Appendix D

How to use the X98824-SS Calibrated Hall Device

Description

Magnetic characteristics for Hall effect devices are specified within particular ranges. To insure that all devices will operate and release in the application, gauss levels should be verified. The calibrated Hall device will allow the user to measure the gauss levels produced in the application. Calibrated devices are intended from laboratory use only. Any application of a magnetic sensor requires a thorough understanding of the magnetic gauss levels and how they change. The calibrated Hall device is used to determine the flux density produced at the sensor by the magnet.

The X98834-SS calibrated Hall device provides an output proportional to magnetic flux densities. This device is supplied with an accurate, individual plot of output voltage versus gauss (calibration data). A millivoltmeter with ungrounded input terminals and a 1MΩ minimum input impedance was used to measure the output voltage. In order for the calibration data to be accurate, a stable, precise power supply was used (5 ± .003VDC) and a temperature of 24 ± 2°C was maintained. A 2.2KΩ resistor connected between output and minus terminals was used as the load during calibration.

An output voltage (null offset) exists when no magnetic field is present. This offset voltage is a result of a mismatch of the internal connections to the Hall element and is accounted for in the calibration data. Measure the null offset voltage at 24°C with an 5.000 VDC power supply and a 2.2KΩ resistor after a 15 minute warm-up period. If the null offset voltage measured with the application's equipment is different from the one shown in the calibration data, use your value to get the most accurate gauss measurements in your application.

Mount the calibrated Hall device and magnet(s) with provisions for moving the magnet(s) in known increments. A micrometer and increments of 0.025 inch (0.6mm) are recommended. If pole pieces or flux concentrators will be used in the magnetic system, they must be included during measurement. Initial measurements should be made in the head-on mode. The magnetic curves for this mode are not only useful for head-on sensing, but also for determining the effect of gap distance and pole piece effect for other modes.

Move the magnet toward the package using the head-on mode of operation. If the set-up is correct, the millivolt reading will increase. However, if the magnet polarization is incorrect, the reading will be positive, but will begin moving towards negative as the magnet approaches the package. In this case, reverse the magnet. Continue moving the magnet until it is touching the device package face evenly. This will provide the maximum reading in millivolts and the maximum induction available from the magnetic actuator.

When the magnetic field decreases, the output voltage decreases in a like manner. Referring to the calibration data supplied, a reading on the voltmeter is easily converted to gauss. Mechanical characteristics can be verified by first plotting a gauss versus distance graph. By comparing the curve to the magnetic characteristics of the sensor, the possible mechanical ranges of operate point and release point can be determined.

Once the operating limits of the magnet and sensor combination have been established, feeler gages, etc. may be used during installation to insure that the correct gap is maintained. The X98824-SS calibrated Hall device remains linear over a span of -600 gauss to +600 gauss. Using this device allows a thorough analysis of a mechanical/magnetic system. This information is needed to determine system reliability and tolerances.