NeoLoch

Inquisitor 4116 DRAM Blade Manual

Overview

The Inquisitor 4116 DRAM blade is designed to test 16 pin DRAM ICs. Current tests include 4116, 9016, D416, 4027 and 4096. The Inquisitor 4116 DRAM tester can conduct fast two pass test or a more in depth test to discover if a DRAM is good or bad.

Preliminary Release

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

Table of Contents

1.0 Device Connection & Power Requirements

1.1 CN1 – Card Edge Connector

Edge of PC board that plugs into the card edge socket on the Inquisitor Core PC board. When plugging in the SRAM Blade, line up the white triangle with the white triangle on the Core PC board.

1.2 CN2 – ICSP (In-Circuit Serial Programming)

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

1.3 LED 1 – Power LED

Indicates when power is applied to the Blade.

1.4 Power Requirements

	Minimum	Typical	Maximum
VCC	4.5V	5.0V	5.5V
VDD	10.8V	12.0V	13.2V
VBB	-4.5V	-5.0V	-5.5V

Make sure the +12V side is using a regulated source. These DRAM ICs use the +12V supply as part of their power scheme. The -5V is supplied via the TC7662 voltage inverter and will be the opposite of the +5V supply.

2.0 Understanding the DRAM Testing Process

To begin testing a DRAM, use the following steps:

- Insert the DRAM blade into the Core module.
- Power up the tester.
- Insert the DRAM IC to be tested into the ZIF socket, make sure pin 1 is the closest pin to the ZIF's lever.
- Lower the lever to lock the DRAM in place.
- Press the left or right arrow key to select either the 4116 / 9016 / D416 or 4027 / 4096 test.
- Press the enter key to start the test.

2.1 Menu System

Pressing the ← or → keys will guide your through the menu system, which consists of:

2.1.1 – 4116 / 9016 / D416

Test 4116 DRAM and compatible DRAM.

2.1.2 – 4027 / 4096

Test 4027 DRAM and compatible DRAM.

2.1.3 – Long Test

Determines if a long or short test is done when testing DRAM, yes = long test and no = short test.

Short Test: The DRAM is written with all zero's and then all one's. This is a quick test but may not discover all problems with a bad DRAM, this test consists of:

Scan 1: Writes all zeroes to the DRAM and then reads the data back for comparison.
Scan 2: Writes all ones to the DRAM and then reads the data back for comparison.

Long Test: The long test does a far more extensive investigation of the DRAM and will discover problems the short test will miss. This test consists of:

Scan 1: Writes all zeroes to the DRAM and then reads the data back for comparison.

Scan 2: Writes all ones to the DRAM and then reads the data back for comparison.

Scan 3 – 18: The long test is a far more intensive look at the DRAM's capability to store, retain, and retrieve data correctly. The idea behind this test is to write a wide variety of changing data to

each and every address. To accomplish this in a timely manner the following scheme is used:

First, the DRAM's memory is divided up into 8 bit chunks (bytes).

Two counters are used to generate values for the upper and lower nibbles. Counter 1 decrements and counter 2 increments. The low nibble of counter 1 is placed in the current DRAM's address range upper nibble, and the lower nibble of counter 2 is placed in the upper nibble. So:

DRAM bits 7 – 4 = Counter 1's lower four bits (lower nibble).
DRAM bits 3 – 0 = Counter 2's lower four bits (lower nibble).

So, if counter 1 & 2 both = 0 and we are on the very first byte range in the DRAM's memory, then bits 0 through 7 DRAM would all be clear. Byte 0 (address's 0 through 7) = 0x00.

Next, counter 1 is decremented, so would equal 0xFF. Counter 2 is incremented and equals 0x01. The following table illustrates this process and how the data changes for each byte in the DRAM over each scan.

	Scan 3	Scan 4	Scan 5	Scan 6	Scan 7	Scan 8	Scan 9	...
Bits 0-7 (Byte 0)	0xF1	0xE2	0xD3	0xC4	0xB5	0xA6	0x97	...
Bits 8-15 (Byte 1)	0xE2	0xD3	0xC4	0xB5	0xA6	0x97	0x88	...
Bits 16-23 (Byte 2)	0xD3	0xC4	0xB5	0xA6	0x97	0x88	0x79	...
Bits 24 -31 (Byte 3)	0xC4	0xB5	0xA6	0x97	0x88	0x79	0x6A	...
Bits 32 -39 (Byte 4)	0xB5	0xA6	0x97	0x88	0x79	0x6A	0x5B	...
Bits 40 -47 (Byte 5)	0xA6	0x97	0x88	0x79	0x6A	0x5B	0x4C	...
Bits 48 -55 (Byte 6)	0x97	0x88	0x79	0x6A	0x5B	0x4C	0x3D	...
...	...	...	...	...	...	...	...	...

For 4116 DRAM the long test takes approximately 28 seconds.
For 4027 DRAM the long test takes approximately 10 seconds.

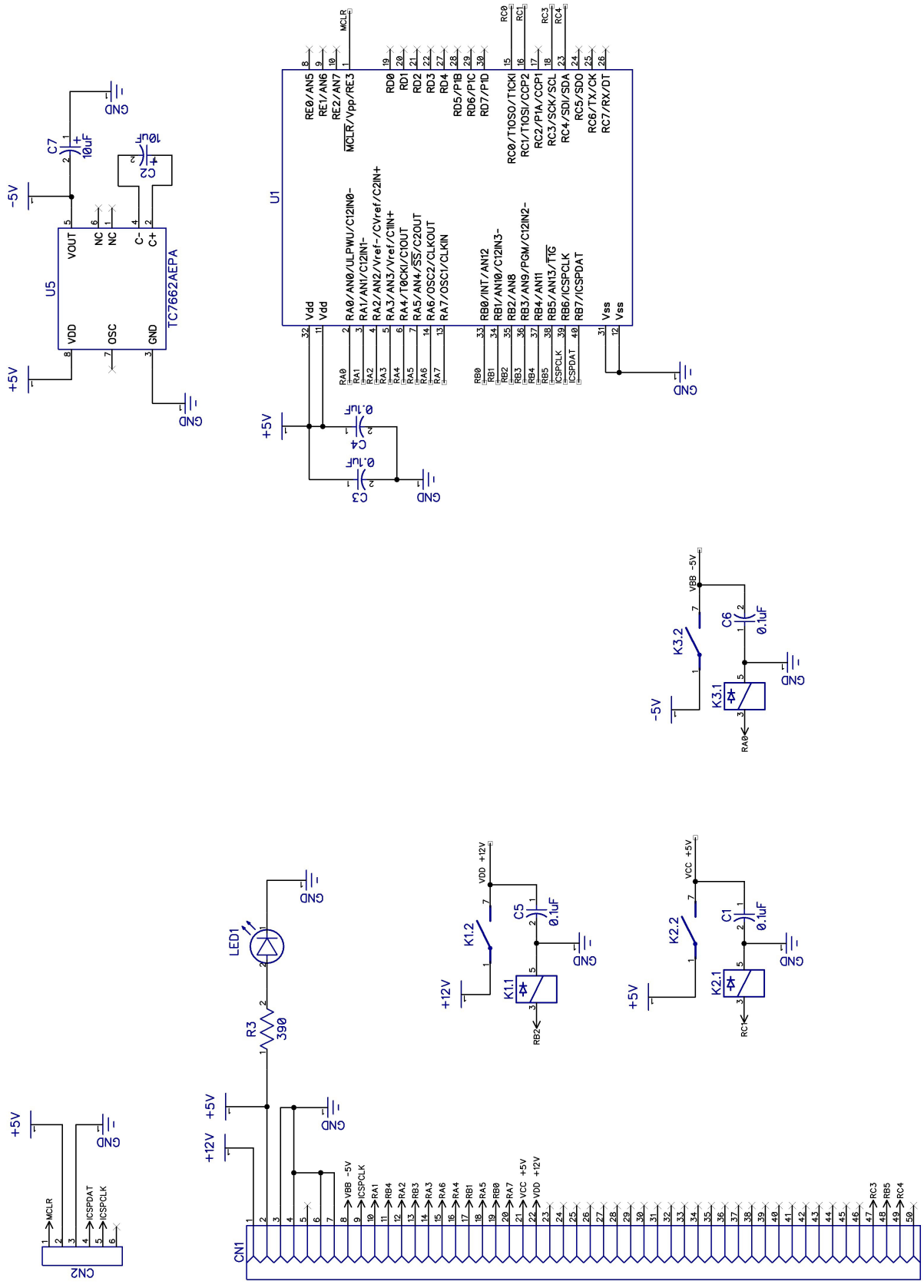
2.2 LED Result

At the conclusion of a test, LED 3 on the main board will visually display the result. Green means the DRAM passed and red means the DRAM failed. During the test the LED will be orange.

2.3 Display DRAM Results.

If a DRAM tests bad, you can use the up and down arrows keys to get a better idea of what happened during each scan. The first address a bad bit was detected at is listed along with the number of bad bits encountered during that pass.

3.0 Schematic



4.0 Card Edge to MCU Connections

Below is a table that lays out the pin assignment between the card edge connector, the MCU and the Port Expander.

Card Pin #	Function	Card Pin #	Function
2	+5V	1	+12V
4	Ground	3	Ground
6	Card Error LED (Gnd to turn LED off)	5	Not Connected
8	ZIF Pin 1 – VBB -5V	7	ZIF Pin 40 – GND
10	ZIF Pin 2 – MCU RA1	9	ZIF Pin 39 – MCU RB6 (PGC)
12	ZIF Pin 3 – MCU RA2	11	ZIF Pin 38 – MCU RB4
14	ZIF Pin 4 – MCU RA3	13	ZIF Pin 37 – MCU RB3
16	ZIF Pin 5 – MCU RA4	15	ZIF Pin 36 – MCU RA6
18	ZIF Pin 6 – MCU RA5	17	ZIF Pin 35 – MCU RB1
20	ZIF Pin 7 – MCU RA7	19	ZIF Pin 34 – MCU RB0
22	ZIF Pin 8 – VDD +12V	21	ZIF Pin 33 – VCC +5V
24	ZIF Pin 9 – NC	23	ZIF Pin 32 – NC
26	ZIF Pin 10 – NC	25	ZIF Pin 31 – NC
28	ZIF Pin 11 – NC	27	ZIF Pin 30 – NC
30	ZIF Pin 12 – NC	29	ZIF Pin 29 – NC
32	ZIF Pin 13 – NC	31	ZIF Pin 28 – NC
34	ZIF Pin 14 – NC	33	ZIF Pin 27 – NC
36	ZIF Pin 15 – NC	35	ZIF Pin 26 – NC
38	ZIF Pin 16 – NC	37	ZIF Pin 25 – NC
40	ZIF Pin 17 – NC	39	ZIF Pin 24 – NC
42	ZIF Pin 18 – NC	41	ZIF Pin 23 – NC
44	ZIF Pin 19 – NC	43	ZIF Pin 22 – NC
46	ZIF Pin 20 – NC	45	ZIF Pin 21 – NC
48	Switches – MCU RB5	47	I2C – SCL – MCU RC3
50	Not Connected	49	I2C - SDA – MCU RC4

5.0 Parts List

- 1 – Printed circuit board
- 1 – 40 pin socket
- 1 – 8 pin socket
- 1 – PIC16F1719 microcontroller (Programmed)
- 1 – TC7662 Voltage Inverter.
- 3 – Reed Relays (Polarized)
- 1 – 390 Ohm Resistor (Orange, White, Brown)
- 1 – 2x5 rectangle green LED
- 5 – 0.1uF Ceramic Capacitors
- 2 – 10uF capacitor

Appendix A: Firmware Revision History

Firmware Version 1.00

- Initial Release

Appendix B: Document Revision History

Revision A (4/2016)

- Initial release of this document

