NeoLoch

NLT-5101A IC Tester Datasheet

Overview

The NLT-5101A IC Tester is designed to test 5101 RAM ICs quickly and provide rapid feedback as to the state of the IC under test.

Though the NLT-5101A IC Tester was originally designed to test 5101 RAM ICs, NeoLoch offers a service to customize the 5101A IC tester to operate with other compatible ICs.

The unit also comes with a ICSP programming port to allow custom device programming by individuals.

This document details the operation of the default configuration of the 5101A tester as well as details on the device's operation for custom code design.

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1.0 Device Connection

1.1 CN1 – ICSP

ICSP connector, this port is designed to attach to a PICKit 2, PICkit 3 or compatible programmer.

1.2 CN2 – Power Connecter

Positive voltage supply greater than 6V, this connector feeds the on board +5V regulator. Input voltage shouldn't exceed 12V.

1.3 CN3 – +5V Power Connector

This connector can either supply 5V power to the tester or be used to power another device provided that CN2 is regulating a higher input voltage. Please note that the on board regulator is limited to 100 ma and the tester uses up to approximately 40ma to power the IC under test as well as the LEDs. So external power draw should be limited to no more than 40 to 50 ma.

Higher current draws will most likely require the addition of a heatsink for the 5V regulator.

You will need to supply an appropriate power source for the 5101A tester to operate.

1.4 ZIF 1 – Zero Insertion Force Socket

The ZIF socket provides an easy way to insert and remove ICs under test. Pin 1 of the ZIF socket is the pin closest to pin 1 of the MCU and apposite of the lever of the ZIF socket.

Please not that the ZIF socket is 28 pins while a 5101 RAM IC is only 22 pins. Pin 1 of the IC under test should be lined up and inserted so that it lines up with pin 1 of the ZIF socket.

2.0 5101A Tester Operation

The 5101A tester was designed to be quickly and easily operated. RAM ICs can be inserted into the device while it is powered. When not testing, the ZIF socket is not powered and all pins are either at ground potential or in a high-impedance state.

2.1 Understanding The Tester (V1.0 Firmware)

Some pinball machines do not use the full range of available memory in a 5101 RAM IC, because of this a RAM IC that fails the test may very well still work in a pinball machine.

Version 1 of the firmware provided pass / fail feedback for each test type. This could potentially cause a RAM IC that could still be of use to be discarded, the firmware has been upgraded to correct this possible scenario.

2.2 Understanding The Tester (V2.0 Firmware)

Firmware version 2 provides more information about which part of the RAM failed a test. Each LED pair represents a memory address range (see below) and indicates if that range of RAM is good or bad. This allows memory that may still work in one pinball machine but not another, due to actual memory used by the pinball machine, to be identified.

From left to right:

LED Pair 1: Indicates that RAM address range 00H – 3FH is good or bad.
LED Pair 2: Indicates that RAM address range 40H – 7FH is good or bad.
LED Pair 3: Indicates that RAM address range 80H – BFH is good or bad.
LED Pair 4: Indicates that RAM address range C0H – FFH is good or bad.

The included MCU runs at 8 Mhz, giving it a read / write speed of 2.5 µs on the RAM IC, putting it well under the read / write speeds of tested 5101 RAM ICs of 650 ns and faster.

Once powered, the first LED on the 5101A will begin blinking to indicate the tester is ready to accept the first IC to be tested. Note: The blinking LED will follow the last pass one result from a test. So, if the last pass one test generated a fail then the red LED will blink, if the last pass one test generated a pass then the green LED will blink.

With firmware version 2 and on, other red LEDs will light up to indicate the firmware version (see below).

Note: Upon power up, either the green or red LED will begin blinking.

Once a RAM IC is inserted and locked down in the ZIF socket press the button to begin the testing process. Each test consists of four passes and are as follows.

2.3 Identifying Firmware Version

With firmware version 2.0 and on, the version number will be displayed on LED pairs (from left) two through four in binary. For version two, the third red LED from the left will light up when the unit is first powered on to indicate that the MCU is programmed with firmware version 2.

Firmware version 3 corrects a bug that prevented some 5101 and 5501 RAM ICs from testing correctly. Version 3 firmware is identified by the red LEDs 3 and 4 lighting up when the tester is first powered.

2.4 PASS 1

The value '1111' is written to each address in the RAM IC (00h – FFh) and read back, if all memory addresses pass this test then the PASS 1 green LED will light up, if the test fails then the red LED will light up.

2.5 PASS 2

The Value '0000' is written to each address in the RAM IC (00h – FFh) and read back, if all memory addresses pass this test then the PASS 1 green LED will light up, if the test fails then the red LED will light up.

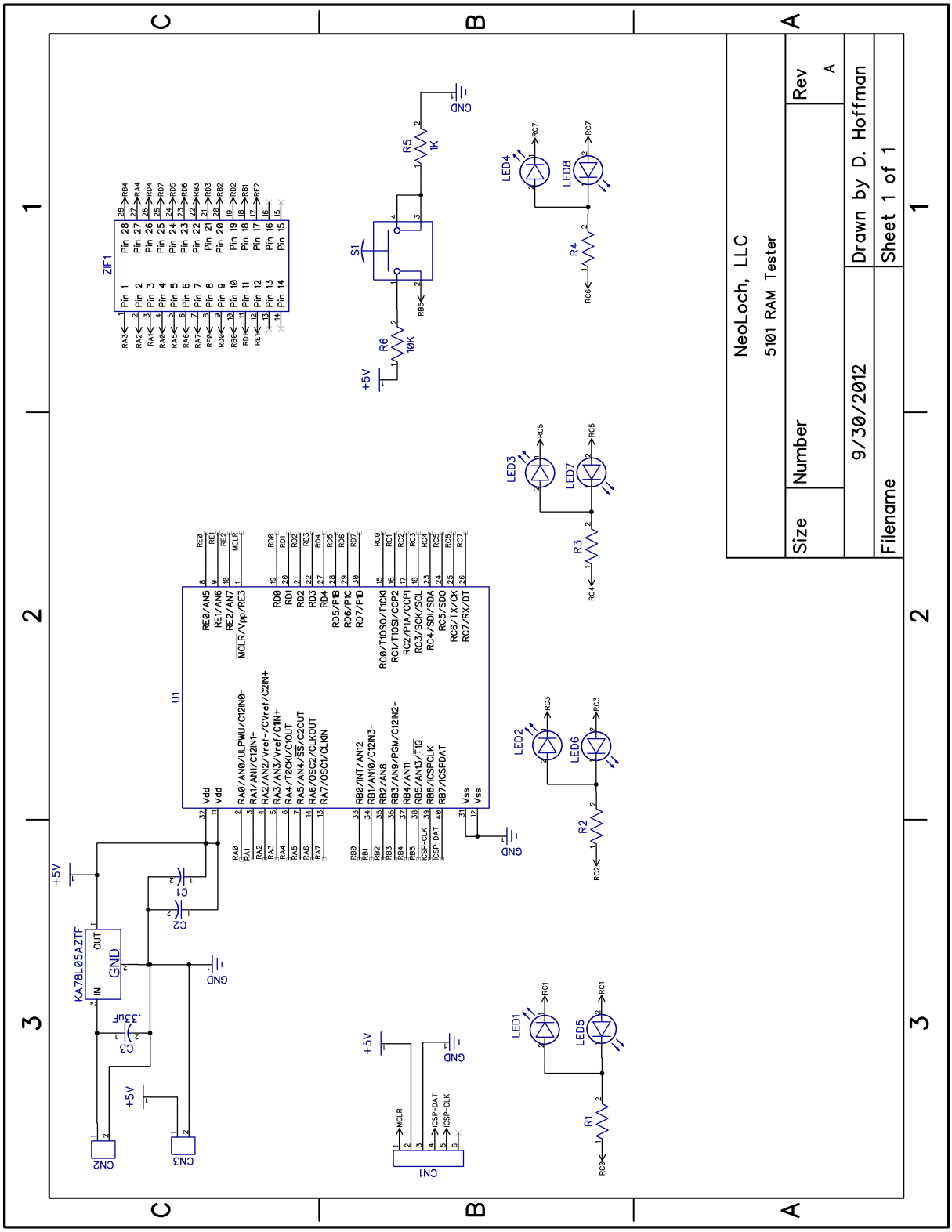
2.6 PASS 3

Two counters are used during this pass, the first keeps track of the memory address being tested and the second is a counter used to write and then read back values between 0h and Fh. This is a more rigorous test than PASS 1 and PASS 2.

2.7 PASS 4

This pass looks to test data retention of a longer period of time and writes a value between 0h and Fh in an incremental manor to each memory location, data is not read back directly after a write. The entire address range is written to first and then the process is repeated to read data back, if even one address fails to contain the correct data then the pass will fail and the red LED will light up.

3.0 Schematic



4.0 Ports Configuration

MCU Pin Number	Description	Assigned to
1	MCLR	ICSP
2	RA0	ZIF Pin 4
3	RA1	ZIF Pin 3
4	RA2	ZIF Pin 2
5	RA3	ZIF Pin 1
6	RA4	ZIF Pin 27
7	RA5	ZIF Pin 5
8	RE0	ZIF Pin 8
9	RE1	ZIF Pin 12*
10	RE2	ZIF Pin 17*
11	VDD	GND
12	VSS	+5V
13	RA7	ZIF Pin 7
14	RA6	ZIF Pin 6
15	RC0	LED 1 Anode & 5 Cathode
16	RC1	LED 1 Cathode & 5 Anode
17	RC3	LED 2 Anode & 6 Cathode
18	RC4	LED 2 Cathode & 6 Anode
19	RD0	ZIF Pin 9
20	RD1	ZIF Pin 11
21	RD2	ZIF Pin 19
22	RD3	ZIF Pin 21
23	RC4	LED 3 Anode & 7 Cathode
24	RC5	LED 3 Cathode & 7 Anode
25	RC6	LED 4 Anode & 8 Cathode
26	RC7	LED 4 Cathode & 8 Anode
27	RD4	ZIF Pin 26
28	RD5	ZIF Pin 24
29	RD6	ZIF Pin 23
30	RD7	ZIF Pin 6
31	VSS	GND
32	VDD	+5V
33	RB0	ZIF Pin 10
34	RB1	ZIF Pin 18
35	RB2	ZIF Pin 20
36	RB3	ZIF Pin 22
37	RB4	ZIF Pin 28
38	RB5	PCB Switch
39	RB6	ICSP
40	RB7	ICSP

* RE1 and RE2 are connected to pins 12 and 17 on the ZIF socket but are not used by the 5101 RAM testing code, these two connections are for use by the user.

4.0 Parts List

1 – PC Board
1 – 40 Pin DIP Socket
1 – 28 Pin ZIF Socket
1 – 6 Pin Right Angle Header
1 – 78L05 +5V Regulator
1 – 0.33 uF Capacitor
4 – Green 2mm x 5mm LED
4 – Red 2mm x 5mm LED
4 – 390 Ohm ¼ Watt Resistors
2 – 0.1 uF Capacitors
1 – 1K Ohm Resistor
1 – 10K Ohm Resistor
1 – PCB Mount Switch
1 – PIC16F884 Microcontroller (Programmed)

Appendix A: Revision History

Revision A (12/2012)
Initial release of this document

Revision B (12/2012)
Added details for firmware version 2.0.

Revision C (1/2013)
Added details for firmware version 3.0.

