Real Time Clock for the Z80

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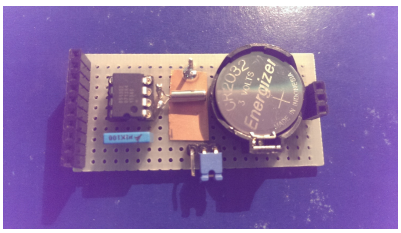
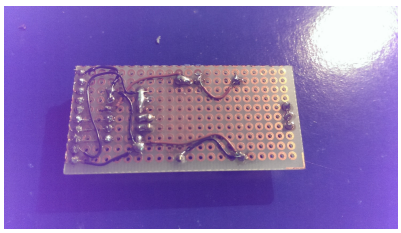
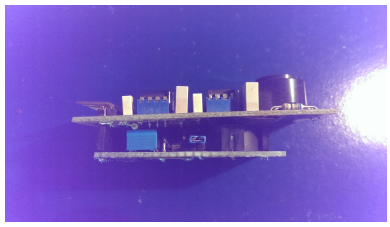
Real Time Clock and new Buzzer for the Z80 by Pino Giaquinto

What I will try to describe this time is the result of my friend Piergiorgio: the implementation (from the HW point of view, but also SW) of an RTC module based on the widespread DS1302 chip (complete with a buffer battery) and 'integrated' in our system Z80 taking advantage of the expansion possibilities offered by the C connector of the LX.529 video-graphics card.
Having made this premise, which I considered absolutely right on my part, let's roll up our sleeves and move on to the wiring diagrams of our Z80 computer. As it is possible to deduce by carefully studying the video-graphics scheme, the designers left the PB2-PB7 'signals' corresponding to the bits 'free' on the expansion connector (it would be the one on which the LX.530 'daughter' card is mounted) b2-b7 of the port B of the Z80-PIO 2 (see IC8 on the diagram of the LX.529). Using precisely three of the available signals, namely PB5-PB7, Piergiorgio has created a fully functional prototype of an RTC module for Z80-NE 'leaning' on the LX.530 daughter board, as can be seen in the following photos:





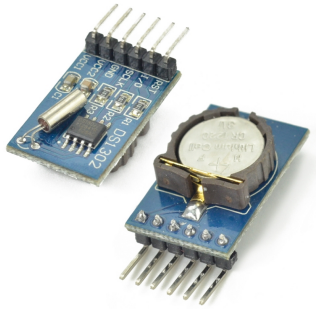


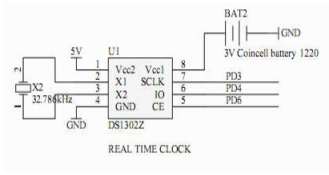
(I underline "prototype" ed)

Obviously it was necessary to write a lot of code to adapt the hardware to the CPM-3 of the DarkStar, but explaining this goes beyond what my job is, I believe and hope that the author of the project will take care of it as soon as possible. person ????

In particular, the task that was entrusted to me by good Piergiorgio concerns the practical realization of a small module that includes the BUZZER (ie the LX.530 daughter board) and its RTC module ... all mounted on a single easy-to-build card. and that it takes up little space.

As for the RTC 'section', remembering having seen something at my trusted electronics retailer (small modules to be used with Arduino boards), I immediately decided to use a 'commercial' based module, as foreseen in the his project, on DS1302 but made in SMD technology ... and this to minimize the overall dimensions:





To get an idea of the dimensions of the module, consider that the battery is a CR1220 which has a diameter of 12.5mm and that the pitch of the SIL connector is the classic 1/10 "(or 2.54mm). On this tiny and very cheap module there is everything and more than what is needed as far as the RTC discourse is concerned, therefore it remains to be considered and resolved 'only' as regards the system 'sounds'.

The original scheme of the LX.530 'daughter' board (which I will show you immediately below), necessary to generate the classic system 'BEEP' in particular conditions, provided for the use of two NE555s configured respectively the first (IC1) as a multivibrator monostable (which generated, if necessary, a pulse of about 0.1s duration t1) and the second (IC2) as an astable multivibrator (which generated, in the presence of the above impulse, a square wave signal with a frequency f of about 1KHz):

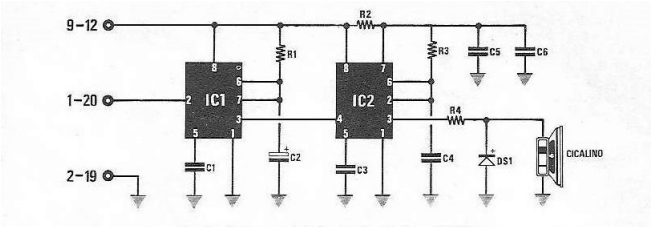


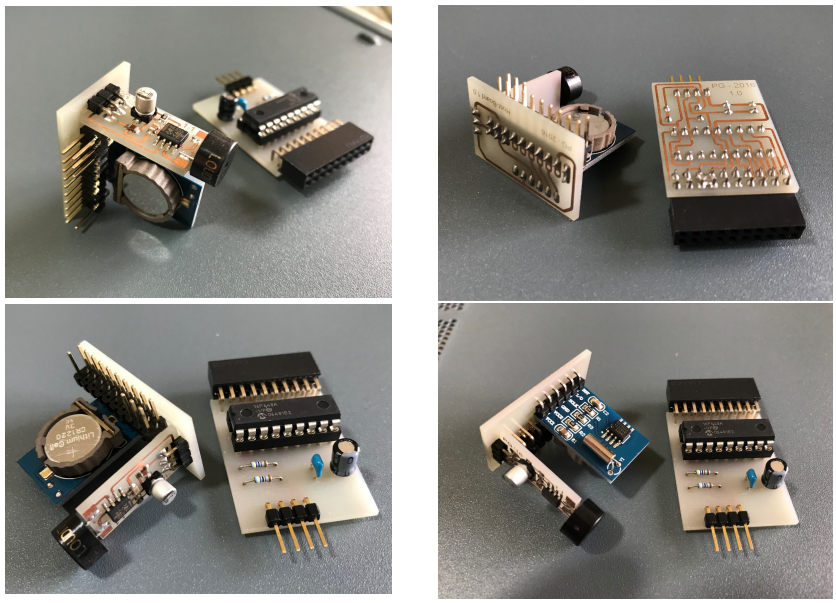
Fig. 4 Schema elettrico della cicalina LX.530.

R1 = 100.000 ohm 1/4 watt
R2 = 10.000 ohm 1/4 watt
R3 = 68.000 ohm 1/4 watt
R4 = 68 ohm 1/4 watt
C1 = 10.000 pF poliestere
C2 = 1 mF elettrol. 63 volt
C3 = 10.000 pF poliestere
C4 = 10.000 pF poliestere
C5 = 100.000 pF poliestere
C6 = 100.000 pF poliestere
DS1 = diodo al silicio 1N4007
IC1 = integrato NE.555
IC2 = integrato NE.555
Cicalino = capsula Souducer

$$t1 = 1.1 \cdot R1 \cdot C2 = 0.11[s]$$

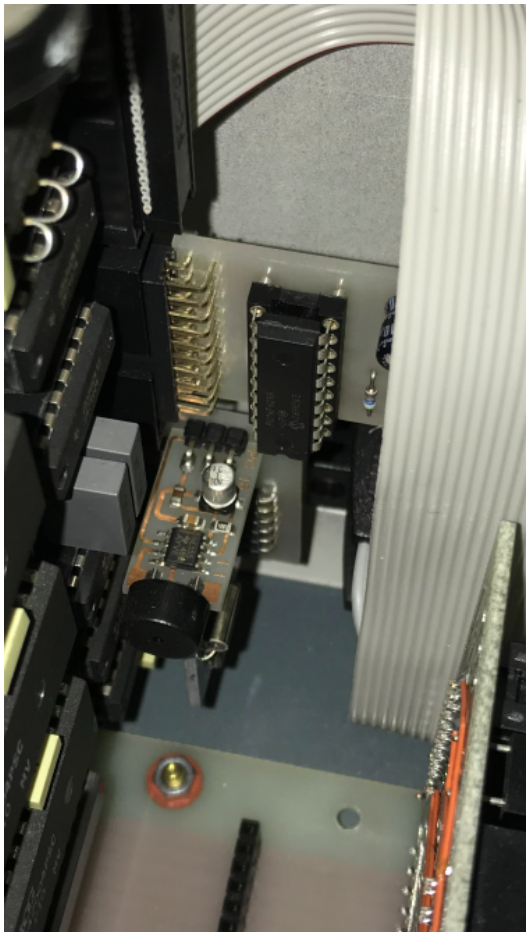
$$f = \frac{1}{T} = \frac{1.44}{(R2 + 2 \cdot R3) \cdot C4} = 986.3[Hz]$$

In this case my idea was to create a small module, always in SMD technology to reduce space, taking inspiration from the original project from which I 'took' only the first part (the monostable multivibrator, I always refer to IC1) and that I used to drive a small BUZZER of the 'active' type. This type of buzzer, when powered, emits a tone of a predetermined frequency (generally around 2KHz) and in this way I have also saved from the point of view of the number of components. In fact, using an active buzzer, I didn't need to generate the square wave and I saved a NE555 and some other passive components!
The buzzer I use is very cheap, easy to find, can be powered with voltages of 3-5V and absorbs on average a few tens of mA (so the NE555 can easily 'bear' it).
At this point, in possession of the two tiny modules, one for the system BEEP and the other for the RTC… how to 'connect' them to the video-graphics? I immediately liked the idea of a HOST ticket and in the photo below I show you the final result of my work. The photos will certainly be more explanatory than any other 'written' presentation. We liked the idea so much… and I hope you like it too ????



(The card you see on the right is the one relating to the ps / 2 interface (/?id=124:interfaccia-per-tastiera-ps-2) . Ed.)

In the photo below, the PS / 2 keyboard interface and the BEEP & RTC expansion card just described, both mounted on the video-graphics LX.529:



Obviously I will make available all the information necessary to carry out this little 'work', including the drawings of the two printed matter that you will immediately find on the website of the legendary Z80-DarkStar (or here! Ed).

See you soon!

The management software can be found here (https://github.com/pbetti/ZDS/blob/master/DarkStar-Monitor/modules/clock.inc.asm) (monitor / bios) and here (https://github.com/pbetti/ZDS/blob/master/CPM3/time.asm) (cp / m 3 module).

Download

PCB layout

- Master (including ps / 2) (/images/Z80NE/files/Master.pdf)
- Assembly diagram (/images/Z80NE/files/Host_Board_e_Beeper.pdf)
- Beeper.brd (/images/Z80NE/files/Beeper.brd)
- Host-Board.brd (/images/Z80NE/files/Host-Board.brd)

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