KH4203

High Performance Ratiometric Linear Hall Effect Sensor

General Description

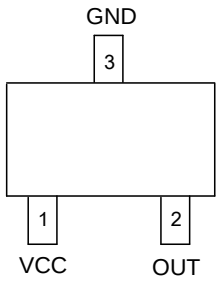
The KH4203 is a small, versatile linear Hall-effect device that is operated by the magnetic field from a permanent magnet or an electromagnet. The output voltage is set by the supply voltage and varies in proportion to the strength of the magnetic field.

For motion detectors, gear tooth sensors, and proximity detectors, they are magnetically driven mirrors of mechanical events. As sensitive monitors of electromagnets, they can effectively measure a system's performance with negligible system loading while providing isolation from contaminated and electrically noisy environments.

The integrated circuitry provides low noise output, which makes it unnecessary to use external filtering components in most cases. It also includes precision resistors to provide increased temperature stability and accuracy. The operating temperature range of these linear Hall sensors is -40°C to +150°C, appropriate for commercial, consumer, and industrial environments.

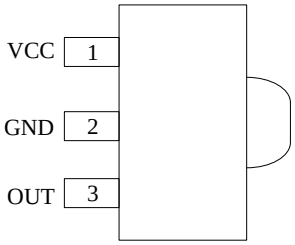
The KH4203 is available in standard TO-92S, SOT23-3 and SOT89-3 packages.

(Top View)



SOT23-3

(Top View)



SOT89-3

Features

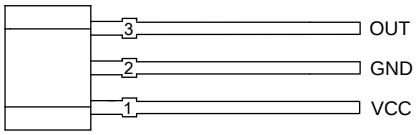
- 4.5V to 10.5V Wide Operating Voltage
- Sensitivity: 3.125mV/GS
- Ratiometric Rail to Rail Linear Output
- Precise sensitivity and temperature compensation
- Superior Temperature Stability: -40~+150 ℃
- A Stable and Accurate Output
- TO-92S(SIP-3L), SOT23-3 and SOT89-3 package

Applications

- Position Sensing
- Liquid Level Sensing
- Weight Sensing
- Ferrous Metal Detector
- Vibration Sensing
- Rotary Encoder
- Magnetic Code Reading
- Motor Control
- Current Sensing

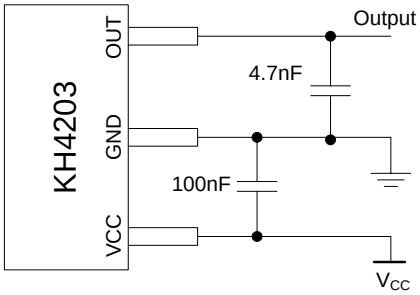
Pin Assignments

(Front View)



TO-92S

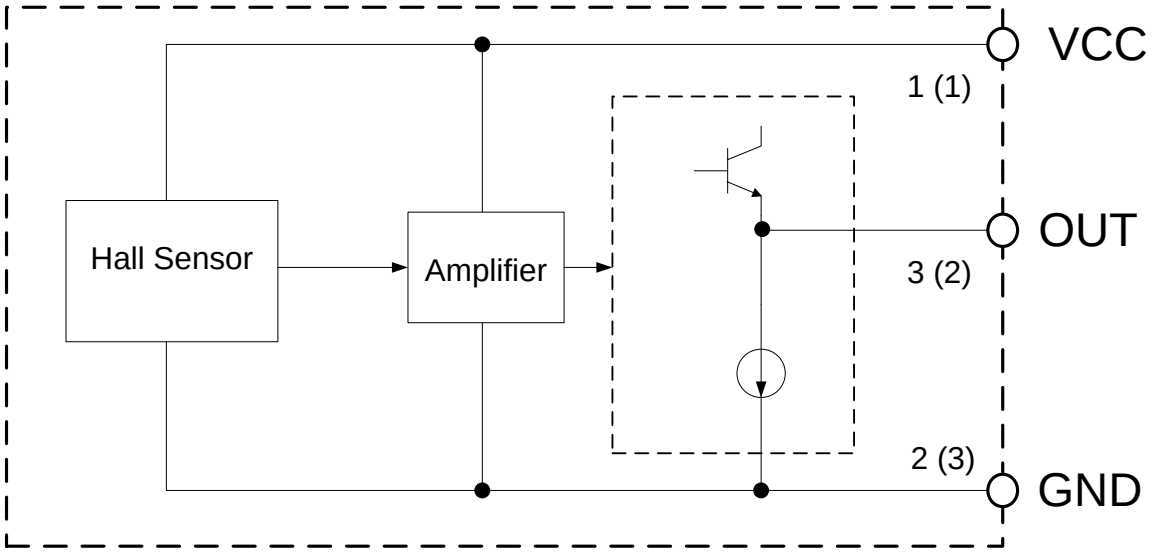
Typical Applications Circuit



Pin Descriptions

Pin Number			Pin Name	Function
TO-92S	SOT23-3	SOT89-3		
1	1	1	VCC	Supply voltage
2	3	2	GND	Ground pin
3	2	3	OUT	Output Pin

Functional Block Diagram



A(B)
A for TO-92S and SOT89-3
B for SOT23-3

Absolute Maximum Rates (@TA=+25°C, Note 1&2)

Symbol	Parameter	Rating		Unit
V_{CC}	Supply Voltage	12		V
Vout	Output Voltage	12		V
Iout	Output Sink Current	5		mA
P_D	Power Dissipation	TO-92S	230	mW
		SOT23-3	301	
		SOT89-3	230	
T_A	Ambient Temperature	-40 to +150		°C
T_{STG}	Storage Temperature	-50 to +165		°C

Notes: 1. Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “Recommended Operating Conditions” is not implied. Exposure to “Absolute Maximum Ratings” for extended periods may affect device reliability.
2. Electronic semiconductor products are sensitive to Electro Static Discharge (ESD). Always observe Electro Static Discharge control procedures whenever handling semiconductor products.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	4.5	10.5	V
T_{OP}	Operating Temperature	-40	+150	°C

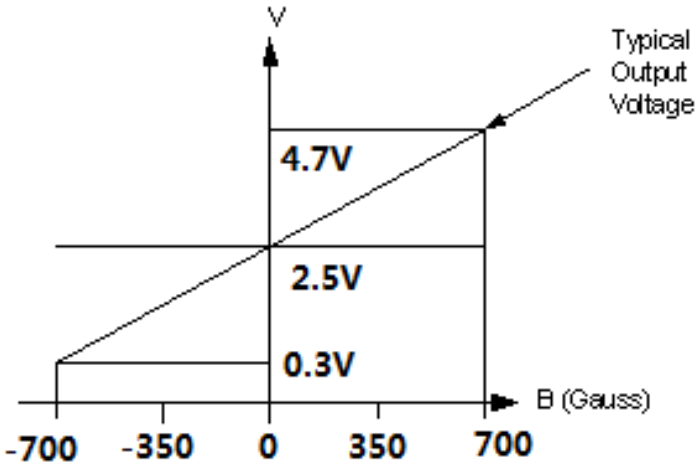
Electrical Characteristics (@TA=+25℃, VCC=5V, unless otherwise specified.)

Symbol	Parameters	Conditions	Min	Typ	Max	Unit
Vcc	Supply Voltage		4.5	5	10.5	
I_{CC}	Supply Current		-	5	8.7	mA
Iout	Output Current		-	1.5	-	mA
V_{NULL}	Quiescent Output Voltage	B = 0 (Gauss)	2.425	2.5	2.575	V
V_{SEN}	Output Voltage Sensitivity	B = 0 to ±600 (Gauss)	3.0	3.125	3.25	mV/Gauss
V_{OUT_S}	Output Voltage Span		0.4 to (V_{CC} -0.4)	-	0.2 to (V_{CC} -0.2)	V
B	Linear Magnetic Range		±600		±670	Gauss
	Linearity of Span		1	-	1.5	%

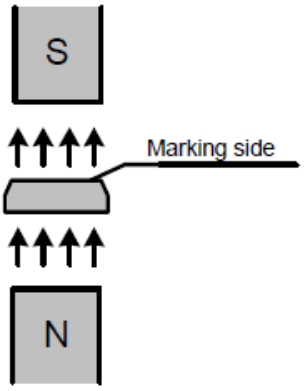
Transferring Characteristics (@T_A=+25°C, V_{CC}=5V)

When there is no external magnetic field (B=0Gauss), the quiescent output voltage is one-half the supply voltage in general.

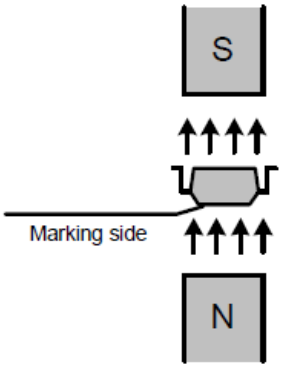
For TO-92S and SOT89-3 package, if a South magnetic pole approaches the part marking surface (the side with part marking ID) of the Hall effect sensor, the circuit will drive the output voltage higher. In contrary, a North magnetic pole will drive the output voltage lower. The variations of voltage level up or down from the quiescent output voltage (the null voltage) are symmetrical and is proportional to the magnetic flux density. In the SOT23-3 the die is placed underneath the lead frame and therefore when a magnet pole approaches the SOT23-3 part marking surface, the direction of the magnetic field in to the die is reversed compared to TO-92S. This results in a reverse response to the magnetic flux density in SOT23-3 package compared with TO-92S and SOT89-3 packages. (i.e. if the reverse magnetic pole approaches the part marking surface of SOT23-3, the output is the same as TO-92S package.) The largest magnetic sensitivity is obtained with a supply voltage of 10.5V, but at the cost of increased supply current and a slight loss of output symmetry. So, it is not recommended to work in such condition unless the output voltage magnitude is a main issue. The output signal can be capacitively coupled to a next-level amplifier for further amplifying if the changing frequency of the magnetic field is high.



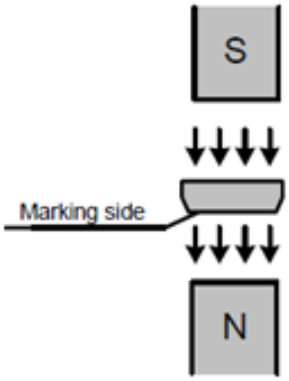
Transfer Characteristic



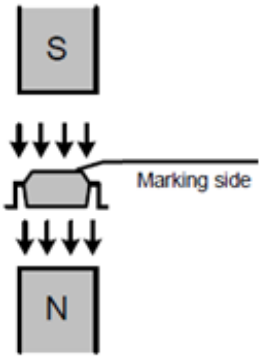
TO-92S&SOT89-3(OUT=2.5V~4.7V)



SOT23-3(OUT=2.5~4.7V)



TO-92S&SOT89-3(OUT=0.3V~2.5V)



SOT23-3(OUT=0.3~2.5V)

Output Voltage vs. Magnetic Flux Density

Ordering Information

KH4203 B XX - X

Product Name	Operating Temperature Range	Package	Packing
	B: -40 to 150°C	UA: TO-92S LH: SOT23-3 LT: SOT89-3	Blank : Bulk R: Tape&Reel

Package	Part Number	Marking ID	Packing Type
TO-92S	KH4203BUA	4203	1000/Bulk
SOT23-3	KH4203BLH	4203	3000/Tape&Reel
SOT89-3	KH4203BLT	4203	3000/Tape&Reel

Marking Informaiton

Package Type: TO-92S

First lines: Marking ID
Second line: Date Code
Y: Year 0 to 9
WW: Week 00 to 52 (Work week of molding)
X: Internal Code

Package Type: SOT23-3

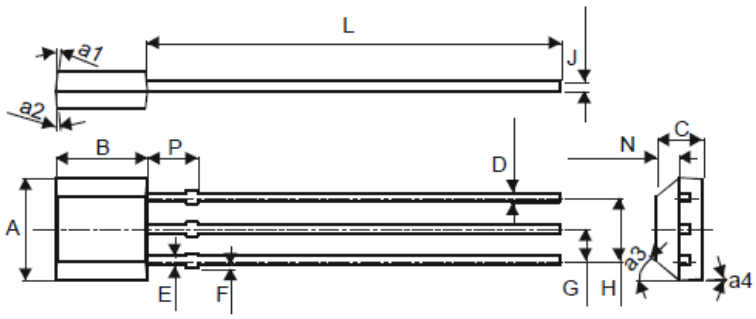
First lines: Marking ID

Package Type: SOT89-3

First lines: Marking ID
Second line: Date Code
Y: Year 0 to 9
WW: Week 00 to 52 (Work week of molding)
X: Internal Code

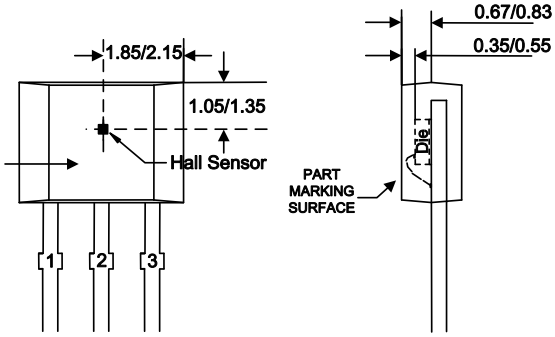
Package Outline Demension

Package Type: TO-92S



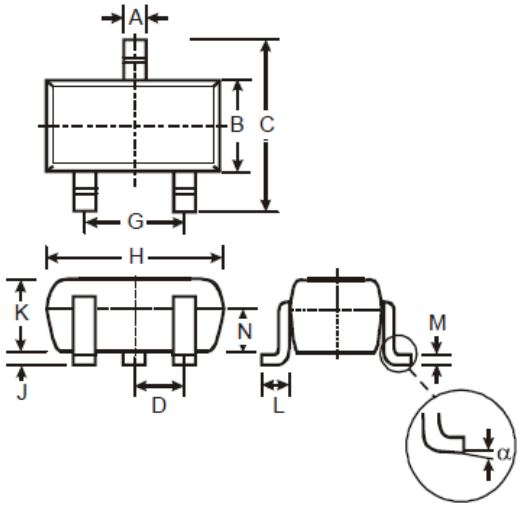
TO-92S		
Dim	Min	Max
A	4.0	4.2
a1	3° Typ	
a2	6° Typ	
a3	45° Typ	
a4	3° Typ	
B	3.08	3.28
C	1.48	1.68
D	0.36	0.56
E	0.44 Typ	
F	-0.05	0.20
G	1.27 Typ	
H	2.54 Typ	
J	0.38 Typ	
L	13.5	14.5
N	0.71	0.81
P	2.60	3.00
All Dimensions in mm		

Min/Max



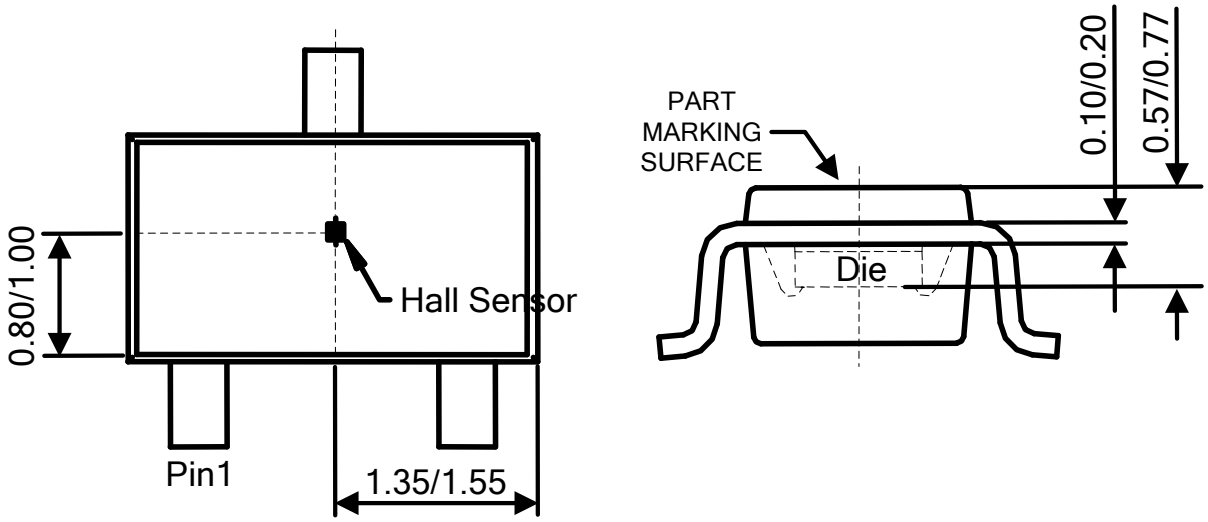
Sensor Location

Package Type: SOT23-3



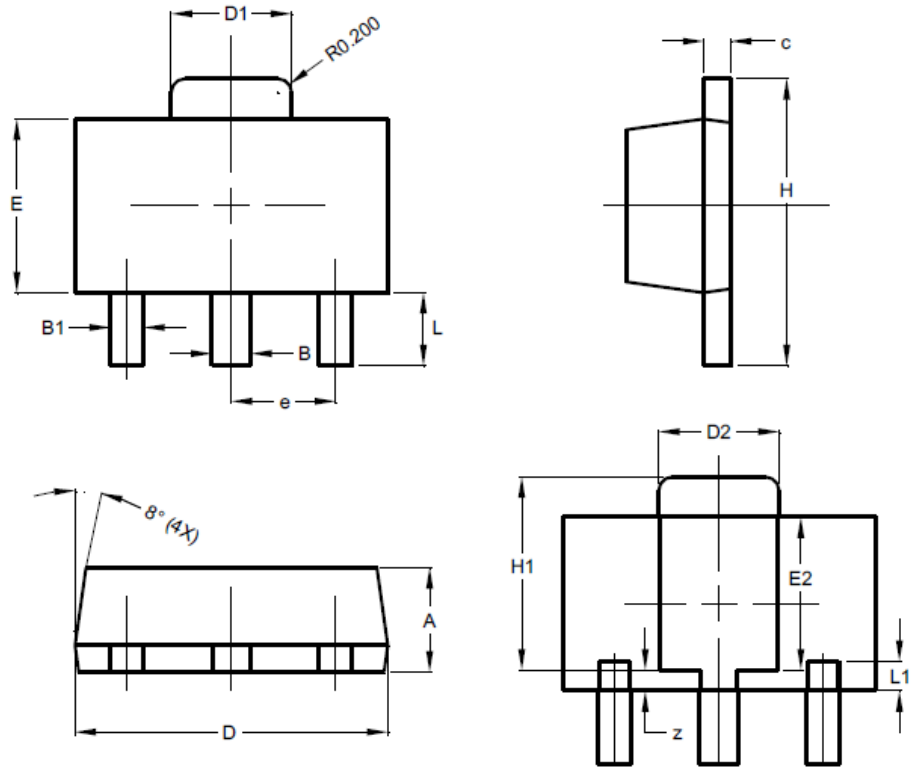
SOT23-3			
Dim	Min	Max	Typ
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	-	-	0.95
G	-	-	1.90
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
N	0.70	0.80	0.75
α	0°	8°	-
All Dimensions in mm			

Min/Max

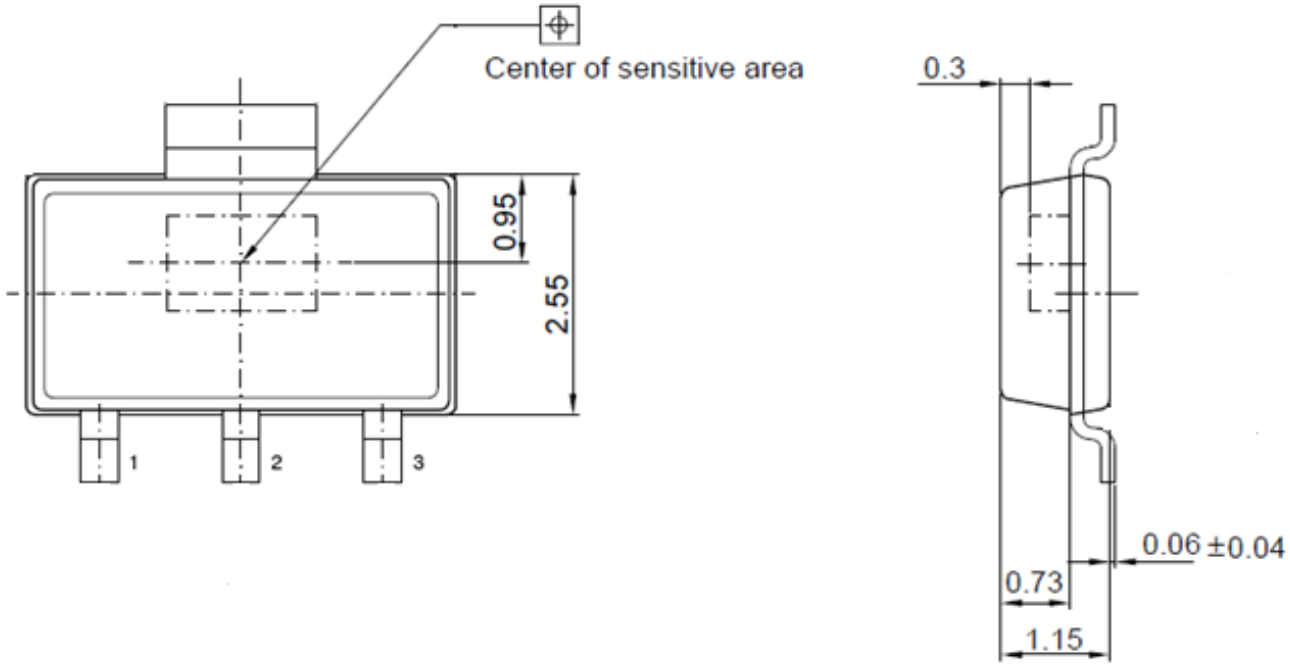


Sensor Location

Package Type: SOT89-3



SOT89-3			
Dim	Min	Max	Typ
A	1.40	1.60	1.50
B	0.50	0.62	0.56
B1	0.42	0.54	0.48
c	0.35	0.43	0.38
D	4.40	4.60	4.50
D1	1.62	1.83	1.733
D2	1.61	1.81	1.71
E	2.40	2.60	2.50
E2	2.05	2.35	2.20
e	-	-	1.50
H	3.95	4.25	4.10
H1	2.63	2.93	2.78
L	0.90	1.20	1.05
L1	0.327	0.527	0.427
z	0.20	0.40	0.30
All Dimensions in mm			



Sensor Location

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