

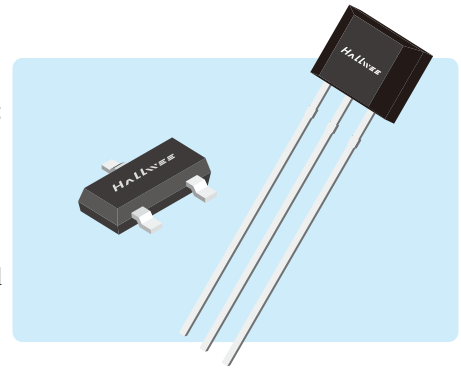
## HL4603/HL4604/HL4605 Linear Hall Effect IC

### 1. Description

The HL460 3/HL460 4/HL460 5 family is high performance ratiometric linear hall effect sensor, produced with Bipolar technology; it is high performance small versatile linear Hall effect devices which are operated by the magnetic field from a permanent magnet or an electromagnet. The ratiometric output voltage is set by the supply voltage and varies in proportion to the strength of the magnetic field.

The HL460 3/HL460 4/HL460 5 family has a quiescent output voltage that is 50% of the supply voltage.

The integrated circuit provides increased temperature stability and sensitivity. The HL460 3/HL460 4/HL460 5 provide high accuracy and temperature compensation. The linear hall sensors have an operating temperature range from  $-40$  to  $+150$  °C, appropriate for home appliances, industrial and automotive environments. They respond to either South or North pole.



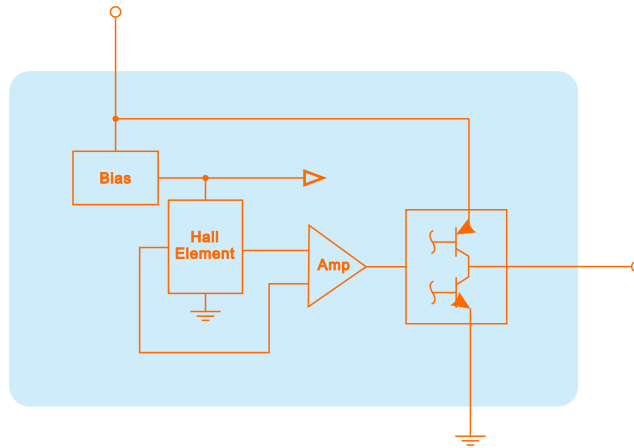
### 2. Features And Functional Diagram

- Power consumption of 4 mA at 5 VDC for energy efficiency
- Single Current Sinking or Current Sourcing Output
- Linear output for circuit design flexibility
- Ratiometric Rail to Rail Linear Output
- Precise Sensitivity and Temperature Compensation
- Wide Operating Voltage Range : Supply Voltage 3.0 ~ 15 V
- Sensitivity at 5V :
  - 3.3mV /Gauss (HL460 3)
  - 2.5mV /Gauss (HL460 4)
  - 5.0mV /Gauss (HL460 5)
- Sensitivity at 3.3V :
  - 2.15mV /Gauss (HL460 3)
  - 1.6mV /Gauss (HL460 4)
  - 3.15mV /Gauss (HL460 5)
- Specified Operating Temperature Range : From  $-40$  °C ~  $150$  °C
- Responds to either positive or negative gauss
- Quad Hall sensing element for stable output

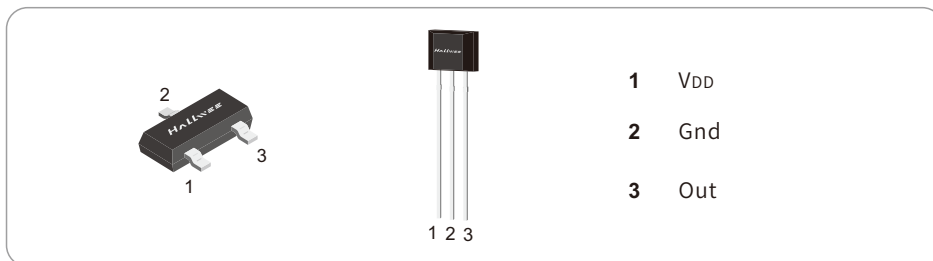
### 3. Applications

- Current sensing
- Speed Detection
- Position Detection
- Magnetic Encoder
- Solid State Switch
- Ferrous metal sensing
- Liquid level sensing
- Vibrations sensing
- Weight sensing

#### 4. Functional Diagram



#### 5. Pin Definitions and Descriptions



#### 6. Absolute Maximum Ratings

Parameter	Symbol	Min	Ma x	Units
Supply Voltage	$V_{DD}$	-	18	V
VDD Reverse Voltage VDD	$V_{RDD}$	-	-0.3	V
Output Voltage	$V_{OUT}$	-0.3	18	V
Output Current	$I_{OUT}$	-	5	mA
Operating Ambient Temperature	$T_A$	-40	150	°C
Storage Temperature	$T_S$	-50	150	°C
Junction temperature	$T_J$	-50	165	°C
Magnetic Flux	B	No Limit		Gauss

Note: Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute maximum - rated conditions for extended periods may affect device reliability.

## 7. ESD Protections

Parameter	Value	Unit
Allpins <sup>1)</sup>	+/-6000	V
Allpins <sup>2)</sup>	+/-400	V
Allpins <sup>3)</sup>	+/-1500	V

1) HBM (human body mode, 100 pF, 1.5 kohm) according to MIL-STD-883H Method 3015.8

2) MM (Machine Mode C=200 pF, R=0) according to JEDEC EIA/JESD 22-A115

3) CDM (charged device mode) according to JEDEC EIA/JESD 22-C 101 F

## 8. Function Description

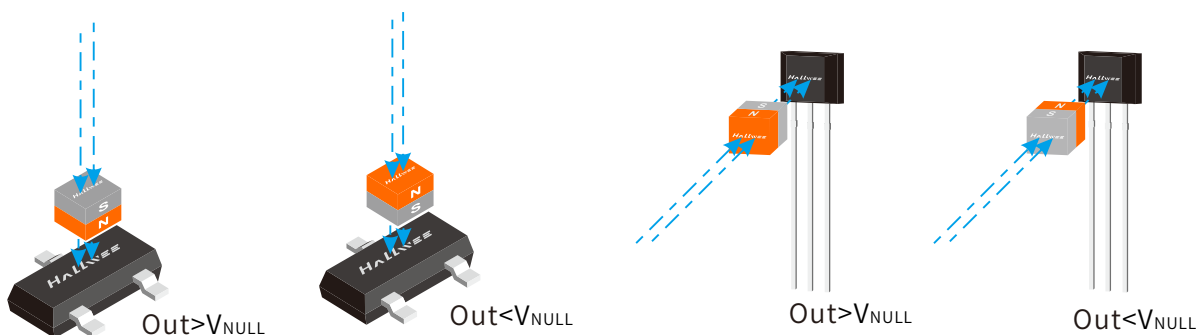
The HL460 3/HL460 4/HL460 5 family MRL (Miniature Ratiometric Linear) sensors are small, versatile linear Hall effect devices which are operated by the magnetic field from a permanent magnet or an electromagnet. The ratiometric output voltage is set by the supply voltage and varies in proportion to the strength of the magnetic field.

The integrated circuitry provides increased temperature stability, sensitivity and temperature compensation. These linear position sensors have an operating temperature range of -40 °C to +150 °C, appropriate for industrial and automotive environments. They respond to either positive or negative gauss, monitoring either or both magnetic poles.

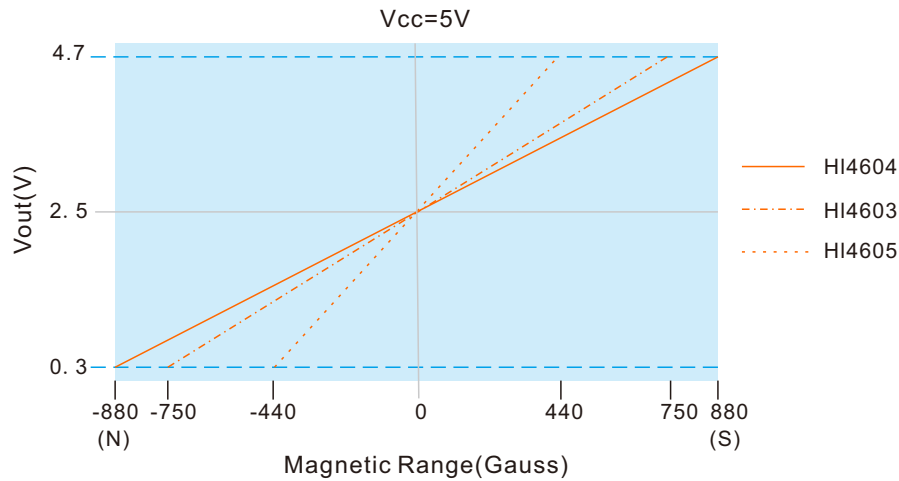
The quad Hall sensing element minimizes the effects of mechanical or thermal stress on the output. The product providing a robust design over a wide temperature range. Rail-to-rail operation (over full voltage range) provides a more usable signal for higher accuracy.

The HL460 3/HL460 4/HL460 5 family has a typical sinking or sourcing output of 1.5 mA continuous, uses 4 mA of supply current at 5.0 volts and 25 °C, and provides predictable performance over the full temperature range. The HL460 3/HL460 4/HL460 5 family Series sensors have wider null and sensitivity tolerances.

## 9. Magnetic Activation



## 10. Transfer Characteristics



## 11. Parameters Specification

(At  $V_{DD} = 5V$ ,  $T_A = -40^{\circ}C$  to  $150^{\circ}C$  except where otherwise specified)

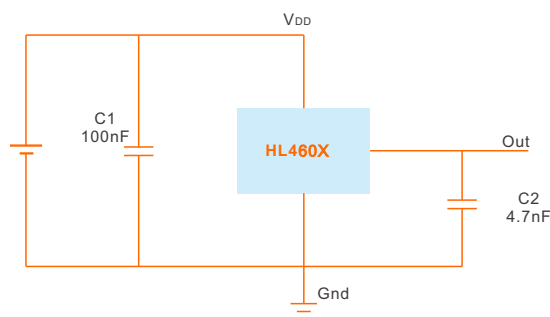
Symbol	Parameter	Test Condition	Min	Typ	Max	Units
$V_{DD}$	Supply voltage	$-40^{\circ}C$ to $150^{\circ}C$	3.0	5.0	15	V
$I_{DD}$	Supply Current	$B=0$		4	8	mA
$V_H$	Output voltage	$B=+1000$ Gs			0.4	V
$V_L$		$B=-1000$ Gs	4.7			V
$V_{NULL}$	Quiescent Voltage	$B=0$ , $25^{\circ}C$ , $V_{DD} = 5V$	2.45	2.5	2.55	V
		$B=0$ , $25^{\circ}C$ , $V_{DD} = 3.3V$	1.60	1.65	1.70	V
$I_{SINK}$	Sink Current	$V_{DD} = 3V$ , $T_A = 25^{\circ}C$	-0.8			mA
$I_{SINK}$		$V_{DD} = 5V$ , $T_A = 25^{\circ}C$	-1			mA
$I_{SOURCE}$	Source Current	$V_{DD} = 3V$ , $T_A = 25^{\circ}C$			1.5	mA
$I_{SOURCE}$		$V_{DD} = 5V$ , $T_A = 25^{\circ}C$			2.0	mA
$V_N$	Output Referred Noise (HL460 5)	$T_A = 25^{\circ}C$ , $CL = 0.1 \mu F$		4.2		mV (p-p)
	Output Referred Noise (HL460 3)	$T_A = 25^{\circ}C$ , $CL = 0.1 \mu F$		3.1		mV (p-p)
	Output Referred Noise (HL460 4)	$T_A = 25^{\circ}C$ , $CL = 0.1 \mu F$		2.6		mV (p-p)
$LIN$	Linearity		-5		+5	%
$V_{NULL}(T)$	Delta $V_{null}$ as temperature		-5		+5	%
$V_{NULL}(V)$	Ratiometry, $V_{null}$		-5		+5	%
$SENS(T)$	Delta Sens as temperature		-10		+10	%

## 12. Electrical Characteristics

(At VDD =5 V, TA = -40°C to 150 °C except where otherwise specified)

Symbol	Parameter	Test Condition	Min	Typ	Max	Units
S <sub>ENS</sub>	Sensitivity (HL460 3)	T <sub>A</sub> =25°C, VDD =5 V		3.3		mV /Gs
S <sub>ENS</sub>	Sensitivity (HL460 4)	T <sub>A</sub> =25°C, VDD =5 V		2.5		mV /Gs
S <sub>ENS</sub>	Sensitivity (HL460 5)	T <sub>A</sub> =25°C, VDD =5 V		5		mV /Gs
S <sub>ENS</sub>	Sensitivity (HL460 3)	T <sub>A</sub> =25°C, VDD =5 V		2.15		mV /Gs
S <sub>ENS</sub>	Sensitivity (HL460 4)	T <sub>A</sub> =25°C, VDD =3.3 V		1.6		mV /Gs
S <sub>ENS</sub>	Sensitivity (HL460 5)	T <sub>A</sub> =25°C, VDD =3.3 V		3.15		mV /Gs
B+	Magnetic Range (HL460 3)	T <sub>A</sub> =25°C, VDD =5 V		666		Gauss
B-		T <sub>A</sub> =25°C, VDD =5 V		-666		Gauss
B+	Magnetic Range (HL460 4)	T <sub>A</sub> =25°C, VDD =5 V		880		Gauss
B-		T <sub>A</sub> =25°C, VDD =5 V		-880		Gauss
B+	Magnetic Range (HL460 5)	T <sub>A</sub> =25°C, VDD =5 V		440		Gauss
B-		T <sub>A</sub> =25°C, VDD =5 V		-440		Gauss
B+	Magnetic Range (HL460 3)	T <sub>A</sub> =25°C, VDD =3.3 V		650		Gauss
B-		T <sub>A</sub> =25°C, VDD =3.3 V		-650		Gauss
B+	Magnetic Range (HL460 4)	T <sub>A</sub> =25°C, VDD =3.3 V		850		Gauss
B-		T <sub>A</sub> =25°C, VDD =3.3 V		-850		Gauss
B+	Magnetic Range (HL460 5)	T <sub>A</sub> =25°C, VDD =3.3 V		430		Gauss
B-		T <sub>A</sub> =25°C, VDD =3.3 V		-430		Gauss

## 13. Typical Application Circuit

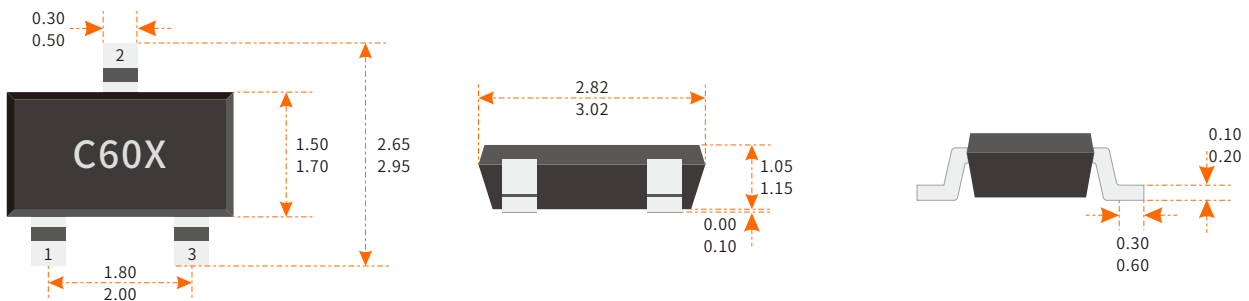


## 14. Order information

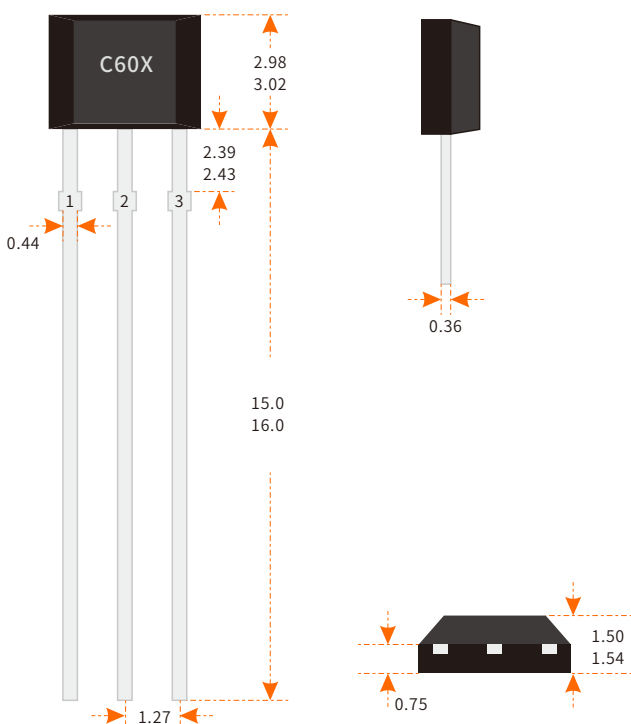
Part Number	Package Dimension	MPQ
HL4603/4/5 SO	SO(SOT-23-3L)	3000PCS
HL4603/4/5 UA	UA(TO-92S)	1000PCS

## 12. Package Dimension

### SOT-23 SO



### TO-92S UA



#### NOTES:

- Controlling dimension: mm
- Lead thickness after solder plating will be 0.254mm maximum
- Chip must be in PKG. center.
- PINOUT (See Top View at left :
  - Pin 1 V<sub>DD</sub>
  - Pin 2 GND
  - Pin 3 Output