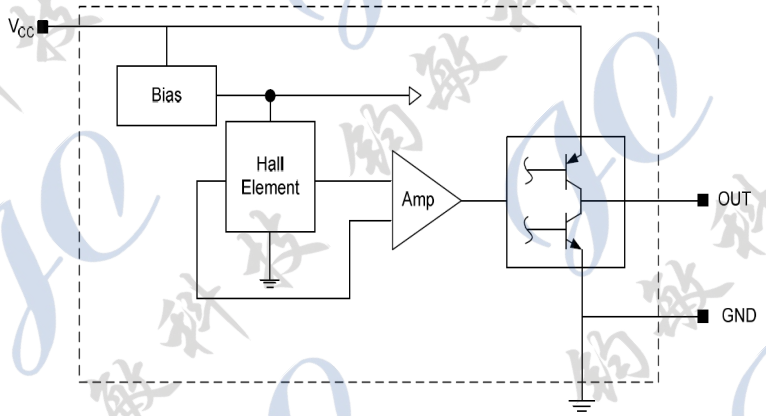
REV 0.2

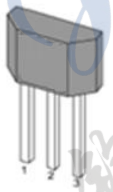
FEATURES and FUNCTIONAL DIAGRAM

- 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 3.0~15V
- Sensitivity:
  3.3mV/Gauss (CH603)
  2.5mV/Gauss (CH604)
  5.0mV/Gauss (CH605)
- Specified Operating Temperature Range: From -40℃~150℃
- Responds to either positive or negative gauss
- Quad Hall sensing element for stable output
- Lead Free Package: Flat TO-92, SOT-89-3L, SOT-23-3L
- High ESD Protection
- RoHS Compliant
  2011/65/EU

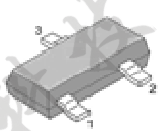
Functional Block Diagram



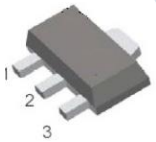
PACKAGE



TO-92S



SOT-23-3L



SOT-89-3L

APPLICATIONS

Automotive, Industrial, Home, appliances,
Current sensing
Speed Detection
Position Detection
Magnetic Encoder
Solid-State Switch
Ferrous metal sensing
Liquid level sensing
Vibration sensing
Weight sensing

DESCRIPTION

The CH603/CH604/CH605 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 CH603/CH604/CH605 family has a quiescent output voltage that is 50% of the supply voltage.

The integrated circuitry provides increased temperature stability and sensitivity. The CH603/CH604/CH605 provide high accuracy and temperature compensation. The linear hall sensors have an operating temperature range from -40 to +150℃, appropriate for home appliances, industrial and automotive environments. They respond to either South or North pole.

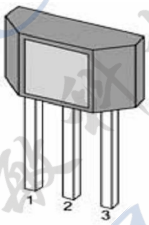
Table of Contents

1. Product Family Members

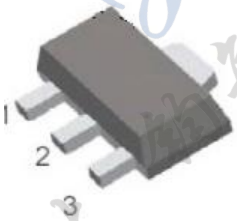
Part Number	Marking ID	Description
CH603ATB	C603	Linear Hall sensor IC, flat, TO-92S package, bulk packing (1000 units per bag)
CH603AER	C603	Linear Hall sensor IC, SOT-89-3L package, tape and reel packing (1000 units per reel)
CH603ASR	C603	Linear Hall sensor IC, SOT-23-3L package, tape and reel packing (3000 units per reel)
CH604ATB	C604	Linear Hall sensor IC, flat, TO-92S package, bulk packing (1000 units per bag)
CH604AER	C604	Linear Hall sensor IC, SOT-89-3L package, tape and reel packing (1000 units per reel)
CH604ASR	C604	Linear Hall sensor IC, SOT-23-3L package, tape and reel packing (3000 units per reel)
CH605ATB	C605	Linear Hall sensor IC, flat, TO-92S package, bulk packing (1000 units per bag)
CH605AER	C605	Linear Hall sensor IC, SOT-89-3L package, tape and reel packing (1000 units per reel)
CH605ASR	C605	Linear Hall sensor IC, SOT-23-3L package, tape and reel packing (3000 units per reel)

2. Pin Definitions and Descriptions

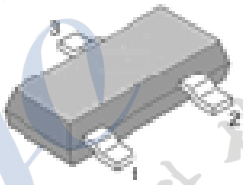
TO-92S (T)	SOT-89-3L (E)	SOT-23-3L (E)	Name	Type	Function
1	1	1	VDD	Supply	Supply Voltage pin
2	2	3	GND	Ground	Ground pin
3	3	2	OUT	Output	Output pin



TO-92S



SOT-89-3L



SOT-23-3L

3. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units
Supply Voltage	V_{DD}	-	20	V
VDD Reverse Voltage VDD	V_{RDD}	-	-0.3	V
Output Voltage	V_{OUT}	-0.3	20	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.

4. ESD Protections

Parameter	Value	Unit
All pins 1)	+/-6000	V
All pins 2)	+/-400	V
All pins 3)	+/-1500	V

1) HBM (human body mode, 100pF, 1.5 kohm) according to MIL-STD-883H Method 3015.8
2) MM (Machine Mode C=200pF, R=0Ý) according to JEDEC EIA/JESD22-A115
3) CDM (charged device mode) according to JEDEC EIA/JESD22-C101F

5. Function Description

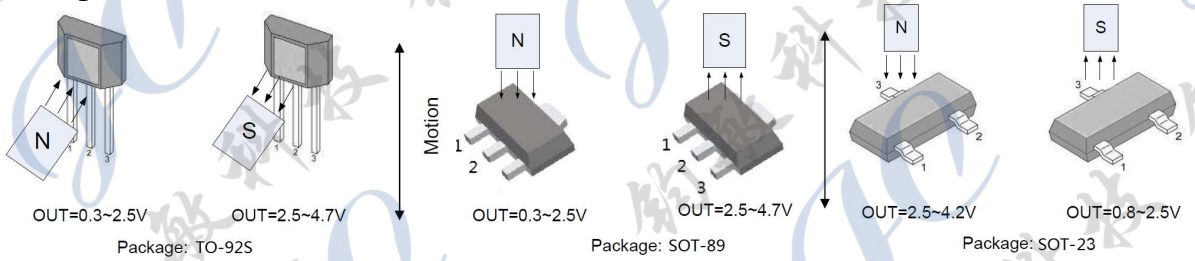
The CH603/CH604/CH605 family MRL (Miniature Ratiometric Linear) sensors are small,versatile linear Hall effect devices which are operated by the magnetic field from a permanent magnet or an electromagnet. The ratiometric output voltage is set by the supply voltage and varies in proportion to the strength 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 -40ºC to +150°C, appropriate for industrial and automotive environments. They respond to either positive or negative gauss, monitoring either or both magnetic poles.

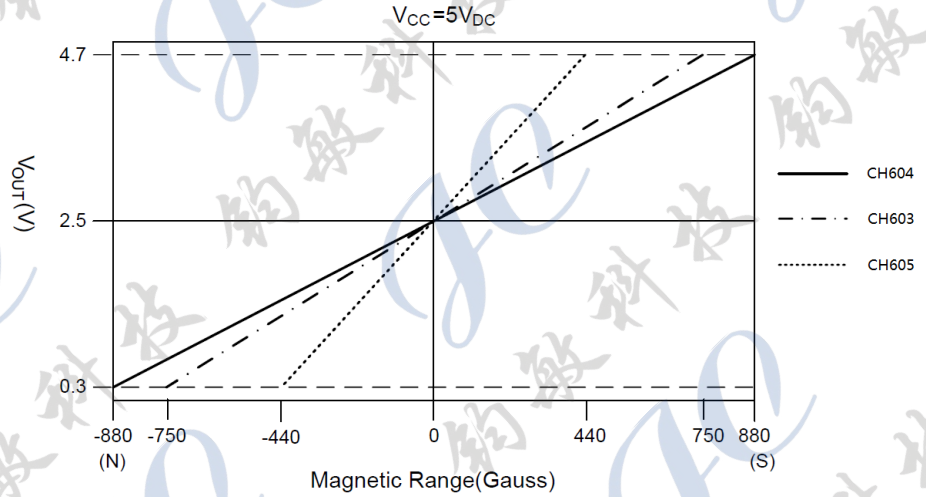
The quad Hall sensing element minimizes the effects of mechanical or thermal stress on the output. The product providing a robust design over a wide temperature range. Rail-to-rail operation (over full voltage range) provides a more usable signal for higher accuracy.

The CH603/CH604/CH605 family has a typical sinking or sourcing output of 1.5 mA continuous, uses 4 mA of supply current at 5.0 volts and 25ºC, and provides predictable performance over the full temperature range. The CH603/CH604/CH605 family Series sensors have wider null and sensitivity tolerances.

6. Magnetic Activation



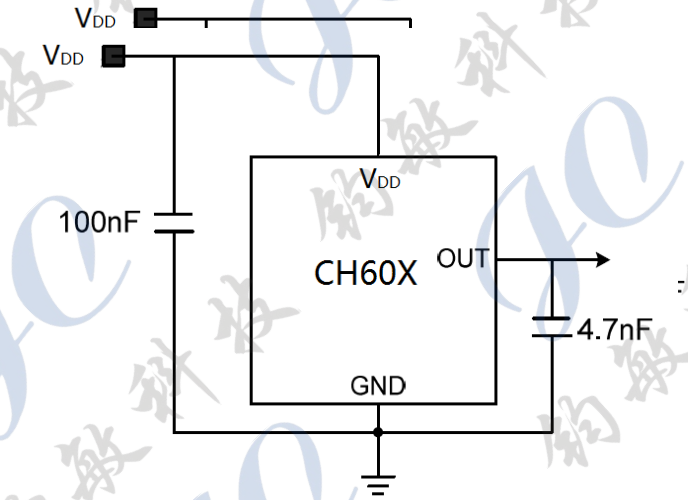
7. Transfer Characteristics



8. Parameters Specification (At V_{DD}=5V, T_A= -40 ºC to 150 ºC except where otherwise specified.)

Symbol	Parameter	Test Condition	Min	Typ	Max	Units
V_{DD}	Supply voltage	-40 °C to 150 °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 at 25 °C	2.45		2.55	V
I_{SINK}	Sink Current	V_{DD}=3V T_A=25ºC	-0.8			mA
I_{SINK}		V_{DD}=5V T_A=25ºC	-1			mA
I_{SOURCE}	Source Current	V_{DD}=3V T_A=25ºC			1.5	mA
I_{SOURCE}		V_{DD}=5V T_A=25ºC			2.0	mA
V_N	Output Referred Noise(CH605)	TA = 25°C, CL = 0.1 εF		4.2		mV(p-p)
	Output Referred Noise(CH603)	TA = 25°C, CL= 0.1 εF		3.1		mV(p-p)
	Output Referred Noise(CH604)	TA = 25°C, CL = 0.1 εF		2.6		mV(p-p)
L_{IN}	Linearity		-5		+5	%
V_{NULL}(T)	Delta Vnull as temperature		-5		+5	%
V_{NULL}(V)	Ratiometry, Vnull		-5		+5	%
SENS(T)	Delta Sens as temperature		-10		+10	%
S_{ENS}	Sensitivity(CH603)	TA=25ºC		3.3		mV/Gs
S_{ENS}	Sensitivity(CH604)			2.5		mV/Gs
S_{ENS}	Sensitivity(CH605)			5		mV/Gs
B+	Magnetic Range (CH603)	T_A=25ºC		666		Gauss
B-		T_A=25ºC		-666		Gauss
B+	Magnetic Range (CH604)	T_A=25ºC		880		Gauss
B-		T_A=25ºC		-880		Gauss
B+	Magnetic Range (CH605)	T_A=25ºC		440		Gauss
B-		T_A=25ºC		-440		Gauss

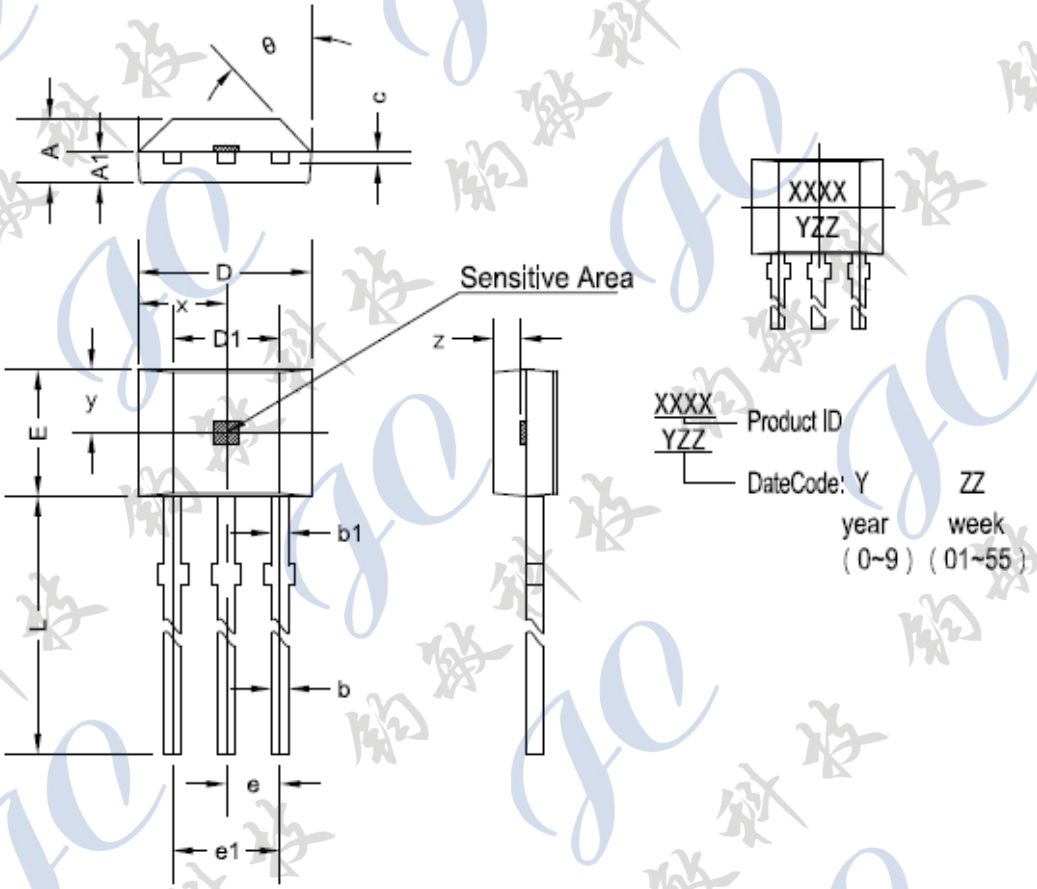
9. Typical Application Circuit



10. Package Information:

PACKAGE DESIGNATOR

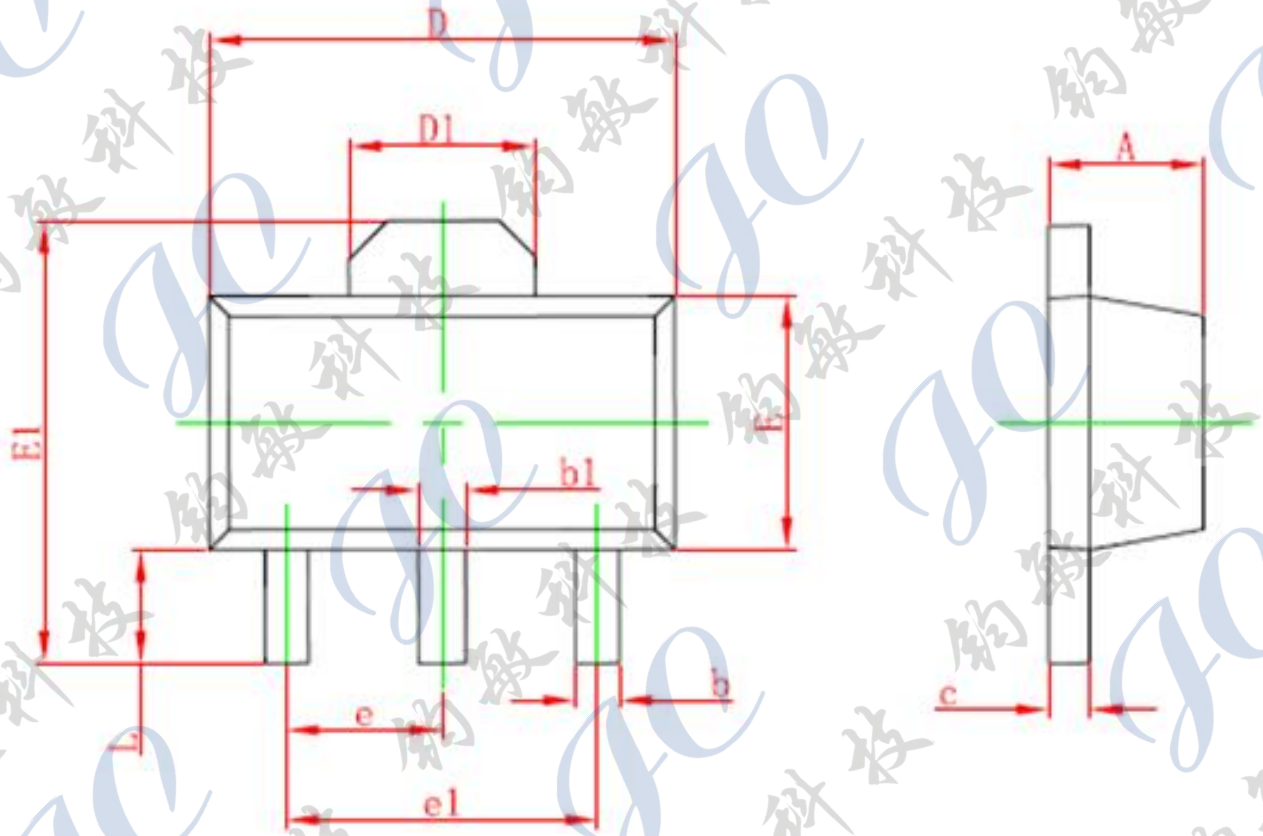
TO-92



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.420	1.670	0.056	0.066
A1	0.660	0.860	0.026	0.034
b	0.350	0.560	0.014	0.022
b1	0.400	0.550	0.016	0.022
C	0.360	0.510	0.014	0.020
D	3.900	4.200	0.154	0.165
D1	2.970	3.270	0.117	0.129
E	2.900	3.280	0.114	0.129
e	1.270 TYP		0.050 TYP	
e1	2.440	2.640	0.096	0.104
L	13.500	15.500	0.531	0.610
x	2.025TYP		0.080TYP	
y	1.545TYP		0.061TYP	
z	0.500TYP		0.020TYP	
θ	45°TYP		45°TYP	

PACKAGE DESIGNATOR

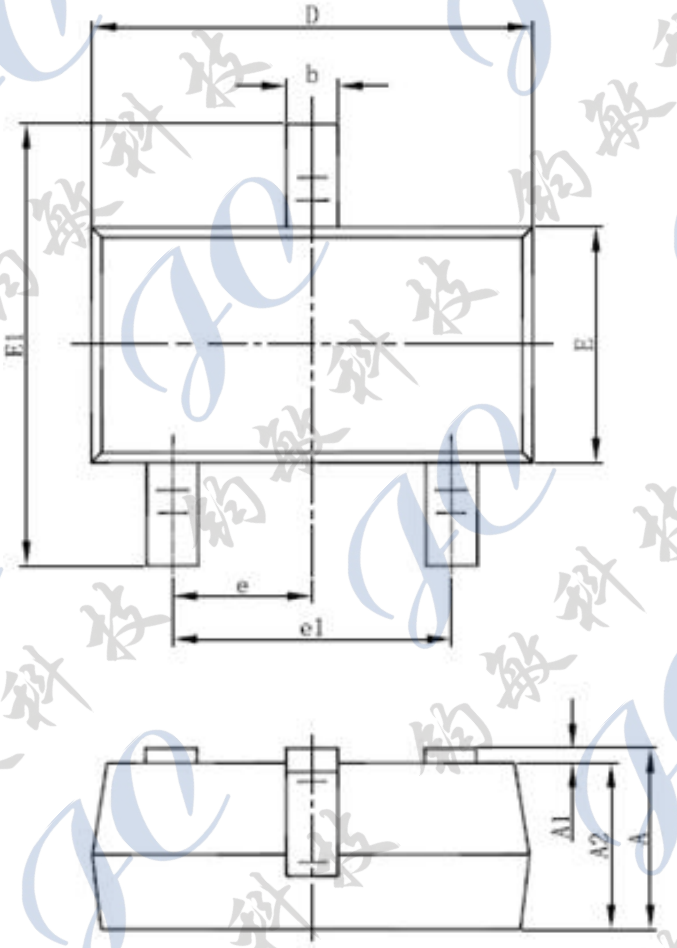
SOT-89-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060 TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047

PACKAGE DESIGNATOR

SOT-23-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°