DESCRIPTION

The JYM16919 is a sophisticated IC featuring an on-chip 10-bit A/D Converter and logic that act as a digital sample and hold circuit. A separate 4-bit D/A converter provides a fixed hysteresis. The JYM16919 does not have a chopper delay and uses a single Hall plate which is immune to rotary alignment problems. The bias magnet can be from 1000GS to 4000Gs. As the signal is sampled, the logic recognizes an increasing or decreasing flux density.

The output will turn off (B_{RP}) after the flux has reached its peak and then decreased by an amount equal to the hysteresis. Similarly, the output will turn on (B_{OP}) after the flux has reached its minimum value and then increased by an amount equal to the hysteresis.

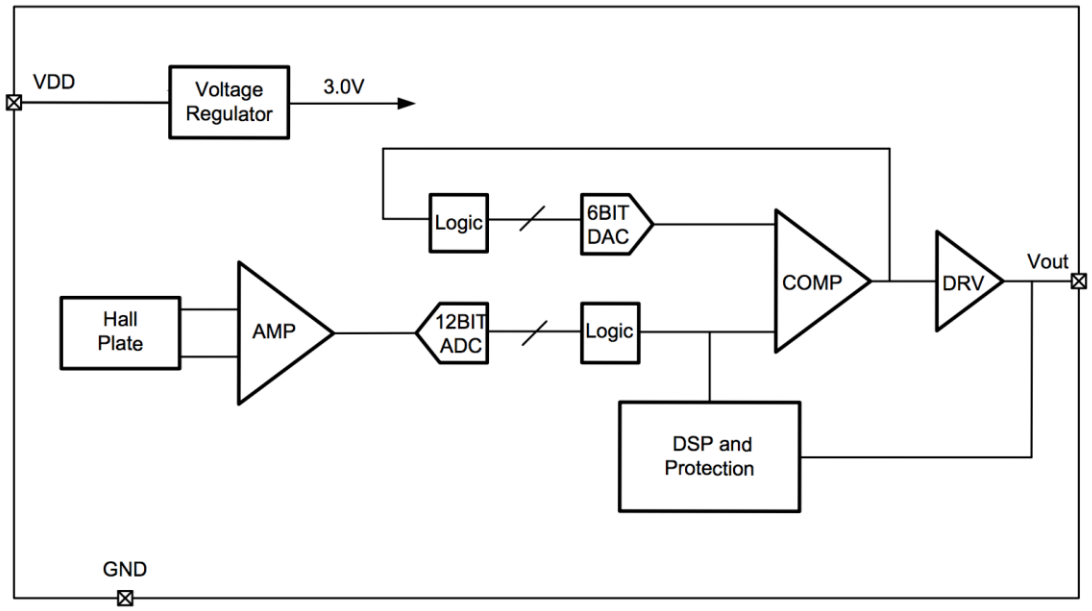
The device is available in a 3-pin SIP package and is lead (Pb) free, with 100% matte tin lead frame plating.

FEATURES

- Zero speed detection
- 4.5 to 24V supply operating range
- -40℃-150℃ operating temperature range
- Output protection against electrical disturbances
- Insensitive to orientation
- Self-adjusting magnetic range
- Short circuit protection
- RoHs compliant

CONTENTS

Block Diagram



ORDERING INFORMATION

Part Number	Packing	Mounting	Ambient, T_A	Marking
JYM16919	Tube,60 pieces/Tube	3-pin SIP	-40℃ to 150℃	900G

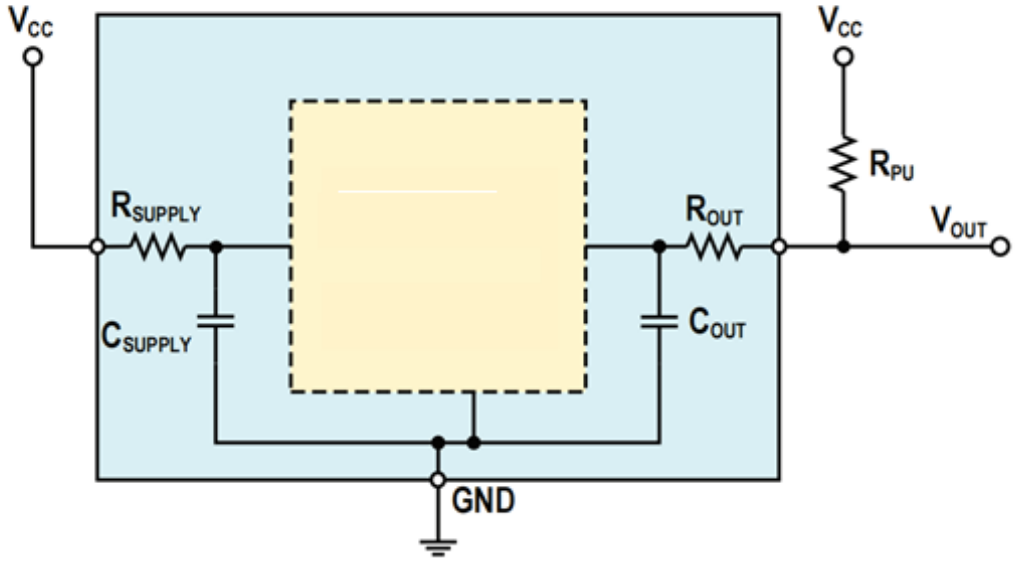
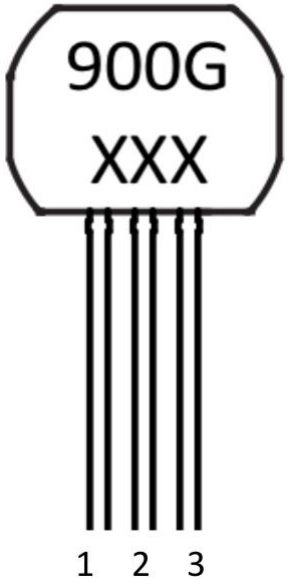


Figure 1. Typical circuit for the JYM16919

INTERNAL PASSIVE COMPONENTS RATINGS

Symbol	Characteristic	Rating	Unit
C_{SUPPLY}	Rated Nominal Capacitance	100	nF
C_{OUT}	Rated Nominal Capacitance	1	nF
R_{SUPPLY}	Rated Nominal Resistance	50	Ω
R_{OUT}	Rated Nominal Resistance	50	Ω

Pinout Diagram



Terminal		Type	Description
Name	Number		
V_{DD}	1	PWR	3.0 V ~ 24 V power supply
GND	2	Ground	Ground
OUT	3	Output	Open-drain output required a pull-up resistor

ABSOLUTE MAXIMUM RATINGS

over operating free-air temperature range

Parameter	Symbol	Min.	Max.	Units
Power supply voltage	V_{DD}	-0.5	30	V
Output terminal voltage	OUT	-0.5	30	V
Output terminal current sink	I_{SINK}	0	30	mA
Operating ambient temperature	T_A	-40	150	℃
Maximum junction temperature	T_J	-55	165	℃
Storage temperature	T_{STG}	-65	175	℃

Note: Stresses above those listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ESD PROTECTION

Human Body Model (HBM) tests according to: standard AEC-Q100-002

Parameter	Symbol	Min.	Max.	Units
ESD-Protection	V_{ESD}	-4	4	KV

THERMAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	Rating	Units
$R_{\theta JA}$	Package thermal resistance	Single-layer PCB, with copper limited to solder pads	166	℃/W

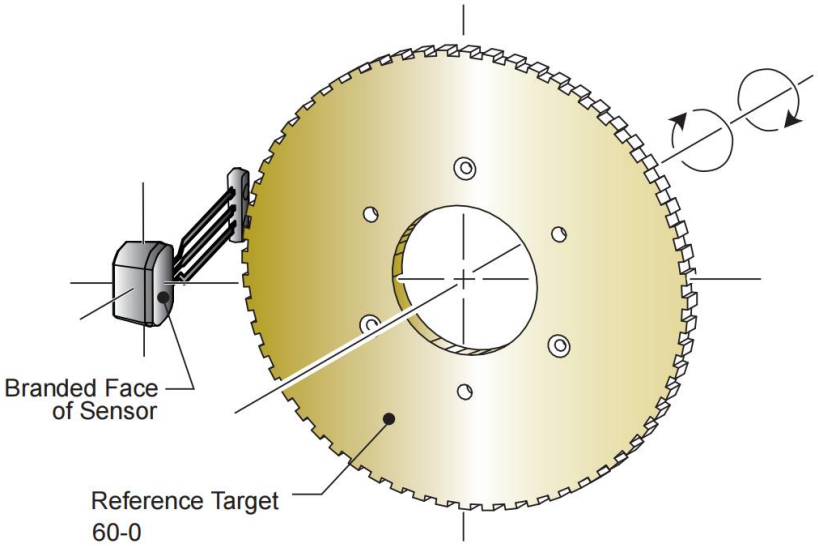


Figure 2: Reference Target Measurement Setup

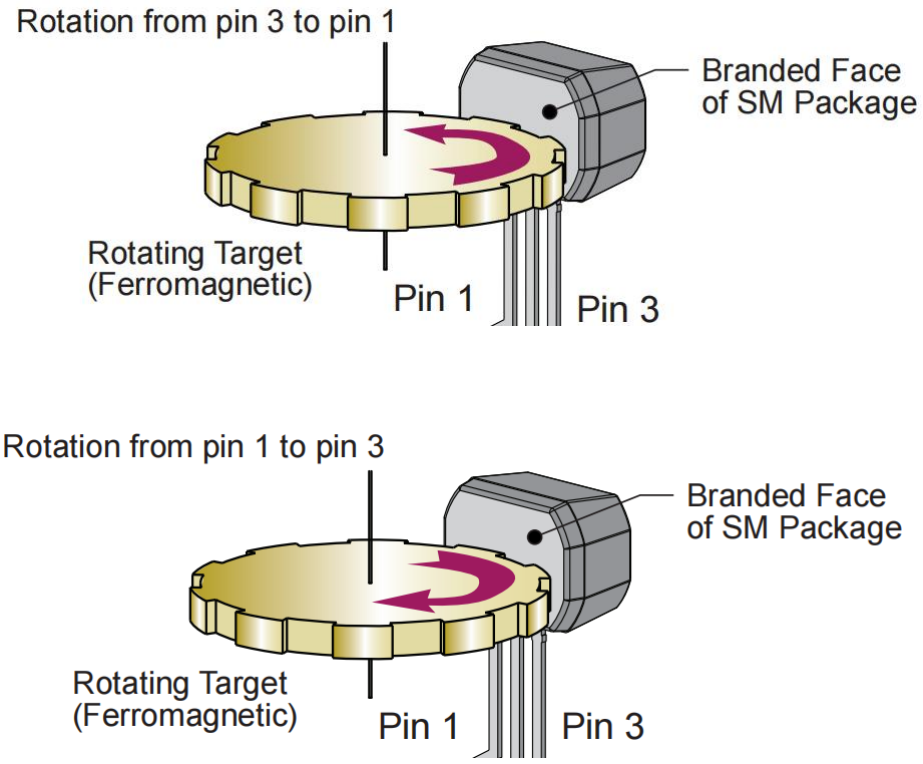


Figure 3: Sensor and target configuration. The out put is low when a tooth of the target gear is nearest the branded face of the package.

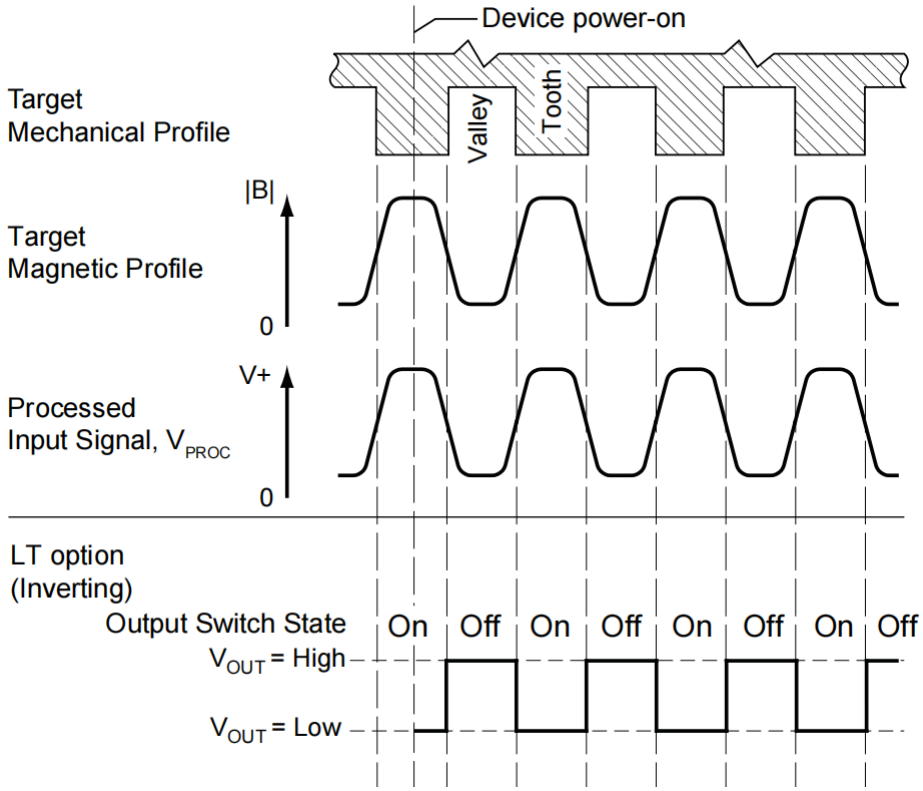


Figure 4: The magnetic profile reflects the features of the target, allowing the sensor IC to present an accurate digital representation of the target teeth.

OPERATING CHARACTERISTICS

over operating free-air temperature range (V_{DD}=12V, unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Electrical parameters						
V_{DD}	Operating voltage	$T_J<T_{J(max)}$	3	--	24	V
I_{DD}	Operating supply current	V_{DD}=3.0V to 24 V	1	2	3.5	mA
V_{Qsat}	Output saturation voltage	I_O=20mA, T_A=25℃	--	150	400	mV
I_{QL}	Output leakage current	V_{DD} < 24V	--	--	10	μA
t_{rp}[1]	Response time	V_{DD}>3.0V, f=1kHz	0	--	50	mS
t_r[2]	Output rise time	R1=1Kohm Co=20pF	--	--	0.5	μS
t_f	Output fall time	R1=1Kohm Co=20pF	--	--	0.5	μS
f_{cu}	Upper corner frequency	-3dB, single pole	--	20	--	kHz
f_{cl}	Lower corner frequency	-3dB, single pole	--	0	--	Hz
Magnetic Characteristics						
B_{Back}	Pre-induction		-3	--	300	mT
B_{OP}	Turn on hysteresis	B_{Back}=300mT	1	2.5	4	mT
B_{RP}	Turn off hysteresis	B_{Back}=300mT	1	2.5	4	mT
--	Linear Region	V_{DD}=3.0V to 24 V	50	0	300	mT

1mT=10Gs

[1]Time required to initialize device.

[2]Output Rise Time will be dominated by the RC time constant.

FUNCTIONAL DESCRIPTION

Internal Electronics

This device contains a self-calibrating Hall effect IC that includes a Hall element, a temperature compensated amplifier, and offset cancellation circuitry. The IC also contains a voltage regulator

that provides supply noise rejection over the operating voltage range. The Hall transducers and the electronics are integrated on the same silicon substrate by a proprietary BiCMOS process.

Changes in temperature do not greatly affect this device, due to the stable amplifier design and the offset rejection circuitry. The Hall IC supports a chopper stabilized Hall element that measures

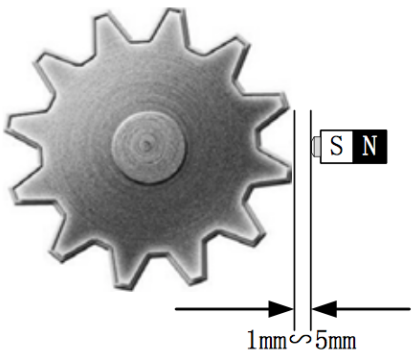
the intensity of magnetic gradients and provides an electrical signal that represents the target features.

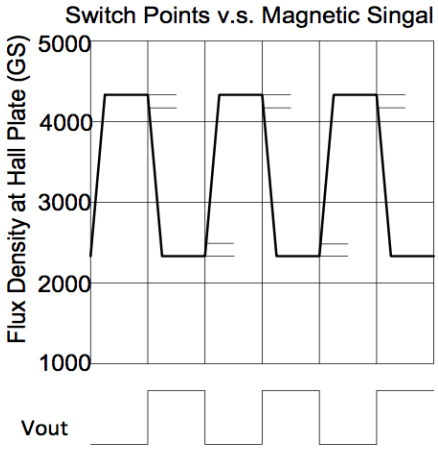
Hall Technology

The JYM16919 contains a single-chip Hall effect sensor IC, a 3-pin leadframe, a specially designed rare-earth pellet, and a ferrous pole piece (a precisely-mounted magnetic field concentrator).

The Hall IC supports a chopper stabilized Hall element that measures the magnetic gradient created by the passing of a fer romagnetic object. This is illustrated in figure 5. The difference in the magnetic gradients created by teeth and valleys allows the devices to generate a digital output signal that is representative of the target features.

Gear Tooth Sensing





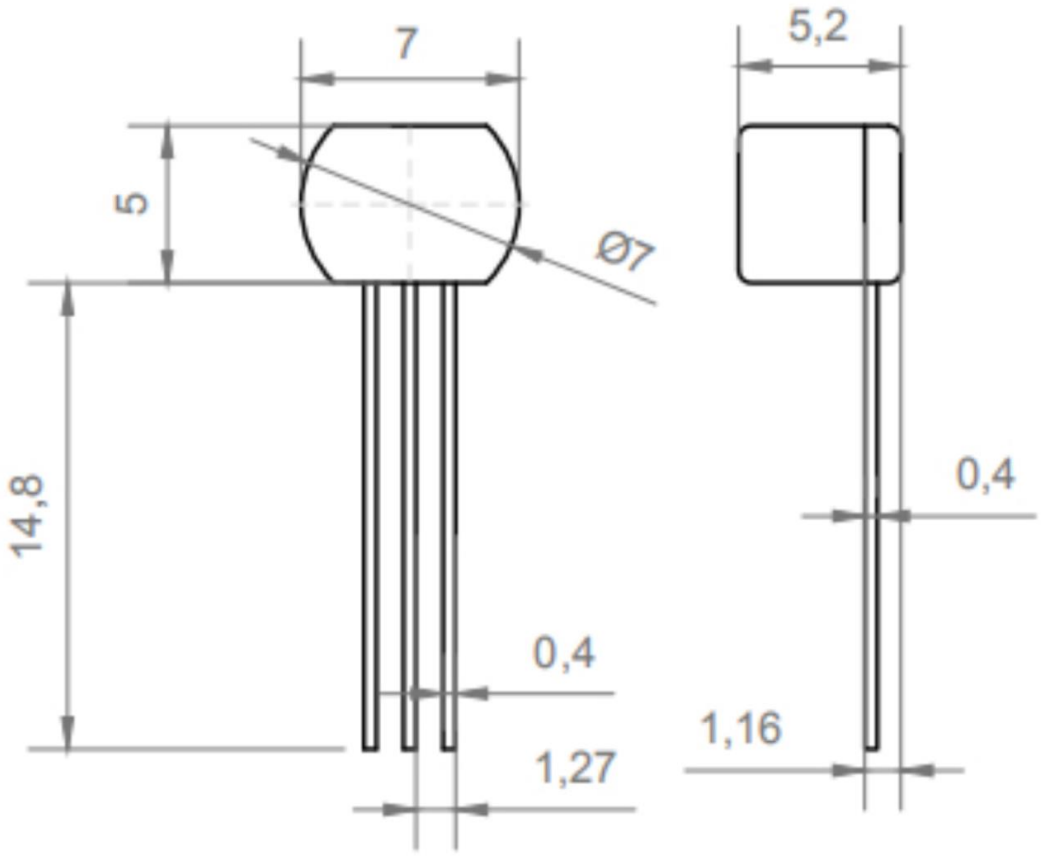
In the case of Ferromagnetic toothed wheel application the IC has to be biased by the south pole of a permanent magnet (Maximum 4000Gs). When assemble the sensor system, suggest choose a magnet as back bias flux from 1000Gs to 4000Gs. Normally the South pole of magnet faces the unbranded side of the IC and be glued to the back surface (non branded side) of the IC using a adhesive or suitable epoxy. Duo to the JYM16919 is “Self adjusting” over a wide range of back bias flux eliminating the need for any trimming in the application.

At the chip power on state, the output is reset to the high state whatever the field is. The output only changes after the first min is detected. The reset state holds no information about the field. If the supply of the chip is raised slowly, the reset state is not stable; the output maybe can’t set to the high state. The maximum air gap depends on

- the magnetic field strength (magnet used; pre-induction) and

- the toothed wheel that is used (dimensions, material, ect.) It is strongly recommended that an external ceramic bypass capacitor in the range 10nF to 1uF be connected between the supply and ground of the device to reduce external noise. The series resistor in combination with the bypass capacitor creates a filter for EMC pulse. The pull-up resistor should be chosen to limit the current though the output transistor; do not exceed the maximum continuous output current of the device.

Package Information



Notes:

1.Exact body and lead configuration at vendor's option within limits shown.

2.Height does not include mold gate flash.

3.Where no tolerance is specified, dimension is nominal.

REVISON HISTORY

Revision	Date	Description
Rev1.0	2016/8/15	Preliminary datasheet
Rev2.0	2022/12/18	The final revision datasheet