MH235H Hall-effect sensor is a temperature stable, stress-resistant, Low Tolerance of Sensitivity Ultra-power switch. Superior high-temperature performance is made possible through a dynamic offset cancellation that utilizes chopper-stabilization. This method reduces the offset voltage normally caused by device over molding, temperature dependencies, and thermal stress.

MH235H is special made for low operation voltage, 2.7V, to active the chip which is includes the following on a single silicon chip: voltage regulator, Hall voltage generator, small-signal amplifier, chopper stabilization, Schmitt trigger, CMOS output driver. Advanced CMOS wafer fabrication processing is used to take advantage of low-voltage requirements, component matching, very low input-offset errors, and small component geometries. This device requires the presence of omni-polar magnetic fields for operation.

The package type is in a Halogen Free version has been verified by third party Lab.

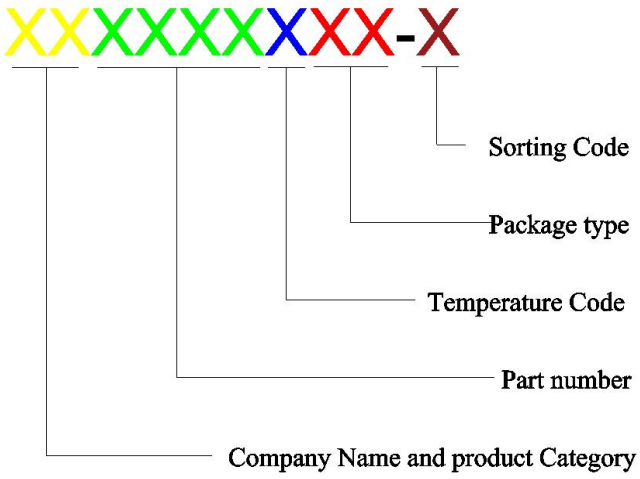
Features and Benefits

- Output-on & Inverted Output-on without Magnet present in one chip
- Low and high Hz presented in one chip
- Strong RF noise protection
- 2.7 to 5.5V for battery-powered applications
- Omni polar, output switches with absolute value of North or South pole from magnet
- Operation down to 2.7V
- High Sensitivity for reed switch replacement applications
- Multi Small Size option
- Low sensitivity drift in crossing of Temp. range
- Ultra-Low power consumption at 1.6uA (Avg)
- High ESD Protection, HBM>±4KV(min)
- Totem-pole output
- RoHS compliant 2011/65/EU and Halogen Free.

Applications

- Solid state switch
- Handheld Wireless Handset Awake Switch
- Lid close sensor for battery powered devices
- Magnet proximity sensor for reed switch replacement in low duty cycle applications
- Floating Meter
- Security
- 3C
- Smart Meter
- TWS

Ordering Information



Company Name and Product Category

MH:MST Hall Effect/MP:MST Power IC

Part number

181,D182,183,184,185,248,477,D381,D381F,381R,D382…..

If part # is just 3 digits, the forth digit will be omitted.

Temperature range

E: 85 ℃, I: 105 ℃, K: 125 ℃, L: 150 ℃

Package type

UA:TO-92S,VK:TO-92S(4pin),VF:TO-92S(5pin),SO:SOT-23,
SQ:QFN-3,ST:TSOT-23,SN:SOT-553,SF:SOT-89(5pin),
SS:TSOT-26,SD:DFN-6

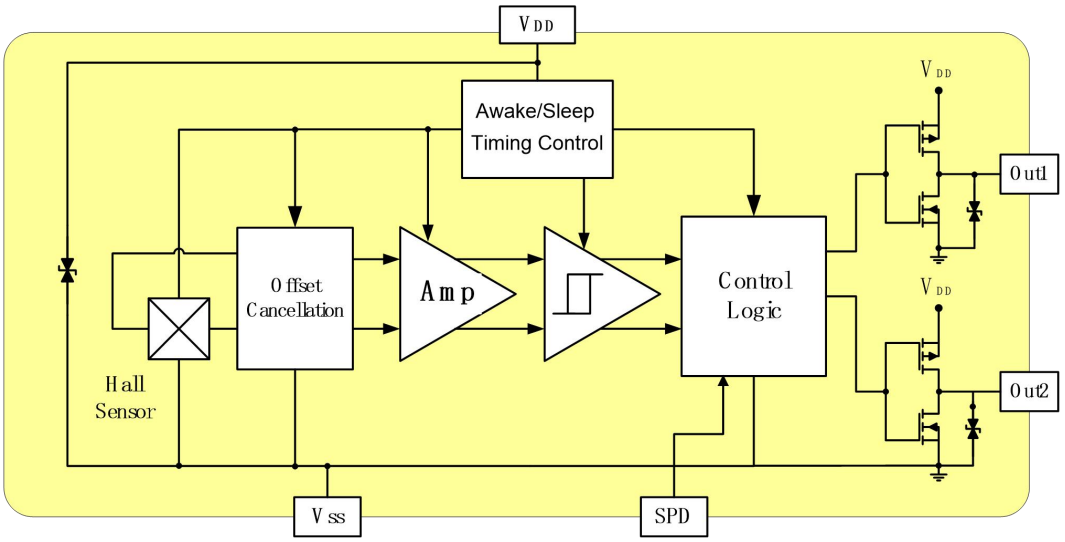
Sorting

α,β,Blank…..

Part No.	Temperature Suffix	Package Type
MH235HESO	E (-40°C to + 85°C)	SO(SOT-23)
MH235HEUA	E (-40°C to + 85°C)	UA(TO-92S)

Custom sensitivity selection is available by MST sorting technology

Functional Diagram



***Note**: Static sensitive device; please observe ESD precautions. Reverse V_{DD} protection is not included. For reverse voltage protection, a 100Ω resistor in series with V_{DD} is recommended.*

MH 235, HBM>±4KV which is verified by third party lab.

Absolute Maximum Ratings *At(Ta=25℃)*

Characteristics		Values	Unit
Supply voltage, (V_{DD})		6	V
Output Voltage, (V_{out})		6	V
Magnetic flux density		Unlimited	Gauss
Output current, (I_{OUT})		5	mA
Operating temperature range, (Ta)		-40 to +85	℃
Storage temperature range, (Ts)		-65 to +150	℃
Maximum Junction Temp, (Tj)		150	℃
Thermal Resistance	(θ_{JA}) UA/SO	206/543	℃/A
	(θ_{JC}) UA/SO	148/410	℃/A
Package Power Dissipation, (PD) UA/SO		606/230	mW

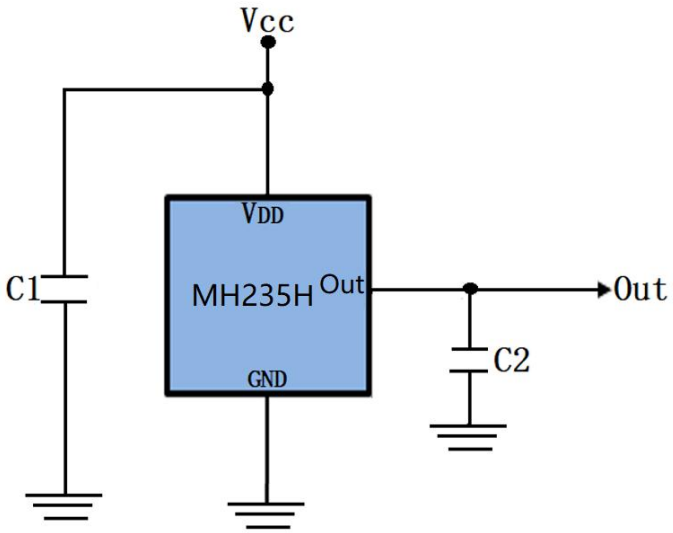
Note: *Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute maximum-rated conditions for extended periods may affect device reliability.*

Electrical Specifications

DC Operating Parameters：Ta=25℃, V_{DD}=3.0V

Parameters	Test Conditions	Min	Typ	Max	Units
Supply Voltage, (V_{DD})	Operating	2.7		5.5	Volts
Supply Current, (I_{DD})	Awake State		2.0		mA
	Sleep State		1.0		μA
	Average		1.6		μA
Output High Voltage, (V_{OH})	I_{OUT}=1.0mA (Source)	V_{DD}-0.2			V
Output Low Voltage, (V_{OL})	I_{OUT}=1.0mA (Sink)			0.2	V
Awake mode time, (T_{aw})	Operating		20	40	uS
Sleep mode time, (T_{SL})	Operating		80	150	mS
Duty Cycle, ($D.C$)			0.025		%
Power-On Time, (T_{PO})			16	32	nS
Output Switch Time, (T_{SW})	Operating		80	160	mS
Output Switch Frequency, (F_{SW})	Operating	15			Hz
Electro-Static Discharge	HBM	4			KV

Typical Application circuit



C1：10nF

C2：100pF

MH235H UA/SO Magnetic Specifications

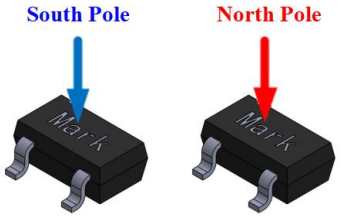
DC Operating Parameters：Ta = -40 to 85℃, V_{DD} =2.7V to 5.5V

Parameter	*Test Conditions*	*Min.*	*Typ.*	*Max.*	*Units*
Operate Point, BOPS(BOPN)	B>|B_{OP}X|	20(-55)		55(-20)	Gauss
Release Point, BRPS(BRPN)	B<|B_{RP}X |	10(-45)		45(-10)	Gauss
Hysteresis, (BHYS)	|BOPX - BRPX|		10		Gauss

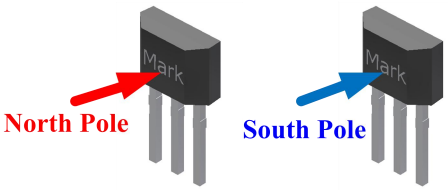
MH235H UA/SO Output Behavior versus Magnetic Polar

DC Operating Parameters：Ta =-40 to 85℃， V_{DD} =2.7V to 5.5V

Parameter	*Test condition*	*OUT*
South pole	B>Bop-S	High
Null or weak magnetic field	B=0 or B <| B_{RP}X|	Low
North pole	B>|Bop-N|	High

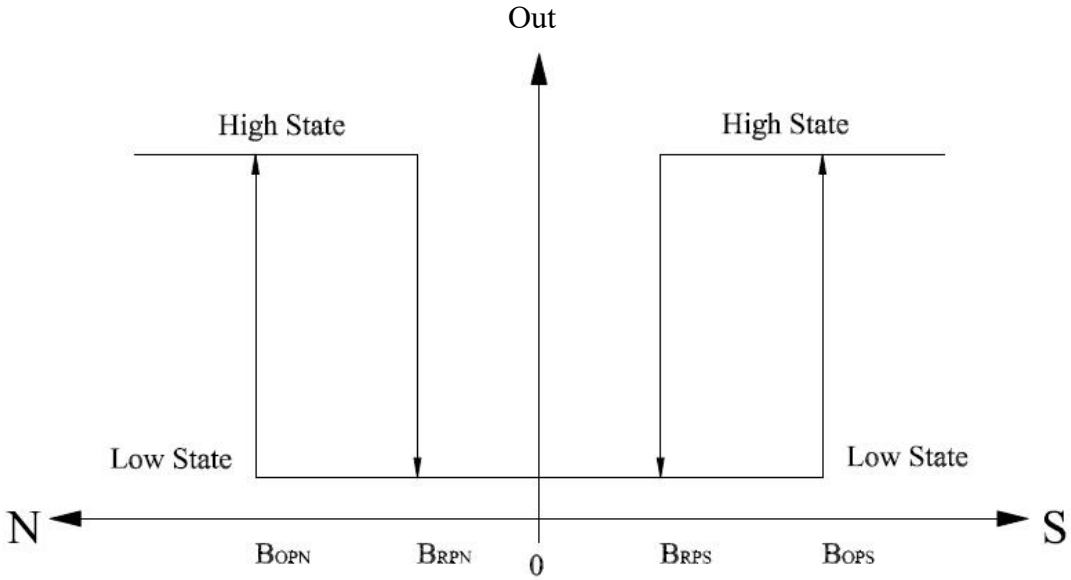


SO Package



UA Package

Output Behavior



Function Description

(1) V_{DD} PIN

The pin is Supplied power to IC as circuit operation and output transition requirements, and the Supplied voltage must greater than the minimum operating voltage-2.7V.

(2) V_{SS} PIN

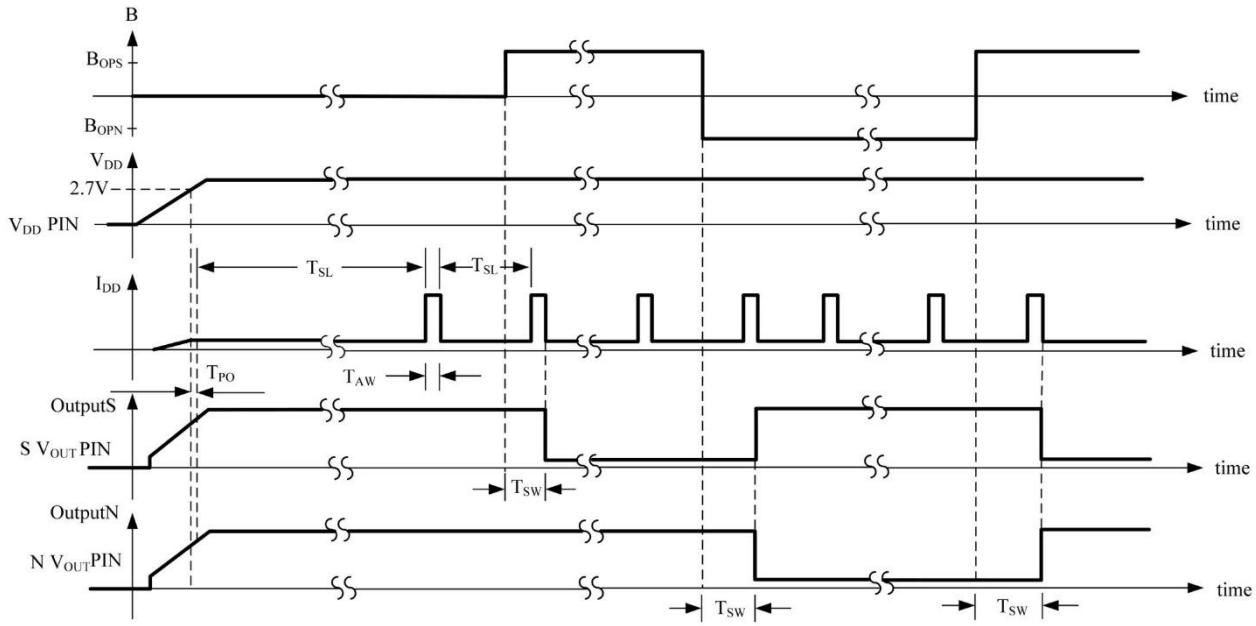
The pin is connected to ground of the supplied power and must to be connected firmly.

(3) S Vout PIN

When the South of magnetic field near the marking of IC, and magnetic force is greater than B_{OPS} , this pin output state will turn to low voltage, when magnetic force is less than B_{RPS} or North magnetic field, this pin output state will turn to high voltage. Every time of the output transition is after T_{SW}.

(4) N Vout PIN

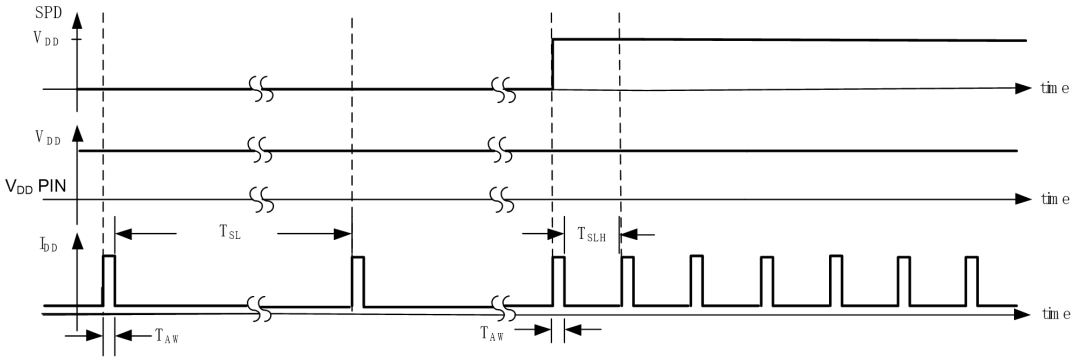
When the North of magnetic field near the marking of IC, and magnetic force is greater than B_{OPN} ,this pin output state will turn to low voltage, when magnetic force is less than B_{RPN} or South magnetic field, this pin output state will turn to high voltage. Every time of the output transition must be after T_{SW}.



- Power-On time (T_{PO}) :
  When input voltage to V_{DD} of IC, IC is awaked after Power-On Time ($T_{PO.}$)
- Awake mode time (T_{AW}) :
  At awake mode, the IC can detect magnetic field and change output state.
- Sleep mode time, (T_{SL}) :
  During sleep mode, the IC only very weak current to maintain the IC “standby”.
- Output switch time, (T_{SW}) :
  The time from magnetic field change to output transition is called output switch time, it is designed to detect the same magnetic field in two times awake period to prevent magnetic field bounce.

（5） SPD PIN

When the SPD is connected to the VDD, the TSL time is shortened become TSLH and the output switching time is accelerated



Package Power Dissipation

The power dissipation of the Package is a function of the pad size. This can vary from the minimum pad size for soldering to a pad size given for maximum power dissipation. Power dissipation for a surface mount device is determined by $T_{J\ (max)}$, the maximum rated junction temperature of the die, $R_{\theta JA}$, the thermal resistance from the device junction to ambient, and the operating temperature, Ta. Using the values provided on the data sheet for the package, *PD* can be calculated as follows:

$$P_D = \frac{T_{J(max)} - T_a}{R_{\theta ja}}$$

The values for the equation are found in the maximum ratings table on the data sheet. Substituting these values into the equation for an ambient temperature Ta of 25°C, one can calculate the power dissipation of the device which in this case is 416 milliwatts.

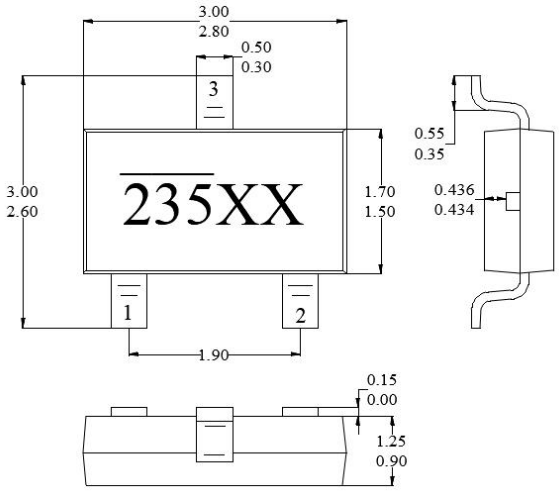
$$P_D(\mathrm{UA}) = \frac{150℃ - 25℃}{206℃/w} = 606w$$

The 206℃/w for the UA package assumes the use of the recommended footprint on a glass epoxy printed circuit board to achieve a power dissipation of 606 milliwatts. There are other alternatives to achieving higher power dissipation from the Package. Another alternative would be to use a ceramic substrate or an aluminum core board such as Thermal Clad. Using a board material such as Thermal Clad, an aluminum core board, the power dissipation can be doubled using the same footprint.

Sensor Location, package dimension and marking

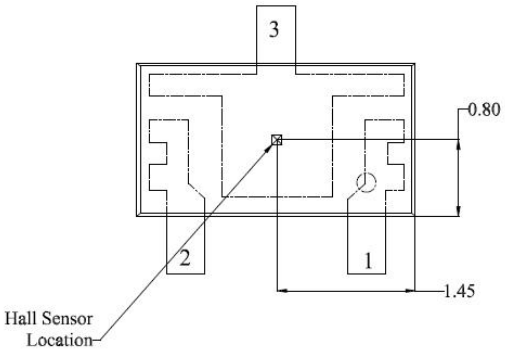
SO Package (SOT-23)

(Top View)

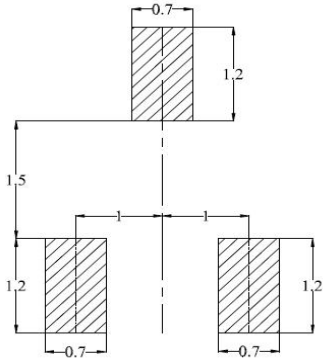


Hall Plate Chip Location

(Bottom view)



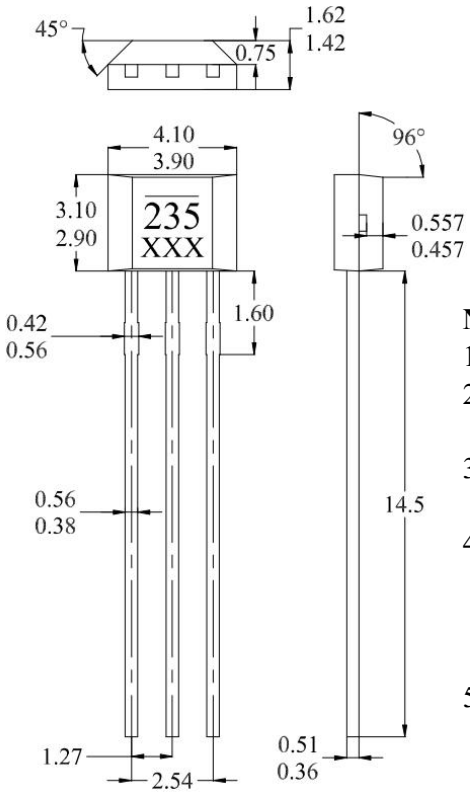
(For reference only)Land Pattern



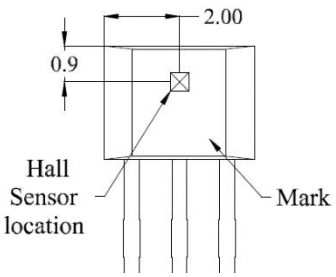
NOTES:

2. PINOUT (See Top View at left:)
   Pin 1 VDD ； Pin 2 Output； Pin 3 GND
3. Controlling dimension: mm;
4. Lead thickness after solder plating will be 0.254mm maximum
5. XX: Date Code, Refer to DC table

UA Package(TO-92)



Hall Chip location



NOTES:

1. Controlling dimension: mm
2. Leads must be free of flash and plating voids
3. Do not bend leads within 1 mm of lead to package interface.
4. PINOUT:
   Pin 1 VDD
   Pin 2 GND
   Pin 3 Output
5. XXX； 1st X=Year； 2nd and 3rd XX=Week

Output Pin Assignment

(Top view)

