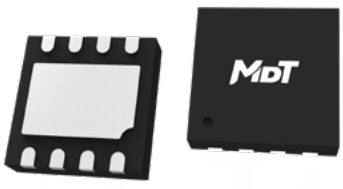
TMR1222 / TMR1228

MicroAmpere High Frequency Response Dual-Axis Bipolar Magnetic Switch Sensor

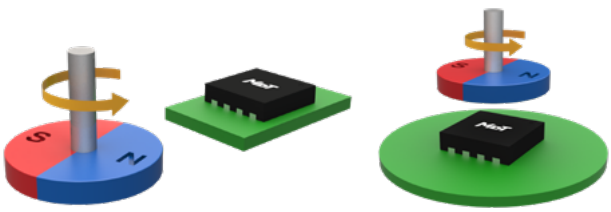
Description

The TMR1222/TMR1228 series magnetic switches integrated the tunneling magnetoresistance (TMR) magnetic sensor and CMOS 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 TMR1222/1228 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, the TMR1222/TMR1228 can provide true continuous detection of magnetic field signals, avoiding sampling errors from the traditional time-sharing power supply mode.



DFN8L

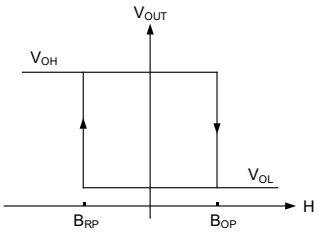


Features and benefits

- Tunneling magnetoresistance (TMR) technology
- Low power consumption: supply current 1.5 μA
- High frequency response: typ. 1 kHz
- Bipolar latching operation
- Wide range supply voltages: 1.8 V to 5.5 V
- CMOS 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
- Linear and rotation direction sensing



Selection Guide

Part Number	Supply Current	Response Frequency	Operating Ambient Temperature	Operating Point	Release Point	Package	Packing Form
TMR1222D	1.5 μA	0 to 1 kHz	-40 °C to 125 °C	17 Gs	-17 Gs	DFN8L	Tape & Reel
TMR1228D	1.5 μA	0 to 1 kHz	-40 °C to 125 °C	5 Gs	-5 Gs	DFN8L	Tape & Reel
Note: Please contact MultiDimension Technology local sales for customizing operating and release points.							

Catalogue

1. Functional Block Diagram

The TMR1222/TMR1228 series switches 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 circuit as shown in Figure 1.

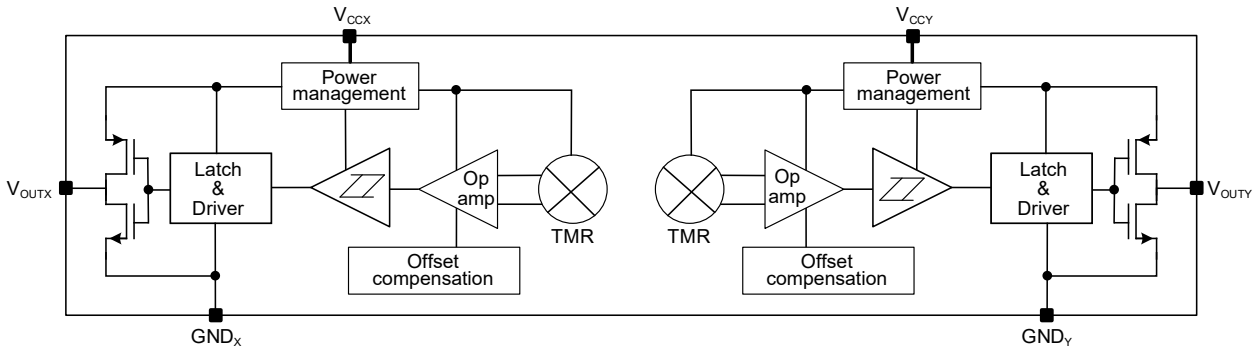


Figure 1. Block diagram

2. Switching Characteristics

The TMR1222/TMR1228 series switches' sensing directions are parallel to the silkscreen surface of the package as shown by the arrows in Figure 2.

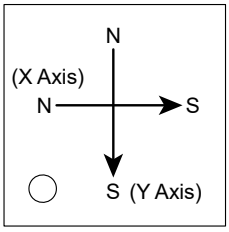


Figure 2. Sensing direction

The output is "High", when power is on at zero magnetic field. B is the external magnetic field along the sensing direction, B_{OP} is the operating point, B_{RP} is the release point, and hysteresis B_H is defined as the difference between B_{OP} and B_{RP}.

The sensor outputs a low level, when the magnetic field along the sensing axis exceed the operating point B_{OP}, and the device outputs a high level, when the magnetic field is reduced below the release point B_{RP} as shown in Figure 3.

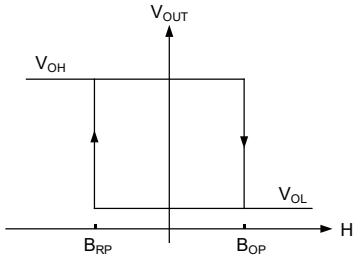


Figure 3. Switching characteristics

3. Pin Configuration

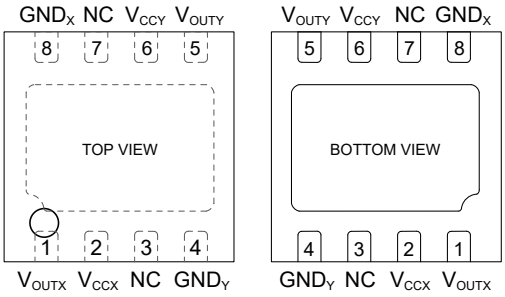


Figure 4. Pin configuration

Pin Number	Name	Function
1	V_{OUTX}	X axis output
2	V_{CCX}	X axis power supply
3	NC	NC
4	GND_Y	Y axis ground
5	V_{OUTY}	Y axis output
6	V_{CCY}	Y axis power supply
7	NC	NC
8	GND_X	X axis ground

4. Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Unit	Applicable Part Number
Supply voltage	V_{CC}	-0.3	7	V	All parts
Output current	I_{SINK} and I_{SOURCE} 1)	-	9	mA	All parts
Magnetic flux density	B	-	4000	Gs	All parts
ESD performance (HBM)	V_{ESD}	-	4	kV	All parts
Operating ambient temperature	T_A	-40	125	°C	All parts
Storage ambient temperature	T_{STG}	-50	150	°C	All parts

1) I_{SINK} is the current flowing through the pin of switch, when the output is turned on, and I_{SOURCE} is the current flowing through the pin of the switch, when the output is turned off.

5. Electrical Specifications

V_{CC} = 3.0 V, T_A = 25 °C, a 0.1 μF capacitor is connected between V_{CC} and GND unless specified otherwise

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Applicable Part Number
Supply voltage	V_{CC}	operating	1.8	3.0	5.5	V	All parts
Output high voltage	V_{OH}	RP status	V_{CC}-0.3	-	V_{CC}	V	All parts
Output low voltage	V_{OL}	OP status	0	-	0.2	V	All parts
Supply current	I_{CC} 2)	OP and RP status	0.5	1.5	2	μA	All parts
Response frequency	F	-	0 to 1000			Hz	All parts

2) I_{CC} defines the single axis mode current consumption. Dual axis mode current consumption is 2X single axis mode consumption.

6. Magnetic Specifications

V_{CC} = 3.0 V, T_A = 25 °C, a 0.1 μF capacitor is connected between V_{CC} and GND unless specified otherwise

TMR1222

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operate point	B_{OPX}, B_{OPY}	10	17	25	Gs
Release point	B_{RPX}, B_{RPY}	-25	-17	-10	Gs
Hysteresis	B_{HX}, B_{HY}	20	-	50	Gs

TMR1228

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operate point	B_{OPX}, B_{OPY}	2	5	9	Gs
Release point	B_{RPX}, B_{RPY}	-9	-5	-2	Gs
Hysteresis	B_{HX}, B_{HY}	4	-	18	Gs

7. Typical Supply Voltage Characteristics

TMR1222D Supply Voltage Characteristics

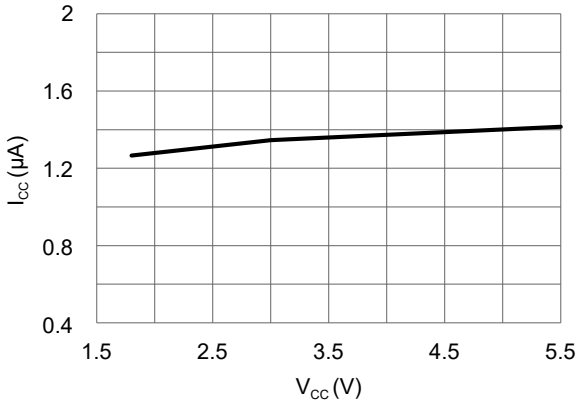


Figure 5. Supply current versus supply voltage (T_A=25°C)

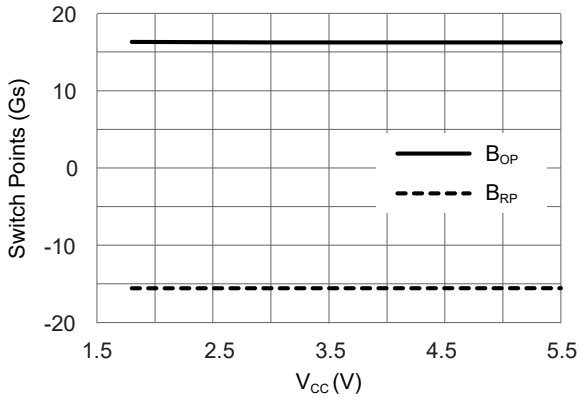


Figure 6. Switch points versus supply voltage (T_A=25°C)

TMR1228D Supply Voltage Characteristics

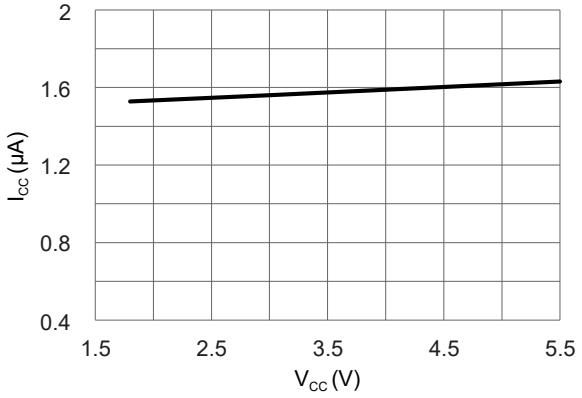


Figure 7. Supply current versus supply voltage (T_A=25°C)

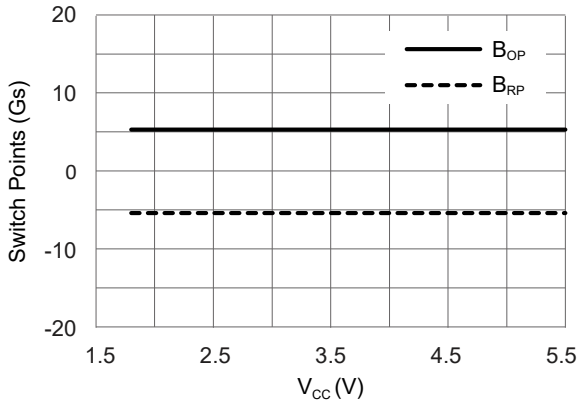


Figure 8. Switch points versus supply voltage (T_A=25°C)

8. Typical Temperature Characteristics

TMR1222D Temperature Characteristics

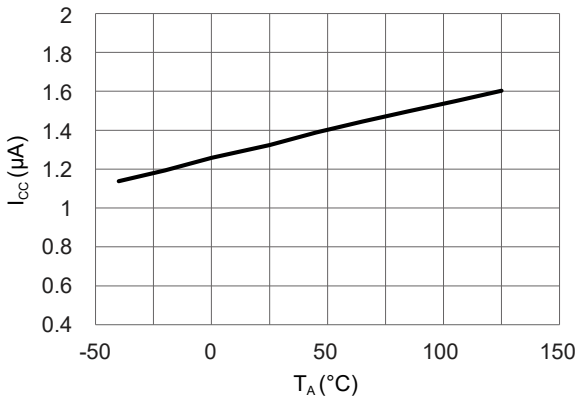


Figure 9. Supply current versus temperature (V_{CC} = 3 V)

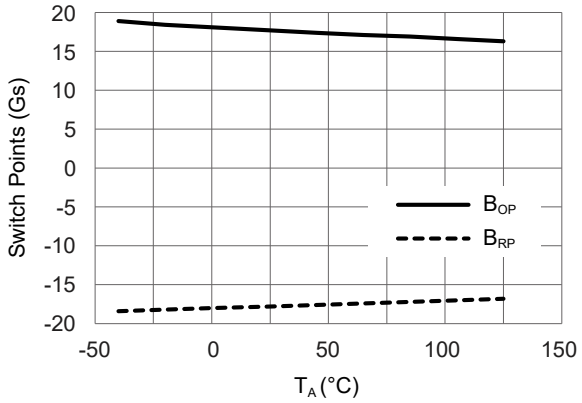


Figure 10. Switch points versus temperature (V_{CC} = 3 V)

TMR1228D Temperature Characteristics

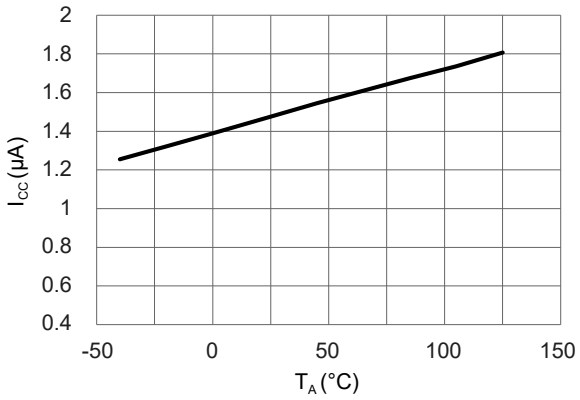


Figure 11. Supply current versus temperature (V_{CC} = 3 V)

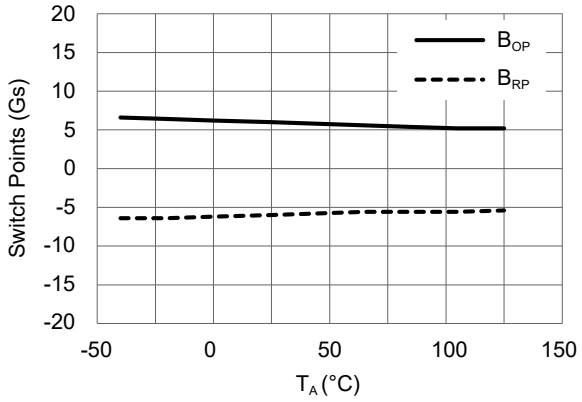


Figure 12. Switch points versus temperature (V_{CC} = 3 V)

9. Application Information

IIt is recommended to add a filter capacitor with the typical value of 0.1 μF between the switch power supply and ground (close to the sensor) to reduce external noise as shown in Figure 13.

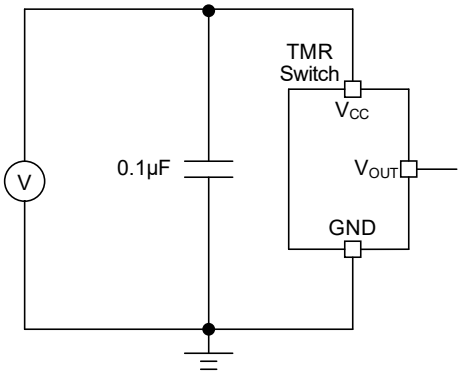


Figure 13. Application circuit diagram

The TMR1222/1228 series switches are not suitable for driving power loads. Figure 14 illustrates the general method of improving the drive capability is utilizing the output voltage of V_{OUT} pin as a signal to input the MCU or drive a triode or MOS.

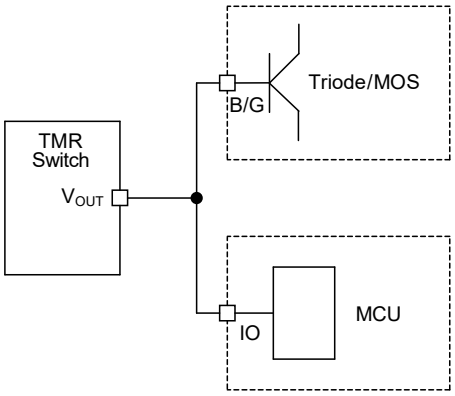


Figure 14. Application diagram for driving power load

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} and I_{SOURCE} 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

DFN8L Package

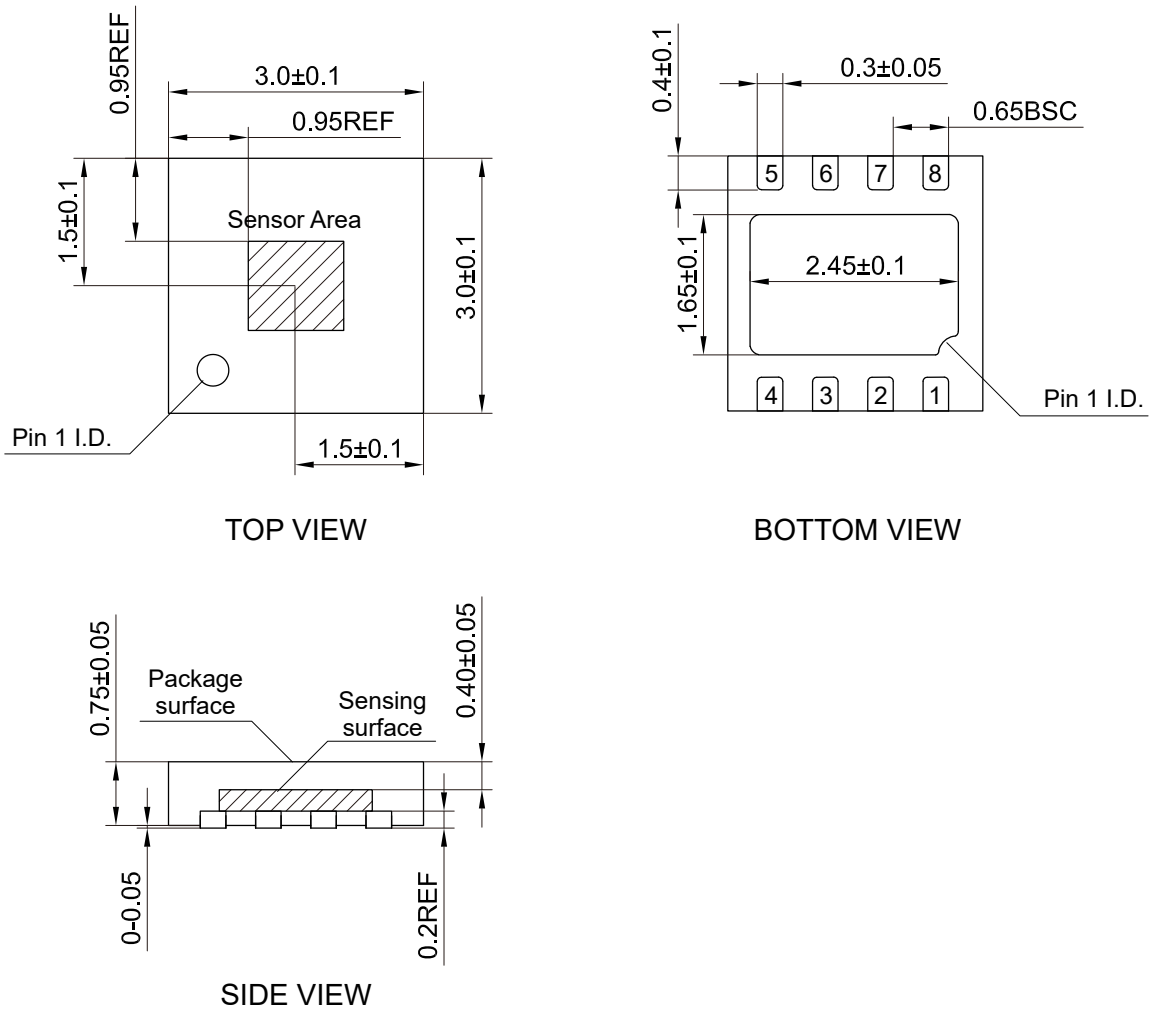


Figure 15. Package outline of DFN8L (unit: mm)

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