

The MH4963ESV Series product is a low-voltage, low-power linear Hall effect sensor IC with sleep mode by user-selectable. The MH4963ESV can work under the ultra-low operating voltage from 1.7V~3.6V. In addition, by setting $\overline{\text{SLEEP}} < \text{VINL}$, 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 $\text{SLEEP} > \text{VINH}$, 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 series product is proportional to the VREF pin. When there is no magnetic field, $\text{VOUT} = 6.47\%$ of VREF ($\text{VCC} = \text{VREF} = 3.0$), so it is not related to the power supply. In addition, the MH4962 series is only sensitive to south pole proportionally.

Features and Benefits

- CMOS process
- Working voltage: 1.7~3.6V
- Operating temperature: - 20~85 °C
- Low consumption current
- $\overline{\text{SLEEP}} < \text{VINL}$, $\text{ICC} = 50\mu\text{A}$
- $\text{SLEEP} > \text{VINH}$, $\text{ICC} = 2\text{mA}$
- Sensitivity: 2.50mV/Gs ($\text{VCC} = \text{VREF} = \text{VCCN}$)
- The user can customize the sleep mode. High impedance output is available in the sleep mode
- The output voltage is proportional to the reference voltage (VREF pin)
- Package form: DFN-2030
- RoHS compliant: (EU) 2015/863

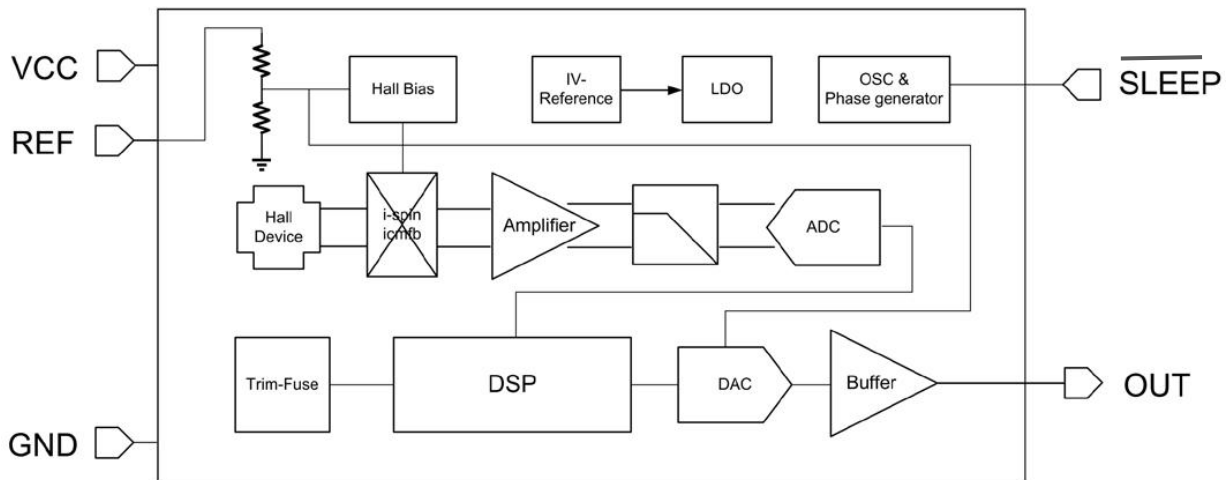
Applications

- Position detection
- Application of magnetic tape
- AR/VR handle trigger
- Game handle remote lever
- Headphone position detection
- Portable battery powered equipment.

Product Overview

Item No	Description
MH4963ESV	DFN-2030 tape rolling type (3000pcs/package)

Functional block diagram



Electrical magnetic characteristics

Absolute maximum rating

The absolute maximum rating is the limit value for independent application, and exceeding this value may damage the usability of the circuit. The impact on the functionality may not be obvious after the damage, but the reliability of the device may be affected if the device is under the condition of absolute maximum rating for a long time.

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	°C
TS	Storage temperature	-50	150	°C
TJ	Junction temperature	-	150	°C

Symbol	Description	Reference	Class
VESD	Human-body model (HBM)	AEC-Q100-002	Class II
	Charged-device model(CDM)	AEC-Q100-011	Class C3
	Latch up	AEC-Q100-004	Class IA

Electrical Specifications

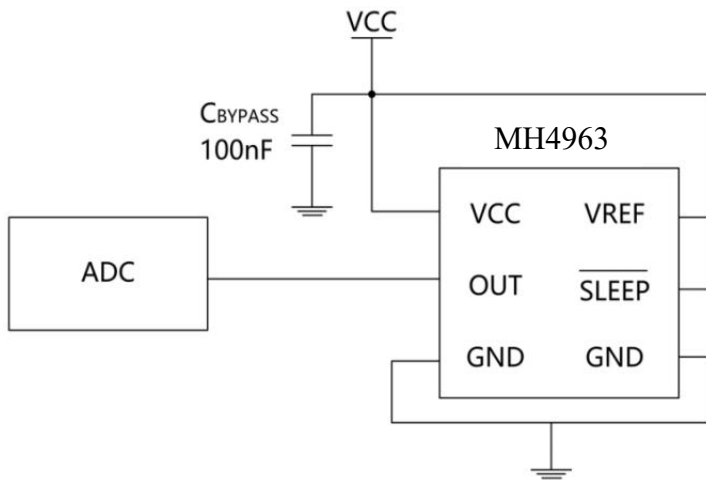
TA=- 20~85 °C, Vcc=1.7V~3.6V, CBYPASS=0.1uF (unless otherwise specified)

Parameters	Description	Test conditions	Min	Typ	Max	Unit
VCC ¹⁾	Supply voltage	-	1.7	-	3.6	V
VCCN	Nominal supply voltage	-	-	3.0	-	V
VREF ¹⁾	Ratiometric Supply Reference Voltage		1.8	-	VCC	V
VINH	Active Threshold Voltage	For active mode	-	0.45 x VCC	-	V
VINL	Sleep Threshold Voltage	For sleep mode	-	0.20 x VCC	-	V
RREF	Proportional reference input resistance	TA=25°C	250	-	-	kΩ
ICC	Supply Current	VSLEEP>VINH, VCC=VCCN, TA=25°C	-	2	-	mA
		VSLEEP<VINL, VCC=VCCN, TA=25°C	-	20	-	uA
TPO	Power on time	TA=25°C	-	75	-	us
Tawake	Awake time	TA=25°C, sleep to active	-	25	-	us
Tsleep	Sleep time	TA=25°C, sleep to sleep	-	1	-	us
BW	Bandwidth	-3dB, CL=1nF, VCC=VCCN	-	10	-	KHz
ROUT	Output impedance	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	Drop down to GND	4.7	-	-	KΩ
		Pull up to VCC	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

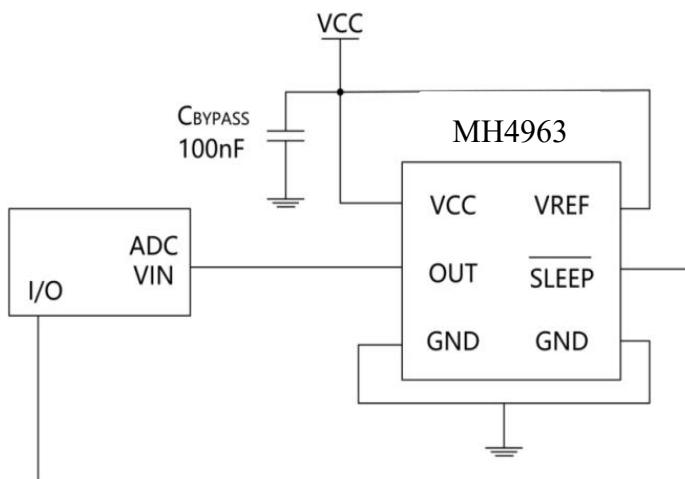
TR	Rise Time	TA=25°C, B=B(max) VCC=VREF=VCCN		18		us
TPD	Propagation Delay Time	TA=25°C, B=B(max) VCC=VREF=VCCN		19		us
ELIN	Linear	TA=25°C, VOUT= 0.1V~VREF-0.1V	-1.5	-	1.5	%
VOQ	Quiescent Voltage	TA=25°C, B=0Gs	-	6.47	-	%VREF
VOE	Quiescent Voltage Error	TA=25°C, B=0Gs VCC=VREF=VCCN	0.168	0.194	0.220	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

Typical application circuit



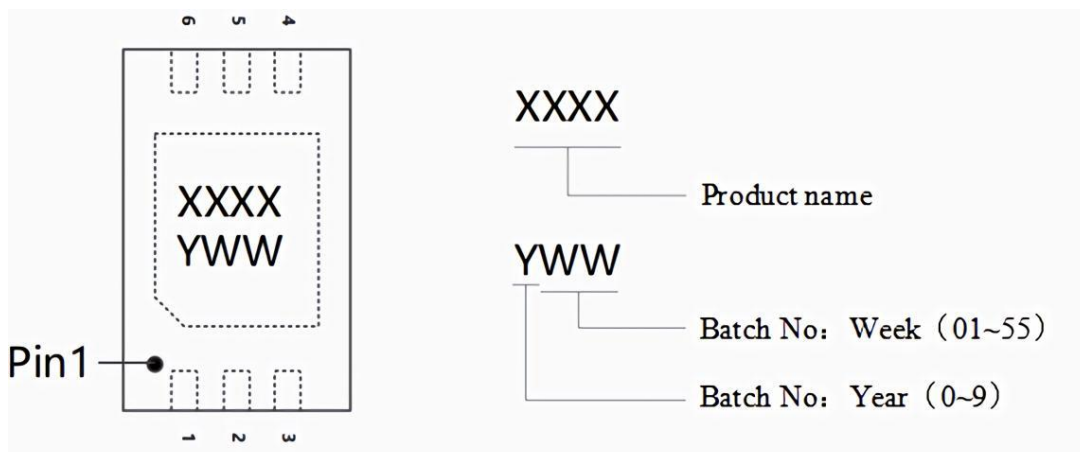
Active mode Application Circuits



User Selectable Sleep Application Circuits

Package Information

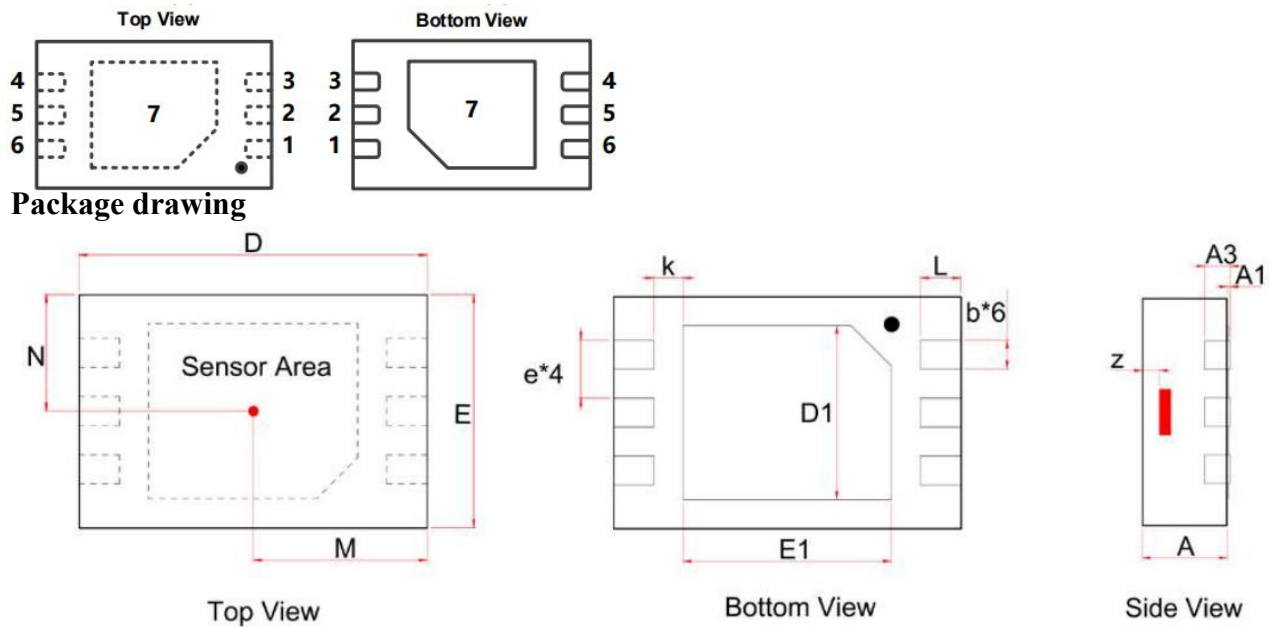
Marking specification.



Pin configuration and function

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

DFN-2030



Parameters	Dimensions in mm		Dimensions in inches	
	Min	Max	Min	Max
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A3	0.203 REF		0.008 REF	
D	2.950	3.050	0.116	0.120
E	1.950	2.050	0.077	0.081
D1	1.400	1.600	0.055	0.063
E1	1.600	1.800	0.063	0.071
b	0.200	0.300	0.008	0.012
e	0.500 TYP		0.020 TYP	



MH4963ESV Specifications

Unidirectional Linear Hall Sensor

k	0.200 MIN		0.008 MIN	
L	0.300	0.400	0.012	0.016
M	1.500 TYP		0.060 TYP	
N	1.000 TYP		0.040 TYP	