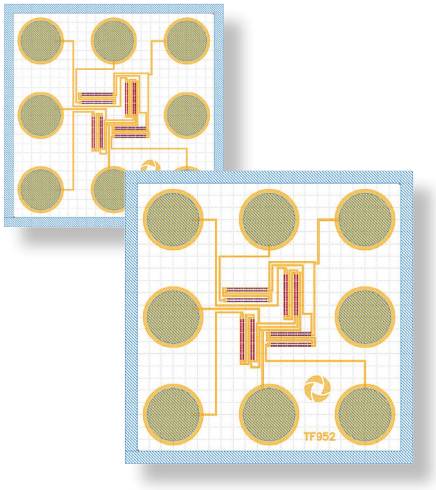
SENSITEC
KÖRBER SOLUTIONS

DATA SHEET

TF952

MagnetoResistive Magnetic Field Sensor



The TF952 is a magnetic field sensor based on the Tunnel MagnetoResistive (TMR) effect. The Sensor contains two Wheatstone bridges. This allows the measurement of two magnetic field directions (X and Y) in parallel.

The sensor is ideal for measuring magnetic fields in a linear range from -20 mT up to 20 mT. A typical application is endpoint detection of pneumatic or hydraulic cylinders.

The TF952 is available as flip-chip for SMD assembly.

Product Overview

Article Description	Package	Delivery Type
TF952APA-AE	Flip-Chip	Tape and Reel (tbd. pcs)

Quick Reference Guide

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{CC}	Supply voltage	-	±3.3	±5.5	V
B_{Lin}	Linear magnetic range	-20	-	+20	mT
S_{Linmax}	Sensitivity (in linear range)	6.0	9.0	12	mV/V/mT
R_S	Sensor resistance	20	50	80	kΩ
R_B	Bridge resistance	40	100	160	kΩ

Absolute Maximum Ratings

In accordance with the absolute maximum rating system (IEC60134).

Symbol	Parameter	Min.	Max.	Unit
V_{CC}	Supply voltage	-5.5	+5.5	V
T_{amb}	Ambient temperature	-40	+125	°C

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Features

- Based on the TunnelMagnetoResistive (TMR) effect
- Flip-Chip assembly
- For two magnetic field directions
- Temperature range from -40 °C to +125 °C

Advantages

- Large working distance
- High Sensitivity
- Large measurement range
- Low hysteresis

Applications

- Endpoint detection in cylinders
- Reference monitoring
- Magnetic switches

ESD

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Magnetic Data

Symbol	Parameter	Min.	Typ.	Max.	Unit
B_{Lin}	Linear magnetic flux density range (abs) [1]	-20	-	+20	mT
B_{sat}	Saturation magnetic flux density [2]	-	±30	-	mT

[1] By exceeding the value of B_{Lin} the output signal is no longer unique and the sensor has to be reset by turning off the magnetic field.

[2] At B_{sat} the sensor delivers the maximal output voltage of minimum 100 mV/V.

Electrical Data

T_{amb} = 25 °C; unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{CC}	Supply voltage		-	±3.3	±5.5	V
V_{OFF}	Offset voltage per V_{CC}		-3.0	-	+3.0	mV/V
TC_{VOFF}	Temperature coefficient of offset voltage [3]		-5.0	-	+5.0	µV/V/K
R_S	Sensor resistance		20	50	80	kΩ
R_B	Bridge resistance		40	100	160	kΩ
TC_{RB}	Temperature coefficient of bridge resistance [4]		-0.08	-0.1	-0.12	%/K
S_{Linmax}	Sensitivity (in linear max. range)		6.0	9.0	12	mV/V/mT
S_{Lin5}	Sensitivity (B = ±5 mT)		7.0	-	-	mV/V/mT
TC_S	Temperature coefficient of sensitivity [5]		-0.13	-0.16	-0.19	%/K

[3] $TC_{Voff} = \frac{V_{off(T2)} - V_{off(T1)}}{V_{peak2}}$ with T1 = 25°C; T2 = 125°C, Target Value: ±1 µV/V/K

[4] $TC_{RB} = 100 \cdot \frac{R_{B(T2)} - R_{B(T1)}}{R_{B(T1)} \cdot (T_2 - T_1)}$ with T1 = 25°C; T2 = 125°C

[5] $TC_S = 100 \cdot \frac{S_{T2} - S_{T1}}{S_{T1} \cdot (T_2 - T_1)}$ with T1 = 25°C; T2 = 125°C

Accuracy

T_{amb} = 25 °C; unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
ε_{Linmax}	Linearity error (in max. linear range)		-	5.0	-	% of V_{Out}
ε_{Lin5}	Linearity error (B = ±5mT)	see Fig. 2	-	2.0		% of V_{Out}
H_C	Hysteresis error [6]	see Fig. 3	-	-	0.05	mT

[6] The hysteresis error is determined in the magnetic field, ramped from +5 mT to -5 mT and back to +5 mT.

Typical Performance Graphs

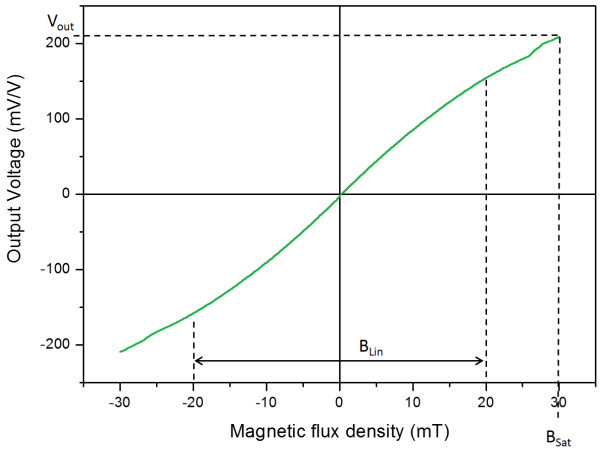


Fig. 1: Typical output voltage of the TF952 depending on the magnetic flux density.

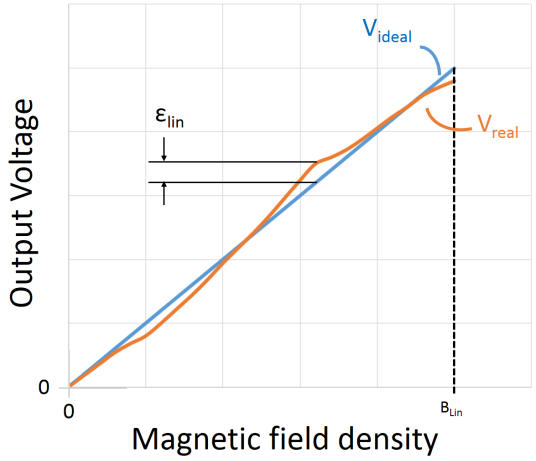


Fig. 2: Definition of linearity error ε_{Lin} (schematic).

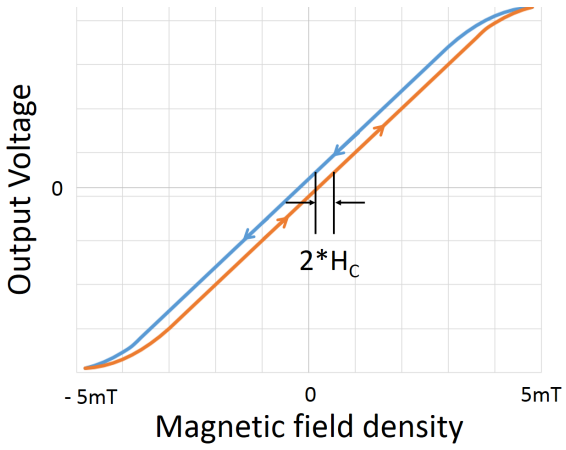


Fig. 3: Definition of hysteresis error H_C (schematic)

TF952 Bare Die

Pinning

Pad	Symbol	Parameter
A1	V_{CCY}	Power supply Y
A2	$-V_{0Y}$	Negative output voltage Y
A3	$-V_{0X}$	Negative output voltage X
B1	NC	Not connected
B3	V_{CCX}	Power supply X
C1	$+V_{0Y}$	Positive output voltage Y
C2	GND	Ground
C3	$+V_{0X}$	Positive output voltage X

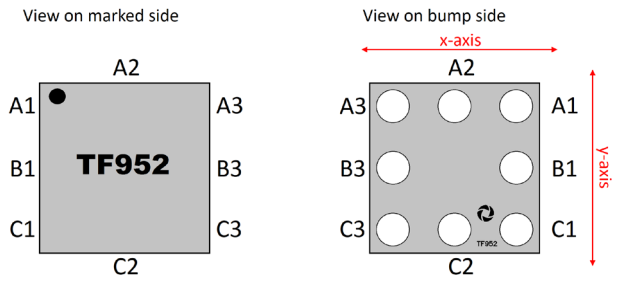
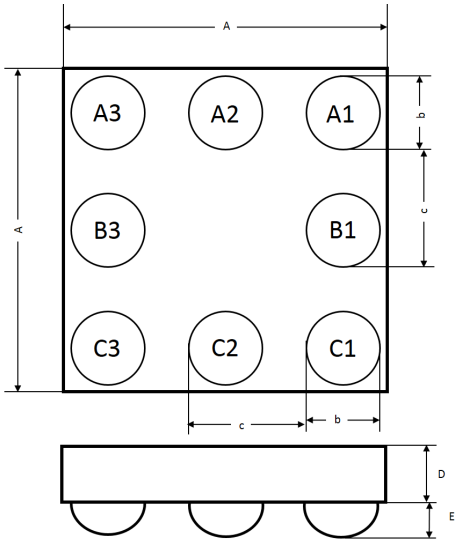


Fig. 4:
Left: Marked side of the flip chip package with pin 1 indicator.
Right: TF952 on its bump side shown with the directions of the sensitive axes (red).

Mechanical Data



Symbol	Parameter	Min.	Typ.	Max.	Unit
A	Length	1100	1130	1160	µm
b	Diameter		250		µm
c	Pitch		400		µm
D	Height		380		µm
E	Standoff		200		µm

Fig. 5: Chip outline of TF952.

Data for Packaging and Interconnection Technologies

Parameter	Conditions	Value	Unit
Solder ball material		SnAg2.6Cu0.6	
Maximum solder temperature	6s	250	°C

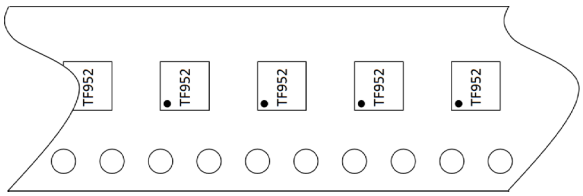


Fig. 6: Orientation of chip (bumps down) in tape and reel.

General Information

Product Status

Article	Status
TF952APA-AE	The product is under development, qualification has not started. Deliverables have a sample status. The datasheet is preliminary.
Note	The status of the product may have changed since this data sheet was published. The latest information is available on the internet at www.sensitec.com.

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