MT1401 Series

CMOS, Latch, Hall-Effect Magnetic Position Sensors

MagnTek

Features and Benefits

- **CMOS Technology**
- **Magnetic Type: Latch**
- **Wide Operating Voltage Range:**
  Supply Voltage 3.0~18V
- **Specified Operating Temperature Range:**
  From –40℃~125℃
- **High Magnetic Sensitivity**
  Bop=20Gauss, Brp=-20Gauss (typical)
- **Lower Power Consumption**
  Supply Current <3mA
- **Lead Free Package**
  Flat TO-92, SOT-23, SOT-89B
- **High ESD Rating**
- **Open Drain Output**
- **Reversed Power Supply Protection**
- **RoHS Compliant**
  2011/65/EU

Applications

- Automotive, Home appliances, Industrial
- Electric Fan,Electric tools
- Brushless DC Motor Communication
- Magnetic Encoder
- Solid-State Switch
- Water Flow Sensor

Family Members

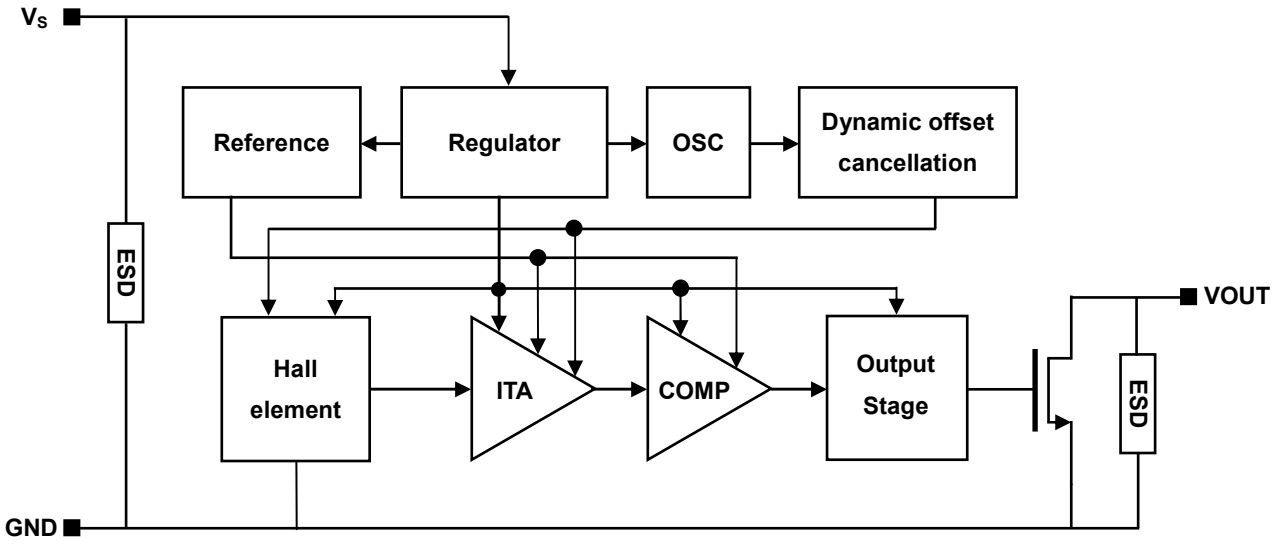
Part number	Description
MT1401A	Flat TO-92 package, bulk packaging (1000pcs/bag)
MT1401A-T	Flat TO-92 package, Radial lead, bulk packaging (1000pcs/bag)
MT1401AT	SOT-23 package, tape and reel packaging (3000pcs/bag)
MT1401BT	SOT-89B package, tape and reel packaging (1000pcs/bag)
MT1401ET	SOT-23(thin outline) package, tape and reel packaging (3000pcs/bag)

General Description

The MT1401 family, produced with CMOS technology, The Hall IC internally includes an on-chip Hall voltage generator, a voltage regulator for operation with supply voltages of 3.0 to 18V, temperature compensation circuitry, small-signal amplifier, Hall sensor with dynamic offset cancellation system, Schmitt trigger and an open-drain output.

They are designed to respond to alternating North and South poles. While the magnetic flux density(B) is larger than operate point (Bop), the output will be turned on (Low), the output is held until the magnetic flux density(B) is lower than release point (Brp), then turn off (High).

The MT1401 family provides a variety of packages to customers: SOT-23/SOT-89B for surface mount and TO-92 flat for through-hole mount. All packages are RoHS compliant.



Functional Block Diagram

Function Description

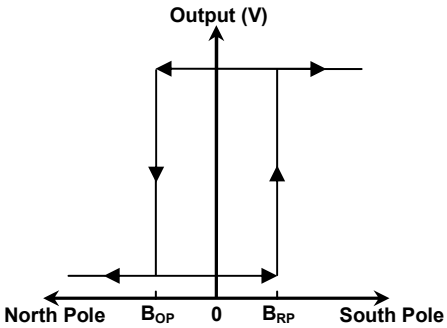
Definition of Magnetic Parameters

BOP: Operating Point
Magnetic flux density applied on the branded side of the package which turns the output driver ON (V_{OUT} = Low)

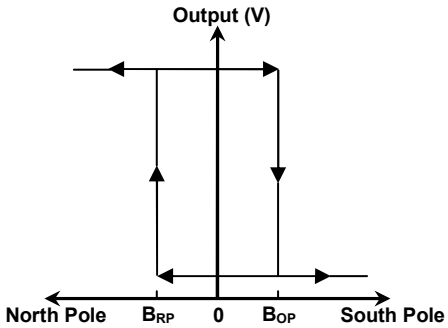
BRP: Release Point
Magnetic flux density applied on the branded side of the package which turns the output driver OFF (V_{OUT} = high)

BHYST: Hysteresis Window
BOP-BRP

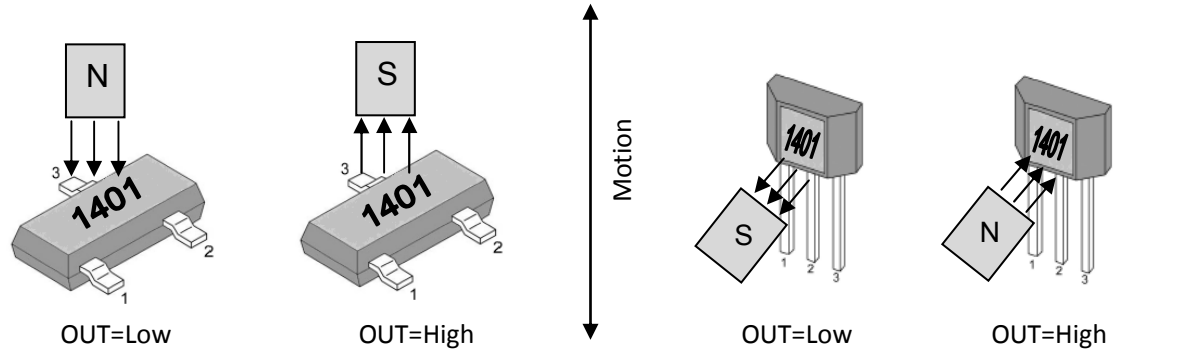
Definition of Switching Function

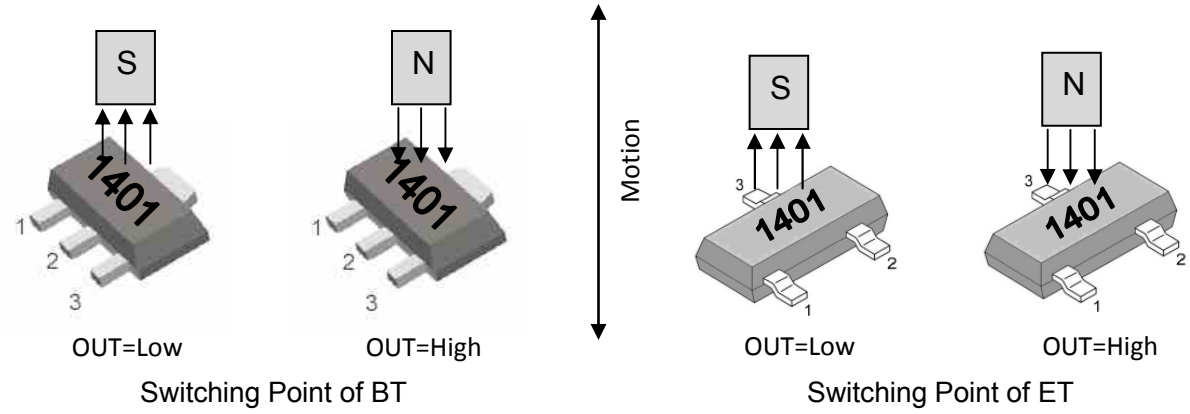


Switching Behavior of AT



Switching Behavior of A, BT and ET





Note: Direction of magnetic flux

Pin Description

MT1401AT

Name	Number	Description
Vs	1	Power
GND	3	Ground
Output	2	Open-Drain output

MT1401A (MT1401A-T)

Name	Number	Description
Vs	1	Power
GND	2	Ground
Output	3	Open-Drain output

MT1401ET

Name	Number	Description
Vs	1	Power
GND	3	Ground
Output	2	Open-Drain output

MT1401BT

Name	Number	Description
Vs	1	Power
GND	2	Ground
Output	3	Open-Drain output

Electrical and Magnetic Characteristics

Absolute Maximum Ratings

Absolute maximum ratings are limiting values to be applied individually, and beyond which the serviceability of the circuit may be impaired. Functional operability is not necessarily implied. Exposure to absolute maximum rating conditions for an extended period of time may affect device reliability.

Absolute maximum ratings: all voltages listed are referenced to GND.

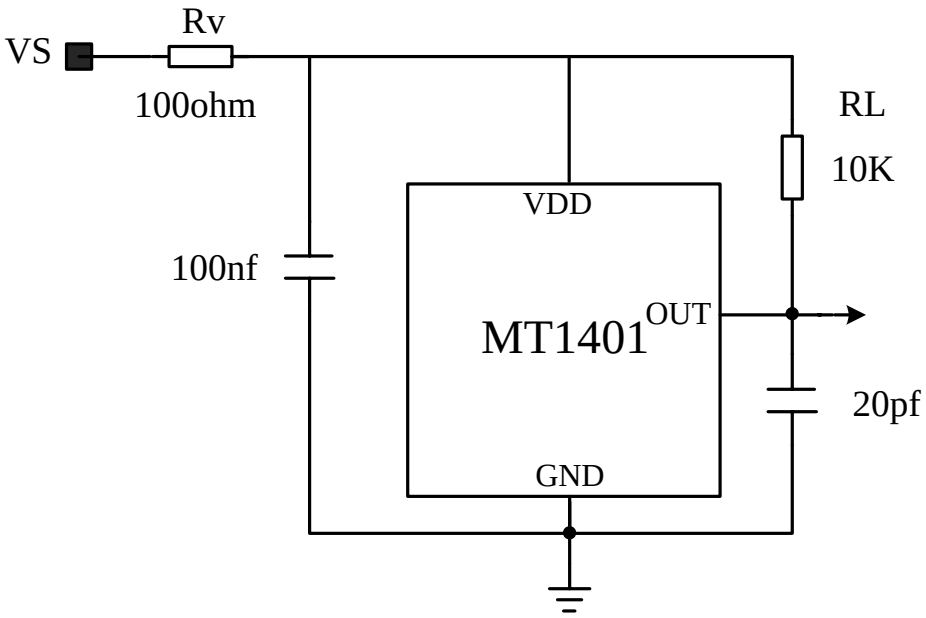
Symbol	Parameters	Min	Max	Units
V_S	Supply Voltage	-	30	V
V_{RCC}	Reverse Battery Voltage	-	-30	V
V_{OUT}	Output Voltage	-	30	V
I_{OUT}	Continuous output current	-	200	mA
T_A	Operating Ambient Temperature	-40	125	℃
T_s	Storage temperature	-50	150	℃
T_J	Junction temperature	-	150	℃
B	Magnetic flux	No Limit		Gauss

MT1401 Series Specifications

at T_A = -40℃ to 125℃, Vs = 3.0V to 18V (unless otherwise specified)

Symbol	Parameter	Test Condition	Min	Typ	Max	Units
V_S	Supply Voltage	Operating	3.0	-	18	V
I_S	Supply Current	B<B_{RP}	0.5	-	2	mA
V_{DSON}	Output Saturation Voltage	I_{OUT}=20mA, B>B_{OP}	-	-	0.4	V
I_{OFF}	Output Leakage Current	B<B_{RP}, V_{OUT}=18V	-	-	10	uA
T_R	Output Rise Time	R_L=1KOhm, C_L=20pF	-	-	4.0	uS
T_F	Output Fall Time	R_L=1KOhm, C_L=20pF	-	-	1.0	uS
F_{SW}	Maximum Switching Frequency		-	-	10	KHz
R_{TH}	SOT-23 Package Thermal Resistance		-	301	-	℃/W
	TO-92 Package Thermal Resistance		-	230	-	℃/W
	SOT-89B Package Thermal Resistance		-	230	-	℃/W
B_{OP}	Magnetic Operating Point	At T_A = 25℃	5	20	40	Gauss
B_{RP}	Magnetic Release Point	At T_A = 25℃	-40	-20	-5	Gauss
B_{HYST}	Hysteresis Window	At T_A = 25℃, | B_{OP}-B_{RP} |	10	40	80	Gauss

Typical Application Circuit



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