Order Code - 55548B
Hall Effect Experiment with
Compter Connection Interfacing Module & Software

The resistivity measurements of semiconductors can not reveal whether one or two types of carriers are present; nor distinguish between them. However, this information can be obtained from Hall Coefficient measurements, which are also basic tools for the determination of carrier density and mobilities in conjuction with resistivity measurement.

Theory

As you are undoubtedly aware, a static magnetic field has no effect on charges unless they are in motion. When the charges flow, a magnetic field directed perpendicular to the direction of flow produces a mutually perpendicular force on the charges. When this happens, electrons and holes will be separated by opposite forces. They will in turn produce an electric field ($\bar{E}$) which depends on the cross product of the magnetic intensity, H, and the current density, J.

$$\bar{E} = R\bar{J} \times \bar{H}$$

Where R is called the Hall Coefficient

Now, let us consider a bar of semiconductor, having dimension, x, y and z. Let J is directed along X and H along Z then $\bar{E}$ will be along Y.

Then we could write

$$R = \frac{V_h/y}{JH} = \frac{V_h.z}{IH}$$

Where V_h is the Hall voltage appearing between the two surfaces perpendicular to y and I=Jyz

Hall Effect experiment consists of the following:

1. Hall Probe (Ge Crystal) n & p-type
2. Hall Effect Set-up
3. Electromagnet
4. Constant Current Power Supply
5. Digital Gaussmeter

Hall Probe (Ge Crystal)

Ge single crystal with four spring-type pressure contacts is mounted on a sunmica-decorated bakelite strip. Four leads are provided for connections with measuring devices.

Technical Specification

Material	:	Ge single crystal n & p-type both are provided
Resistivity	:	8-10W.cm
Contacts	:	Spring type (solid silver)
Zero-field potential	:	<1mV (adjustable)
Hall Voltage	:	25-35mV/10mA/KG

It is designed to give a clear idea to the students about Hall Probe and is recommended for class room experiment. A minor drawback of this probe is that it may require zero adjustment.

Hall Effect Set-up

Hall Effect Set-up is a high performance instrument of outstanding flexibility. The set-up consists of a digital millivoltmeter and a constant current power supply. The Hall voltage and probe current can be read on the same digital panel meter through a selector switch. The unit is made compatible with interface unit, for computer control option.

(i) Digital Millivoltmeter

Intersil 3½ digit single chip A/D Converter ICL 7107 have been used. It has high accuracy like, auto zero to less than 10μV, zero drift of less than 1μV/°C, input bias current of 10pA max. and roll over error of less than one count. Since the use of internal reference causes the degradation in performance due to internal heating, an external reference has been used. Digital voltmeter is much more convenient to use in Hall experiment, because the input voltage of either polarity can be measured.

Note: Specifications are subject to change.

Tesca Technologies Pvt. Ltd.
IT-2013, Ramchandrapura Industrial Area, Sitapura Extension,
Near Bombay Hospital, Vidhani Circle, Jaipur-302022, Rajasthan, India,
Tel: +91-141-2771791 / 2771792; Email: info@tesca.in, tesca.technologies@gmail.com
Website: www.tescaglobal.com

Order Code - 55548B
Hall Effect Experiment with
Compter Connection Interfacing Module & Software

Specifications		
Range	:	0-200mV (100mV minimum)
Accuracy	:	±0.1% of reading ±1 digit

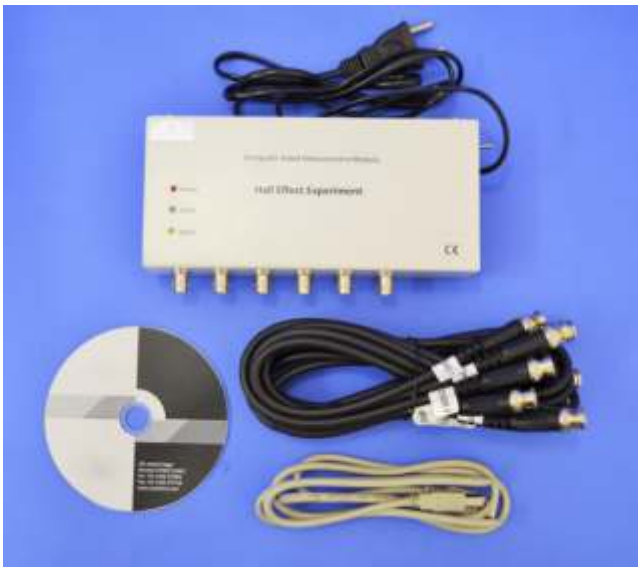
(ii) Constant Current Power Supply

This power supply, specially designed for Hall Probe, provides 100% protection against crystal burn-out due to excessive current. The supply is a highly regulated and practically ripple free dc source.

Specifications		
Current	:	0-20mA
Resolution	:	10µA
Accuracy	:	±0.2% of the reading ±1 digit
Load regulation	:	0.03% for 0 to full load
Line regulation	:	0.05% for 10% variation

Computer Interface

An interface enables the userto operate the hall effect setup through a computer. the interface is attached to any USB port and on activation a GUI shows the computer control, data storage and graph plotting of the experiment. Also included is the option for automatic computation of hall coefficient, carrier mobility and carrier density.



Datasheets of other sub units is available separately.

The experiment in complete in all respect.

Note: Specifications are subject to change.

Tesca Technologies Pvt. Ltd.
IT-2013, Ramchandrapura Industrial Area, Sitapura Extension,
Near Bombay Hospital, Vidhani Circle, Jaipur-302022, Rajasthan, India,
Tel: +91-141-2771791 / 2771792; Email: info@tesca.in, tesca.technologies@gmail.com
Website: www.tescaglobal.com