

Van der Pauw Experiment

VDX-01

SES Instruments Pvt Ltd.

Van der Pauw Set-Up for measurement of resistivity and determination of hall coefficients in semiconductor samples



Introduction

Semiconductor material research and device testing often involve determining the resistivity and Hall mobility of a sample. The resistivity of the semiconductor material is often determined using a four-point probe technique. With a fourprobe, or Kelvin, technique, two of the probes are used to source current and the other two probes are used to measure voltage. Using four probes eliminates measurement errors due to the probe resistance, the spreading resistance under each probe, and the contact resistance between each metal probe and the semiconductor material. Because a high impedance voltmeter draws little current, the voltage drops across the probe resistance, spreading resistance, and contact resistance are very small. One common Kelvin technique for determining the resistivity of a semiconductor material is the van der Pauw (VDP) method. The van der Pauw method involves applying a current and measuring voltage using four small contacts on the circumference of a flat, arbitrarily shaped sample of uniform thickness. This method is particularly useful for measuring very small samples because geometric spacing of the contacts is unimportant. Effects

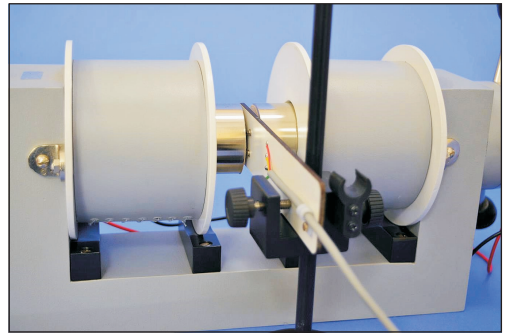
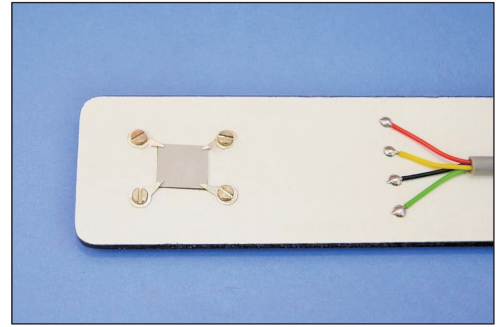
Description of Experimental Set-up

1. Probes Arrangement

Ge single crystal with four pure silver, spring type pressure contacts is mounted on a sunmica coated bakelite strip. Suitable connector is provided for connection connections with the current source and hall voltage measuring devices.

2. Van der Pauw Set-up, VDP-01

The set-up, VDP-01 consists of two sub units to handle probe current and hall voltage. While the probe current is generated and measured by a constant current source (0-20mA) having a resolution of $10\mu\text{A}$, the hall voltage is measured by a high input resistance millivoltmeter in the range 0-200mV having a resolution of 100mV. The probe current and hall voltage are both displayed on separate 3.5 digit LED panel meters. Various combinations of Voltage and Current probe locations used in Van der Pauw measurements can be conveniently selected using bandswitch provided on the panel both for Resistivity and Hall Effect measurements.



3. Electromagnet, EMU-50V (Refer datasheet for specifications)

4. Constant Current Power Supply, DPS-50 (Refer datasheet for specifications)

5. Digital Gaussmeter, DGM-202 (Refer datasheet for specifications)

The setup is complete in itself

