
Low Voltage Operation Omnipolar Detection Type Hall Effect Switch IC

DESCRIPTION

The SUM7761OC is a high sensitivity and high-accuracy Hall effect switch IC that operates at a low voltage and low current consumption. The output voltage will be pulled low when this IC detects the magnetic flux density is larger than operate point(B_{OP}) and the output voltage will recover to high until the magnetic flux density is smaller than the release point(B_{RP}). Using this IC with a magnet makes it possible to detect the open / close status in various applications.

Due to its low voltage operation and low current consumption the SUM7761OC is suitable for battery powered portable devices such as mobile phones and portable PCs etc.

FEATURES

- Pole detection: Detection of omnipolar.
- Output logic: Active "L"
- Output form: CMOS output
- Operating cycle (current consumption): $t_{CYCLE} = 50 \text{ ms}$ ($I_{DD} = 1.1 \text{ }\mu\text{A}$) typ.
- Power supply voltage range: $V_{DD} = 1.65 \text{ V}$ to 5.5 V
- Operation temperature range: $T_A = -40 \text{ }^{\circ}\text{C}$ to $+85 \text{ }^{\circ}\text{C}$
- Package: SOT23-3
- High ESD resistance 4KV(HBM)

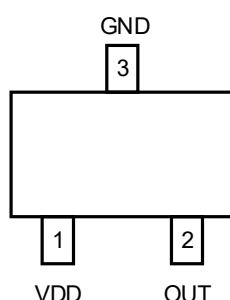
APPLICATION

- Open/Close detection for flip mobile phones
- Smart cover for smart phones
- Smart cover for portable PCs, tablet PCs
- Digital video cameras and portable game consoles
- Home appliances

ORDER INFORMATION

Model	Package	Ordering Number	Packing Option
SUM7761OC	SOT23-3	SUM7761OCKA3	Tape and Reel, 3000

PIN CONFIGURATION (TOP VIEW)



SOT23-3

ABSOLUTE MAXIMUM RATINGS

(Ta = +25°C unless otherwise specified)

Parameter	Symbol	Rating	Unit
Power supply voltage	V _{DD}	- 0.3 ~ + 6	V
Output current	I _{OUT}	± 1.0	mA
CMOS Output voltage	V _{OUT}	- 0.3 ~ + 0.3	V
Operation ambient temperature	T _A	-40 ~ + 85	°C
Operation Junction temperature Range	T _J	-40 ~ + 150	°C
Storage temperature	T _{stg}	-65 ~ + 150	°C
Maximum Power Dissipation	P _D	230	mW
Maximum Soldering Temperature(at leads, 10 sec)		260	°C

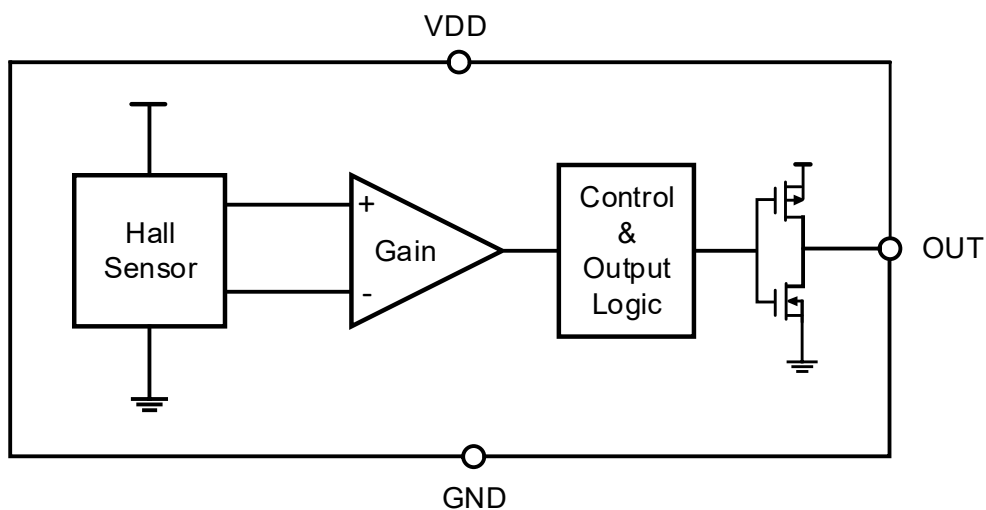
Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

CAUTION

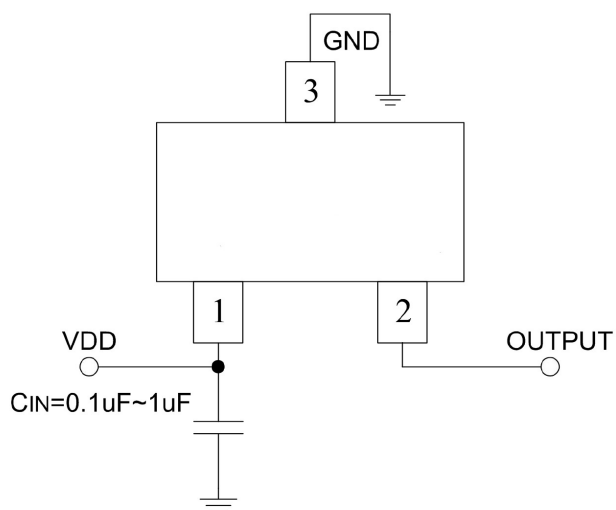
This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SUMSEMI recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

SUMSEMI reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SUMSEMI sales office to get the latest datasheet.

BLOCK DIAGRAM



TYPICAL APPLICATION CIRCUIT



ELECTRICAL CHARACTERISTICS

(Ta = +25°C, V_{DD} = 1.8 V, unless otherwise specified)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Power supply voltage	V _{DD}	-	1.65	3.3	5.50	V
Output voltage	V _{OUT}	Output transistor Nch, I _{OUT} = 0.5 mA			0.2	V
		Output transistor Pch, I _{OUT} = -0.5 mA	V _{DD} - 0.2			V
Supply Current 1	I _{DD1} (AVG)	V _{DD} = 1.8V, Average		1.0		μA
Supply Current During Startup Time 1	I _{DD1} (EN)	V _{DD} = 1.8V, During Startup Time Value		0.69		mA
Supply Current During Standby Time 1	I _{DD1} (DIS)	V _{DD} = 1.8V, During Standby Time Value		0.4		μA
Supply Current 2	I _{DD2} (AVG)	V _{DD} = 3.0V, Average		2.2		μA
Supply Current During Startup Time 2	I _{DD2} (EN)	V _{DD} = 3.0V, During Startup Time Value		0.8		mA
Supply Current During Standby Time 2	I _{DD2} (DIS)	V _{DD} = 3.0V, During Standby Time Value		1.3		μA
Awake mode time	t _{AW}	-		0.1		ms
Sleep mode time	t _{SL}	-		50		ms
Operating cycle	t _{CYCLE}	t _{AW} + t _{SL}		50	100	ms

MAGNETIC CHARACTERISTICS

(Ta = +25°C, V_{DD} = 1.85 V, unless otherwise specified)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Operation point	N pole	B _{OPN}	-5.0	-3.5	-2.5	mT
	S pole	B _{OPS}	2.5	3.5	5.0	mT
Release point	N pole	B _{RPN}	-4.0	-2.5	-1.5	mT
	S pole	B _{RPS}	1.5	2.5	4.0	mT
Hysteresis width	N pole	B _{HYSN}	B _{HYSN} = B _{OPN} - B _{RPN}		1.5	mT
	S pole	B _{HYSS}	B _{HYSS} = B _{OPS} - B _{RPS}		1.5	mT

Note:

*1. Operating points (B_{OPN}, B_{OPS}):

B_{OPN} is the value of magnetic flux density triggers the output voltage (V_{OUT}) to low by increasing the N pole magnetic flux density applied to this IC.

Even when the magnetic flux density is larger than B_{OPN}, V_{OUT} status is held.

*2. Release points (B_{RPN}, B_{RPS}):

B_{RPN} is the values of magnetic flux density makes the output voltage (V_{OUT}) recover to high by decreasing the N pole magnetic flux density applied to this IC.

Even when the magnetic flux density is lower than B_{RPN}, V_{OUT} status is held.

*3. Hysteresis widths (B_{HYSN}, B_{HYSS}):

B_{HYSN} and B_{HYSS} are the difference between B_{OPN} and B_{RPN}, and B_{OPS} and B_{RPS}, respectively.

*4. The unit of magnetic density mT can be converted by using the formula 1 mT = 10 Gauss.

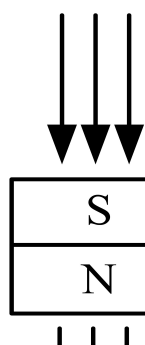
OPERATION

Applied magnetic flux

The magnetic flux applied to SUM7761OC should be on the vertical direction on marking surface. If not, the horizontal component has no effect to detection.

The product is omnipolar type detector, the output voltage (V_{OUT}) is inverted when the S or N type magnetic flux is applied to IC.

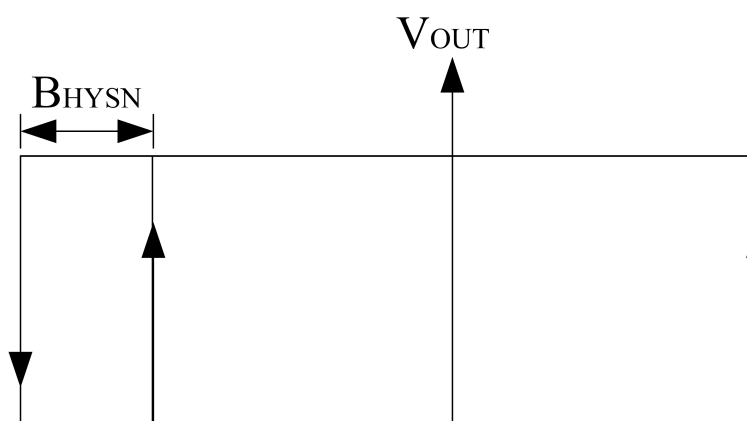
Below shows the direction in which magnetic flux should be applied.



Detecting Operation

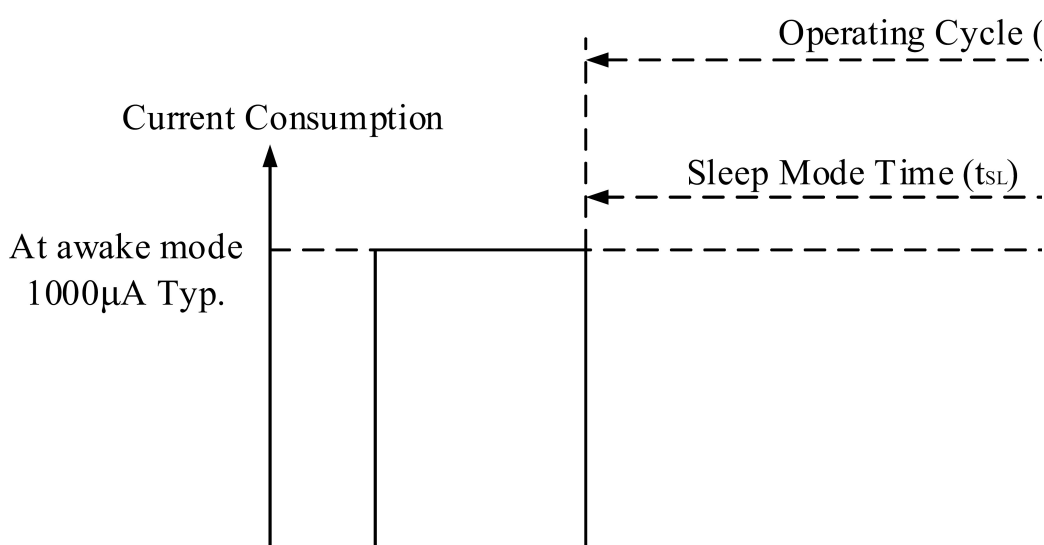
SUM7761OC detects magnetic field periodically. When vertical component of the magnetic flux applied to IC exceeds the operating point (B_{OPN} or B_{OPS}) such as the N or S pole of a magnet is moved closer to IC, V_{OUT} changes from "H" to "L". On the contrary, if magnetic flux is lower than the release point (B_{RPN} or B_{RPS}), V_{OUT} changes from "L" to "H".

The relationship between the magnetic flux density and V_{OUT} is shown below.



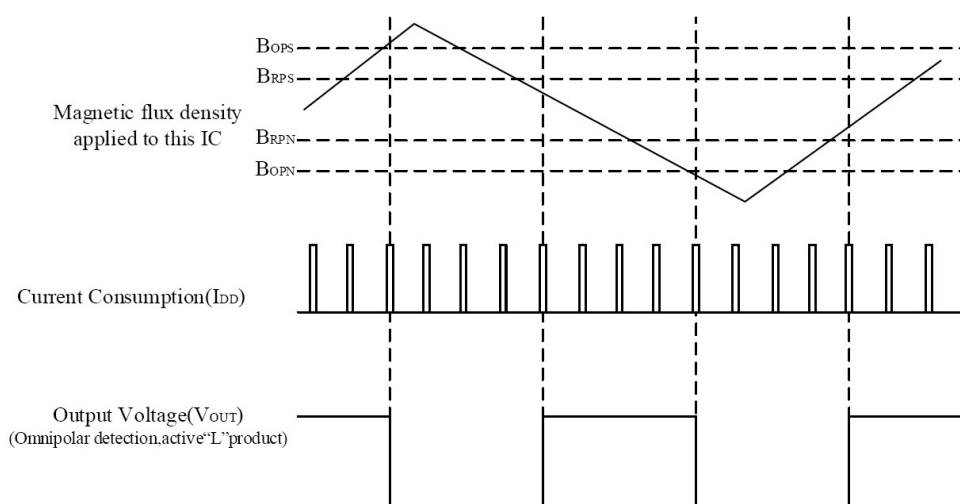
Operating Current

SUM7761OC perform the intermittent operation, therefore the average current consumption depends on the current in active mode, the active period (t_{AW}), the current in sleep mode, and sleep period (t_{SL}). The active current is about 1000 μ A typically, and 0.5 μ A at sleep mode. Please refer to electrical characteristic table for detail. The time dependency of the current consumption is shown below.



Timing Diagram

The operation timing of this IC is shown below.



Precautions

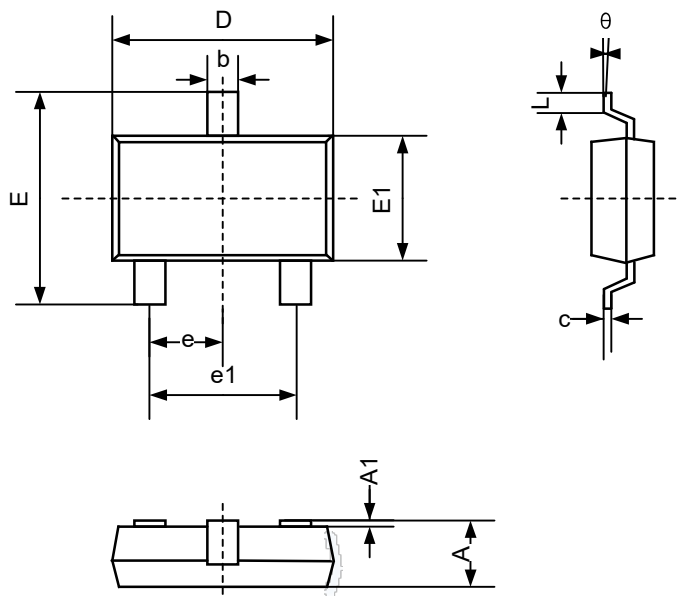
The power supply for this IC should have low impedance, the IC may malfunction due to a supply voltage drop caused by feed through current.

Power supply voltage rapidly changing may cause IC malfunction.

Large stress on this IC may affect the magnetic characteristics. Avoid large stress applied to the IC on a board.

PACKAGE OUTLINE

SOT23-3



Symbol	Dimensions In Millimeters	
	MIN	MAX
A	1.05	1.25
A1	0.00	0.10
b	0.30	0.40
c	0.10	0.20
D	2.82	3.02
E	2.60	3.00
E1	1.50	1.70
e	0.95BSC	
e1	1.80	2.00
L	0.30	0.60
θ	0°	8°