Solid State Electronics – Unit 2: PN Junctions and Diodes

Lab: Working with the Diode in DC Circuits

Name: _____

All portions of LAB 3 DIODE LAB covered in this document must be completed and verified before moving on.

OBJECTIVES

Assemble circuits using diodes. Understand Diode ratings Learn how diodes function in DC circuits. Use digital meters to measure voltages at various points in diode circuits. Troubleshooting of DC diode circuits.

MATERIALS

DC Power Supply Multimeter 1N4007 diode Breadboard

PROCEDURE

PART A DIODE SPECIFICATIONS

Step 1. The 1N4007 is one of a family of diodes. This particular diode is considered a General Purpose Plastic Rectifier. Go online and acquire a 1N4007 diode specification sheet.
http://www.vishay.com/docs/88503/1n4001.pdf

Step 2. Look at the data sheet and find the specification for the following terms related to the !N4007 diode.

Maximum forward current = _____ The voltage across the diode @ maximum current = _____ Maximum reverse current = _____

PIV = _____ Maximum forward current = _____

Package type = _____

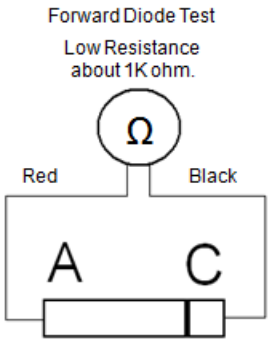
Solid State Electronics – Unit 2: PN Junctions and Diodes

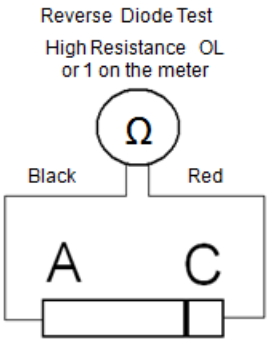
Lab: Working with the Diode in DC Circuits

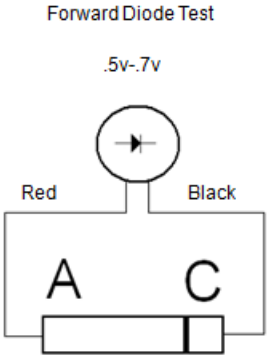
PART B DIODE TESTING

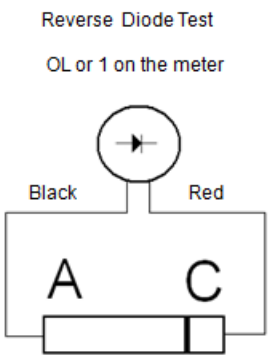
Most digital multimeters have a setting to test diodes. If a multimeter does not have this function the resistance function may be used. In order to understand how both functions operate you will be asked to perform both types of measurements on a diode.

Step 3. The first method of testing a diode is as follows: Connect a red test lead into the V/Ω jack of the multimeter. Connect a black test lead into the common jack of the multimeter. To begin, put the multimeter on the resistance scale. Place the leads across the diode and measure the resistance across the diode. Reverse the leads of the diode and place across the diode again. Measure the resistance. One reading should be high resistance the other reading should be low resistance. Enter your readings in the table.









Solid State Electronics – Unit 2: PN Junctions and Diodes

Lab: Working with the Diode in DC Circuits

Step 4. The second method of testing allows the multimeter to force a small current through the diode. This forward or reverse biases the diode. To perform this method of testing, the red and black leads of the multimeter are connected as in the previous example. The multimeter is put on the diode test function. This usually shows a small diode symbol on the multimer scale.

Since the meter puts only a small current through the diode, the multimeter will only show a forward voltage drop of about .5-.6 volts for a silicon diode. This is

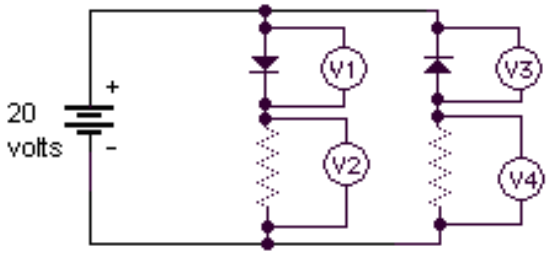
less than if the diode was actually in a circuit. For this test take readings across the diode in both directions. Enter the values of the readings in the table.

	Testing Method 1			Testing Method 2	
	Forward Resistance	Reverse Resistance		Forward Bias Voltage	Reverse Bias Voltage
D1					
D2					

Step 5. From these tests you should be able to also determine which end is the cathode and which end is the anode. When the measurement showed low resistance or about .5-.6 volts the end the red lead was connected to was the anode. The diode end the black lead was connected to was the cathode.

PART C

Step 6. Examine the circuit and predict the voltage drps across each component. Place your predictions in the table.



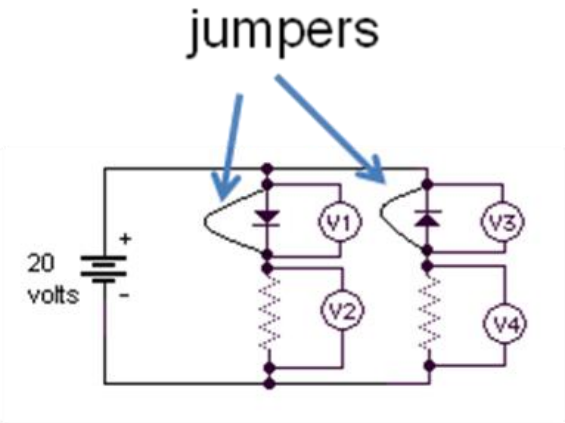
Solid State Electronics – Unit 2: PN Junctions and Diodes

Lab: Working with the Diode in DC Circuits

Step 7. Measure the voltage drops and place the answers in the table.

Voltage Reading	Predicted Voltage	Measured Voltage
V1		
V2		
V3		
V4		

Step 8. Place small jumper wires across the diodes in the circuits. Take voltage measurements again and place in the table.

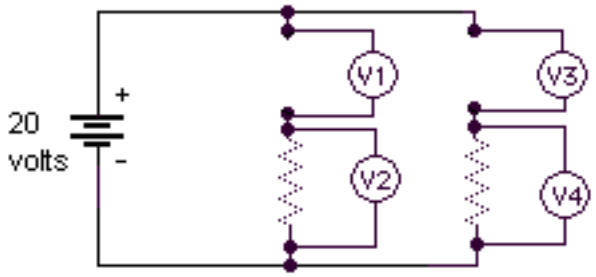


Solid State Electronics – Unit 2: PN Junctions and Diodes

Lab: Working with the Diode in DC Circuits

	Jumpers across diodes	
Voltage Reading	Predicted Voltage	Measured Voltage
V1		
V2		
V3		
V4		

Step 9. Remove the jumpers and the diodes from the circuit. Take voltage measurements again and place in the table.

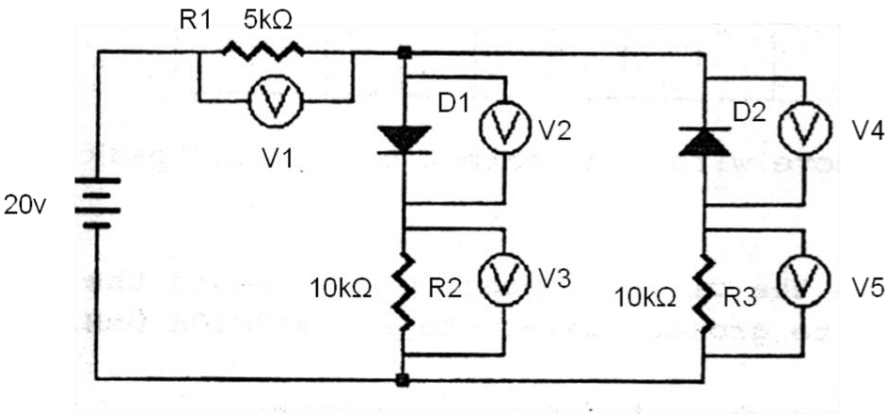


	No Jumpers or Diodes in Circuit	
Voltage Reading	Predicted Voltage	Measured Voltage
V1		
V2		
V3		
V4		

Solid State Electronics – Unit 2: PN Junctions and Diodes

Lab: Working with the Diode in DC Circuits

Step 10. Connect the following circuit.



Step 11. Predict and measure the voltages. Place the measured values into the table.

Voltage Reading	Predicted Voltage	Measured Voltage
V1		
V2		
V3		
V4		
V5		

Solid State Electronics – Unit 2: PN Junctions and Diodes

Lab: Working with the Diode in DC Circuits

Step 12. Answer the following questions.

What can be said about current flow through a forward biased diode?

_____ .

What can be said about current flow through a reverse biased diode?

_____ .

What can be said about current flow through a shorted diode?

_____ .

What can be said about current flow through an open diode?

_____ .

Name some trivalent impurities. _____ .

Name some pentavalent impurities.

_____

What is the majority carrier in P-type semconductor material?_____

What is the majority carrier in N-type semconductor material?_____

Solid State Electronics – Unit 2: PN Junctions and Diodes

Lab: Working with the Diode in DC Circuits

SAFETY DISCLAIMER:

M-SAMC educational resources are in no way meant to be a substitute for occupational safety and health standards. No guarantee is made to resource thoroughness, statutory or regulatory compliance, and related media may depict situations that are not in compliance with OSHA and other safety requirements. It is the responsibility of educators/employers and their students/employees, or anybody using our resources, to comply fully with all pertinent OSHA, and any other, rules and regulations in any jurisdiction in which they learn/work. M-SAMC will not be liable for any damages or other claims and demands arising out of the use of these educational resources. By using these resources, the user releases the Multi-State Advanced Manufacturing Consortium and participating educational institutions and their respective Boards, individual trustees, employees, contractors, and sub-contractors from any liability for injuries resulting from the use of the educational resources.

DOL DISCLAIMER:

This product was funded by a grant awarded by the U.S. Department of Labor's Employment and Training Administration. The product was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including any information on linked sites and including, but not limited to, accuracy of the information or its completeness, timeliness, usefulness, adequacy, continued availability, or ownership.

RELEVANCY REMINDER:

M-SAMC resources reflect a shared understanding of grant partners at the time of development. In keeping with our industry and college partner requirements, our products are continuously improved. Updated versions of our work can be found here: http://www.msamc.org/resources.html.