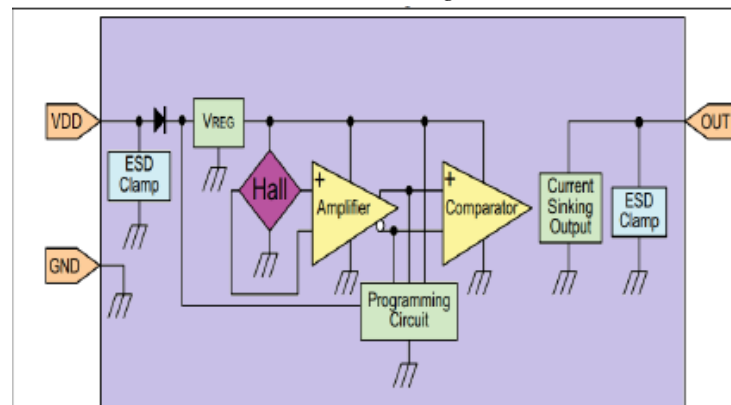


Features and Function Block Diagram

- Bipolar latching magnetics respond to alternating North and South poles, making these products well-suited for accurate speed sensing and RPM (revolutions per minute) measurement
- Enhanced sensitivity: will operate from only 35 Gauss typical, at 25 °C allowing the use of smaller, potentially lower-cost magnets or wider air gaps
- Subminiature, SOT-23-3L(LC2431S) or SOT-89-3L(LC2431E) surface mount package supplied on tape and reel allows for a compact design with automated component placement, helping to reduce manufacturing costs
- Small, leaded, flat, TO-92S package (LC2431T) allows for a compact PCB layout
- Wide operating voltage range of 2.5V to 12V makes these sensors useable in a wide range of applications
- Built-in reverse voltage capability enhances the protection of the sensor and the circuits with which it is used
- Robust design: will operate up to 85 °C
- RoHS-compliant material meets directive 2002/95

Function Block Diagram

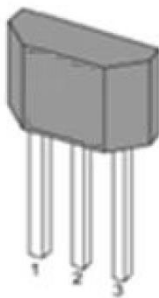


Applications

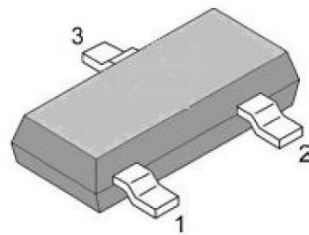
- Transportation
 - Speed and RPM (revolutions per minute)
- Sensing
 - Tachometer, counter pickup
 - Motor and fan control
 - Electric window lift
 - Convertible roof position
 - Automotive transmission position
- Industrial
 - Speed and RPM sensing

- Tachometer, counter pickup
- Flow-rate sensing
- Brushless dc (direc current) motor commutation
- Motor and fan control
- Robotics control
- Medical
 - Motor assemblies
 - Medication dispense control

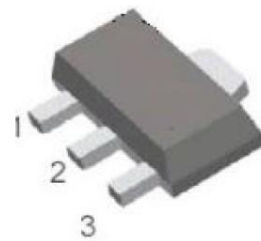
Packages



TO-92S



SOT-23 -3L



SOT-89-3L

Descriptions

- The LC2431S, LC2431E and LC2431T are small, versatile digital Hall-effect devices that are operated by the magnetic field from a permanent magnet or an electromagnet.
- These unipolar sensors are designed to meet the requirements of a wide range of potential applications. These economical unipolar sensors are well suited for simple, high-volume, cost-sensitive position and motion sensing applications.
- The 2.5Vdc to 12 Vdc supply voltage range allows this device to be used in very wide voltage applications.
- These sensors are available in two package styles: the LC2431S in the subminiature SOT-23-3L surface mount package, the LC2431E in the subminiature SOT-89-3L surface mount package, the LC2431T is available in the leaded, flat TO-92-style package.
- The LC2431S and LC2431E are available on tape and reel (LC2431S 3000 units per reel, LC2431E 1000 units per reel), the LC2431T is available in a bulk package (1000 units per bag).

	LiBrave Europe B. V. Add: Sir Winston Churchillaan 299k, 2288DC Rijswijk, the Netherlands Website: www.librave.nl E-mail: info@librave.nl	LC2431S/LC2431T/LC2431E	
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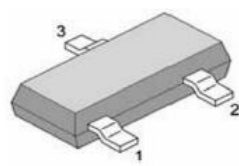
1. Product Family Members	4
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1. Product Family Members

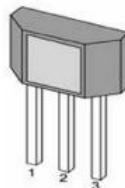
Part Number	Marking ID	Description
LC2431SR	C431	Bipolar latching, Hall-effect digital sensor IC, SOT-23-3L package, tape and reel packing (3000 units per reel)
LC2431TB	C431	Bipolar latching, Hall-effect digital sensor IC, flat, TO-92S package, bulk packing (1000 units per bag)
LC2431ER	C431	Bipolar latching, Hall-effect digital sensor IC, SOT-89-3L package, tape and reel packing (1000 units per reel)

2. Pin Definitions and Descriptions

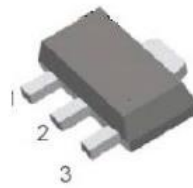
SOT-23-3L(S)	TO-92S(T)	Name	Type	Function
1	1	VDD	Supply	Supply Voltage pin
2	3	OUT	Output	Collector Output pin (include pull-up resistor)
3	2	GND	Ground	Ground pin



SOT-23-3L



TO-92S



SOT-89-3L

3. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V_{DD}	-	12	V
Reverse Voltage	R_{DD}	-	-12	V
Supply Current	I_{DD}	-	12	mA

Output Voltage	V_{OUT}	-	12	V
Output Current	I_{OUT}	-	5	mA
Operating Ambient Temperature	T_A	-30	85	°C
Storage Temperature	T_S	-50	150	°C
Junction temperature	T_J	-50	165	°C
Magnetic Flux	B	No Limit		Gauss

Note: Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute maximum-rated conditions for extended periods may affect device reliability.

4. Function Description

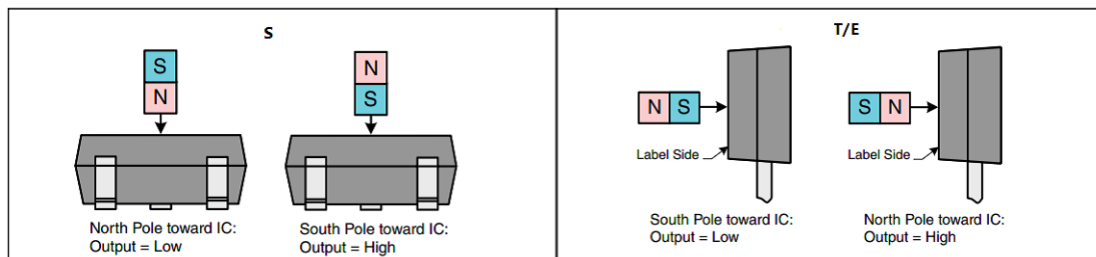
The LC2431S/LC2431T/LC2431E exhibits latch magnetic switching characteristics. Therefore, it requires both south and north poles to operate properly.

The device behaves as a latch with symmetric operating and release switching points ($BOP=|BRP|$). This means magnetic fields with equivalent strength and opposite direction drive the output high and low.

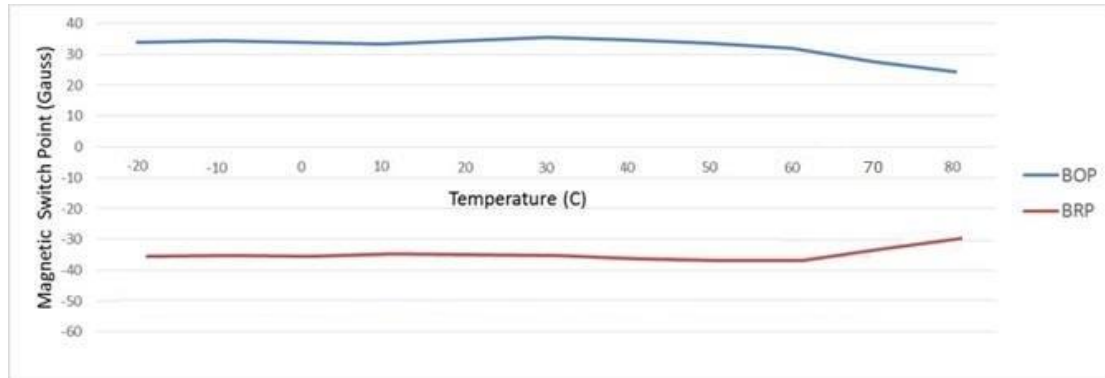
Removing the magnetic field ($B \rightarrow 0$) keeps the output in its previous state. This latching property defines the device as a magnetic memory.

A magnetic hysteresis BHYST keeps BOP and BRP separated by a minimal value. This hysteresis prevents output oscillation near the switching point.

5. Magnetic Activation



6. Temperature Characteristics



7. Parameters Specification (At 2.5V to 12V supply, 5mA load, TA= -30 °C to 85 °C except where otherwise specified.)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V _{DD}	Supply voltage	-40 °C to 150 °C	2.5	-	12	V
I _{DD}	Supply current	V _{DD} = 5V	-	5	12	mA
V _{DSon}	Output saturation voltage	at 20mA, Gauss >200	-	-	0.4	V
I _{OFF}	Output leakage current	B<50GS	-	-	10	uA
T _R	Output rise time	V _{DD} =12V at 25 °C CL= 20 pF	-	-	1.5	uS
T _F	Output fall time	V _{DD} =12V at 25 °C CL= 20 pF	-	-	1.5	uS
R _{TH}	Thermal resistance: LC2431S (SOT-23-3L) LC2431T (TO-92S) LC2431E (SOT-89-3L)	-	-	303 203 230	-	°C/W °C/W °C/W
B _{OP}	Magnetic operating point	TA=25 °C			35	Gauss
B _{RP}	Magnetic release point	TA=25 °C	-35			Gauss
B _{HYST}	Magnetic hysteresis window	TA=25°C BOP-BRP	20		45	Gauss
T	Operating temperature		-30	-	85	°C
T _S	Storage temperature:	-	-40	-	150	°C

⚠ NOTICE

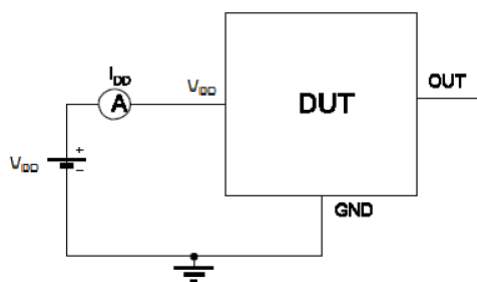
1. Bipolar Hall-effect sensor ICs may have an initial output in either the ON or OFF state if powered up with an applied magnetic field in the differential zone (applied magnetic field $>B_{RP}$ and $<B_{OP}$). LiBrave recommends allowing 10 μ s for output voltage to stabilize after supply voltage has reached 5V.

2. The magnetic field strength (Gauss) required to cause the switch to change state (operate and release) will be as specified in the magnetic characteristics. To test the switch against the specified magnetic characteristics, the switch must be placed in a uniform magnetic field.

8. Test Conditions

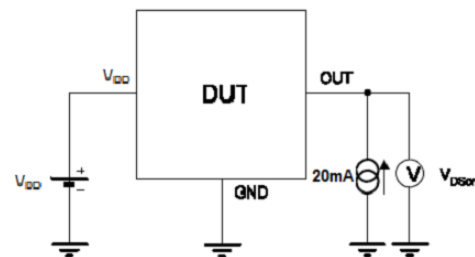
Note: DUT=Device Under Test

Supply Current



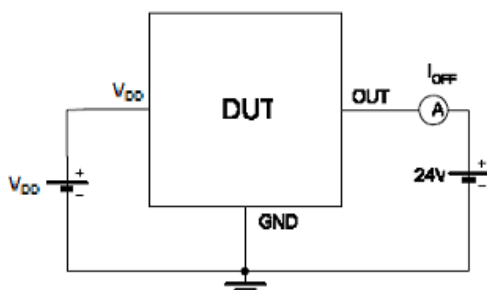
Note 1: The supply current I_{DD} represents the static supply current. OUT is left open during measurement;
 Note 2: The device is put under magnetic field with $B < B_{RP}$.

Output Saturation Voltage



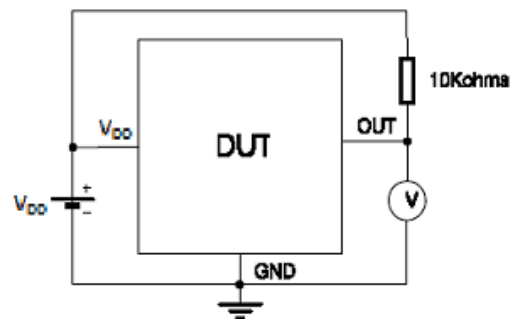
Note 1: The output saturation voltage V_{DSon} is measured at $V_{DD}=2.5V$ and $V_{DD}=12V$;
 Note 2: The device is put under magnetic field with $B > B_{OP}$.

Output Leakage Current



Note 1: The device is put under magnetic field with $B < B_{RP}$.

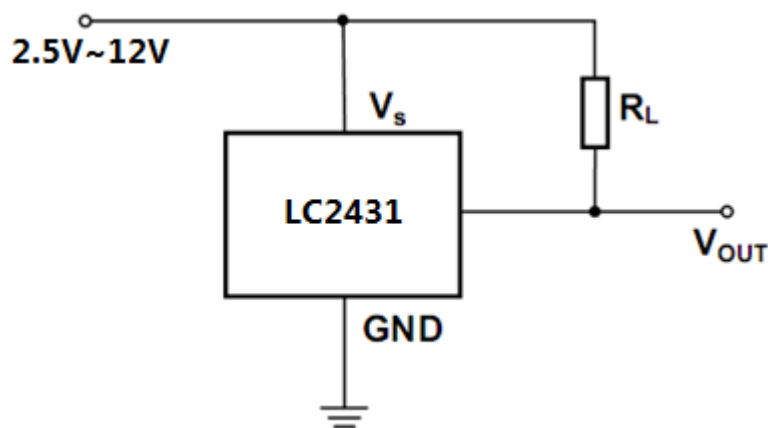
Magnetic Thresholds



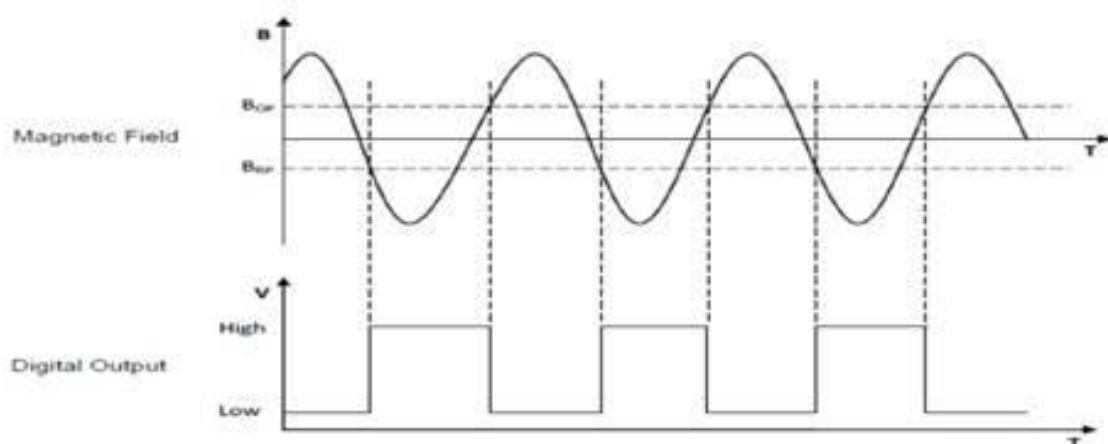
Note 1: BOP is determined by putting the device under magnetic field swept from B_{RPmin} up to B_{OPmax} until the output is switched on;

Note 2: B_{RP} is determined by putting the device under magnetic field swept from B_{OPmax} down to B_{RPmin} until the output is switched off.

9. Typical Application Circuit



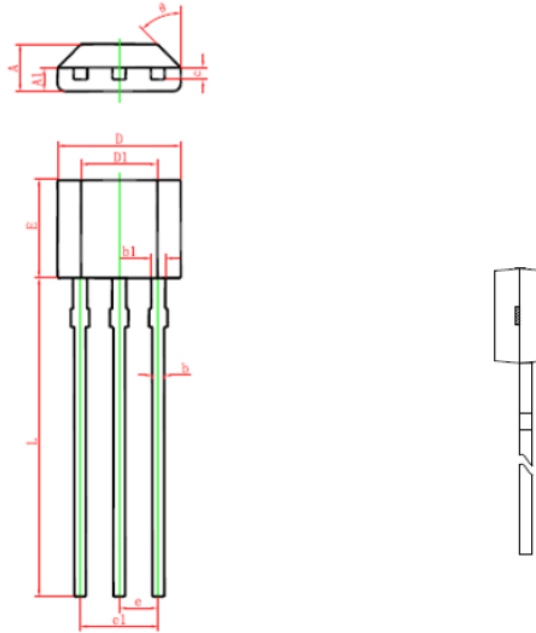
10. Typical Output Waveform (The TO-92S package as an example)



11. Package Information

Package Designator

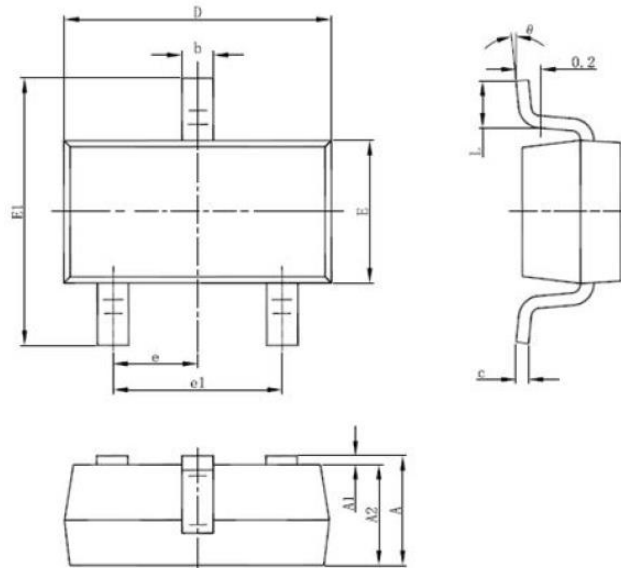
TO-92S



Symbol	Dimensions in Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.420	1.620	0.056	0.064
A1	0.660	0.860	0.026	0.034
b	0.350	0.430	0.014	0.019
b1	0.400	0.550	0.016	0.022
c	0.360	0.510	0.014	0.020
D	3.900	4.100	0.154	0.161
D1	2.280	2.680	0.090	0.106
E	3.050	3.250	0.120	0.128
e	1.270 TYP.		0.050 TYP.	
e1	2.440	2.640	0.096	0.104
L	15.100	15.500	0.594	0.610
θ	45 °TYP.		45 °TYP.	

Package Designator

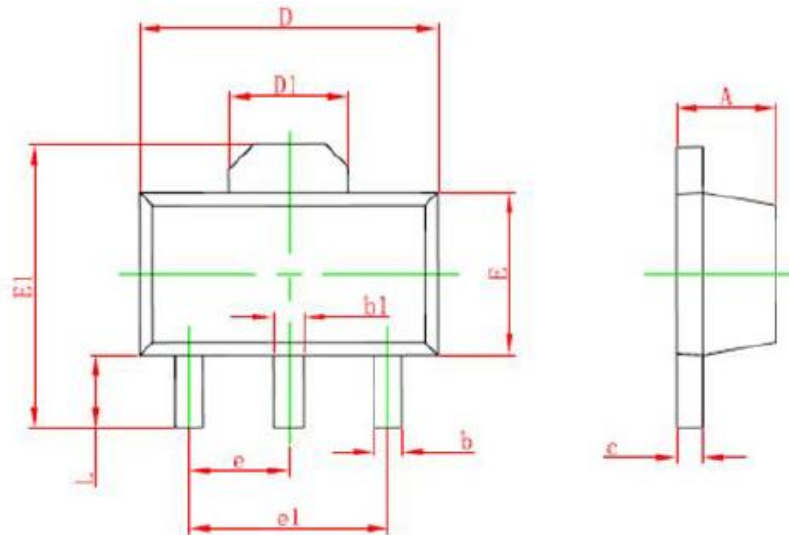
SOT-23-3L



Symbol	Dimensions in Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.2:00	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 (BSC)		0.037 (BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

Package Designator

SOT-89-3L



Symbol	Dimensions in Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
bl	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060 TVP	
e1	3.000 TYP		0.118 TYP	
L	0.900	1.200	0.035	0.047

	<p style="text-align: center;">LiBrave Europe B. V.</p> <p>Add: Sir Winston Churchillaan 299k, 2288DC Rijswijk, the Netherlands Website: www.librave.nl E-mail: info@librave.nl</p>	LC2431S/LC2431T/LC2431E	
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