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Logic Probe

Project report

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# Concept and Requirements Document

## Project goals

Design and build a prototype of a Logic Probe for a final project. Logic probes are useful tools when testing and troubleshooting digital circuits. This project is to bring exceptional hands-on experience in the fabrication and design of a low-cost logic probe. All the skills learned throughout the semester will be implemented in the elaboration of this project.

## Project Objective

The project is to have the following objectives:

* Inexpensive to produce
* Handy and easy to use
* Safe
* Neat soldering

## Project responsibility

Students enrolled in this course will be liable for their design, drawings, evaluations and all related work of their projects. The due dates for each phase are given by the instructor and correspond to the last week of the semester.

## Project theory of operation

The core of functionality consists of the implementation of two operational amplifiers used as comparators; one is used for high-voltage reference and another for low voltage reference. J4 and J5 are the connections to the LOGIC FAMILY implemented in the circuit to be tested on. The probe is common between one inverting and non-inverting input of the operational amplifier. When the probe is used to test a certain logic level, it is compared between the two comparators. If this logic level is a logic high, then the upper comparator is enabled as this logic level is greater than the high reference voltage applied to its inverting input driving high LED2, buzzing and disabling the lower comparator. If this logic level is a logic low, the lower comparator is enabled as this logic level is lower than the low reference voltage applied to its non-inverting input driving high LED1 and disabling the upper comparator.

# Experiments and Test Results

## Conclusions:

The logic probe project performs well according to the functional requirements under the breadboard conditions.

## Test results

|  |  |  |
| --- | --- | --- |
| **Referent Voltages[V]** | | **Average Value**  **(all Projects)[V]** |
| VREF1 | 1.97 | 1.98 |
| VREF2 | 0.97 | 1.01 |
| VREF3 | 2.11 | 2.2 |

|  |  |  |
| --- | --- | --- |
| **Threshold Voltages[V]** | | **Average Value**  **(all Projects)[V]** |
| Vin(LOW) | 0.93 | 0.97 |
| Vin(HIGH) | 2.17 | 2.19 |

|  |  |  |
| --- | --- | --- |
| **Threshold Voltages[V]** | | **Average Value**  **(all Projects)[V]** |
| ITOTAL | 16.11mA | 17.14mA |

|  |  |  |
| --- | --- | --- |
| **Buzzer frequency[kHz]** | | **Average Value**  **(all Projects)[kHz]** |
| ITOTAL | 2.7 | 4.27 |

|  |  |  |  |
| --- | --- | --- | --- |
| **#** | **PRELIMINARY TEST RESULTS** | **DATE** | **INITIALS** |
| **1** | Is all wiring complete and correct | 4/16/16 | G.P |
| **2** | Are all soldering connections good? | 4/16/16 | G.P |
| **3** | Are all components in the correct locations? | 4/16/16 | G.P |
| **4** | Are all components installed in the correct direction? | 4/16/16 | G.P |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **#** | **Operational test results** | **YES** | **NO** | **Initials** |
| **1** | Any catastrophic failure? |  | X | G.P |
| **2** | Any minor problems? |  | X | G.P |
| **3** | Is calibration required? |  | X | G.P |
| **4** | Is troubleshooting required? |  | X | G.P |
| **5** | Is device operation satisfactory at this time? | X |  | G.P |

|  |  |  |  |
| --- | --- | --- | --- |
| **#** | **Troubleshooting results** | **DATE** | **Initials** |
| **1** | Define the problem?  None. | 4/16/16 | G.P |
| **2** | Steps taken to correct the problem?  N/A | 4/16/16 | G.P |
| **3** | Is the device operation satisfactory at this time?  YES | 4/16/16 | G.P |

|  |  |  |  |
| --- | --- | --- | --- |
| **#** | **Performance Test Results** | **Date** | **Initials** |
| 1 | User test performed  Tried it on different breadboards and microcontroller applications and worked satisfactory | 4/16/16 | G.P |

# Summary and recommendation Document

The goal was to design and fabricate a low-cost logic probe prototype project. All the requirements have been met and the logic probe passed all the evaluations. The initial design has proven valid. No problem anticipated and developed during prototype construction. It is the recommendation of this technician that full-scale production of this logic probe may be considered

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Signature: \_\_\_\_\_\_\_\_\_\_

Date: 4/16/16