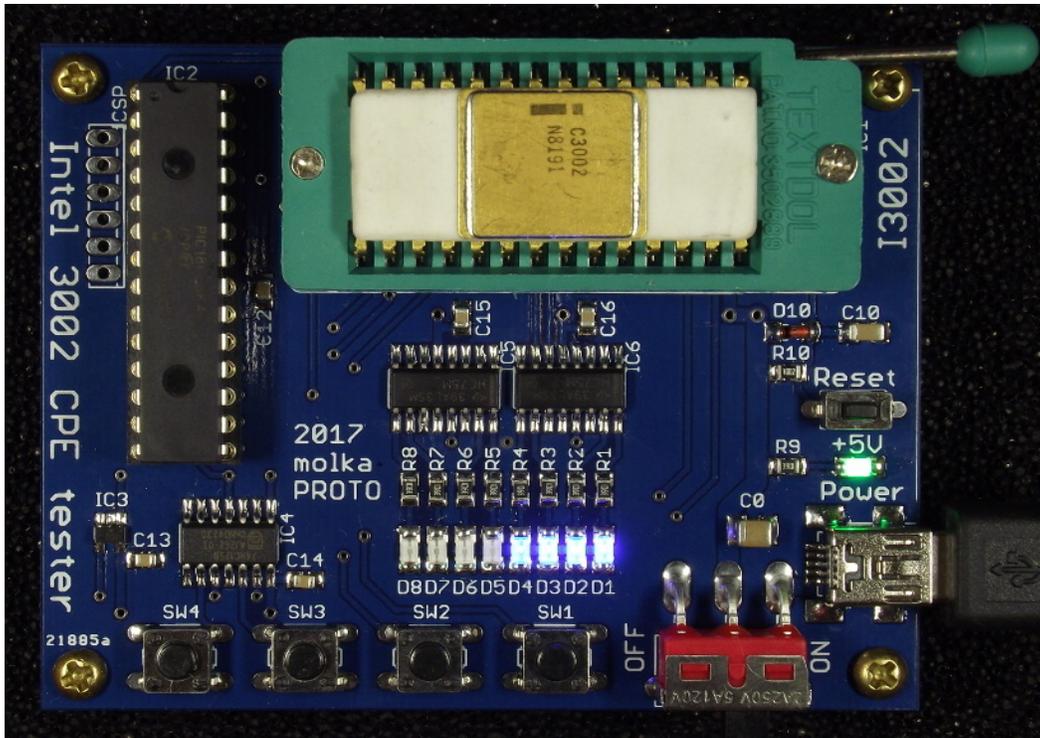


# intel

## 3002 Bit Slice CPE Tester



## Intel 3002 CPE Test Board User's Manual

2017-Aug-31 Ver.:PROTO  
by molka

## Overview

The Intel 3002 CPE Test Board is intended to test the working condition of the Intel 3002 Central Processing Element (CPE) and its many compatible CPE chips.

The Intel 3000 bit-slice processor family was introduced in 1973 and were made on a Schottky Bipolar process. The 3002 series was also second sourced by Signetics, Siemens, and Intersil, and clones were made by the USSR and Tesla (Czech). The 3002 CPE is a 2-bit ALU and register file that can perform logical and arithmetic operations, left/right shifting and bit/zero value testing. The 3002 also includes 11 registers (R0-R9, T), an accumulator and a Memory Address Register (MAR). The 3002 CPE elements execute micro instructions generated by the 3001 Microprogram Controller Unit (MCU) based on micro code stored in PROM.

In this test board, a PIC MCU is used instead of a microcode PROM and microprogram controller.

The PIC MCU's test program provides register and functional tests of the 3002 CPE and test routines with LED animations. It also supports 4 push buttons as inputs, and 8 LEDs as output devices.

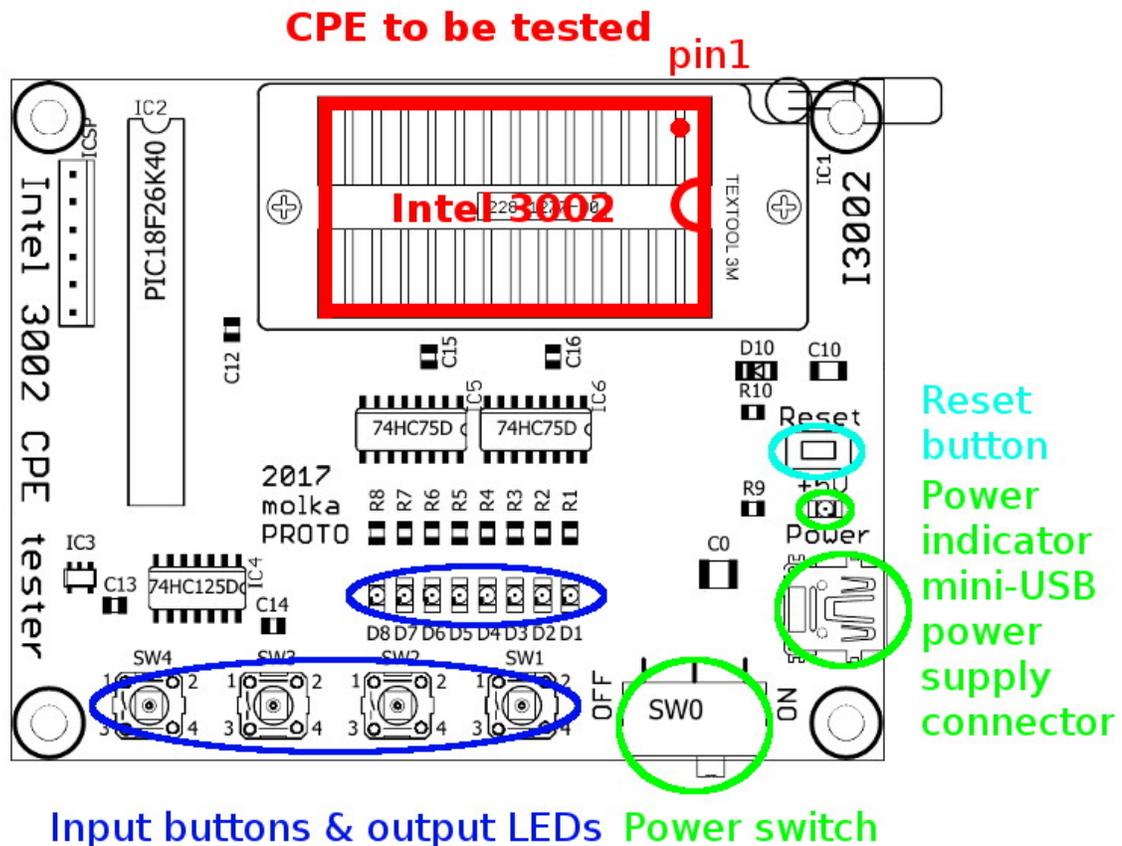
The board consists of the following base components of an 2-bit microcomputer system:

- **28-pin ZIF Socket:** For 3002 CPE to be tested.
- **PIC MCU:** Microcode controller to generate micro instruction of test code.
- **8 LEDs:** Output devices.
- **4 Push Buttons:** Input devices.

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 of current so a computer USB connector or cell phone charger that can provide at least 400mA 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 connector, indicates the 5V power level.
- **Reset Button:** The board contains a Power-Up reset circuit, but can be reset manually by pressing Reset button.
- **28-pin ZIF socket:** For the 3002 CPE. **Ensure proper orientation!!!** Pin 1 is at upper-right corner, next to the release lever of the socket.
- **Eight output LEDs:** Display simple animations/flashes to indicate that the CPE is working.
- **Four push buttons:** Used for testing inputs and changing animation sequences.

## Usage

- Before inserting or removing the 3002 CPE in the ZIF socket, make sure the power is off. **The power indicator LED should be off!**
- Place the CPE 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 CPE is in working condition the 8 output LEDs should be flashing (1sec on/1sec off pattern).
- **At this point the 3002 CPE can be considered WORKING. Congrats!**

## Standard Test Function

- 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.

## Register and unit test error results

Right after reset the register and function test process is executed.

If any error is detected the result is displayed on LEDs D1-D7.

After successful test the 8 LED flashing sequence is started.

Error values displayed on LEDs D1 - D8:

- D1-D4 malfunctioned register number -
  - 0000 - R0
  - 0001 - R1
  - 0010 - R2
  - 0011 - R3
  - 0100 - R4
  - 0101 - R5
  - 0110 - R6
  - 0111 - R7
  - 1000 - R8
  - 1001 - R9
  - 1100 - T
  - 1101 - AC
  - 1111 - MAR
- D5-D6 value read from the register
- D7-D8 expected value

## 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 400mA.
  - Thin, poor quality USB cable can also cause this problem.
  - There is short-circuit (fault) in the CPE.
- 
- The 8 output LEDs do not start flashing.
    - Press the Reset button. If the output LEDs continue to remain off then the CPE may be faulty.
    - Check the CPE pins, if they are dirty or dusty clean them, and try testing again.
    - It may help to press firmly on the CPE while lowering the lock level to ensure it is properly seated in the socket.

## Tested CPEs:

Manufacturer

Variant

Intel

C3002, MD3002/B

Signetics

N3002I, N3002 XL

Tesla

MH3002

**Thanks to CPUShack for review and advises!**

Feel free to write an e-mail to me at [molnar.kalman@freemail.hu](mailto:molnar.kalman@freemail.hu) or send a PM to molka on the CPU-World forum if you have any questions.