

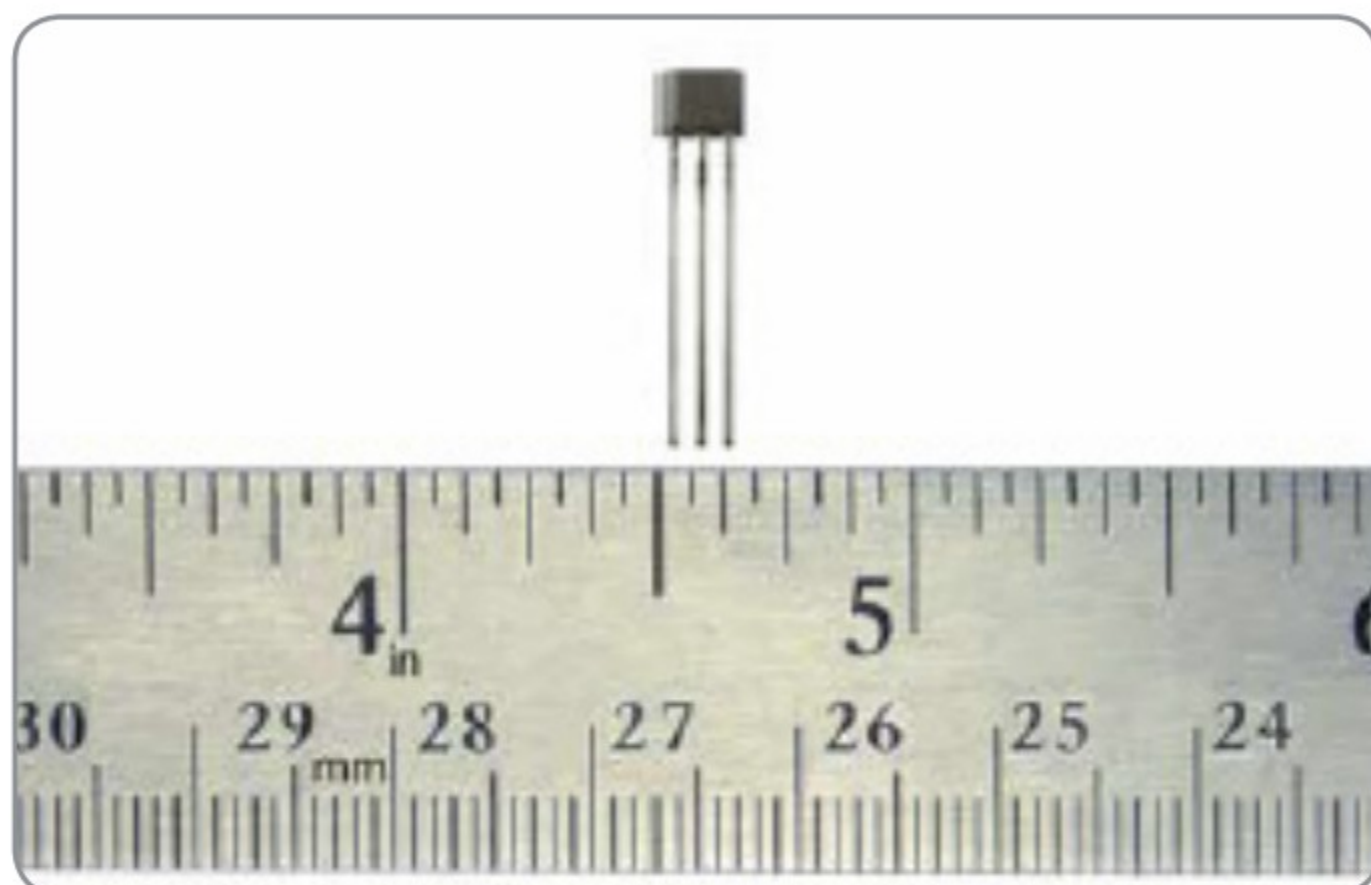
## Low-cost Digital Bipolar Hall-effect Sensor ICs

SS40F6

XXXXXXX

Issue A

Datasheet



### DESCRIPTION

The SS40F6 are small, versatile digital Hall-effect devices that are operated by the magnetic field from a permanent magnet or an electromagnet, and are designed to respond to alternating North and South poles.

A built-in regulator provides enhanced stability of operation over 4.5 Vdc to 60 Vdc supply voltage range, and internal circuitry is designed to prevent sensor damage in case the supply voltage polarity is accidentally reversed.

The open-collector sinking output voltage is easily interfaced with a wide variety of electronic circuits.

The SS40F6 is factory tested at 25 °C [77 °F]  
With tested at both 25 °C [77 °F] and 125 °C [257 °F].

#### Output Short Circuit Protection

The sensor turns off the output transistor when the output load current exceeds the output current limit specified in the operating characteristics table. The output remains off until the next  $B > B_{op}$  field application where it will retry to turn on.

- **SS40F6** : Flat TO-92-style package with straight leads in bulk packaging which allows for a compact PC board layout

### FEATURES

- Small, leaded, flat TO-92-style package allows for a compact PCB layout
- Wide operating voltage range of 4.5 Vdc to 60 Vdc allows these sensors to be used in a variety of applications
- Current consumption of only 3.6 mA max. at 4.5 Vdc for energy efficiency
- Bipolar magnetics for ring magnet applications with alternating North and South poles
- Robust design: Will operate up to 150 °C [302 °F]
- RoHS-compliant materials meet Directive 2002/95/EC +/-16 kV ESD (HBM)

### POTENTIAL APPLICATIONS

#### Transportation

- Speed and RPM sensing
- Commutation and control of electric motors used in transportation

#### Industrial and Commercial

- Flow-rate sensing for appliances
- Tachometer counter pickup
- Brushless dc motor commutation
- Motor and fan control for commercial, consumer or industrial equipment

#### Medical

- Any medical equipment or instruments using electric motors

### PORTFOLIO

The SS40F6 is part of Honeywell's family of low-cost digital bipolar Hall-effect sensor ICs, including:

- [SS30AT](#), [SS40A](#), [SS50AT](#)
- [SS311PT](#), [SS411P](#)
- [SS41F](#), [SS41G](#)
- [SS51T](#), [SS511AT](#), [SS513AT](#)

# Low-cost Digital Bipolar Hall-effect Sensor ICs, SS40F6

**Table 1. SS40F6 Electrical and Environmental Specifications**

Characteristics at  $4.5V \leq V_S \leq 60V$ ,  $-40^\circ C \leq T_A \leq 150^\circ C$ ,  $I_O=15mA$  unless otherwise specified

| Characteristic            | Symbol       | Conditions                              | Min.  | Typ.  | Max.  | Units   |
|---------------------------|--------------|-----------------------------------------|-------|-------|-------|---------|
| Supply Voltage            | $V_S$        |                                         | 4.5   | 24.0  | 60.0  | volts   |
| Supply current            | $I_S$        |                                         |       | 3.6   | 10.0  | mA      |
| Output Voltage (ON)       | $V_{SAT}$    | $I_O=15mA$                              |       | 0.215 | 0.600 | volts   |
| Output Leakage Current    | $I_{OH}$     |                                         |       |       | 10.0  | $\mu A$ |
| Output Current Limitation | $I_{O(SCP)}$ | Short circuit protection <sup>(1)</sup> | 40    |       |       | mA      |
| Rise Time                 | $t_r$        | $T_A=25^\circ C$                        |       |       | 1.5   | $\mu S$ |
| Fall Time                 | $t_f$        | $T_A=25^\circ C$                        |       |       | 1.5   | $\mu S$ |
| ESD (HBM)                 | $V_{ESD}$    | JEDEC JS-001-2014                       | +/-16 |       |       | kv      |

## NOTICE

These 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  $<B_{op}$ ). Honeywell recommends allowing 10  $\mu s$  after supply voltage has reached 3 V for the output voltage to stabilize.

## NOTICE

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 limits, the switch must be placed in a uniform magnetic field.



## CAUTION

ELECTROSTATIC SENSITIVE DEVICES  
DO NOT OPEN OR HANDLE EXCEPT AT A STATIC FREE WORKSTATION



ESD SENSITIVITY:  
CLASS 3B

<sup>(1)</sup>Output Short Circuit Protection

The sensor turns off the output transistor when the output load current exceeds the output current limit specified in the operating characteristics table. The output remains off until the next  $B > B_{OP}$  field application where it will retry to turn on.

**Table 2. Magnetic Characteristics**

Characteristics at  $4.5V \leq V_S \leq 60V$ ,  $-40^\circ C \leq T_A \leq 150^\circ C$

| Characteristic | Symbol    | Condition        | Min. | Typ. | Max. | Units |
|----------------|-----------|------------------|------|------|------|-------|
| Operate        | $B_{OP}$  |                  |      | 25   | 115  | gauss |
| Operate        | $B_{OP}$  | $T_A=25^\circ C$ |      | 25   | 65   | gauss |
| Release        | $B_{RP}$  |                  | -115 | -25  |      | gauss |
| Release        | $B_{RP}$  | $T_A=25^\circ C$ | -65  | -25  |      | gauss |
| Hysteresis     | $B_{HYS}$ |                  | 30   |      |      | gauss |

## Low-cost Digital Bipolar Hall-effect Sensor ICs, SS40F6

Table 3. ABSOLUTE MAXIMUM RATINGS

| Parameter             | Symbol          | Condition     | Min  | Typ | Max               | Unit  |
|-----------------------|-----------------|---------------|------|-----|-------------------|-------|
| Operating Temperature | $T_a$           |               | -40  |     | 150               | °C    |
| Junction Temperature  | $T_j$           |               | -40  |     | 165               | °C    |
| Storage Temperature   | $T_s$           |               | -40  |     | 150               | °C    |
| Thermal Resistance    | $R_{\theta JA}$ |               |      |     | 233               | °C/W  |
| Supply Voltage        | $V_s$           |               | -0.5 |     | 60                | volts |
| Output Voltage        | $V_o$           |               | -0.5 |     | 60                | volts |
| Output Current        | $I_o$           |               |      |     | NA <sup>(2)</sup> | mA    |
| Magnetic Flux         | B               |               |      |     | No limit          | gauss |
| Soldering Temp        |                 | 3 sec maximum |      |     | 260               | °C    |

<sup>(2)</sup>see Output Current Limitation in Electrical Characteristics

**NOTE: “Absolute Maximum Ratings”** are those values beyond which the safety of the device cannot be guaranteed. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum ratings for extended periods may affect reliability.

# Low-cost Digital Bipolar Hall-effect Sensor ICs, SS40F6

Figure 1. Magnetic Performance vs Temperature ( $V_{\text{supply}} = 12 \text{ Vdc}$ )

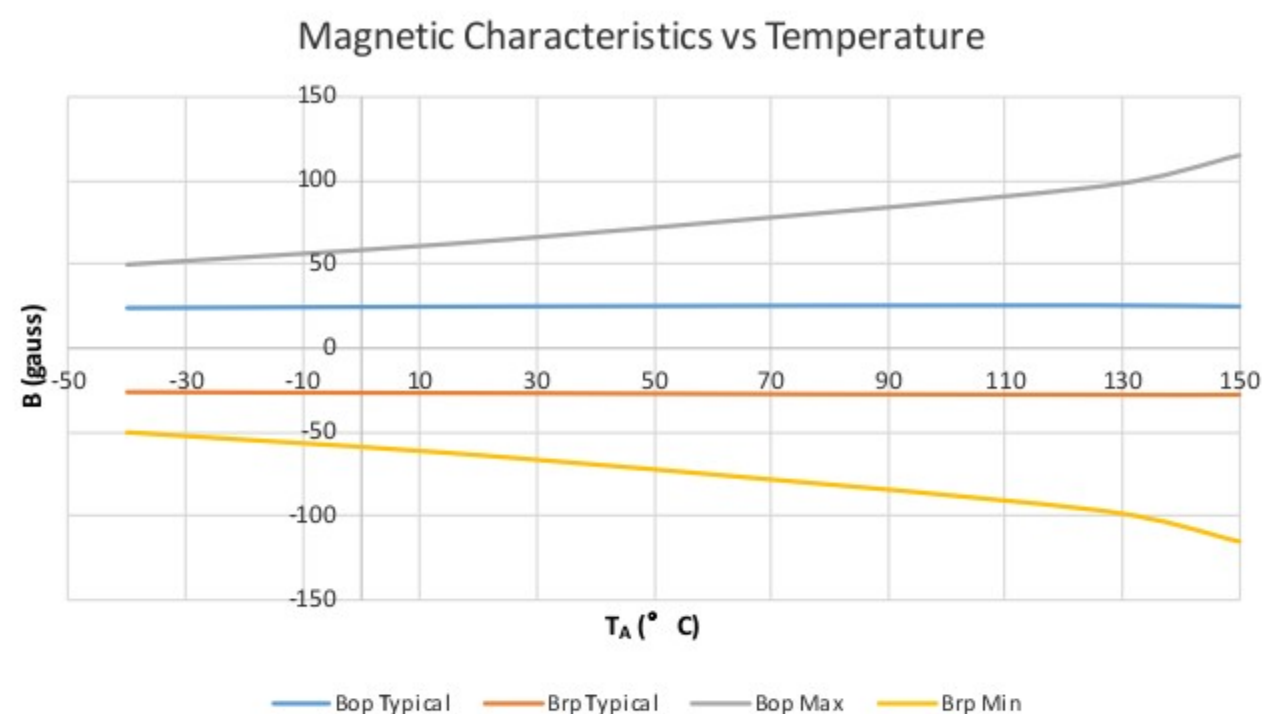


Figure 2. Current Sinking Output Block Diagram

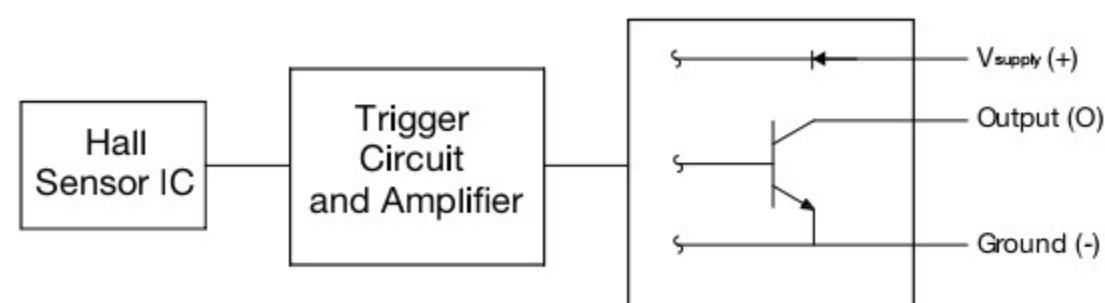
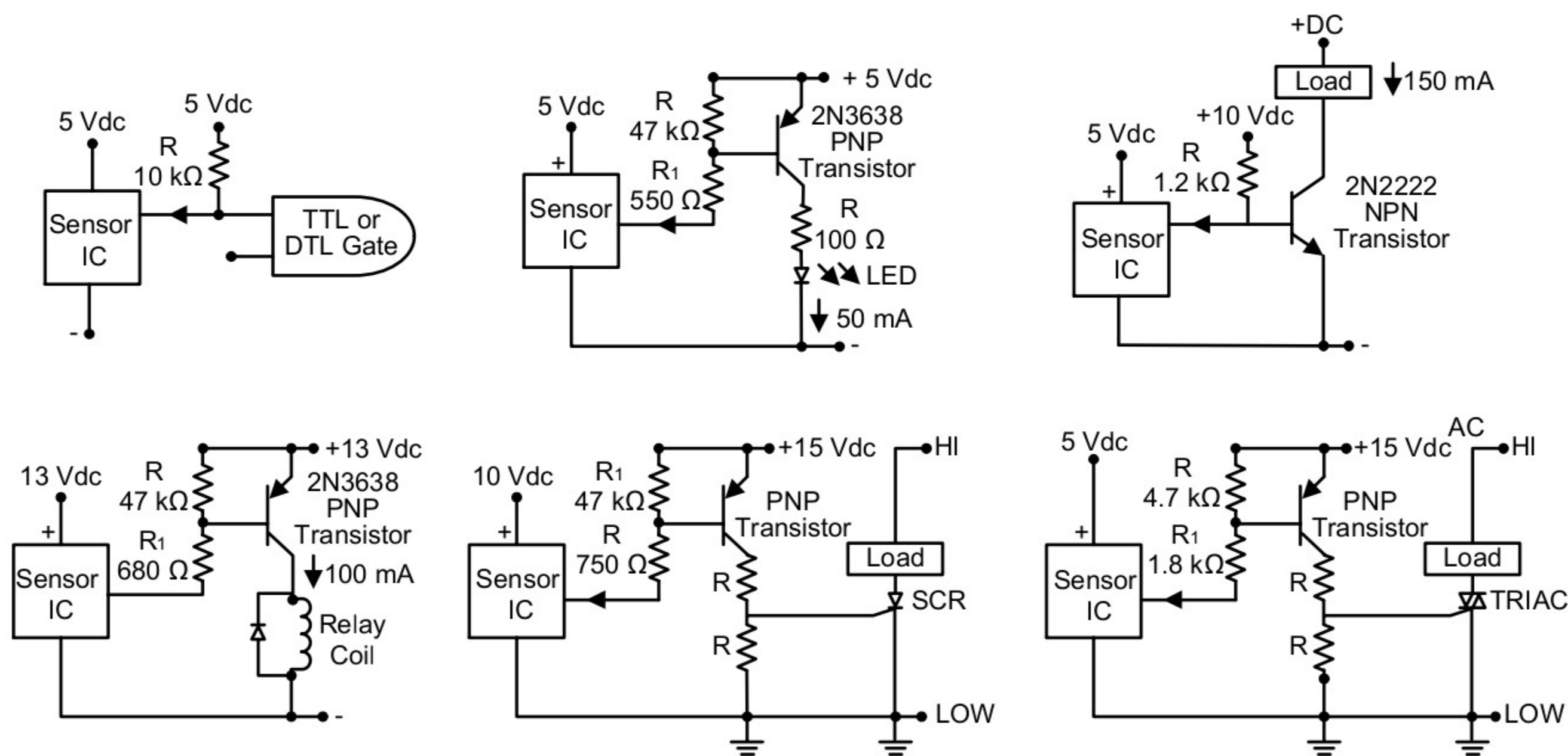


Figure 3. Wiring Diagrams



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Figure 4. SS40F6 Sensor IC Mounting Dimensions (For reference only. mm/in.)

Table 4. Order Guide

| Catalog Listing | Description                                                                                                                            |                                                                                       |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| SS40F6          | Low-cost digital bipolar Hall-effect sensor IC, tested at 25 °C [77 °F], flat TO-92-style package, bulk packaging (1000 units per bag) |  |

## ADDITIONAL MATERIALS

The following associated literature is available at [sensing.honeywell.com](http://sensing.honeywell.com):

- Product Range Guide
- Product Line Guide
- Product Installation Instructions
- Technical Information

### **⚠ WARNING**

#### **PERSONAL INJURY**

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

**Failure to comply with these instructions could result in death or serious injury.**

### **⚠ WARNING**

#### **MISUSE OF DOCUMENTATION**

- The information presented in this datasheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

**Failure to comply with these instructions could result in death or serious injury.**

## **Warranty/Remedy**

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective.

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