Transponder

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OVERVIEW

The idea about using PIC12C508 as a transponder device resides on its ability to function in a wide VDD area, on the presence of a Start-Up Timer and Watchdog Timer (a very stable Reset), its very low power consumption, low price and on the need of only four additional elements (or three, if the coil is realized as a part of the PCB).

The advantages achieved by this design are as follows:

- Flexibility, in terms of codes and protocols of the transmitted information (limited only by the designers imagination)
- Possibility to achieve a high level of authorization and safety of the transmitted data
- Very low price (in most of the cases lower than by standard solutions)

IMPLEMENTATION

The wiring diagram is shown on Figure 1.To explain the operation, pay attention to Figure 2. There the diodes D2 and D3 are the internal protective diodes on pin 2 GP5/CLKIN and respectively D4 and D5 on pin 5 GP2. These chip internal diodes (IMAX=20 mA) build a rectifying bridge in which first diagonal the resonant circuit (L1/C1) is connected as an energy source. In the second diagonal – a Zener diode D1 – 5.1V, filter capacitor C2 – 0.15 µF (absolutely enough for frequencies >100 KHz) and VDD,VSS pins of the chip. In this manner the microcontroller is powered by putting a resonant circuit in a field with frequency close to its resonance frequency. If the microcontroller is configured to use external clock - XT or LP, because of the specific wiring of pin CLKIN it function synchronously with a clock Fosc frequency equal to the frequency of the field. To achieve an amplitude modulation of the external field is enough to alternate by suitable ordinance IN/OUT states on pin GP2. When pin GP2 is configured as input the field load is minimal and is defined by the consumption of the chip or by the current through D1 in case of more powerful field. When pin GP2 in configured as output not dependent by 1 or 0 state the result is loaded on the one of the half-periods. The fluctuations of Vdd appearing in this mode of modulation are minimal and does not affect of the stable function of the microcontroller, because only the one of the half-periods is loaded.

FIGURE 1: GRAPHICAL HARDWARE REPRESENTATION

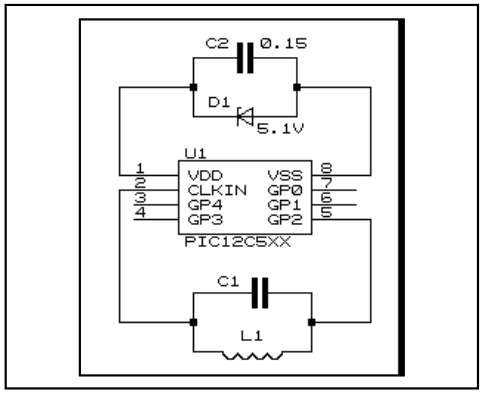
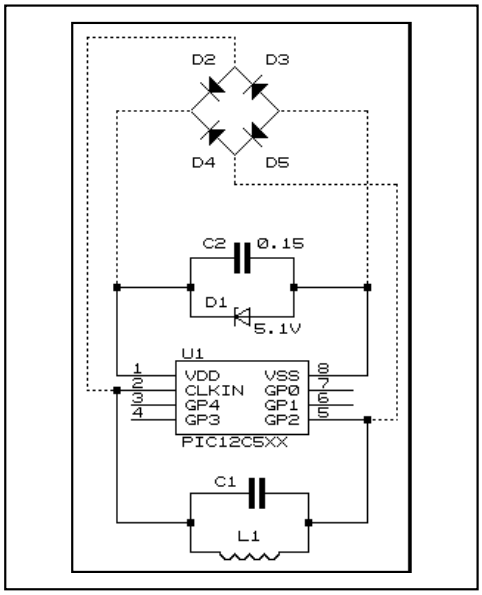


FIGURE 2: GRAPHICAL EXPLANATION



PRACTICAL REALIZATION AND RESULTS

In December 1996, I develop a system for access control based on the presented idea. The transponder cards were realized on a PCB with 1"x1.5" in size and 0.04" in thick. The inductance was realized like double-sided paths on the PCB and except the PIC12C508 microcontroller there were only three elements D1,C1 and C2. The PCB was accommodated in a thin plastic box. The card reader was produced on the base of PIC16C73 with minimum additional elements. The working frequency of the field was 333.333 KHz. By 2.5" x 3" size of the reader card on which the reader's inductance is realized by double-sided printed paths, the result was a stable function up to distance of 6" between the reader and the transponder card. I used Manchester code by sending two bytes synchrocode, four bytes identification code and one byte control sum. The frequency of the amplitude modulation of the field was 256 times lower than the field frequency.

If you are interested in it I could present you the complete technical documentation of this development.

My experience reveal that using of PIC12C5xx as transponder in most of the cases results better and more price efficient than using the standard transponder chips of other producers.

MICROCHIP HARDWARE DEVELOPMENT TOOLS USED

PICSTART Plus / 10-00157/V. 1.30.00

MPLAB 3.22.02,MPASM 1.50