MH4963 is a low-voltage, low-power linear Hall effect sensor IC with sleep mode by user-selectable. MH4963 can work under the ultra-low operating voltage from1.7V~3.6V. In addition, by setting $\overline{\text{SLEEP}}$<VINL, the chip change to sleep mode, and the current consumption is only 25uA. At this time, the output of the chip change to "high resistance state", and does not respond to the change of external magnetic field; By setting $\overline{\text{SLEEP}}$>VINH, the chip change to active mode. The current consumption is 2mA, and the output is proportional to the induced magnetic field.

The $\overline{\text{SLEEP}}$ pin can be set to select the sleep and awake mode to help users further reduce power consumption. Therefore, it is very suitable for battery powered applications. In the sleep mode, since the output changes to "high resistance state", multiple chips can share one ADC interface.

The output of MH4963 is proportional to the VREF pin. When there is no magnetic field, VOUT=6.47% of VREF (VCC=VREF=3.0), so it is not related to the power supply. In addition, MH4963 is only sensitive to south pole proportionally.

Features and Benefits

- CMOS process
- Working voltage: 1.7~3.6V
- Operating temperature: - 20~85 ℃
- Low consumption current
  MH4963(DFN-2030):
  $\overline{\text{SLEEP}}$<VINL, ICC=25uA
  $\overline{\text{SLEEP}}$>VINH, ICC=2mA
  MH4963(SOT23):
  ICC=2mA
- Sensitivity Option:(only sensitive to S pole)
  MH4963(DFN-2030):3.78mV/Gs (VCC=VREF=VCCN)
  MH4963(SOT23):3.78mV/Gs(VCC=3V)
- User-Selectable Sleep Mode(only MH4963(DFN-2030))
- High-impedance output during sleep mode
- The output voltage is proportional to the reference voltage (VREF pin)
- Package form: DFN-2030/SOT23(Thin outline)
- RoHS compliant: (EU) 2015/863

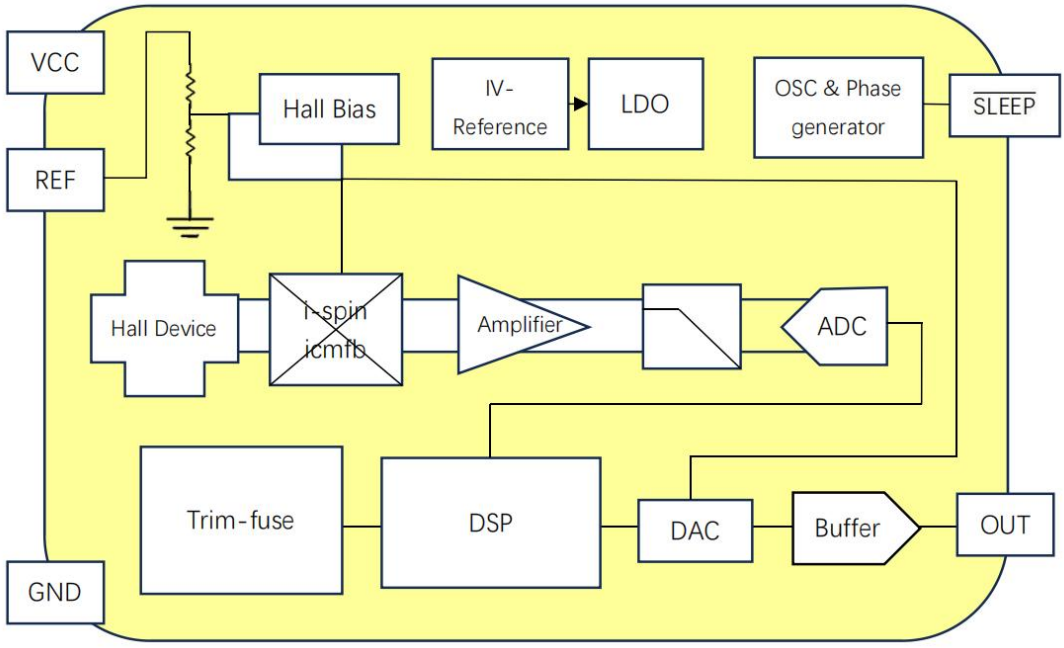
Applications

- Position detection
- Magnetic scale
- AR/VR handle trigger
- Game 3D joystick
- Keyboard
- Battery-Powered Devices.

Ordering Information

Part No	Temperature suffix	Package Type
MH4963ESV	E(-40°C to + 85°C)	SV(DFN-2030）
MH4963EST-S	E(-40°C to + 85°C)	ST(TSOT23-3）

Functional block diagram



Absolute maximum rating

Parameters	Description	Min	Max	Unit
VCC	Supply voltage	-	6	V
VRCC	Reverse Battery Voltage	-0.1	-	V
VREF	Ratiometric Supply Voltage	-	6	V
VRREF	Reverse Ratiometric supply Reference Voltage	-0.1	-	V
VSLEEP	Logic Supply voltage	-	6	V
VRSLEEP	Reverse-Logic Supply Voltage	0.1	-	V
VOUT	Output voltage	-	VCC+0.1	V
IOUT	Continuous output current	-	10	mA
TA	Operating ambient temperature	-20	85	℃
TS	Storage temperature	-50	150	℃
TJ	Junction temperature	-	150	℃

Note:Absolute maximum rating are limited values to be applied individually, and beyond which the serviceability of the circuit may be impaired. Functional operability is not necessarily implied. Exposure to absolute maximum rating conditions for an extended period of time may affect device reliability.

Electrical Specifications

TA=- 20~85 ℃, Vcc=1.7V~3.6V, CBYPASS=0.1uF (unless otherwise specified)

Parameters	Description	Test conditions	Min	Typ	Max	Unit
VCC[1)]	Supply voltage	-	1.7	-	3.6	V
VCCN[2)]	Nominal supply voltage	-	-	3.0	-	V
VREF[1)2)]	Ratiometric Supply Reference Voltage		1.8	-	VCC	V
VINH[2)]	Active Threshold Voltage	For active mode	-	0.45 x VCC	-	V
VINL[2)]	Sleep Threshold Voltage	For sleep mode	-	0.20 x VCC	-	V
RREF[2)]	Proportional reference input resistance	TA=25℃	250	-	-	kΩ
ICC	Supply Current	VSLEEP>VINH[2)], VCC=VCCN ， TA=25℃	-	2	-	mA
		VSLEEP<VINL[2)], VCC=VCCN ， TA=25℃	-	20	-	uA
		MH4963EST TA=25℃	-	2	-	mA
TPO	Power on time	TA=25℃		75		us
Tawake[2)]	Awake time	TA=25℃, sleep to active	-	25	-	us
Tsleep[2)]	Sleep time	TA=25℃, active to sleep	-	1	-	us
BW	Bandwidth	-3dB, CL=1nF, VCC=VCCN	-	10	-	KHz
ROUT	Output Resistance	IOUT<1.5mA,VCC=VCCN VSLEEP>VINH, B=0Gs	-	5	10	Ω
		IOUT<1.5mA,VCC=VCCN VSLEEP<VINH, B=0Gs	4	-	-	MΩ
RL	Output load resistance	Output to ground	4.7	-	-	KΩ
		Output to Supply	4.7	-	-	KΩ
CL	Output load capacitance	OUT to GND	-	-	10	nF
VOL[1)]	Linear output low voltage	VCC=VCCN, RL>=4.7KΩ	-	-	0.1	V
VOH[1)]	Linear output high voltage	VCC=VCCN, RL>=4.7KΩ	VREF-0.1	-	-	V

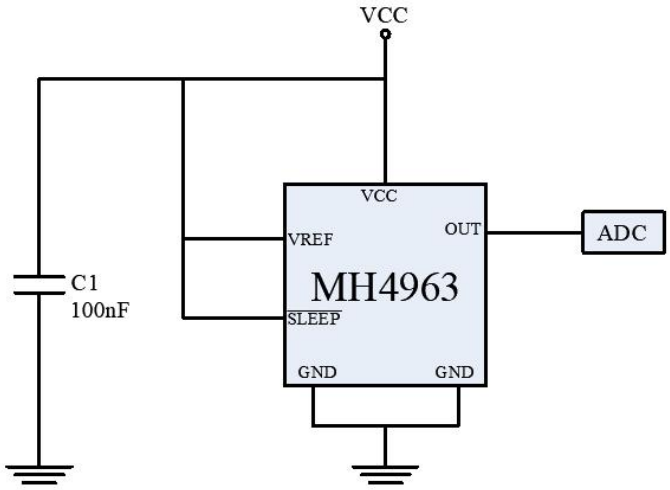
TRESP	Response Time	TA=25°C, B=B(max） VCC=VREF=VCCN		36		us
TR	Rise Time	TA=25°C, B=B(max） VCC=VREF=VCCN		18		us
TPD	Propagation Delay Time	TA=25°C, B=B(max） VCC=VREF=VCCN		19		us
ELIN	Linear	TA=25°C, VOUT= 0.1V~VREF-0.1V	-1.5	-	1.5	%
VOQ	Quiescent Voltage	TA=25°C, B=0Gs	-	6.47	-	%VREF
VOE	Quiescent Voltage Error	TA=25°C, B=0Gs VCC=VREF=VCCN	0.168	0.194	0.220	V
SNST	Sensitivity	TA=25°C, VCC=VREF=VCCN	3.59	3.78	4.00	mV/Gs
VOQ_TC	VOQ Variation Over Temperature	-	-2	-	2	%
SNST_TC	SNST Variation Over Temperature	-	-	1100	-	ppm/°C
ERAT_VOQ	Ratiometry Quiescent Voltage Output Error	TA=25°C, VREF=1.7~1.9V	-1.5	-	1.5	%
		TA=25°C, VREF=2.7~3.3V	-1.5	-	1.5	%
ERAT_SNST	Ratiometry sensitivity Error	TA=25°C, VREF=1.7~1.9V	-2	-	2	%
		TA=25°C, VREF=2.7~3.3V	-2	-	2	%
VN	Noise	-	-	35		mVpp

[1] VREF<=VCC

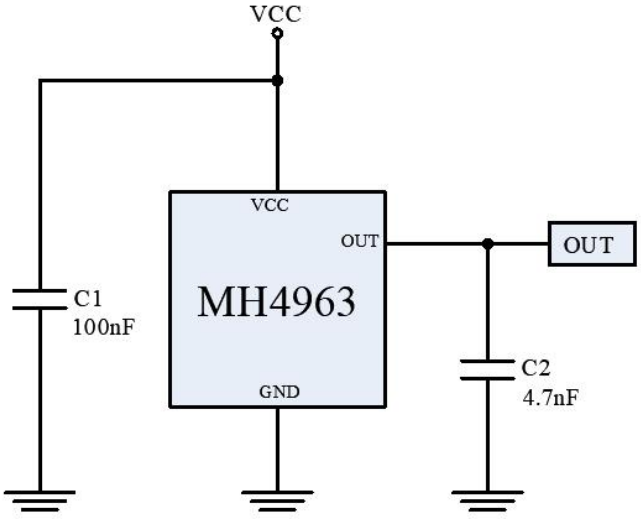
[2] Only for MH4963ESV

Typical Application Circuit

Active mode Application Circuits

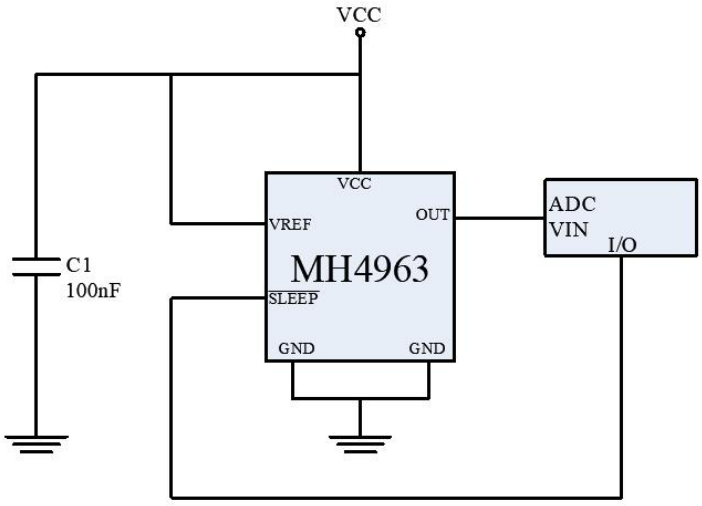


MH4963ESV



MH4963EST-S

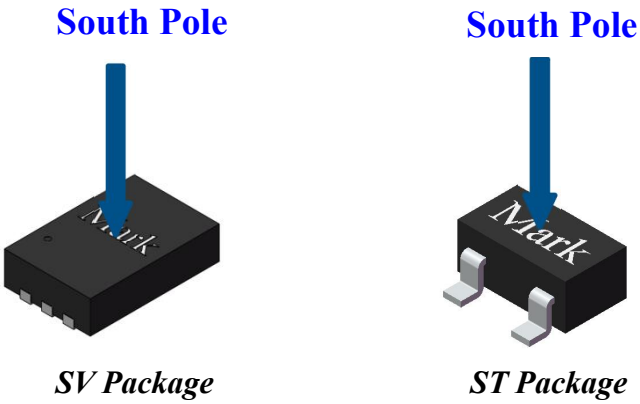
User Selectable Sleep Application Circuits



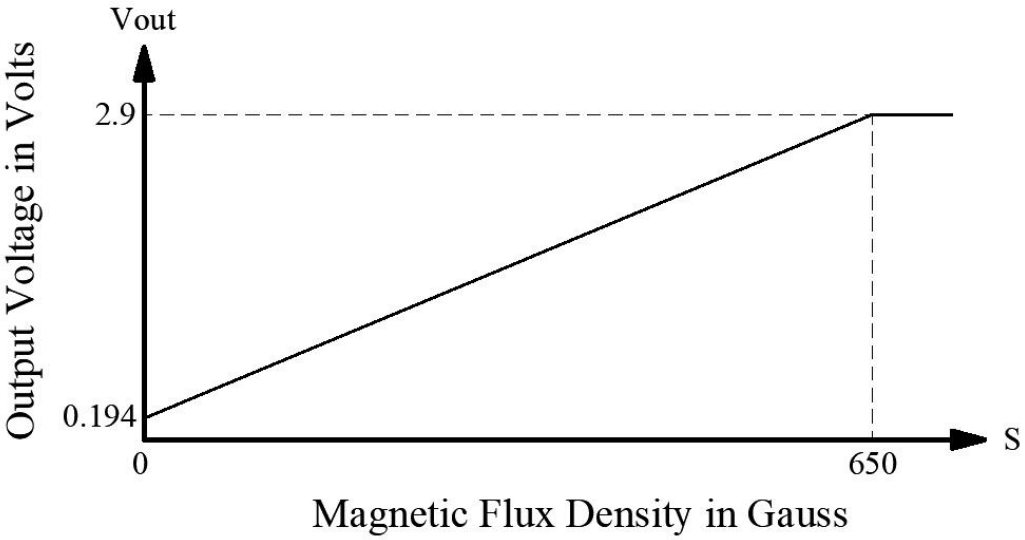
MH4963ESV

Output Behavior Versus Magnetic Pole

DC Operating Parameters： T_a = 25℃, V_{CC}= 3V

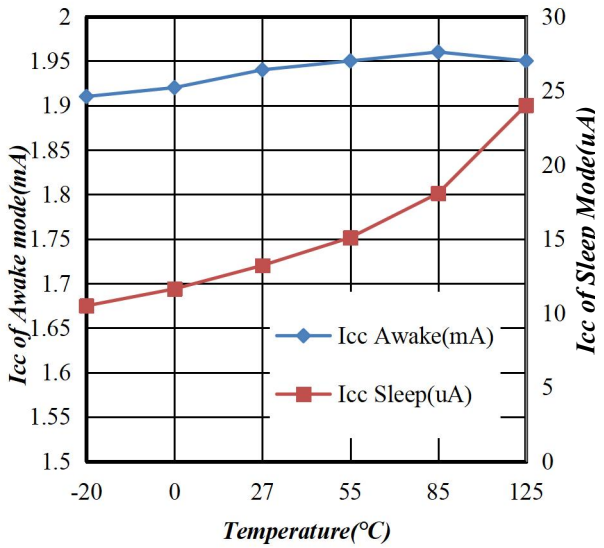


SV Package ***ST Package***

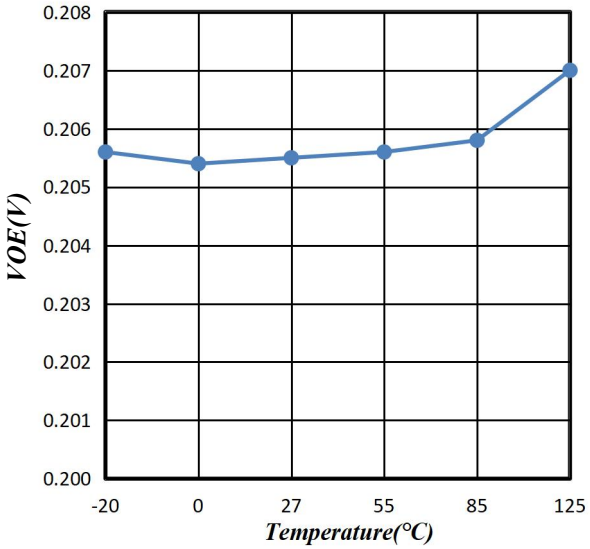


Performance Graph

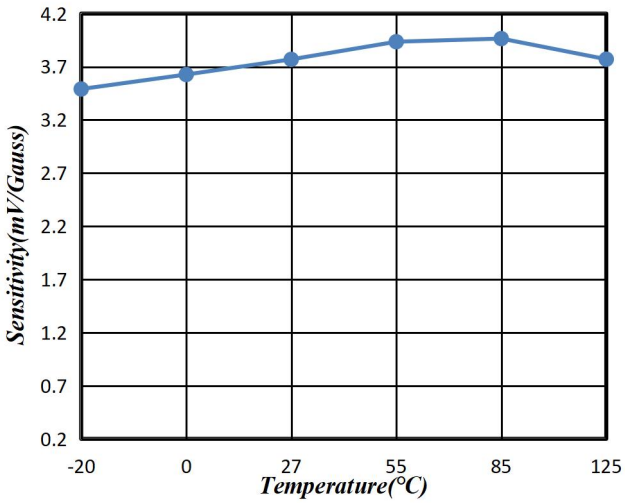
Typical Temperature(T_A) Versus Supply Current(I_{CC})



Typical Temperature(T_A) Versus VOE



Typical Temperature (T_A) Versus Sensitivity

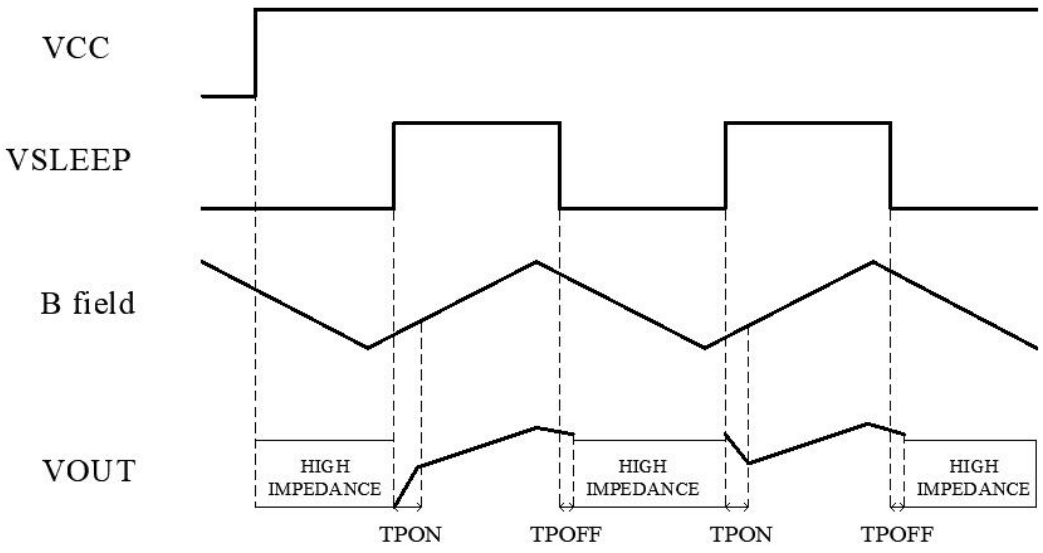


Time Diagram

MH4963 is low-power Hall effect sensor IC that perfect for power sensitive customer applications. The current consumption of MH4963 is 2mA typically, while the device is in the active mode, and 25μA when the device is in the sleep mode. Toggling the logic level signal through the $\overline{\text{SLEEP}}$ pin drives the device into either the active mode or the sleep mode.

A logic low signal drives the device into the sleep mode, while a logic high signal drives the device into the active mode through the $\overline{\text{SLEEP}}$ pin.

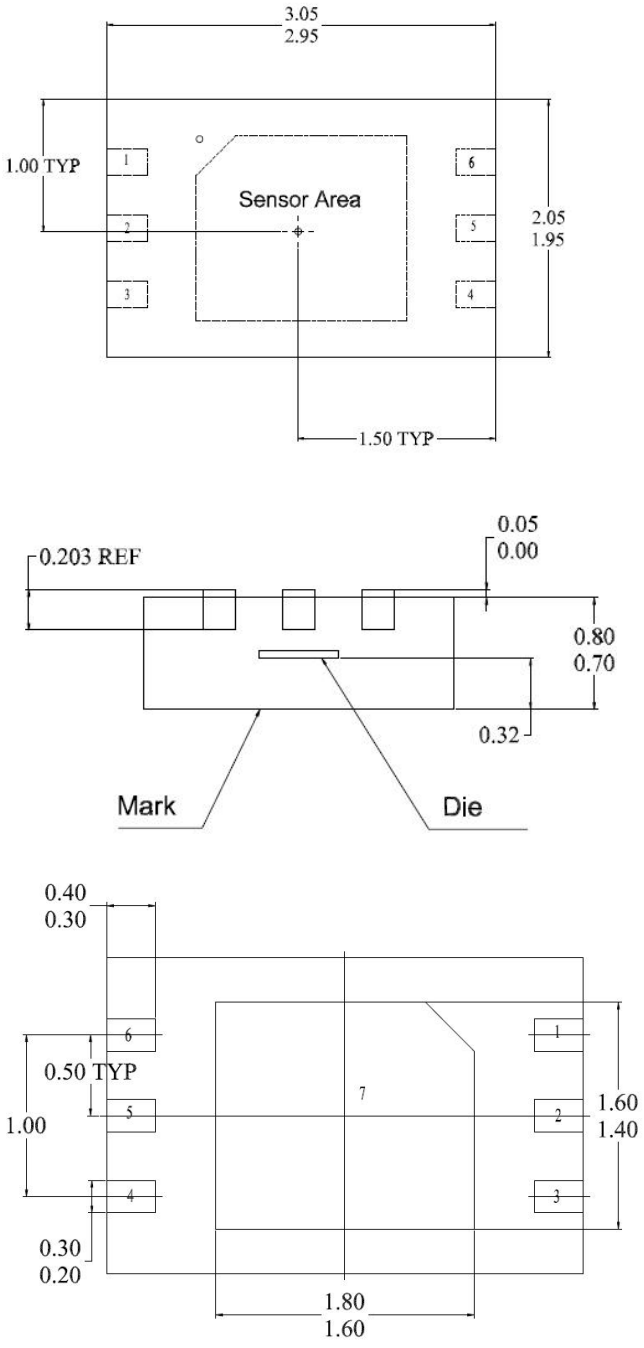
In the case in which the VREF pin is powered before the VCC pin, the device will not operate within the specified limits until the supply voltage is equal to the reference voltage. When the device is switched from the sleep mode to the active mode, a time defined by TPON must elapse before the output of the device is valid. The device output transitions into the high impedance state approximately TPOFF after a logic low signal is applied to the $\overline{\text{SLEEP}}$ pin (Refer to the figure below).



Sensor location，Package Dimension and Marking

SV package

(Top View）



（Bottom View）

Notes：

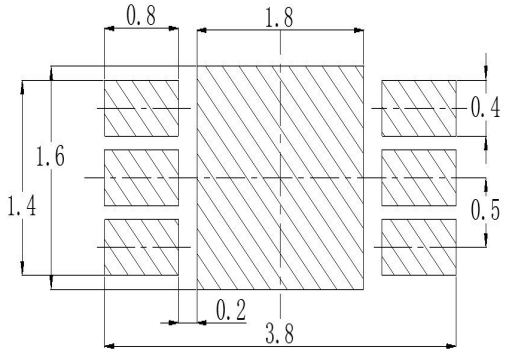
Controlling dimension：mm

1:Leads must be free of flash and plating voids

2:PINOUT:

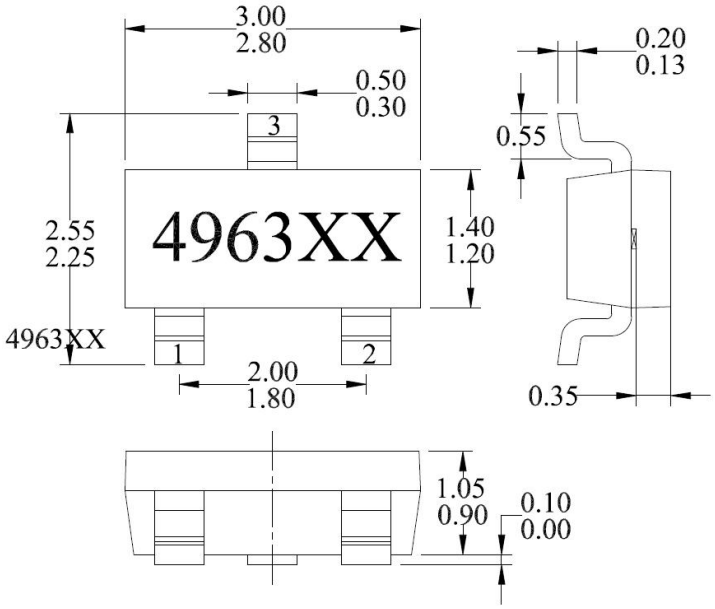
Pin No.	Name	Description
1	VCC	Power supply
2	OUT	Analog voltage output
3	GND	Ground
4	GND	Ground
5	$\overline{\text{SLEEP}}$	Toggle sleep mode
6	VREF	Supply for ratiometric reference
7	GND	Ground

3：（For reference only) Land pattern



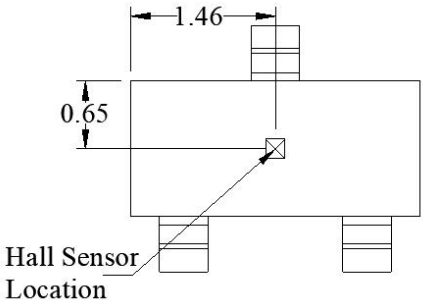
ST Package

(Top View)

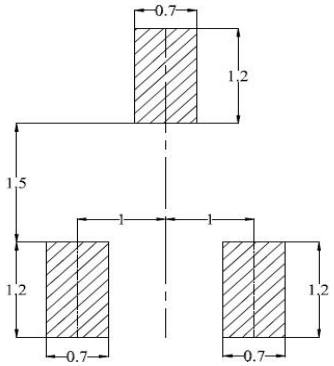


Hall Plate Chip Location

(Bottom view)



(For reference only)Land Pattern



NOTES:

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

Package Information

DFN-2030	Weight	TSOT23	Weight
3000PCS/Reel	0.12kg	3000PCS/Reel	0.13kg