Honeywell
THE POWER OF CONNECTED

Ratio-metric Linear Hall Effect Sensor

SS398AT

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Issue A
Datasheet

DESCRIPTION

SS398AT, a linear Hall-effect sensor, is composed of Hall sensor, linear amplifier and Totem-Pole output stage. It features low noise output, which use an external capacitance. It also can provide increased temperature stability and accuracy. The linear Hall sensor has a wide operating temperature range of -40°C to +125°C, appropriate for commercial, consumer, and industrial environments.

The high sensitivity of Hall-effect sensor accurately tracks extremely weak changes in magnetic flux density. The linear sourcing output voltage is set by the supply voltage and in proportion of vary of the magnetic flux density. That is proportional to the applied magnetics and features a null voltage output of half of the applied voltage.

The SOT-23 package is a three-lead mini SMD in SMT process.

SS398AT is fast response time, wide output range, stable and accurate of Totem-Pole linear output of hall IC.

- DMOS Hall Effect Sensor
- Supply Voltage 2.8 ~ 6.0V
- Sensitivity 2.0mV/G
- Output Totem-Pole
- Package SOT-23

FEATURES AND BENEFITS

- Operating Voltage Range: 2.8V~6.0V
- Power consumption of 3.3mA at 5 VDC for energy efficiency
- Low-Noise output
- Linear output for circuit design flexibility
- Totem-Pole for a stable and accurate output
- Responds to either positive or negative gauss
- Small SOT-23 package for SMD
- Robust ESD performance

APPLICATIONS

- Current sensing
- Motor control
- Position sensing
- Vibration sensing
- Liquid level sensing
- Weight sensing
- Magnetic code reading
- Rotary encoder
- Ferrous metal detector

Ratio-metric Linear Hall Effect Sensor, SS398AT

Table 1. Absolute Maximum Ratings (*DC Operating Parameters: T_A=+25°C* **)**

Characteristics	Values	Unit
Supply Voltage (V_{DD})	8	V
Reverse Voltage, (V_{DDR})	-0.5	V
Output Voltage, (V_{out})	8	V
Output current, (I_{out})	5	mA
Operating Temperature Range, (T_A)	-40 ~ +125	°C
Storage temperature Range, (T_S)	-65 ~ +150	°C
Maximum Junction Temp,(T_J)	150	°C

Table 2. Electrical Specifications (*DC Operating Parameters:T_A=+25°C, VDD=5V* **)**

Parameters	Test Conditions	Min	Typ	Max	Units
Supply Voltage,(V_{DD})	Operating	2.8		6.0	V
Supply Current,(I_{DD})	B= 0 Gauss		3.3	5.0	mA
Output Current,(I_O)	VDD > 3V	1.0	1.5		mA
Null Output Voltage,(V_{NULL})	B= 0 Gauss,	2.375	2.5	2.625	V
High Output Voltage, (V_{OH})	B> Max Magnetic Gauss		4.9	4.99	V
Low Output Voltage, (V_{OL})	B> Min Magnetic Gauss	0.01	0.1		V
Output Voltage Span,(V_{OS})			4.8		V
Output Referred Noise, (V_{ON})	Ta=25°C, output open		20		mV
Power-On Time, (T_P)				100	uS
Output Switch Time, (T_{SW})				150	uS
Output Switch Frequency, (F_{SW})		3			kHz
Magnetic Range Gauss		±1200			Gauss
Ratiometry Null output error, (R_{VON})	Operating voltage range relative to 5V		±1.5		%
Ratiometry Sensitivity error, (R_{SEN})	Operating voltage range relative to 5V		±1.5		%
Linearity, (L_{IN})	% of Span		±1.5		%
Sensitivity		1.8	2.0	2.2	mV/G
Sensitivity Temperature Coefficient, (TC_{Sens})	Ta=125°C, relative to Sens@25°C		±10		%/°C
Delta null voltage, ($\triangle V_{ON}$)	Ta=125°C, relative to V_{ON} @25°C		20		mV
Electro-Static Discharge	HBM	4			KV

Figure 1. Typical Application circuit

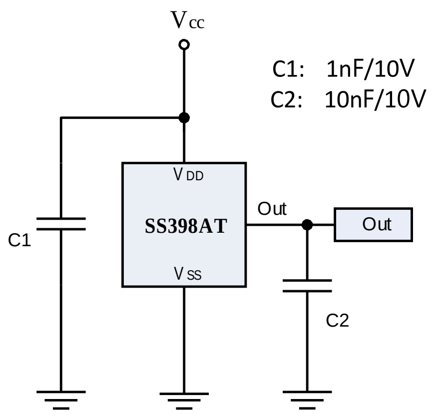


Figure 2 . Functional Block Diagram

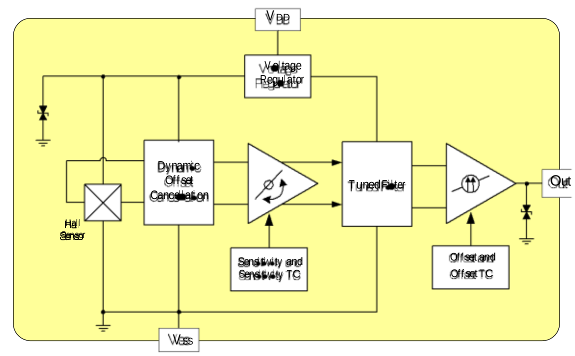
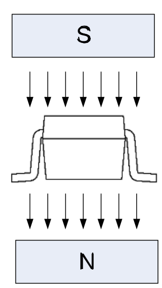


Figure 3. Output Behavior versus Magnetic Polar

(*DC Operating Parameters TA = -40 to 125°C, VCC =2.8 to 6.0 V* **)**

c	*Test condition*	*OUT(SOT-23)*	
South pole	B>0 Gauss	$>V_{NULL}$	
North pole	B<0 Gauss	$<V_{NULL}$	



SOT-23 package

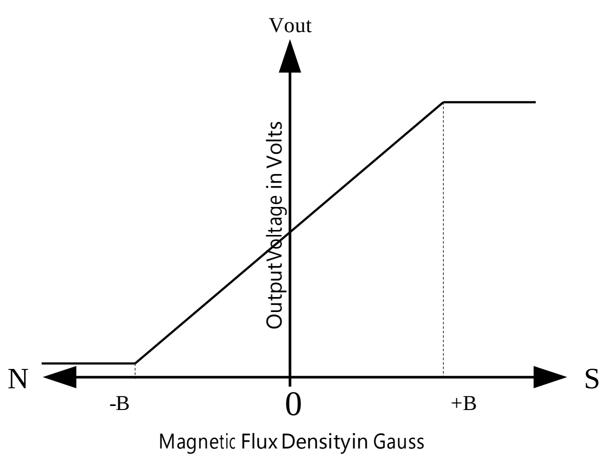
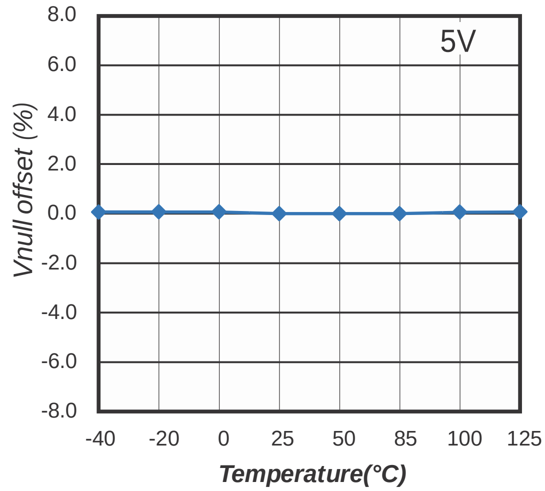
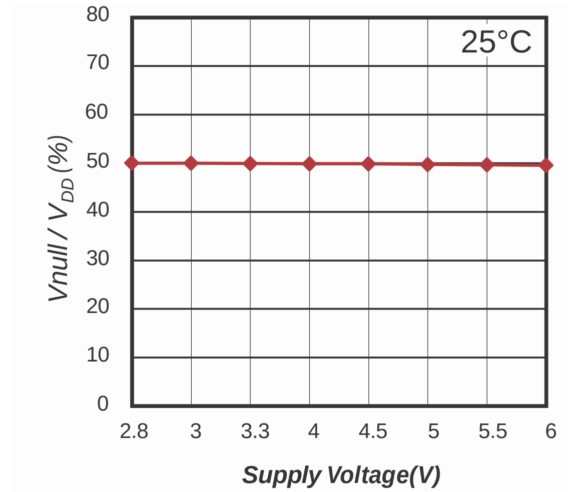


Figure 4. Performance Graph

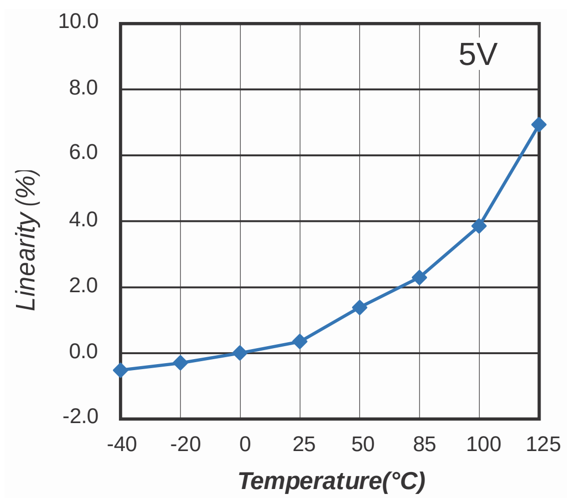
Typical Temperature(T_A) Versus Output Voltage Offset



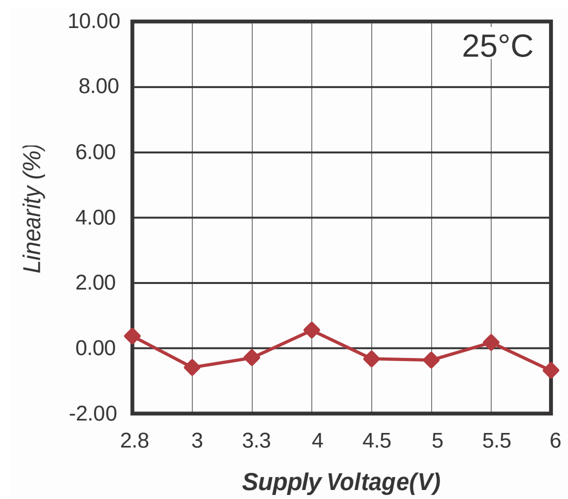
Typical Supply Voltage(V_{DD}) Versus Ratio of Vnull to V_{DD}



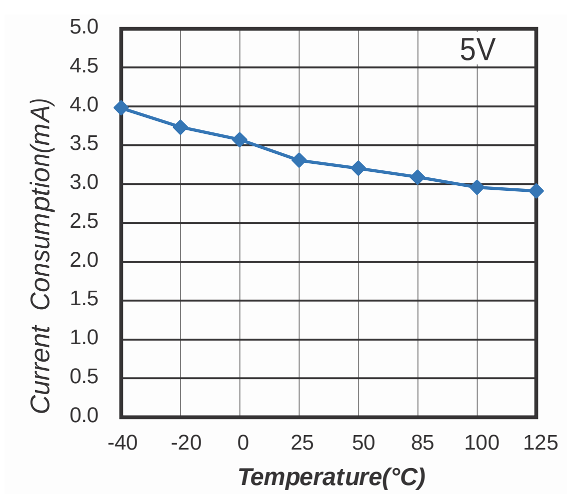
Typical Temperature(T_A) Versus Linearity



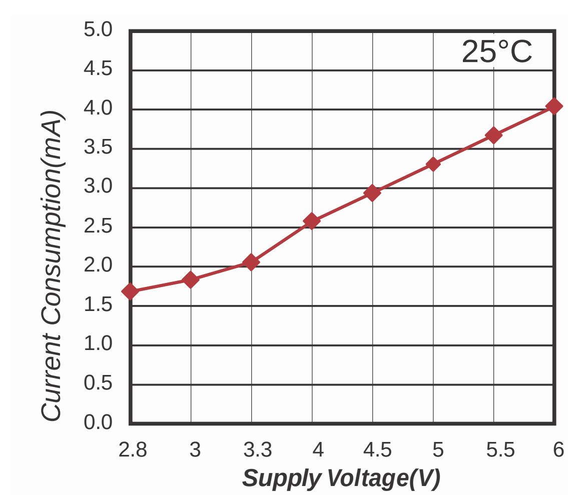
Typical Supply Voltage(V_{CC}) Versus Linearity



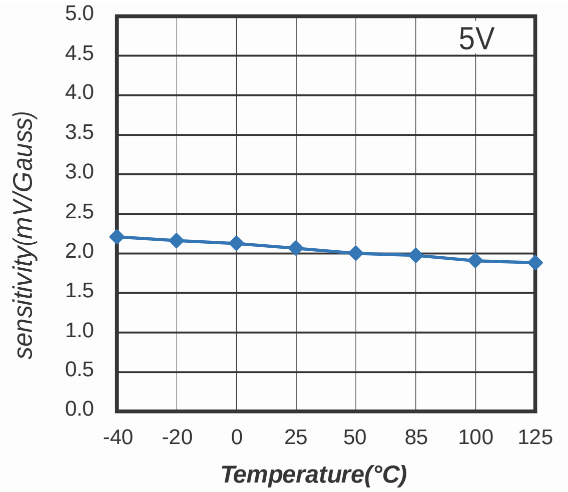
Typical Temperature(T_A) Versus Supply Current(I_{DD})



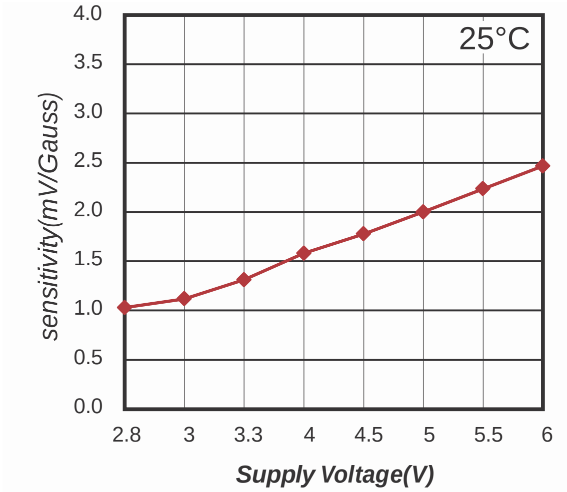
Typical Supply Voltage(V_{DD}) Versus Supply Current(I_{DD})



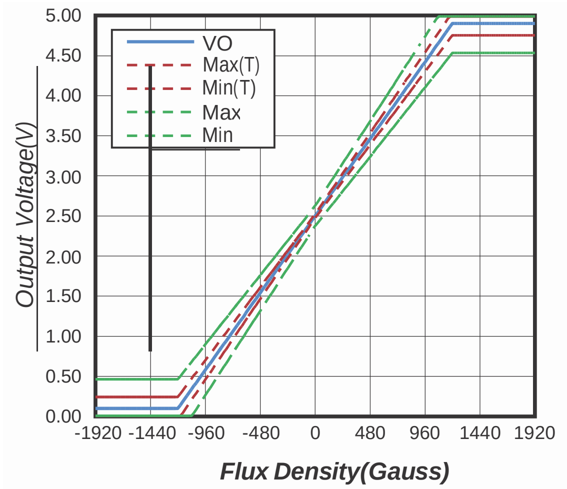
Typical Temperature(T_A) Versus Sensitivity



Typical Supply Voltage(V_{CC}) Versus Sensitivity



Typical Flux Density Versus Output Voltage



Function Description

1. Power On Time

When the applied voltage is into the device, the device output requires a response time to react to the ratiometry magnetic field.

2. Null Voltage output

In the zero magnetic field state, the output voltage is half of the applied voltage VDD.

3. Sensitivity

The amount of the output voltage is proportional to the magnetic fields changes. This proportionality is specified as the below

$$Sens = \frac{V_{OUT(B+)} - V_{OUT(B-)}}{(B+) - (B-)}$$

4. Linearity

The device is designed to provide linear output in response to a ramping applied magnetic field. Consider two magnetic fields, B1 and B2. Ideally, the sensitivity of a device is the same for both fields, for a given applied voltage and temperature. The Linearity is calculated separately for positive and negative applied magnetic fields.

$$Lin_{B+} = (1 - \frac{Sens_{(B2+)}}{Sens_{(B1+)}}) \times 100 \ (\%)$$

$$Lin_{B\_} = (1 - \frac{Sens_{(B2-)}}{Sens_{(B1-)}}) \times 100 \ (\%)$$

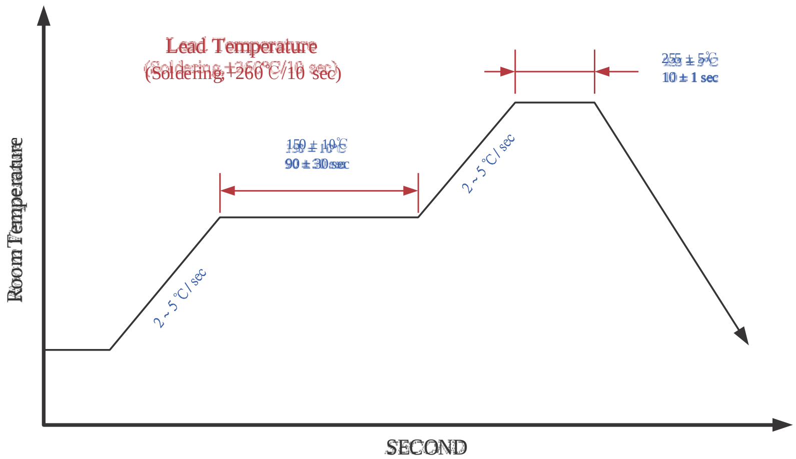
5. Ratiometry Error

The device provides ratiometric output. The means that Null voltage output, Vnull, and the magnetic sensitivity, Sens, are proportional to the applied voltage, VDD. The ratiometric amount is relative to 5V, and defined as the below

$$R_{Von} = (1 - \frac{Vnull_{VDD}/Vnull_{5V}}{V_{DD}/5V}) \times 100 \ (\%)$$

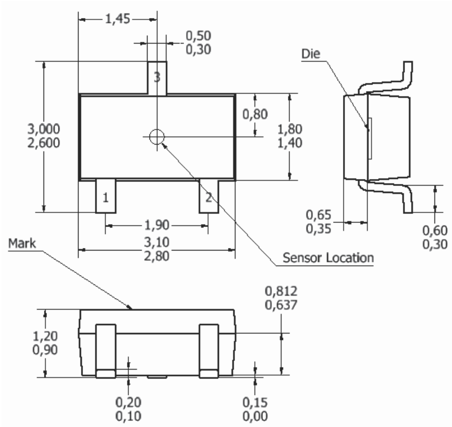
$$R_{sen} = (1 - \frac{Sens_{VDD}/Sens_{5V}}{V_{DD}/5V}) \times 100 \ (\%)$$

Figure 5. IR reflow curve



SOT-23 Soldering Condition

Figure 6. Package Dimension and Sensor Location

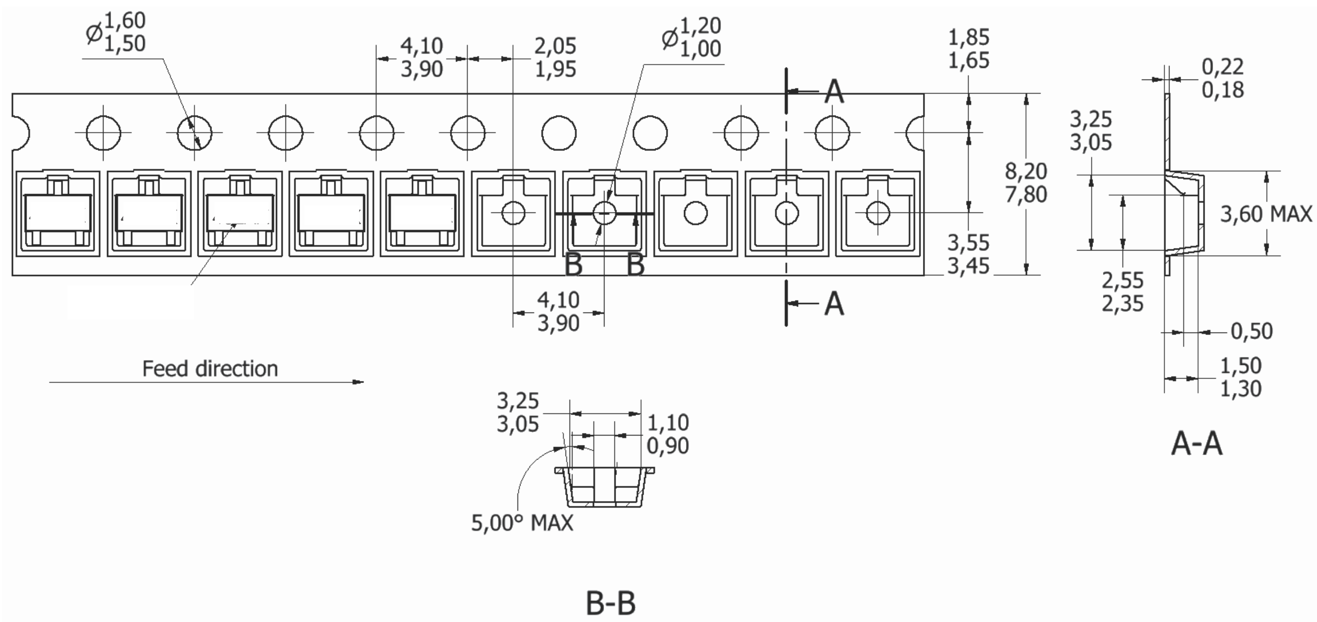


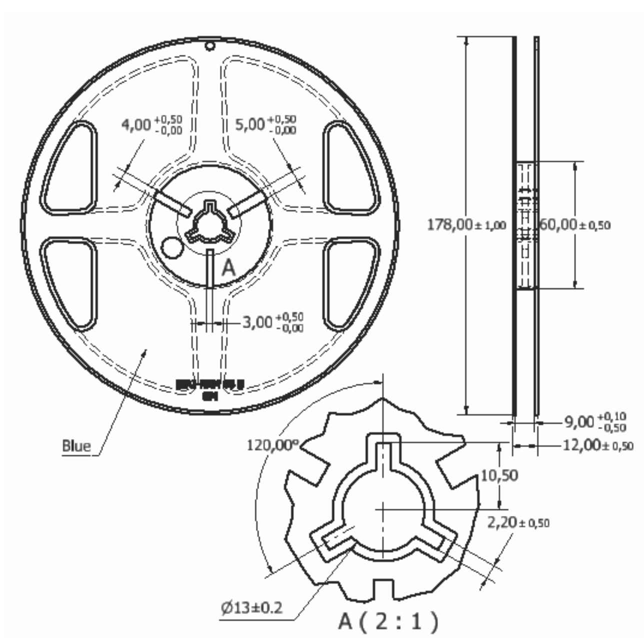
NOTES:

1. Controlling dimension: mm
2. Leads must be free of flash and plating voids
3. Lead thickness after solder plating will be 0.254mm maximum
4. PINOUT:

Pin No.	Pin Name	Function
1	V_{DD}	Power Supply
2	V_{OUT}	Output
3	V_{SS}	Ground

Figure 7. SOT-23 package Tape On Reel Dimension





NOTES:

1. Material: Conductive polystyrene;
2. DIM in mm;
3. 10 sprocket hole pitch cumulative tolerance±0.2;
4. Camber not to exceed 1mm in 100mm;
5. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole;
6. (S.R. OHM/SQ) Means surface electric resistivity of the carrier tape.

ADDITIONAL MATERIALS

The following associated literature is available at sensing.honeywell.com:

- Product range guide
- Product application-specific information
  - Application Note: Honeywell Pressure Switches
  - Sensors and switches in front loaders
  - Sensors and switches in mobile cranes
  - Sensors and switches in oil rig applications
  - Industrial product line card

⚠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.

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Honeywell Safety and Productivity Solutions

9680 Old Bailes Road
Fort Mill, SC 29707
honeywell.com

SS398AT-1-EN IL50 GLO
Nov. 2017

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