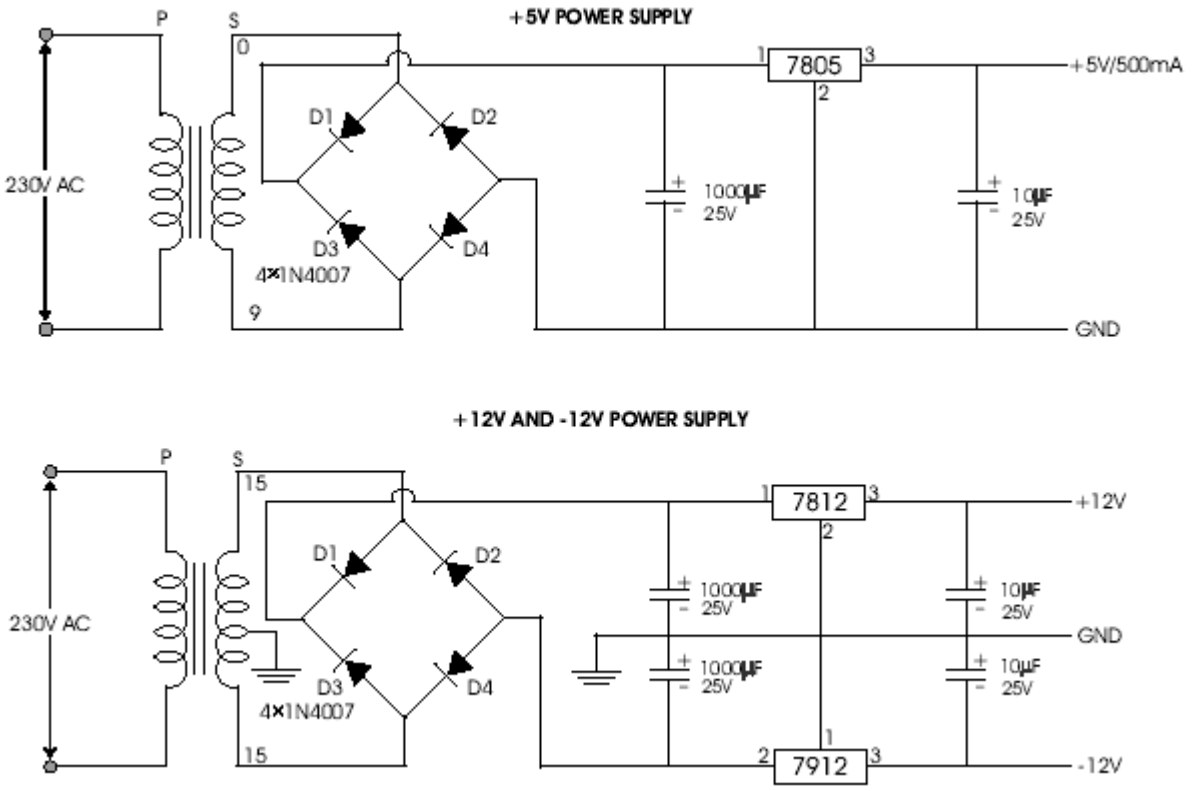
Block diagram



When four diodes are connected as shown in figure, the circuit is called as bridge rectifier. The input to the circuit is applied to the diagonally opposite corners of the network, and the output is taken from the remaining two corners. Let us assume that the transformer is working properly and there is a positive potential, at point A and a negative potential at point B. the positive potential at point A will forward bias D3 and reverse bias D4. The negative potential at point B will forward bias D1 and reverse D2. At this time D3 and D1 are forward biased and will allow current flow to pass through them; D4 and D2 are reverse biased and will block current flow. The path for current flow is from point B through D1, up through RL, through D3, through the secondary of the transformer back to point B. this path is indicated by the solid arrows. Waveforms (1) and (2) can be observed across D1 and D3.One-half cycle later the polarity across the secondary of the transformer reverse, forward biasing D2 and D4 and reverse biasing D1 and D3. Current flow will now be from point A through D4, up through RL, through D2, through the secondary of T1, and back to point A. This path is indicated by the broken arrows. Waveforms (3) and (4) can be observed across D2 and D4. The current flow through RL is always in the same direction. In flowing through RL this current develops a voltage corresponding to that shown waveform (5). Since current flows through the load (RL) during both half cycles of the applied voltage, this bridge rectifier is a full-wave rectifier.

IC voltage regulators

Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection all in a single IC. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustable set voltage. The regulators can be selected for operation with load currents from hundreds of milli amperes to tens of amperes, corresponding to power ratings from milli watts to tens of watts.

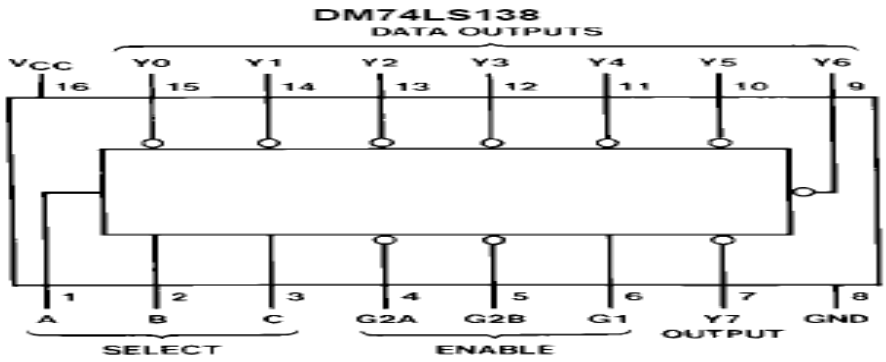


Circuit diagram (Power supply)

A fixed three-terminal voltage regulator has an unregulated dc input voltage, Vi, applied to one input terminal, a regulated dc output voltage, Vo, from a second terminal, with the third terminal connected to ground. The series 78 regulators provide fixed positive regulated voltages from 5 to 24 volts. Similarly, the series 79 regulators provide fixed negative regulated voltages from 5 to 24 volts.

DECODER

DM74LS138

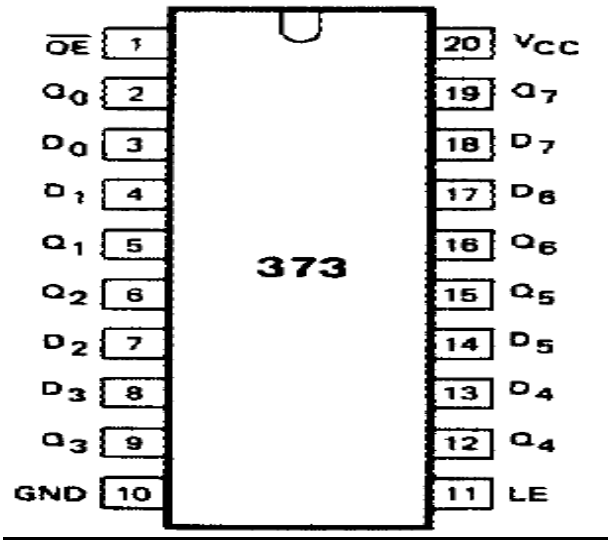


Description:

These schottky – clamped circuits are designed to be used in high – performance, memory – decoding or data routing applications, requiring very short propagation delay times. In high – performance memory systems these decoders can be used to minimize the effects of system decoding. When used with high speed memories, the delay times of these decoders are usually less than the typical access time of the memory. This means the effective system delay introduced by the decoder is negligible.

The DM74LS138 decodes one-of-eight lines, based upon the conditions at the three binary select inputs and the three enable inputs. Two active-low and one active-high enable inputs reduce the need for external gates or inverters when expanding. A 24-line decoder can be implemented with no external inverters, and a 32-line decoder requires only one inverter. An enable input can be used as a data input for demultiplexing applications.

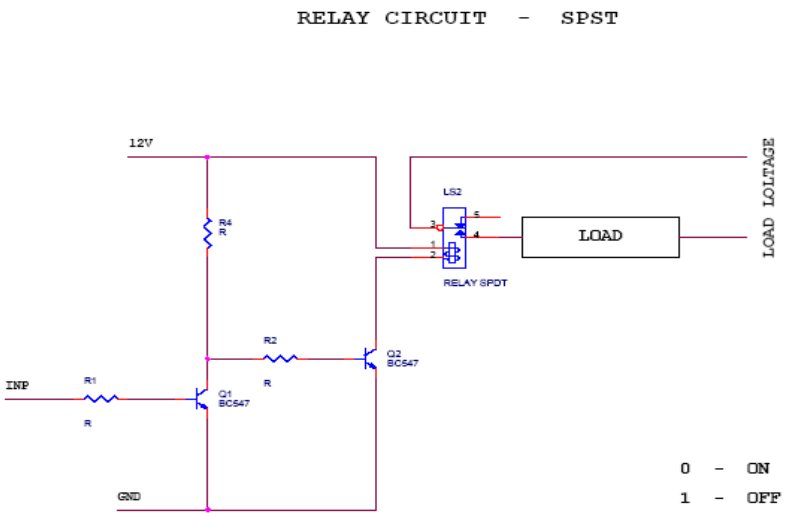
LATCH
74HC373



Description:

The 74HC/HCT373 are high-speed Si-gate CMOS devices and are pin compatible with low power Schottky TTL (LSTTL). The 74HC/HCT373 are octal D-type transparent latches featuring separate D-type inputs for each latch and 3-state outputs for bus oriented applications. A latch enable (LE) input and an output enable (OE) input are common to all latches.
The "373" consists of eight D-type transparent latches with 3-state true outputs. When LE is HIGH, data at the D inputs enters the latches. In this condition the latches are transparent, i.e. a latch output will change state each time its corresponding D-input changes. When LE is LOW the latches store the information that was present at the D-inputs a set-up time preceding the HIGH-to-LOW transition of LE. When OE is LOW, the contents of the 8 latches are available at the outputs. When OE is HIGH, the outputs go to the high impedance OFF-state. Operation of the OE input does not affect the state of the latches.

RELAY



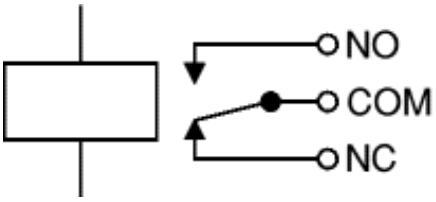
Relay:

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are doublethrow (changeover) switches. Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical.

The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify

the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly without amplification.

Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available. Most relays are designed for PCB mounting but you can solder wires directly to the pins providing you take care to avoid melting the plastic case of the relay. The animated picture shows a working relay with its coil and switch contacts. You can see a lever on the left being attracted by magnetism when the coil is switched on. This lever moves the switch contacts. There is one set of contacts (SPDT) in the foreground and another behind them, making the relay DPDT.



The relay's switch connections are usually labelled COM, NC and NO:
COM = Common, always connect to this, it is the moving part of the switch.
NC = Normally Closed, COM is connected to this when the relay coil is **off**.
NO = Normally Open, COM is connected to this when the relay coil is **on**.

Lcd :

Liquid crystal displays (LCDs) have materials, which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal.

An LCD consists of two glass panels, with the liquid crystal material sand witched in between them. The inner surface of the glass plates are coated with transparent electrodes which define the character, symbols or patterns to be displayed polymeric layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a defined orientation angle.

One each polarizes are pasted outside the two glass panels. These polarizes would rotate the light rays passing through them to a definite angle, in a particular direction. When the LCD is in the off state, light rays are rotated by the two polarizes and the liquid crystal, such that the light rays come out of the LCD without any orientation, and hence the LCD appears transparent.

Conclusion:

Thus fingerprint identification enhances the security of a vehicle and makes it possible only for some selected people to start the car. Thus by implementing this relatively cheap and easily available system on a car one can ensure much greater security and exclusivity than that offered by a conventional lock and key.
In actual case a success would initiate a trigger in the spark plug. But due to limitation in initiating a spark plug and due to safety reason a prototype has been developed here. The output can be seen using an LED.

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