

Bipolar Detection Hall ICs

DESCRIPTION

The SUM7764DC is a low voltage Hall-effect switch designed in mixed signal CMOS technology.

The device integrates a voltage regulator, Hall sensor with advanced offset cancellation system and an push-pull output driver, all in a single package. The device features a low voltage regulator with optimized performances targeting low power consumption at low voltage levels.

FEATURES

- Bipolar detection
- AVG 25 μ A Micro power operation (small current using intermittent operation method)
- Input Voltage Range: 1.65 V ~ 5.5 V
- High Speed 2 KHz
- Very high sensitivity hall sensor
- Package: SOT23-3
- High ESD resistance 4 KV(HBM)

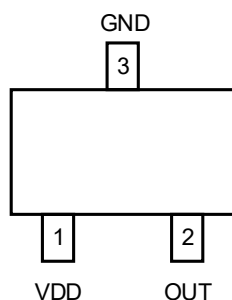
APPLICATION

- BLDC motor commutation
- Electrical power steering
- Solid-state Latch
- Low power applications.

ORDER INFORMATION

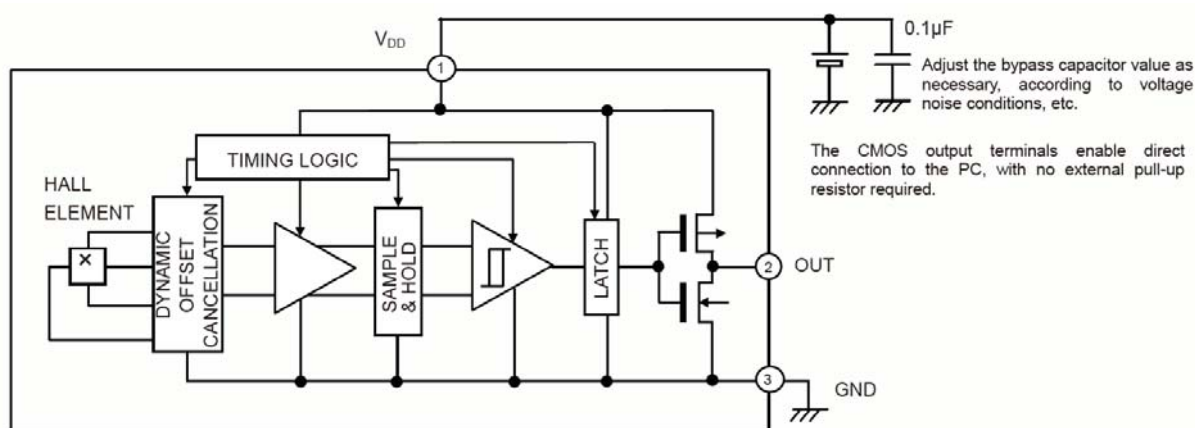
Model	Package	Ordering Number	Packing Option
SUM7764DC	SOT23-3	SUM7764DCKA3	Tape and Reel, 3000

PIN CONFIGURATION (TOP VIEW)

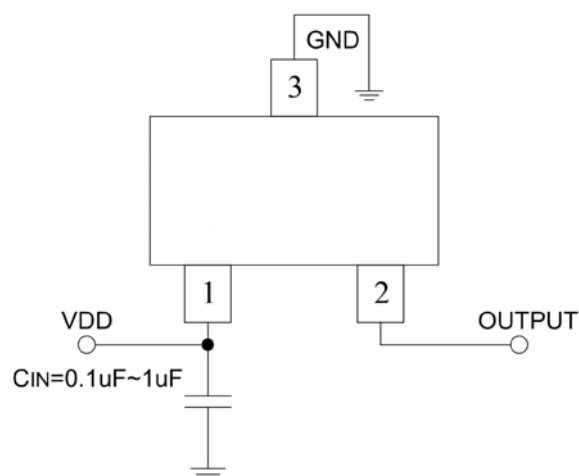


SOT23-3

BLOCK DIAGRAM



TYPICAL APPLICATION CIRCUIT



ABSOLUTE MAXIMUM RATINGS

($T_A = 25^{\circ}\text{C}$, unless otherwise noted)

Parameter	Symbol	Rating	Unit
V_{DD} to GND	V_{DD}	-0.3 ~ 6	V
Magnetic Flux Density	B	Unlimited	
Storage Temperature Range	T_S	-65 ~ +150	$^{\circ}\text{C}$
Operating Junction Temperature Range	T_J	-40 ~ +150	$^{\circ}\text{C}$
Maximum Power Dissipation	P_D	230	mW
Maximum Soldering Temperature (at leads, 10 sec)	T_{LEAD}	260	$^{\circ}\text{C}$

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.

RECOMMENDED OPERATING CONDITIONS

(T_A = 25°C, unless otherwise noted)

Parameter	Symbol	Rating	Unit
Supply Voltage	V _{DD}	1.65 ~ 5.5	V
Operating Temperature Range	T _A	-40 ~ +85	°C

ELECTRICAL CHARACTERISTICS

(T_A = 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	5.5	V
Operate Point	B _{OP}		-	30	50	Gs
Release Point	B _{RP}		-30	-40	-	Gs
Hysteresis	B _{hys}		-	75	-	Gs
Period	P		-	500		μs
Output High Voltage	V _{OH}	B < B _{RP} ^{*1} , I _{OUT} = -0.5 mA	V _{DD} - 0.2	-	-	V
Output Low Voltage	V _{OL}	B _{OP} < B ^{*1} , I _{OUT} = +0.5 mA	-	-	0.2	V
Supply Current 1	I _{DD1} (AVG)	V _{DD} = 1.8 V, Average	-	25	-	μA
Supply Current During Startup Time 1	I _{DD1} (EN)	V _{DD} = 1.8 V, During Startup Time Value	-	0.5	-	mA
Supply Current During Standby Time 1	I _{DD1} (DIS)	V _{DD} = 1.8 V, During Standby Time Value	-	24	-	μA
Supply Current 2	I _{DD2} (AVG)	V _{DD} = 3.0 V, Average	-	35	-	μA
Supply Current During Startup Time 2	I _{DD2} (EN)	V _{DD} = 3.0 V, During Startup Time Value	-	0.9	-	mA
Supply Current During Standby Time 2	I _{DD2} (DIS)	V _{DD} = 3.0 V, During Standby Time Value	-	30	-	μA

Note:

*1. B = Magnetic flux density

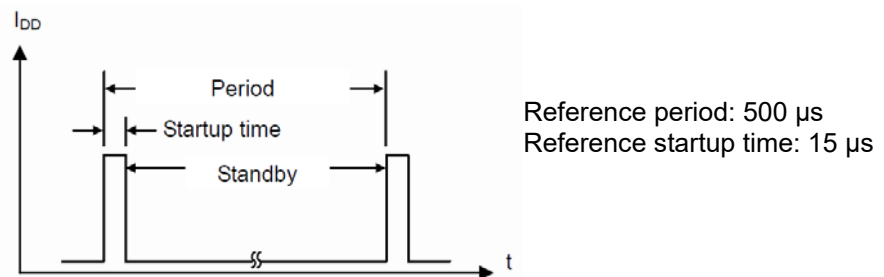
Positive ("+") polarity flux is defined as the magnetic flux from south pole which is direct toward to the branded face of the sensor. After applying power supply, it takes one cycle of period (TP) to become definite output.

Radiation hardness is not designed.

DESCRIPTION of OPERATIONS

Micropower Operation

The unipolar detection Hall IC adopts an intermittent operation method to save energy. At startup, the Hall elements, amp, comparator and other detection circuit power ON and magnetic detection begins. During standby, the detection circuits power OFF, thereby reducing current consumption. The detection results are held while standby is active, and then output.



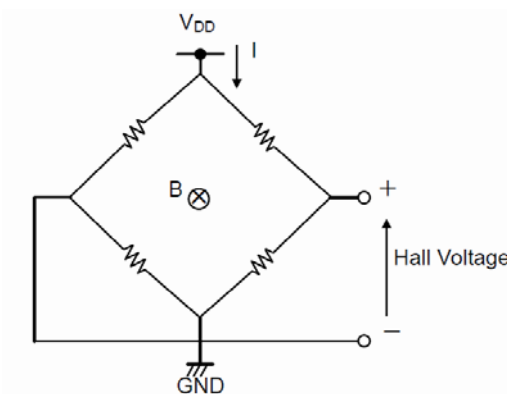
Offset Cancellation

The Hall elements form an equivalent Wheatstone (resistor) bridge circuit. Offset voltage may be generated by a differential in this bridge resistance, or can arise from changes in resistance due to package or bonding stress. A dynamic offset cancellation circuit is employed to cancel this offset voltage.

When Hall elements are connected as shown in the figure below and a magnetic field is applied perpendicular to the Hall elements, voltage is generated at the mid-point terminal of the bridge. This is known as Hall voltage.

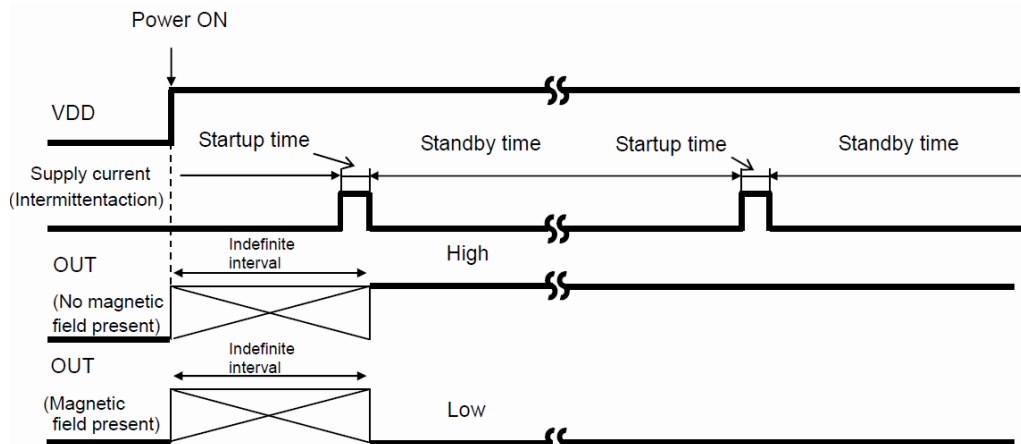
Dynamic cancellation switches the wiring (shown in the figure) to redirect the current flow to a 90° angle from its original path, and thereby cancels the Hall voltage.

The magnetic signal (only) is maintained in the sample/hold circuit during the offset cancellation process and then released.

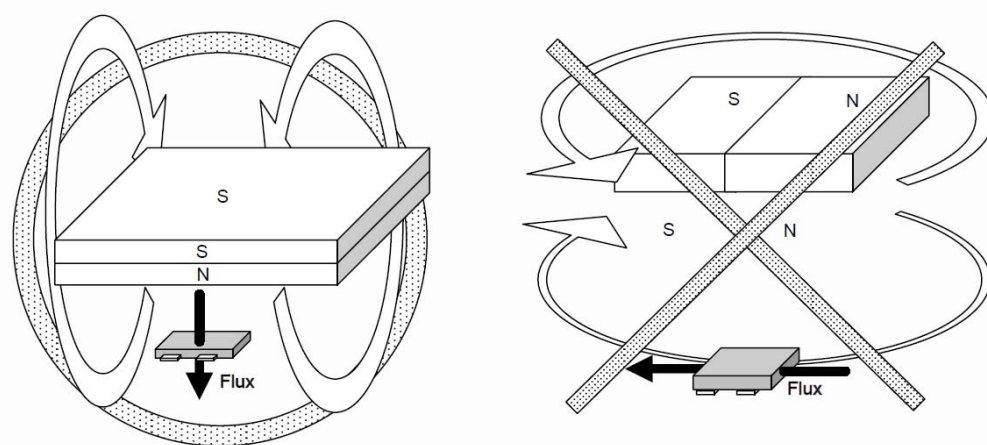


INTERMITTENT OPERATION at POWER ON

The bipolar detection Hall IC adopts an intermittent operation method in detecting the magnetic field during startup, as shown in the figure below. It outputs to the appropriate terminal based on the detection result and maintains the output condition during the standby period. The time from power ON until the end of the initial startup period is an indefinite interval, but it cannot exceed the maximum period, 100 ms. To accommodate the system design, the Hall IC output read should be programmed within 100 ms of power ON, but after the time allowed for the period ambient temperature and supply voltage.



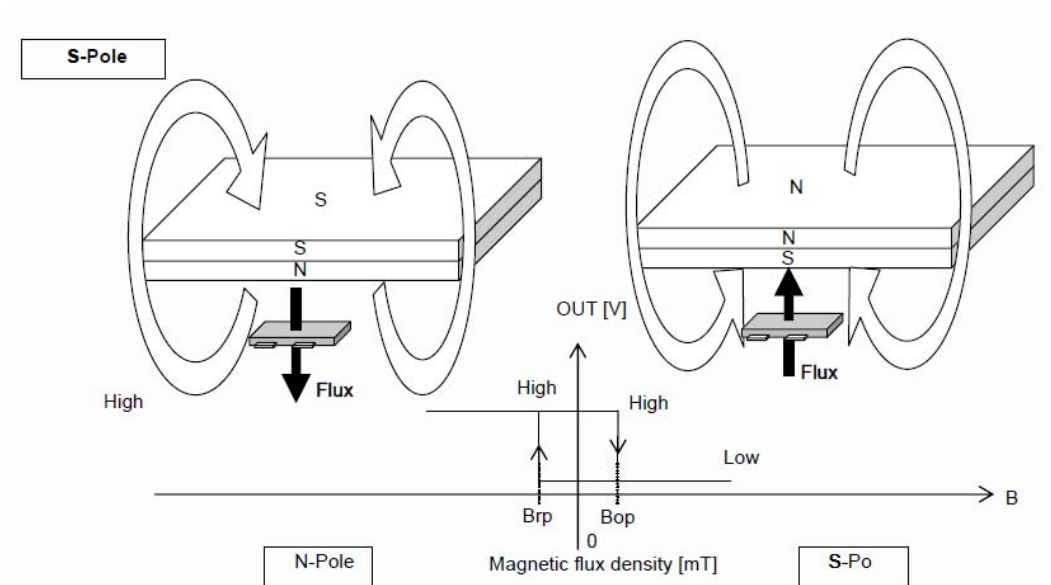
Magnetic Field Detection Mechanism



The Hall IC cannot detect magnetic fields that run horizontal to the package top layer.

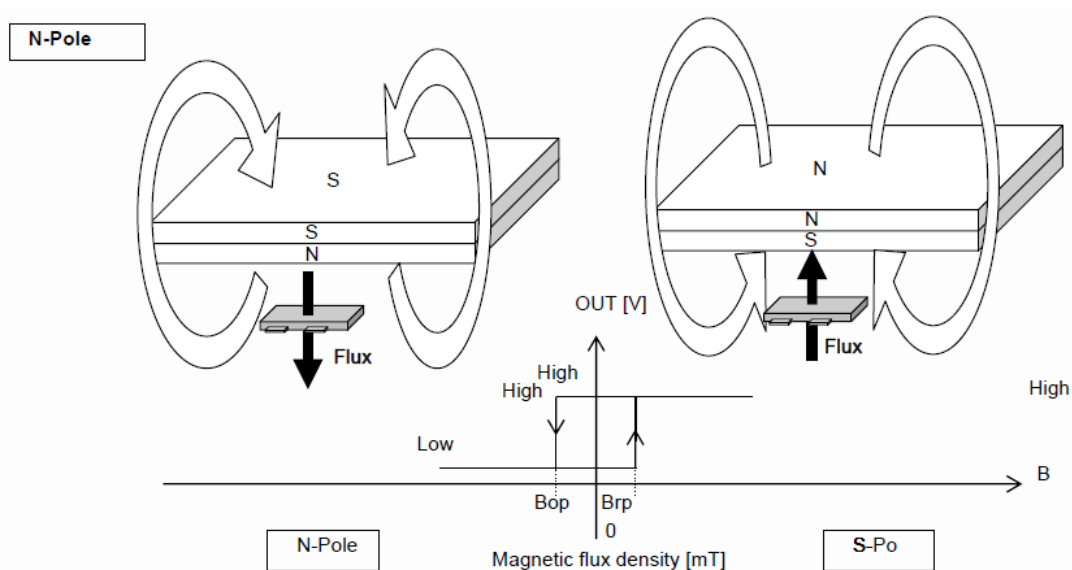
Be certain to configure the Hall IC so that the magnetic field is perpendicular to the top layer.

S-Pole Active Detection



SUM7764DC exhibits bipolar magnetic switching characteristics. Therefore, it operates with both south and north poles.

N-Pole Active Detection

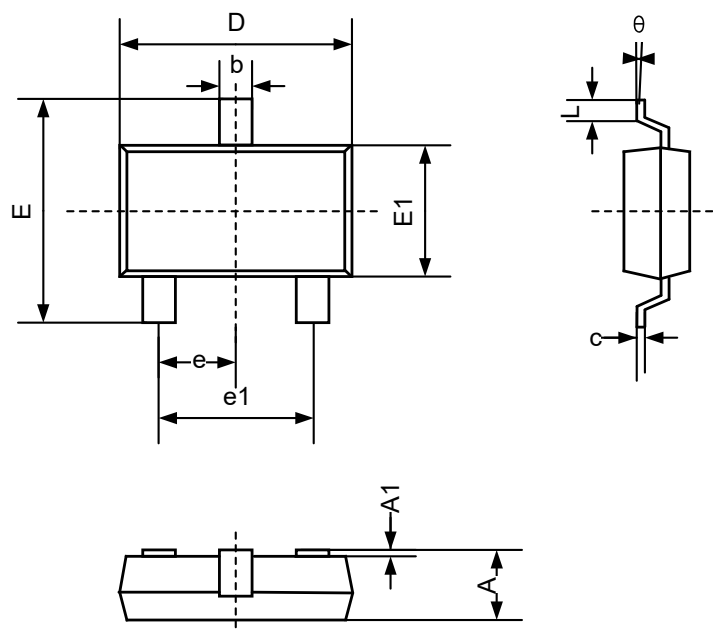


SUM7764DC exhibits bipolar magnetic switching characteristics. Therefore, it operates with both south and north poles.

The bipolar detection Hall IC detects magnetic fields running perpendicular to the top surface of the package. The device behaves as a latch with symmetric operating and release switching points ($B_{OP} = |B_{RP}|$). This means magnetic fields with equivalent strength and opposite direction drive the output high and low. Removing the magnetic field ($B \rightarrow 0$) keeps the output in its previous state. This latching property defines the device as a magnetic memory.

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	0.95 BSC	
e1	1.80	2.00
L	0.30	0.60
θ	0°	8°