

Kitronik



BUILD YOUR OWN MEMORY & REACTIONS

ELECTRONIC GAME KIT



BUILD INSTRUCTIONS

Before you put any components in the board or pick up the soldering iron, just take a look at the Printed Circuit Board (PCB). The components go in the side with the writing on and the solder goes on the side with the tracks and silver pads.

1

PLACE RESISTORS

Start with the seven resistors. The text on the board shows where R1, R2, etc go. Make sure that you put the resistors in the right place (i.e. the 47 Ω goes in to R7)

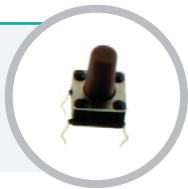
| PCB Ref | Value | Colour Bands |
|---------|--------------|-----------------------|
| R1-R6 | 680 Ω | Blue, grey, brown |
| R7 | 47 Ω | Yellow, purple, black |



2

SOLDER THE SWITCHES

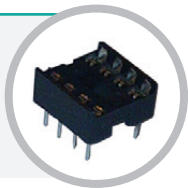
Solder the four switches into the board where it is labeled SW1, SW2, SW3 & SW4. Once you have got the pins lined up with the holes they can be pushed firmly into place.



3

SOLDER THE IC HOLDER

Solder the Integrated Circuit (IC) holder in to IC1. When putting this into the board, be sure to get it the right way around. The notch on the IC holder should line up with the notch on the lines marked on the PCB.



4

SOLDER THE LEDs

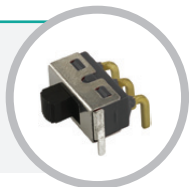
Solder the four Light Emitting Diodes (LEDs) into LED1 – LED4. It does not matter which colour goes where, but the game won't work if they don't go in the right way around. If you look carefully one side of the LED has a flat edge, which must line up with the flat edge on the lines on the PCB.



5

SOLDER THE SWITCH

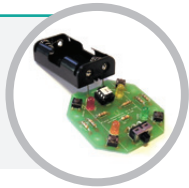
Solder the PCB mount right angled on / off switch into SW5. The row of three pins that exit the back of the switch must be soldered, but it doesn't matter too much if you can't solder the other two pins.



6

FIT THE BATTERY HOLDER

Finally place the battery holder into the board, so that it sticks out off the edge of the board. This part should be soldered with the holder raised off from the board with 5mm of lead going through to the back of the board.



7

FIT THE IC INTO THE HOLDER

The IC can be put into the holder ensuring the notch on the chip lines up with the notch on the holder.

8

SECURING THE BATTERY HOLDER

Check that the board works before folding the battery holder under the board and fixing in place with the M3 nut and bolt.

CHECKING YOUR GAME PCB

Carefully check the following before you insert the batteries:

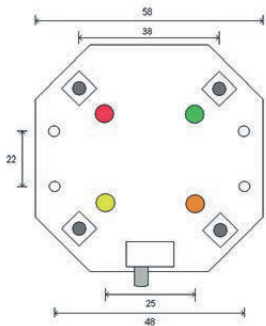
- Check the bottom of the board to ensure that:
 - All holes (except the 5 large (3 mm) holes in the corners) are filled with the lead of a component.
 - All these leads are soldered.
 - Pins next to each other are not soldered together.
- Check the top of the board to ensure that:
 - The notch on the IC holder / IC is near the edge of the board.
 - The flat edge of each of the LEDs is next to the switch.
 - The colour bands on R7 are yellow, purple, black.

TESTING THE PCB

The software on the microcontroller has been specially designed to allow easy testing of the PCB. When the batteries are inserted and SW5 is in the on position, the game will:

- Illuminate LED1, LED2, LED3 & LED4 in sequence for one second each.
 - If the LEDs don't light in order stop testing and check the solder joints on on switch SW5, the solder joints on the 47 Ω resistor, the solder joints and orientation of the IC.
- Once the LEDs have gone out, pressing any of the four buttons will cause the LED next to it to light.
 - Check that all four buttons work, if this is not the case check the solder joints on the corresponding push switch, as well as the IC and all 680 Ω resistors.
- Turn the game off using SW5.
- If all four buttons tested OK, next time the game is turned on it will work normally.

MECHANICAL DETAILS

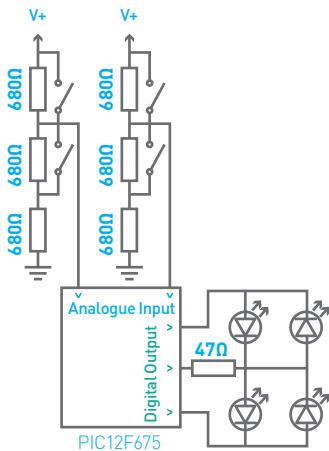


Switch Diameter: 3.5mm
LED Diameter: 5mm
Mounting hole Diameter: 3.3mm



Dimensions in mm

HOW THE GAME WORKS



At the heart of the electronic circuit is a microcontroller. A microcontroller is in effect a small computer. The circuit uses a clever design to allow four switches and four LED's to be connected to only five input / outputs.

The switches are connected to an analogue to digital converter so that it gets a digital representation of the voltage on the input. A set of three resistors is used to make up a potential divider. As each of the resistors is the same value an equal amount of voltage is present across

each of these resistors. The top two resistors also have a switch across them. When the switch is pressed the voltage across the resistor will become zero. So depending upon which of the two switches is pressed will depend upon what the voltage is at the point where it is fed into the PIC microcontroller. This allows the microcontroller to work out which button is pressed. The third resistor is used to prevent the batteries being rapidly flattened should both switches be pressed at the same time. The other two switches on the board work in the same way. This may sound overly complicated however it uses less input pins than switches with individual pull up resistors. The LEDs are driven by three outputs. Because the LED only works when current flows through it in one direction the four LEDs can be turned on by changing the outputs to make one high, whilst another is low. More than one LED can be turned on if a little dimmer by taking it in turns to turn the LEDs on hundreds of times a second. The 47Ω resistor limits the current that can flow through the LED's. This protects the LED and controls the brightness.

USING THE GAME

- SW5 can be used to turn the game on and off (as indicated on the PCB).
- When the game is turned on LED1 & LED4 flash rapidly to indicate that a game should be selected. Press SW1 for the memory game or SW4 for the reactions game (both are marked on the PCB).
- If you wish to change the game you are playing turn the game off and back on and select the other game.
- Don't forget to switch it off when your not playing otherwise you will flatten the batteries.

Memory Game

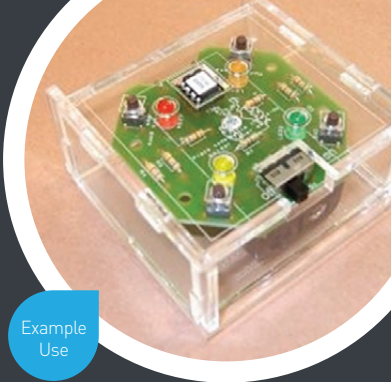
- The LEDs will flash a sequence. Simply copy this sequence.
- If you get it correct the LEDs will quickly flash in turn, before the sequence is shown again with an extra LED on the end.
- When you do get it wrong the LEDs quickly flash in turn three times then your score is shown. The more LEDs you light the better you have done!

Reactions Game

- After a random amount of time one of the four LEDs will be illuminated. Simply press the button next to the LED, before the LED goes off.
- If you have pressed the button fast enough then a short while later a new LED will turn on, but you have less time to press the button to stay in the game.
- When you don't manage to press the LED fast enough the LEDs quickly flash in turn three times then your score is shown. The more LEDs you light the better you have done!



The kit has four buttons and LEDs to make up a game, which can be used as both a memory game and a reactions game. A PIC micro-controller, pre-programmed with special software controls the game. The on / off switch and battery pack mount directly onto the board allowing it to be used as built or the game can be housed into an enclosure.



Example Use



TOOLS REQUIRED:

- Soldering Iron
- Solder
- Wire Cutters
- Screwdriver



INSTRUCTIONS:

This booklet contains build instructions and a circuit explanation. For more detailed resources please visit our website at www.kitronik.co.uk/2103



KIT REQUIRES

2 x AA batteries



STOCK CODE

2103 or 1003 (Retail Version)



WARNING: Contents may inspire creativity

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Designed & manufactured in the UK by



For more information on RoHS and CE please visit kitronik.co.uk/rohs-ce. Children assembling this product should be supervised by a competent adult. The product contains small parts so should be kept out of reach of children under 3 years old.