Hall Sensors: Ordering Codes, Packaging, Handling

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MICRONAS

Contents

1. Ordering Codes for Hall Sensors

1.1 Overview

The Product group “Hall sensors” from Micronas comprises several families of Hall switches and linear sensors available in a variety of packages, packaging variants, and temperature ranges.

This brochure gives an overview of the packaging variants and explains the ordering code system.

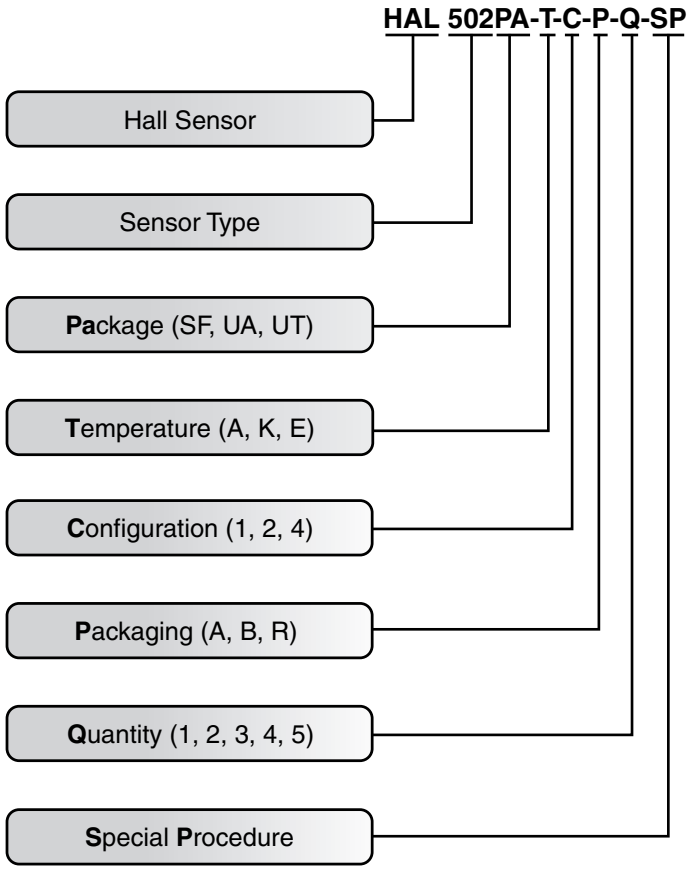


Figure 1: Key to ordering codes

First, all components of the ordering codes are explained separately. In section 2, from page 8 onwards, the complete ordering codes for the packaging variants are shown. This overview also serves as a selection guide. In section 4, from page 14 onwards, marking of the sensors and available packaging units with their ordering codes are displayed.

The sensor type is determined by the application, the package, and the temperature range. Therefore, the first part of the ordering code is already specified, while the second part depends on the desired packaging variant.

1.2 Hall Sensor

The first three characters of the ordering codes are fixed to “HAL” as symbolic designation for all Hall sensors.

1.3 Sensor Type

The following three digits are reserved for the designation of the sensor. Thus, the sensor type “502” refers to the Hall sensor “HAL 502”. A detailed description of functions, features, and parameters can be found in the data sheet “HAL 5xx”.

1.4 Package “PA”

The Hall sensors from Micronas are available in the following packages:

Table 1: Package Codes

Package Code	Package	Pins
UA	TO-92UA	leaded
UT	TO-92UT	leaded
SF	SOT-89B	SMD

1.5 Temperature Range “T”

The Hall sensors from Micronas are suitable for the following temperature ranges:

Table 2: Temperature Codes

Temperature Code	Junction temperature range (T_J) of the sensors	
	min.	**max.**
E	–40 °C	100 °C
K	–40 °C	140 °C
A	–40 °C	170 °C

Note: The specified temperature ranges for all sensors in this brochure and in the data sheets always refer to the junction temperature. On account of self-heating, the junction temperature (T_J) is always higher than the ambient temperature (T_A). The relationship between junction temperature and ambient temperature is explained in the data sheet section „Application Notes“. This allows the calculation of the maximum permissible ambient temperature for the appropriate application.
The maximum permissible ambient temperature is always lower than the specified junction temperature.

The following table gives an overview of packages availability and temperature ranges.

Table 3: Packages and temperature ranges of the sensors

Type	UA-A	UA-K	UA-E	SF-A	SF-K	SF-E	UT-A	UT-K	UT-E
HAL 114, HAL 115	–	•	•	–	•	•	–	–	–
HAL 300, HAL 320	•	•	•	•	•	•	–	–	–
HAL 401	–	–	–	•	•	•	–	–	–
HAL 50x, HAL 51x HAL 525, HAL 535	•	•	•	•	•	•	–	–	–
HAL 55x, HAL 56x	•	•	•	•	•	•	–	–	–
HAL 57x, HAL 58x	–	•	•	–	•	•	–	–	–
HAL 621, HAL 629	•	•	•	•	•	•	–	–	–
HAL 7xx	–	–	–	–	•	•	–	–	–
HAL 8xx	–	–	–	–	–	–	•	•	•
HAL 1000	–	–	–	–	–	–	•	•	•

• = variant available – = variant not available

1.6 Configuration “C”

Three different configurations are offered.

The packages TO-92UA and TO-92UT are offered in two configurations. The basic type has straight legs (inline, not spread; configuration “2”). For simple PCB designs, this package is also available with spread legs (inline, spread; configuration “1“).

Table 4: Description of the configuration codes

Configuration Code	Configuration	Remark
1	Inline, spread TO-92UA or TO-92UT	see Figure 4 on page 10 and Figure 5 on page 10
2	Inline, not spread TO-92UA or TO-92UT	see Figure 4 on page 10 and Figure 5 on page 10
4	SOT-89B on blister tape	see Figure 6 on page 11

The SOT-89B is produced in a 3-pin and a 4-pin version. The detailed pin configuration is described in the appropriate data sheet.

1.7 Packaging “P”

Depending on the sensor package, different packaging variants are offered:

All sensors in the packages TO-92UA and TO-92UT are available in both bulk and carrier tape form (Ammopack, according to IEC 286) with straight and spread legs. The four possible variants are shown in Figure 3 on page 9 by means of an example. Detailed dimensions for the Ammopack are shown in Figure 7 on page 12 and Figure 8 on page 13.

The package SOT-89B is available in blister tapes on reels according to IEC 286. Figure 2 on page 8 demonstrates both variants.

Table 5: Packaging Codes

Packaging Code	Delivery	Package
B	Bulk	TO-92UA and TO-92UT
A	Ammopack	TO-92UA and TO-92UT
R	Reel	SOT-89B

1.8 Quantity “Q”

The sensors are delivered in different packaging units and quantities. The packaging size is determined by the inner packaging (basic unit) and the outer packaging (cardboard box).

Only entire packaging units (outer packaging) can be delivered.

Table 6: Delivery Quantities

Quantity Code	External Packaging	Internal Packaging	Package and Form Of Delivery
1	2000	1000	TO-92UA/UT Bulk and SOT-89B 2 reels with 1000 sensors
2	2000	2000	TO-92UA/UT Ammopack 1 tape with 2000 sensors
3	20000	1000	TO-92UA/UT Bulk 20 bags with 1000 sensors
4	8000	8000	TO-92UA/UT Ammopack 1 tape with 8000 sensors
5	15000	5000	SOT-89B Reel 3 reels with 5000 sensors

Packaging is described from page 16 onwards.

The following tables show possible variants of configuration, packaging, and quantity depending on the sensor's package.

Table 7: Available Variants for **TO-92UA/UT**

Configuration Code	Packaging Code	Quantity Code				
		1	**2**	**3**	**4**	**5**
1 (=spread)	**A** (=Ammopack)	–	•	–	•	–
1 (=spread)	**B** (=Bulk)	•	–	•	–	–
2 (=non-spread)	**A** (=Ammopack)	–	•	–	•	–
2 (=non-spread)	**B** (=Bulk**)**	•	–	•	–	–

• = Variant available – = Variant not available

In Figure 3 on page 9, an overview with examples and the complete ordering codes is given in the selection guide.

Table 8: Available Variants for **SOT-89B**

Configuration Code	Packaging Code	Quantity Code				
		1	**2**	**3**	**4**	**5**
4 (=SMD)	**R** (=Reel)	•	–	–	–	•

• = Variant available – = Variant not available

In Figure 2 on page 8 an overview with examples and the complete ordering codes is given in the selection guide.

1.9 Special Procedure "SP"

These two characters of the ordering code are reserved for customer-specific variants (special conditions). Should this be the case, please use the number code provided by Micronas.

The value "00" is used for standard parts.

2. Selection Guide

In this section, possible forms of delivery and the appropriate ordering codes are shown using the sensor “HAL 502” in the temperature range “A” as an example.

Table 3 demonstrates the available variants (sensor type, package, and temperature range).

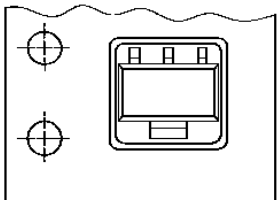
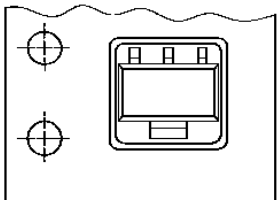
Blister Tape 12 mm **Reel Diameter 180 mm** Configuration Code: 4 (SOT-89B) Packaging Code: R (Reel) Quantity Code: 1 (1000/2000) Example: HAL 502SF-A-**4-R-1**-00	
Blister Tape 12 mm **Reel Diameter 330 mm** Configuration Code: 4 (SOT-89B) Packaging Code: R (Reel) Quantity Code: 5 (5000/15000) Example: HAL 502SF-A-**4-R-5**-00	

Figure 2: Possible forms of delivery for sensors in the package SOT-89B

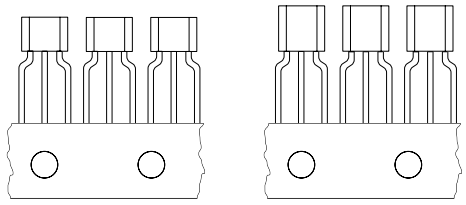
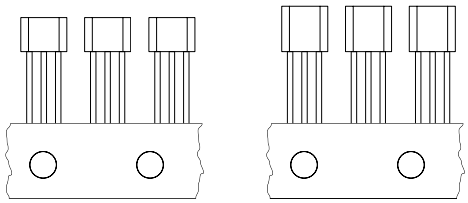
Ammopack Inline spread Configuration Code: 1 (TO-92UA/UT, spread) Packaging Code: A (Ammopack) Quantity Code: 2 (2000/2000) or 4 (8000/8000) Example: HAL 502UA-A-**1-A-2**-00 or HAL 502UA-A-**1-A-4**-00	
Ammopack Inline not spread Configuration Code: 2 (TO-92UA/UT, inline) Packaging Code: A (Ammopack) Quantity Code: 2 (2000/2000) or 4 (8000/8000) Example: HAL 502UA-A-**2-A-2**-00 or HAL 502UA-A-**2-A-4**-00	
Bulk Inline spread Configuration Code: 1 (TO-92UA/UT, spread) Packaging Code: B (Bulk) Quantity Code: 1 (1000/2000) or 3 (1000/20000) Example: HAL 502UA-A-**1-B-1**-00 or HAL 502UA-A-**1-B-3**-00	
Bulk Inline not spread Configuration Code: 2 (TO-92UA/UT, inline) Packaging Code: B (Bulk) Quantity Code: 1 (1000/2000) or 3 (1000/20000) Example: HAL 502UA-A-**2-B-1**-00 or HAL 502UA-A-**2-B-3**-00	

Figure 3: Possible forms of delivery for sensors in the package TO-92UA or TO-92UT

3. Outline Dimensions

If not otherwise specified, tolerance range is ±50 µm.

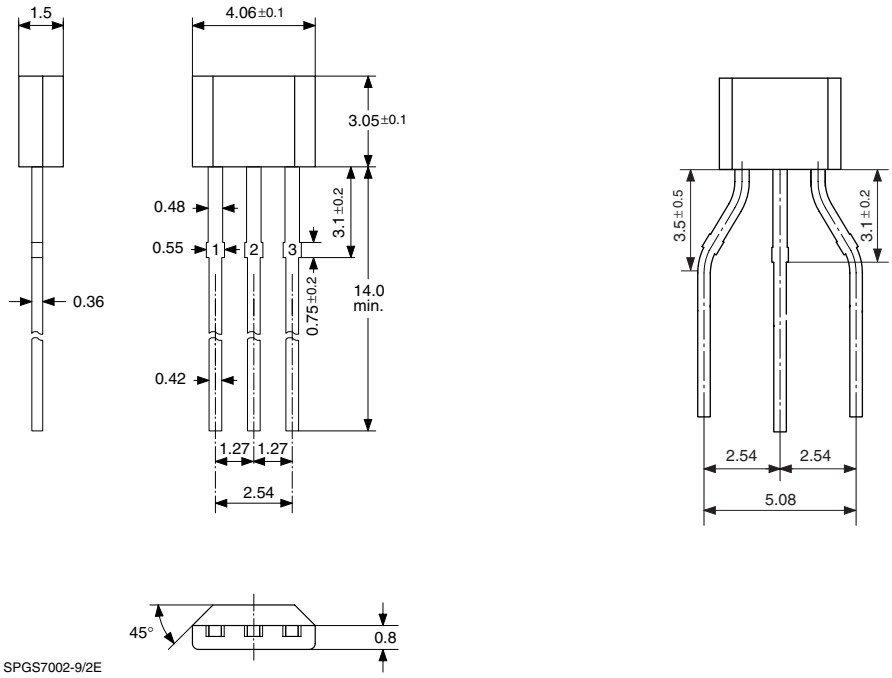


Figure 4:
Plastic Transistor Single Outline Package **(TO-92UA)**
Weight approx. 0.12 g
Dimensions in mm

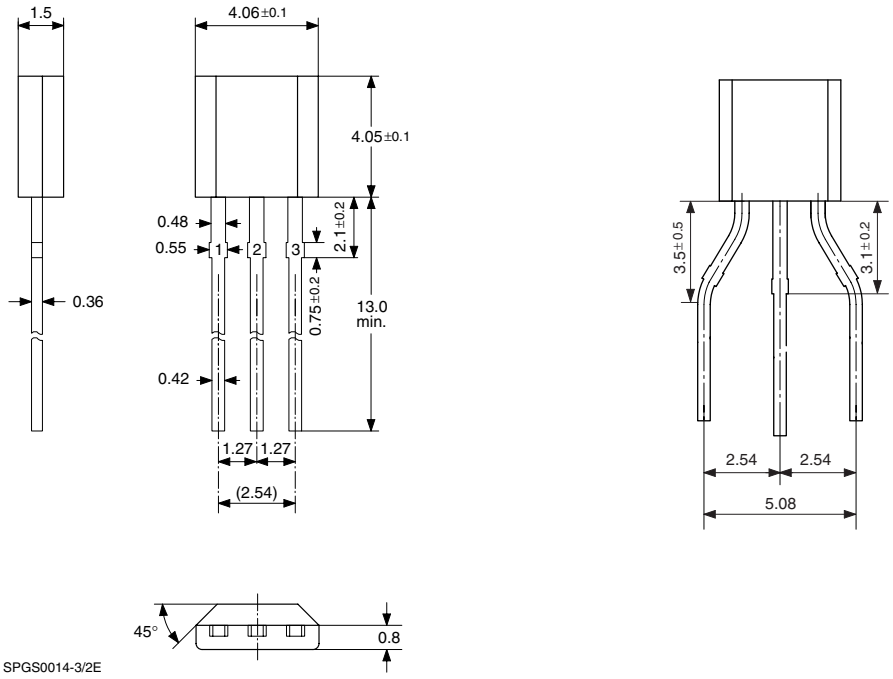


Figure 5:
Plastic Transistor Single Outline Package **(TO-92UT)**
Weight approx. 0.14 g
Dimensions in mm

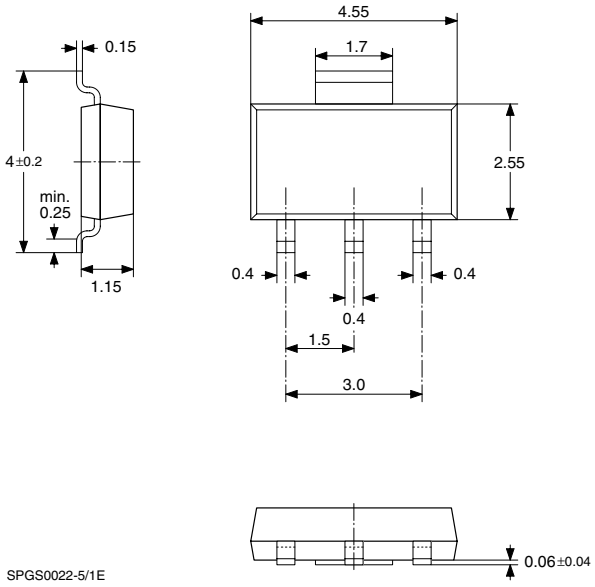


Figure 6:
Plastic Small Outline Transistor Package **(SOT-89B)**
Weight approx. 0.035 g
Dimensions in mm

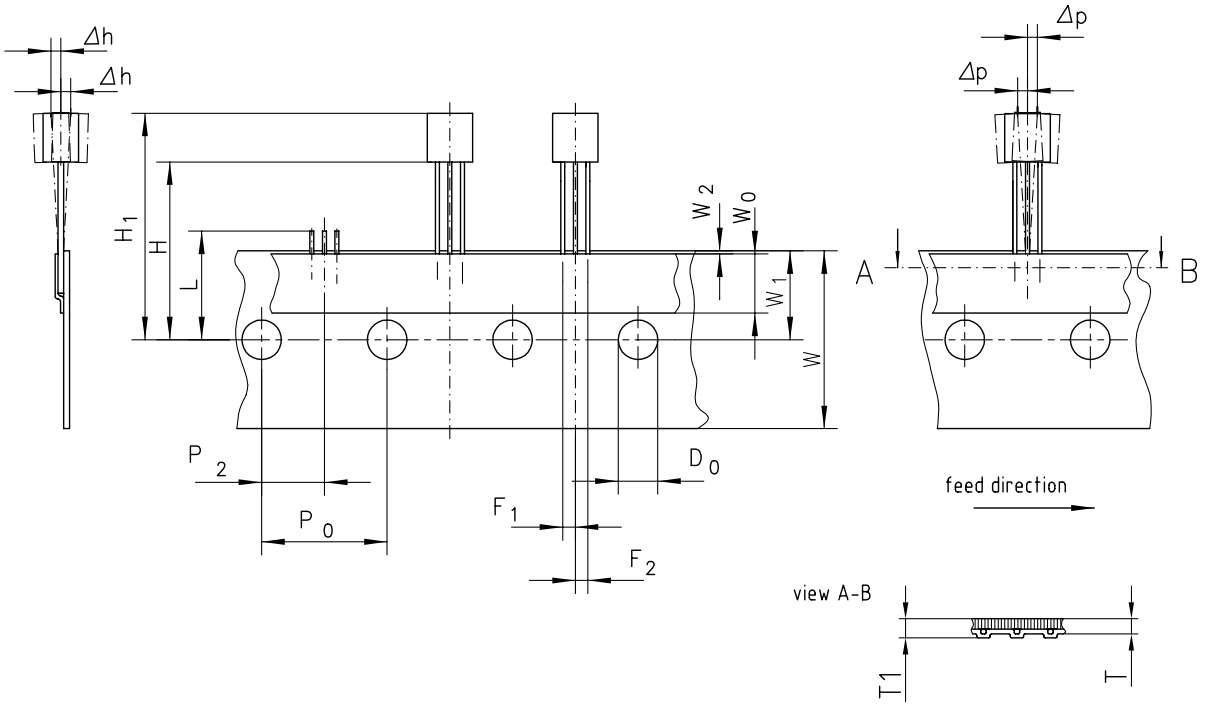


Figure 7: Dimensions of the Ammopack inline, not spread

Parameter	Symbol	TO-92UA	TO-92UT
distance	H_1	22.0	23.0
distance	H	19.0	
tolerance	Δh	±1	
tolerance	Δp	±1	
tape width	W	18.0	
strap width	W_0	6.0	
distance	W_1	9.0	
distance	W_2	0.3	
interval of transport holes	P_0	12.7	
distance	P_2	6.35	
distance	L	11.0	
diameter of transport holes	D_0	4.0	
pin distance	F_1	1.27	
pin distance	F_2	1.27	
total thickness of tape	T1	0.9	
total thickness with hold-down tape	T	0.5	
max. tolerance of deviation about 20 holes		±1	
all dimensions in mm; all values typical			

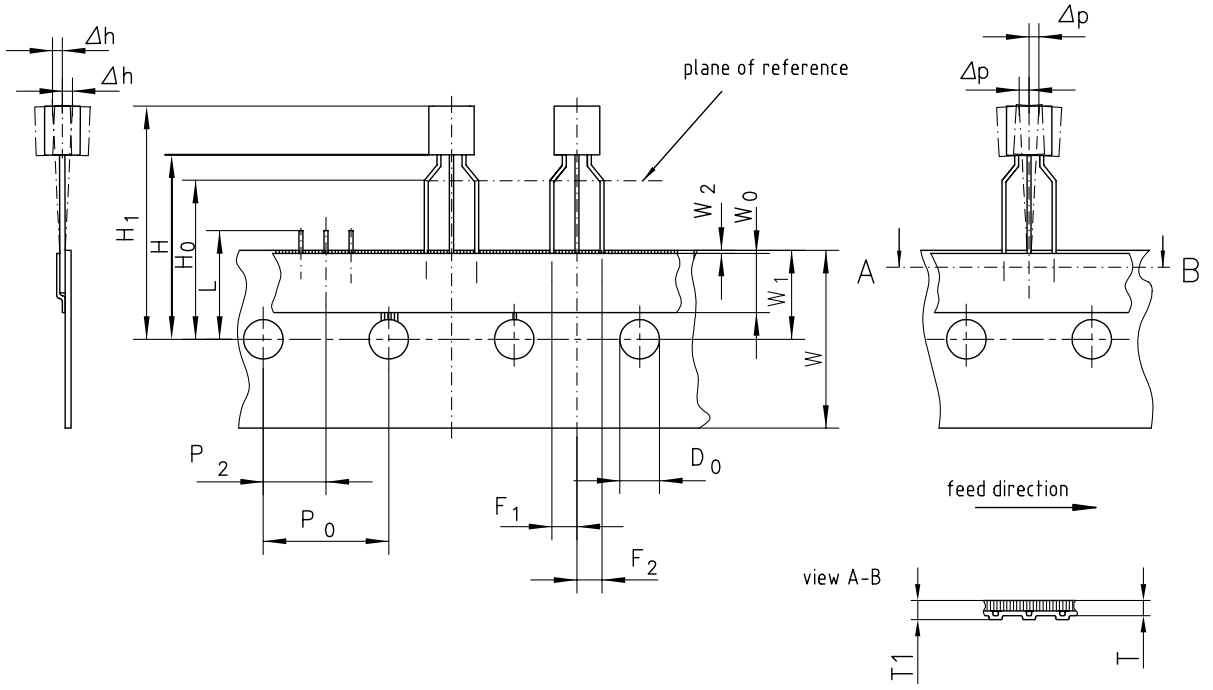


Figure 8: Dimensions of the Ammopack inline, spread

Parameter	Symbol	TO-92UA	TO-92UT
distance	H_1	22.0	23.0
distance	H	19.0	
distance	H_0	16.0	
tolerance	Δh	±1	
tolerance	Δp	±1	
tape width	W	18.0	
strap width	W_0	6.0	
distance	W_1	9.0	
distance	W_2	0.3	
interval of transport holes	P_0	12.7	
distance	P_2	6.35	
distance	L	11.0	
diameter of transport holes	D_0	4.0	
pin distance	F_1	2.54	
pin distance	F_2	2.54	
total thickness of tape	T1	0.9	
total thickness of tape with hold-down tape	T	0.5	
max. tolerance of deviation about 20 holes		±1	
all dimensions in mm, all values typical			

4. Marking and Packaging

4.1 Marking of the Sensors

All sensors are marked on top of the package (branded side). Because of the small outline, only sensor type, temperature range, and date code (date of final testing) are labeled. Marking is done via laser beam.

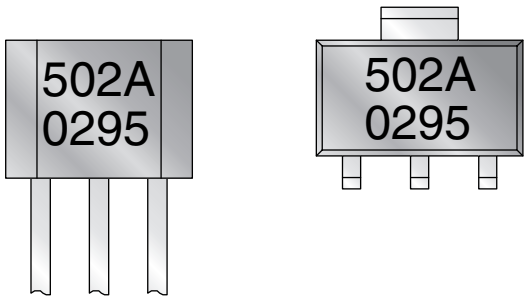


Fig. 9: Marking of the sensors

The upper row includes the designation of the sensors and the junction temperature range T_J. Marking corresponds to the information in the data sheets (section “marking code”).

In the lower row, the date code is represented as a 4-digit number.

Date Code

1st Digit	2nd Digit and 3rd Digit	4th Digit
Year (0...9)	Week (1...52)	Day (1...7)
9=1999, 0=2000, 1=2001 etc.	01=Week 1 to 52=Week 52	1=Monday to 7=Sunday

Example:

In figure 9, the HAL 502 in temperature range “A” is depicted. The date code is 0295.
These sensors have been tested in 2000, week 29 on the fifth day (Friday): This was the 21st of July 2000.

4.2 Packaging Labels

Both the outer packaging, as well as the inner packaging units are labeled with all relevant information. Figure 10 gives an example describing each element separately.

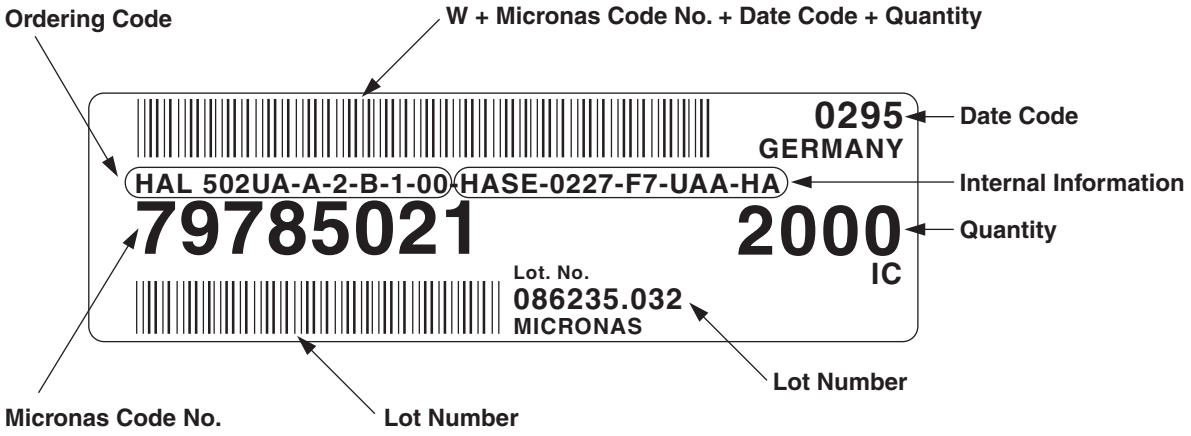


Fig. 10: Information on the label

The complete ordering code plus additional internal information is printed on the label. The Micronas code number refers to this ordering code. Every packaging variant is defined by the complete ordering code or the Micronas code number.

Moreover, the label contains the date code, the quantity of sensors, and the lot number (Micronas charge number).

Note: The lot number on the label enables internal backtracking of the sensor. In case of further inquiries, please provide us with this number or a copy of the label.

The label includes two barcode markings for automatic registration. The upper barcode starts with “W”, followed by the Micronas code number, the date code, and the quantity. The lower barcode contains the lot number (Micronas charge number).

4.3 Packaging

On the following pages, all packaging variants are shown separately.
Each quantity code refers to a particular packaging variant.

In the illustrations, the labels carry a real ordering code. All other data – especially the Micronas code number – is represented symbolically.

Quantity Code: 1

For quantity code “1”, sensors in the package **SOT-89B** are delivered in a cardboard box containing 2000 pieces. (2 reels with 1000 sensors each). The cardboard box has two labels; each reel is individually labeled.

Dimensions in mm

Cardboard Box			Reel
Length	Width	Height	Diameter
200	190	40	180

The appropriate order code is HAL xxxSF-x-**4-R-1**-00

Fig. 11: Closed cardboard box

Fig. 12: Inner view

For quantity code “1”, sensors in the package **TO-92UA** or **TO-92UT** are delivered in a cardboard box containing 2000 pieces bulk (2 bags with 1000 sensors each). The cardboard box has two labels; each bag is individually labeled.

Dimensions in mm

Cardboard Box		
Length	Width	Height
350	115	40

All sensors in the package TO-92UA or TO-92UT with straight or spread legs are available in this packaging variant.

The appropriate order codes are
HAL xxxUA/UT-x-**2-B-1**-00 for sensors with straight legs (inline, not spread)
HAL xxxUA/UT-x-**1-B-1**-00 for sensors with spread legs (inline, spread)

Fig. 13: Closed cardboard box

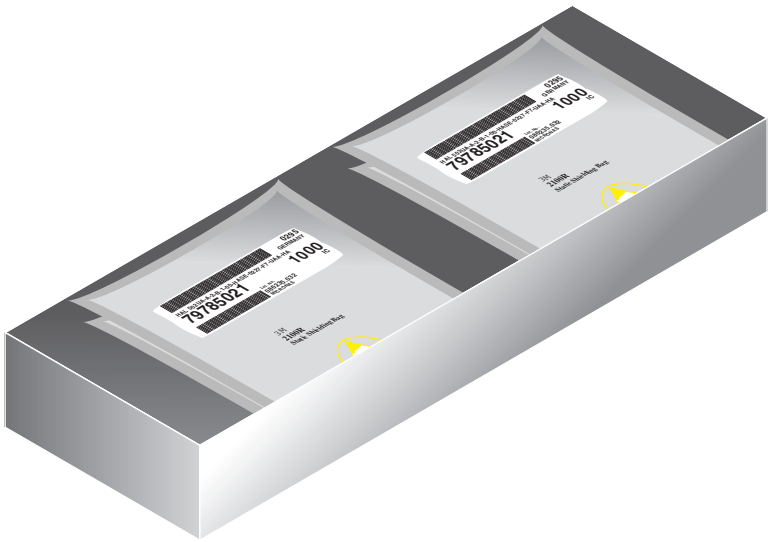


Fig. 14: Inner view

Quantity Code: 2

For quantity code “2”, sensors in the package **TO-92UA** or **TO-92UT** are delivered in a cardboard box containing 2000 pieces in carrier tape (Ammopack: folded tape without additional packaging). The cardboard box has two labels.

Dimensions in mm

Cardboard Box		
Length	Width	Height
350	115	40

All sensors in the package TO-92UA or TO-92UT with straight or spread legs are available in this packaging variant.

The appropriate order codes are
HAL xxxUA/UT-x-**2-A-2**-00 for sensors with straight legs (inline, not spread)
HAL xxxUA/UT-x-**1-A-2**-00 for sensors with spread legs (inline, spread)

Fig. 15: Closed cardboard box

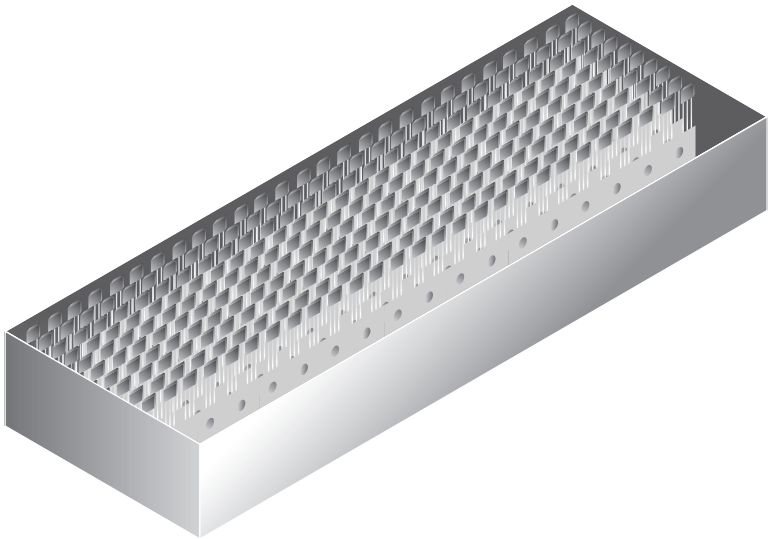


Fig. 16: Inner view

Quantity Code: 3

For quantity code “3”, sensors in the package **TO92-UA** or **TO-92UA** are delivered in a cardboard box containing 20000 pieces bulk (20 bags with 1000 sensors each). The cardboard box has two labels; each bag is individually labeled.

Dimensions in mm

Cardboard Box		
Length	Width	Height
340	340	115

All sensors in the package TO-92UA or TO-92UT with straight or spread legs are available in this packaging variant.

The appropriate order codes are
HAL xxxUA/UT-x-**2-B-3**-00 for sensors with straight legs (inline, not spread)
HAL xxxUA/UT-x-**1-B-3**-00 for sensors with spread legs (inline, spread)

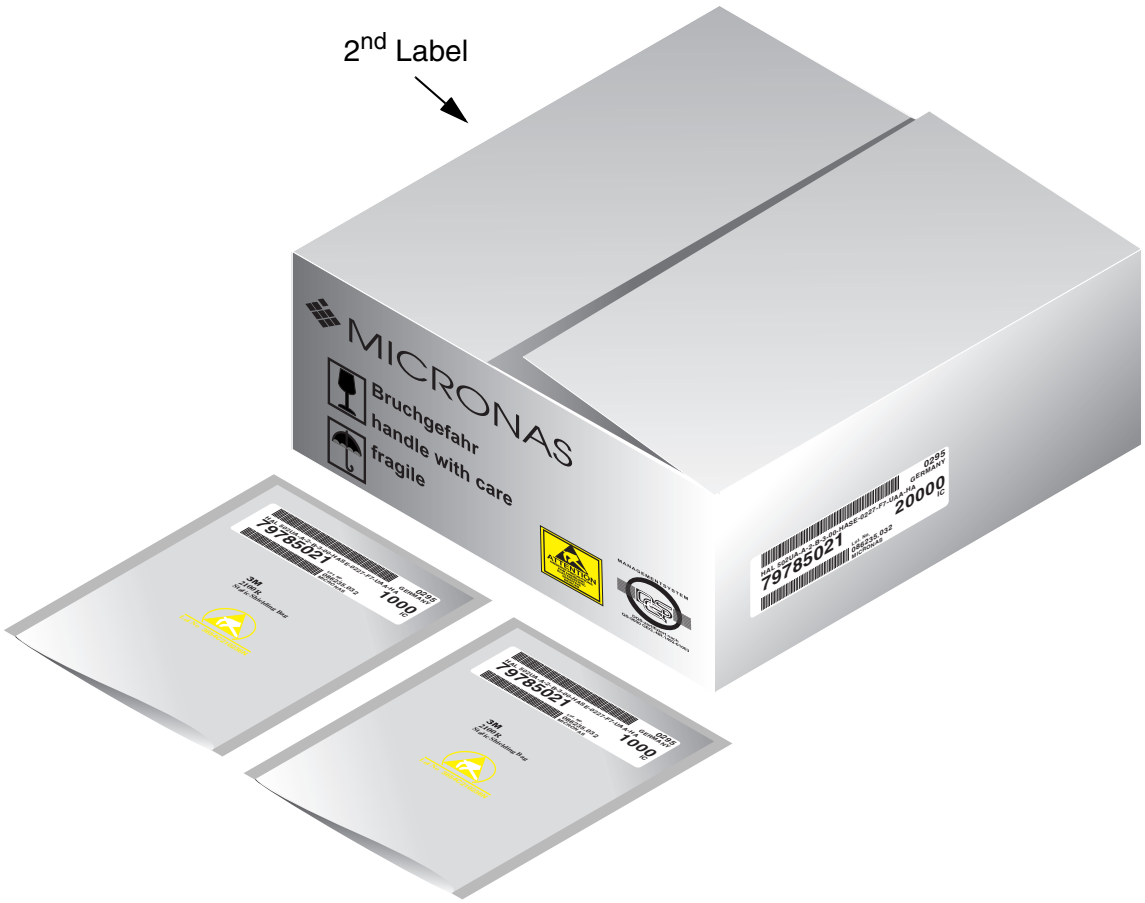


Fig. 17: Closed cardboard box with two bags as an example

Quantity Code: 4

For quantity code “4”, all sensors in the package **TO92-UA** or **TO-92UT** are delivered in a cardboard box containing 8000 pieces in carrier tape (Ammopack: folded tape without additional wrapping). The cardboard box has two labels.

Dimensions in mm

Cardboard Box		
Length	Width	Height
340	340	45

All sensors the package TO-92UA or TO-92UT with straight or spread legs are available in this packaging variant.

The appropriate order codes are:
HAL xxxUA/UT-x-**2-A-4**-00 for sensors with straight legs (inline, not spread)
HAL xxxUA/UT-x-**1-A-4**-00 for sensors with spread legs (inline, spread)

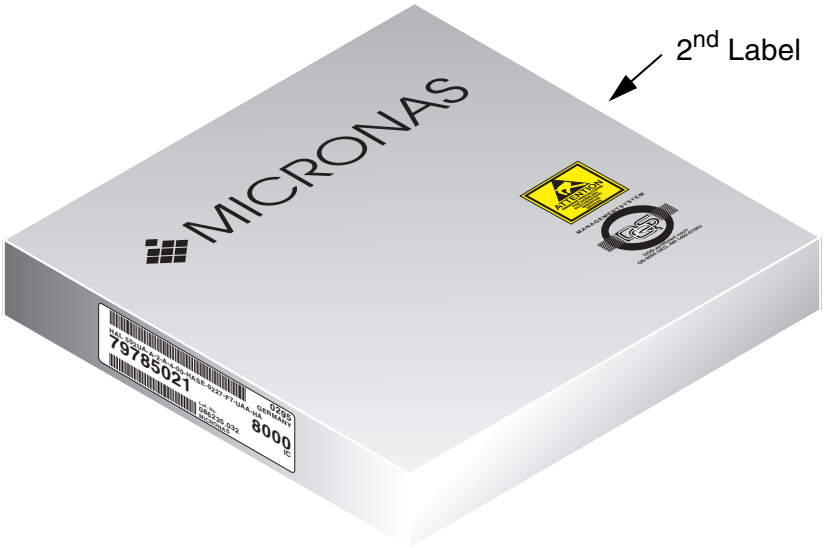


Fig. 18: Closed cardboard box

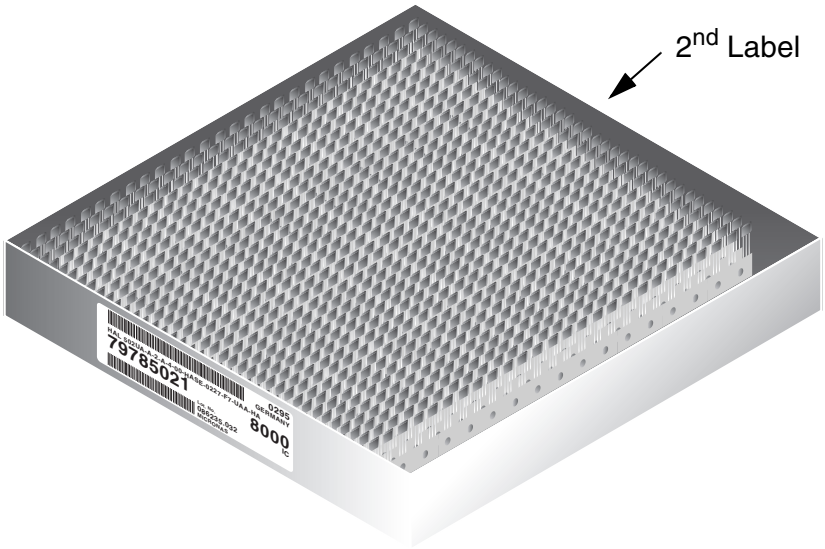


Fig. 19: Inner view

Quantity Code: 5

For quantity code “5”, sensors in the package **SOT-89B** are delivered in a cardboard box containing 15000 pieces (3 reels with 5000 sensors each).
The cardboard box has two labels; each reel is individually labeled.

Dimensions in mm

Cardboard Box			Reel
Length	Width	Height	Diameter
200	340	115	330

All sensors in the package SOT-89B are available in this packaging variant.

The appropriate order code is HAL xxxSF-x-**4-R-5**-00

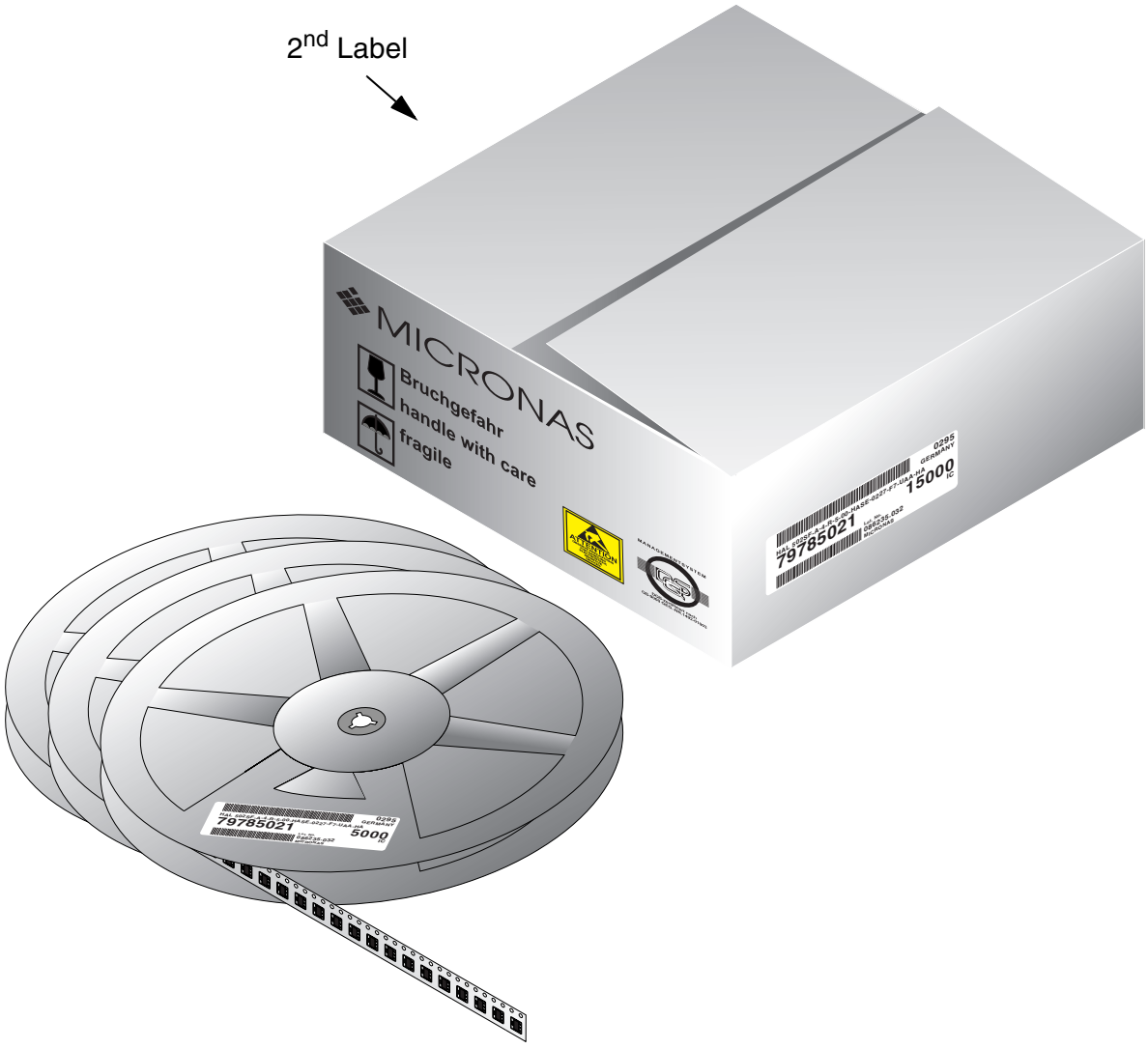


Fig. 20: Closed cardboard box including the three reels

5. Notes on Processing

All Hall sensors from Micronas are manufactured in CMOS technology and are provided with internal ESD protection devices. In general, CMOS components may become damaged or destroyed by electrostatic discharge (ESD).

The DIN EN 100 015 “Protection of ESD-endangered components” describes in detail the requirements for ESD-proof working places, transport and storage. The sensors should only be processed in working areas fulfilling these requirements.

ESD-performance is verified during the internal device qualification procedure. The results are included in the reliability report. Please contact Micronas for detailed information.

5.1 Structure of the Sensors

Micronas uses a thermosetting mold compound. The legs are made of pure copper, which is galvanically plated after molding. The plating consists of tin and lead.

All sensors (exception: HAL 11x family) are equipped with an active offset compensation, which minimizes the influence of mechanical stress on the magnetic characteristics.

5.2 Soldering

The packages SOT-89B, TO-92UA, and TO-92UT are suited for all current soldering methods. During automatic or manual soldering, the temperature at the plastic package must not exceed 260 °C.

5.3 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 package SOT-89B achieves 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.

5.4 Processing

During processing of the sensors make sure that only lowest possible forces are applied to the plastic package. Otherwise, there is a risk of mechanically damaging the package (e. g. cracks), leading to an early failure.

This especially concerns bending, shortening of the legs, molding, fixing, and overmolding or potting of the application.

5.5 Bending the Legs

During bending, the legs have to be fixated to avoid forces to the plastic package. Due to the material characteristics of the copper frame, the bending radia should not be less than suggested. Furthermore, the minimum distance to the plastic body has to be regarded. Otherwise, tensions within the frame could be transmitted into the case.

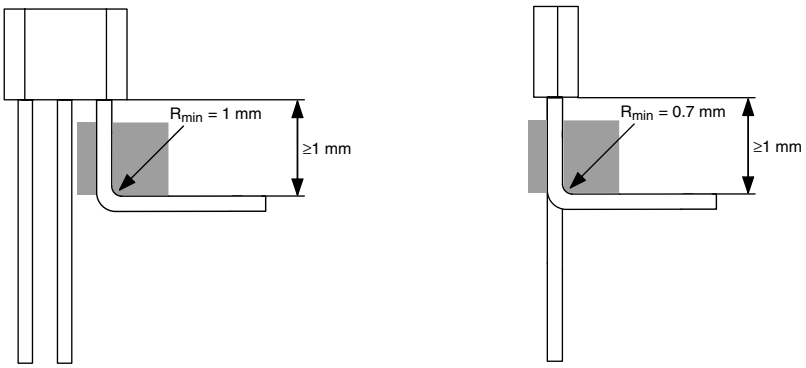


Bild 21: Minimum distances for bending

5.6 Overmolding and Potting

Due to the built-in active offset compensation, influences of overmolding or potting on the magnetic characteristics are minimized.

During the overmolding process, make sure that only lowest possible forces are applied to the sensor. Otherwise, there is a risk of mechanically damaging the component.

9. Document History

1. Hall Sensors: Ordering Codes, October 24, 1997, 6200-249-1E. First release.

2. Hall Sensors: Ordering Codes, Packaging, Handling, Sept. 12, 2001, 6200-249-2E. Second release.

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