

Features and Benefits

- **1.40mm Hall Elements Spacing**
- **Magnetic Type: Bipolar Switch**
- **Operating Voltage Range:**
Supply Voltage 3.0~24V
- **Specified Operating Temperature Range:**
From -40°C~150°C
- **High Magnetic Sensitivity**
 $B_{OP}=120\text{Gauss}$, $B_{RP}=-120\text{Gauss}$ (typical)
- **Lead Free Package**
Flat TO-94, SOT-89B
- **High ESD Rating**
- **RoHS Compliant**
2011/65/EU

Applications

- **Magnetic encoder**
- **Speed detection**
- **Direction detection**

Family Members

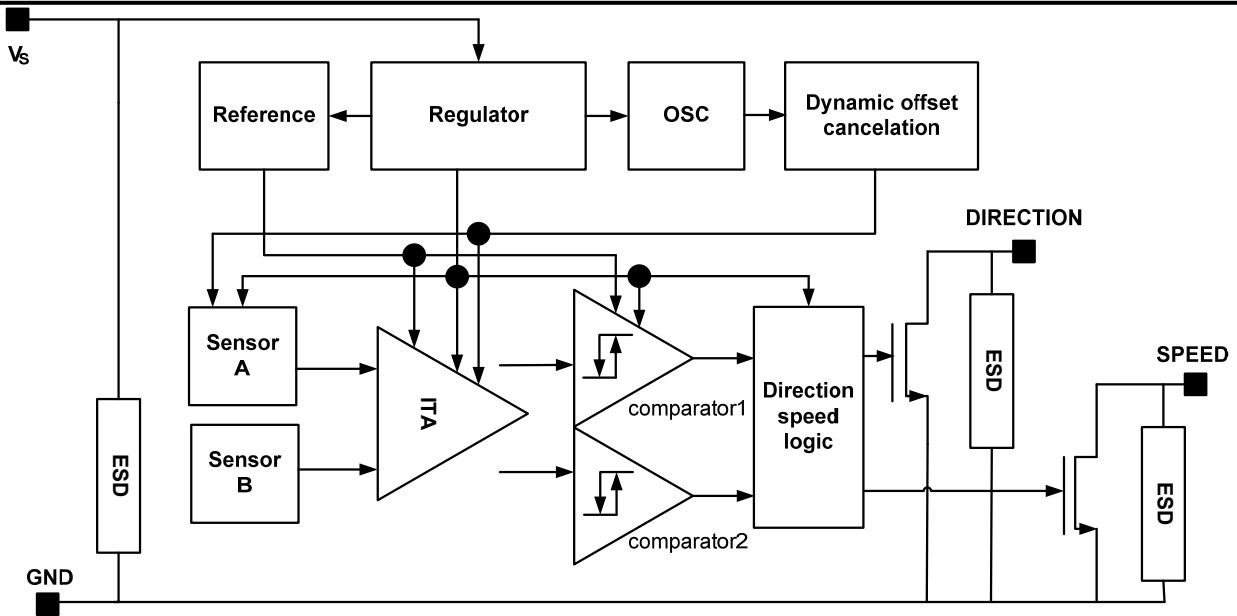
| Part number | Description |
|-------------|--|
| MT1452A-EN | Flat TO-94 package, bulk packaging (1000pcs/bag) |
| MT1452BT-EN | SOT-89B package, tape and reel packaging (1000pcs/bag) |

General Description

The MT1452-EN is a dual channel switch Hall sensor with two Hall sensing elements. It outputs two digital signals for speed and direction processing.

The MT1452-EN internally includes two Hall sensing elements located 1.40mm apart, an on-chip Hall voltage generator, voltage regulator for operation with supply voltage 3.0 to 24V, temperature compensation circuitry, small-signal amplifier, Hall sensor with dynamic offset cancellation system, Schmitt trigger and open-drain output. Signal processing of speed and direction signals is easy.

The MT1452-EN family provides a variety of packages to customers: flat TO-94 for through-hole mount and SOT-89B for surface mount. All packages are RoHS compliant.



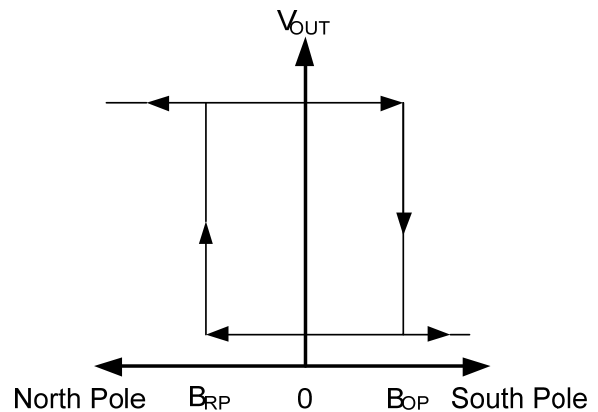
Functional Block Diagram

Definition of Magnetic Parameters

B_{OP} : Operating point, magnetic flux density applied on the branded side of the package which turns the output driver ON ($V_{OUT}=Low$)

B_{RP} : Release point, magnetic flux density applied on the branded side of the package which turns the output driver OFF ($V_{OUT}=High$)

B_{HYST} : Hysteresis window, $|B_{OP}-B_{RP}|$



Pin Description

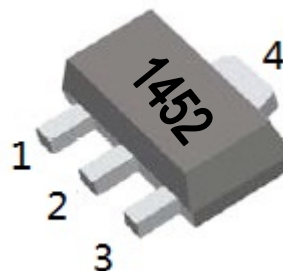
MT1452A-EN

| Name | Number | Description |
|-----------|--------|----------------------|
| V_S | 1 | Power Supply |
| DIRECTION | 2 | Direction Signal Out |
| SPEED | 3 | Speed Signal Out |
| GND | 4 | Ground |



MT1452BT-EN

| Name | Number | Description |
|-----------|--------|----------------------|
| V_S | 1 | Power Supply |
| DIRECTION | 2 | Direction Signal Out |
| SPEED | 3 | Speed Signal Out |
| GND | 4 | Ground |



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.

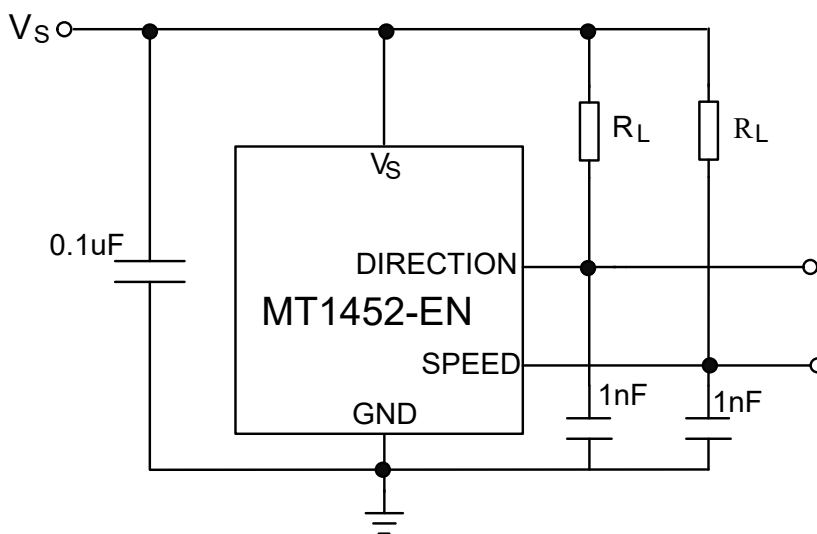
| Symbol | Parameters | Min | Max | Units |
|------------------|-------------------------------|----------|------|-------|
| V _S | Supply Voltage | - | 30 | V |
| V _{RCC} | Reverse Battery Voltage | - | -0.5 | V |
| V _{OUT} | Output Voltage | - | 30 | V |
| I _{OUT} | Continuous output current | - | 25 | mA |
| T _A | Operating Ambient Temperature | -40 | 150 | °C |
| T _S | Storage temperature | -50 | 165 | °C |
| T _J | Junction temperature | - | 165 | °C |
| B | Magnetic flux | No Limit | | Gauss |

MT1452-EN Series Specifications

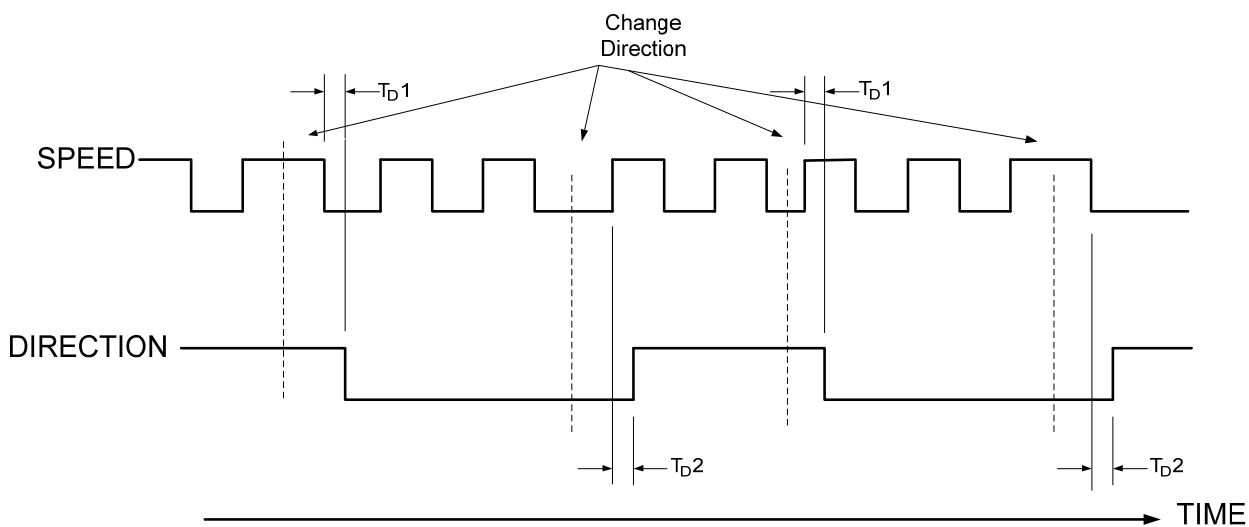
At T_A = -40°C to 150°C, V_S = 3.0V to 24V (unless otherwise specified)

| Symbol | Parameter | Test Condition | Min | Typ | Max | Units |
|-------------------|---------------------------|--|------|------|------|-------|
| V _S | Supply Voltage | Operating | 3.0 | 5 | 24 | V |
| I _S | Supply Current | B < B _{RP} | - | 2.5 | 4 | mA |
| V _{SON} | Output Saturation Voltage | I _{OUT} = 20mA, B > B _{OP} | - | - | 0.4 | V |
| I _{OFF} | Output Leakage Current | B < B _{RP} , V _{OUT} = 24V | - | 0.1 | 1.0 | µA |
| T _R | Output Rise Time | R _L = 10kohm, C _L = 20pF | - | - | 1.0 | µs |
| T _F | Output Fall Time | R _L = 10kohm, C _L = 20pF | - | - | 1.0 | µs |
| T _{D1} | Delay Time 1 | | - | 1.4 | - | µs |
| T _{D2} | Delay Time 2 | | - | 1.0 | - | µs |
| B _{OP} | Magnetic Operating Point | At T _A = 25°C | 90 | 120 | 150 | Gauss |
| B _{RP} | Magnetic Release Point | At T _A = 25°C | -150 | -120 | -90 | Gauss |
| B _{HYST} | Hysteresis Window | At T _A = 25°C, B _{OP} - B _{RP} | 200 | 240 | 280 | Gauss |
| D _{IS} | Distance of Hall elements | | 1.39 | 1.40 | 1.41 | mm |

Typical Application Circuit Note: R_L recommend 1Kohm to 10Kohm

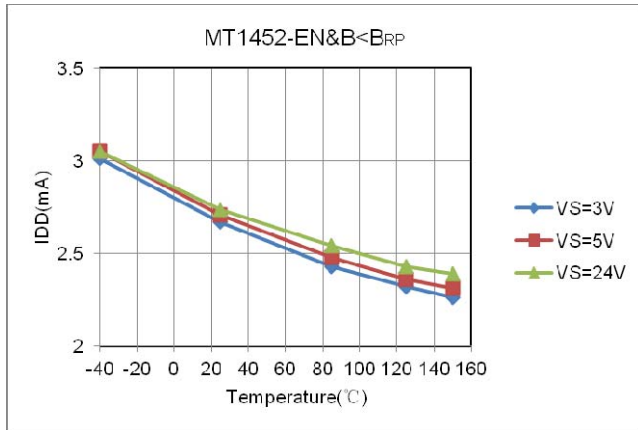


Typical Output Waveform

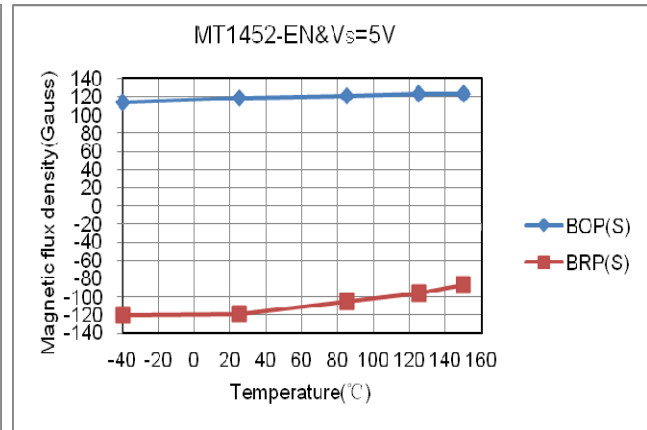


Characteristic Performance

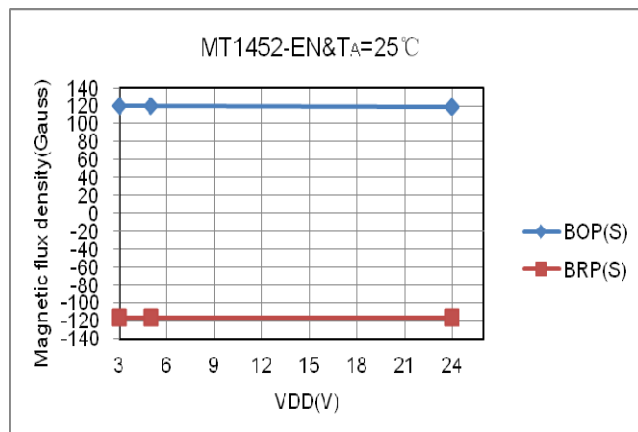
Average Supply Current versus Temperature



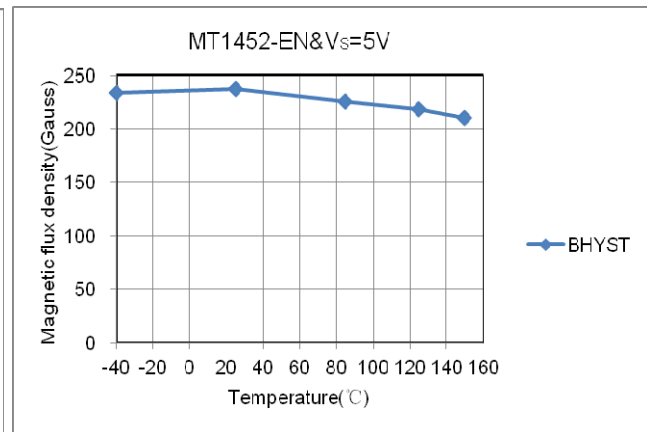
Magnetic Characteristics versus Temperature (VS=5V)



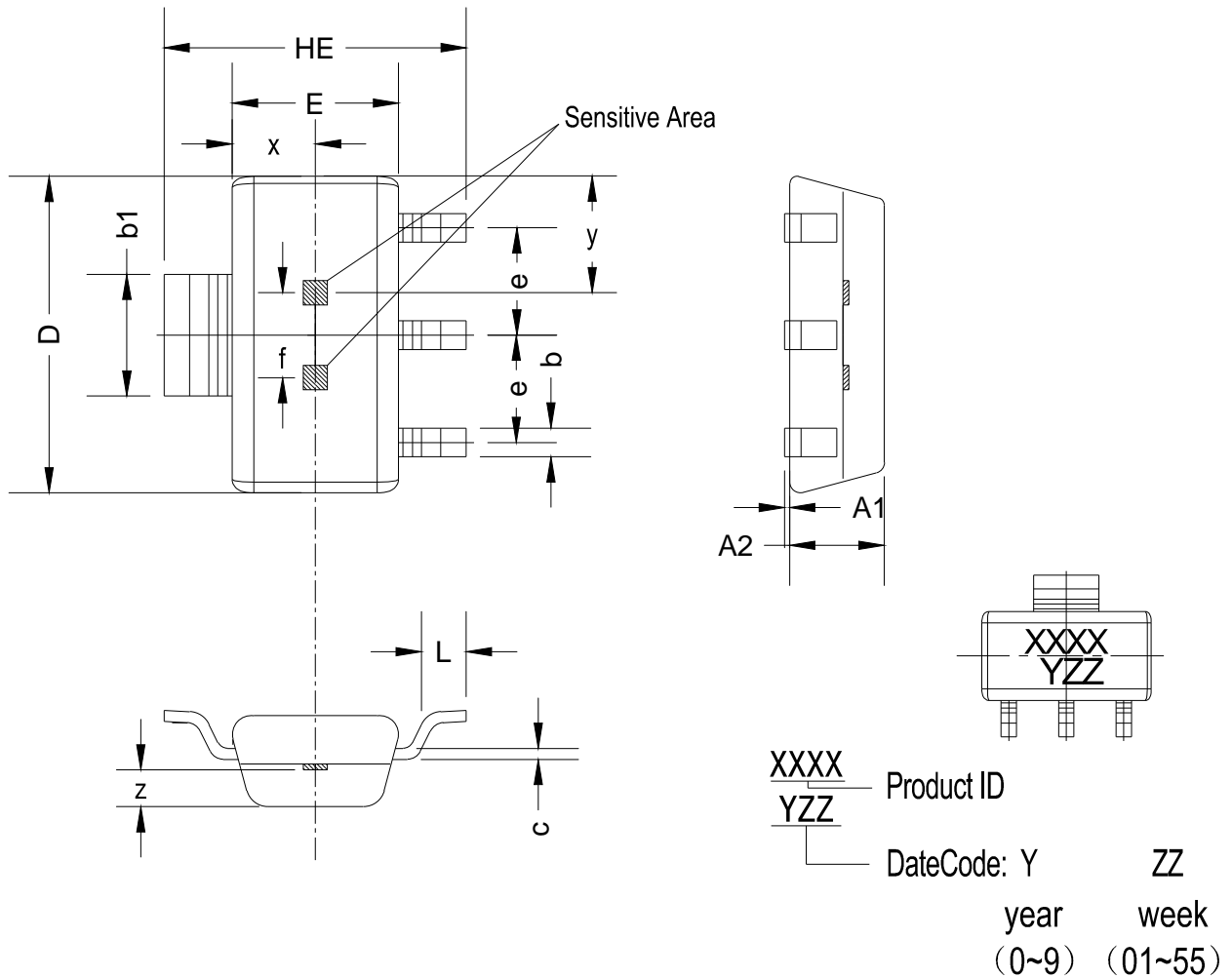
Magnetic Characteristics versus Supply Voltage (TA=25°C)



Hysteresis window versus Temperature (VS=5V)



PACKAGE DESIGNATOR (MT1452BT-EN) SOT-89B



| Symbol | Dimensions in Millimeters | | Dimensions in Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.220 | 1.420 | 0.048 | 0.056 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| b1 | 1.600 | 1.800 | 0.063 | 0.070 |
| D | 4.400 | 4.600 | 0.173 | 0.181 |
| c | 1.152REF | | 0.045REF | |
| E | 2.400 | 2.600 | 0.094 | 0.102 |
| HE | 4.000 | 4.400 | 0.157 | 0.173 |
| e | 1.500TYP | | 0.060TYP | |
| L | 0.350 | 0.550 | 0.014 | 0.022 |
| x | 0.800 | 1.000 | 0.031 | 0.039 |
| y | 1.450 | 1.650 | 0.057 | 0.065 |
| f | 1.390 | 1.410 | 0.055 | 0.056 |
| z | 0.400TYP | | 0.016TYP | |