MICROPOWER,HIGH SENSITIVITY OMNIPOLAR HALL-EFFECT SWITCH

◆ General Description

The HG7503 is an ultra-sensitive Hall-effect switch with digital latched output, mainly designed for battery-operation, hand-held equipments.

Special CMOS process is used for low-voltage and low-power requirement. A chopper stabilized amplifier improves stability of magnetic switch points. A sleep-awake logic controls the IC in sleep time or awake time. This function will reduce the average operating current of the IC. During the awake time, the output is changed with the magnetic flux density. During the sleep time, the output is latched in its previous state and the current consumption will reduce to some μA.

The IC switching behaviour is omnipolar, either north or south pole sufficient strength will turn the output on. If the magnetic flux density is larger than operating point (B_{OP}), the output will be turned on; if it is less than releasing point (B_{RP}), the output will be turned off.

The HG7503 is available in SIP-3L, SOT-23-3L and DFN1616-3 packages which are optimized for most applications.

◆ Features

- Micropower Operation
- 1.8 to 5.5V Power Supply
- Switching for Both Poles of a Magnet (Omnipolar)
- Stabilized Chopper
- Superior Temperature Stability
- Digital Output Signal
- Built-in Pull-up Resistor

◆ Applications

- Cover Switch in Notebook PC/PDA
- Handheld Wireless Application Awake Switch
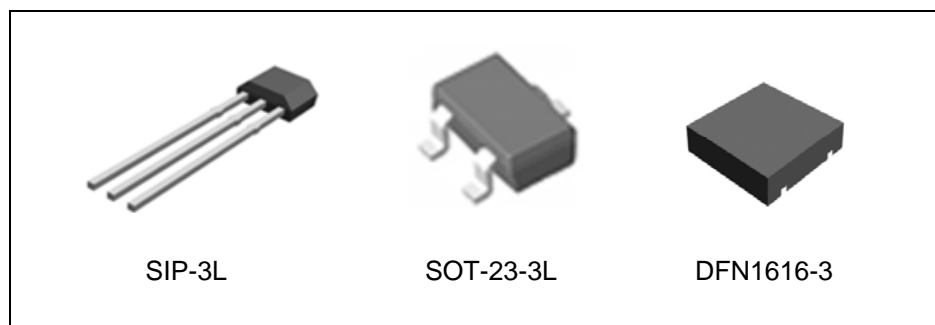- Magnet Switch in Low Duty Cycle Applications

SIP-3L   SOT-23-3L   DFN1616-3

Figure 1. Package Types of HG7503

◆ Pin Configuration

SIP-3L

SOT-23-3L

GND

VDD GND OUTPUT

VDD   OUTPUT

(Front View)

(Top View)

DFN1616-3
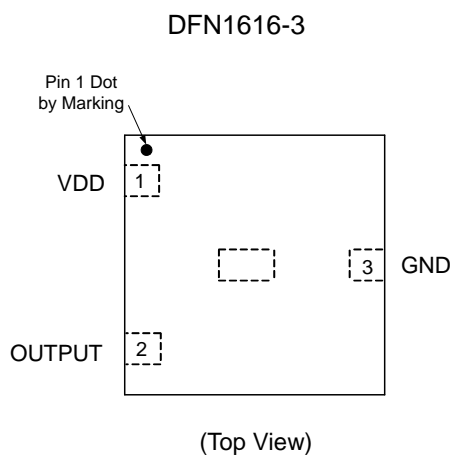
Pin 1 Dot
by Marking

VDD

OUTPUT

GND

(Top View)
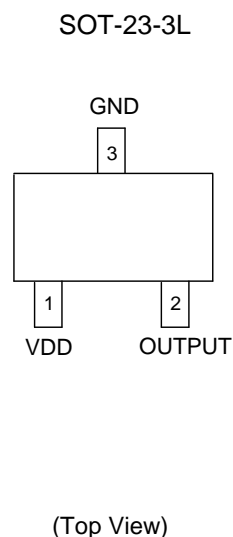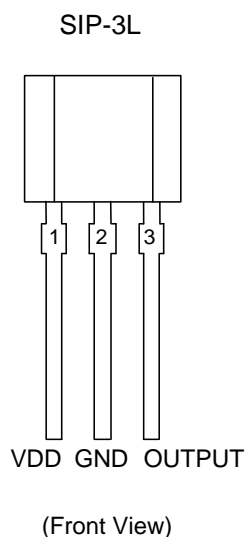
Figure 2. Pin Configuration of HG7503

◆ Pin Description

Pin Number			Pin Name	Function
SIP-3L	SOT-23-3L	DFN1616-3		
1	1	1	VDD	Power Supply
2	3	3	GND	Ground pin
3	2	2	OUTPUT	Output pin

◆ **Functional Block Diagram**
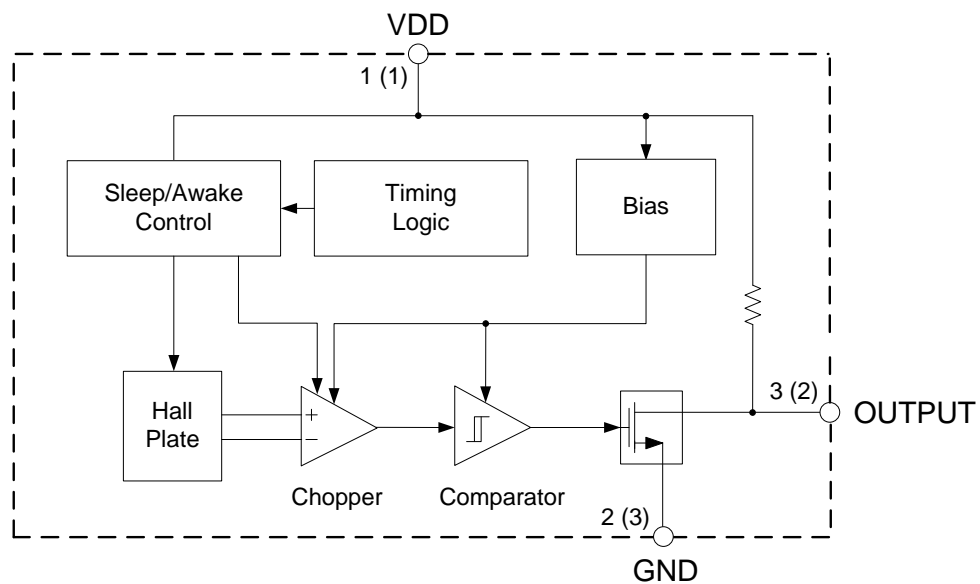
A (B)
A for SIP-3L
B for SOT-23-3L and DFN1616-3

Figure 3. Functional Block Diagram of HG7503

◆ Absolute Maximum Ratings (T$_A$=25°C, Note 1)

Parameter	Symbol	Value		Unit
Supply Voltage	V$_{DD}$	7.0		V
Supply Current (Fault)	I$_{DD}$	5.0		mA
Output Voltage	V$_{OUT}$	7.0		V
Output Current	I$_{OUT}$	5.0		mA
Magnetic Flux Density	B	Unlimited		Gauss
Power Dissipation	P$_D$	SIP-3L	400	mW
		SOT-23-3L	230	
Storage Temperature	T$_{STG}$	-55 to 150		°C
Junction Temperature	T$_J$	150		°C

Note 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.

Note 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

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V$_{DD}$	1.8	5.5	V
Operating Temperature	T$_{OP}$	-40	85	°C

◆ Electrical Characteristics

V_{DD}=3.0V, T_A =25°C, unless otherwise specified.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply Voltage	V_{DD}	Operating	1.8	3.0	5.5	V
Supply Current	I_{AW}	Awake		1.2	1.8	mA
	I_{SL}	Sleep		1.0	2.0	μA
	I_{AVG}	Average		2.5	5.0	μA
Output Current	I_{OUT}				5.0	mA
Output Leakage Current	I_{LEAK}	B< ｜ B_{RP} ｜		<0.01	1.0	μA
Saturation Voltage	V_{SAT}	I_{OUT} =1.0mA		0.05	0.25	V
Awake Mode Time	t_{AW}	Operating	15	25	35	μs
Sleep Mode Time	t_{SL}	Operating	20	30	40	ms
Duty Cycle	D			0.10		%

◆ Magnetic Characteristics (Note 3)

V_{DD}=3.0V, T_A =25°C, unless otherwise specified.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Operating point	B_{OPS}	South pole to branded side B>B_{OPS},V_{OUT}=low(output on)		16	25	Gauss
	B_{OPN}	North pole to branded side B>B_{OPN},V_{OUT}=low(output on)	-25	-16		Gauss
Releasing Point	B_{RPS}	South pole to branded side B<B_{RPS},V_{OUT}=high(output off)	5	10	15	Gauss
	B_{RPN}	North pole to branded side B<B_{RPN},V_{OUT}=high(output off)	-15	-10		Gauss
Hysteresis	B_{HYS}	｜ B_{OPX} - B_{RPX} ｜ (Note 4)	3	6	9	Gauss

Note 3: The specifications stated here are guaranteed by design. 1 Gauss=0.1mT
Note 4: B_{OPX}=operating point(output turns on); B_{RPX}=releasing point(output turns off)

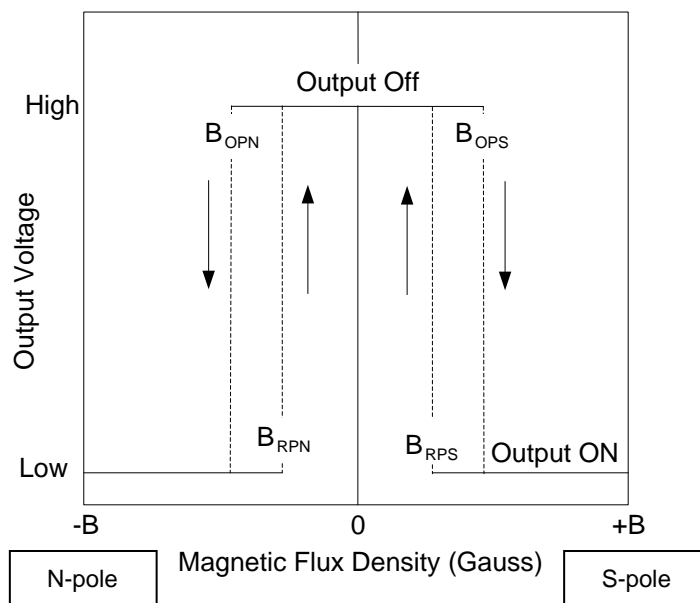# ◆ Magnetic Characteristics (Continued)

Figure 4. Output Voltage vs. Magnetic Flux Density
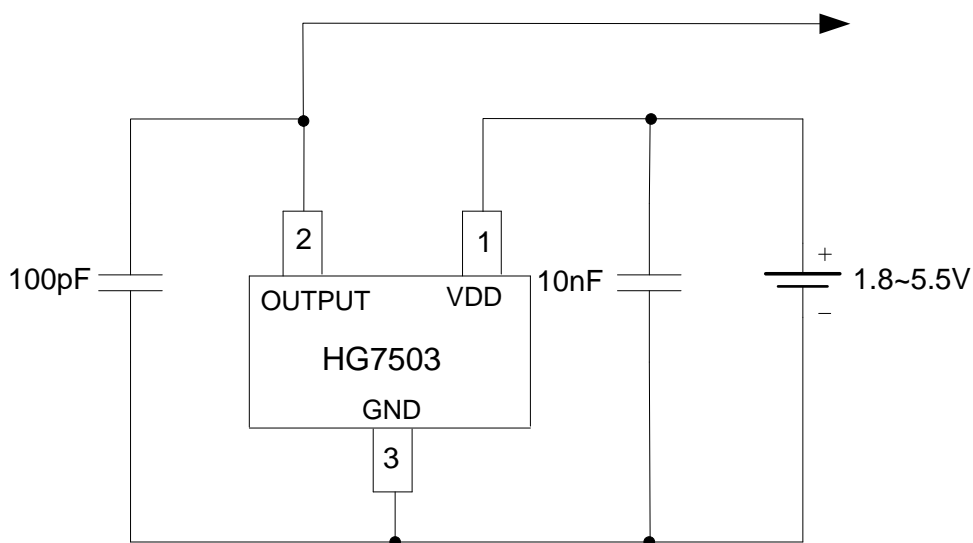
◆ Typical Application Circuit

Figure 5. Typical Application of HG7503

◆ Mechanical Dimensions

SIP-3L   Unit: mm(inch)

$\dfrac{44^\circ}{46^\circ}$

$\dfrac{0.750(0.030)}{\text{TYP.}}$

$\dfrac{1.420(0.056)}{1.620(0.064)}$

$\dfrac{3.850(0.152)}{4.150(0.163)}$

$\dfrac{1.050(0.041)}{1.350(0.053)}$

$\dfrac{1.850(0.073)}{2.150(0.085)}$

$\dfrac{2.900(0.114)}{3.310(0.130)}$

Package Sensor Location

$\dfrac{0.380(0.015)}{0.550(0.022)}$

$\dfrac{1.600(0.063)}{\text{TYP.}}$

$\dfrac{0.360(0.014)}{0.480(0.019)}$

$\dfrac{14.000(0.551)}{15.500(0.610)}$

$\dfrac{1.270(0.050)}{\text{TYP.}}$

$\dfrac{0.360(0.014)}{0.510(0.020)}$
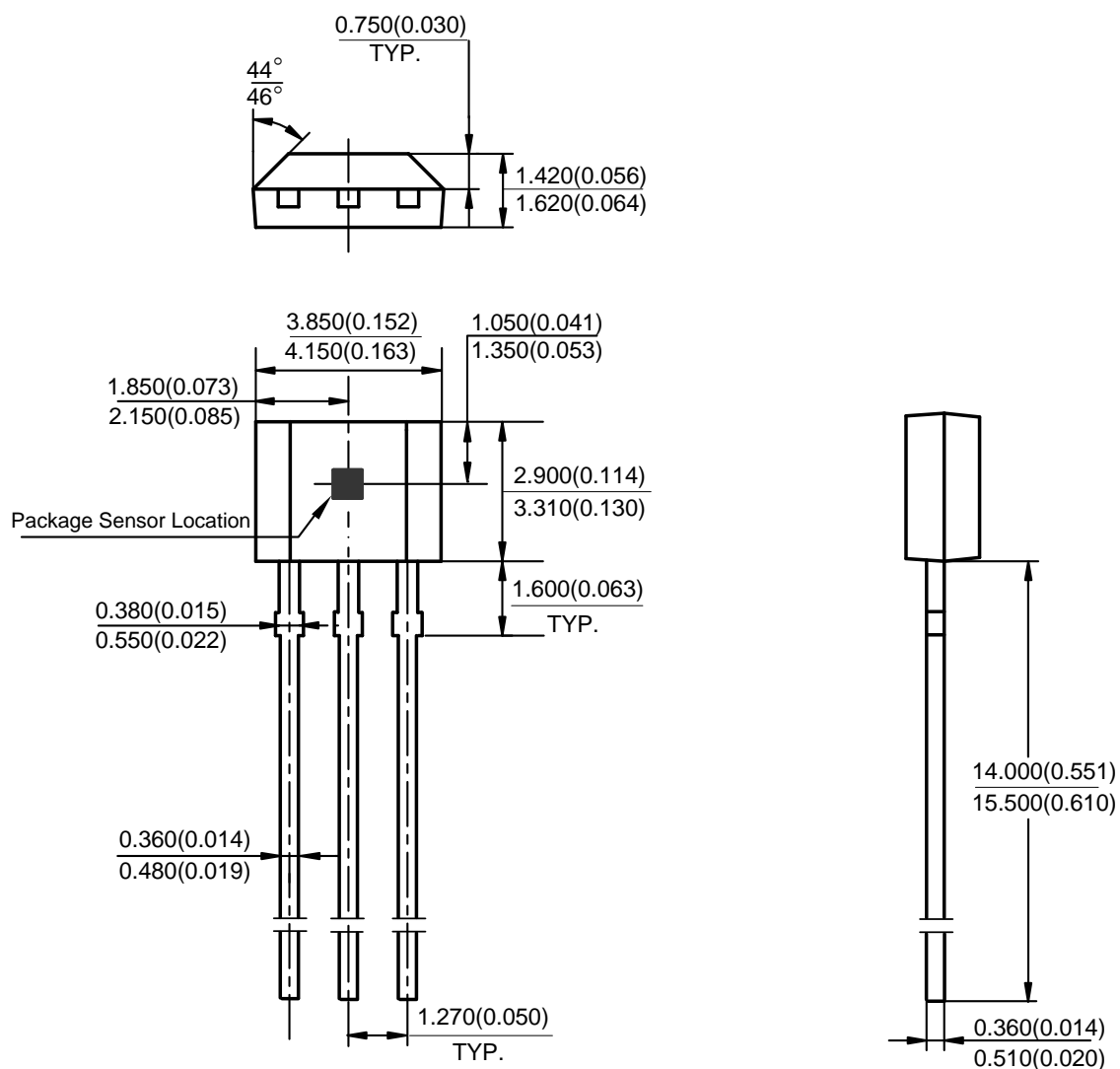
◆ Mechanical Dimensions (Continued)

SOT-23-3L   Unit: mm(inch)

2.820(0.111)
3.020(0.119)

1.45(0.057)
TYP

2.650(0.104)
2.950(0.116)

1.500(0.059)
1.700(0.067)

0.950(0.037)
TYP

1.800(0.071)
2.000(0.079)

0.300(0.012)
0.500(0.020)

0.900(0.035)
TYP

0.100(0.004)
0.200(0.008)

0.300(0.012)
0.600(0.024)

0.200(0.008)

0°
8°

1.450(0.057)
MAX.

0.000(0.000)
0.150(0.006)

0.900(0.035)
1.300(0.051)
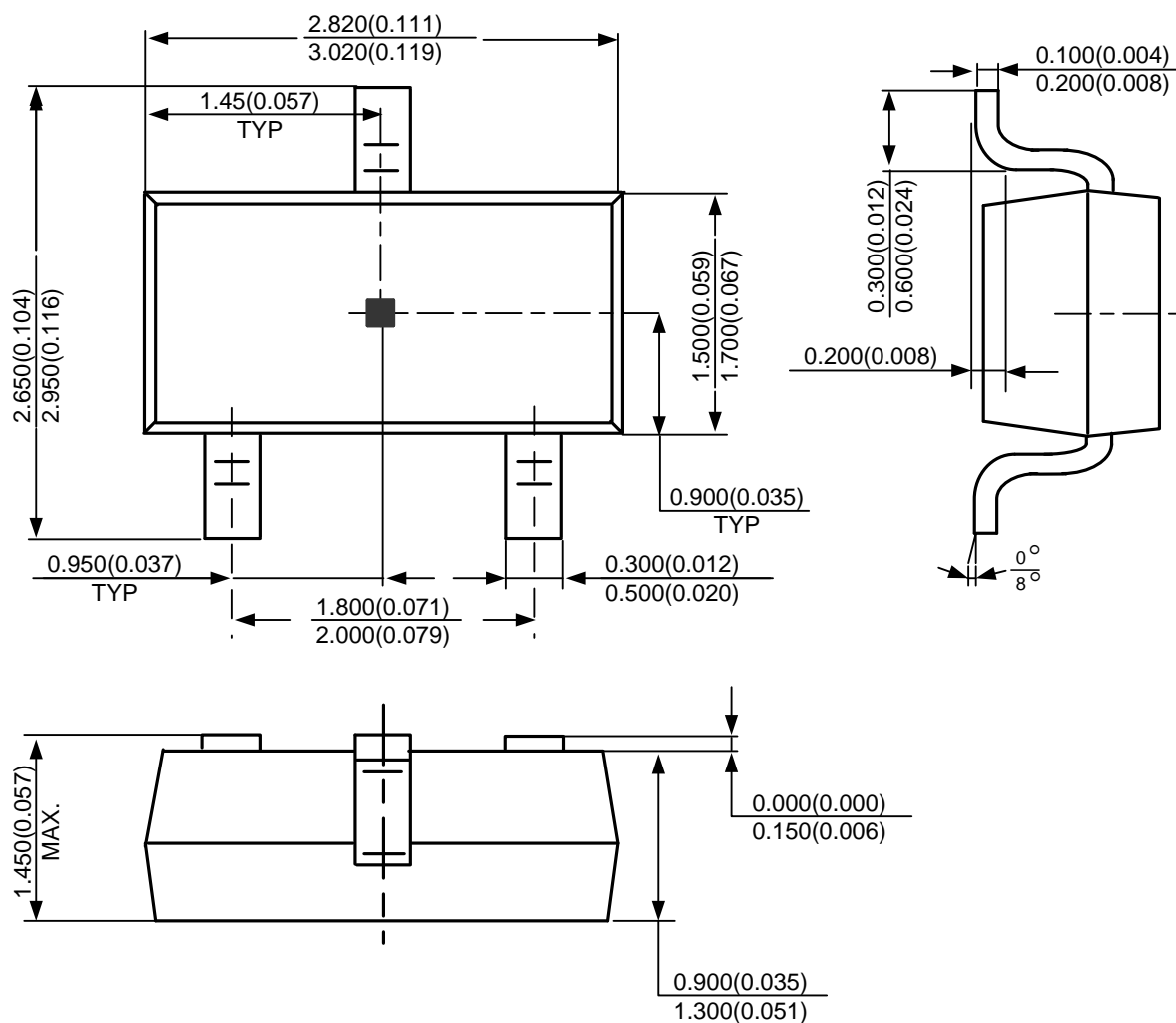
◆ **Mechanical Dimensions (Continued)**

DFN1616-3   Unit: mm(inch)

1.550(0.061)
1.650(0.065)

1.550(0.061)
1.650(0.065)

0.800(0.031)
TYP

1.000(0.039)
TYP.

0.200(0.008)
0.300(0.012)

0.450(0.018)
0.550(0.020)

0.200(0.008)
0.300(0.012)

0.200(0.008)
0.300(0.012)

0.150(0.006)
TYP.

0.500(0.020)
0.600(0.024)

0.000(0.000)
0.050(0.020)