## Features and Benefits

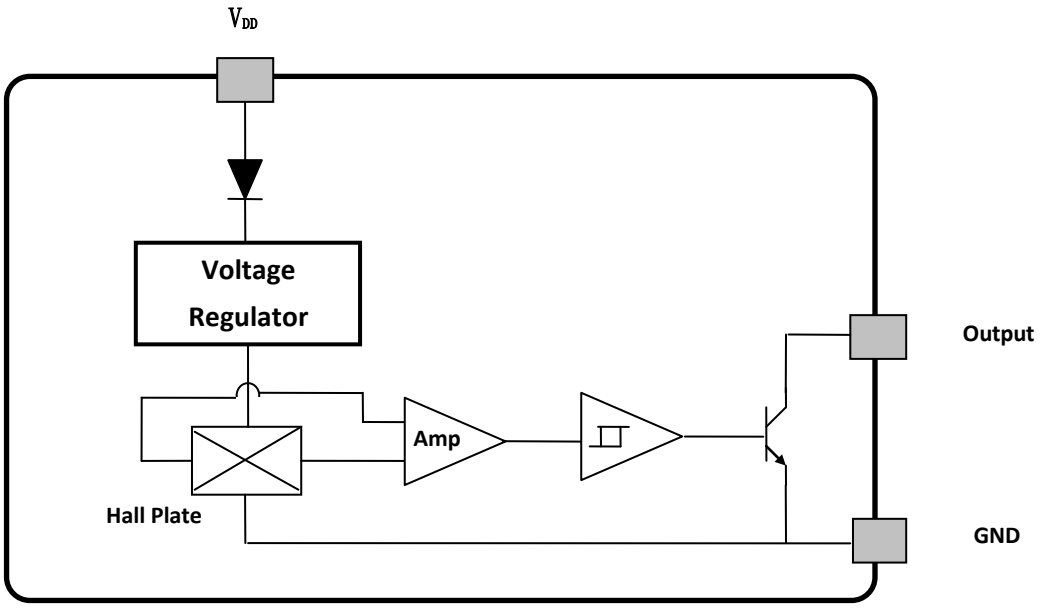
- 3.8V to 24V Operation
- -40°C to 150°C Superior temperature operation
- Bipolar technology
- Open-collector 50 mA output
- Reverse battery protection
- Small Size SOT89 3L
- Solid-state reliability
- Resistant to 60V supply voltage
- Sensitivity of temperature compensation circuitry

## Application Examples

- Automotive, Consumer and Industrial
- Solid-state switch
- Brushless DC motor commutation
- Speed detection
- Linear position detection
- Angular position detection
- Proximity detection

3 pin SOT89 (suffix SP)

## Functional Block Diagram



## General Description

The SS143 is a unipolar Hall-effect sensor IC fabricated from bipolar technology. The device integrates a voltage regulator, reverse battery protection diode, Hall sensor with dynamic offset cancellation system, temperature compensation circuitry, small signal amplifier, Schmitt trigger and an open-collector output to sink up to 50 mA. With suitable output pull up, they can be used with bipolar or CMOS logic circuits.

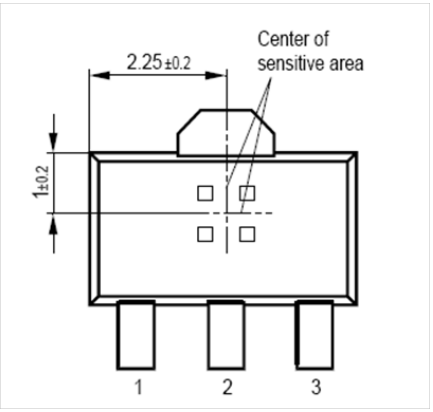
These Hall-effect switches are monolithic integrated circuits with tighter magnetic specifications, designed to operate continuously over extended temperatures to +150°C,and are more stable with both temperature and supply voltage changes. Internal compensation characteristic makes the sensitivity increase slightly with temperature increasing, so that this IC is Particularly suitable to be used with the commonly low-cost magnets. If a magnetic flux density larger than threshold Bop, Output is turned on (low). When a magnetic flux density reversal falls below Brp, Output will be turned off (high).

Thanks to its wide operating voltage range, extended choice of temperature range and high reliability, it is quite suitable for use in automotive, industrial and consumer applications.

## Glossary of Terms

| | |
|---|---|
| MilliTesla (mT), Gauss | Units of magnetic flux density: 1mT = 10 Gauss |
| RoHS | Restriction of Hazardous Substances |
| Operating Point ($B_{OP}$) | Magnetic flux density applied on the branded side of the package which turns the output driver ON ($V_{OUT} = V_{DSon}$) |
| Release Point ($B_{RP}$) | Magnetic flux density applied on the branded side of the package which turns the output driver OFF ($V_{OUT}$ = high) |

## Pin Definitions and Descriptions




| SOT Pin № | Name | Type | Function |
|---|---|---|---|
| 1 | $V_{DD}$ | Supply | Supply Voltage pin |
| 2 | GND | Ground | Ground pin |
| 3 | OUT | Output | Open Collector Output pin |

## Absolute Maximum Ratings

| Parameter | Symbol | Value | Units |
|---|---|---|---|
| Supply Voltage | $V_{DD}$ | 60 | V |
| Reverse Voltage | $V_{DD}$ | -24 | V |
| Output Voltage | $V_{OUT}$ | 30 | V |
| Output Current | $I_{OUT}$ | 50 | mA |
| Magnetic Flux Density | B | No limit | |
| Operating Temperature Range | $T_A$ | -40 to +150 | °C |
| Storage Temperature Range | $T_S$ | -65 to 170 | °C |
| Maximum Junction Temperature | $T_J$ | +150 | °C |
| Lead Temperature(Solding, 5 sec) | $T_L$ | +250 | °C |
| Package Power Dissipation | $P_D$ | 450 | mW |

| Operating Temperature Range | Symbol | Value | Units |
|---|---|---|---|
| Temperature Suffix “E” | $T_A$ | -40 to 85 | °C |
| Temperature Suffix “K” | $T_A$ | -40 to 125 | °C |
| Temperature Suffix “L” | $T_A$ | -40 to 150 | °C |

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

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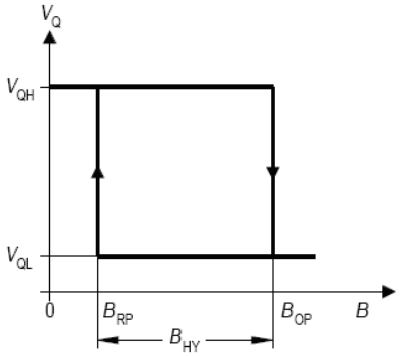
## General Electrical Specifications

DC Operating Parameters $T_A$ = 25°C, $V_{DD}$= 3.8V to 24V (unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Supply Voltage | $V_{DD}$ | Operating | 3.8 | | 24 | V |
| Supply Current | $I_{DD}$ | $V_{DD}$=12V | | 5 | 10 | mA |
| Output Saturation Voltage | $V_{DSon}$ | $I_{OUT}$ = 20mA, B > $B_{OP}$ | | 0.45 | 0.6 | V |
| Output Current | $I_{ON}$ | B > $B_{OP}$ | | | 10 | mA |
| Output Leakage Current | $I_{OFF}$ | B < $B_{RP}$ | | 0.1 | 10 | µA |
| Output Rise Time | tr | $V_{CC}$=12V, $R_L$ = 1.1KΩ, $C_L$ = 20pF | | 0.2 | 1.5 | µs |
| Output Fall Time | tf | $V_{CC}$=12V, $R_L$ = 1.1KΩ, $C_L$ = 20pF | | 0.5 | 1.0 | µs |

## Magnetic Specifications

| Package | Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| SP | Operating Point | $B_{OP}$ | Ta=25°C,Vdd=12V DC | 75 | | 120 | G |
| | Release Point | $B_{RP}$ | | 25 | | 80 | G |
| | Hysteresis | $B_{HYST}$ | | | 50 | | G |



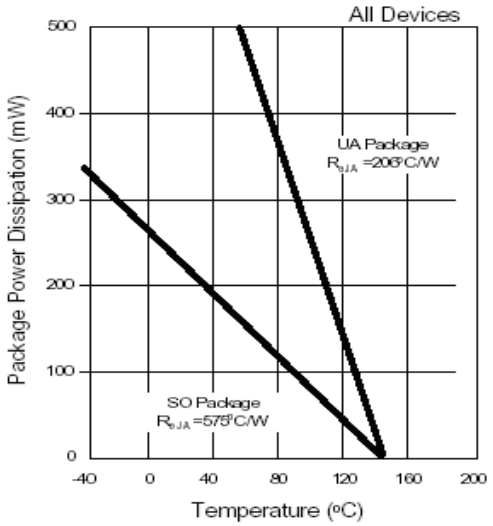

## Output Behavior versus Magnetic Pole

DC Operating Parameters TA = -40°C to 150°C, VDD = 3.8V to 24V (unless otherwise specified)

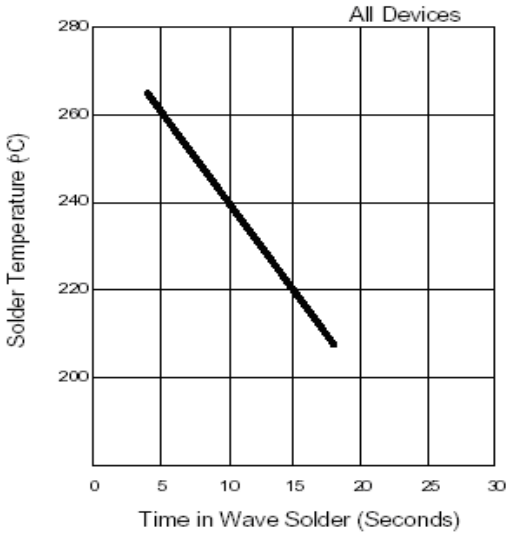
| Test Conditions (SP) | OUT |
|---|---|
| B < $B_{RP}$ | High |
| B > $B_{OP}$ | Low |

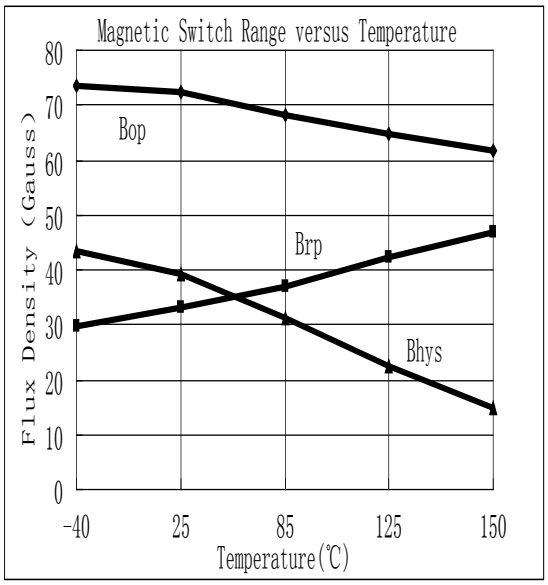
## Performance Characteristics

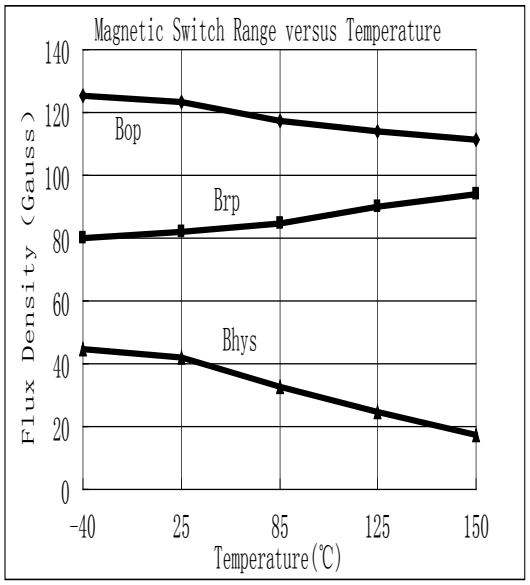
**Power Dissipation versus Temperature**



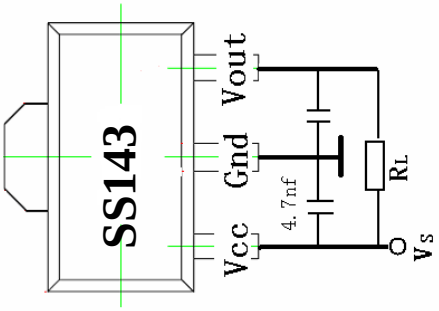

**Wave Soldering Parameters**



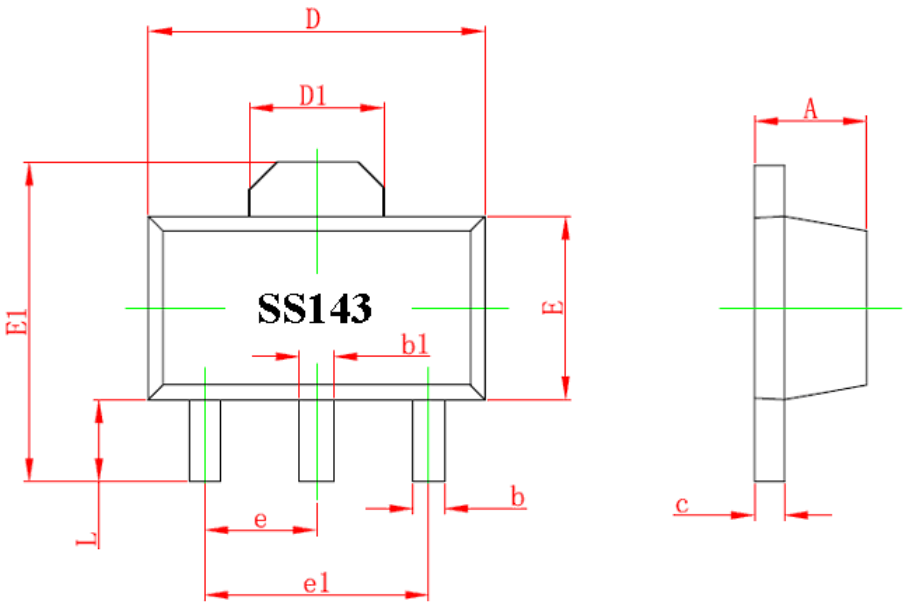




## Application Information



## Package SP, 3-Pin SOT-89:




| 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 | 0.197 |
| b1 | 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 | | 0.060TYP | |
| e1 | 3.000 TYP | | 0.118TYP | |
| L | 0.900 | 1.200 | 0.035 | 0.047 |

## Ordering Information

| Part No. | Pb-free | Temperature Code | Package Code | Packing |
|---|---|---|---|---|
| SS143ESPT | YES | -40°C to 85°C | SOT-89 | 7-in. reel, 3000 pieces/reel |
| SS143KSPT | YES | -40°C to 125°C | SOT-89 | 7-in. reel, 3000 pieces/reel |
| SS143LSPT | YES | -40°C to 150°C | SOT-89 | 7-in. reel, 3000 pieces/reel |