Hall-Effect Switches

Selection Guide for Automotive and Industrial Applications

www.micronas.tdk.com

Packages

Package	Marking Code	MOQ / MSQ Quantity			Package Drawing	RoHS compliant
		Reel	Ammopack [1), 2)]	Bulk [2)]		
TO92UA	UA	–	2,000	2,000		Yes
TO92UT	UT	–	2,000	2,000		Yes
SOT23	SU	20,000	–	–		Yes
SOT23	SV	20,000	–	–		Yes

For additional information please read or ask for our documentation "Sensors and Controllers: Ordering Codes, Packaging, Handling"

[1)] Pin configuration inline, spread
[2)] Pin configuration inline, not spread

TDK-Micronas Contact

Contact	Information available
www.micronas.tdk.com	General
www.service.micronas.com (registration needed)	Data sheets, application notes, programming guides, software…
mic-product-support@tdk.com	Technical support
mic-sales@tdk.com	Worldwide sales contact

TDK-Micronas GmbH
Hans-Bunte-Strasse 19 | 79108 Freiburg | Germany
Phone +49 761 517-0

www.micronas.tdk.com

Development Tool

HAL APB 5.1
Application & Programming Board
Supported Sensors: HAL 10xy
Stand-alone Tool

Technical Definitions

	2-Wire Switch	3/4-Wire Switch
Unipolar	The switch turns to high current consumption with the magnetic south pole on the top side of the package and turns to low consumption if the magnetic field is removed. The switch does not respond to the magnetic north pole on the top side.	The output turns low with the magnetic south pole on the top side of the package and turns high if the magnetic field is removed. The switch does not respond to the magnetic north pole on the top side.
Unipolar Inverted	The switch turns to low current consumption with the magnetic south pole on the top side of the package and turns to high consumption if the magnetic field is removed. The switch does not respond to the magnetic north pole on the top side.	The output turns high with the magnetic south pole on the top side of the package and turns low if the magnetic field is removed. The switch does not respond to the magnetic north pole on the top side.
Bipolar	(3-wire only)	The output turns low with the magnetic south pole on the top side of the package and turns high with the magnetic north pole on the top side. The output state is not defined if the magnetic field is removed again.
Latching	The switch turns to high current consumption with the magnetic south pole on the top side of the package and turns to low consumption with the magnetic north pole on the top 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.	The output turns low with the magnetic south pole on the top side of the package and turns high with the magnetic north pole on the top side. The output does not change if the magnetic field is removed. For changing the output state, the opposite magnetic field polarity must be applied.

2-Wire Switch	The current is monitored and the switch operates as indicated by the type of switch. Current level is as specified within the data sheet.
3/4-Wire Switch	The voltage is monitored and the switch operates as indicated according to the type of switch.

About TDK Corporation

TDK Corporation (TSE:6762) is a global technology company and innovation leader in the electronics industry, based in Tokyo, Japan. With the tagline "In Everything, Better" TDK aims to realize a better future across all aspects of life, industry, and society. For over 90 years, TDK has shaped the world from within; from the pioneering ferrite cores to cassette tapes that defined an era, to powering the digital age with advanced components, sensors, and batteries, leading the way towards a more sustainable future. United by TDK Venture Spirit, a start-up mentality built on visions, courage and mutual trust, TDK's passionate team members around the globe pursue better—for ourselves, customers, partners, and the world. Today, the state-of-the-art technologies of TDK are in everything, from industrial applications, energy systems, electric vehicles, to smartphones and gaming, at the core of modern life. TDK's comprehensive, innovative-driven portfolio includes cutting-edge passive components, sensors and sensor systems, power supplies, lithium-ion and solid-state batteries, magnetic heads, AI and enterprise software solutions, and more—featuring numerous market-leading products. These are marketed under the product brands TDK, InvenSense, Micronas, Tronics, TDK-Lambda, TDK SensEI, and ATL. Positioning the AI ecosystem as a key strategic area, TDK leverages its global network across the automotive, information and communication technology, and industrial equipment sectors to expand its business in a wide range of fields. In fiscal 2026, TDK posted total sales of USD 16.6 billion and employed about 107,000 people worldwide.

TDK-Micronas Sites

TDK-Micronas is the center of competence for magnetic-field sensors and CMOS integration within the TDK group. TDK-Micronas has gained operational excellence for sensors and actuators production in over 25 years of in-house manufacturing. It has been the first company to integrate a Hall-effect based sensor into CMOS technology in 1993. Since then, TDK-Micronas has shipped over eight billion Hall sensors to the automotive and industrial market. The operational headquarters are located in Freiburg im Breisgau (Germany). Currently, TDK-Micronas employs around 1,000 people.

Design Centers, Germany
- Freiburg
- Munich

Production Site, Germany
- Freiburg

www.micronas.tdk.com | Order No. PR-2028-11E | First published in May 2026

Selection by Application – Automotive

	Recommended Solution	Comment
BLDC Motor Commutation	HAL 15xy 3-wire latching	– High temperature resistance up to 150 °C (TA) – Low current consumption of only 1.6 mA – High switching accuracy – Small SOT23 JEDEC package
Clutch and Brake Pedal Position Detection	Brake: HAL 156y 2-wire unipolar Clutch: HAL 150y 3-wire unipolar	– ISO 26262 compliant for safety critical applications – High ESD protection ±8 kV (HBM) – Provided with open drain output or with current interface
Gear Shift Lever	HAL 150y 3-wire unipolar	– Price-attractive solution– Small SOT23 JEDEC package – ISO 26262 compliance for safety-critical applications
Window Lifter	HAL 13xy dual ouput latching	– Price-attractive solution – Quadrature signal for accurate anti-ptich implementation – Small SOT23 5-pin package – Reliable motion and position detection
Seat Track Position	HAL 156y 2-wire unipolar	– ISO 26262 compliance for safety-critical applications – Power supply down to 2.7 V – ESD protection ±8 kV (HBM) – 2-wire IC for reduced wire harness
Seat Belt Presence Detection	HAL 156y 2-wire unipolar or latching	– ISO 26262 compliant for safety-critical applications – Power supply down to 2.7 V – ESD protection ±8 kV (HBM) – 2-wire IC for reduced wire harness
Valve position	HAL 13xy dual output latching or HAL1504	– Reliable motion and position detection – Flexible integration and mult-dimensional sensing – Compact design with small SOT23 package – ISO 26262 compliant for safety-critical applications
Liquid Level Sensing	HAL 156y 2-wire unipolar	– ISO 26262 compliant for safety-critical applications – Power supply down to 2.7 V – ESD protection ±8 kV (HBM) – 2-wire IC for reduced wire harness
Tailgate and sunroof motor	HAL 13xy dual output latching	– Reliable motion and position detection – Flexible integration and mult-dimensional sensing – Compact design with small SOT23 5-pin package – Quadrature independent of magnet pole pitch and air gap
Steering column and seat track motor	HAL 13xy dual output latching	– ISO 26262 compliant for safety-critical applications – Wide Power supply range from 3V to 24V – Price-attractive solution – compact design with small SOT23 5-pin package

Selection of Hall–Effect Switch Type

Variant		Magnetic Characteristics Typical @ 25 °C		Type				Typical Temperature Coefficient					Configuration	Package			Current Consumption				Supply Voltage			Application Range		
		B_{ON} – [mT]	B_{OFF} – [mT]	Unipolar	Unipolar Inverted	Bipolar	Latching	0 ppm/K	–300 ppm/K	–1000 ppm/K	–1200 ppm/K	–2000 ppm/K	2/3/4-Wire	SOT23	TO92UA[1,2]	TO-92UT	I_{SUP} [mA]	$I_{SUPLow1}$ = 2...5 mA	$I_{SUPLow2}$ = 5...7 mA	$I_{SUPHigh}$ = 12...17 mA	V_{SUP} = 2.7...24 V	V_{SUP} = 3...24 V	V_{SUP} = 4.5 V... 8.5 V	Position Detection	RPM Measurement	Brushless DC Motor
HAL 10xy[3]	**HAL 1002**	**Programmable**		•	•		•	**Programmable[5]**					3			•	7						•			
HAL 13xy[3,4]	**HAL 1301**	1.2	–1.2				•	•					4	•			3								•	
	HAL 1302	2.5	–2.5				•	•					4	•			3								•	
	HAL 1303	3.0	–3.0				•					•	4	•			3								•	
	HAL 1304	7.5	–7.5				•	•					4	•			3								•	
	HAL 1305	1.7	–1.7				•	•					4	•			3								•	
	HAL 1306	9.0	–9.0				•				•		4	•			3								•	
	HAL 1307	7.5	–7.5				•	•					4	•			3								•	
	HAL 1308	1.7	–1.7				•	•					4	•			3								•	
HAL 15xy[3,4]	**HAL 1501**	0.4	–0.4			•		•					3	•	•		1.6				•			•	•	•
	HAL 1502	2.5	–2.5				•			•			3	•	•		1.6				•			•	•	•
	HAL 1503	5.5	3.7	•						•			3	•	•		1.6				•			•	•	•
	HAL 1504	7.6	–7.6				•				•		3	•	•		1.6				•			•	•	•
	HAL 1505	13.5	–13.5				•				•		3	•	•		1.6				•			•	•	•
	HAL 1506	18.9	17.3	•							•		3	•	•		1.6				•			•	•	
	HAL 1507	28.2	23.9	•					•				3	•	•		1.6				•			•	•	
	HAL 1508[6]	–5.5	–3.7	•						•			3	•	•		1.6				•			•	•	•
	HAL 1509	3.7	5.5		•					•			3	•	•		1.6				•			•	•	•
	HAL 1510	12	7	•							•		3	•	•		1.6				•			•	•	•
	HAL 1561	4	–4				•	•					2	•	•				•	•		•		•	•	•
	HAL 1562	12	–12				•	•					2	•	•				•	•		•		•	•	•
	HAL 1563	7.6	9.4		•			•					2	•	•				•	•		•		•	•	•
	HAL 1564	4.1	6		•					•			2	•	•			•		•		•		•	•	•
	HAL 1565	6	4.1	•						•			2	•	•			•		•		•		•	•	•
	HAL 1566	9.4	7.6	•				•					2	•	•				•	•		•		•	•	•

[1] straight or spread leads [2] standard 15.7 ± 0.2 mm or long lead length 21 ± 0.2 mm [3] T_J = –40 °C to 170 °C [4] ISO 26262 compliant [5] from 0 to –2000 ppm/K [6] north pole sensitive

Selection by Application – Industrial

	Recommended Solution	Comment
BLDC Motor Commutation	HAL 1502, HAL 1501	These Hall switches in SOT23 packages offer high switching accuracy and low power consumption and are used for the commutation of brushless DC motors e.g. in power tools, washing machines, dish washers, ventilation fans or electric bikes.
Rotation and Speed Sensor	HAL 13xy	The HAL 13xy switch family enable short output switching time and is used to detect or to control the speed of motors, fans or liquid flow, e.g. in power tools, home appliances, white goods (water delivery) and wheel-speed in electric vehicles and electric bikes.
Rotation and Speed Sensor	HAL 15xy	The HAL 15xy switch family is offered in small packages and enable accurate switching points and a short output refresh time. They are used as proximity sensors to detect the end-position to stop the motor or to detect the absence or presence of material, e.g. rolling shutter, doors, factory automation.
Position and Rotation Sensor with 2 wires	HAL 1565, HAL 1564	These 2-wire Hall switches for wire saving with high switching accuracy, low power consumption and integrated wire-break detection can be used to detect e.g. if the door is closed or open.