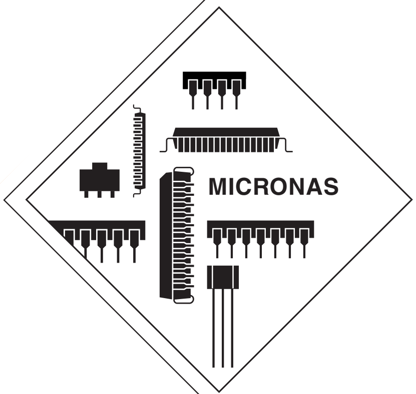
ADVANCE INFORMATION

HAL1500
Programmable Low-Voltage Hall Effect Switch



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MICRONAS

Contents

Programmable Low-Voltage Hall Effect Switch in CMOS Technology

1. Introduction

The HAL 1500 is a programmable Hall switch designed and produced in an automotive submicron CMOS technology and can be used for position detection and rotating speed measurement.

The sensor includes a temperature-compensated Hall plate with active offset compensation, a comparator, an open-drain output transistor, an EEPROM memory with lock function for the calibration data, a serial interface for programming the EEPROM, and protection devices at all pins.

The comparator compares the actual magnetic flux through the Hall plate (Hall voltage) with the programmed reference values (switching points). Accordingly, the output transistor is switched on or off.

The major magnetic characteristics like switching points, temperature coefficient of switching points, and output switching polarity are programmable in a non-volatile memory.

The HAL 1500 is programmable by modulating the voltage at the output pin of the sensor. No additional programming pin is needed.

An individual adjustment of each sensor during the customers manufacturing process is possible. With this calibration procedure, the tolerances of the sensor, the magnet and the mechanical positioning can be compensated in the final assembly.

The calculation of the individual sensor characteristics and the programming of the EEPROM memory can easily be done with a PC and the application kit from Micronas. The HAL 1500 eases logistic because its characteristics can be programmed within a wide range. Therefore, one Hall IC type can be used for various applications.

The sensor is designed for hostile industrial and automotive applications and operates with supply voltages from 3.5 V to 18 V in ambient temperature range from –40 °C up to 150 °C.

All sensors are available in a SMD-package (SOT-89B) and in a leaded version (TO-92UA).

1.1. Major Applications

Due to the sensor's versatile programming characteristics, the HAL 1500 is the optimal system solution for applications such as:

– applications with large air gap or weak magnets,
– rotating speed measurements,
– camshaft sensors,
– solid state switches,
– contactless solution for replacing microswitches,
– position and end-point detection, and
– multi-pole magnet applications.

1.2. Features

– high-precision programmable Hall effect sensor with open-drain output
– programmable via output pin
– choppered offset compensation at typ. 125 kHz
– operates from 3.5 V to 18 V supply voltage
– operates from –40 °C to 150 °C ambient temperature
– operates with magnetic fields from DC to 10 kHz
– programmable as a single-level switch or a multi-level switch with 4-bit resolution and PWM (Pulse Width Modulated) output signal
– programmable magnetic switching points (single-level switch) or programmable magnetic range and reference level (multi-level switch)
– programmable temperature coefficient of magnetic switching points or of range and reference level
– lock function and redundancy for EEPROM memory
– on-chip temperature compensation circuitry minimizes shifts over temperature and supply voltage
– over-voltage protection and reverse-voltage protection of V_{DD}-Pin
– short-circuit protected open-drain output by thermal shut down
– magnetic characteristics extremely robust against mechanical stress
– EMC-optimized design

1.3. Marking Code

The HAL 1500 has a marking on the package surface (branded side). This marking includes the name of the sensor and the temperature range.

Type	Temperature Range	
	A	K
HAL 1500	1500A	1500K

1.3.1. Special Marking of Prototype Parts

Prototype parts are coded with an underscore beneath the temperature range letter on each IC. They may be used for lab experiments and design-ins, but are not intended to be used for qualification tests or as production parts.

1.4. Operating Junction Temperature Range

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

A: T_J = –40 °C to +170 °C

K: T_J = –40 °C to +140 °C

Note: Due to high power dissipation at high current consumption, there is a difference between the ambient temperature (T_A) and junction temperature (see Section 5.3. on page 16).

1.5. Hall Sensor Package Codes

HALXXXPA-T

- Temperature Range: A or K
- Package: SF for SOT-89B
  UA for TO-92UA
- Type: 1500

Example: **HAL1500SF-A**

→ Type: 1500
→ Package: SOT-89B
→ Temperature Range: T_J = –40 °C to +170 °C

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

1.6. Solderability

All packages: according to IEC68-2-58.

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

Components stored in the original packaging should provide a shelf life of at least 12 months, starting from the data code printed on the labels, even in environments as extreme as 40 °C and 90% relative humidity.

1.7. Pin Configuration and Short Descriptions

Pin No.	Pin Name	Type	Short Description
1	V_{DD}	IN	Supply Voltage Pin
2	GND		Ground
3	OUT	IN OUT	Open-Drain Output and Programming Pin

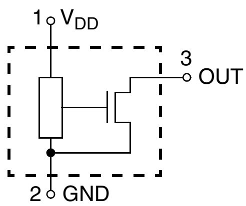

Fig. 1–1: Pin configuration

2. Functional Description

The HAL 1500 is a programmable switch and allows the programming of single- or multi-level switching, magnetic switching points, temperature coefficient of magnetic switching points, and output switching polarity.

2.1. General Function

This Hall effect sensor is a monolithic integrated circuit that responses 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 predetermined temperature-dependent bias increases the supply voltage of the Hall plate and adjusts the switching points to the decreasing induction of magnets at higher temperatures.

Magnetic offset caused by mechanical stress is compensated for by using the “switching offset compensation technique”. Therefore, an internal oscillator provides a two-phase clock. The Hall voltage is sampled at the end of the first phase. At the end of the second phase, both sampled and actual Hall voltages are averaged and compared with the actual switching threshold. Subsequently, the comparator switches to the appropriate state.

The time from crossing the magnetic switch level to switching of the output can vary between zero and $1/f_{OSC}$.

On-chip EEPROM cells allow the programming of the magnetic switching points for calibration in the system environment. Electrical programming is provided with an voltage modulation sequence at the output.

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

Single-Level Switch Output Mode

When the magnetic field exceeds the threshold level, the comparator switches to the appropriate state to control the MOSFET (open-drain) output. The built-in hysteresis eliminates oscillation and maintains a switching behavior of the output without bouncing.

Multi-Level Switch Output Mode

An internal counter increases the switching level. When the counter reaches the level of the external magnetic field, the comparator switches and the sensor provides a PWM-coded output signal. After that the counter begins a new cycle.

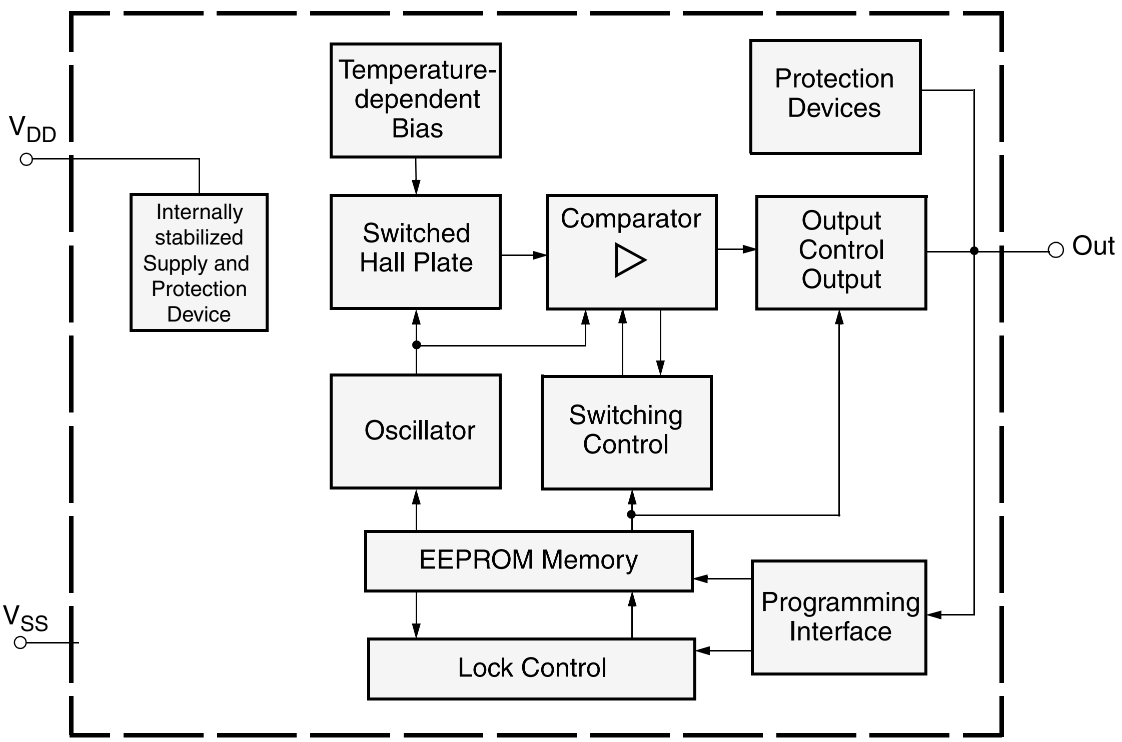

Fig. 2–1: HAL 1500 block diagram

2.2. Major Programming Characteristics

The description of the output characteristic of the sensor must be distinguished between a sensor programmed as a single-level switch or as a multi-level switch.

2.2.1. Single-Level Switch

– magnetic hysteresis from 1 mT to 32 mT in steps of 1 mT

– magnetic offset from –31.5 mT to 31.5 mT in steps of 0.5 mT

– for normal switching characteristics (magnetic south pole at the branded side of package), the magnetic switching points can be calculated as follows:

$B_{ON} = B_{OFFSET} + 1/2\ B_{HYS}$

$B_{OFF} = B_{OFFSET} - 1/2\ B_{HYS}$

– temperature behavior of magnetic switching points

– normal or inverted output switching mode

2.2.2. Multi-Level Switch

– magnetic range 8 mT and 16 mT with 4-bit resolution

– magnetic reference level from –31.5 mT to 31.5 mT in steps of 0.5 mT

– temperature behavior of magnetic sensitivity

– normal or inverted output switching

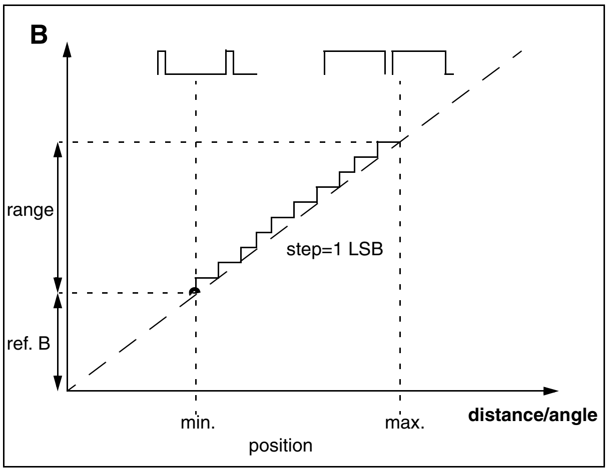

Fig. 2–2: Multi-level switching behavior

2.3. EEPROM

The EEPROM consists of two parts:

– Part 1 contains the registers for: OUTPUT_TYPE, HYSTERESIS (RANGE), OFFSET (REFERENCE-LEVEL), TC and OUTPUTPOLARITY. These registers are programmable by the customer.

– Part 2 contains the Micronas registers. These registers are programmed and locked during Micronas production. The registers are used for oscillator frequency trimming and several other special characteristics.

2.3.1. Terminology

HYSTERESIS: name of the **register** or **register value**

Hysteresis: name of the **parameter**

2.3.2. EEPROM Cells

Single-Level Switch, Multi-Level Switch

The OUTPUT_TYPE bit determines whether the sensor acts as a single- or multi-level switch.

Table 2–1: OUTPUT_TYPE bit

OUTPUT_TYPE	Application
0	Single-level switch
1	Multi-level switch

Magnetic Hysteresis, Magnetic Range

The HYSTERESIS bits determine the magnetic switching hysteresis of the sensor. The HYSTERESIS range is from 0 (1 mT) to 31 (32 mT). If the sensor is programmed as a multi-level switch (OUTPUT_TYPE set to 1), the RANGE bits determine the range of the multi-level switch. The possible ranges are 0 (8 mT) and 1 (16 mT). The higher bits are not used when the sensor is programmed as a multi-level switch.

Table 2–2: HYSTERESIS bits

No of Bits	**Magnetic Hysteresis Range (OUTPUT_TYPE = 0)**
5	1 mT…32 mT
No of Bits	**Magnetic Range (OUTPUT_TYPE =1)**
1 LSB	8 mT, 16 mT

Magnetic Offset, Magnetic Reference Level

The OFFSET bits determine the magnetic offset of the sensor. The OFFSET register range is from –63 (–31.5 mT) to 63 (31.5 mT). If OUTPUT_TYPE is set to 1, the REFERENCE-LEVEL bits determine the reference level of the multi-level switch. The range is from –31.5 mT to 31.5 mT.

Table 2–3: OFFSET bits

No of Bits	**Magnetic Offset Range (OUTPUT_TYPE = 0)** **Magnetic Reference level (OUTPUT_TYPE = 1)**
7	–31.5 mT…31.5 mT

Temperature Coefficient of Magnetic Switching Points

The TC bits determine the temperature coefficient of the magnetic switching points. The TC range is from 0 (–2280 ppm/K) to 31 (1360 ppm/K) in approximately +110 ppm/K steps.

Table 2–4: TC bits

No of Bits	**Temperature Coefficient Range of Magnetic Switching Points**
5	1360 ppm/K…–2280 ppm/K

Output Switching Polarity

The OUTPUTPOLARITY bit determines the polarity of the output switching behavior.

Table 2–5: OUTPUTPOLARITY bit

OUTPUT-POLARITY	**Output Switching Polarity**
0	$B_{ON} > B_{OFF}$, normal mode
1	$B_{OFF} > B_{ON}$, inverted mode

3. Specifications

3.1. Outline Dimensions

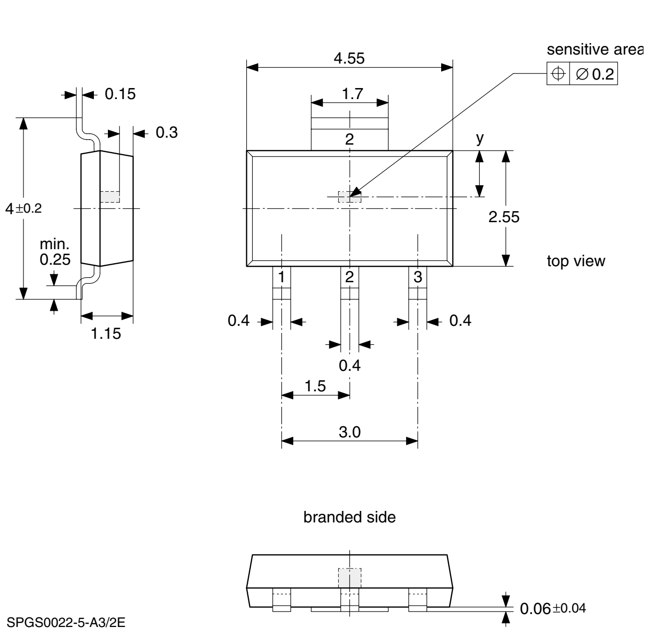

Fig. 3–1:
Plastic Small Outline Transistor Package
(SOT89B)
Weight approximately 0.4 g
Dimensions in mm

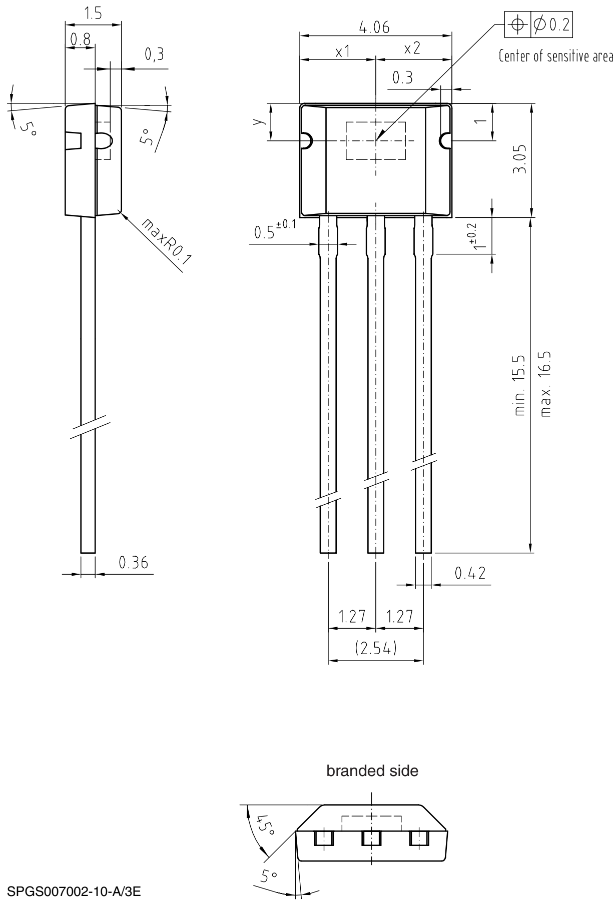

Fig. 3–2:
Plastic Transistor Single Outline Package
(TO-92UA)
Weight approximately 0.12 g
Dimensions in mm

3.2. Dimension of Sensitive Area

0.25 mm×0.12 mm

3.3. Positions of Sensitive Areas

	SOT-89B	TO-92UA
x	center of the package	center of the package
y	0.95 mm nominal	1 mm nominal

Note: For all package diagrams, a mechanical tolerance of ±0.05 mm applies to all dimensions where no tolerance is explicitly given. All package dimensions exclude molding flash.

3.4. Absolute Maximum Ratings

Symbol	Parameter	Pin No.	Min.	Max.	Unit
V_{DD}	Supply Voltage	1	–15	26.5 [1)]	V
V_O	Output Voltage	3	–0.3	26.5 [1)]	V
I_O	Continuous Output On Current	3	–	30	mA
T_J	Junction Temperature Range		–40	170	°C
[1)] t < 5 min					

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 or any other conditions beyond those indicated in the “Recommended Operating Conditions/Characteristics” of this specification is not implied. Exposure to absolute maximum ratings conditions for extended periods may affect device reliability.

3.4.1. Storage, Moisture Sensitivity Class, and Shelf Life

Storage has no influence on the electrical and magnetic characteristics of the sensors. However, under disadvantageous conditions, extended storage time can lead to alteration of the lead plating, which affects the soldering process.

Moisture Sensitivity Class:

The target for the package SOT-89B is level 1 according to J-STD-020A “Moisture/Reflow Sensitivity Classification for Non-hermetic Solid State Surface Mount Devices”. If the sensors are stored at maximum 30 °C and maximum 90% relative humidity, no Dry Pack is required.

The permissible storage time (shelf life) of the sensors would be minimum 12 month, beginning from the date of manufacturing (see section 4.1), if they are stored in the original packaging at maximum 40 °C ambient temperature and maximum 90% relative humidity.

3.5. Recommended Operating Conditions

Symbol	Parameter	Pin No.	Min.	Typ.	Max.	Unit
V_{DD}	Supply Voltage	1	3.5	–	18	V
I_O	Continous Output On Current	3	0	–	20	mA
V_O	Output Voltage (output switched off)	3	0	–	18	V

3.6. Electrical Characteristics

at T_J = –40 °C to +170 °C, V_{DD} = 3.5 V to 18 V, after programming, as not otherwise specified in Conditions.
Typical Characteristics for T_J = 25 °C and V_{DD} = 12 V

Symbol	Parameter	Pin No.	Min.	Typ.	Max.	Unit	Conditions
I_{DD}	Supply current	1	2.0	3.2	5.0	mA	T_J = 25 °C
I_{DD}	Supply current over Temperature Range	1	1.6	3.2	6	mA	
V_{DDZ}	Overvoltage Protection at Supply	1	-	29	32	V	I_{DD} = 25 mA, T_J = 25 °C, t = 20 ms
V_{OZ}	Overvoltage Protection at Output	3	-	29	32		I_{OH} = 25 mA, T_J = 25 °C, t = 20 ms Output switched off
V_{OL}	Output Voltage	3	-	130	240	mV	I_{OL} = 20 mA, T_J = 25 °C, V_{DD} = 3.5 V to 18 V
V_{OL}	Output Voltage over Temperature Range	3	-	130	400	mV	I_{OL} = 20 mA
I_{OH}	Output Leakage Current	3	-	-	10	µA	Output switched off, $T_J \leq$ 150 °C, V_{OH} = 3.5 V to 18 V
f_{OSC}	Internal Oscillator Chopper Frequency	-	-	128	-	kHz	T_J = 25 °C, V_{DD} = 3.5 V to 18 V
f_{OSC}	Internal Oscillator Chopper Frequency over Temperature Range	-	-	128	-	kHz	
$t_{en(O)}$	Enable Time of Output after V_{DD} Setting	1	-	50	-	µs	V_{DD} = 12 V[1)]
t_r	Output Rise Time	3	-	75	400	ns	V_{DD} = 12 V, R_L = 820 Ω, C_L = 20 pF
t_f	Output Fall Time	3	-	50	400	ns	V_{DD} = 12 V, R_L = 820 Ω, C_L = 20 pF
f_{PWM}	PWM frequency	3	-	125	-	Hz	
R_{thJSB} case SOT-89B	Thermal Resistance Junction to Substrate Backside	-	-	150	200	K/W	Fiberglass Substrate 30 mm × 10 mm × 1.5 mm, pad size see Fig. 3–3
R_{thJA} case TO-92UA	Thermal Resistance Junction to Soldering Point	-	-	150	200	K/W	

[1)] B > B_{ON} + 2mT or B < B_{OFF} – 2 mT for normal output, B > B_{OFF} + 2 mT or B < B_{ON} – 2 mT for inverted output

3.7. Magnetic Characteristics

at T_J= –40 °C to +170 °C, V_{DD} = 3.5 V to 18 V. Typical Characteristics for T_J = 25 °C and V_{DD} = 12 V.

Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
B_{HYS}	magnetic hysteresis	-	1	-	mT	HYSTERESIS = 0
B_{HYS}	magnetic hysteresis	-	32	-	mT	HYSTERESIS = 31
	LSB value of magnetic hysteresis	-	1	-	mT	
B_{OFFSET}	magnetic offset	-	–31.5	-	mT	OFFSET = –63
B_{OFFSET}	magnetic offset	-	31.5	-	mT	OFFSET = 63
	LSB value of magnetic offset	-	0.5	-	mT	
	LSB value of temperature coefficient of magnetic switching point	-	–110	-	ppm/K	

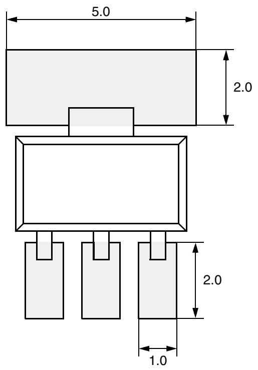

Fig. 3–3: Recommended pad size SOT-89B
Dimensions in mm

4. Programming of the Sensor

4.1. Definition of Programming Pulses

The sensor is addressed by modulating a serial telegram (V_{CON}) on the output pin. The sensor answers with a serial telegram (V_{SENS}) on the output pin.

A logical “0” is coded as no voltage change within the bit time. A logical “1” is coded as a voltage change between 50% and 80% of the bit time. After each bit, a voltage change occurs.

4.2. Definition of the Telegram

Each telegram starts with the Sync bit (logical 0), 4 bits for the Command (COM), and the Command Parity bit (CP).

There are three kinds of telegrams:

– Write the sensor (see Fig. 4–2)
  After the CP bit, follow 20 Data bits (DAT). If the telegram is valid and the command has been processed, the sensor answers with an Acknowledge bit (logical 0) on the output.

– Read the sensor (see Fig. 4–3)
  After evaluating this command, the sensor answers with 20 Data bits on the output.

– Programming the EEPROM cells (see Fig. 4–4)
  After evaluating this command, the sensor answers with the Acknowledge bit. After the delay time t_w, the output voltage is low for the next 100 ms. After that the next positive edge will end the programming.

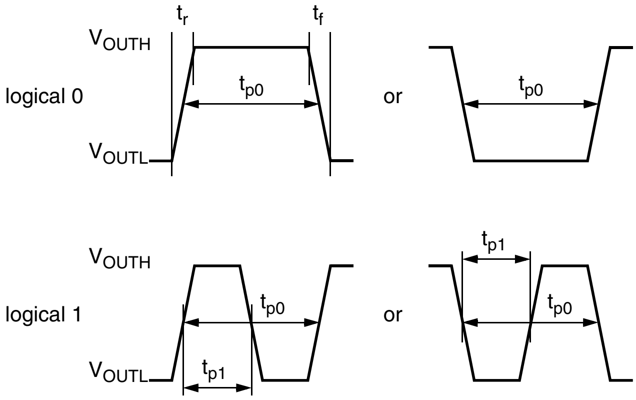

Fig. 4–1: Definition of logical 0 and 1 bit

Table 4–1: Telegram parameters

Symbol	Parameter	Pin	Min.	Typ.	Max.	Unit	Remarks
V_{OUTL}	Output Voltage for Low Level during Programming	3	0	-	0.2	V	
V_{OUTH}	Output Voltage for High Level during Programming	3	4.8	-	5	V	
t_r	Rise Time	1	-	-	0.05	ms	
t_f	Fall Time	1	-	-	0.05	ms	
t_{p0}	Bit Time on V_{OUT}	1	0.6	1	1.4	ms	t_{p0} is defined by the Sync bit
t_{p1}	Voltage Change for logical 1	3	50	65	80	%	% of t_{p0} or t_{pOUT}
V_{DDPROG}	Supply Voltage during Programming the EEPROM	1	4.75	5	5.25	V	
t_{PROG}	Programming Time for EEPROM	1	95	100	105	ms	

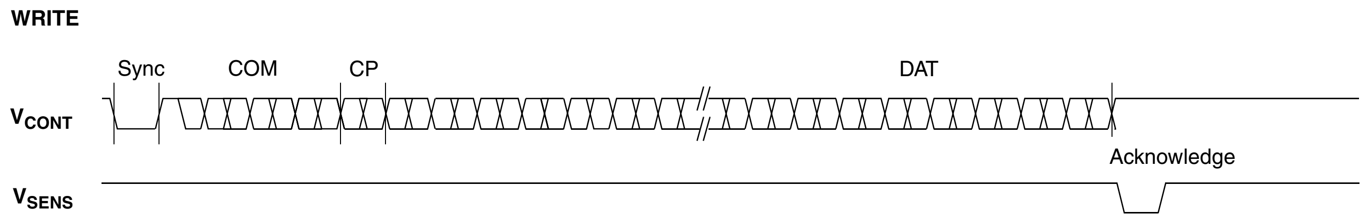

Fig. 4–2: Telegram for coding a WRITE command

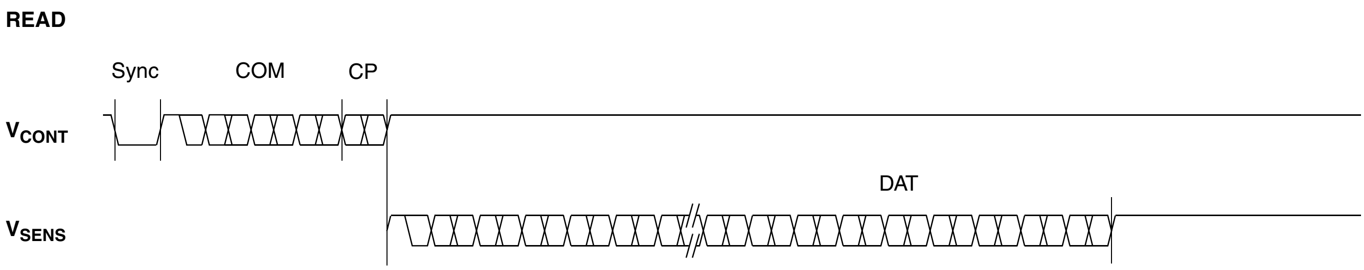

Fig. 4–3: Telegram for coding a READ command

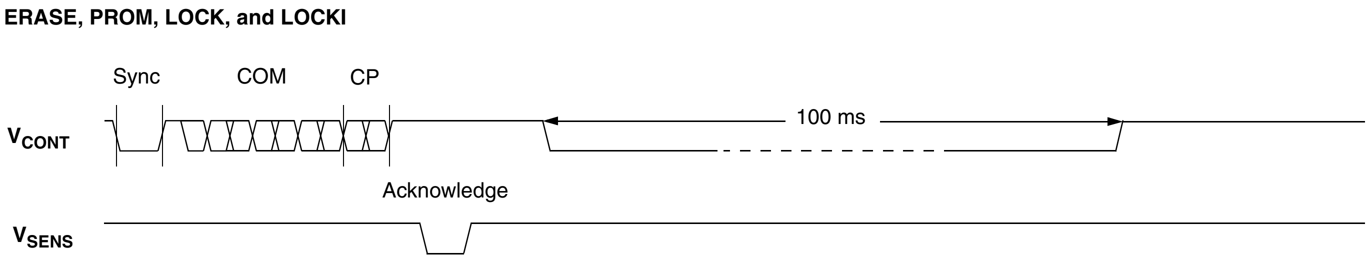

Fig. 4–4: Telegram for coding a ERASE, PROM, or LOCK command

4.3. Telegram Codes

Sync Bit

Each telegram starts with the Sync bit. This logical “0” pulse defines the exact timing for t_{p0}.

Command Bits (COM)

The Command code contains 4 bits and is a binary number. Table 4–2 shows the available commands and the corresponding codes for the HAL 1500.

Command Parity Bit (CP)

This parity bit is “1” if the number of zeros within the four Command bits is odd. The parity bit is “0”, if the number of zeros is even.

Data Bits (DAT)

The 20 Data bits contain the register information.

Acknowledge

After each telegram, the output answers with the Acknowledge signal. This logical “0” pulse defines the exact timing for t_{pOUT} (not for the READ command).

Table 4–2: Available commands

Command	Code	Explanation
READ	2	read a register
WRITE	3	write a register
PROM	d	program all nonvolatile registers (except the lock bits)
ERASE	8	erase all nonvolatile registers (except the lock bits)
WROUTEN	f	write a register and enable output
LOCK	e	lock the whole device and switch permanently to the analog-mode

4.4. Number Formats

Binary Number

The most significant bit is given as first, the least significant bit as last digit.

Example: `101001` represents 41 decimal.

4.5. Register Information

HYSTERESIS

– The register range is from 0 up to 31.

– The register value is calculated by:

$B_{HYST\_MAX} = 0.98\ mT + 0.98\ mT * 31$

OFFSET

– The register range is from –63 up to 63.

– The register value is calculated by:

$B_{OFFS\_MAX} = 0.49\ mT * 63$

TC

– The TC register range is from 0 up to 31.

Please refer to Section 5.2. on page 16 for the recommended values.

4.6. Programming Information

If the content of the EEPROM (except the lock cell) is to be changed, the desired value must first be written into the corresponding RAM. Before reading out the RAM again, the value must be permanently stored in the EEPROM.

Permanently storing a value in the EEPROM is done by first sending an ERASE command followed by sending a PROM command. ERASE and PROM act on all EEPROM cells in parallel.

The number of programming or erase cycles is limited to 100.

Table 4–3: Available programmable parameters

Parameter	Data Bits	Format	Customer	Remark
HYSTERESIS	5	binary	read/write/program	magnetic hysteresis
OFFSET	7	binary	read/write/program	magnetic offset
TC	5	binary	read/write/program	temperature coefficient of magnetic hysteresis and offset
OUTPUT_TYPE	1	binary	read/write/program	
OUTPOLARITY	1	binary	read/write/program	sets $B_{off} > B_{on}$

5. Application Notes

5.1. Application Circuit

For EMC protection, it is recommended to connect one ceramic 4.7-nF capacitor each between ground and the supply voltage, respectively the output pin. It is also recommended to use a series resistor of 220 Ω in the V_{DD} line of the sensor. In addition, the input of the controller unit should be pulled-up with a 1.2-kΩ resistor. You should also use a 4.7-nF capacitor between the input of the controller and GND.

5.2. Temperature Compensation

The relationship between the temperature coefficient of the magnet and the corresponding TC code for compensation is given in Table 5–1.

5.3. Ambient Temperature

Due to the internal power dissipation, the temperature on the silicon chip (junction temperature T_J) is higher than the temperature outside the package (ambient temperature T_A).

$T_J = T_A + \Delta T$

At static conditions, the following equation is valid:

$\Delta T = I_{DD} * V_{DD} * R_{th}$

For typical values, use the typical parameters. For worst case calculation, use the max. parameters for I_{DD} and R_{th}, and the max. value for V_{DD} from the application.

For V_{DD} = 5 V, R_{th} = 200 K/W and I_{DD} = 3.2 mA the temperature difference is ΔT =3.2 K.

For all sensors, the junction temperature T_J is specified. The maximum ambient temperature T_{Amax} can be calculated as:

$T_{Amax} = T_{Jmax} - \Delta T$

Table 5–1: TC codes

Temperature Coefficient of Magnet (ppm/K)	TC
1360	31
1250	30
1140	29
1030	28
910	27
800	26
690	25
580	24
470	23
350	22
230	21
120	20
10	19
–110	18
–220	17
–350	16
–460	15
–580	14
–690	13
–810	12
–930	11
–1050	10
–1170	9
–1290	8
–1420	7
–1530	6
–1660	5
–1790	4
–1910	3
–2030	2
–2160	1
–2280	0

5.4. Extended Operating Conditions

All sensors fulfill the electrical and magnetic characteristics when operated within the Recommended Operating Conditions (see Section 3.5. on page 8).

Supply Voltage Below 3.5 V

Typically, the sensors operate with supply voltages above 3 V, however, below 3.5 V some characteristics may be outside the specification.

Note: The functionality of the sensor below 3.5 V has not been tested. For special test conditions, please contact Micronas.

5.5. Start-up Behavior

Due to the active offset compensation, the sensors have an initialization time (enable time $t_{en(0)}$) after applying the supply voltage. The parameter $t_{en(0)}$ is specified in the Electrical Characteristics (see Section 3.6. on page 9).

During the initialization time, the output state is not defined and the output can toggle. After $t_{en(0)}$, the output will be in switching state defined by the applied magnetic filed and the programmed magnetic characteristics.

When the sensor is programmed as a single level switch, the output state will be not defined for magnetic fields between B_{ON} and B_{OFF}. In order to achieve a well-defined output state, the applied magnetic field must be above B_{ONmax}, respectively, below B_{OFFmin}.

5.6. EMC and ESD

For applications with disturbances on the supply line or radiated disturbances a series resistor and a capacitor are recommended (see Fig. 5–1). The series resistor and the capacitor should be placed as closely as possible to the Hall Sensor.

Applications with this arrangement will pass the EMC tests according to the product standard DIN40839.

Note: The international standard ISO 7637 is similar to the used product standard DIN 40839.

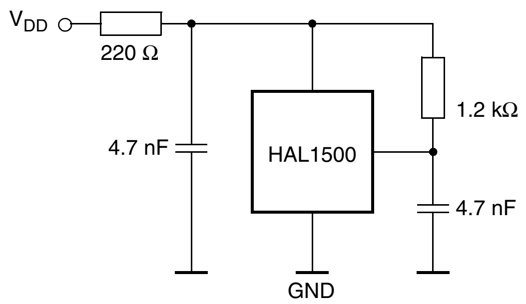

Fig. 5–1: Recommended application circuit

6. Data Sheet History

1. Advance Information: “HAL 1500 Programmable Low-Voltage Hall Effect Switch”, Aug. 8, 2002, 6251-496-1AI. First release of the advance information.

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