

Magnet and sensor orientation

TI Precision Labs - TI Magnetic Sense Simulator

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Magnet and sensor orientation

The screenshot shows the TI Magnetic Sense Simulator (TIMSS) interface. The main 3D view displays a red and blue magnet above a sensor. The right-hand panel is set to the 'Magnet' tab, showing the following configuration:

- Magnet Specifications**
- Magnet Geometry**
- Magnet Motion**
- Origin Position**
 - Position: X Axis: 0 mm, Y Axis: 0 mm, Z Axis: 0 mm
 - Angle: X Axis: 0 Deg, Y Axis: 0 Deg, Z Axis: 0 Deg
- Final Position**
 - Position: X Axis: 10 mm, Y Axis: 0 mm, Z Axis: 0 mm

A 'Simulate' button is located at the bottom of the interface.

The screenshot shows the TI Magnetic Sense Simulator (TIMSS) interface with the 'Sensor' tab selected in the right-hand panel. The main 3D view shows the magnet and sensor in a different relative orientation. The 'Sensor' panel configuration is as follows:

- Sensor Details**
- Sensor Select**: Sensor 1 : TMAG5273
- Sensor Specifications**
- Sensor Position**
 - Position Properties**
 - Position: X Axis: 0 mm, Y Axis: 0 mm, Z Axis: -5 mm
 - Angle: X Axis: 0 Deg, Y Axis: 0 Deg, Z Axis: 0 Deg

An 'Edit Sensor Selection' button is visible above the sensor select dropdown. A 'Simulate' button is located at the bottom of the interface.

Magnet orientation

The screenshot displays the TI Magnetic Sense Simulator (TIMSS) interface. At the top, the title bar reads "TI Magnetic Sense Simulator (TIMSS)" and the user "Alicia" is logged in. The main workspace shows a 3D view of a magnet (a red and blue block) and a sensor (a black component in a red wireframe box) on a grid. A coordinate system with X, Y, and Z axes is visible. The right-hand panel contains configuration options for the magnet, sensor, and simulation settings. The "Magnet" tab is active, showing "Magnet Specifications", "Magnet Geometry", and "Magnet Motion" sections. The "Origin Position" section includes input fields for X Axis (0 mm), Y Axis (0 mm), and Z Axis (0 mm). The "Angle" section includes input fields for X Axis (0 Deg), Y Axis (0 Deg), and Z Axis (0 Deg). The "Final Position" section includes input fields for X Axis (10 mm), Y Axis (0 mm), and Z Axis (0 mm). A "Simulate" button is located at the bottom center of the 3D view.

TIPL: Magnet and Sensor Orientation * Function Linear Save

Design Edit Design Output

Parametric Sweep Compare Design

Magnet Sensor Sim Settings

- > Magnet Specifications
- > Magnet Geometry
- ▼ Magnet Motion

Origin Position

Position

X Axis	Y Axis	Z Axis
0 mm	0 mm	0 mm

Angle

X Axis	Y Axis	Z Axis
0 Deg	0 Deg	0 Deg

Final Position

Position

X Axis	Y Axis	Z Axis
10 mm	0 mm	0 mm

Simulate

Magnet orientation

The screenshot displays the TI Magnetic Sense Simulator (TIMSS) interface. The main workspace shows a 3D view of a magnet (red and blue halves) and a sensor (black and white components) on a grid. A tooltip indicates: "Rotate the magnet to match your starting alignment. Rotations are applied in XYZ order". The right-hand panel is titled "Magnet" and contains the following settings:

- Function: Linear
- Save button
- Sections: Magnet Specifications, Magnet Geometry, Magnet Motion
- Origin Position:
 - Position: X Axis (0 mm), Y Axis (0 mm), Z Axis (0 mm)
 - Angle: X Axis (0 Deg), Y Axis (0 Deg), Z Axis (0 Deg)
- Final Position:
 - Position: X Axis (10 mm), Y Axis (0 mm), Z Axis (0 mm)

Magnet orientation

The screenshot displays the TI Magnetic Sense Simulator (TIMSS) interface. The main workspace shows a 3D view of a magnet (red and blue) and a sensor (black and white) on a grid. A tooltip indicates: "Rotate the magnet to match your starting alignment. Rotations are applied in XYZ order". The right-hand panel is titled "TIPL: Magnet and Sensor Orientation" and includes a "Save" button. The "Magnet" tab is active, showing the following settings:

- Magnet Specifications**
- Magnet Geometry**
- Magnet Motion**
 - Origin Position**
 - Position: X Axis: 0 mm, Y Axis: 0 mm, Z Axis: 0 mm
 - Angle: X Axis: 0 Deg, Y Axis: 0 Deg, Z Axis: 0 Deg
 - Final Position**
 - Position: X Axis: 10 mm, Y Axis: 0 mm, Z Axis: 0 mm

Magnet orientation

The screenshot displays the TI Magnetic Sense Simulator (TIMSS) interface. At the top, the title bar reads "TI Magnetic Sense Simulator (TIMSS)" and the user name "Alicia" is visible. The main workspace is titled "TIPL: Magnet and Sensor Orientation *". On the left, there are navigation options: "Edit Design" (selected), "Output", "Design", "Parametric Sweep", and "Compare Design". The central workspace shows a 3D coordinate system with X, Y, and Z axes. A red rectangular magnet is positioned in the lower-left quadrant. A callout box points to the magnet with the text: "Rotate the magnet to match your starting alignment. Rotations are applied in XYZ order". To the right, a settings panel is open, showing tabs for "Magnet", "Sensor", and "Sim Settings". The "Magnet" tab is active, displaying sections for "Magnet Specifications", "Magnet Geometry", and "Magnet Motion". Under "Magnet Motion", the "Origin Position" section includes input fields for X Axis (0 mm), Y Axis (0 mm), and Z Axis (0 mm). The "Angle" section includes input fields for X Axis (0 Deg), Y Axis (0 Deg), and Z Axis (0 Deg), with a mouse cursor hovering over the Z Axis field. The "Final Position" section includes input fields for X Axis (10 mm), Y Axis (0 mm), and Z Axis (0 mm). A red "Simulate" button is located at the bottom center of the workspace.

Magnet orientation

The screenshot displays the TI Magnetic Sense Simulator (TIMSS) interface. The main workspace shows a 3D model of a magnet (red and blue) and a sensor (black) on a grid. The magnet is positioned at the origin (0, 0, 0) mm. The sensor is positioned at (10, 8, 0) mm. The interface includes a top navigation bar with the title 'TI Magnetic Sense Simulator (TIMSS)' and a user profile 'Alicia'. The left sidebar contains icons for 'Design', 'Parametric Sweep', and 'Compare Design'. The right sidebar has tabs for 'Magnet', 'Sensor', and 'Sim Settings', with 'Magnet' selected. The 'Magnet' tab is expanded to show 'Magnet Specifications', 'Magnet Geometry', and 'Magnet Motion'. The 'Magnet Motion' section is further expanded to show 'Origin Position' and 'Final Position' settings.

TIPL: Magnet and Sensor Orientation * Function Linear Save

Design | Edit Design | Output

Parametric Sweep

Compare Design

Magnet | Sensor | Sim Settings

> Magnet Specifications

> Magnet Geometry

▼ Magnet Motion

Origin Position

Position

X Axis	Y Axis	Z Axis
0 mm	0 mm	0 mm

Angle

X Axis	Y Axis	Z Axis
0 Deg	0 Deg	0 Deg

Final Position

Position

X Axis	Y Axis	Z Axis
10 mm	8 mm	0 mm

Simulate

Magnet configuration

▼ Magnet Specifications ⓘ

Magnet Shape: Bar

Poles: 2

Magnet Material: Sintered Neodymium Ir...

Material Grade: N42

Select Remanence Value: Average Remanence V...

Remanence (Br)	Temperature
1310 mT at 20°C	20 °C
Temperature Coefficient	Coercivity
-0.12 %/°C	11.5 KOe

▼ Magnet Geometry ⓘ

Magnet Length - X dim: 3 mm

Magnet Width - Y dim: 3 mm

Magnet Height - Z dim: 3 mm

TI Magnetic Sense Simulator (TIMSS)
Alicia

TIPL: Magnet and Sensor Orientation * ✎

Function: Linear Save

Design | Edit Design | Output

Design

Parametric Sweep

Compare Design

>>

Magnet | Sensor | Sim Settings

> Magnet Specifications ⓘ

> Magnet Geometry ⓘ

▼ Magnet Motion ⓘ

Origin Position

Position		
X Axis	Y Axis	Z Axis
0 mm	-8 mm	2 mm
Angle		
X Axis	Y Axis	Z Axis
90 Deg	90 Deg	0 Deg

Final Position

Position		
X Axis	Y Axis	Z Axis
0 mm	8 mm	2 mm

Sensor orientation

The screenshot displays the TI Magnetic Sense Simulator (TIMSS) interface. At the top, the title bar reads "TI Magnetic Sense Simulator (TIMSS)" and the user name "Alicia" is visible. The main workspace shows a 3D model of a magnet (red and blue) and a sensor (red cube) on a white surface. A coordinate system with X, Y, and Z axes is shown in the upper right. The right-hand panel is titled "Sensor" and contains the following elements:

- Function: Linear
- Save button
- Tabbed interface: Magnet, **Sensor**, Sim Settings
- Section: **Sensor Details**
- Button: **Edit Sensor Selection**
- Sensor Select dropdown: Sensor 1 : TMAG5273
- Section: **Sensor Specifications**
- Section: **Sensor Position**
- Position Properties:
 - Position:
 - X Axis: 0 mm
 - Y Axis: 0 mm
 - Z Axis: -5 mm
 - Angle:
 - X Axis: 0 Deg
 - Y Axis: 0 Deg
 - Z Axis: 0 Deg

A callout box with a red border points to the X Axis angle input field, containing the text: "Rotate the sensor to the desired orientation in XYZ order". At the bottom of the workspace is a red "Simulate" button.

Sensor orientation

The screenshot displays the TI Magnetic Sense Simulator (TIMSS) interface. The main workspace shows a 3D model of a sensor (a blue cube) positioned above a magnet (a grey rectangular block). A coordinate system with X, Y, and Z axes is visible. The right-hand panel is titled "Sensor Details" and includes a red "Edit Sensor Selection" button. Below this, a dropdown menu shows "Sensor 1 : TMAG5273". The "Sensor Specifications" section is expanded to show "Sensor Position" properties:

Position Properties		
Position		
X Axis	Y Axis	Z Axis
0 mm	0 mm	-5 mm
Angle		
X Axis	Y Axis	Z Axis
0 Deg	0 Deg	0 Deg

A callout box with a hand icon points to the Y Axis angle input field, containing the text: "Rotate the sensor to the desired orientation in XYZ order". At the bottom of the interface, there is a red "Simulate" button.

Sensor orientation

The screenshot displays the TI Magnetic Sense Simulator (TIMSS) interface. At the top, the title bar reads "TI Magnetic Sense Simulator (TIMSS)" and the user name "Alicia" is visible. The main workspace shows a 3D grid with a red and blue magnet on the left and a sensor component on the right. A coordinate system with X, Y, and Z axes is shown in the upper right. A tooltip points to the sensor with the text: "Rotate the sensor to the desired orientation in XYZ order".

The right-hand panel is titled "Sensor" and contains the following settings:

- Function: Linear
- Save button
- Tab: Sensor (selected)
- Section: Sensor Details
- Button: Edit Sensor Selection
- Sensor Select: Sensor 1 : TMAG5273
- Section: Sensor Specifications
- Section: Sensor Position
- Position Properties:
 - Position:
 - X Axis: 0 mm
 - Y Axis: 0 mm
 - Z Axis: -5 mm
 - Angle:
 - X Axis: 0 Deg
 - Y Axis: 0 Deg
 - Z Axis: 0 Deg (with a mouse cursor pointing to the input field)

Sensor configuration

Sensor Specifications			
Sensor Family	Multi-axis linear & angle po:		
Device	TMAG5273		
Part Number	TMAG5273A1QDBVR		
Package	SOT-23	Pin Count	6
Max Vcc	Min Vcc	Applied Vcc	
3.6	V 1.7	V 3.3	V
Max Input	40 mT	Min Input	-40 mT
Input Referred Noise	X: 22 Y: 22 Z: 12	uTRMS	
Sensitivity	819.2	LSB/mT	
Sensitivity Dir Y-X-Z	Quiescent O/P	0	code
Temperature Compensation	0	%C	
Averaging	32	Samples	

TI Magnetic Sense Simulator (TIMSS)

TIPL: Magnet and Sensor Orientation * Function Linear Save

Design Edit Design Output

Sensor Details Edit Sensor Selection

Sensor Select Sensor 1 : TMAG5273

Sensor Specifications

Sensor Position

Position Properties

Position

X Axis: -0.4 mm Y Axis: 0 mm Z Axis: -5 mm

Angle

X Axis: 0 Deg Y Axis: 0 Deg Z Axis: 90 Deg

Simulate

Simulation results

6.3 Feature Description

6.3.1 Magnetic Flux Direction

As shown in Figure 6-1, the TMAG5273 generates positive ADC codes in response to a magnetic north pole in proximity. Similarly, the TMAG5273 generates negative ADC codes if the magnetic south poles approach from the same directions.

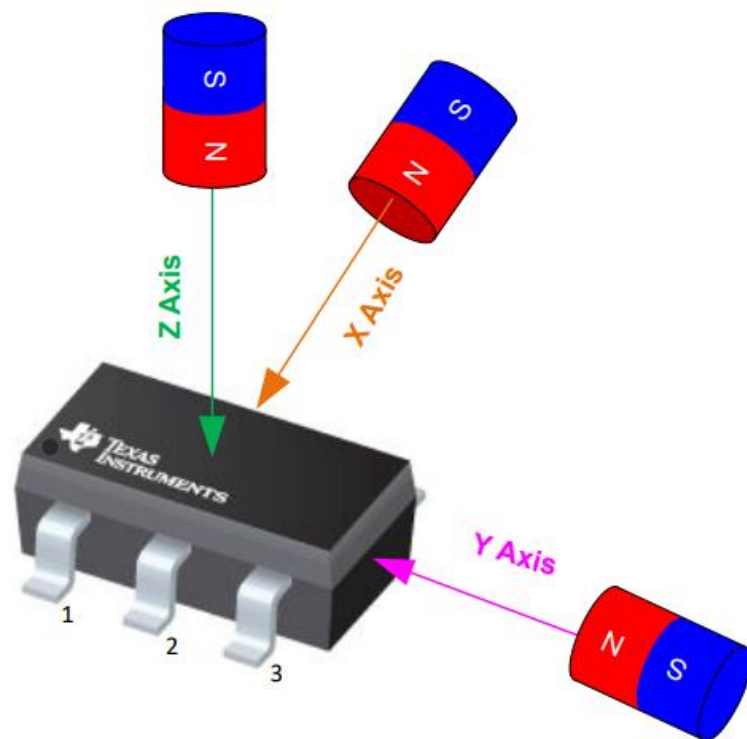
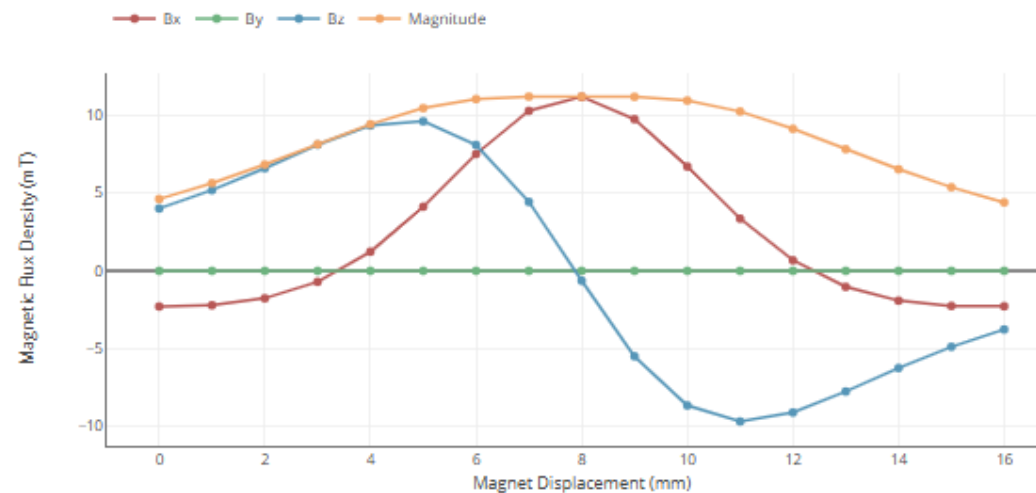


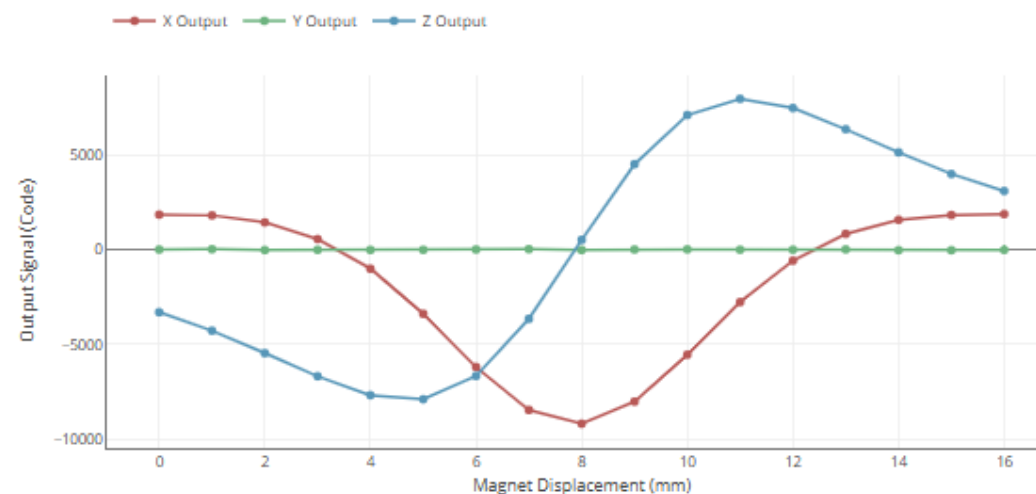
Figure 6-1. Direction of Sensitivity

following publication source: <https://authors.elsevier.com/td/article/S2352711020900170>

Magnet Field Density vs Distance



Device Output 1



Learn more

- TI Magnetic Sense Simulator Product Folder
<https://www.ti.com/TIMSS>
- TI Magnetic Sense Simulator User's Guide
<https://www.ti.com/lit/ug/slyu067/slyu067.pdf>
- TI Magnetic Sense Simulator App Brief
<https://www.ti.com/lit/ab/slya083/slya083.pdf>
- Magnetic Sensors Product Page
<https://www.ti.com/sensors/magnetic-sensors/overview.html>
- Position Sensing Demo Video Series
<https://www.ti.com/video/series/position-sensing-demos.html>
- TI Precision Labs: Magnetic Sensor Training Videos
<https://www.ti.com/video/series/precision-labs/ti-precision-labs-magnetic-sensors.html>
- Sensors E2E Forum
<https://e2e.ti.com/support/sensors-group/sensors/f/sensors-forum>
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