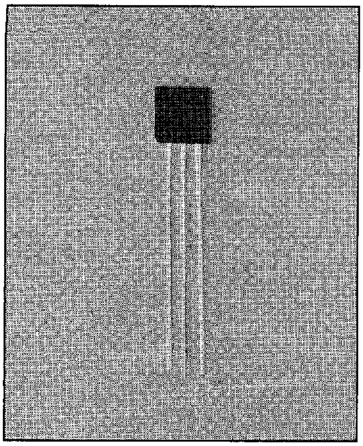
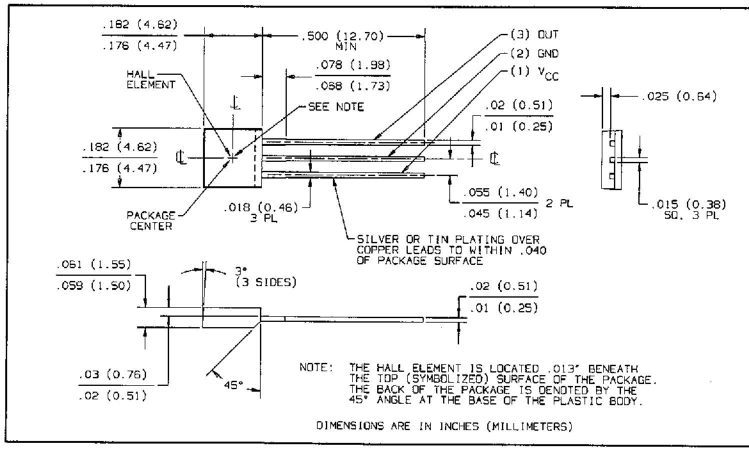
Product Bulletin OHN3506/3507
August 1996

Ratiometric Linear Hall Effect Sensor
Types OHN3150U, OHN3151U, OHS3150U, OHS3151U





Features

- A ratiometric linear output capable of sinking and sourcing current
- 4.5 V to 6.0 V operation
- Responds equally to positive and negative magnetic field
- Excellent temperature stability to operate in harsh environments
- Robust package capable of withstanding harsh environments

Description

The ratiometric linear Hall Effect sensor each contain a monolithic integrated circuit on a single chip. The circuit incorporates a quadratic Hall sensing element which minimizes the effects of mechanical and thermal stress on the Hall element and temperature compensating circuitry to compensate for the inherent Hall element sensitivity change over temperature current.

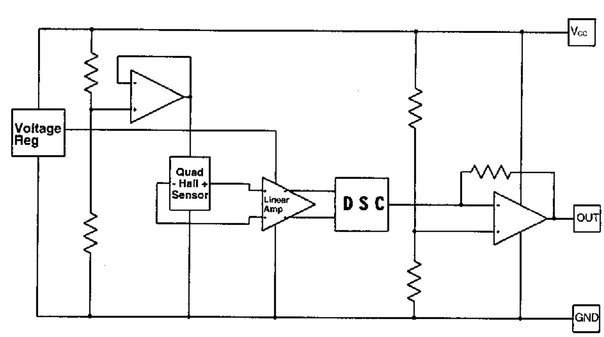
These ratiometric linear Hall Effect sensors provide an output voltage that varies in proportion to the applied magnetic field. The voltage output will increase in response to a south pole (positive) magnetic field applied perpendicular to the package symbolization face, and decrease in response to a north pole (negative) magnetic field.

These 3150U & 3151U ratiometric linear Hall Effect sensors can be used as contactless sensors for rotary and linear position sensing and for current sensing. The devices in this series are similar in performance except for their allowable quiescent voltage output change over the specified operating temperature range.

Absolute Maximum Ratings

Supply Voltage, V_{CC}	6 V
Storage Temperature Range, T_S	-65° C to +170° C
Operating Temperature Range, T_A (OHS prefix)	-40° C to +150° C
(OHN prefix)	-20° C to +85° C
Lead Soldering Temperature (1/8 inch [3.2 mm] from case for 5 sec, with soldering iron)	260° C(1)
Power Dissipation, P_D	100 mW
Output Current, I_O	5 mA
Magnetic Flux Density, B	Unlimited

Block Diagram



DSC = Dual to Single Converter

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Type OHN3150U, OHN3151U, OHS3150U, OHS3151U

Electrical Characteristics (Over Operating Temperature Range, at V_{CC} = 5 V, unless otherwise noted)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
V_{CC}	Supply Voltage	4.5	5.0	6.0	V	
I_{CC}	Supply Current		5.5	10	mA	V_{CC} = 6 V, I_O = 0 mA, B = OG
V_{OQ}	Quiescent Voltage Output	2.25	2.5	2.75	V	B = OG, T_A = 25° C
		2.10	2.5	2.90	V	B = OG
I_O	Sink Current	0.5			mA	
I_O	Source Current	-1.0			mA	

(1) Negative current is defined a coming out of (sourcing) the output.

Magnetic Characteristics (Over Operating Temperature, V_{CC} = 5 V, I_O = 1 mA

SYMBOL	PARAMETER	OHS3150U			OHS3151U			OHN3150U			OHN3151U			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
T_A	Operating Temperatiure Range	-40		150	-40		150	-20		85	-20		85	° C
Sens	Sensitivity @ T_A = 25° C over T_A	 2.25 2.0	 2.5	 2.75 3.0	 2.25 2.0	 2.5	 2.75 3.0	 2.25 2.0	 2.5	 2.75 3.0	 2.25 2.0	 2.5	 2.75 3.0	 mV/G mV/G
$\Delta Sens_{(\Delta T)}$	Sens Change @ T_A > 25° C @ T_A < 25° C	 -2 -10		 8 0	 -2 -10		 8 0	 -2 -10		 8 0	 -2 -10		 8 0	 % %
$\Delta V_{OQ(\Delta T)}$	V_{OQ} Change over T_A			±35			±50			±35			±50	G
$\Delta Sens_{(\Delta V)}$	Ratiometric Sens Change		100			100			100			100		%
$\Delta V_{OQ(\Delta V)}$	Ratiometric V_{OQ} Change		100			100			100			100		%
+Lin	Positive Lin ≥ 25 < 25	99 99		105 110	99 99		105 110	99 99		105 110	99 99		105 110	%
-Lin	Negative Lin ≥ 25 < 25	95 90		101 101	95 90		101 101	95 90		101 101	95 90		101 101	%
Sym	Output Symmetry	95	100	105	95	100	105	95	100	105	95	100	105	%

See characteristics definitions for test conditions and calculation formulas.

Characteristics Definitions

Quiescent Voltage Output: With no magnetic field present the device is in the quiescent state and the voltage output is approximately equal to on-half the supply voltage ($V_{OQ} \approx V_{CC}/2$) over the operating voltage and temperature range. The change in quiescent voltage output over temperature gives the device's equivalent accuracy and is specified in gauss by the calculation.

$$\Delta V_{OQ(T)} = \frac{V_{OQ(TA)} - V_{OQ(25^{\circ} C)}}{Sens_{(25^{\circ} C)}}$$

Sensitivity: A magnetic south pole at. and perpendicular to , the device's symbolized package face will increase the voltage output above the quiescent value. Conversely a magnetic north pole will decrease the voltage output below the quiescent value. This change in voltage output with applied magnetic field is sensitivity and is specified in mV/G by the calculation.

$$Sens = \frac{V_{O(500G)} - V_{O(-500G)}}{1000}$$

The change is sensitivity over temperature is specified in percent by the calculation

$$\Delta Sens_{(\Delta T)} = \frac{Sens_{(TA)} - Sens_{(25^{\circ} C)}}{Sens_{(25^{\circ} C)}} \text{ X } 100\%$$

Ratiometry: The quiescent voltage output and sensitivity of these ratiometric linear Hall Effect devices are proportional to the supply voltage. The change in quiescent voltage output with supply voltage is specified in percent by the calculation.

$$\Delta V_{OQ(\Delta V)} = \frac{V_{OQ(VCC)} - V_{OQ(5\,V)}}{V_{CC}/5\text{ V}} \text{ X } 100\%$$

The Change in sensitivity with supply voltage is also specified in percent by the calculation

$$\Delta Sens_{(\Delta V)} = \frac{Sens_{(VCC)}/Sens_{(5\,V)}}{V_{CC}/5\text{ V}} \text{ X } 100\%$$

Linearity and Symmetry: The ability of the voltage output to vary in constant proportion to the applied magnetic field is linearity and is specified in percent by the calculation

$$+\text{Lin} = \frac{V_{O(500G)} - V_{OQ}}{2(V_{O[250G]} - V_{OQ})} \text{ X } 100\%$$

$$-\text{Lin} = \frac{V_{O(-500G)} - V_{OQ}}{2(V_{O[-250G]} - V_{OQ})} \text{ X } 100\%$$

The output symmetry is also specified in percent by the calculation

$$Sym = \frac{V_{O(500G)} - V_{OQ}}{V_{OQ} - V_{O(-500G)}} \text{ X } 100\%$$