ROHM SEMICONDUCTOR

Innovations Embedded

IC *Sensors*

Ultra-Small Hall ICs

for magnetic switch applications

- Mobile Phones
- Notebook Computers
- PDAs
- Digital Cameras

ROHM Marketing USA

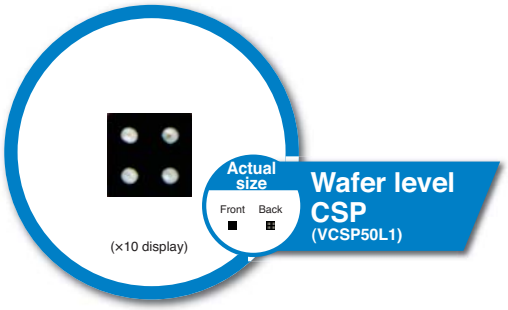
Selection Guide

Hall Effect Switches
from ROHM Semiconductor

The demands for extended battery operation, greater reliability and increased features are driving the designs of mobile phones, notebook computers, video cameras, navigation systems and game controllers to use smaller, higher performance components.

Ultra-small, hall effect, non-contact switches from ROHM Electronics can simplify and enhance your designs while offering the benefits of high-reliability and low power consumption. These high performance devices are the ideal choice for a range of switch applications:

- Portable phone or PDA in or out of its carrying case
- Slide-open or closed on cell phone or camera
- Flip phone or laptop cover open or closed
- Cell phone or tablet PC screen orientation
- Track wheel position on MP3 players, toys and games



ROHM's advanced packaging options include the industry's smallest BGA chip-scale package as well as low-profile, ultra-small SMT package.

High sensitivity for precise magnetic field detection

Rohm's Hall IC detects and converts magnetic fields emanating from magnets into electronic signals (voltages). The Hall element is integrated into a single chip.

- N — S-pole detection only
- S — N-pole detection only
- SN — Both S- and N-pole detection
- SN — Both S- and N-pole detection with polarity discrimination output

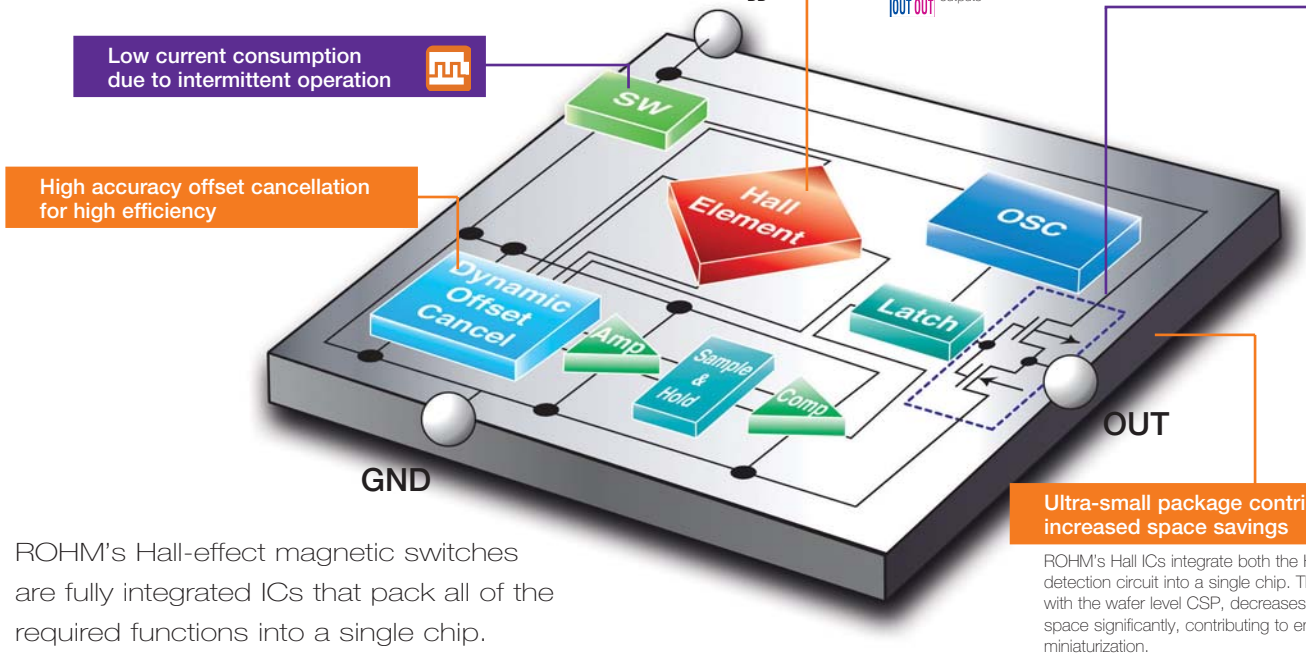
CMOS output eliminates the need for an external resistor, resulting in lower power consumption

CMOS output enables direct connection to the microcontroller, reducing current flow and power consumption.

- 1 OUT — Magnetic field-detecting output
- 2 DUAL — Magnetic field-detecting output (with reversing output)
- SN OUT OUT — Both S- and N-pole outputs

Low current consumption due to intermittent operation

High accuracy offset cancellation for high efficiency



ROHM's Hall-effect magnetic switches are fully integrated ICs that pack all of the required functions into a single chip.

Ultra-small package contributes increased space savings

ROHM's Hall ICs integrate both the Hall element and detection circuit into a single chip. This, combined with the wafer level CSP, decreases mounting space significantly, contributing to end-product miniaturization.

- CSP — Magnetic field-detecting output
- Ultra Small — Magnetic field-detecting output (with reversing output)

Hall Effect Switches
from ROHM Semiconductor

Designed for Performance and Reliability

Single-chip IC with built-in Hall element
- Eliminates wire-bonding reliability problems

Low current consumption with CMOS output
- Eliminates the need for external pull-up resistor

Intermittent operation for longer battery life
- Pulsed detection reduces average power consumption

High detection sensitivity
- Integrated dynamic offset cancellation yields high performance in small package

-40C to +85C Operating Range
- Assures worry-free operation under extreme conditions

8 kV ESD Withstand
- High reliability in real-world conditions

Selections for Every Application

Unipolar Operation
- These devices detect the presence of either a N-pole or S-pole magnetic field of sufficient strength, but not both. They offer the lowest power consumption. The output switches state when the magnetic field is removed

Omnipolar Operation
- These devices detect the presence of either a N-pole or S-pole magnetic field eliminating the need to orient the magnet for detection. This can simplify the manufacturing process. The trade-off is slightly higher power consumption

Polarity Discrimination
- These devices feature dual outputs, one switches state in the presence of a N-pole magnetic field, the other in the presence of a S-pole. Both outputs revert to the alternative state when the field is removed. These devices are used to detect the combination of operation (open/closed) and position (front/back)

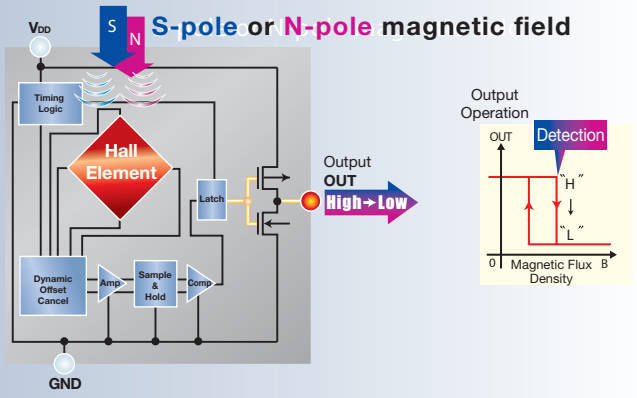
Bipolar Operation
- These devices change output state whenever a magnetic field of the opposite polarity is detected. The output remains fixed in its current state if no magnetic field is present. Applications are in jog wheel or track ball movement detection. They have higher sampling rates and power consumption

Omnipolar Detection

The application of bipolar detection Hall ICs simplifies product design, assembly and maintenance. These devices can detect both S-pole and N-pole magnetic fields. Magnet management is simplified since the Hall IC will operate properly regardless of magnet orientation.

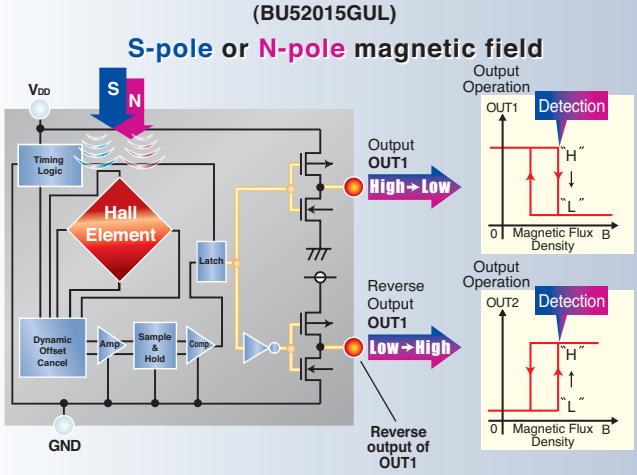
Outputs 'Low' once a magnetic field is detected

(BU52001GUL, BU52011HFV, BU52021HFV)



Outputs 'Low' (OUT1) and 'High' (OUT2) once a magnetic field is detected

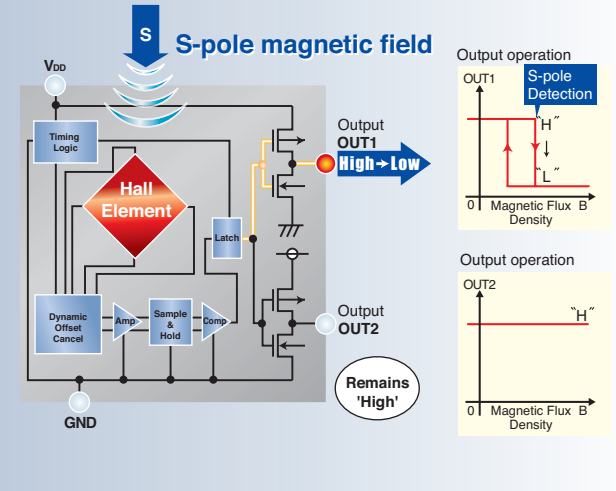
(BU52015GUL)



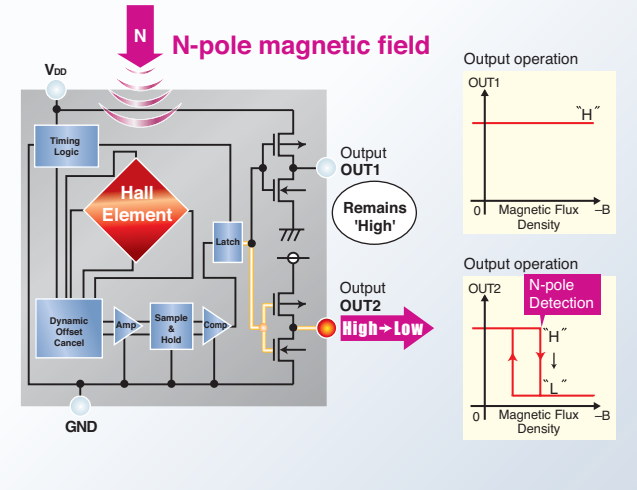
Polarity Discrimination

Omnipolar detection Hall ICs with built-in polarity discrimination add the capability of both detecting the position and the orientation of the magnet — important in applications where the display orientation of the device can be rotated.

Outputs 'Low' through OUT1 (only) when S-pole magnetic field is detected



Outputs 'Low' through OUT2 (only) when N-pole magnetic field is detected

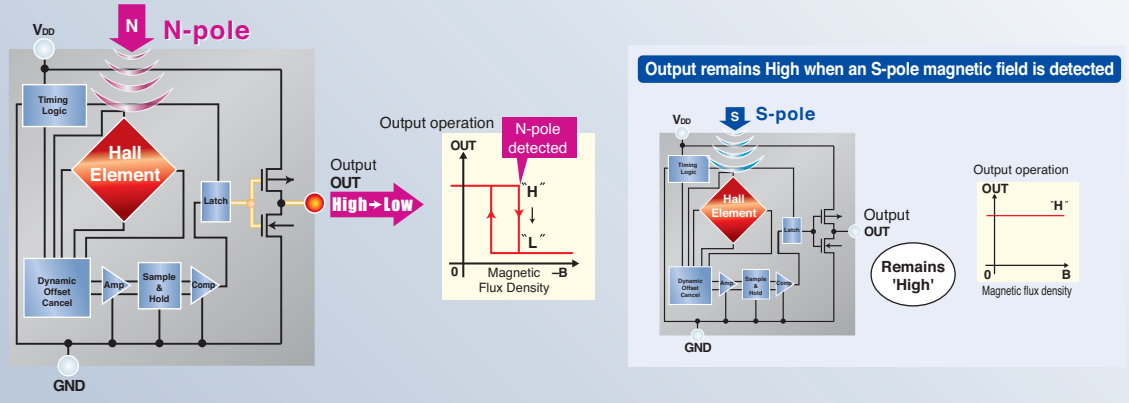


Unipolar Detection

For the most cost-effective and lowest power implementation, unipolar detection Hall ICs provide the answer. The trade off comes from the need to assure proper magnet orientation in the production process.

Type that outputs 'Low' upon detection of N-pole magnetic field

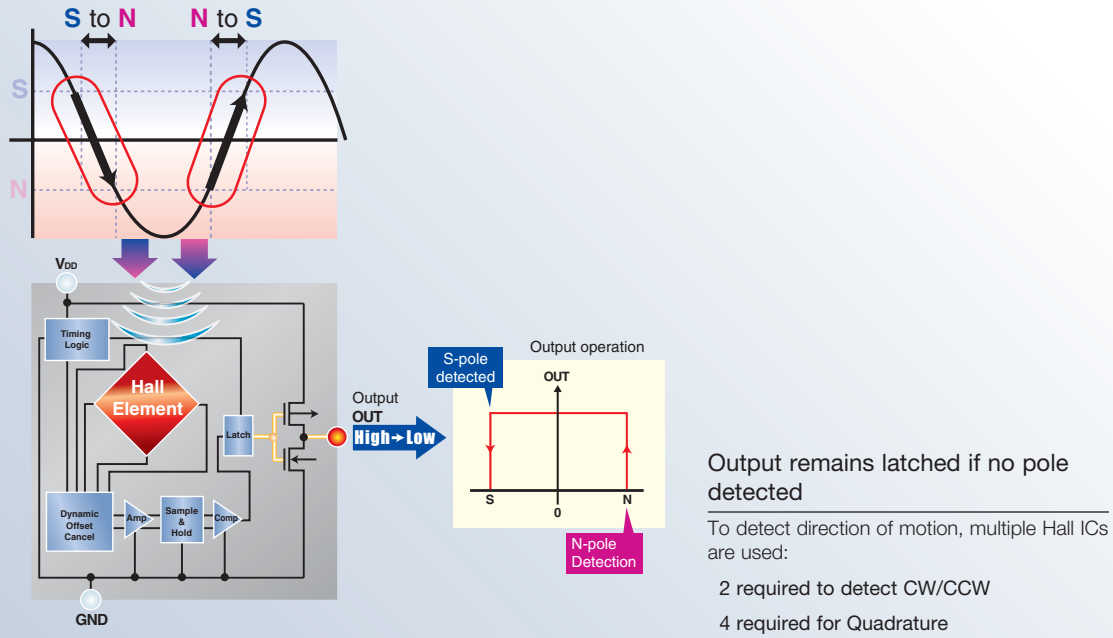
(BU52003GUL, BU52013HFV)



Bipolar (Latching) Detection

Bipolar (latching) Hall ICs add the capability of detecting the dynamic movement of devices like jog wheels or track balls. Two of these devices are typically used to detect CW and CCW movement.

Output changes when magnetic field alternates between S-pole to N-pole



Output remains latched if no pole detected

To detect direction of motion, multiple Hall ICs are used:

- 2 required to detect CW/CCW
- 4 required for Quadrature

Hall Effect IC
Selection Guide

Omnipolar Detection Hall ICs

Detects both S-pole and N-pole magnetic fields and turns the output ON (active Low).

Part Number	Supply Voltage (V)	Operating Magnetic Flux Density (mT)	Hysteresis (mT)	Pulse Driving Cycle (mS)	Current Consumption (Typ.) (µA)	Output	Package
BU52001GUL	2.40 - 3.3	±3.7	0.8	50	8.0	CMOS	VCSP50L1
BU52011HFV	1.65 - 3.3	±3.0	0.9	50	5.0	CMOS	HVSOF5
BU52015GUL*	1.65 - 3.3	±3.0	0.9	50	5.0	CMOS	VCSP50L1

**The BU52015GUL features reverse output*

BU52001GUL	S N	CSP	2.4~ POWER SUPPLY	1 OUT	High sensitivity		8kV	-40°C +85°C	C MOS		
BU52011HFV	S N	Ultra Small	1.65~ POWER SUPPLY	1 OUT	High sensitivity		8kV	-40°C +85°C	C MOS	LOW CURRENT	
BU52015GUL	S N	CSP	1.65~ POWER SUPPLY	2 DUAL	High sensitivity		8kV	-40°C +85°C	C MOS	LOW CURRENT	

Polarity Discrimination Hall ICs

Features two outputs to discriminate between N-pole and S-pole detection.

Part Number	Supply Voltage (V)	Operating Magnetic Flux Density (mT)	Hysteresis (mT)	Pulse Driving Cycle (mS)	Current Consumption (Typ.) (µA)	Output	Package
BU52004GUL	2.40 - 3.3	±3.7	0.8	50	8.0	CMOS	VCSP50L1
BU52014HFV	1.65 - 3.3	±3.0	0.9	50	5.0	CMOS	HVSOF5

BU52004GUL	S N	CSP	2.4~ POWER SUPPLY	S N OUT OUT	High sensitivity		8kV	-40°C +85°C	C MOS	discrimination		
BU52014HFV	S N	Ultra Small	1.65~ POWER SUPPLY	S N OUT OUT	High sensitivity		8kV	-40°C +85°C	C MOS	discrimination	LOW CURRENT	

Key

- S N — Both S- and N-pole detection
- S N — Both S- and N-pole detection with polarity discrimination output
- S — S-pole detection only
- N — N-pole detection only
- CSP — Chip Size Package type – thin and ultra-small
- Ultra Small — Small surface-mount package
- 1 OUT — Magnetic field detection output
- 2 DUAL — Magnetic field detection output (with reverse output
- S N OUT OUT — Both S- and N-pole outputs
- High sensitivity — High accuracy offset cancel function built in for high sensitivity
- Intermittent operation for low-power consumption
- 8kV — 8kV ESD resistance

Order Guide

- C MOS — CMOS output
- discrimination — Polarity discrimination output
- LOW CURRENT — Low current consumption
- -40°C +85°C — Wide operating temperature range of -40C to +85C
- 1.65~ POWER SUPPLY / 2.4~ POWER SUPPLY — Operating power supply voltage

Hall Effect IC
Selection Guide

Unipolar Detection Hall ICs

Detects either N-pole or S-pole but not both.

Part Number	Supply Voltage (V)	Operating Magnetic Flux Density (mT)	Hysteresis (mT)	Pulse Driving Cycle (mS)	Current Consumption (Typ.) (µA)	Output	Package
BU52002GUL	2.40 - 3.3	3.7	0.8	50	6.5	CMOS	VCSP50L1
BU52003GUL	2.40 - 3.3	-3.7	0.8	50	6.5	CMOS	VCSP50L1
BU52012HFV	1.65 - 3.3	3.0	0.9	50	3.5	CMOS	HVSOF5
BU52013HFV	1.65 - 3.3	-3.0	0.9	50	3.5	CMOS	HVSOF5

BU52002GUL	S	CSP	2.4~ POWER SUPPLY	1 OUT	High sensitivity		8kV	-40C +85C	C MOS		
BU52003GUL	N	CSP	2.4~ POWER SUPPLY	1 OUT	High sensitivity		8kV	-40C +85C	C MOS		
BU52012HFV	S	Ultra Small	1.65~ POWER SUPPLY	1 OUT	High sensitivity		8kV	-40C +85C	C MOS	LOW CURRENT	
BU52013GUL	N	Ultra Small	1.65~ POWER SUPPLY	1 OUT	High sensitivity		8kV	-40C +85C	C MOS	LOW CURRENT	

Bipolar (Latching) Detection Hall ICs

Features two outputs to discriminate between N-pole and S-pole detection.

Part Number	Supply Voltage (V)	Operating Magnetic Flux Density (mT)	Hysteresis (mT)	Pulse Driving Cycle (mS)	Current Consumption (Typ.) (µA)	Output	Package
BU52040HFV	1.65 - 3.3	±3.0	±6.0	500	300	CMOS	HVSOF5

BU52013GUL	S N	Ultra Small	1.65~ POWER SUPPLY	S N OUT OUT	High sensitivity		8kV	-40C +85C	C MOS	discrimination	LOW CURRENT

Key

- S N — Both S- and N-pole detection
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- discrimination — Polarity discrimination output
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- -40C +85C — Wide operating temperature range of -40C to +85C
- 1.65~ POWER SUPPLY / 2.4~ POWER SUPPLY — Operating power supply voltage

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