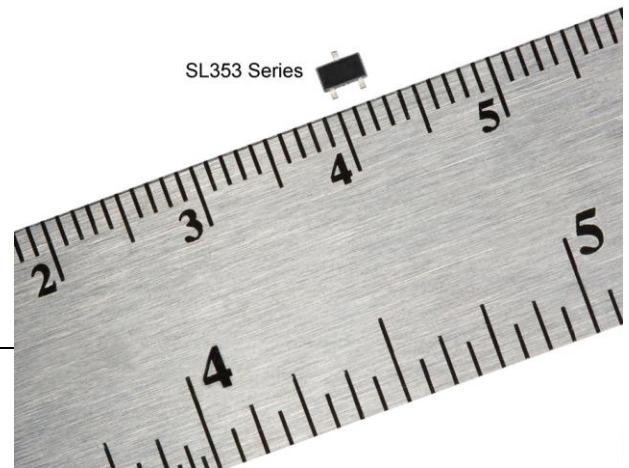


## SL353 Series

### Micropower Omnipolar Digital Hall-Effect Sensor ICs



#### DESCRIPTION

The SL353 Series sensor ICs (Integrated Circuits) are small, versatile, digital Hall-effect devices operated by the magnetic field from a permanent magnet or an electromagnet. These sensitive devices are designed to meet a wide range of potential applications with low power requirements.

The SL353 Series responds to either a North or South pole, meaning that they do not require the magnet polarity to be identified, providing an easier installation and potentially reducing system cost.

These low-power sensing devices use BiCMOS (Bipolar Complementary Metal Oxide Semiconductor) technology and a timing circuit that turns the power on for only a short time – it is off for the rest of the period (duty cycle) – significantly reducing the average current consumption.

Both products can operate from a supply voltage as low as 2.2 V, promoting energy efficiency.

#### VALUE PROPOSITIONS

##### SL353LT

For device manufacturers who need **ultra low power sensing for battery-operated, mobile applications**, Honeywell's SL353LT Omnipolar Hall-Effect Sensor IC provides an **ultra low power (1.8  $\mu$ A, 2.8 Vdc) sensor IC** and helps **minimize PCB (Printed Circuit Board) space, part count and cost for the entire application**.

Unlike other low power Hall-effect sensors, the SL353LT offers **ultra low power** sensing with **significantly lower noise emissions** and the ability to **minimize PCB space and cost for the entire application** as demonstrated by a **non-chopper stabilized design, subminiature SOT-23 packaging, omnipolar sensing, the shortest active mode time and lowest average current in its class**.

The push-pull output does not require a pull-up resistor and can operate with very low current levels, potentially helping to reduce cost and minimizing the total current consumption.

The SL353 Series is available in two duty cycle configurations to accommodate a variety of application needs:

- SL353HT: High duty cycle (13% typ.) for applications requiring high switching speed and a lower current (0.33 mA typ.) than standard Hall-effect sensor ICs.
- SL353LT: Very low duty cycle (0.013% typ.), resulting in extended battery life in applications requiring extremely low current drain (1.8  $\mu$ A typ.) and not requiring a high switching speed.

The SL353 Series has a typical operating point of  $\pm 60$  Gauss at 25 °C [77 °F].

These sensors are available in the subminiature SOT-23 surface mount package on tape and reel (3000 units per reel), for use in automated pick-and-place component installation.

##### SL353HT

For device manufacturers who need to **optimize the PCB board in energy efficient, "green" products** with higher **switching frequency requirements**, Honeywell's SL353HT Omnipolar Hall-Effect Sensor IC provides a **low power sensor IC** that can be used in **higher switching frequency applications**.

Unlike standard Hall-Effect sensors, the SL353HT offers the ability to **optimize the PCB in high switching frequency applications** as demonstrated by its **low power (0.33 mA, 2.8 Vdc) use, high duty cycle (13% typ.)** and **subminiature SOT-23 package size**.

# SL353 Series

## FEATURES AND BENEFITS (★ = competitive differentiator)

- ★ **Energy efficient:** Supply voltage as low as 2.2 Vdc, combined with very low average current (1.8  $\mu$ A typ. for SL353LT—the lowest in its class), reduces power consumption, provides extended battery life, and promotes energy efficiency
- ★ **Push-pull output does not require external pull-up resistor:** Simplifies interface with common electrical circuits and potentially reduces PC board space and costs to the customer
- ★ **Non-chopper stabilized design:** Does not utilize chopper stabilization, eliminating the noise generated by products using this technique. This means that customers do not need filters to compensate for the noise, helping to reduce PC board space, part counts, and costs for the application
- **Versatile:** Omnipolar capability with high and low duty cycle options allows for use in a variety of potential applications with low power requirements and/or battery operation, including motion control, lid closure detection, presence-absence, metering, and displacement sensing
- **Stable:** Thermally balanced integrated circuit provides for stable operation over a wide temperature range, from -40° to 85 °C [-40° to 185 °F]
- **Subminiature size:** The SOT-23 subminiature package size requires less PCB space, allowing for use in smaller assemblies
- **Price competitive:** By using BiCMOS technology, Honeywell has been able to design a reduced size integrated circuit, saving on manufacturing costs while still meeting customer requirements; these savings can result in lower costs to customers
- **Helps reduce total system cost:** Because they can be operated by a North pole or a South pole, they do not require the magnet polarity to be identified, thus making the installation easier and potentially reducing the system cost
- **Reduces manufacturing costs:** SL353 Series is supplied on tape and reel, often allowing for automated, lower-cost pick and place assembly which can help the customer reduce manufacturing costs
- **Supplied on tape and reel:** Allows for a compact design with automated component placement, helping to reduce manufacturing costs
- **Compliant:** RoHS-compliant materials meet Directive 2002/95/EC

## POTENTIAL APPLICATIONS

Battery-operated, mobile equipment such as:

- Door or lid closure detection in computer notebooks, scanners, hand-held industrial computers and instrumentation
- Mobile printer head position sensing
- Small, hand-held medical and dental equipment
- Trigger switch for battery-operated hand tools (i.e., drills, drivers)
- Reed switch replacement in battery operated security systems
- Magnetic encoder for building access (array)
- Power switch or open-close detection in small battery-operated appliances (i.e., vacuum cleaners, fans)
- Gas or water consumption measurement in remote, battery-operated utility meters

# Micropower Omnipolar Digital Hall-Effect Sensor ICs

**Table 1. SL353 Series Specifications<sup>1</sup>**

| Characteristic           | Condition   | Min.      | Typ.      | Max.      | Unit    |
|--------------------------|---|-----------|-----------|-----------|---------|
| Supply voltage (Vs)      | Ta = -40 °C to 85 °C  | 2.2       | 2.8       | 5.5       | V       |
| Active mode current      | Vs = 2.8 V, Ta = 25 °C<br>Vs = 2.2 V to 5.5 V, Ta = -40 °C to 85 °C | –         | 2.5       | 4         | mA      |
|                          |   | –         | 2.5       | 9         |         |
| Sleep mode current       | Vs = 2.8 V, Ta = 25 °C<br>Vs = 2.2 V to 5.5 V, Ta = -40 °C to 85 °C | –         | 1.5       | 2.5       | µA      |
|                          |   | –         | 1.5       | 8         |         |
| Average current:         |   |           |           |           |         |
| SL353HT                  | Vs = 2.8 V, Ta = 25 °C  | –         | 0.33      | 0.64      | mA      |
| SL353HT                  | Vs = 2.2 V to 5.5 V, Ta = -40 °C to 85 °C                           | –         | 0.33      | 2.3       | mA      |
| SL353LT                  | Vs = 2.8 V, Ta = 25 °C  | –         | 1.8       | 3         | µA      |
| SL353LT                  | Vs = 2.2 V to 5.5 V, Ta = -40 °C to 85 °C                           | –         | 1.8       | 9         | µA      |
| Active mode time         | Vs = 2.8 V, Ta = 25 °C<br>Vs = 2.2 V to 5.5 V, Ta = -40 °C to 85 °C | 3         | 6         | 9         | µs      |
|                          |   | 3         | 6         | 30        |         |
| Period:                  |   |           |           |           |         |
| SL353HT                  | Vs = 2.8 V, Ta = 25 °C  | 30        | 45        | 80        | µs      |
| SL353HT                  | Vs = 2.2 V to 5.5 V, Ta = -40 °C to 85 °C                           | 20        | 45        | 150       | µs      |
| SL353LT                  | Vs = 2.8 V, Ta = 25 °C  | 30        | 45        | 80        | ms      |
| SLS353LT                 | Vs = 2.2 V to 5.5 V, Ta = -40 °C to 85 °C                           | 20        | 45        | 150       | ms      |
| Duty cycle:              |   |           |           |           |         |
| SL353HT                  | Vs = 2.8 V, Ta = 25 °C  | 10        | 13        | 16        | %       |
| SL353HT                  | Vs = 2.2 V to 5.5 V, Ta = -40 °C to 85 °C                           | 5         | 13        | 25        |         |
| SL353LT                  | Vs = 2.8 V, Ta = 25 °C  | 0.01      | 0.013     | 0.016     |         |
| SL353LT                  | Vs = 2.2 V to 5.5 V, Ta = -40 °C to 85 °C                           | 0.005     | 0.013     | 0.025     |         |
| Vout <sup>1</sup> :      |   |           |           |           |         |
| high                     | Vs = 2.8 V, Ta = 25 °C, load current = 100 µA                       | Vs - 0.15 | Vs - 0.11 | –         | V       |
| high                     | Vs = 2.2 V to 5.5 V, Ta = -40 °C to 85 °C, load current = 100 µA    | Vs - 0.25 | Vs - 0.11 | –         |         |
| low                      | Vs = 2.8 V, Ta = 25 °C, load current = 100 µA                       | –         | 0.11      | 0.15      |         |
| low                      | Vs = 2.2 V to 5.5 V, Ta = -40 °C to 85 °C, load current = 100 µA    | –         | 0.11      | 0.25      |         |
| Operate point (positive) | Vs = 2.2 V to 5.5 V, Ta = -40 °C to 85 °C                           | 20        | 60        | 110       | Gauss   |
| Operate point (negative) | Vs = 2.2 V to 5.5 V, Ta = -40 °C to 85 °C                           | -110      | -60       | -20       | Gauss   |
| Release point (positive) | Vs = 2.2 V to 5.5 V, Ta = -40 °C to 85 °C                           | 5         | 45        | 95        | Gauss   |
| Release point (negative) | Vs = 2.2 V to 5.5 V, Ta = -40 °C to 85 °C                           | -95       | -45       | -5        | Gauss   |
| Differential             | Vs = 2.2 V to 5.5 V, Ta = -40 °C to 85 °C                           | 3         | 15        | 60        | Gauss   |
| Operating temperature    | Vs = 2.2 V to 5.5 V, Ta = -40 °C to 85 °C                           | -40 [-40] | –         | 85 [185]  | °C [°F] |
| Storage temperature      | –   | -40 [-40] | –         | 150 [302] | °C [°F] |

**Note 1:** These Hall-effect sensors 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 > Brp and < Bop). Honeywell recommends that the application circuit designer allow 10 µs after supply voltage has reached its rated value for the output voltage to stabilize.

**Table 2. SL353 Series Absolute Maximum Ratings<sup>1</sup>**

| Characteristic        | Condition         | Min.      | Typ. | Max.      | Unit   |
|-----------------------|-------------------|-----------|------|-----------|--------|
| Supply voltage        | –                 | -0.5      | –    | 6         | V      |
| Operating temperature | ambient           | -40 [-40] | –    | 150 [302] | C [°F] |
| Soldering temperature | applied for <10 s | –         | –    | 265 [509] | C [°F] |
| Output (load) current | –                 | –         | –    | 5         | mA     |

**Note 1:** The magnetic field strength (Gauss) required to cause the sensor to change state (operate and release) will be as specified in the magnetic characteristics. To test the sensor against the specified magnetic characteristics, the sensor must be placed in a uniform magnetic field.

# SL353 Series

## NOTICE

Absolute maximum ratings are the extreme limits that the device will withstand without damage to the device. However, the electrical and mechanical characteristics are not guaranteed as the maximum limits (above recommended operating conditions) are approached, nor will the device necessarily operate at absolute maximum ratings.



Figure 1. SL353 Series Block/Electrical Diagram

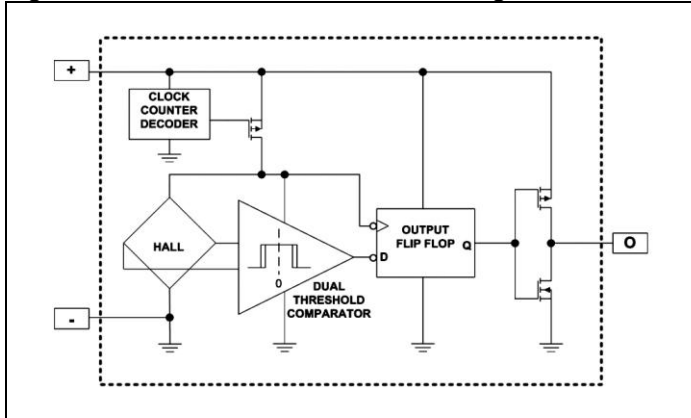


Figure 2. SL353HT and SL353LT Typical Magnetic Performance vs Temp.

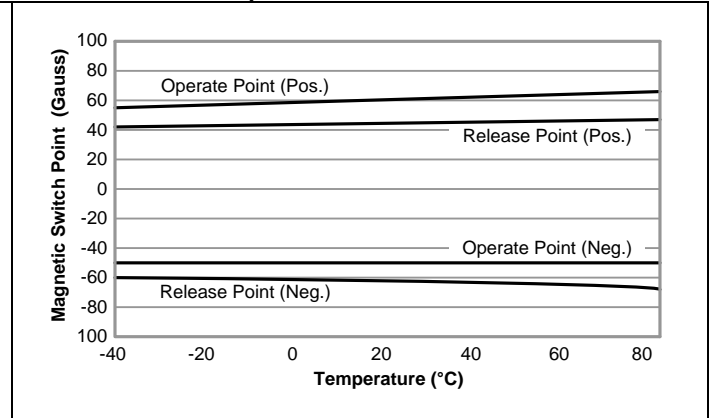


Figure 3. SL353HT and SL353LT Typical Period vs Temp.

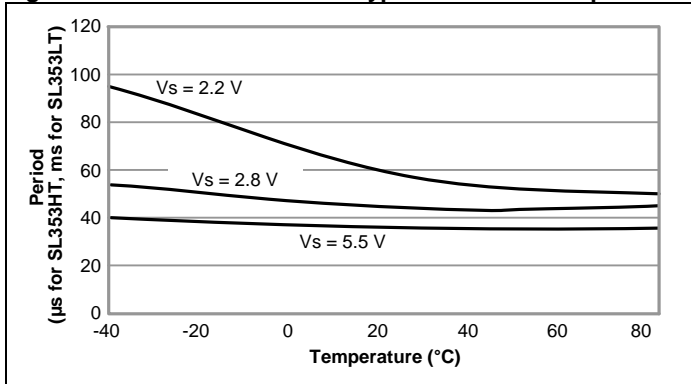


Figure 4. SL353HT and SL353LT Typical Active Mode Time vs Temp.

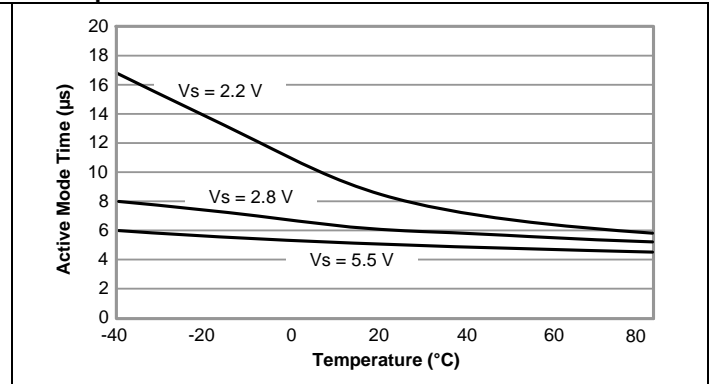


Figure 5. SL353HT Typical Average Current vs Temp.

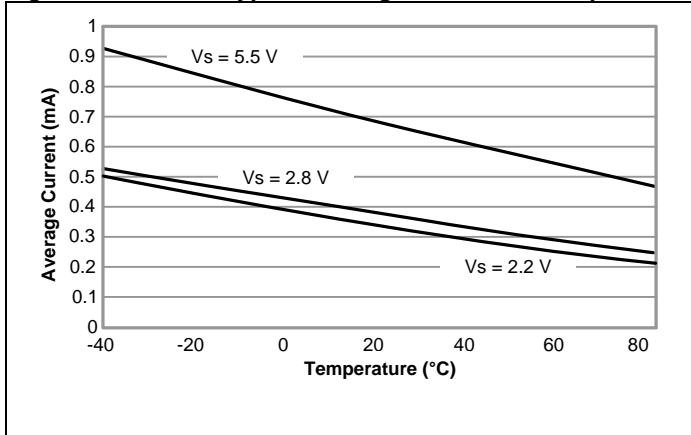
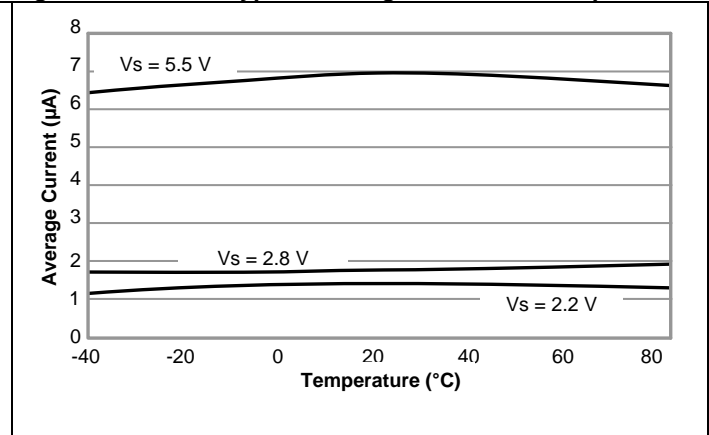
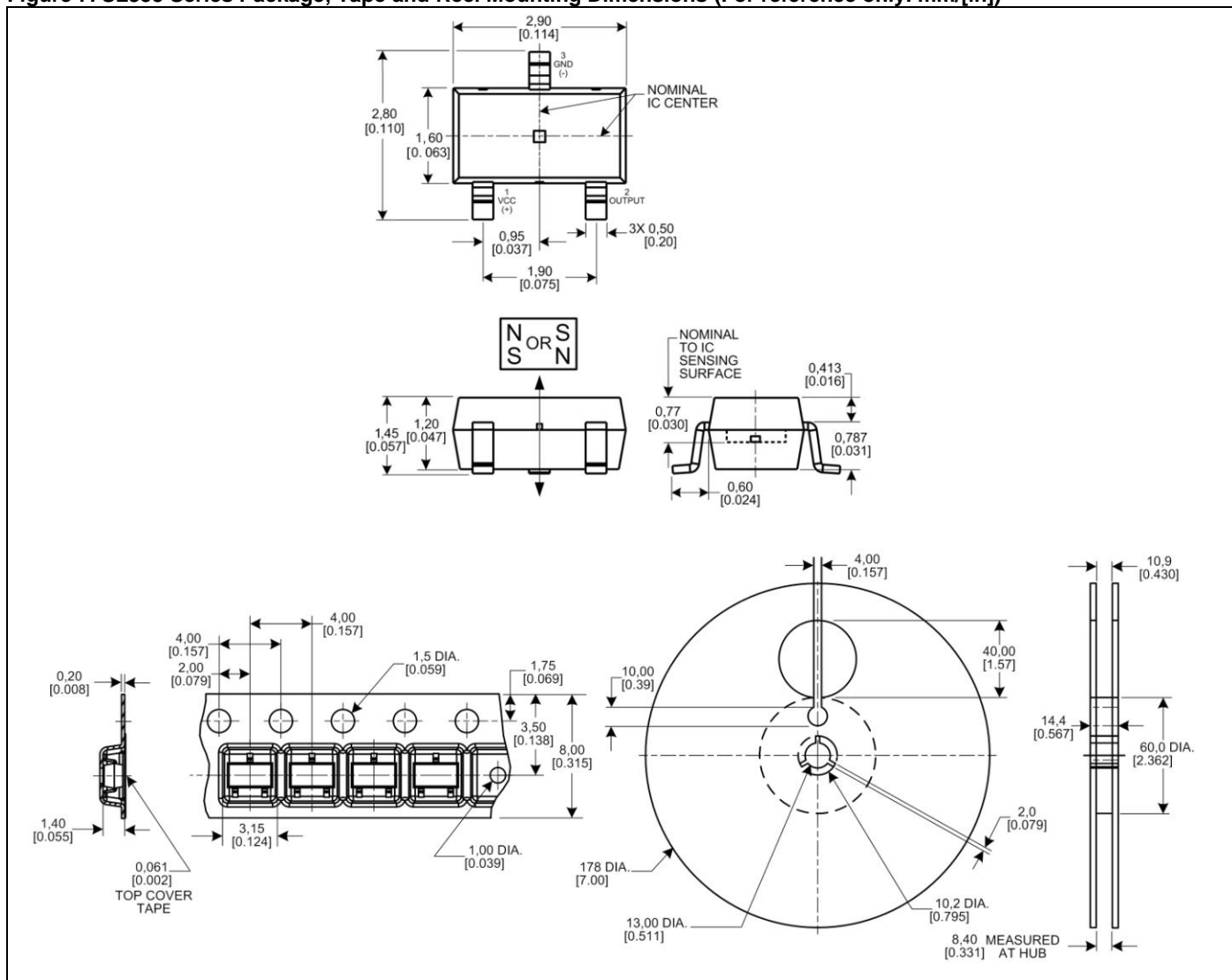


Figure 6. SL353LT Typical Average Current vs Temp.



# Micropower Omnipolar Digital Hall-Effect Sensor ICs

Figure 7. SL353 Series Package, Tape and Reel Mounting Dimensions (For reference only. mm/[in])



## Order Guide

| Catalog Listing | Description   |
|-----------------|---|
| SL353HT         | SL353 Series micropower omnipolar digital Hall-effect sensor IC, high duty cycle, SOT-23 package, tape and reel packaging (3000 units per reel) |
| SL353LT         | SL353 Series micropower omnipolar digital Hall-effect sensor IC, low duty cycle, SOT-23 package, tape and reel packaging (3000 units per reel)  |

## **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.**

### **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. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

## **WARNING**

### **MISUSE OF DOCUMENTATION**

- The information presented in this product sheet 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.**

### **SALES AND SERVICE**

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

E-mail: [info.sc@honeywell.com](mailto:info.sc@honeywell.com)

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