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MICRONAS

Hardware
Documentation

Data Sheet

HAL® 573...HAL 576, 579
HAL 581...HAL 584

Two-Wire Hall-Effect Sensor Family

Edition Dec. 22, 2008
DSH000145_003EN

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Contents

Two-Wire Hall-Effect Sensor Family
in CMOS technology

Release Note: Revision bars indicate significant changes to the previous edition.

1. Introduction

This sensor family consists of different two-wire Hall switches produced in CMOS technology. All sensors change the current consumption depending on the external magnetic field and require only two wires between sensor and evaluation circuit. The sensors of this family differ in the magnetic switching behavior and switching points.

The sensors include a temperature-compensated Hall plate with active offset compensation, a comparator, and a current source. The comparator compares the actual magnetic flux through the Hall plate (Hall voltage) with the fixed reference values (switching points). Accordingly, the current source is switched on (high current consumption) or off (low current consumption).

The active offset compensation leads to constant magnetic characteristics in the full supply voltage and temperature range. In addition, the magnetic parameters are robust against mechanical stress effects.

The sensors are designed for industrial and automotive applications and operate with supply voltages from 3.75 V to 24 V in the junction temperature range from –40 °C up to 140 °C. All sensors are available in the SMD package SOT89B-1 and in the leaded versions TO92UA-1 and TO92UA-2.

1.1. Features

- current output for two-wire applications
- low current consumption: 5 mA...6.9 mA
- high current consumption: 12 mA...17 mA
- junction temperature range from –40 °C up to 140 °C.
- operates from 3.75 V to 24 V supply voltage
- operates with static magnetic fields and dynamic magnetic fields up to 10 kHz
- switching offset compensation at typically 145 kHz
- overvoltage and reverse-voltage protection
- magnetic characteristics are robust against mechanical stress effects
- constant magnetic switching points over a wide supply voltage range
- the decrease of magnetic flux density caused by rising temperature in the sensor system is compensated by a built-in negative temperature coefficient of the magnetic characteristics
- ideal sensor for applications in extreme automotive and industrial environments
- EMC corresponding to ISO 7637

1.2. Family Overview

Type	Switching Behavior	Sensitivity	see Page
573	unipolar	low	19
574	unipolar	medium	21
575	latching	medium	23
576	unipolar	medium	25
579	latching	medium	27
581	unipolar inverted	medium	29
584	unipolar inverted	medium	31

Unipolar Switching Sensors:

The sensor turns to high current consumption with the magnetic south pole on the branded side of the package and turns to low consumption if the magnetic field is removed. The sensor does not respond to the magnetic north pole on the branded side.

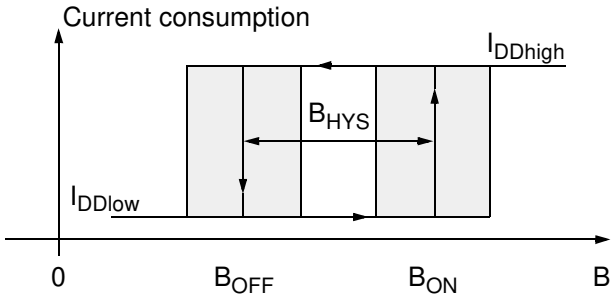


Fig. 1–1: Unipolar Switching Sensor

Unipolar Inverted Switching Sensors:

The sensor turns to low current consumption with the magnetic south pole on the branded side of the package and turns to high consumption if the magnetic field is removed. The sensor does not respond to the magnetic north pole on the branded side.

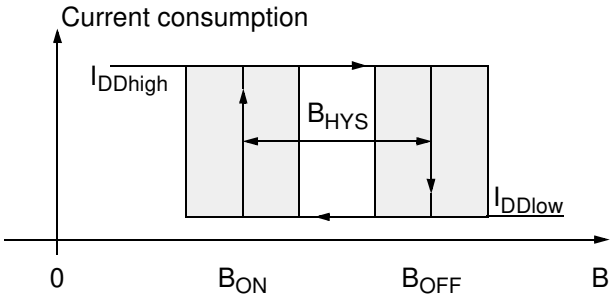


Fig. 1–2: Unipolar Inverted Switching Sensor

Latching Sensor:

The sensor turns to high current consumption with the magnetic south pole on the branded side of the package and turns to low consumption with the magnetic north pole on the branded side. The current consumption does not change if the magnetic field is removed. For changing the current consumption, the opposite magnetic field polarity must be applied.

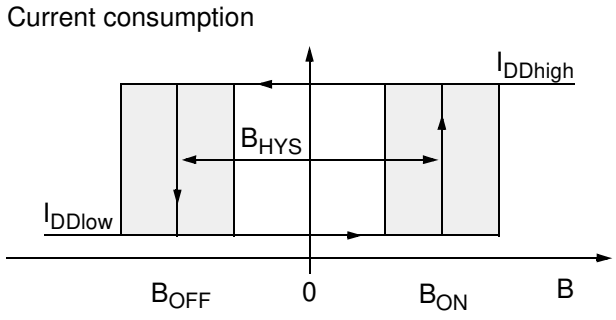


Fig. 1–3: Latching Sensor

1.3. Marking Code

All Hall sensors have a marking on the package surface (branded side). This marking includes the name of the sensor and the temperature range.

Type	Temperature Range	
	K	E
HAL573	573K	573E
HAL574	574K	574E
HAL575	575K	575E
HAL576	576K	576E
HAL579	579K	579E
HAL581	581K	581E
HAL584	584K	584E

1.4. Operating Junction Temperature Range (T_J)

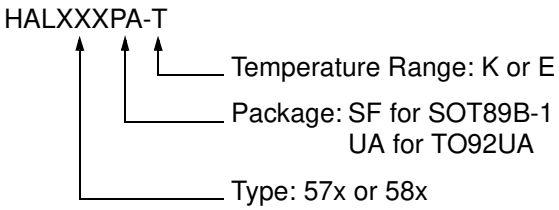
The Hall sensors from Micronas are specified to the chip temperature (junction temperature T_J).

K: T_J = –40 °C to +140 °C

E: T_J = –40 °C to +100 °C

Note: Due to the high power dissipation at high current consumption, there is a difference between the ambient temperature (T_A) and junction temperature. Please refer to Section 5.4. on page 34 for details.

1.5. Hall Sensor Package Codes



Example: **HAL581UA-E**

→ Type: 581
→ Package: TO92UA
→ Temperature Range: T_J = –40 °C to +100 °C

Hall sensors are available in a wide variety of packaging versions and quantities. For more detailed information, please refer to the brochure: “Hall Sensors: Ordering Codes, Packaging, Handling”.

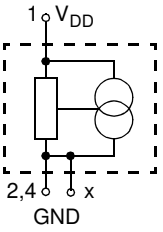
1.6. Solderability and Welding

Solderability

During soldering reflow processing and manual reworking, a component body temperature of 260 °C should not be exceeded.

Welding

Device terminals should be compatible with laser and resistance welding. Please note that the success of the welding process is subject to different welding parameters which will vary according to the welding technique used. A very close control of the welding parameters is absolutely necessary in order to reach satisfying results. Micronas, therefore, does not give any implied or express warranty as to the ability to weld the component.



x = pin 3 for TO92UA-1/-2 package
x = pin 4 for SOT89B-1 package

Fig. 1–4: Pin configuration

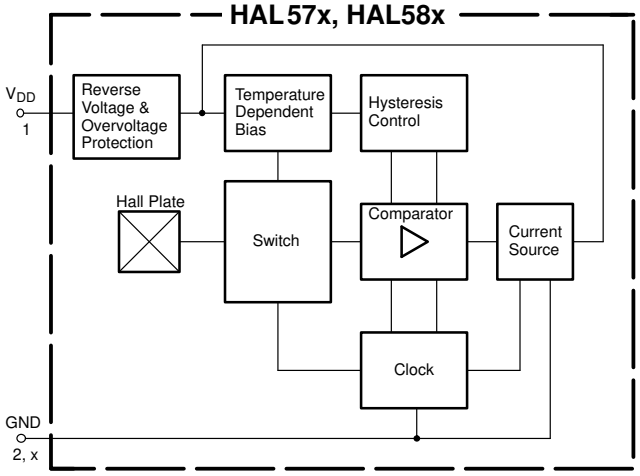
2. Functional Description

The HAL57x, HAL58x two-wire sensors are monolithic integrated circuits which switch in response to magnetic fields. If a magnetic field with flux lines perpendicular to the sensitive area is applied to the sensor, the biased Hall plate forces a Hall voltage proportional to this field. The Hall voltage is compared with the actual threshold level in the comparator. The temperature-dependent bias increases the supply voltage of the Hall plates and adjusts the switching points to the decreasing induction of magnets at higher temperatures.

If the magnetic field exceeds the threshold levels, the current source switches to the corresponding state. In the low current consumption state, the current source is switched off and the current consumption is caused only by the current through the Hall sensor. In the high current consumption state, the current source is switched on and the current consumption is caused by the current through the Hall sensor and the current source. The built-in hysteresis eliminates oscillation and provides switching behavior of the output signal without bouncing.

Magnetic offset caused by mechanical stress is compensated for by using the “switching offset compensation technique”. An internal oscillator provides a two-phase clock. In each phase, the current is forced through the Hall plate in a different direction, and the Hall voltage is measured. At the end of the two phases, the Hall voltages are averaged and thereby the offset voltages are eliminated. The average value is compared with the fixed switching points. Subsequently, the current consumption switches to the corresponding state. The amount of time elapsed from crossing the magnetic switching level to switching of the current level can vary between zero and $1/_{fosc}$.

Shunt protection devices clamp voltage peaks at the V_{DD}-pin together with external series resistors. Reverse current is limited at the V_{DD}-pin by an internal series resistor up to −15 V. No external protection diode is needed for reverse voltages ranging from 0 V to −15 V.



x = pin 3 for TO92UA-1/-2 package
x = pin 4 for SOT89B-1 package

Fig. 2–1: HAL57x, HAL58x block diagram

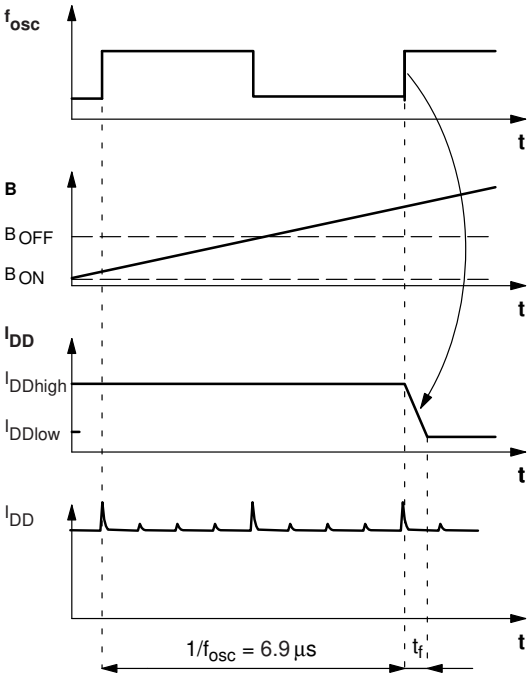
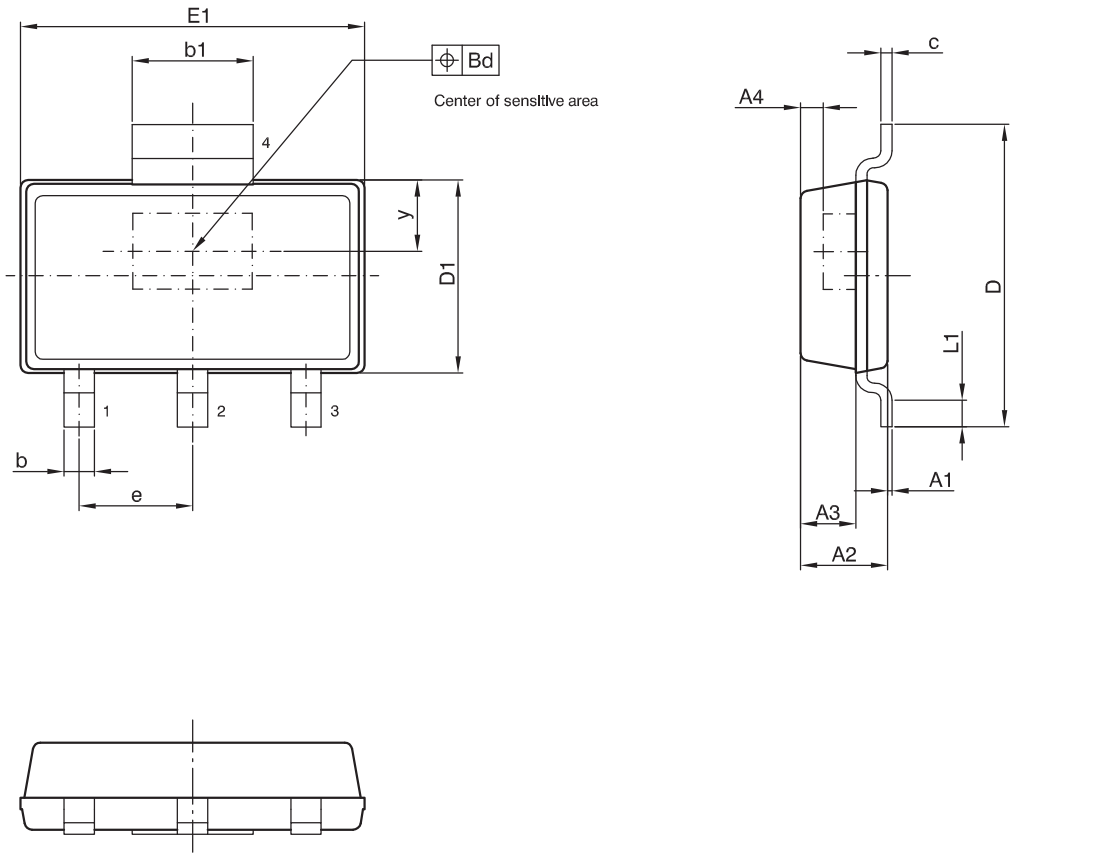


Fig. 2–2: Timing diagram (example: HAL581)

3. Specifications

3.1. Outline Dimensions



physical dimensions do not include moldflash.

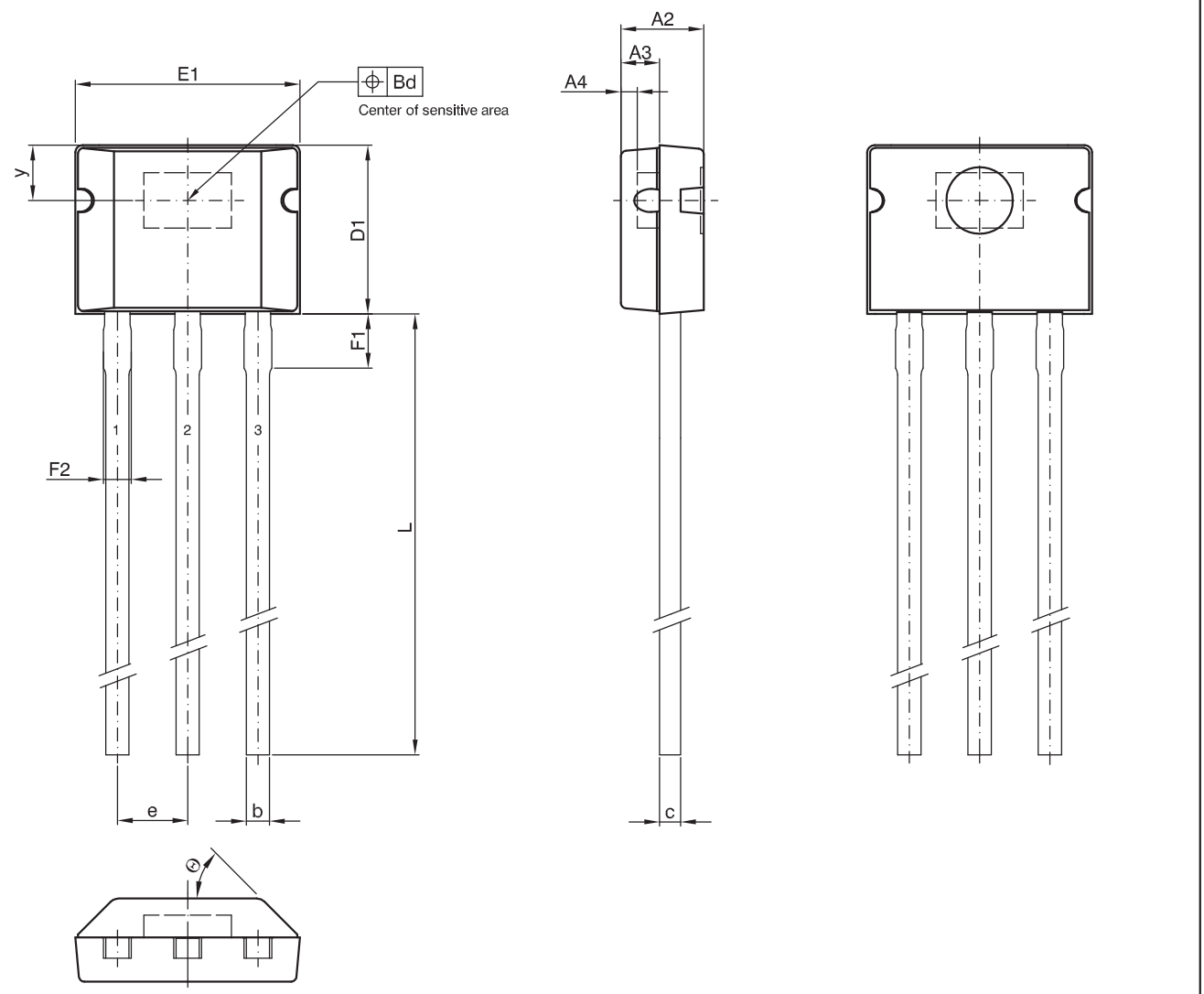
A4, y= these dimensions are different for each sensor type and are specified in the data sheet.

0 2.5 5 mm
scale

UNIT	A1	A2	A3	b	b1	Bd	c	D	D1	e	E1	L1
mm	0.10 0.02	1.20 1.10	0.73	0.4	1.7	0.2	0.15	4.0	2.6 2.5	1.5	4.6 4.5	0.25 min.

JEDEC STANDARD		ANSI	ISSUE DATE YY-MM-DD	DRAWING-NO.	ZG-NO.
ISSUE	ITEM NO.				
-	-		07-07-02	06610.0001.4	ZG001010_Ver.03

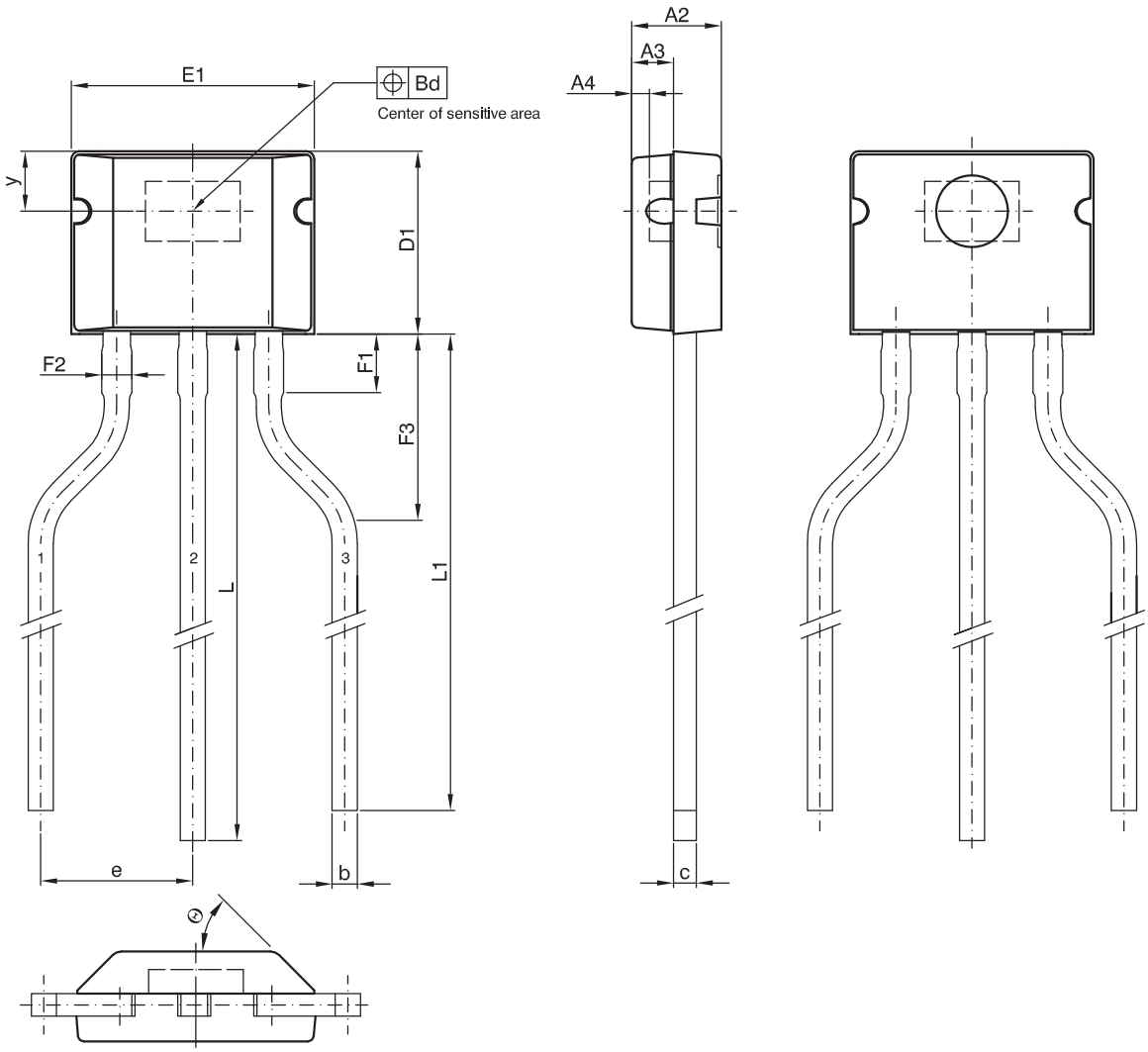
Fig. 3–1:
SOT89B-1: Plastic **S**mall **O**utline **T**ransistor package, 4 leads
Weight approximately 0.034 g



UNIT	A2	A3	A4	b	Bd	c	D1	e	E1	F1	F2	L	Θ
mm	1.55 1.45	0.7	0.3	0.42	0.2	0.36	3.1 3.0	1.27	4.11 4.01	1.2 0.8	0.60 0.42	15.5 min	45°

JEDEC STANDARD		ANSI	ISSUE DATE YY-MM-DD	DRAWING-NO.	ZG-NO.
ISSUE	ITEM NO.				
-	-		07-07-03	06612.0001.4	ZG001012_Ver.04

Fig. 3–2:
TO92UA-2: Plastic Transistor Standard UA package, 3 leads, not spread
Weight approximately 0.106 g



physical dimensions do not include moldflash.

solderability is guaranteed between end of pin and distance F1.

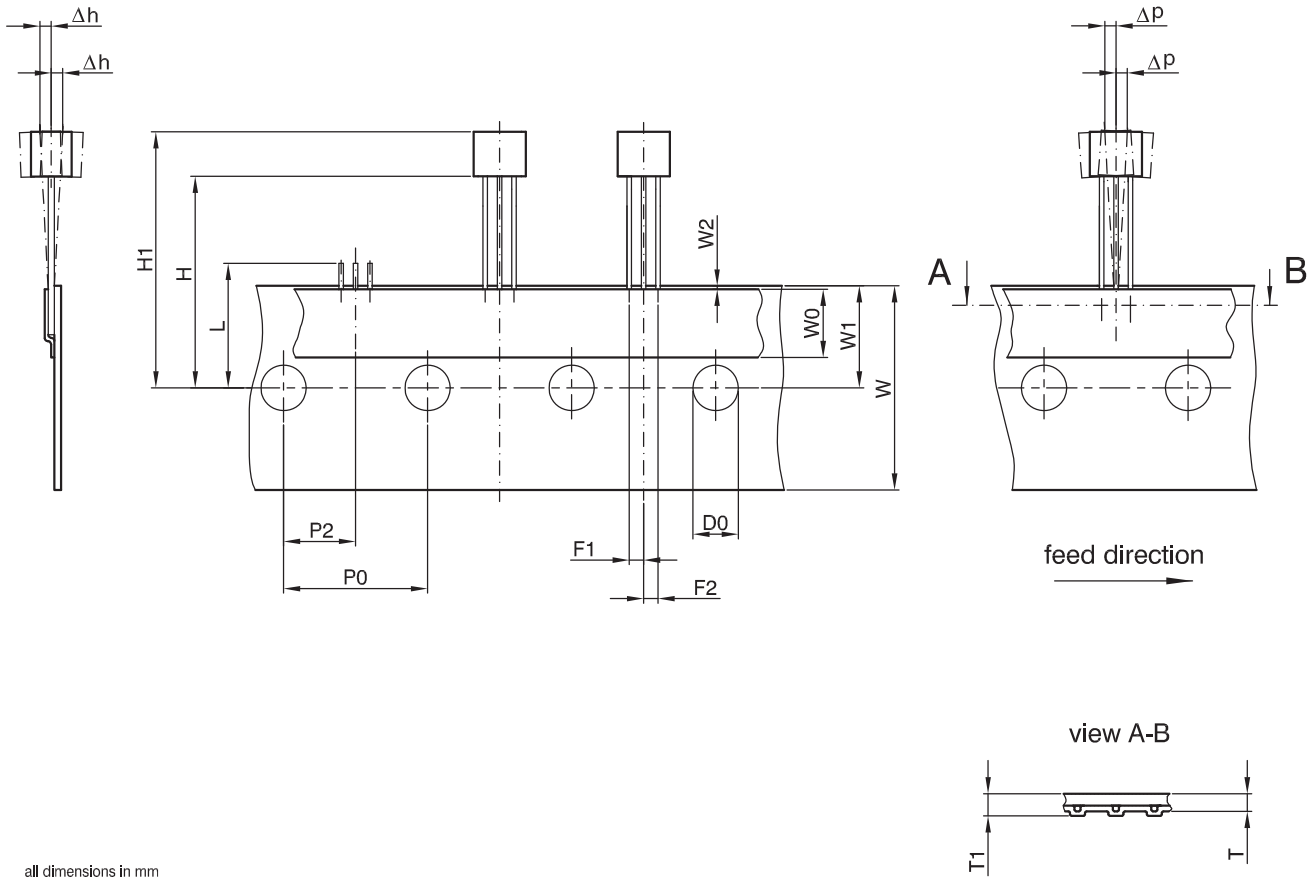
y= this dimension is different for each sensor type and is specified in the data sheet.

0 2.5 5 mm
scale

UNIT	A2	A3	A4	b	Bd	c	D1	e	E1	F1	F2	F3	L	L1	Θ
mm	1.55 1.45	0.7	0.3	0.42	0.2	0.36	3.1 3.0	2.54	4.11 4.01	1.2 0.8	0.60 0.42	4.0 2.0	15.5 min	14.5 min	45°

JEDEC STANDARD		ANSI	ISSUE DATE YY-MM-DD	DRAWING-NO.	ZG-NO.
ISSUE	ITEM NO.				
-	-		07-07-03	06616.0001.4	ZG001016_Ver.03

Fig. 3–3:
TO92UA-1: Plastic Transistor Standard UA package, 3 leads, spread
Weight approximately 0.106 g

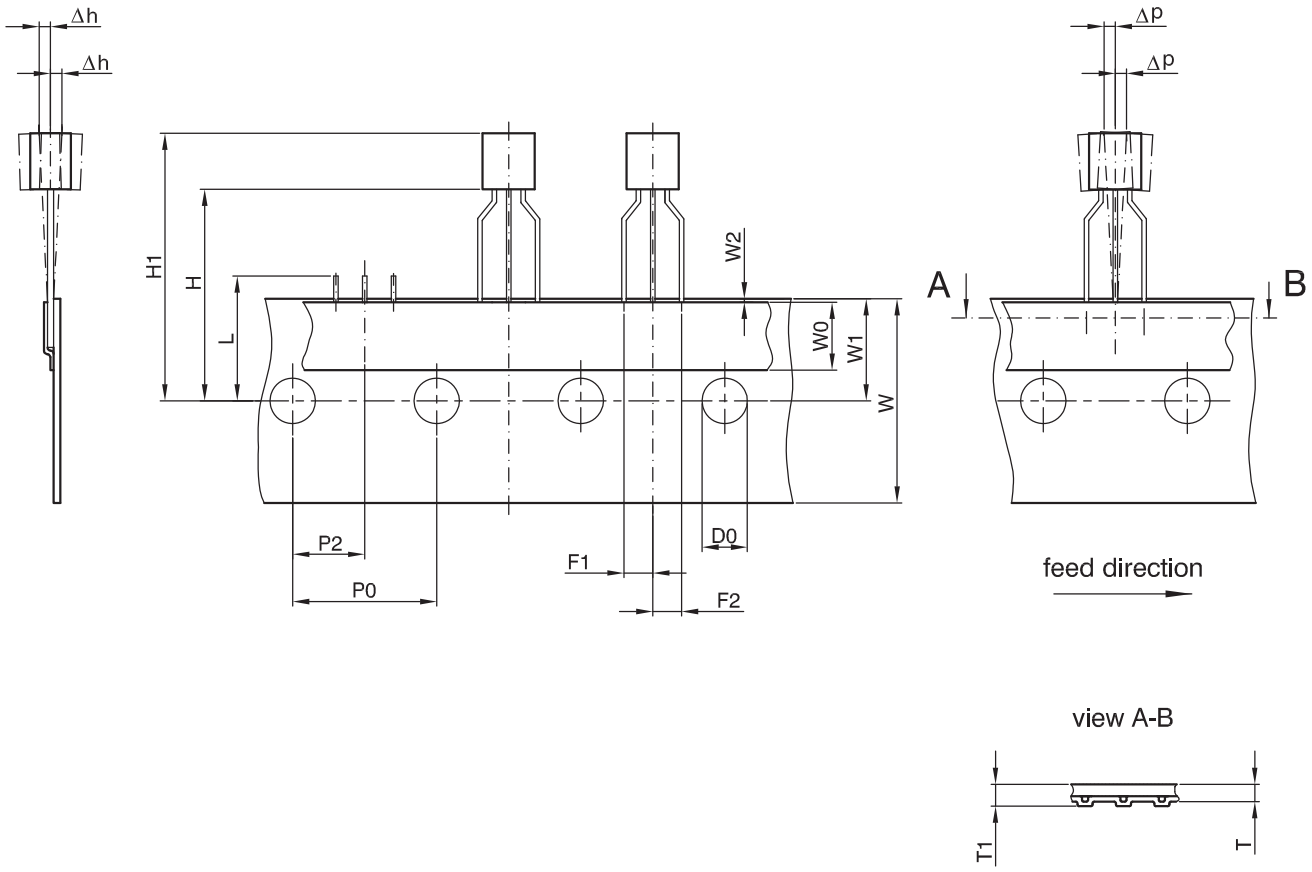


all dimensions in mm
other dimensions see drawing of bulk
max. allowed tolerance over 20 hole spacings ±1.0
H1= this dimension is different for each sensor type and is specified in the data sheet

UNIT	D0	F1	F2	H	Δh	L	P0	P2	Δp	T	T1	W	W0	W1	W2
mm	4.0	1.47 1.07	1.47 1.07	20.0 18.0	±1.0	11.0 max	13.2 12.2	7.05 5.65	±1.0	0.5	0.9	18.0	6.0	9.0	0.3

JEDEC STANDARD		ANSI	ISSUE DATE YY-MM-DD	DRAWING-NO.	ZG-NO.
ISSUE	ITEM NO.				
-	ICE 60286-2		07-01-18	06631.0001.4	ZG001031_Ver.03

Fig. 3–4:
TO92UA-2: Dimensions ammopack inline, not spread



all dimensions in mm
other dimensions see drawing of bulk
max. allowed tolerance over 20 hole spacings ±1.0
H1 = this dimension is different for each sensor type and is specified in the data sheet

UNIT	D0	F1	F2	H	Δh	L	P0	P2	Δp	T	T1	W	W0	W1	W2
mm	4.0	2.74 2.34	2.74 2.34	20.0 18.0	±1.0	11.0 max	13.2 12.2	7.05 5.65	±1.0	0.5	0.9	18.0	6.0	9.0	0.3

JEDEC STANDARD		ANSI	ISSUE DATE YY-MM-DD	DRAWING-NO.	ZG-NO.
ISSUE	ITEM NO.				
-	ICE 60286-2		07-01-18	06632.0001.4	ZG001032_Ver.04

Fig. 3–5:
TO92UA-1: Dimensions ammopack inline, spread

3.2. Dimensions of Sensitive Area

0.25 mm x 0.12 mm

3.3. Positions of Sensitive Areas

	SOT89B-1	TO92UA-1/-2
y	0.85 mm nominal	0.9 mm nominal
A4	0.3 mm nominal	

3.4. Absolute Maximum Ratings

Stresses beyond those listed in the “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only. Functional operation of the device at these conditions is not implied. Exposure to absolute maximum rating conditions for extended periods will affect device reliability.

This device contains circuitry to protect the inputs and outputs against damage due to high static voltages or electric fields; however, it is advised that normal precautions be taken to avoid application of any voltage higher than absolute maximum-rated voltages to this circuit.

All voltages listed are referenced to ground (GND).

Symbol	Parameter	Pin Name	Min.	Max.	Unit
V_{DD}	Supply Voltage	1	–15[1)2)]	28[2)]	V
T_J	Junction Temperature Range		–40	170	°C

[1)] –18 V with a 100 Ω series resistor at pin 1 (–16 V with a 30 Ω series resistor)
[2)] as long as $T_J$max is not exceeded

3.4.1. Storage and Shelf Life

The permissible storage time (shelf life) of the sensors is unlimited, provided the sensors are stored at a maximum of 30 °C and a maximum of 85% relative humidity. At these conditions, no Dry Pack is required.

Solderability is guaranteed for one year from the date code on the package.

3.5. Recommended Operating Conditions

Functional operation of the device beyond those indicated in the “Recommended Operating Conditions/Characteristics” is not implied and may result in unpredictable behavior, reduce reliability and lifetime of the device.

All voltages listed are referenced to ground (GND).

Symbol	Parameter	Pin No.	Min.	Typ.	Max.	Unit
V_{DD}	Supply Voltage	1	3.75		24	V
T_A	Ambient Temperature for Continuous Operation		–40		85[1)]	°C
t_{on}	Supply Time for Pulsed Mode		–	30	–	µs

[1)] when using the”K” type and $V_{DD} \leq 16$ V

Note: Due to the high power dissipation at high current consumption, there is a difference between the ambient temperature (T_A) and junction temperature. The power dissipation can be reduced by repeatedly switching the supply voltage on and off (pulse mode). Please refer to Section 5.4. on page 34 for details.

3.6. Characteristics

at T_J = –40 °C to +140 °C, V_{DD} = 3.75 V to 24 V
at Recommended Operation Conditions if not otherwise specified in the column “Conditions”.
Typical Characteristics for T_J = 25 °C and V_{DD} = 12 V.

Symbol	Parameter	Pin No.	Min.	Typ.	Max.	Unit	Test Conditions
I_{DDlow}	Low Current Consumption over Temperature Range	1	5	6	6.9	mA	
			4.5	6	6.9	mA	for HAL579 only
I_{DDhigh}	High Current Consumption over Temperature Range	1	12	14.3	17	mA	
V_{DDZ}	Overvoltage Protection at Supply	1	–	28.5	32	V	I_{DD} = 25 mA, T_J = 25 °C, t = 20 ms
f_{osc}	Internal Oscillator Chopper Frequency over Temperature Range	–	–	145	–	kHz	
$t_{en(O)}$	Enable Time of Output after Setting of V_{DD}	1	–	30	–	µs	1)
t_r	Output Rise Time	1	–	0.4	1.6	µs	V_{DD} = 12 V, R_s = 30 Ω
t_f	Output Fall Time	1	–	0.4	1.6	µs	V_{DD} = 12 V, R_s = 30 Ω
SOT89B Package							
	Thermal Resistance						30 mm x 10 mm x 1.5 mm, pad size (see Fig. 3–6)
R_{thja}	Junction to Ambient	–	–	–	209 2)	K/W	
R_{thjc}	Junction to Case	–	–	–	56 2)	K/W	
R_{thjs}	Junction to Solder Point	–	–	–	82 3)	K/W	
TO92UA Package							
	Thermal Resistance						
R_{thja}	Junction to Ambient	–	–	–	246 2)	K/W	
R_{thjc}	Junction to Case	–	–	–	70 2)	K/W	
R_{thjs}	Junction to Solder Point	–	–	–	127 3)	K/W	

1) B > B_{ON} + 2 mT or B < B_{OFF} – 2 mT for HAL57x, B > B_{OFF} + 2 mT or B < B_{ON} – 2 mT for HAL58x
2) Measured with a 1s0p board
3) Measured with a 1s1p board

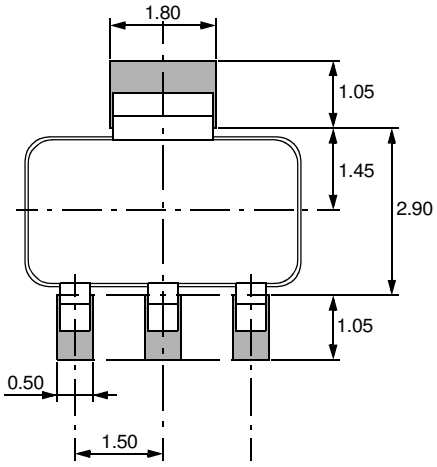


Fig. 3–6: Recommend pad size SOT89B-1
Dimensions in mm

3.7. Magnetic Characteristics Overview

at T_J = –40 °C to +140 °C, V_{DD} = 3.75 V to 24 V,
Typical Characteristics for T_J = 25 °C and V_{DD} = 12 V.

Magnetic flux density values of switching points.
Positive flux density values refer to the magnetic south pole at the branded side of the package.

Sensor	Parameter	On point B_{ON}			Off point B_{OFF}			Hysteresis B_{HYS}			Unit
Switching Type	**T_J**	**Min.**	**Typ.**	**Max.**	**Min.**	**Typ.**	**Max.**	**Min.**	**Typ.**	**Max.**	
HAL573	–40 °C	37	44.2	49	34	42	48	0.5	2.2	5	mT
unipolar	25 °C	37	43.5	49	34	41.5	47	0.5	2	5	mT
	100 °C	34	40	46	32	38	44	0.5	2	5	mT
	140 °C	34	38	46	32	36	44	0.2	2	5	mT
HAL574	–40 °C	5.5	9.2	12	5	7.2	11.5	0.5	2	3	mT
unipolar	25 °C	5.5	9.2	12	5	7.2	11.5	0.5	2	3	mT
	100 °C	5.5	9.2	12	5	7.2	11.5	0.5	2	3	mT
	140 °C	5	8.8	12.5	3.5	7.5	11.5	0.2	1.9	3.5	mT
HAL575	–40 °C	0.5	4	8	-8	-4	-0.5	5	8	11	mT
latching	25 °C	0.5	4	8	-8	-4	-0.5	5	8	11	mT
	100 °C	0.5	4	8	-8	-4	–0.5	5	8	11	mT
	140 °C	0.5	4	8	-8	-4	-0.5	5	8	11	mT
HAL576	–40 °C	3.3	5.7	8.2	1.8	4.2	6.7	0.3	1.9	3.5	mT
unipolar	25 °C	3.3	5.7	8.2	1.8	4.2	6.7	0.3	1.9	3.5	mT
	100 °C	2.8	5.5	8.3	1.3	4	6.8	0.3	1.9	3.5	mT
	140 °C	2	5.2	8.3	0.3	3.7	7	0.3	1.9	3.5	mT
HAL579	–40 °C	5.5	12.0	18.5	-18.5	-12.0	-5.5	16.0	22.0	28.0	mT
latching	25 °C	5.5	12.0	18.5	-18.5	-12.0	-5.5	16.0	22.0	28.0	mT
	100 °C	5.5	12.0	18.5	-18.5	-12.0	-5.5	16.0	22.0	28.0	mT
	140 °C	5.5	12.0	18.5	-18.5	-12.0	-5.5	16.0	22.0	28.0	mT
HAL581	–40 °C	6.5	10	13.8	8	12	15.5	0.5	2	3.5	mT
unipolar	25 °C	6.5	10	13.8	8	12	15.5	0.5	2	3.5	mT
inverted	100 °C	6.5	10	13.8	8	12	15.5	0.5	2	3.5	mT
	140 °C	6.5	10.4	14.3	8	12	16	0.5	2	3.5	mT
HAL584	–40 °C	5	7.2	11.5	5.5	9.2	12	0.5	2	3.0	mT
unipolar	25 °C	5	7.2	11.5	5.5	9.2	12	0.5	2	3.0	mT
inverted	100 °C	5	7.2	11.5	5.5	9.2	12	0.5	2	3.0	mT
	140 °C	4.5	8	11.5	5.5	9	12.5	0.2	1.9	3.5	mT

Note: For detailed descriptions of the individual types, see pages 19 and following.

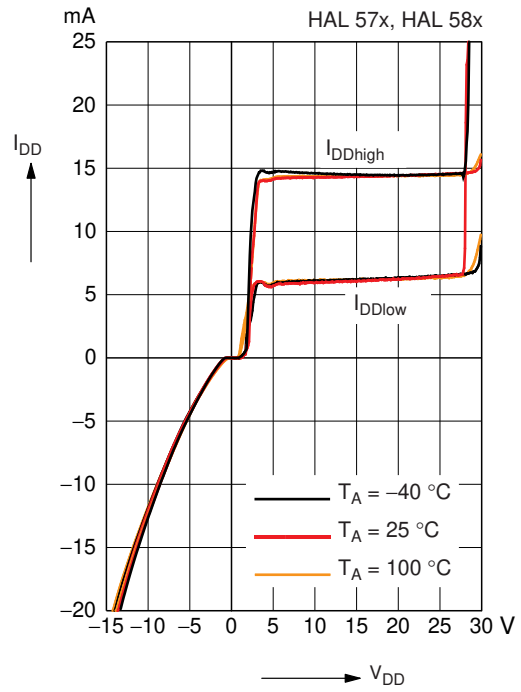


Fig. 3–7: Typical supply current versus supply voltage

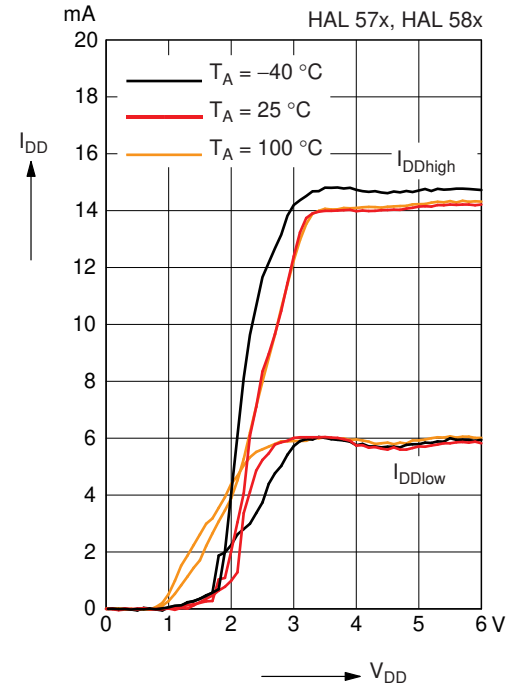


Fig. 3–8: Typical supply current versus supply voltage

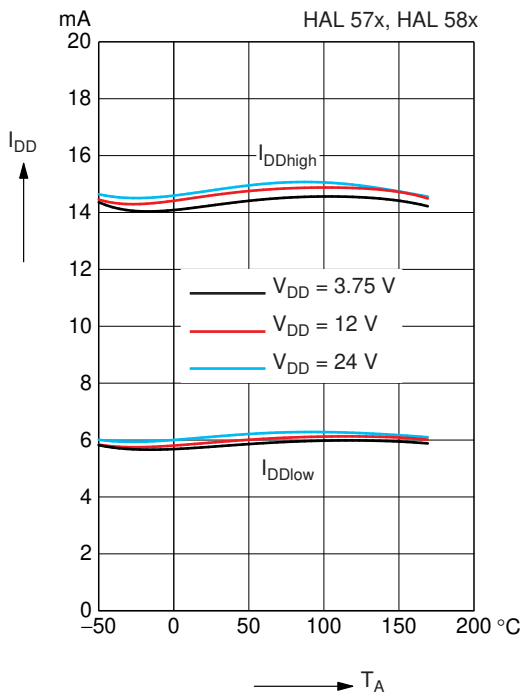


Fig. 3–9: Typical current consumption versus ambient temperature

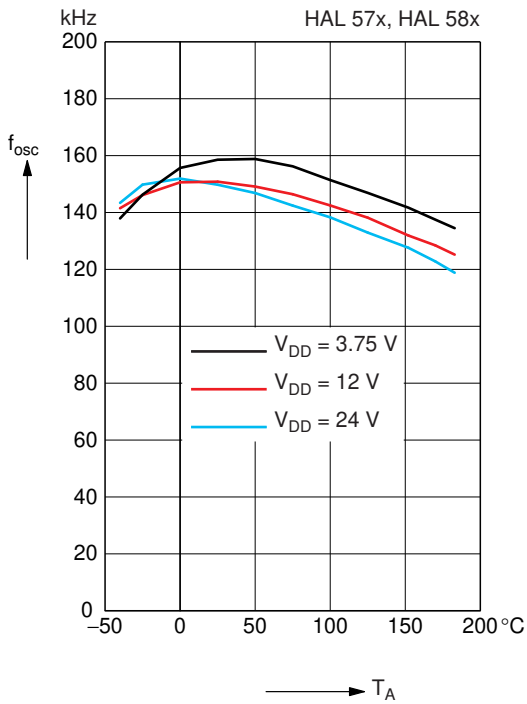


Fig. 3–10: Typ. internal chopper frequency versus ambient temperature

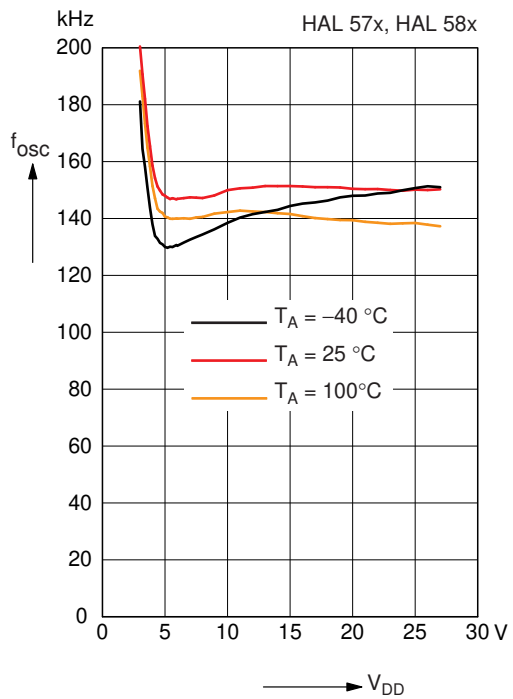


Fig. 3–11: Typ. internal chopper frequency versus supply voltage

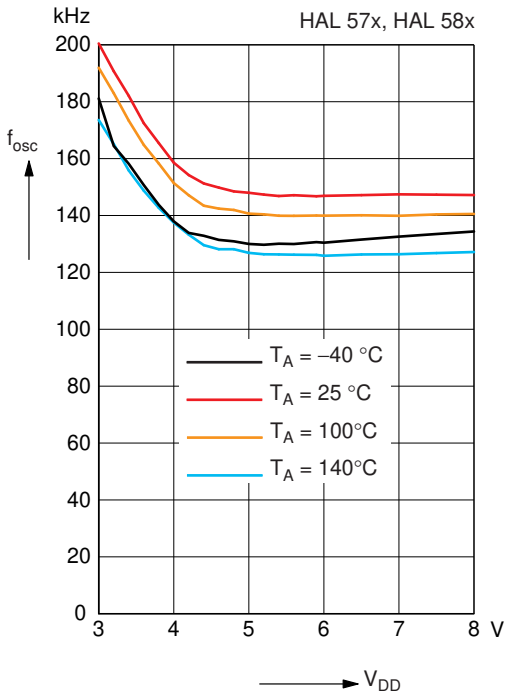


Fig. 3–12: Typ. internal chopper frequency versus supply voltage

4. Type Descriptions

4.1. HAL573

The HAL573 is a unipolar switching sensor with low sensitivity (see Fig. 4–1).

The sensor turns to high current consumption with the magnetic south pole on the branded side of the package and turns to low current consumption if the magnetic field is removed. It does not respond to the magnetic north pole on the branded side.

For correct functioning in the application, the sensor requires only the magnetic south pole on the branded side of the package.

Magnetic Features:

- switching type: unipolar
- low sensitivity
- typical B_{ON}: 43.5 mT at room temperature
- typical B_{OFF}: 41.5 mT at room temperature
- typical temperature coefficient of magnetic switching points is –1100 ppm/K
- operates with static magnetic fields and dynamic magnetic fields up to 10 kHz

Applications

The HAL573 is designed for applications with one magnetic polarity and weak magnetic amplitudes at the sensor position such as:

- solid state switches,
- contactless solutions to replace micro switches,
- position and end point detection, and
- rotating speed measurement.

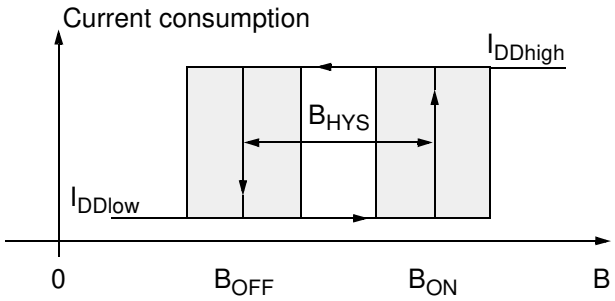


Fig. 4–1: Definition of magnetic switching points for the HAL573

Magnetic Characteristics at T_J = –40 °C° to +140 °C, V_{DD} = 3.75 V to 24 V,
Typical Characteristics for V_{DD} = 12 V

Magnetic flux density values of switching points.
Positive flux density values refer to the magnetic south pole at the branded side of the package.

Parameter	On point B_{ON}			Off point B_{OFF}			Hysteresis B_{HYS}			Magnetic Offset			Unit
T_J	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
–40 °C	37	44.2	49	34	42	48	0.5	2.2	5		44.6		mT
25 °C	37	43.5	49	34	41.5	47	0.5	2	5		42.5		mT
100 °C	34	40	46	32	38	44	0.5	2	5		39		mT
140 °C	34	38	46	32	36	44	0.2	2	5		39		mT

The hysteresis is the difference between the switching points $B_{HYS} = B_{ON} - B_{OFF}$
The magnetic offset is the mean value of the switching points $B_{OFFSET} = (B_{ON} + B_{OFF}) / 2$

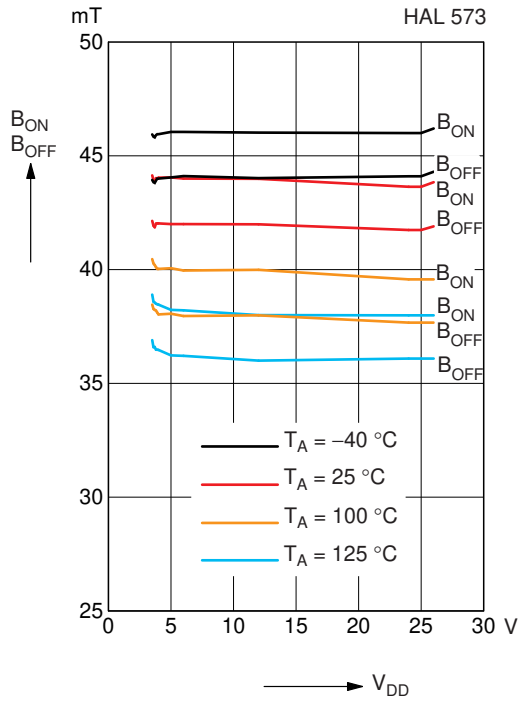


Fig. 4–2: Typ. magnetic switching points versus supply voltage

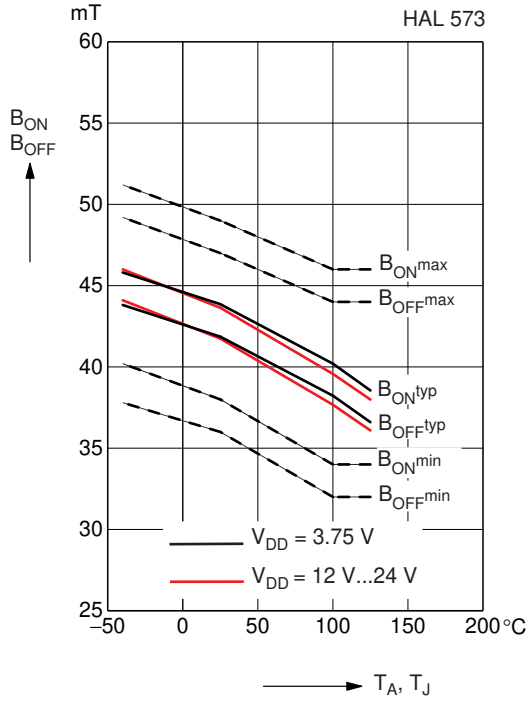


Fig. 4–4: Magnetic switching points versus temperature

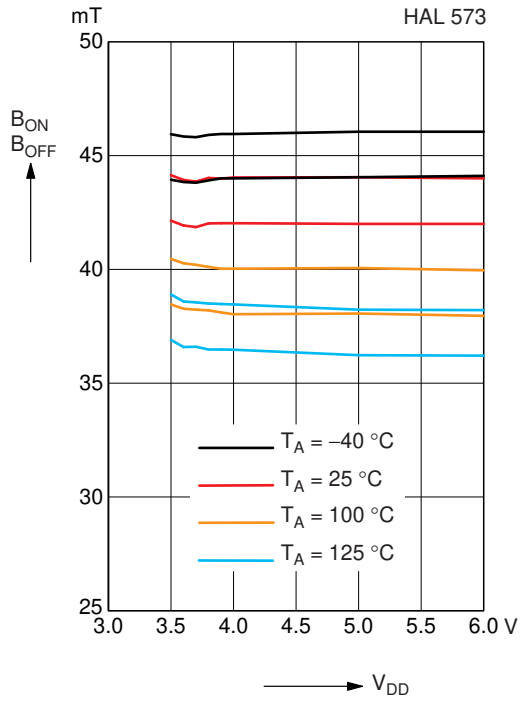


Fig. 4–3: Magnetic switching points versus supply voltage

Note: In the diagram “Magnetic switching points versus temperature” the curves for B_{ON}min, B_{ON}max, B_{OFF}min, and B_{OFF}max refer to junction temperature, whereas typical curves refer to ambient temperature.

4.2. HAL574

The HAL574 is a medium sensitive unipolar switching sensor (see Fig. 4–5).

The sensor turns to high current consumption with the magnetic south pole on the branded side of the package and turns to low current consumption if the magnetic field is removed. It does not respond to the magnetic north pole on the branded side.

For correct functioning in the application, the sensor requires only the magnetic south pole on the branded side of the package.

In this two-wire sensor family, the HAL584 is a sensor with the same magnetic characteristics but with an inverted output characteristic.

Magnetic Features:

- switching type: unipolar
- medium sensitivity
- typical B_{ON}: 9.2 mT at room temperature
- typical B_{OFF}: 7.2 mT at room temperature
- typical temperature coefficient of magnetic switching points is 0 ppm/K
- operates with static magnetic fields and dynamic magnetic fields up to 10 kHz

Applications

The HAL574 is designed for applications with one magnetic polarity and weak magnetic amplitudes at the sensor position such as:

- applications with large airgap or weak magnets,
- solid state switches,
- contactless solutions to replace micro switches,
- position and end point detection, and
- rotating speed measurement.

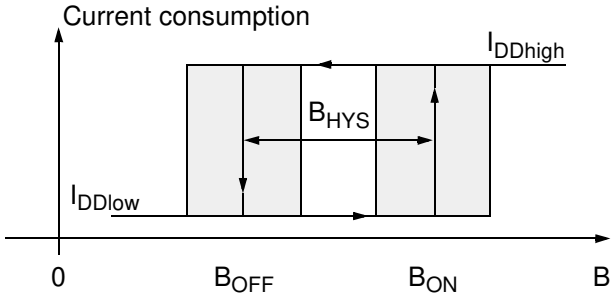


Fig. 4–5: Definition of magnetic switching points for the HAL574

Magnetic Characteristics at T_J = –40 °C to +140 °C, V_{DD} = 3.75 V to 24 V,
Typical Characteristics for V_{DD} = 12 V

Magnetic flux density values of switching points.
Positive flux density values refer to the magnetic south pole at the branded side of the package.

Parameter	On point B_{ON}			Off point B_{OFF}			Hysteresis B_{HYS}			Magnetic Offset			Unit
T_J	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
–40 °C	5.5	9.2	12	5	7.2	11.5	0.5	2	3		8.2		mT
25 °C	5.5	9.2	12	5	7.2	11.5	0.5	2	3		8.2		mT
100 °C	5.5	9.2	12	5	7.2	11.5	0.5	2	3		8.2		mT
140 °C	5	8.8	12.5	3.5	7.5	11.5	0.2	1.9	3.5		8.2		mT

The hysteresis is the difference between the switching points $B_{HYS} = B_{ON} - B_{OFF}$
The magnetic offset is the mean value of the switching points $B_{OFFSET} = (B_{ON} + B_{OFF}) / 2$

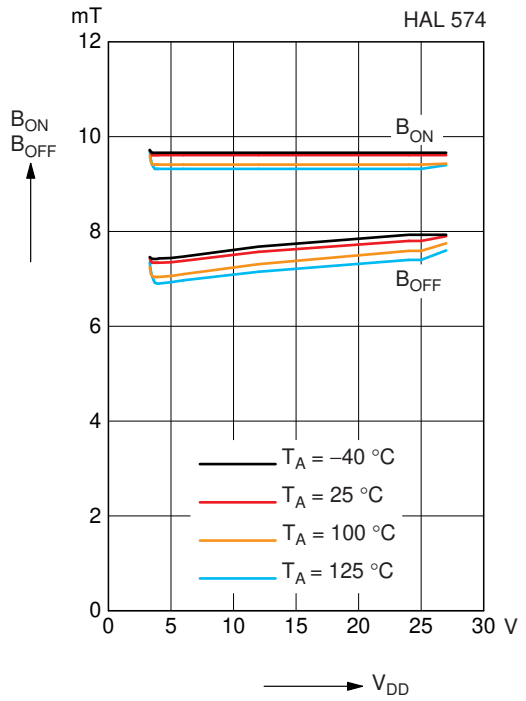


Fig. 4–6: Typ. magnetic switching points versus supply voltage

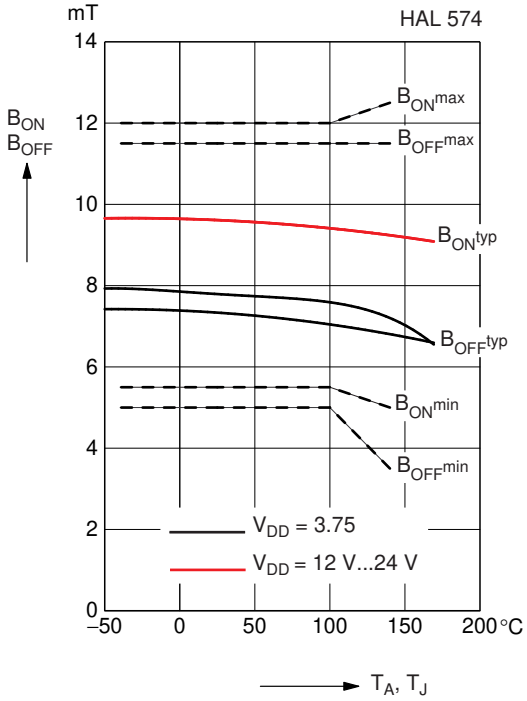


Fig. 4–8: Magnetic switching points versus temperature

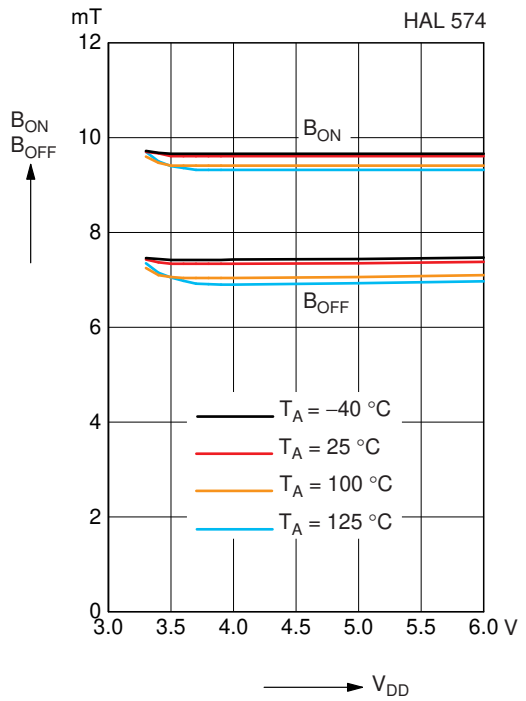


Fig. 4–7: Typ. magnetic switching points versus supply voltage

Note: In the diagram “Magnetic switching points versus temperature”, the curves for B_{ON}min, B_{ON}max, B_{OFF}min, and B_{OFF}max refer to junction temperature, whereas typical curves refer to ambient temperature.

4.3. HAL575

The HAL575 is a medium sensitive latching switching sensor (see Fig. 4–9).

The sensor turns to high current consumption with the magnetic south pole on the branded side of the package and turns to low consumption with the magnetic north pole on the branded side. The current consumption does not change if the magnetic field is removed. For changing the current consumption, the opposite magnetic field polarity must be applied.

For correct functioning in the application, the sensor requires both magnetic polarities on the branded side of the package.

Magnetic Features:

- switching type: latching
- medium sensitivity
- typical B_{ON}: 4 mT at room temperature
- typical B_{OFF}: –4 mT at room temperature
- typical temperature coefficient of magnetic switching points is 0 ppm/K
- operates with static magnetic fields and dynamic magnetic fields up to 10 kHz

Applications

The HAL575 is designed for applications with both magnetic polarities and weak magnetic amplitudes at the sensor position such as:

- applications with large airgap or weak magnets,
- multipole magnet applications,
- contactless solutions to replace micro switches,
- rotating speed measurement.

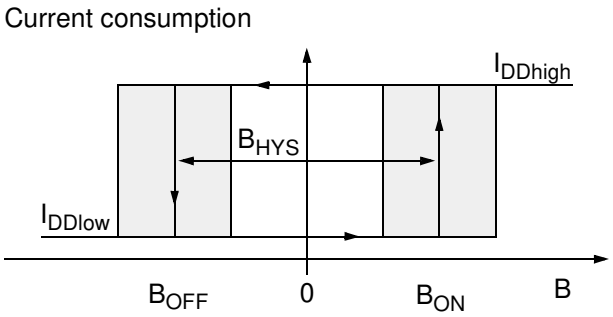


Fig. 4–9: Definition of magnetic switching points for the HAL575

Magnetic Characteristics at T_J = –40 °C to +140 °C, V_{DD} = 3.75 V to 24 V,
Typical Characteristics for V_{DD} = 12 V

Magnetic flux density values of switching points.
Positive flux density values refer to the magnetic south pole at the branded side of the package.

Parameter	On point B_{ON}			Off point B_{OFF}			Hysteresis B_{HYS}			Magnetic Offset			Unit
T_J	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
–40 °C	0.5	4	8	–8	–4	–0.5	5	8	11		0		mT
25 °C	0.5	4	8	–8	–4	–0.5	5	8	11		0		mT
100 °C	0.5	4	8	–8	–4	–0.5	5	8	11		0		mT
140 °C	0.5	4	8	–8	–4	–0.5	5	8	11		0		mT

The hysteresis is the difference between the switching points $B_{HYS} = B_{ON} - B_{OFF}$
The magnetic offset is the mean value of the switching points $B_{OFFSET} = (B_{ON} + B_{OFF}) / 2$

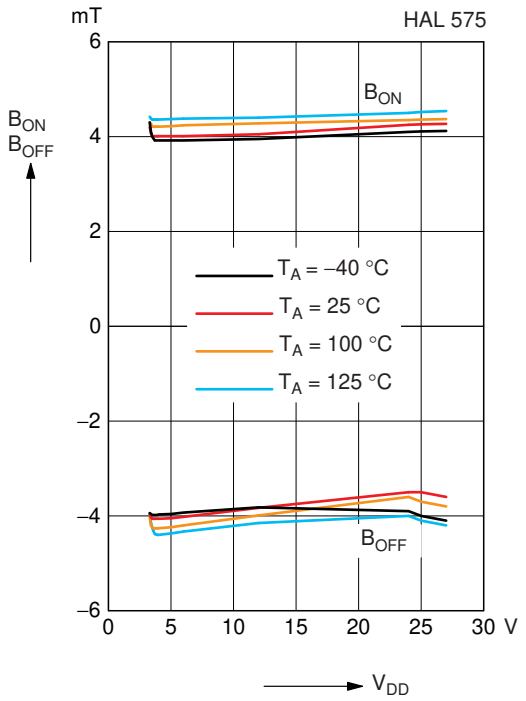


Fig. 4–10: Typ. magnetic switching points versus supply voltage

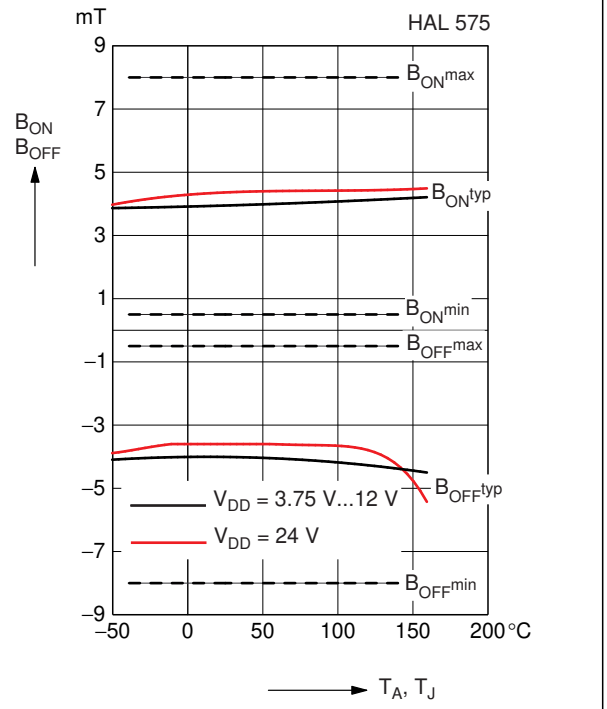


Fig. 4–12: Magnetic switching points versus temperature

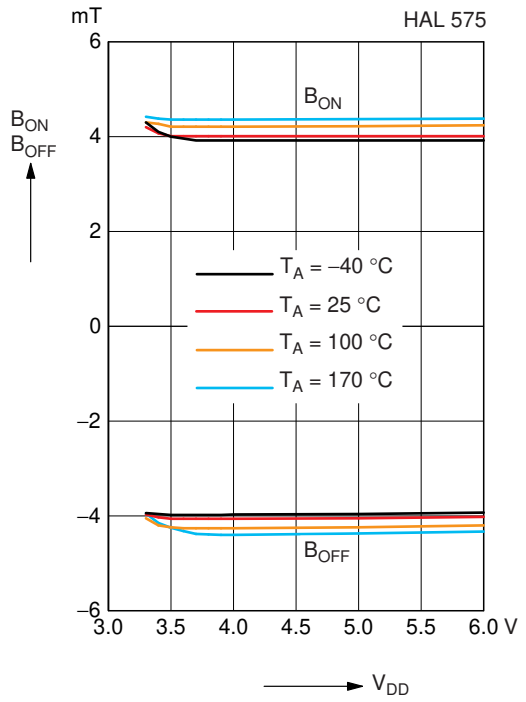


Fig. 4–11: Typ. magnetic switching points versus supply voltage

Note: In the diagram “Magnetic switching points versus temperature”, the curves for B_{ON}min, B_{ON}max, B_{OFF}min, and B_{OFF}max refer to junction temperature, whereas typical curves refer to ambient temperature.

4.4. HAL576

The HAL576 is a medium sensitive unipolar switching sensor (see Fig. 4–13).

The sensor turns to high current consumption with the magnetic south pole on the branded side of the package and turns to low current consumption if the magnetic field is removed. It does not respond to the magnetic north pole on the branded side.

For correct functioning in the application, the sensor requires only the magnetic south pole on the branded side of the package.

Magnetic Features:

- switching type: unipolar
- medium sensitivity
- typical B_{ON}: 5.7 mT at room temperature
- typical B_{OFF}: 4.2 mT at room temperature
- operates with static magnetic fields and dynamic magnetic fields up to 10 kHz

Applications

The HAL576 is designed for applications with one magnetic polarity and weak magnetic amplitudes at the sensor position such as:

- applications with large airgap or weak magnets,
- solid state switches,
- contactless solutions to replace micro switches,
- position and end point detection, and
- rotating speed measurement.

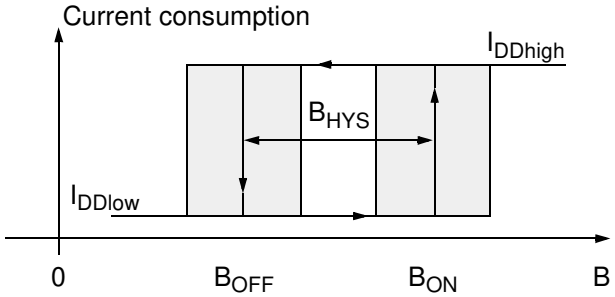


Fig. 4–13: Definition of magnetic switching points for the HAL576

Magnetic Characteristics at T_J = –40 °C to +140 °C, V_{DD} = 3.75 V to 24 V,
Typical Characteristics for V_{DD} = 12 V

Magnetic flux density values of switching points.
Positive flux density values refer to the magnetic south pole at the branded side of the package.

Parameter	On point B_{ON}			Off point B_{OFF}			Hysteresis B_{HYS}			Magnetic Offset			Unit
T_J	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
–40 °C	3.3	5.7	8.2	1.8	4.2	6.7	0.3	1.9	3.5		5		mT
25 °C	3.3	5.7	8.2	1.8	4.2	6.7	0.3	1.9	3.5		5		mT
100 °C	2.8	5.5	8.3	1.3	4	6.8	0.3	1.9	3.5		5		mT
140 °C	2	5.2	8.3	0.3	3.7	7	0.3	1.9	3.5		4.5		mT

The hysteresis is the difference between the switching points $B_{HYS} = B_{ON} - B_{OFF}$
The magnetic offset is the mean value of the switching points $B_{OFFSET} = (B_{ON} + B_{OFF}) / 2$