Sensing Peripheral Devices with MC1489A Receiver

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Presented here is a circuit for monitoring the status of electrical or peripheral devices using the classical MC1489A receiver found in RS232 based devices. RS232 standard is still widely incorporated in embedded systems. Sometimes, there are unused or spare MC1489A receivers in RS232 interface circuits. Fortunately, these can be used for monitoring the status of electrical circuits or mechanical switches. This saves money and space and also adds some safety to embedded systems because receivers for RS232 have internal protection and Schmitt triggers for better noise immunity. MC1489A captures information from peripheral devices that are not TTL/CMOS compatible but are in the working range of this receiver.

Circuit and working

Circuit diagram of the sensing peripheral devices with MC1489A receiver (IC1) is shown in Fig. 1. It consists of four examples for sensing the signals from peripheral devices such as simple DC motors (M1), incandescent lamps (BL1) and DC motor (M2) driven by a full-bridge circuit with four switches (S3-S6) to control bipolar DC voltages. Status of each device is indicated by four LEDs (LED1 through LED4). For example, if switch S1 is closed, bulb BL1 will glow. Status of switching on the bulb is indicated by the glowing of LED2.

PARTS LIST

Semiconductors:
IC1 - MC1489A receiver
D1-D5 - 1N4007 rectifier
LED1-LED4 - 5mm LED

Resistors (all 1/4-watt, ±5% carbon):
R1-R4 - 2.2-kilo-ohm

Capacitors:
C1-C3 - 0.1µF ceramic disk

Miscellaneous:
S1-S6 - On/off toggle switch
BL1 - 24V, 0.1A or similar bulb
M1, M2 - 24V, 0.1A or similar DC motor
CON1, CON3, CON4 - 3-pin berg strip connector
CON2 - 2-pin berg strip connector
CON5 - 5-pin berg strip connector

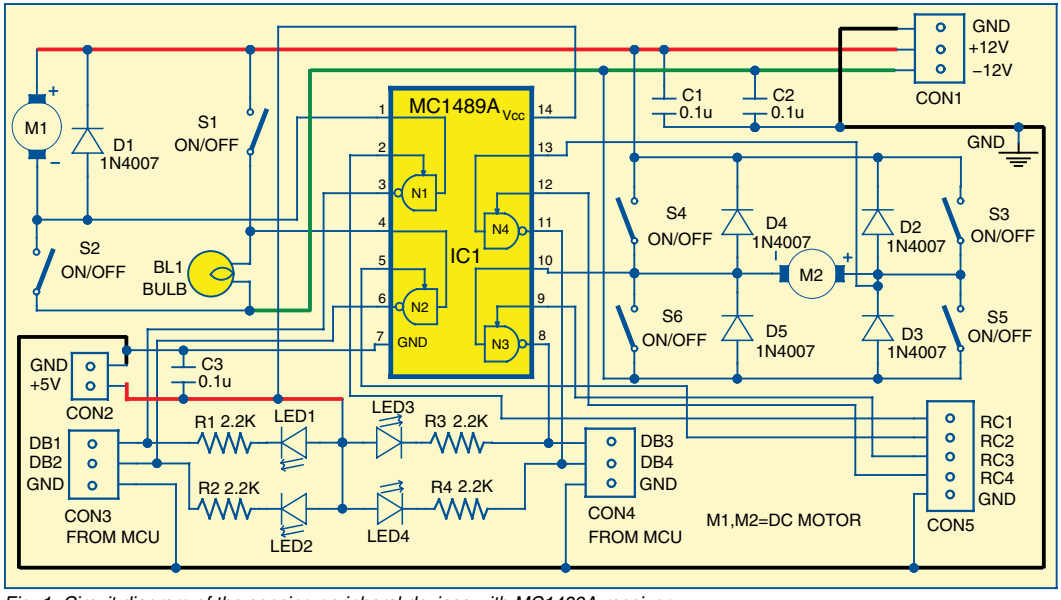

Fig. 1: Circuit diagram of the sensing peripheral devices with MC1489A receiver

MC1489A converts bipolar signals into CMOS/TTL signals. It is a quad-line receiver with response controls (RC1 through RC4). Response control lines are not used here. However, these are included in this design to facilitate users for future applications or expansion.

LED1 through LED4 are connected

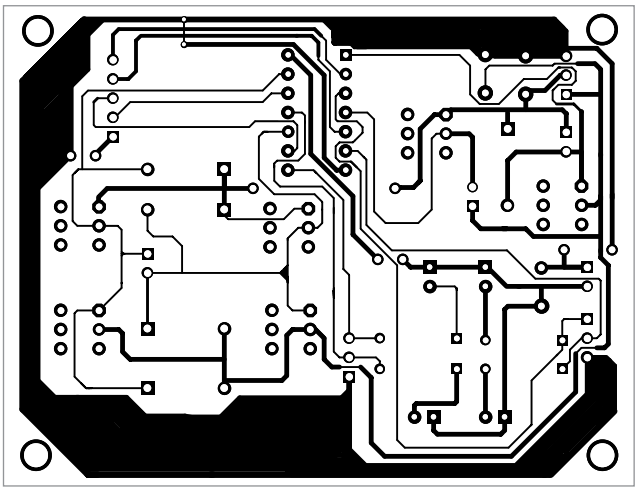

Fig. 2: Actual-size PCB layout of the sensing peripheral devices circuit

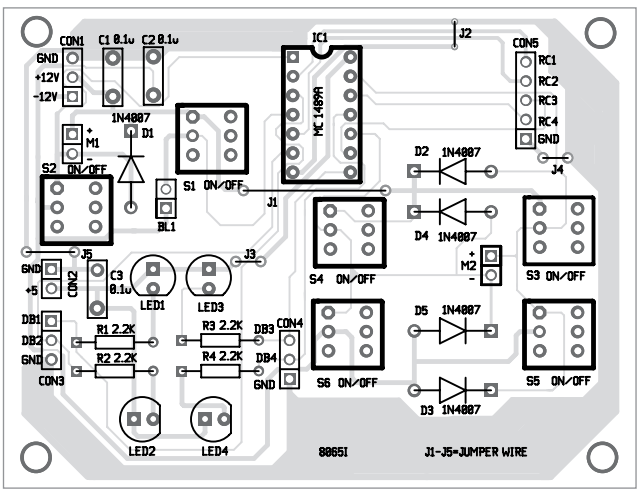

Fig. 3: Component layout of the PCB

to these receivers. You can add protection resistors, capacitors and diodes for inputs of IC1, if required. Also, you can interface any microcontroller (MCU) directly to IC1. Data outputs (DB1 through DB4) of MC1489A can be read with simple input commands from the MCU.

Switches S1 through S6 can be of any kind, be it electronic (transistors) or electromechanical (relays). Ensure that the voltages supplied to MC1489A through these switches do not exceed its operating range. Maximum input voltage range of MC1489A is ±30V.

Construction and testing

Actual-size, single-side PCB layout of the circuit for sensing and controlling peripheral devices with MC1489A receiver is shown in Fig. 2 and its component layout in Fig. 3.

Testing the circuit is very simple. If you do not have actual loads, you can replace bulb BL1 and motors M1 and M2 with appropriate resistors. For example, you may replace these with resistors of 200-ohm, 3W for power supply of ±12V. This will provide currents of 24V/200-ohm = 120mA through loads, when corresponding switches are closed. This current will imitate the working current of the loads.

Switch off and switch on switches S1 through S6 in any working combination. You will notice that the status of the LEDs changes according to the status of the switches.

Pay special attention to the controlling of DC motor M2 in the bridge configuration.

Closing switches S3 through S6 using the right combination is essential; otherwise, there will be a short circuit. Never close switches S3 and S5, and/or S4 and S6, at the same time. To turn on M2, you can close only S3 and S6, or S4 and S5, switches at the same time. ●

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