CYD2462 High Sensitivity Omnipolar Hall Effect Sensors

The CYD2462 family, produced with BiCMOS technology, is a chopper-stabilized Hall Effect Sensor that offers a magnetic sensing solution with superior sensitivity stability over temperature and integrated protection features. Superior high-temperature performance is made possible through dynamic offset cancellation, which reduces the residual offset voltage normally caused by device over moulding, temperature dependencies, and thermal stress. Each device includes on a single silicon chip a voltage regulator, Hall-voltage generator, small-signal amplifier, chopper stabilization, Schmitt trigger, and an open-drain output to sink up to 20mA. An on board regulator permits with supply voltages of 2.5 to 24V which makes the device suitable for a wide range of industrial and automotive applications. The CYD2462 is available in a 3-pin SIP and a plastic SOT23-3 surface mount package. Both packages are lead (Pb) free, with 100% matte tin lead frame plating.

APPLICATIONS

- Flow meters
- Magnetic encoding
- Proximity sensing
- Garage door openers
- Power sliding doors
- Sunroofs motor

FEATURES

- High chopping frequency
- 2.5V to 24V power supply
- Superior temperature stability
- Reverse battery protection (up to 28V)
- Over-voltage protection at all pins
- Robust EMC performance
- **ROHS compliant**

ABSOLUTE MAX. RATINGS over operating free-air temperature range (unless otherwise noted) (1)

Parameter	Symbol	Min.	Max.	Units
Supply voltage	V_{DD}	-28(2)	28	V
Output terminal voltage	V_{OUT}	-0.5	28	V
Output terminal current sink	I_{SINK}	0	30	mA
Operating temperature	Ta	-40	150	°C
Maximum junction temperature	T_J	-55	165	°C
Storage temperature	T_{STG}	.65	175	°C

(1) Stresses above those listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
(2) Ensured by design.

ESD Protection *Human Body Model (HBM) tests according to: standard AEC-Q100-002*

Parameter	Symbol	Min.	Max,	Unit
ESD-Protection	V_{ESD}	-4	4	kV

Thermal Characteristics

Symbol	Parameter	Test conditions	Rating	Unit
$R_{θJA}$	UA Package thermal resistance	Single-layer PCB, with copper limited to solder pads	166	°C/W
$R_{θJA}$	LH Package thermal resistance		228	°C/W

ELECTRICAL CHARACTERISTICS

T_A=25°C, V_{DD}=5.0V

Parameter	Symbol	Test condition	Value			Units
			Min.	Typ.	Max..	
Supply voltage	V_{DD}	$T_J < T_{J(Max.)}$	2.5	--	24	V
Reverse supply voltage	V_{DDR}		-28	--	--	V
Operating supply current	I_{DD}	V_{DD}=2.5 to 24V, T_A=25°C	0.8	1.6	2.0	mA
		V_{DD}=2.5 to 24V, T_A=125°C	0.8	1.7	2.0	µA
Power-on time	T_{ON}		--	35	50	µs
Off-state leakage current	I_{OL}	Output Hi-Z	--	--	1	µA
FET on-resistance	$R_{DS(on)}$	V_{DD}=5V, I_O=10mA, T_A=25°C	--	20	--	Ω
		V_{DD}=5V, I_O=10mA, T_A=125°C	--	30	--	Ω
Output delay time	t_D	B=B_{RP} to B_{OP}	--	15	25	µs
Output rise time (10% to 90%)	t_R	R1=1kΩ Co=50pF	--	--	0.5	µs
Output fall time (90% to 10%)	t_F	R1=1kΩ Co=50pF	--	--	0.2	µs
Frequency Bandwidth	f_{BW}		20	--	--	kHz

Magnetic Characteristics

over operating free-air temperature range (unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Units
Operation Point	B_{OP}	TA=-40°C~125°C	1.5	2.5	3.5	mT
Release Point	B_{RP}		1.0	1.5	3.0	mT
Hysteresis	B_H		--	1.0	--	mT

1mT=10Gs
Magnetic flux density, B, is indicated as a negative value for North-polarity magnetic fields, and as a positive value for South-polarity magnetic fields

Functional Block Diagram

The CYD2462 device is a chopper-stabilized Hall sensor with a digital latched output for magnetic sensing applications. The device can be powered with a supply voltage between 2.5 and 24V, and continuously survives -28V reverse-battery conditions. The device does not operate when voltage supply -28 to 2.2V is applied to the V_{DD} terminal (with respect to the GND terminal). In addition, the device can withstand voltages up to 40V for transient durations.

The output of CYD2462 switches low (turns on) when a magnetic field (South or North polarity) perpendicular to the Hall element exceeds the operate point threshold, B_{OP}. After turn-on, the output is capable of sinking 20mA and the output voltage is $V_{Q(sat)}$. When the magnetic field is reduced below the release point, B_{RP}, the device output goes high (turns off). The difference in the magnetic operation and release points is the hysteresis, B_{HYS}, of the device. This built-in hysteresis allows clean switching of the output even in the presence of external mechanical vibration and electrical noise.

An external output pull-up resistor is required on the OUT terminal. The OUT terminal can be pulled up to V_{DD} or to a different voltage supply. This allows for easier interfacing with controller circuits.

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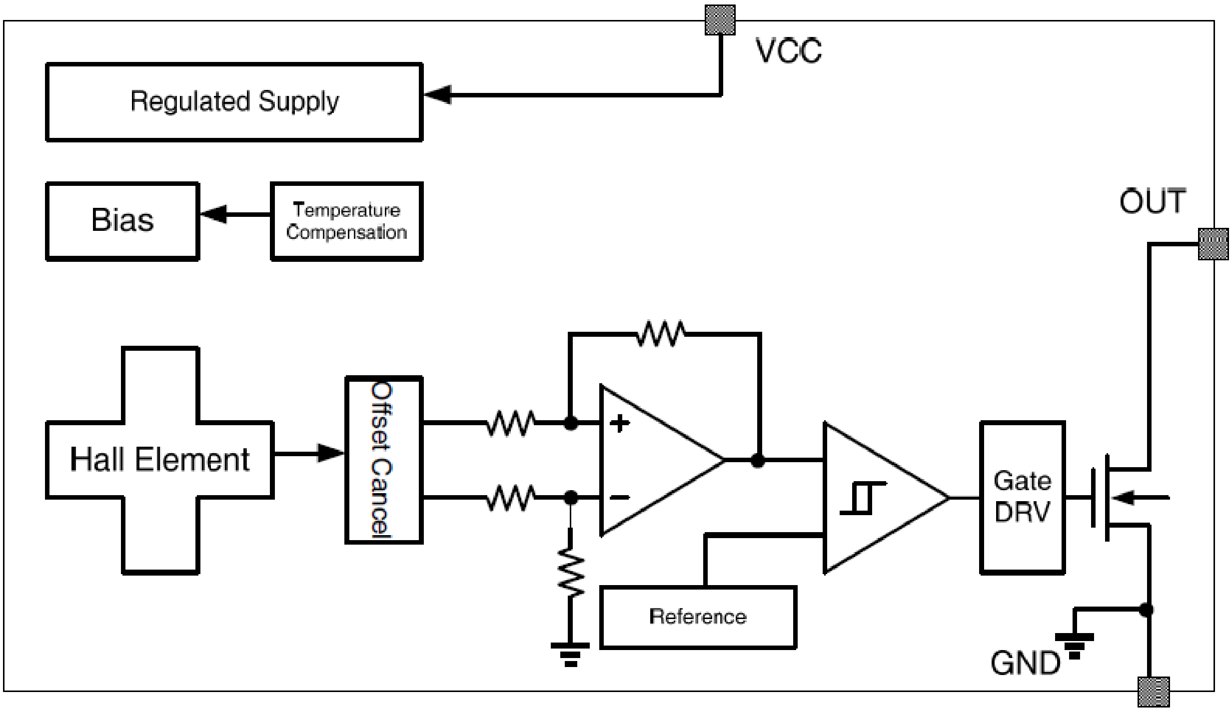
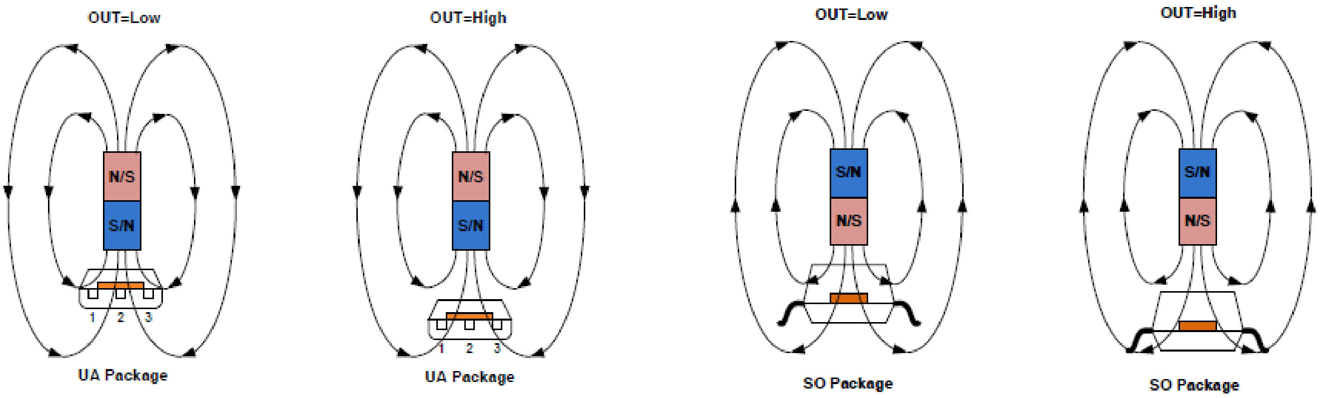


Field Direction Definition

A positive magnetic field is defined as a South pole near the marked side of the package.

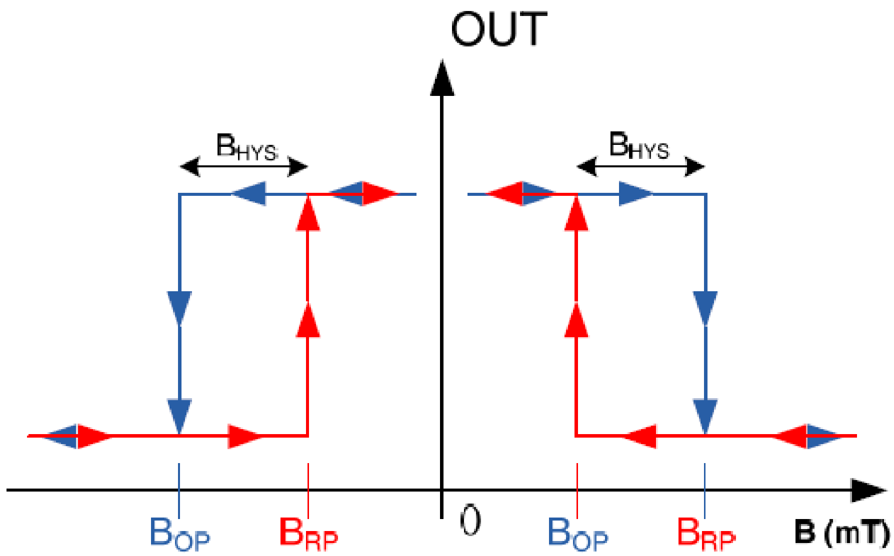


Transfer function

The CYD2462 exhibits “Omnipolar” magnetic characteristics. It means the device reacts to both North and South magnetic pole. The purpose is to detect the presence of any magnetic field applied on the device. This mode of operation simplifies customer production processes by avoiding the need to detect the Hall sensor pole active on the magnet used in the application. Therefore, the “Omnipolar” magnetic behavior helps customers by removing the need of magnet pole detection system during production phase.

Powering-on the device in the hysteresis region, less than B_{OP} and higher than B_{RP}, allows an indeterminate output state. The correct state is attained after the first excursion beyond B_{OP} or B_{RP}.

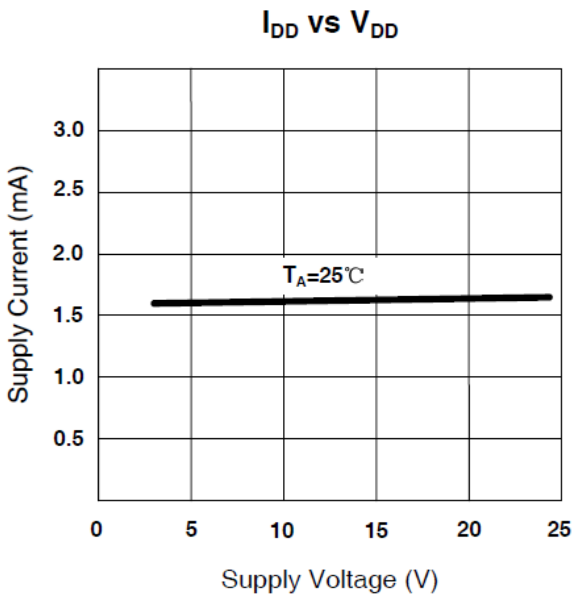
If the field strength is greater than B_{OP}, then the output is pulled low. If the field strength is less than B_{RP}, the output is released.

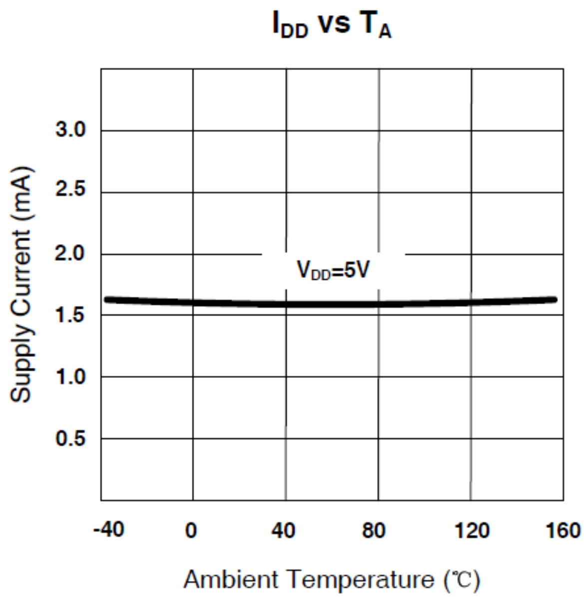


Device Information

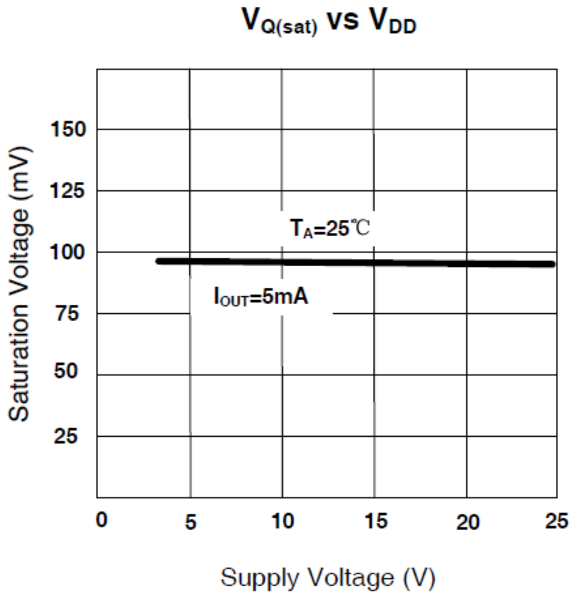
Part number	packing	Mounting	Temperature	B_{OP}(typ.)	B_{RP}(typ.)
CYD2462UA	Bulk, 1000pcs/bag	SIP3	-40°C ~150°C	±2.5mT	±1.5mT
CYD2462LH	Reel, 3000pcs/reel	SOT-23			

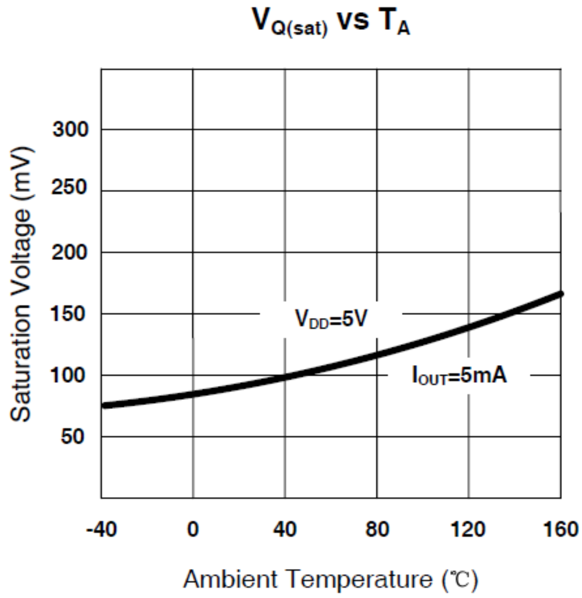
Characteristic Data

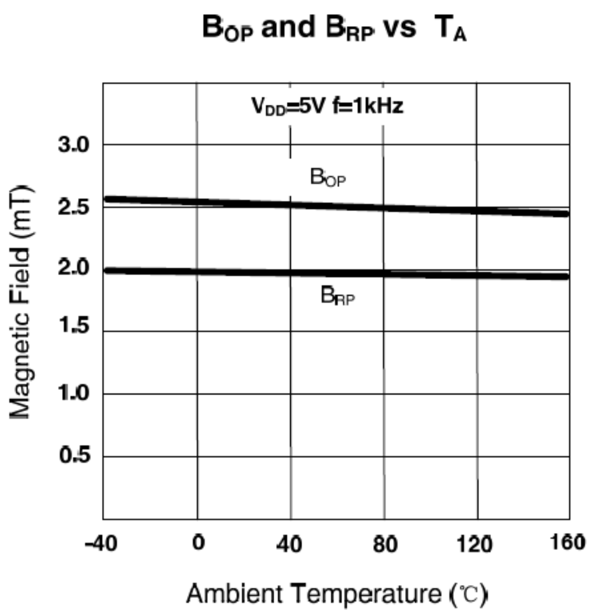


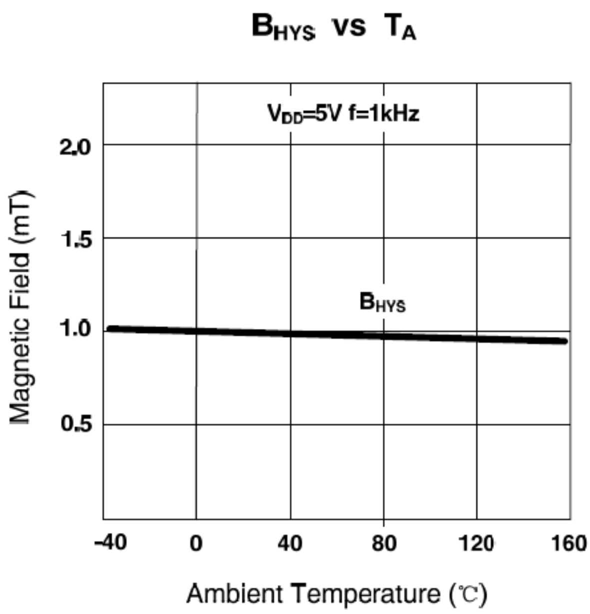


Characteristic Data (Continued)

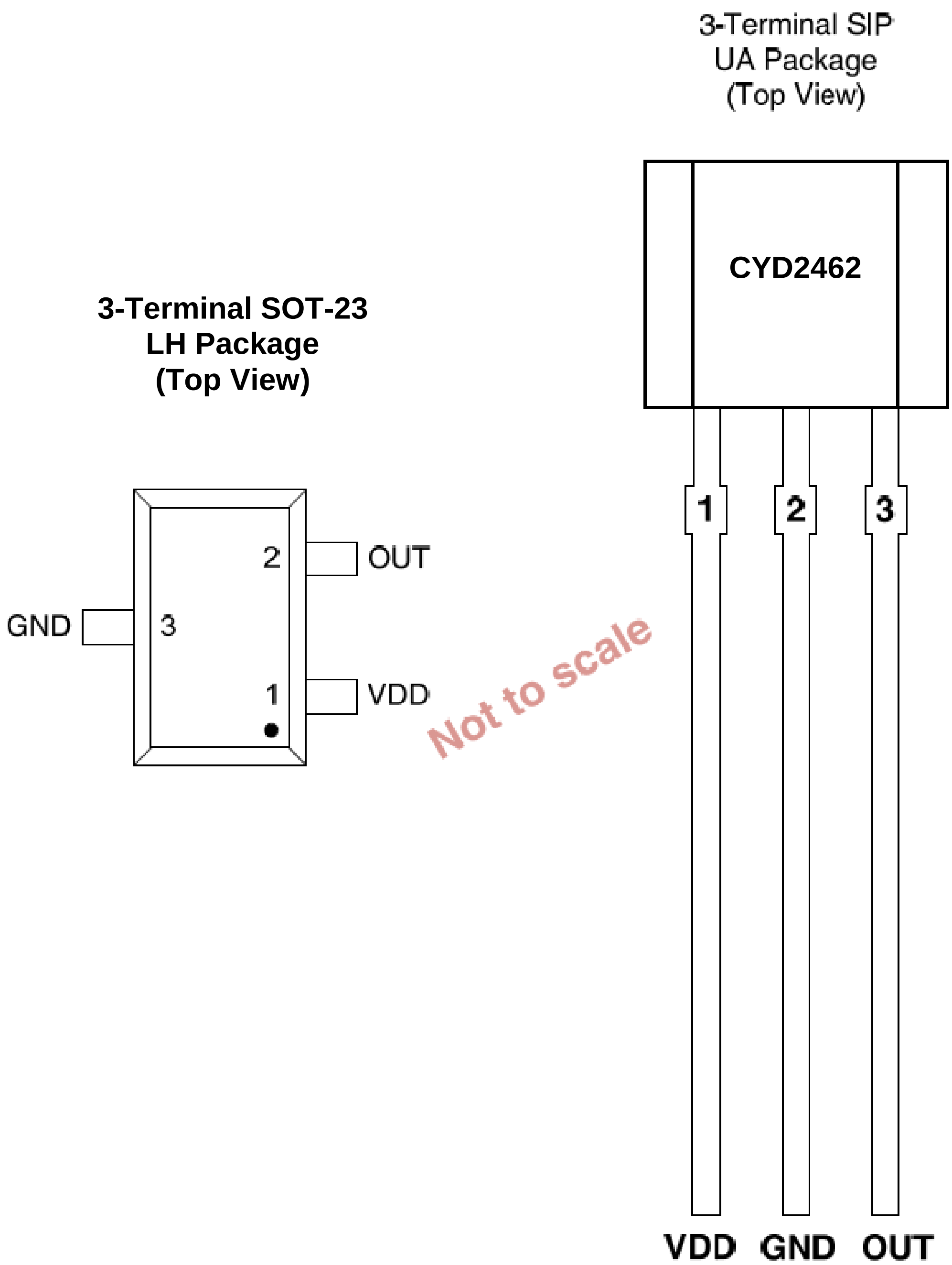








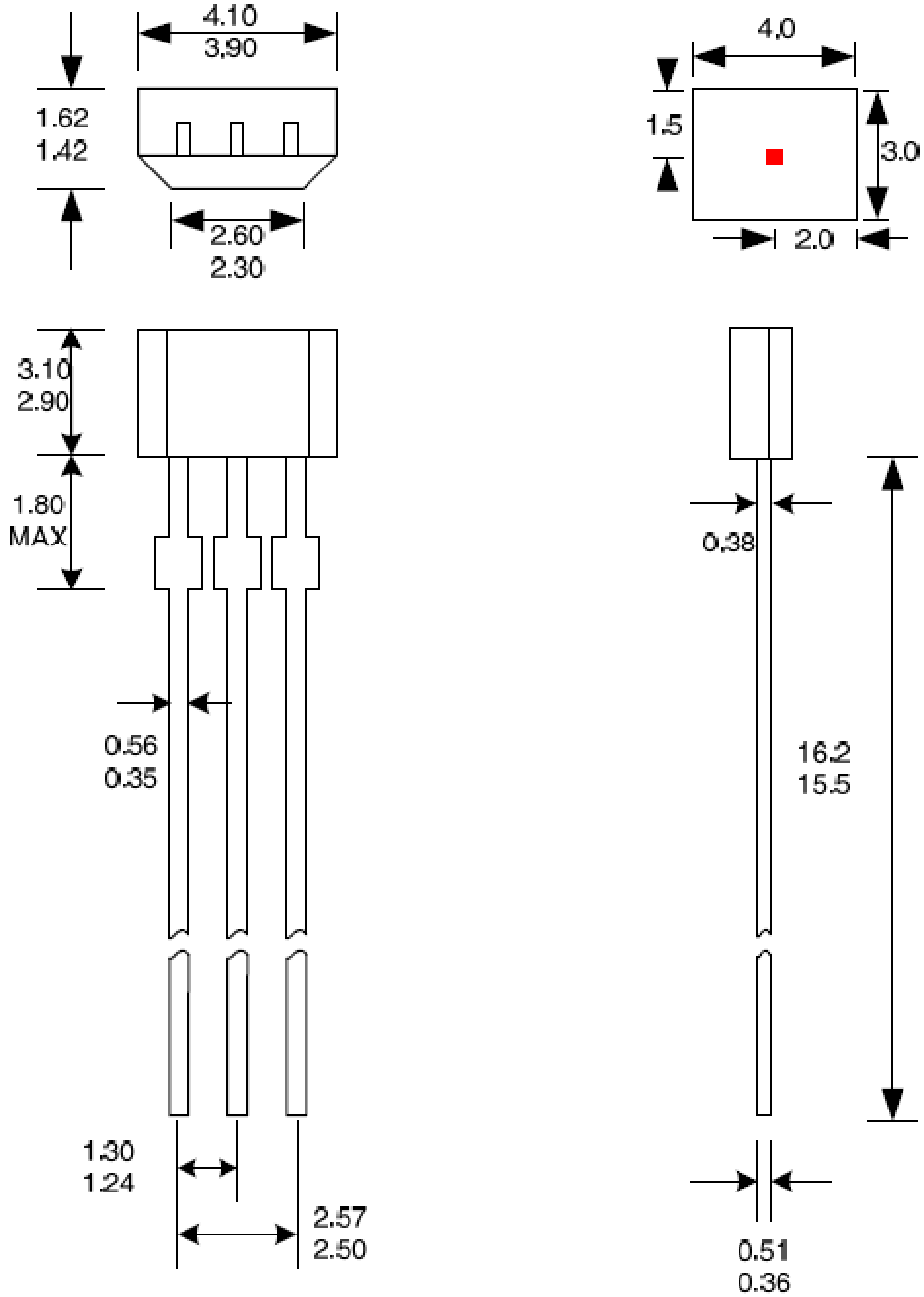
Terminal configuration and functions



Terminal			Type	Description
Name	UA	LH		
VDD	1	1	Power	2.5 to 24V power supply
GND	2	3	Ground	Ground terminal
OUT	3	2	Output	Output terminal

Dimensions (in mm)

3-Termial UA (SIP3) Package



Notes:

1. Exact body and lead configuration at vendor’s option within limits shown
2. Height does not include mold gate flash
3. Where no tolerance is specified, dimension is normal

Version 1
Released in January 2019
Dr.-Ing. habil. Jigou Liu

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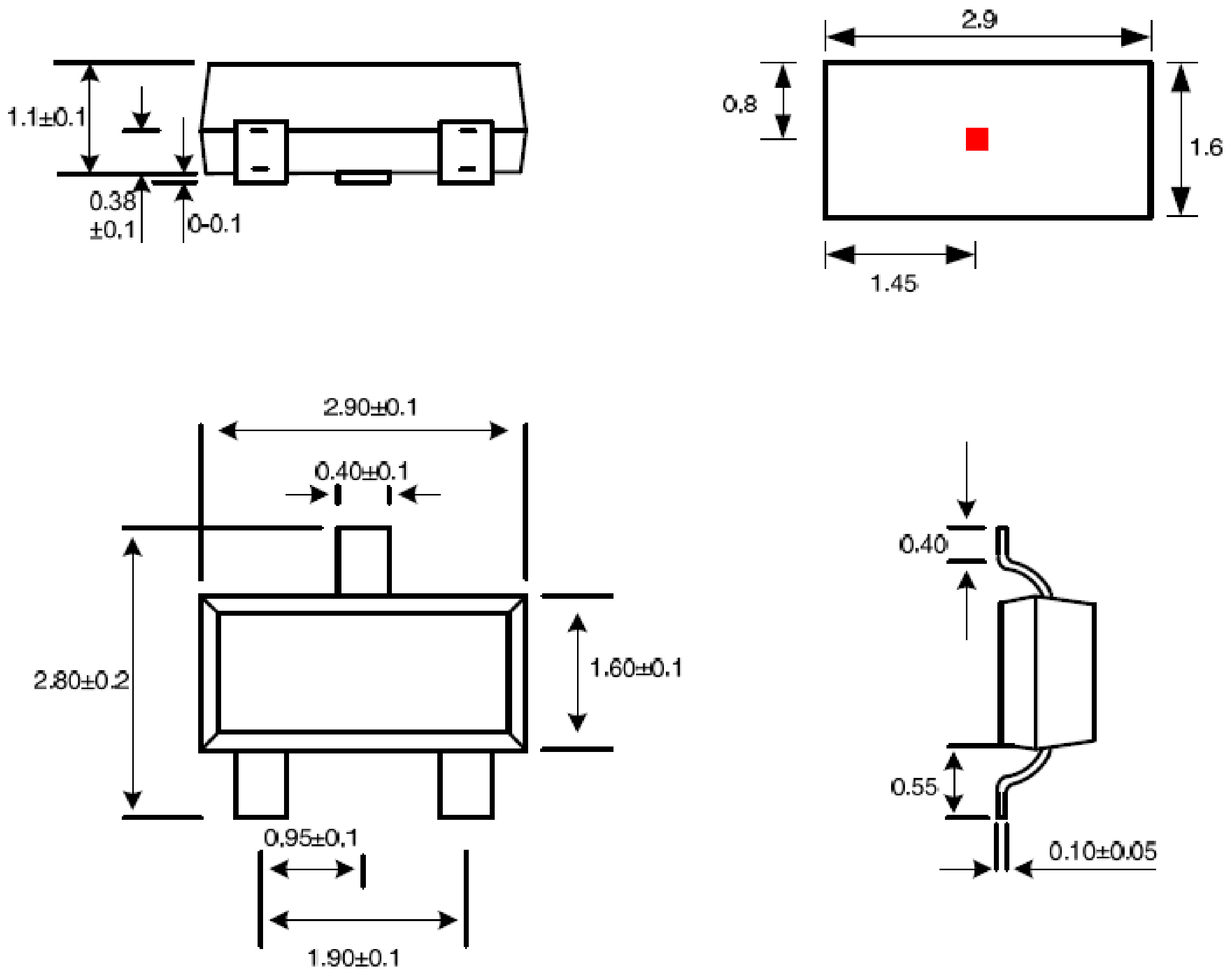
Technologies GmbH & Co. KG

3-Termial LH (SOT-23) Package



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