TMR265x

High Frequency Response Programmable TMR Linear Magnetic Sensor

Description

The TMR265x is a tunneling magnetoresistance (TMR) linear sensor with a dedicated signal conditioning circuit built in. The integrated signal conditioning circuit of TMR265x is able to calibrate zero offset, gain, temperature coefficient of sensitivity (TCS) and temperature coefficient of zero offset (TCO) of the TMR bridge circuit, and outputs the conditioned voltage signals.

In addition to TMR's intrinsic advantages of high resolution, high signal-to-noise ratio, and low power consumption, TMR265x series linear sensors also provide the following characteristics:

1. Fixed voltage output range in linear range
2. Excellent sensitivity consistency
3. Minimal zero drift
4. Low temperature coefficient of sensitivity
5. Low temperature coefficient of offset

This improvement greatly enhances the convenience of design and use of TMR linear sensor products.

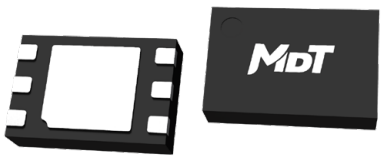
The TMR265x linear magnetic sensor is available in DFN6L (3 mm × 2 mm × 0.75mm) package with P/N of TMR2651D and TMR2652D.

Features and Benefits

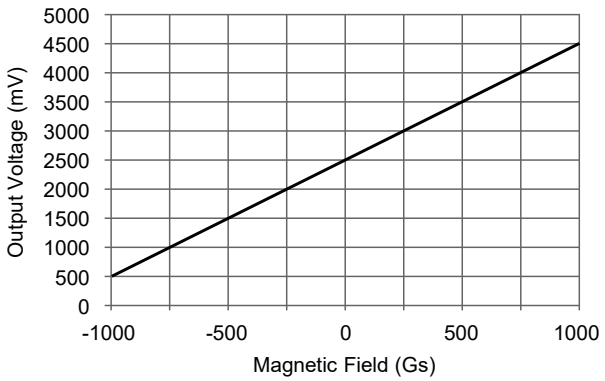
- Tunneling magnetoresistance (TMR) technology
- High frequency response: DC to 2 MHz
- Large dynamic range: TMR2651D: ±1000 Gs
  TMR2652D: ±500 Gs
- Wide range supply voltages: 3 V to 5.5 V
- Nonlinearity: 0.2%
- Programmable sensitivity and zero offset
- Programmable temperature compensation
- RoHS & REACH compliant

Applications

- Current sensor
- Linear position sensor
- Gaussmeter
- Encoder



DFN6L



TMR2651D ±1000 Gs Output Curve

Selection Guide

Part Number	Supply Voltage	Linear Range	Non-Linearity	Package	Packing Form
TMR2651D	3 V to 5.5 V	±1000 Gs	0.2 %	DFN6L	Tape & Reel
TMR2652D	3 V to 5.5 V	±500 Gs	0.2 %	DFN6L	Tape & Reel

Catalogue

1. Functional Block Diagram

TMR265x integrates a linear TMR magnetic sensor and a dedicated signal conditioning chip with a single-ended analog voltage output signal. The V_{OUT} pin can be reused as the OWI (one-wire-interface) protocol programming interface, to adjust zero-point, sensitivity, reference voltage V_{REF} and other parameters in a targeted manner.

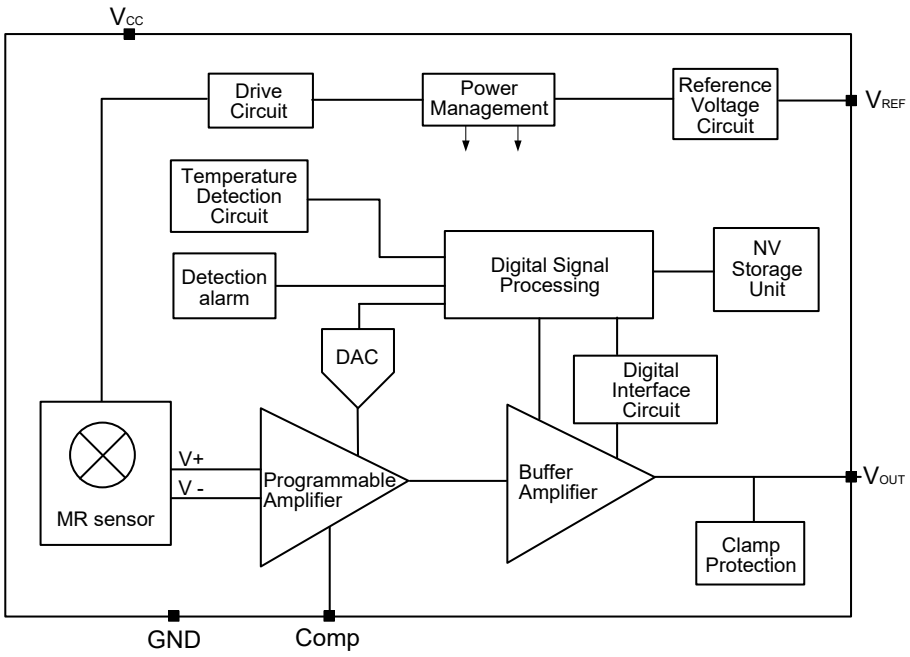


Figure 1. Block diagram of TMR265x

2. Pin Configuration

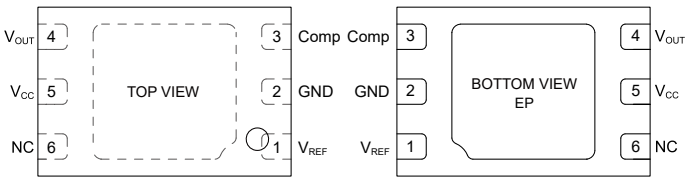


Figure 2. Pin configuration (DFN6L)

Number	Name	Function
1	V_{REF}	Reference voltage output
2	GND	Ground
3	Comp	Analog voltage
4	V_{OUT}	Analog output / OWI communication interface
5	V_{CC}	Power supply
6	NC	Not connected
	EP	Heat dissipation

3. Sensing Direction

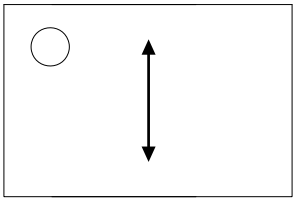


Figure 3. Sensing direction

4. Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Unit
Supply voltage	V_{CC}	3	5.5	V
Supply current	I_{CC} [1)]	-	8	mA
External magnetic field	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

1) Supply current I_{CC} refers to the current to operate after calibration.

5. Electrical Specifications

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Applicable Part Number
Supply voltage	V_{CC}	T_A = 25 °C	3	3.3/5	5.5	V	All parts
Supply current	I_{CC}	V_{CC} = 5 V, T_A = 25 °C	-	5	8	mA	All parts
Power-on time	t_{PO}	T_A = 25 °C	-	100	-	μs	All parts
Linear range	B_{LIN}	-	-1000	-	1000	Gs	TMR2651D
		-	-500	-	500	Gs	TMR2652D
Sensitivity	SEN [2)]	V_{CC} = 5 V, T_A = 25 °C	1 to 100 programmable			mV/Gs	All parts
		V_{CC} = 3.3 V, T_A = 25 °C					All parts
Zero offset	V_{OFFSET}	V_{CC} = 5 V, T_A = 25 °C	-	2.5	-	V	All parts
		V_{CC} = 3.3 V, T_A = 25 °C	-	1.65	-	V	All parts
Reference voltage	V_{REF}	V_{CC} = 5 V, T_A = 25 °C	-	2.5	-	V	All parts
		V_{CC} = 3.3 V, T_A = 25 °C	-	1.65	-	V	All parts
Hysteresis	HYS	T_A = 25 °C, ±200 Gs	-	0.2	-	Gs	All parts
		T_A = 25 °C, ±500 Gs	-	0.5	-	Gs	All parts
		T_A = 25 °C, ±1000 Gs	-	1	-	Gs	All parts
		T_A = 25 °C, ±1500 Gs	-	1.5	-	Gs	All parts
Nonlinearity	NONL	T_A = 25 °C	-	0.2	-	%FS	All parts
Temperature coefficient of sensitivity	TCS [3)]	-40 °C to 125 °C	-	50	-	PPM/°C	All parts
Noise	Noise	T_A = 25 °C, 1Hz	-	150	-	nT/rt(Hz)	All parts
			-	20	-	μV/rt(Hz)	All parts
Temperature coefficient of offset	TCO [4)]	-40 °C to 125 °C	-	0.1	-	mV/°C	All parts
Response frequency	F	varies with gain	DC to 2 MHz				All parts

2) The typical value of sensitivity is programmable via OWI protocol.

3) The sensor can be programmed to perform multi-point temperature measurement to calibrate TCS for better performance.

4) The sensor can be programmed to perform multi-point temperature measurement to calibrate TCO for better performance.

6. Typical Bandwidth Characteristics

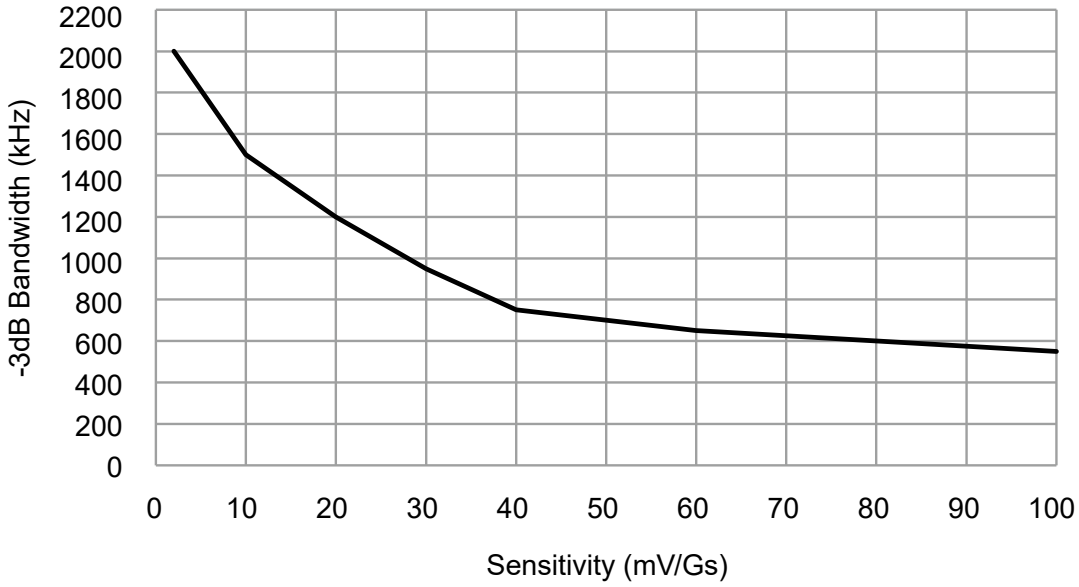
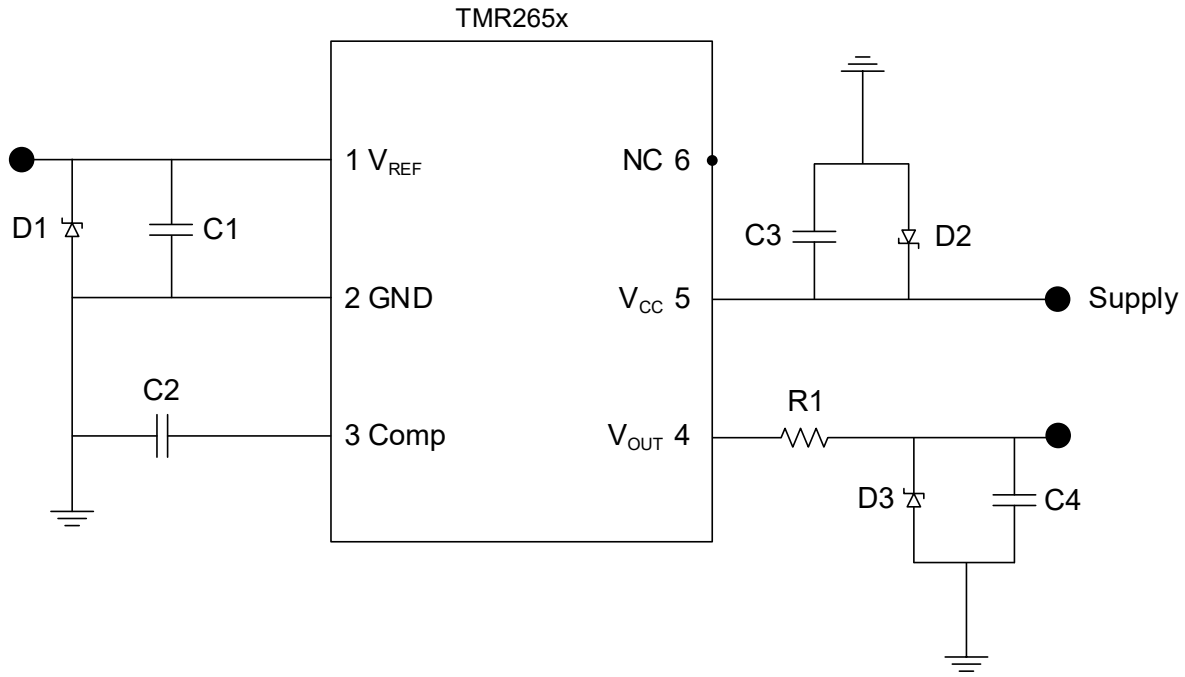


Figure 4. Bandwidth versus sensitivity

7. Application Information



Note:

R1	-	R1/C4: for output pin RC filtering
C1	20 pF	Connects V_{REF} to GND for reference voltage filtering
C2	20 pF	Connects Comp to V_{OUT} for output voltage filtering
C3	0.1 μF	Connects V_{CC} to GND for supply voltage filtering
C4	-	R1/C4: for output pin RC filtering
D1	ESD5341N_5V/NA	Dual lead bidirectional 5V transient voltage suppression devices for ESD/surge protection.
D2	ESD5341N_5V/NA	Dual lead bidirectional 5V transient voltage suppression devices for ESD/surge protection.
D3	ESD5341N_5V/NA	Dual lead bidirectional 5V transient voltage suppression devices for ESD/surge protection.

Figure 5. Typical application circuit

Please refer to the TMR265x product application manual for more product applications and OWI programming instructions.

8. Dimensions

DFN6L Package

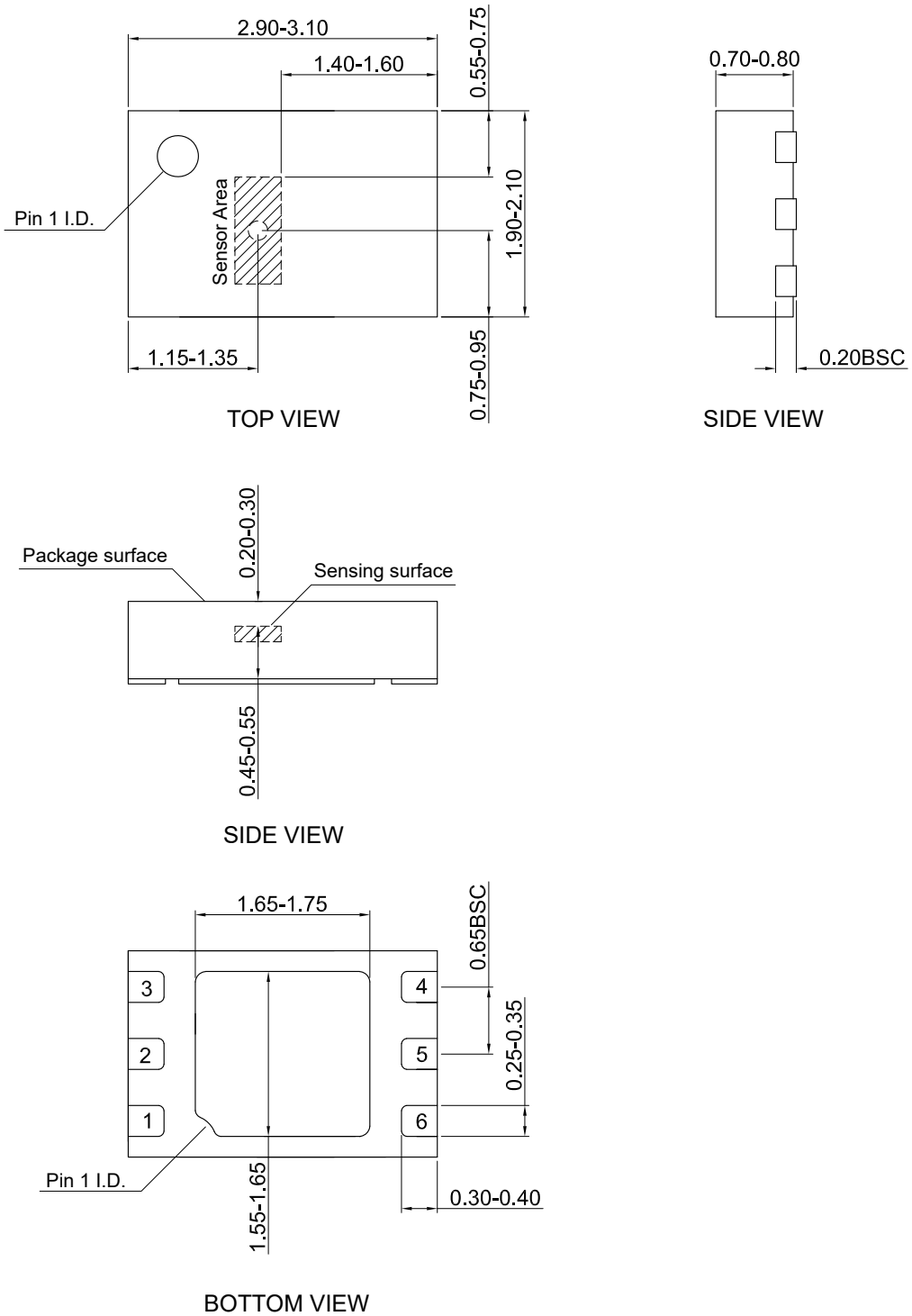


Figure 6. Package outline of DFN6L (unit: mm)

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.

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