

IST8503

Ultralow Power Omnipolar TMR Switch

Datasheet

Table of Contents

1. GENERAL DESCRIPTION	3
2. BLOCK DIAGRAM, PACKAGE DIMENSIONS, PIN CONFIGURATION, AND APPLICATION CIRCUIT	4
2.1. Block Diagram.....	4
2.2. Package Dimensions.....	4
2.3. Land Pattern (for reference only)	5
2.4. TMR Element Location	5
2.5. Marking Information.....	6
2.6. Pin Configuration	6
2.7. Axis of Sensitivity	6
2.8. Application Circuit	7
3. ELECTRICAL SPECIFICATIONS.....	7
3.1. Absolute Maximum Ratings ($T_A=25^{\circ}\text{C}$ unless otherwise noted)	7
3.2. Recommended Operating Conditions ($T_A=25^{\circ}\text{C}$, unless otherwise noted)	7
3.3. Electrical Characteristics	8
3.4. Magnetic Characteristics	8
3.5. Output Vs. Magnetic Pole	8
4. PACKING INFORMATION.....	9
5. LEGAL DISCLAIMER	10
5.1. Warranty and Liability Disclaimer	10
5.2. Application Disclaimer	10
5.3. Disclaimer Regarding Changes	10

1. General Description

IST8503 is an ultra-low power, omnipolar digital magnetic switch based on Tunneling Magnetoresistance (TMR) technology. It integrates a TMR sensor, power management circuitry, chopper-stabilized amplifier, Schmitt trigger, and CMOS-compatible open-drain output.

Featuring a built-in temperature compensation circuit and optimized for low current operation (as low as 1.5 μ A), the IST8503 operates across a wide supply voltage and temperature range. Its high sensitivity and minimal power consumption make it ideal for battery-powered applications that require both performance and efficiency.

Features

- Tunneling Magnetoresistance (TMR) technology
- Ultra-low power consumption: 1.5 μ A (typ.)
- High magnetic sensitivity: Operate point of 14 G (typ.)
- Omnipolar response: activates with either North or South magnetic pole
- Digital open-drain output
- Operating frequency: 1000 Hz
- Wide supply voltage range: 2.4 V to 5.5 V
- Compact SOT23-3L package
- RoHS, Halogen-Free (HF), and TSCA compliant

Applications

- Solid-state switches
- Water meters
- Gas meters
- Industrial smoke detectors

2. Block Diagram, Package Dimensions, Pin Configuration, and Application Circuit

2.1. Block Diagram

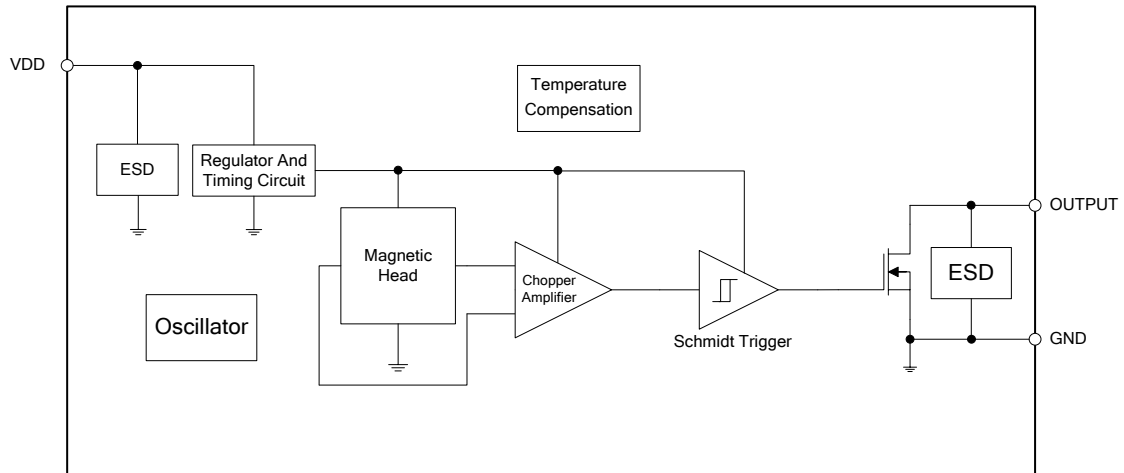


Figure 1. Block Diagram of IST8503

2.2. Package Dimensions

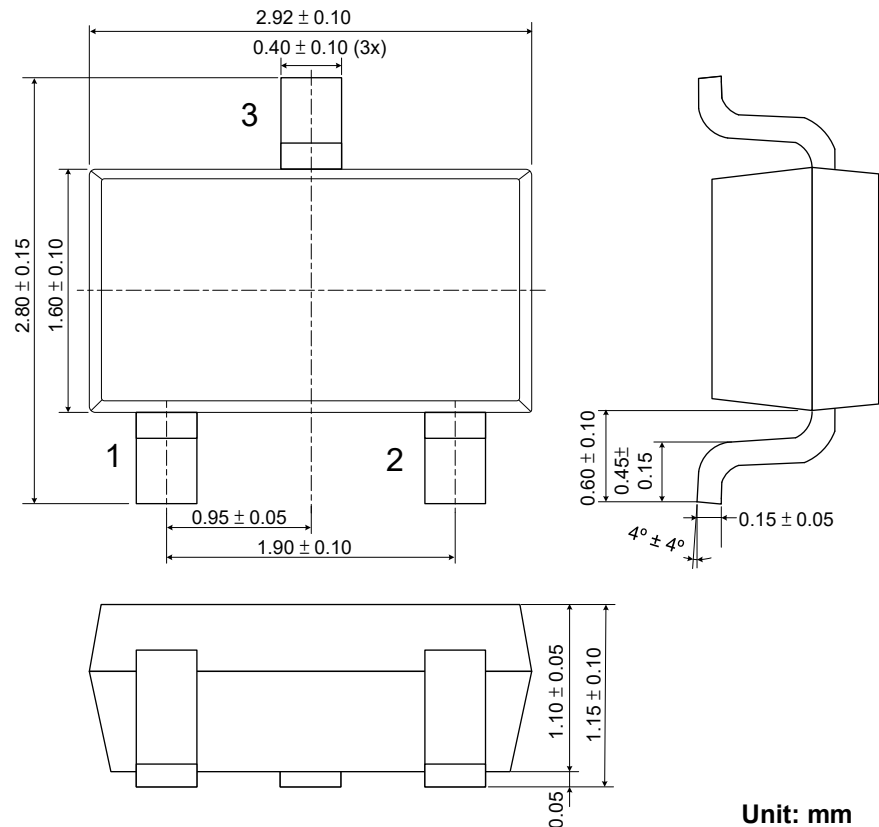


Figure 2. Package Dimensions

2.3. Land Pattern (for reference only)

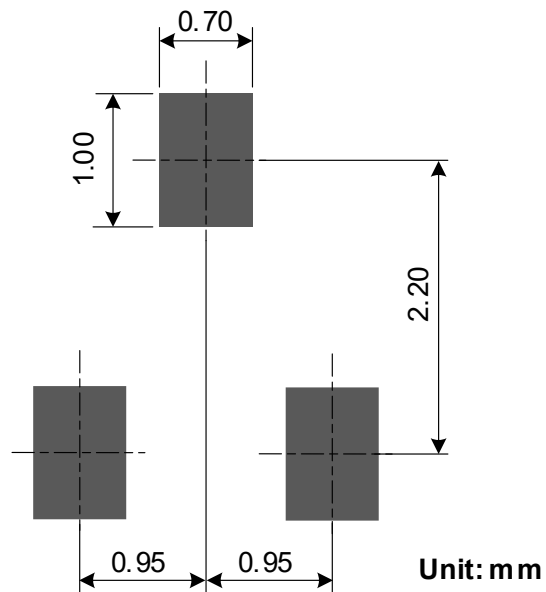


Figure 3. Land Pattern Dimension

2.4. TMR Element Location

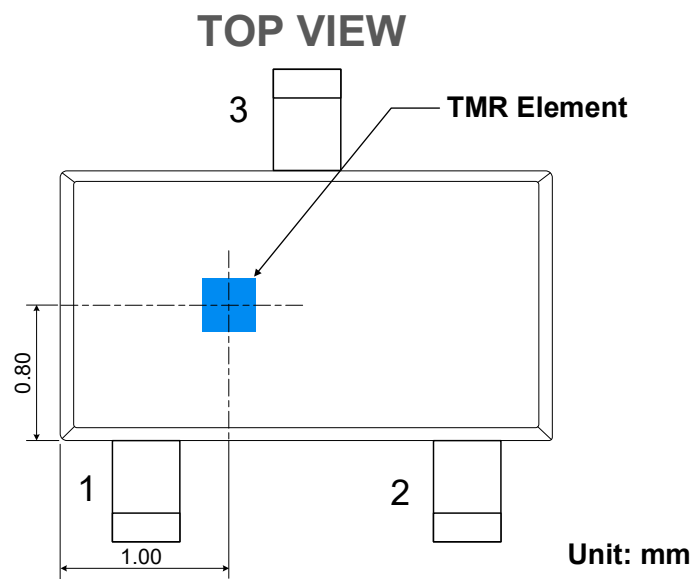


Figure 4. TMR Sensing Element Location

2.5. Marking Information

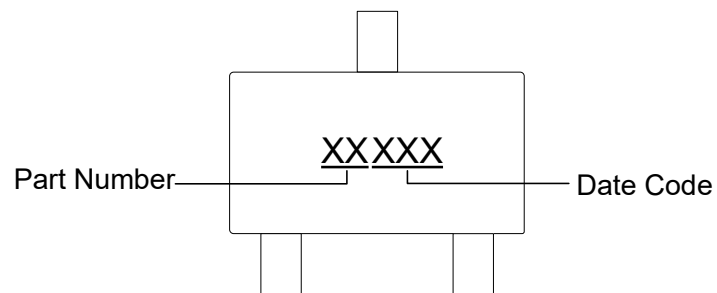


Figure 5. Marking

2.6. Pin Configuration

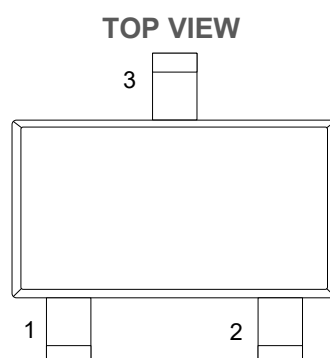


Figure 6. Pin Configuration

Pin Name	Pin Number	Description
V_{DD}	1	Supply Voltage
OUTPUT	2	Output
GND	3	Ground

2.7. Axis of Sensitivity

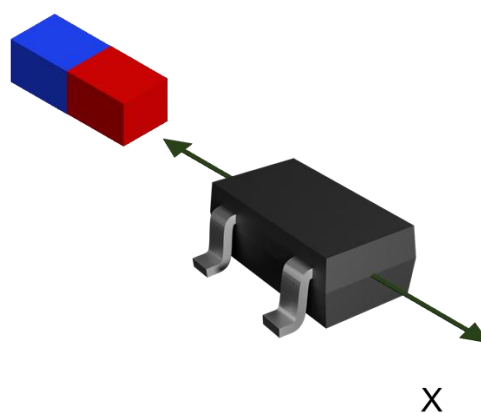


Figure 7. Axis of Sensitivity

2.8. Application Circuit

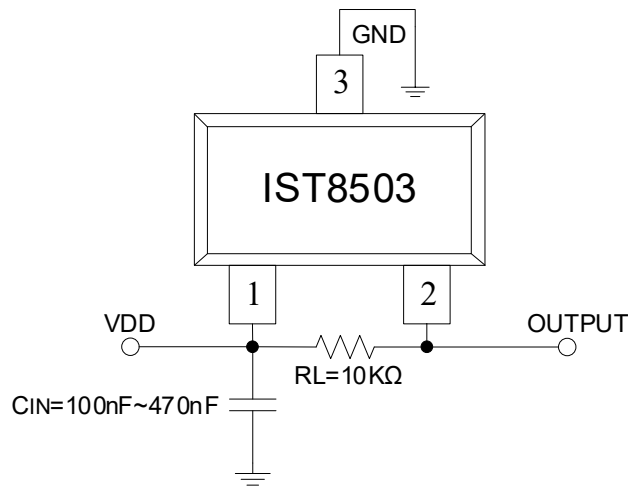


Figure 1. Application circuit

Note: C_{IN} is used for power supply stabilization and to enhance noise immunity. A capacitance value in the range of 100 nF to 470 nF is recommended.

3. Electrical Specifications

3.1. Absolute Maximum Ratings ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Rating	Unit
VDD To GND	VDD	-0.3 to 7	V
Magnetic Flux Density	B	2800	G
Storage Temperature	T_S	-65 to 150	$^{\circ}\text{C}$
Operating Junction Temperature	T_J	-40 to 150	$^{\circ}\text{C}$
Maximum Power Dissipation	P_D	230	mW
Maximum Soldering Temperature (At leads, 10 s)	T_{LEAD}	260	$^{\circ}\text{C}$

3.2. Recommended Operating Conditions ($T_A=25^{\circ}\text{C}$, unless otherwise noted)

Parameter	Symbol	Conditions	Rating	Unit
Supply Voltage	V_{DD}	Operating	2.4 – 5.5	V
Operating Temperature	T_A	Operating	-40 – 125	$^{\circ}\text{C}$

3.3. Electrical Characteristics

(Typical values are at $T_A = 25^\circ\text{C}$, $V_{DD} = 3.3\text{ V}$, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{OL}	Output Low Level	$I_{OUT} = 1\text{ mA}$	-0.3	0.006	0.3	V
$R_{DS(ON)}$	OD Output FET Resistance	Output Low, $V_{DD} = 3.3\text{ V}$	-	-	10	Ω
I_{OFF}	Output Leakage Current	$V_{OUT} = 3.3\text{ V}$, Output off	-	<0.1	1	μA
I_{DD}	Supply Current	Average Supply Current, $T_A = 25^\circ\text{C}$, $V_{DD} = 3.3\text{ V}$	-	1.5	1.8	μA
f	Operating Frequency			1000		Hz

3.4. Magnetic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
South Pole Operate Point	B_{OPS}	10	14	18	G
South Pole Release Point	B_{RPS}	5	10	14	G
North Pole Operate Point	B_{OPN}	-18	-14	-10	G
North Pole Release Point	B_{RPN}	-14	-10	-5	G
Hysteresis ($ B_{OPS} - B_{RPS} $ or $ B_{OPN} - B_{RPN} $)	B_{HYS}	2	5	9	G

3.5. Output Vs. Magnetic Pole

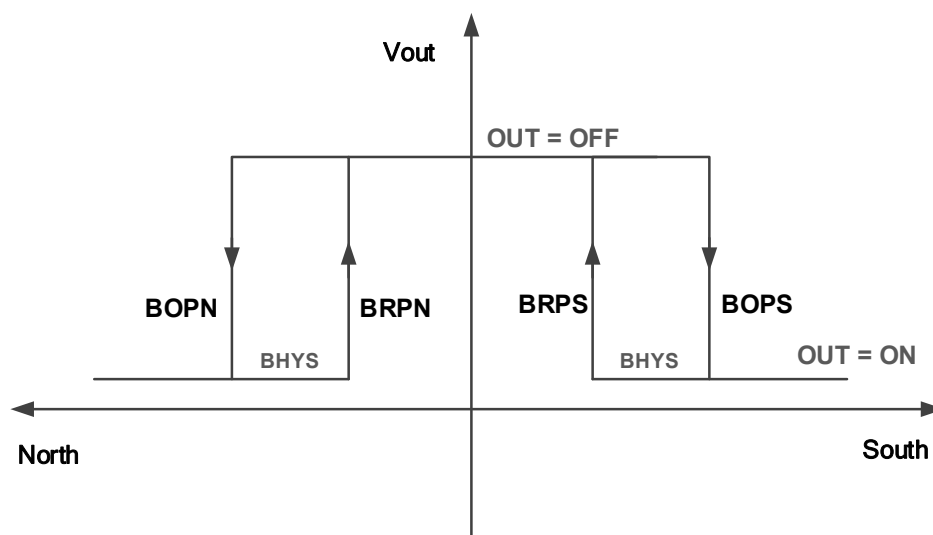
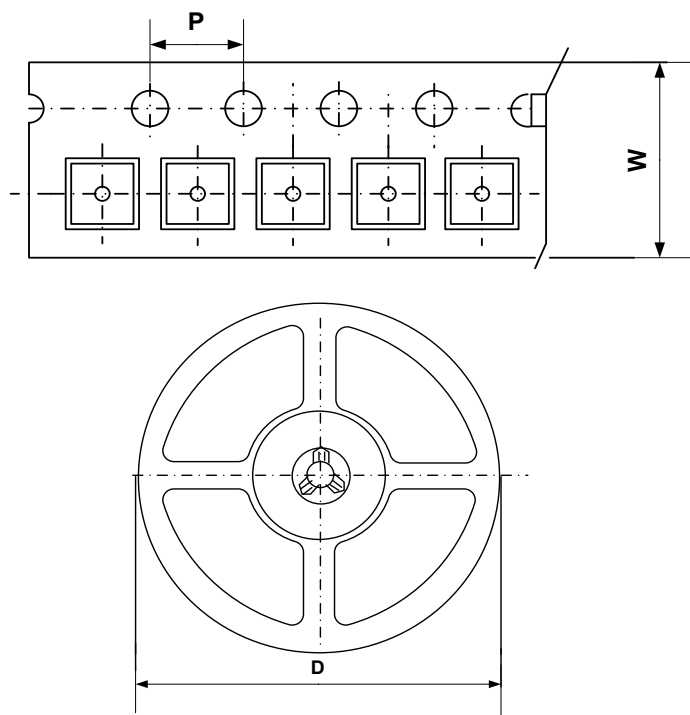


Figure 3. Operational Characteristics

Magnetic Field Pole	Test Conditions	Output Status
South Pole	$B > BOPS$	Low
South Pole	$B < BRPS$	High
North Pole	$B < BOPN$	Low
North Pole	$B > BRPN$	High

4. Packing Information



Package Type	Carrier Width (W)	Pitch (P)	Reel Size(D)	Packing Minimum
SOT23-3L	$8.0 \pm 0.1 \text{ mm}$	$4.0 \pm 0.1 \text{ mm}$	$180 \pm 1 \text{ mm}$	3000 pcs

For more information on iSentek's magnetic sensors, please send an email to sales@isentek.com or visit our website at www.isentek.com.

5. Legal Disclaimer

5.1. Warranty and Liability Disclaimer

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5.3. Disclaimer Regarding Changes

iSentek reserves the right to modify the contents of this datasheet, including specifications and descriptions, at any time and without prior notice. This document supersedes all previously issued information.

Revision History

Revision Version	Date	Description
1.0	July 6 th , 2022	Initial release
1.1	December 28 th , 2022	Edited format and minor changes
1.2	November 26 th , 2024	Edited hysteresis (Page 6)
1.3	July 30 th , 2025	Edited packaging options