TMR134x

MicroAmpere High Frequency Response Omnipolar Magnetic Switch Sensor

Description

TMR134x is an omnipolar magnetic switch integrated the tunnel magnetoresistance (TMR) magnetic sensor and open-drain circuitry, which is able to detect the change of magnetic field and output high and low voltage signals for high accuracy position detection.

Unlike Hall/AMR sensors, TMR sensors with extremely high resistance values allows TMR134x to achieve the supply current as low as 1.5 μA while operating in the full-time power supply mode, and maintaining the response frequency of the magnetic signal is 1 kHz. Therefore, TMR134x can provide true continuous detection of magnetic field signals, avoiding sampling errors from the traditional time-sharing power supply mode.

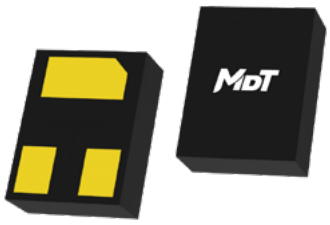
TMR134x allows a wide range of operating supply voltages from 1.8 V to 5.5 V with excellent temperature characteristics, and can meet the requirements of most applications. TMR134x is available in compact LGA3L (2 mm × 1.5 mm × 0.63 mm) packages.

Features and Benefits

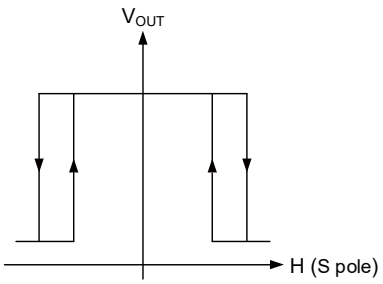
- Tunneling magnetoresistance (TMR) technology
- Low power consumption: supply current 1.5 μA
- High frequency response: typ.1 kHz
- Omnipolar operation
- Wide range supply voltages: 1.8 V to 5.5 V
- Open-drain push-pull output
- High sensitivity
- Excellent temperature stability
- High tolerance to external magnetic field interference
- RoHS & REACH compliant

Applications

- Utility meters: water, gas, and heat meters
- Proximity switches
- Speed sensing
- Linear and rotation position sensing



LGA3L



Selection Guide

Part Number	Supply Current	Response Frequency	Operating Ambient Temperature	Operating Point	Release Point	Package	Packing Form
TMR1341G	1.5 μA	1 kHz	-40°C to 125°C	±34 Gs	±30 Gs	LGA3L	Tape & Reel
TMR1342G	1.5 μA	1 kHz	-40°C to 125°C	±42 Gs	±37 Gs	LGA3L	Tape & Reel
Note: Please contact MultiDimension Technology local sales for customizing operating and release points.							

Catalogue

1. Functional Block Diagram

TMR134x series switch chips are composed of TMR sensors and signal processing circuits. The TMR sensor detects external magnetic field, generates an analog voltage signal, and outputs a logical switch level after processing by the circuits as shown in Figure 1.

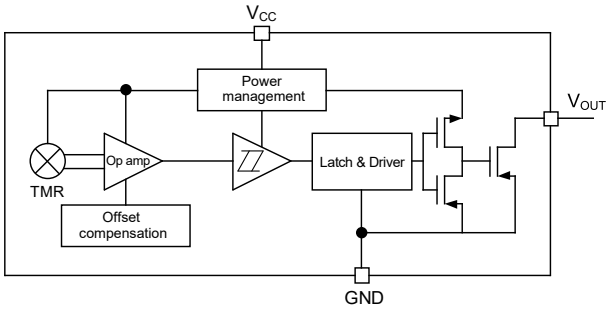


Figure 1. Block diagram

2. Switching Characteristics

The Figure 2 shows the sensing direction is parallel to the silkscreen surface of the package as shown by the arrow.

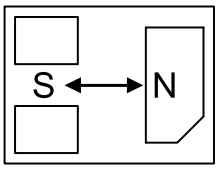


Figure 2. Sensing direction

The output is “High”, when power is on at zero magnetic field. B is the external magnetic field along the sensing direction, B_{OPS} (B_{OPN}) is the operating point, B_{RPS} (B_{RPN}) is the release point, and hysteresis B_H is define as the difference between B_{OPS} and B_{RPS} (B_{OPN} and B_{RPN}).

The sensor outputs a low level, when the magnetic field along the sensing axis exceeds the operate point B_{OPS} (B_{OPN}), and the device outputs a high level, when the magnetic field is reduced below the release point B_{RPS} (B_{RPN}) as shown in Figure 3.

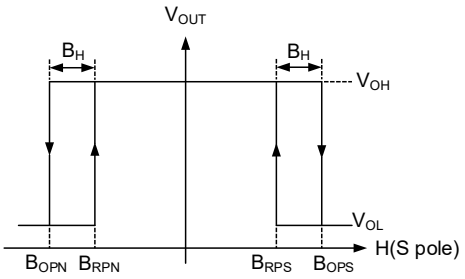


Figure 3. Switching characteristics

3. Pin Configuration

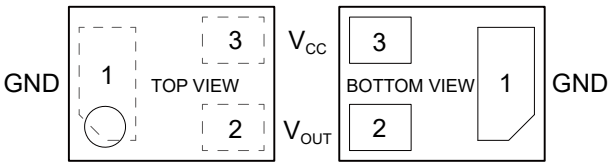


Figure 4. Pin configuration

Pin Number	Name	Function
1	GND	Ground
2	V_{OUT}	Output
3	V_{CC}	Power supply

4. Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Unit
Supply voltage	V_{CC}	-0.3	7	V
Output current	I_{SINK}	-	20	mA
Magnetic flux density	B	-	4000	Gs
ESD performance (HBM)	V_{ESD}	-	4	kV
Operating ambient temperature	T_A	-40	125	°C
Storage ambient temperature	T_{STG}	-50	150	°C

Note: I_{SINK} is the current flowing through the pin of sensor, when the output is turned on.

5. Electrical Specifications

V_{CC} = 3 V, T_A = 25 °C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	V_{CC}	operating	1.8	3.0	5.5	V
Output stress voltage	V_{stress}	-	-	-	5.5	V
Output leak current	I_{leak}	OUT = H	-	-	1	μA
On resistance of output	R_{ON}	OUT = L	-	-	10	Ω
Off resistance of output	R_{OFF}	OUT = H	-	10	-	MΩ
Output low voltage	V_{OL}	OP status	0	-	0.1	V
Supply current	I_{CC}	output open	-	1.5	-	μA
Response frequency	F	-	0 to 1000			Hz

Note: A 0.1 μF capacitor is connected between V_{CC} and GND, and 1 kΩ pull-up resistor is connected between V_{CC} and V_{OUT}

6. Magnetic Specifications

V_{CC} = 3 V, T_A = 25 °C, a 0.1 μF capacitor is connected between V_{CC} and GND

TMR1341G

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operate point	B_{OPS}	25	34	37	Gs
	B_{OPN}	-37	-34	-25	Gs
Release point	B_{RPS}	-	30	-	Gs
	B_{RPN}	-	-30	-	Gs
Hysteresis	B_H	-	4	-	Gs

TMR1342G

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operate point	B_{OPS}	-	42	-	Gs
	B_{OPN}	-	-42	-	Gs
Release point	B_{RPS}	-	37	-	Gs
	B_{RPN}	-	-37	-	Gs
Hysteresis	B_H	-	5	-	Gs

7. Typical Supply Voltage Characteristics

TMR1341G, 1342G Supply Voltage Characteristics

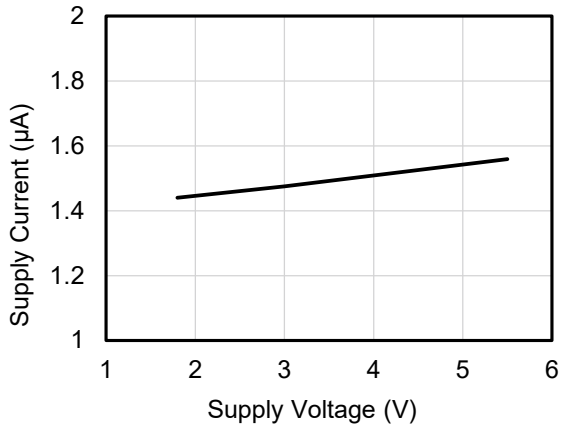


Figure 5. Supply current versus supply voltage (T_A=25°C)

TMR1341G Supply Voltage Characteristics

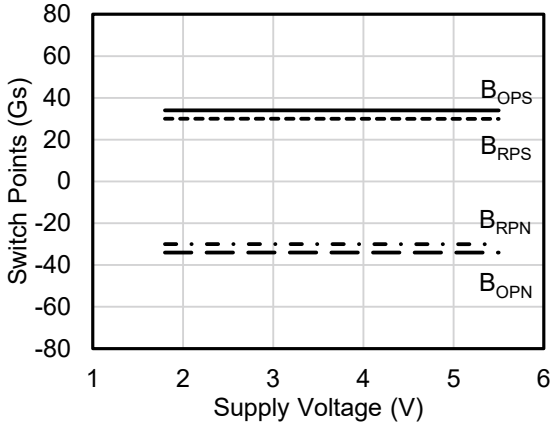


Figure 6. Switch points versus supply voltage (T_A=25°C)

TMR1342G Supply Voltage Characteristics

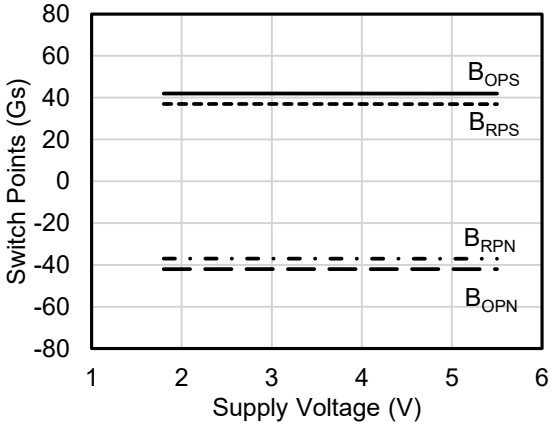


Figure 7. Switch points versus supply voltage (T_A=25°C)

8. Typical Temperature Characteristics

TMR1341G, 1342G Temperature Characteristics

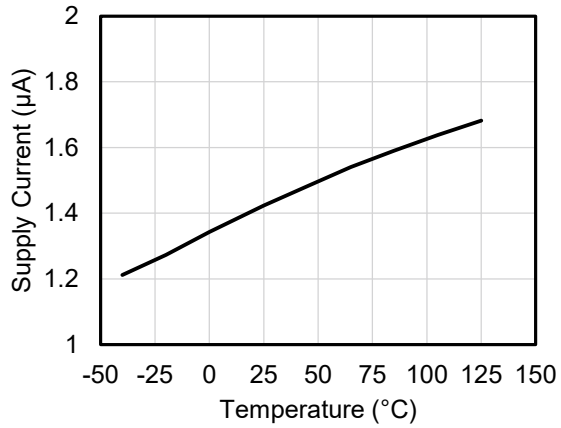


Figure 8. Supply current versus temperature (V_{CC} = 3 V)

TMR1341G Temperature Characteristics

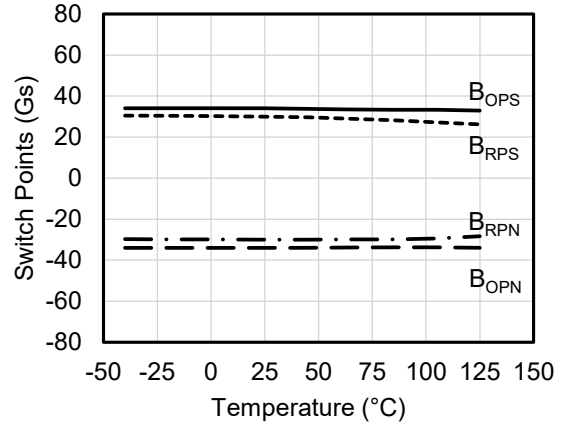


Figure 9. Switch points versus temperature (V_{CC} = 3 V)

TMR1342G Temperature Characteristics

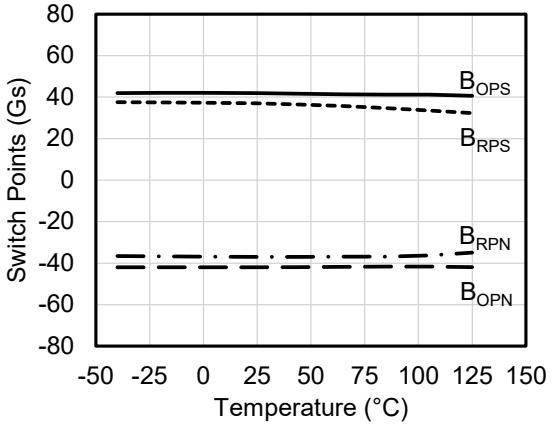


Figure 10. Switch points versus temperature (V_{CC} = 3 V)

9. Application Information

It is recommended to add a filter capacitor between the sensor power supply and ground (close to the sensor) to reduce external noise. As shown in Figure 11, the typical value is 0.1 μF.

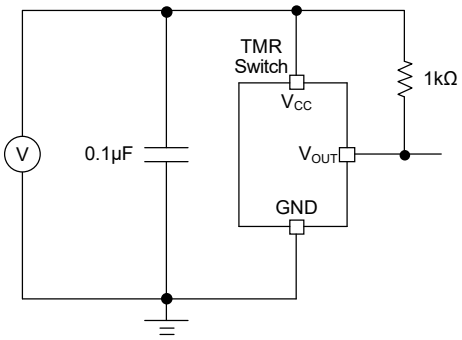


Figure 11. Application circuit diagram

The TMR134x series sensor chips are not suitable for driving power loads. The general method of use is utilizing the output voltage of V_{OUT} pin as a signal to input the MCU or drive a triode or MOS as shown in Figure 12.

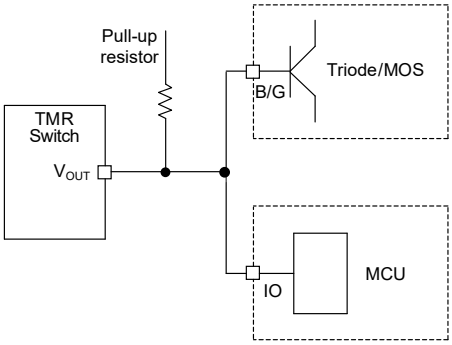


Figure 12. Application diagram for driving power load

Common failure conditions:

- The supply voltage exceeds the limit of absolute maximum ratings
- Absence of matching filter capacitor to power supply when the power supply is unstable, which can cause the product to restart repeatedly
- Using switch output V_{OUT} to control high-power relays, etc., and cause I_{SINK} exceeding the limit of absolute maximum ratings
- The external magnetic field exceeds the limit of absolute maximum ratings
- Operating in a humid environment for a long time, causing vapor penetration and increased power consumption
- Overheating when soldering
- Over bending of pins

10. Dimensions

LGA3L Package

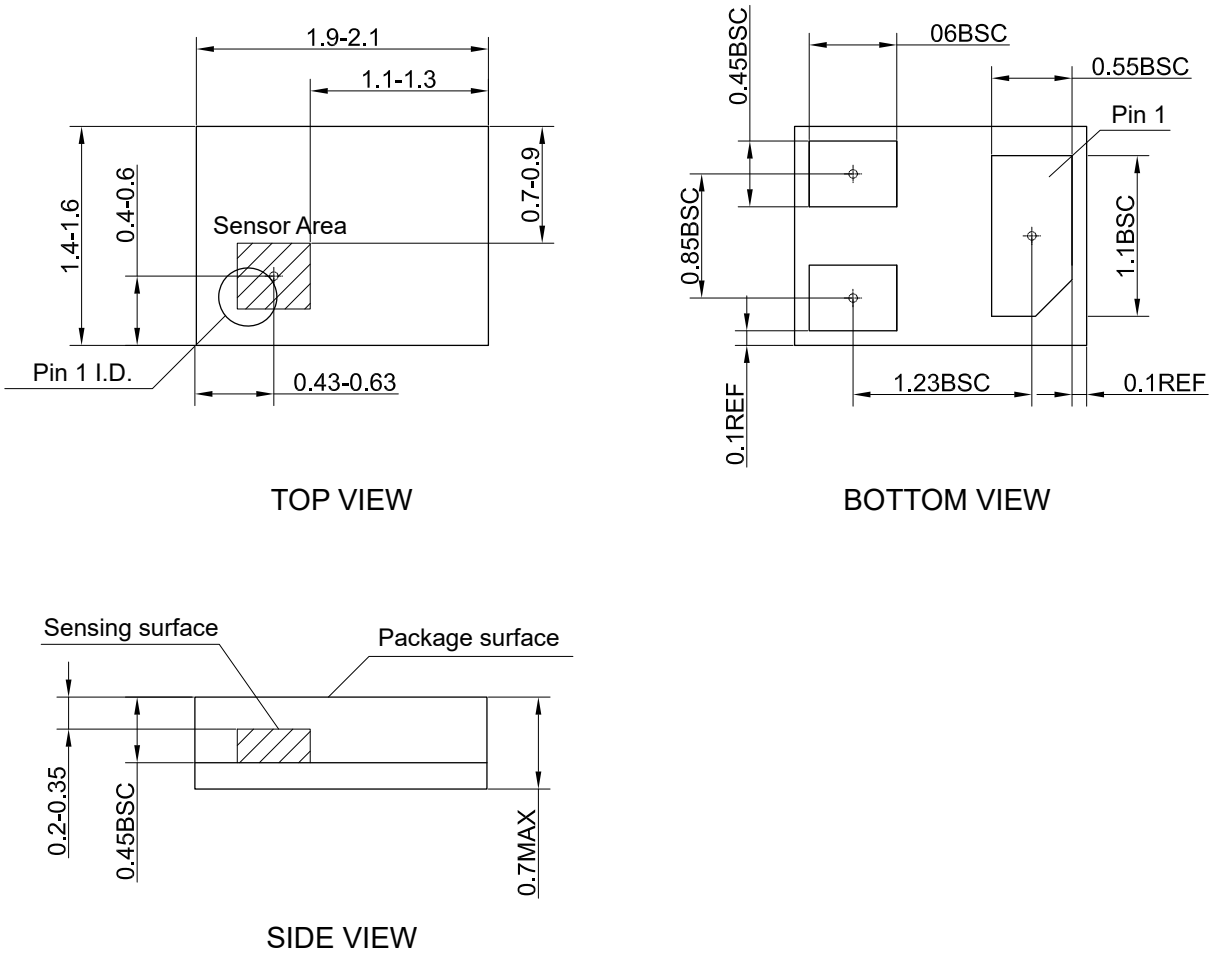


Figure 13. Package outline of LGA3L (unit: mm)

Recycling

The product(s) in this document need to be handed over to a qualified solid waste management services company for recycling in accordance with relevant regulations on waste classification after the end of the product(s) life.

MULTIDIMENSION
MultiDimension Technology Co., Ltd.
No.2 Guangdong Road, Zhangjiagang Free Trade Zone, Jiangsu, China
Web：www.dowaytech.com/en E-mail：info@dowaytech.com