CIRCUIT CELLAR ONLINE

THE MAGAZINE FOR COMPUTER APPLICATIONS

Circuit Cellar Online offers articles illustrating creative solutions and unique applications through complete projects, practical tutorials, and useful design techniques.

RESOURCE LINKS

A Guide to online information about:

HALL EFFECT / MAGNETORESISTIVE (MR) Sensors

by Bob Paddock

DEFINITION: A sensor whose output changes based on changes in magnetic flux. Typically used for RPM, position, or current measurement. Named for E. F. Hall's work in 1879.

- Magnetic Units and Definitions(pdf)
- Magnetic Units(pdf)
- Hall Effect Quiz, with diagrams of the magnetic field
- A New Perspective On Magnetic Field Sensing addresses the various types and applications of magnetic sensors, with particular attention to giant magnetoresistive materials.
- Anisotropic Magnetoresistive Magnetic Field Sensors

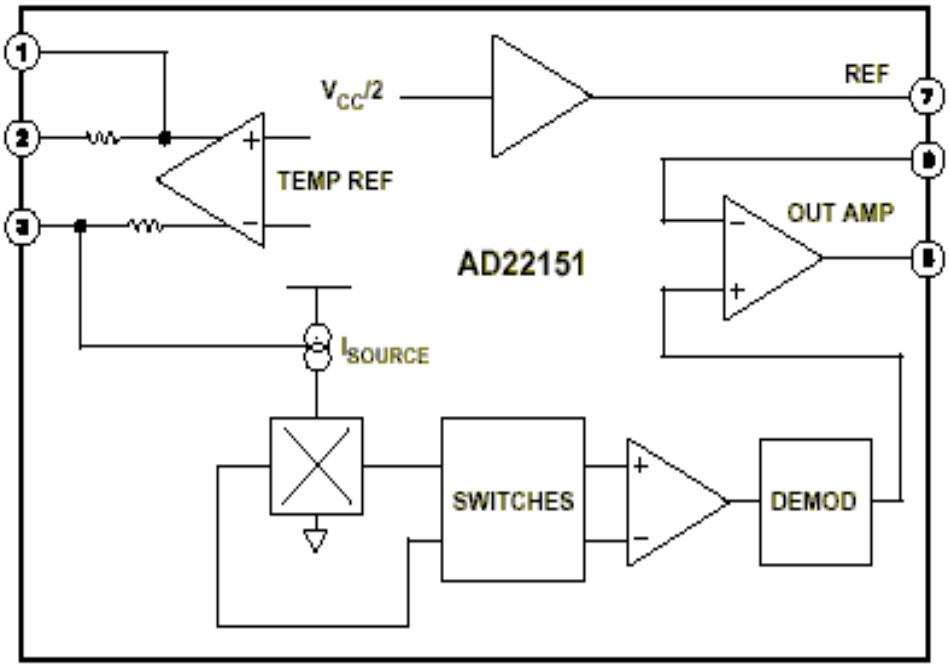
Some of the known manufactures of Hall Effect devices, listed alphabetically:

The Analog Devices AD22151 is a linear magnetic field transducer. The sensor output is a voltage proportional to a magnetic field applied perpendicularly to the package top surface.

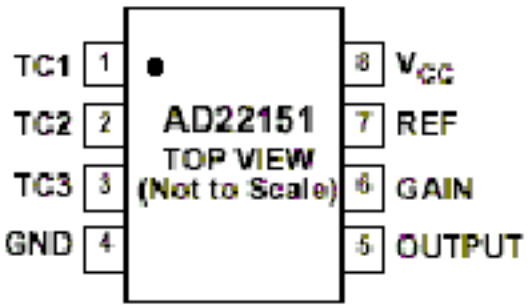
It is designed with Automotive Applications in mind, such as throttle position sensors.

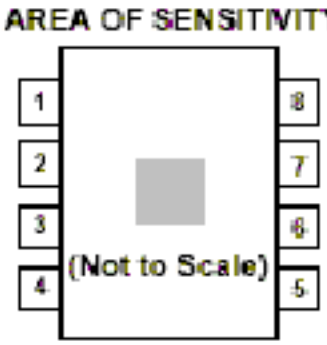
It offers built in temperature compensation, and the ability to program what type of magnetic it is used with for best performance.

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION





* SHADED AREA REPRESENTS MAGNETIC FIELD AREA OF SENSITIVITY (20MILS × 20MILS)

* POSITIVE B FIELD INTO TOP OF PACKAGE RESULTS IN A POSITIVE VOLTAGE RESPONSE

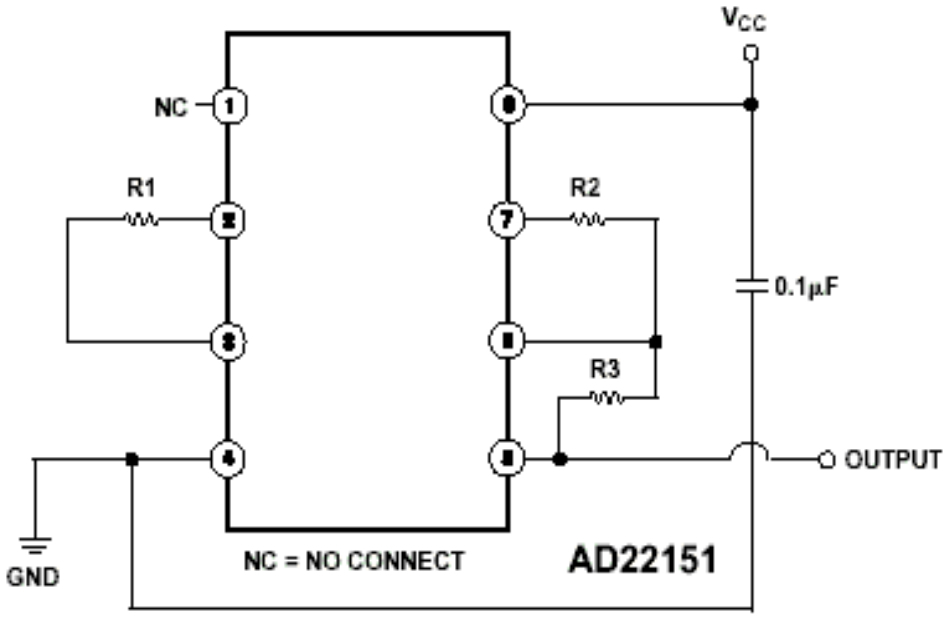


Figure 1. Typical Bipolar Configuration with Low (< –500 ppm) Compensation

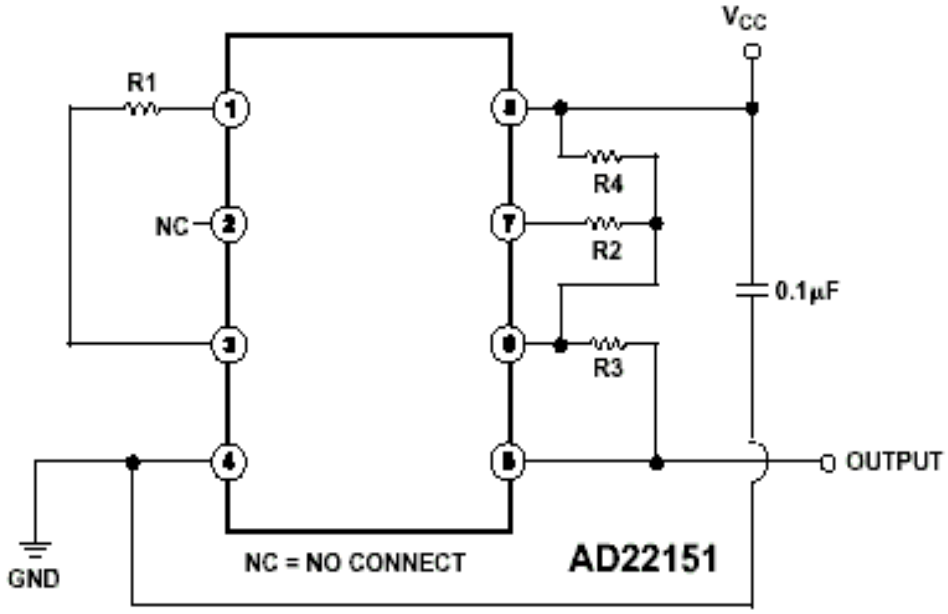


Figure 2. Typical Unipolar Configuration with High (≈ –2000 ppm) Compensation

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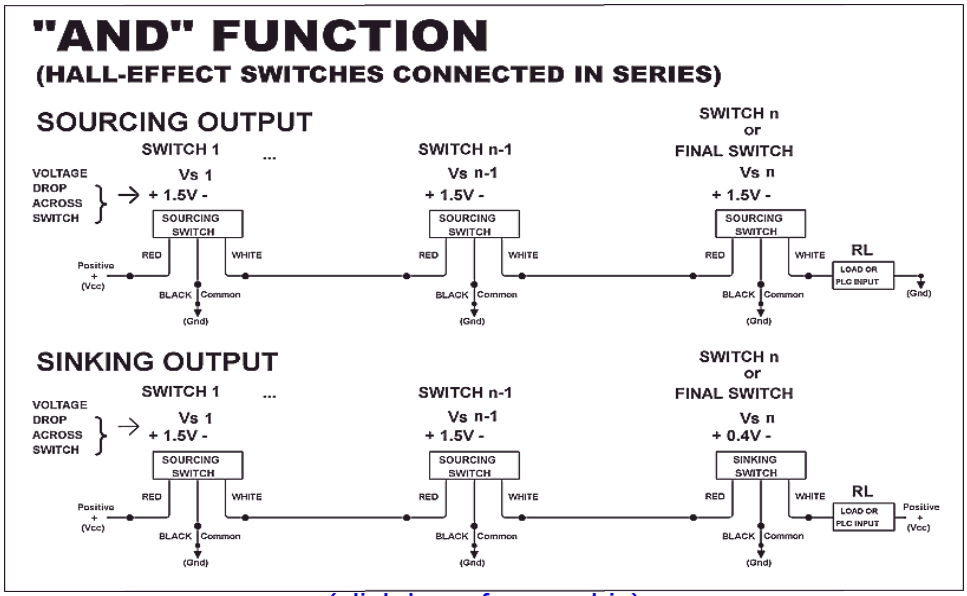
Allegro MicroSystems offers Unipolar, Bipolar, and Linear Outputs. They have several application notes that cover the unglamorous things that must be done for real world uses, such as Soldering of Hall-Sensor Devices (pdf) and Gluing, Potting, Encapsulating, and Lead Forming Hall-Effect Devices.(pdf) A good introductory Application Note (pdf) on Hall Effect Applications, and a separate note on Linear Hall-Effect Applications (pdf) should be on your **Must Read** list if Hall Effect devices are in your future. To my knowledge they offer a unique device that allows up to 30 addressable sensors to be multiplexed on to a

single bus in their 3054 (pdf) Also offered are Subassemblies for such things as Gear Tooth Sensing.

American Electronic Components Inc. Custom-designed sensors for timing, speed and position sensing. Custom-designed housings and connectors.

If you don't want to use addressable sensors then Bimba Manufacturing Company shows you how to hook Hall Effect devices in logical AND and OR configurations.



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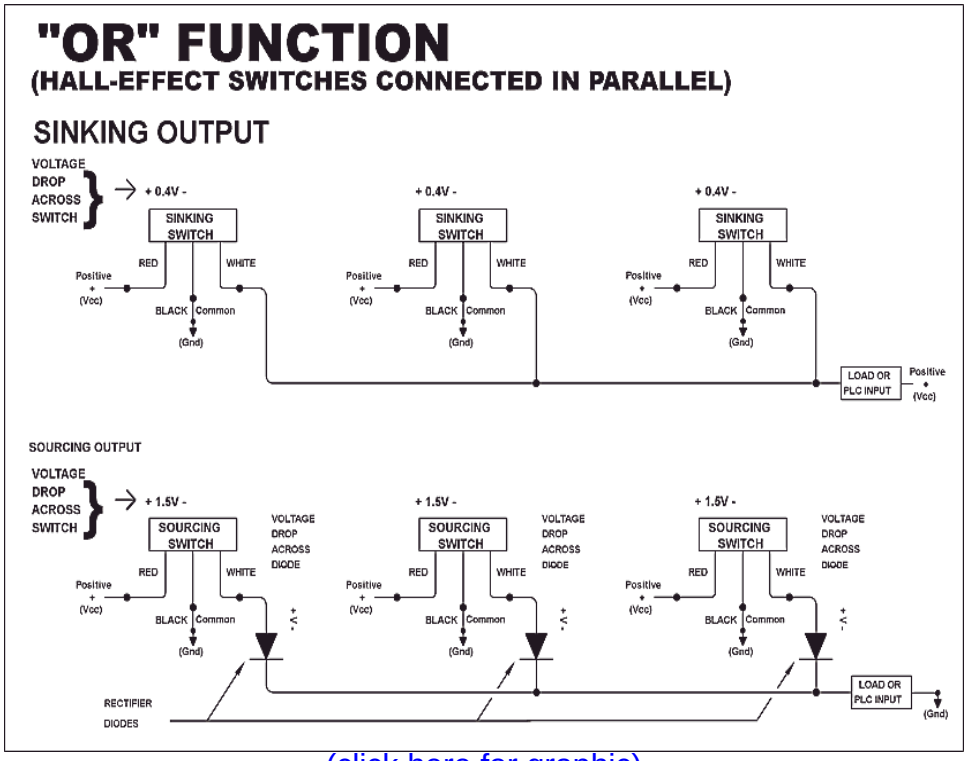

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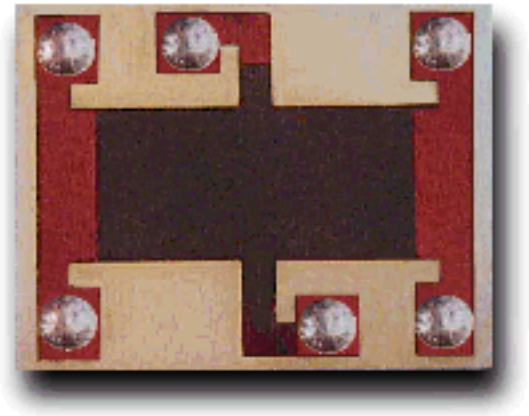
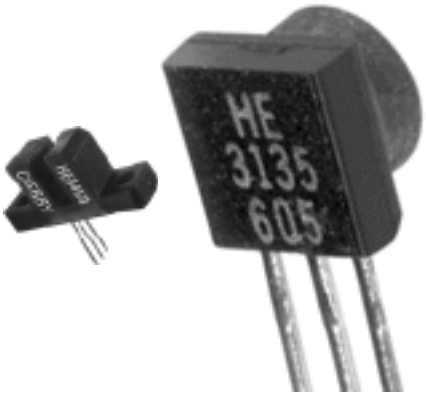
F.W. Bell, A Division of Bell Technologies offers the widest temperature range, -269° C to +185° C. Thirty Standard Models are available. Hall Effect Current Sensors Hall Sensors A Tutorial on Hall Sensors A Tutorial on the New Magnetoresistive Technology Current Sensor F.W. Bell Hall Sensor Spice Models F. W. Bell seems to be the only company to offer Spice Models for their sensors. HS-100 'World's Thinnest Hall Sensor

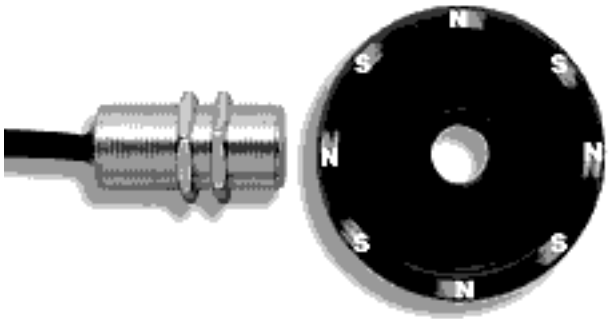


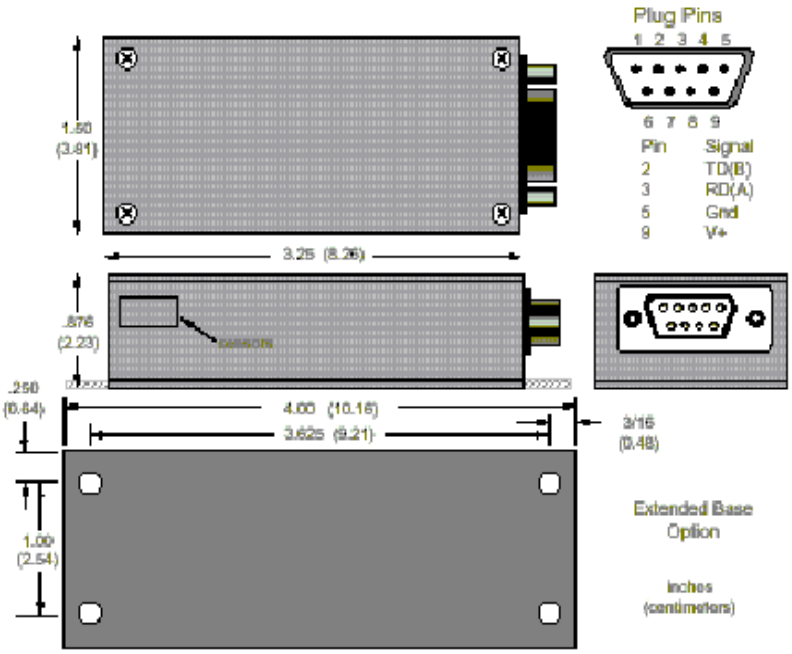
The Actual Size of the HS-100 is 100 x 120 mil.

Cherry Electrical Products offers several styles of devices.

Hall Effect switches are bounce free by nature making them suitable for use in keyboards .







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Infineon [Formally Siemens].

Introduction to Silicon Hall-Effect Sensors.

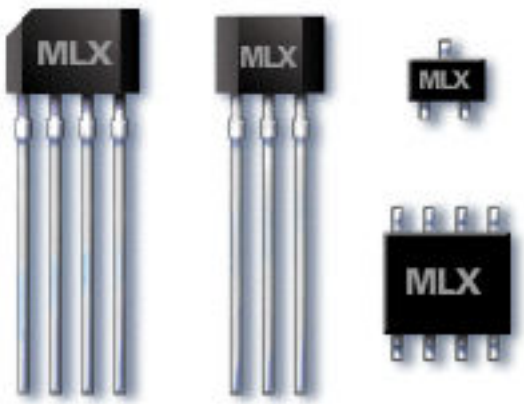
Magnetic Units

Magnetic Units and Definitions

Principles of Operation of Integrated Hall ICs

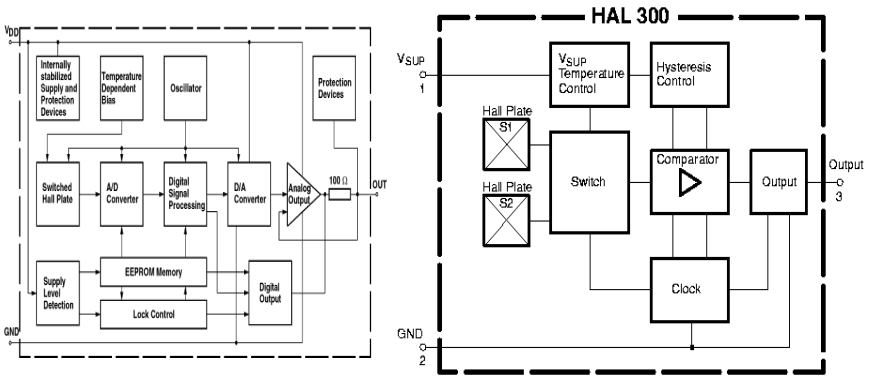
Application Notes: Magnetics .

MELEXIS Microelectronic Integrated Systems has units that will operate down to 2.2V. Offers several styles.



MICRONAS INTERMETALL offers several unique sensors. Such as

one designed for use in Contactless Potentiometers as well as a Differential Hall Effect Sensor .



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Magnetic Sensor Product Highlights

Offers Magnetic Sensors for use in high contamination, high temperature applications such as in automobile engines.

Philips Semiconductors Magnetic field sensors .
Overview of magnetic sensor systems (pdf) .
General introduction to the theory of Magnetoresistive Elements(pdf) .
Magnetic Field Sensors (pdf) in detailed applications. Has examples of compass and vehicle type identification based on three-axis magnetic signature.
Rotational speed measurement(pdf) .

Hall Effect Levitation of Hoverboards

7-99

If you would like to add any information on this topic or request a specific topic to be covered, contact Bob Paddock

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