Signetics
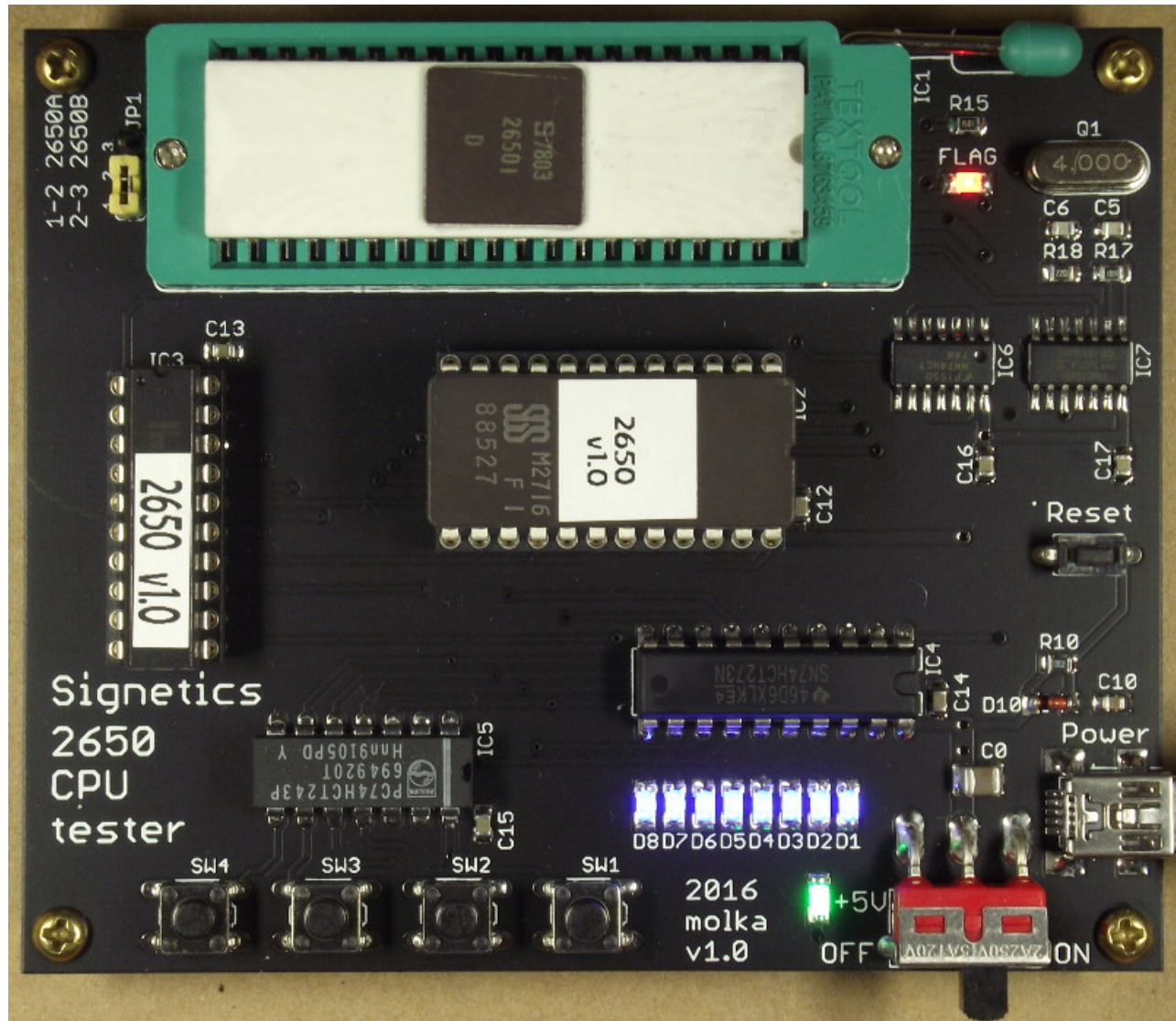# 2650 family

Signetics 2650 CPU Test Board
User's Manual

Overview

The Signetics 2650 test board is intended to test the working condition of Signetics 2650/2650A/2650B and compatible CPUs.   The 2650 is an 8-bit processor designed by Signetics (Bought by Philips) in 1975. The 2650A added some performance and manufacturing tweaks while the 2650B is a slightly enhanced version with some additional instructions. The 2650 was used widely in video games and industrial applications.

The board consists of the base components of a Signetics 2650 system:
- **40-pin ZIF Socket:** For 2650 CPU – provides easy replacement of the CPUs.
- **4MHz Crystal Oscillator and Divider:** Generates 1MHz system clock.
- **8 LEDs:** Output devices.
- **4 Push Buttons:** Input devices.
- **FLAG LED:** Indicates the signal of the CPU's FLAG output.

A 2716 2KB EPROM holds the test program. This program supports 4 push buttons as inputs, and 8 LEDs as output devices. It also provides basic and special feature test routines.

The board requires a single +5V power supply (200mA) provided through a mini-USB connector.
There is a power switch and power indicator LED in the upper left corner of the test board.

Board layout and parts
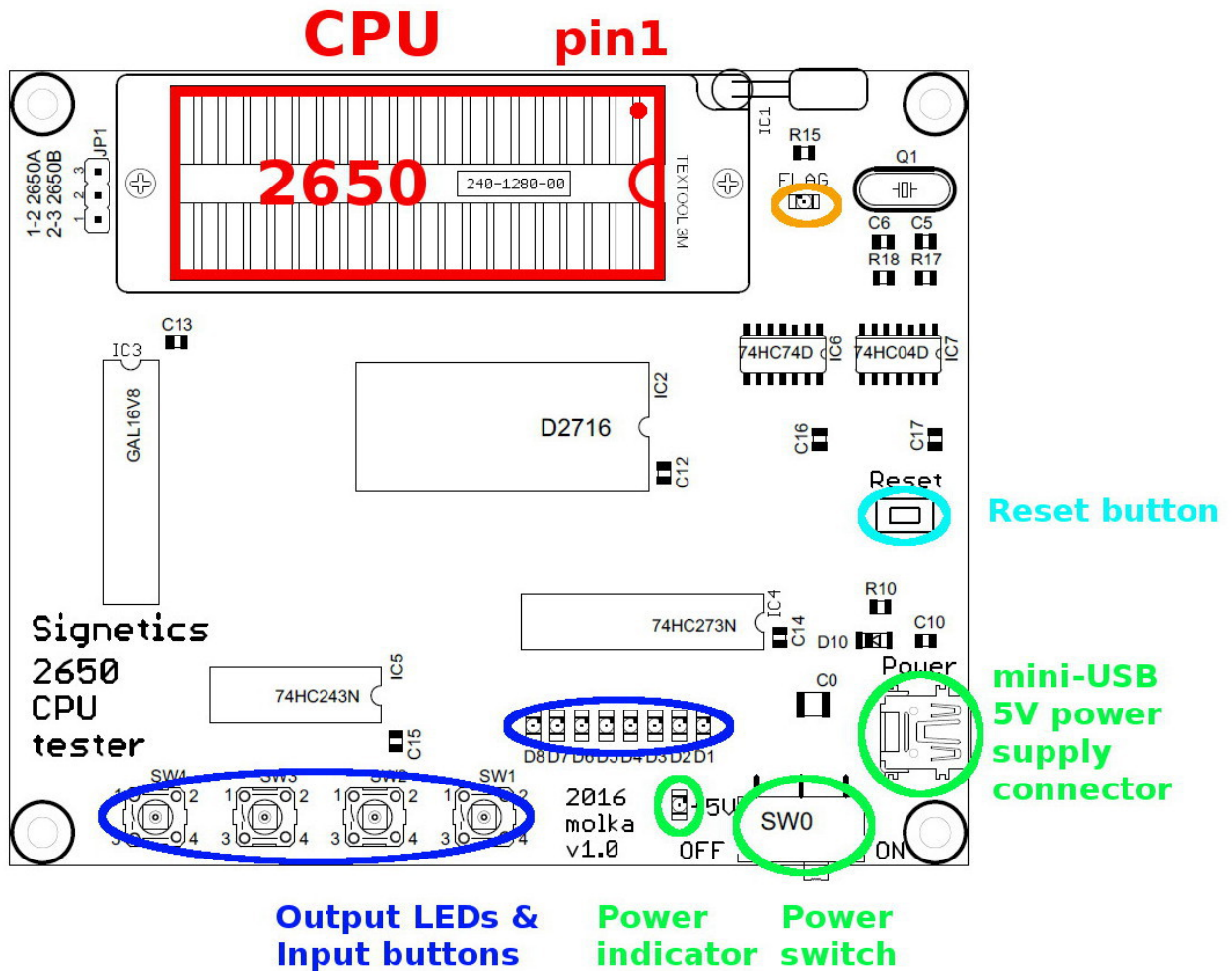
- **Mini-USB 5V power supply connector:** The board consumes around 200mA current so a computer USB connector or cell phone charger that can provide at least 300mA may be used as a power source.
- **Switch:** Power supply can be turned on and off by the sliding switch at the bottom right corner.
- **Green LED:** Next to the power switch, indicates the 5V power level.
- **Reset Button:** The board contains a Power-Up reset circuit, but can be reset manually by pressing Reset button.
- **40-pin ZIF socket**: for the 2650 CPU. Ensure proper CPU orientation!!! The pin-1 is at upper-right corner, next to the release lever of the socket.
- **Red LED:** Labeled FLAG, indicates the status of the CPU's FLAG output.
- **Eight output LEDs:** – Show simple animations/flashes to indicate that the CPU is working.
- **Four push buttons:** Used for testing inputs and changing animation sequences.

Usage

– Before changing the CPU in the ZIF socket, make sure the power is off. The power indicator LED should be off!
– Place the CPU into the socket (socket lever should be in the **UP** position). Ensure proper orientation to prevent damage to the test board and CPU! Pin 1 must be at the upper-right corner, next to the release lever of the ZIF socket. Then lock the socket by moving the lever down into the lock position.
– Connect the power through the USB connector and switch the power switch to ON.
– The green power indicator LED should be illuminated.
– If the CPU is in working condition the 8 output LEDs should be flashing (1sec on/1sec off pattern).
– At this point the CPU can be considered WORKING. Congrats!

Base Function Test

– When you press any of the four push buttons (SW1 – 4) the output LEDs copy the state of the buttons, duplicated in the low and high nibbles.
– Releasing the buttons causes one of the four different animation sequences to start, corresponding to the button released last.
– During the animations of SW2, SW3 the FLAG LED blinks periodically.

Special Feature Test

This test checks the 2650 CPU's flag output and sense input pins usability, and checks if a 2650B type CPU is inserted.
To activate the special feature test **SW1** and **SW4** should be pressed together and held for about 3 seconds.

– First **FLAG** and **SENSE** pins are tested. **LED FLAG** should flash, and the result is shown on **LED D4** & **D8**.
– Then the CPU type is tested and the result is shown on **LED D1** & **D2**.

D1 – 2650/2650A CPU detected
D2 – 2650B CPU detected.
D4 – **FLAG /SENSE** pins work correctly.   D8 – **FLAG** or **SENSE** failure.

Troubleshooting

- After connecting the power supply the power indicator LED remains off.
  Turn off the power immediately!

  This may be caused by:
  - The power supply is unable to provide enough current. Check that it can provide at least 200mA. (300-400mA recommended)
  - Thin, poor quality USB cable can also cause this problem.
  - There is short-circuit (fault) in the CPU.

- The 8 output LEDs do not start flashing.
  - Press the Reset button. If the output LEDs continue to remain off then the CPU may be faulty.
  - Check the CPU pins, if they are dirty or dusty clean them, and try testing again.
  - It may help to press firmly on the CPU while lowering the lock level to ensure it is properly seated in the socket.

Tested CPUs:

Manufacturer	Variant
Signetics	2650I
	2650AI
	2650AN
Philips	MAB2650A

Other compatible CPU's** should be testable as well, but have not yet been verified.

**National Semiconductor was an authorized second source of the 2650A and Intersil was licensed to make the original 2650. It is not clear if either of these companies actually produced chips though.

Synertek made a chip labeled 2650-P-02 that is often mistaken for a 2650 processor. It is NOT a 2650 processor and use of it in the Test Board may produce unexpected results or damage.

Thanks to CPUShack for review and advises!

Feel free to write an e-mail to me at molnar.kalman@freemail.hu or send a PM to molka at CPU-World forum if you have any question.