# Space Invaders

A hand-held version of the classic video game in the shape of a space invader itself.

## Construction

First fit and solder the resistors (R1 and R2) to the circuit board and trim their legs. Identify the resistors by the coloured stripes on the body.

Next fit the chip socket (IC1) matching the notch in the socket against the notch in the symbol on the board. Care should be taken when soldering this component to avoid solder bridges between the pins. It is not recommended that the chip is soldered directly to the board.

Fit and solder the capacitors, paying attention to the polarity of the electrolytics (C1 and C2) (negative is marked by a stripe on the side of the body). The tantalum capacitor (C3) should be fitted such that the shorter leg is by the minus sign. The ceramic capacitors (C4 and C5) can be fitted either way around.

Bend the legs of the regulator (REG1) at right angles and solder it such that the metal heatsink is flat on the board and the side with the writing is facing upwards.

Solder the piezo (PIEZO) and the pushbuttons (S1 to S3) to the board.

Bend the legs of the chip inwards slightly and fit it in its socket matching the small notch in the chip to the notch in the socket.

Fit the battery box to the back of the board using a couple of sticky pads to hold it in place then solder its two legs to the front of the board (BATTERY). See picture below.

The software includes a power-on self-test. Insert 3 AA cells in the battery box, observing the correct polarity, and the piezo should beep twice if the board is functioning correctly. Remove the cells.

Solder the 7-way header to the LCD display (soldering the side with the shorter pins). Push fit the LCD to the circuit board then test again with the AA cells. If the board is completely working (you will see an introductory screen) then the display can be soldered in position or left as a push fit. The remaining sticky pads can be used to secure it in place if desired.

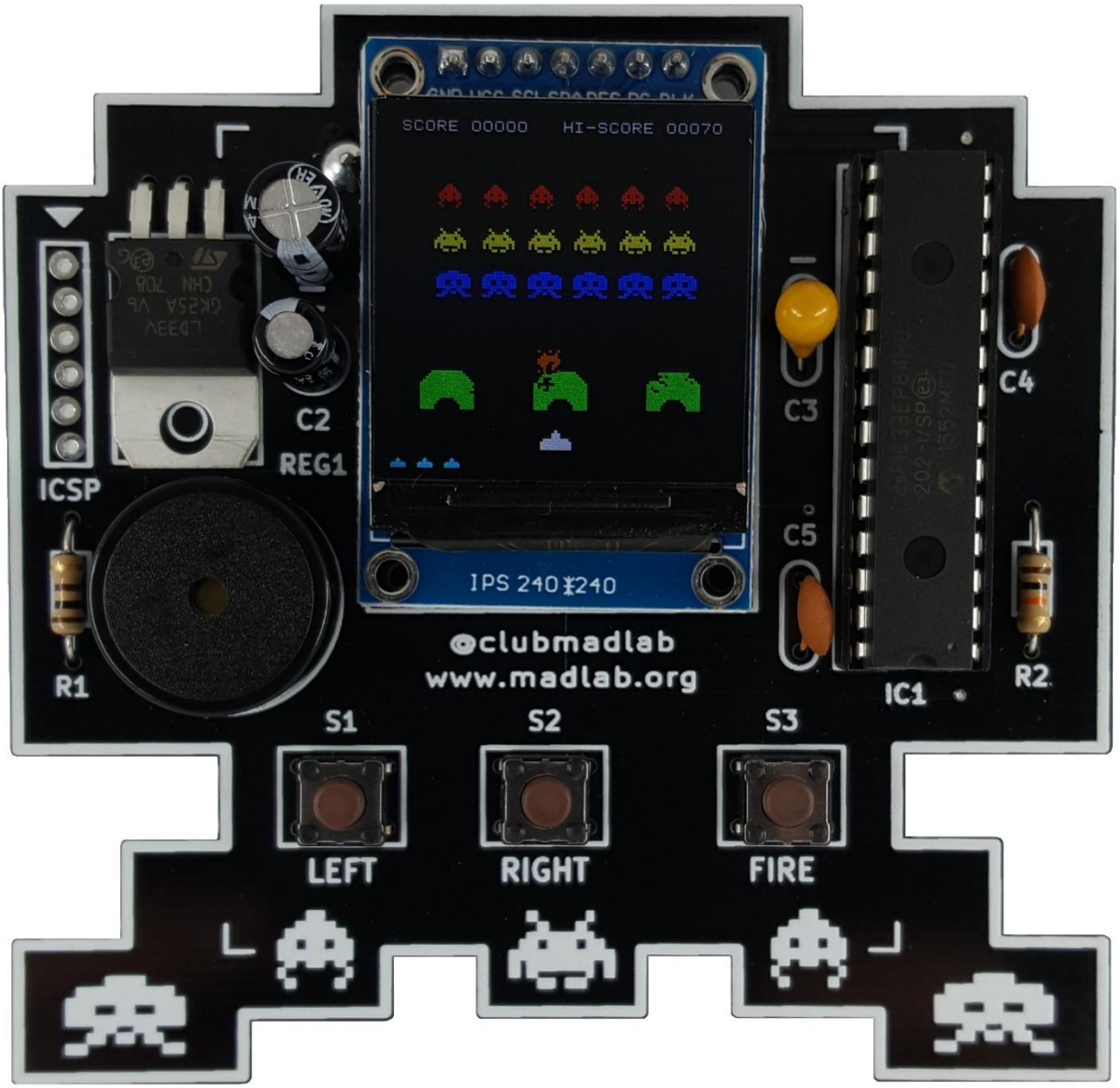
Note the ICSP holes are used in development for re-programming the microcontroller.

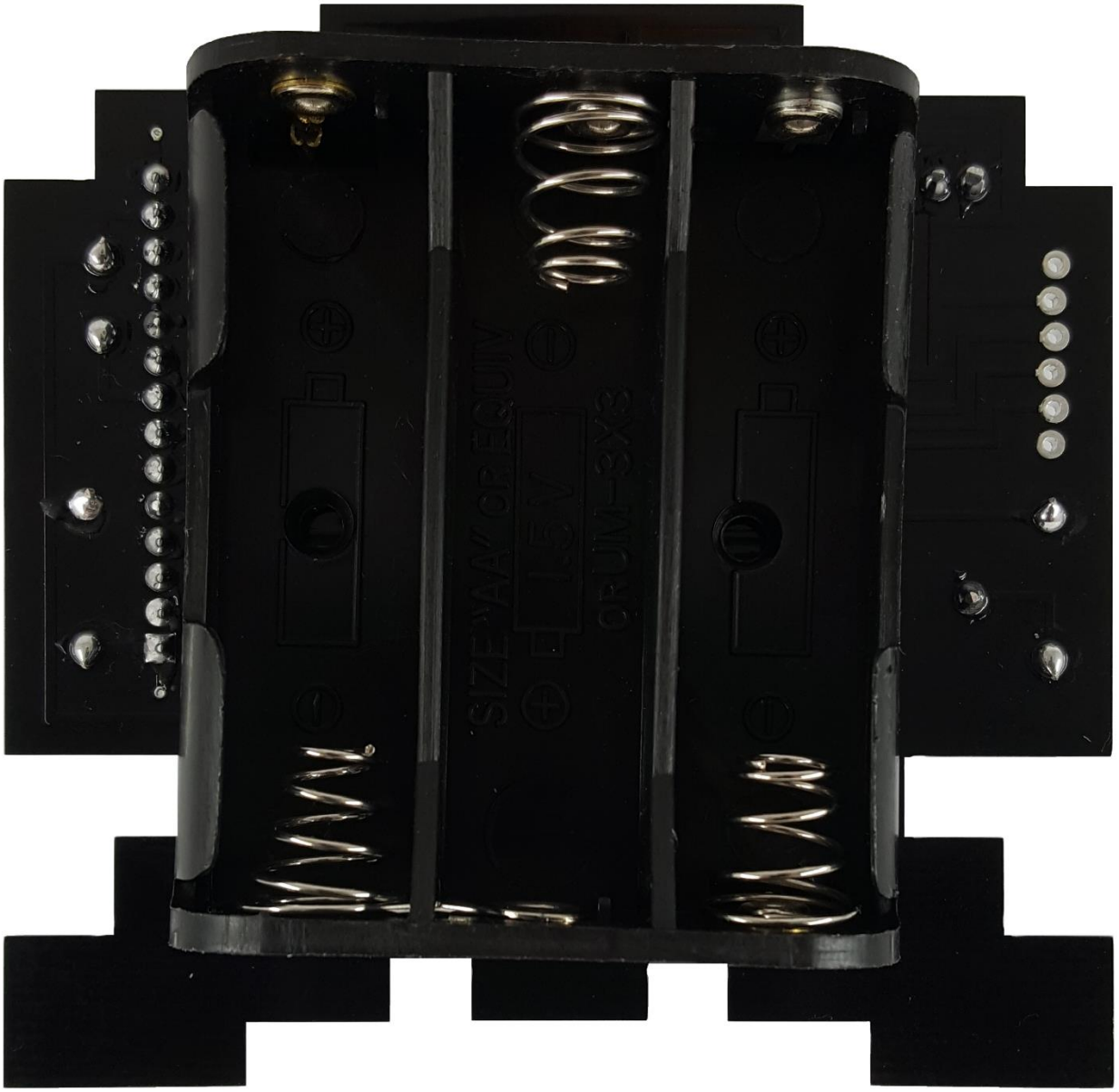
## How to play

The game play is as per the classic version of *Space Invaders*. S1 and S2 move your laser to the left and right and S3 fires at the enemy.

Pressing both left and right pushbuttons at the same time pauses the game. Press any pushbutton to resume.

A screen saver operates after 10 minutes of inactivity to save the display from burn-in. It’s a good idea though to remove the cells when not in use.


SCORE 00000 HI-SCORE 00070
IPS 240x240
ICSP
C2
REG1
C3
C4
C5
R1
R2
IC1
@clubmadlab
www.madlab.org
S1
S2
S3
LEFT
RIGHT
FIRE


8 x AA BATTERIES

## Component list

Resistors

| | |
|---|---|
| R1 | 100R (brown, black, brown, gold) |
| R2 | 10k (brown, black, orange, gold) |

Capacitors

| | |
|---|---|
| C1 | 100uF electrolytic (blue or black) |
| C2 | 10uF electrolytic (blue or black) |
| C3 | 10uF tantalum (yellow/brown, beaded) |
| C4, C5 | 100nF ceramic (brown, marked '104') |

Semiconductors

| | |
|---|---|
| REG1 | LD1117V33 LDO 3.3V 0.8A regulator (black/silver) |
| LCD | 1.3" 240 x 240 LCD display + 7-way SIL header |
| IC1 | dsPIC33EP64MC202 microcontroller + 28-pin socket |

Miscellaneous

| | |
|---|---|
| PIEZO | piezo speaker |
| S1 - S3 | miniature tactile pushbutton |
| BATTERY | 3 x AA battery box |

PCB
Sticky pads x 4



Email: info@madlab.org

Web: www.madlab.org

Twitter: @clubmadlab