Wireless Low-Cost Luggage Security Alarm

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If someone tries to walk away, say, two metres, with your luggage, this circuit would sound an alarm to indicate that the luggage is being stolen. The alarm mimics a police siren that alerts the user and also scares the thief. As the distance is very short, the user can catch him and get back the luggage. This device also makes sure that the owner never forgets about the luggage.

Circuit and working

The circuit of the wireless low-cost luggage security alarm has transmitter and receiver sections. Fig. 1 shows the transmitter section while Fig. 2 shows the receiver section.

The transmitter section is built around 5V regulator 7805 (IC1), an encoder HT12E (IC2), a 433MHz transmitter module (TX1) and a few other components. It requires +5V DC power supply, which is obtained from regulator IC1. Switch S1 is used as power on/off switch.

Transmission enable pin 14 of IC2 is grounded as it is an active low input. So, when the circuit is switched on, it starts encoding according to the data given to its input and address lines. The oscillator is activated by connecting an external 1-mega-ohm resistor (R1) between pin 15 and pin 16 of IC2. DOUT pin of IC2 sends serial data according to the input combination (where A0-A8 equals 11011111 and AD8-AD11 equals 1111) to the RF transmitter module.

Similarly, as shown in Fig. 2, the receiver section is built around 5V regulator 7805 (IC3), decoder HT12D (IC4), a 433MHz receiver module (RX1), tone generator UM3561 (IC5), low-power audio amplifier LM386 (IC6) and a few other components. It also requires +5V DC power supply, which is obtained from regulator IC3. Switch S2 is used as power on/off switch.

The receiver section consists of an RF receiving antenna that receives serial data sent by transmitter TX1 as

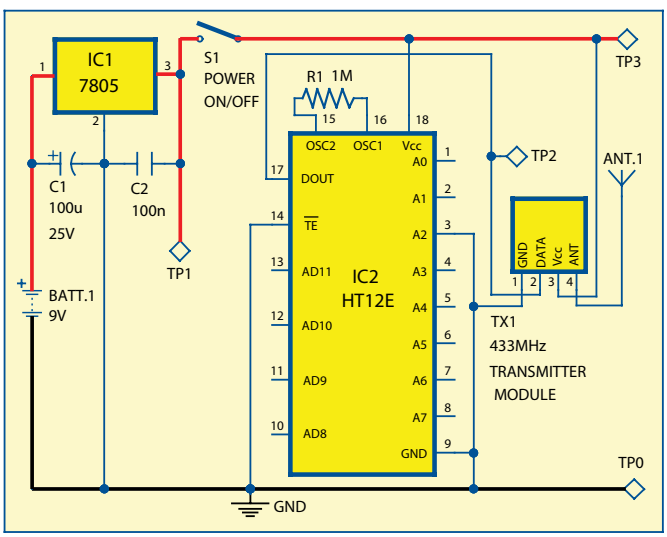

Fig. 1: Circuit of the transmitter section

Test Points

Test point	Details
TP0, TP6	0V (GND)
TP1, TP4	5V
TP2	Pulses during transmission
TP3	5V when switch S1 is closed
TP5	5V when switch S2 is closed
TP7	High during transmission and low when there is no transmission
TP8	3.3V

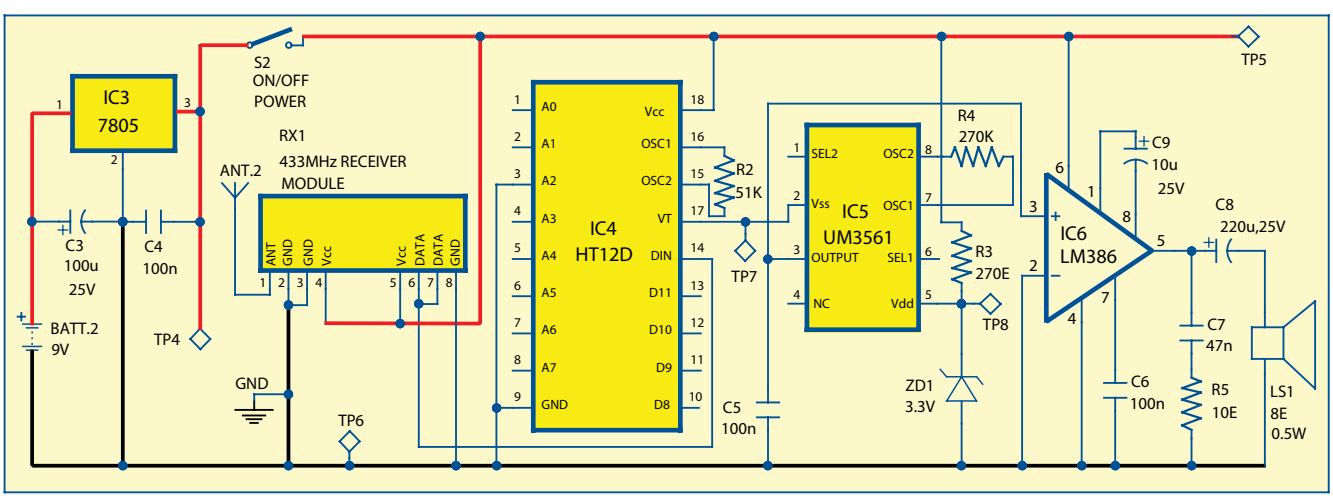

Fig. 2: Circuit of the receiver section

PARTS LIST

Semiconductors:

IC1, IC3	- 7805, 5V regulator
IC2	- HT12E encoder
IC4	- HT12D decoder
IC5	- UM3561 tone generator
IC6	- LM386 low-power audio amplifier
ZD1	- 3.3V zener diode

Resistors (all 1/4-watt, ±5% carbon):

R1	- 1-mega-ohm
R2	- 51-kilo-ohm
R3	- 270-ohm
R4	- 270-kilo-ohm
R5	- 10-ohm

Capacitors:

C1, C3	- 100µF, 25V electrolytic
C2, C4-C6	- 100nF ceramic disk
C7	- 47nF ceramic disk
C8	- 220µF, 25V electrolytic
C9	- 10µF, 25V electrolytic

Miscellaneous:

TX1	- 433MHz transmitter module
RX1	- 433MHz receiver module
BATT.1, BATT.2	- 9V battery
S1, S2	- On/off switch
LS1	- 8-ohm, 0.5W speaker
ANT.1, ANT.2	- 17cm length single-wire antenna

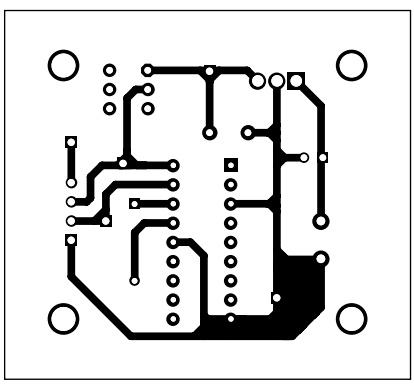

Fig. 3: Actual-size PCB of the transmitter circuit

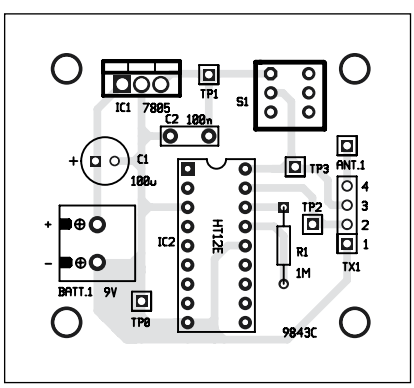

Fig. 4: Component layout of the transmitter

shown in Fig. 1. To generate clock pulses, oscillator pins 15 and 16 of IC4 are connected with an external resistance of 51k (R2).

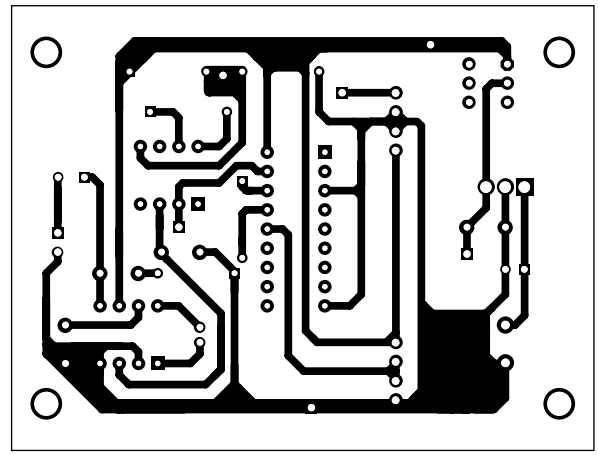

Fig. 5: Actual-size PCB of the receiver circuit

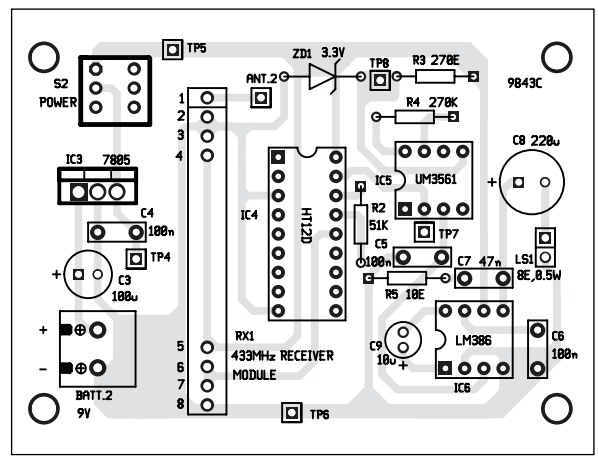

Fig. 6: Component layout of the receiver

The data output of RX1 is given to the data input DIN (pin 14) of HT12D decoder IC4. Incoming data is compared with already set address values. If valid data is received, valid transmission pin VT (pin 17) goes high and the data is accordingly transferred to the data pins. When valid data is not received, VT pin goes low, and vice-versa.

VT pin of IC4 is connected to Vss (pin 2) of UM3561 (IC5). UM3561 is a tone generator IC that gives three different tones, namely, police siren, ambulance and machine gun. These are obtained by different combinations of selection pins (SEL1 and SEL2) and oscillator pins (OSC1 and OSC2). Here, SEL1 (pin 6) and SEL2 (pin 1) of IC5 are left open to produce the police-siren tone.

Operational amplifier LM386 is used to amplify the output of IC5 to generate a louder sound. The gain of this op-amp can be from 20 to 200 by proper selection of external components between pin 1 and pin 8 of IC6. Here, the gain is set to 200. This is achieved by connecting a 10-micro farad capacitor (C9) between pin 1 and pin 8 of IC6. Output of IC5 is given to non-inverting input pin 3 of IC6 and the inverting terminal is grounded. The amplified output is taken from pin 5 through a 220-microfarad capacitor (C8) to an 8-ohm, 0.5W speaker (LS1).

During data transmission, LS1 does not produce sound because VT pin 17 of IC4 remains high to disable IC5. On the other hand, when transmission fails, LS1 produces the sound as VT pin 17 of IC4 goes low to enable IC5.

Construction and testing

Separate PCBs are designed for transmitter and receiver units. An actual-size, single-side PCB for the transmitter circuit is shown in Fig. 3 and its component layout in Fig. 4. Similarly, an actual-size, single-side PCB for the receiver circuit is shown in Fig. 5 and its component layout in Fig. 6. Assemble both circuits separately and enclose these in two separate suitable small boxes. Ensure proper wiring to avoid any errors.

For troubleshooting, verify various voltages as given in the table. ●

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