Foundations of Semiconductor Manufacturing

LAB ACTIVITY: EXTERNAL MICROCHIP INSPECTION AND IDENTIFICATION

Name	Class/Period	Date

1. Overview

In this lab activity, you will perform a non-destructive visual inspection of intact integrated circuits (ICs). Before a microchip is ever opened for internal analysis, engineers must document its external characteristics. You will use basic magnification to decode the laser-etched or printed alphanumeric markings on the exterior packaging to identify the manufacturer, part number, date code, and physical package type. Furthermore, you will use this information to retrieve the component's official datasheet.

2. Performance Objectives

After completing this lab activity, you will be able to:

- Identify common microchip package types (e.g., DIP, SOIC, QFP).
- Locate and decode the manufacturer logo, part number, and date code on a standard IC.
- Explain the purpose of the orientation mark (Pin 1 indicator) on a microchip.
- Utilize component datasheets via internet research to verify chip functionality based strictly on external markings.

3. Required Materials

The following materials are required to complete this lab activity:

- Assorted intact microchips (e.g., NE555 timers, 7400 series logic gates, or older memory chips; DIP or "Dual In-line Package" chips are best for naked-eye viewing) (3 different types per team)
- Standard handheld magnifying glass (3X to 5X magnification) or a jeweler's loupe (1 per team)
- A bright desk lamp or LED ring light for surface illumination (1 per team)
- A computer, tablet, or smartphone with internet access for datasheet lookups (1 per team)

4. Preparation Checklist

Before beginning the lab activity, review this checklist and mark off each item as you complete it.

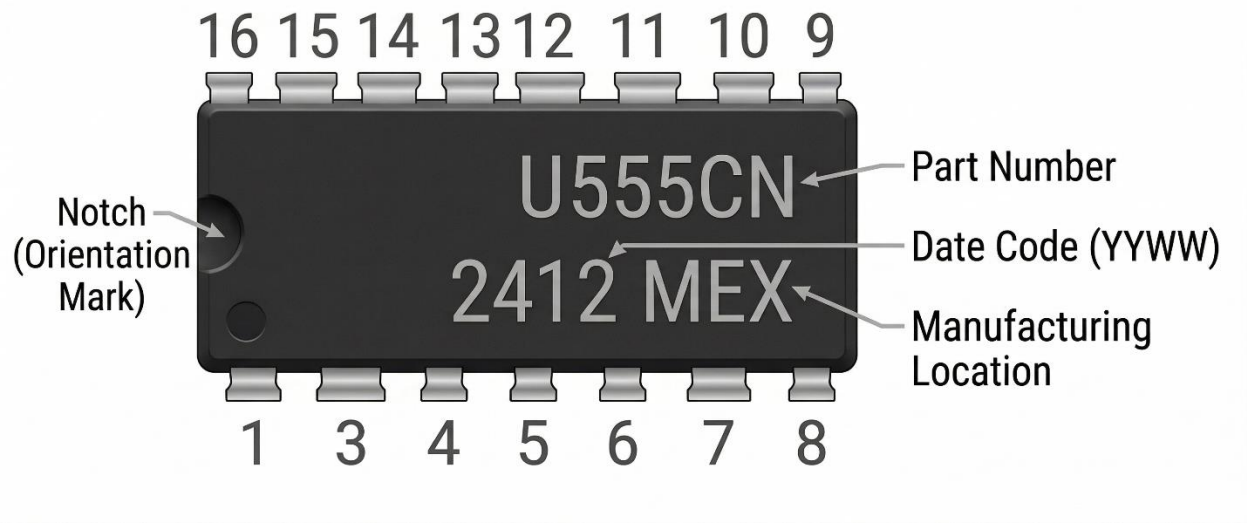
- ☐ All hardware components and microchips are distributed and available for this lab activity.
- ☐ The desk lamps are plugged in and devices for internet research are connected to the network.
- ☐ You have read through the entirety of this document to familiarize yourself with the requirements.

5. Lab Activity

5.1. Key Terms

Before beginning the physical inspection, review these key terms:

- **Silicon Package Type:** The physical casing holding the silicon die, such as DIP or QFP
- **Orientation Mark:** The dimple or notch showing how to insert the chip into a circuit
- **Date Code:** The standard 4-digit number indicating the year and week of manufacture



5.2. Visual Inspection and Decoding

You and your team will now act as failure analysis technicians documenting incoming components.

Perform the following:

1. Select three different microchips from your team's assortment.
2. Turn on your desk lamp to brightly illuminate the workspace. Use the magnifying glass to carefully read the text on the top of the black resin package.
3. Locate Pin 1: Find the orientation notch (a half-moon cutout at one end) or the small circular dimple in the corner. This indicates where "Pin 1" is located.
4. Identify the Manufacturer: Look for a manufacturer's logo or name (e.g., the outline of Texas Instruments, the "M" of Motorola, or the Intel logo).
5. Record the Part Number: Locate the main alphanumeric sequence (e.g., SN74LS00N or NE555P). Write this down for each of your three chips.
6. Decode the Date Code: Locate the 4-digit Date Code. This is usually formatted as YYWW (Year, Year, Week, Week). For example, "2114" means the chip was manufactured in the 14th week of the year 2021. Record the manufacturing date for your chips.

5.3. Datasheet Verification

Now that you have the part numbers, you must determine what these chips actually do.

Perform the following:

1. Using your internet-connected device, open a search engine.
2. Type in the Part Number you recorded for your first chip, followed by the word "datasheet" (e.g., "SN74LS00N datasheet").
3. Open the manufacturer's PDF document.
4. Read the **Description** or **General Information** section on the first page of the datasheet to identify the chip's primary function (e.g., "Quad 2-input NAND gate", "Precision Timer").
5. Repeat this process for the other two chips. Discuss with your team why identifying the chip's external function is a necessary first step before deciding whether to perform a more invasive investigation of the chip.

6. Authentic Skill Assessment

Have your instructor verify that you have met the requirements for the performance objectives and sign below. Keep this lab activity sheet for future reference.

Instructor Signature	Date