High-precision, programmable linear Hall-effect sensors Up to ±18V Power and ±12V Output Gain

Description:

The SL920 is a member of Senko's programmable linear Hall chip designed to provide a fully integrated Hall current sensor IC for current sensing applications operating with dual supply voltages. The SL920 uses piecewise linear interpolation temperature compensation technology to provide higher accuracy in terms of sensitivity and offset voltage adjustment. This improvement does not reduce the device's high analog signal bandwidth, but rather greatly reduces the total error over the operating temperature range.

The sensor integrates a high-sensitivity Hall element and BiCMOS interface integrated circuit, a small-signal high-gain amplifier, a clamped low-impedance output stage, and a proprietary high-bandwidth dynamic offset cancellation technology. The SL920 Hall-effect sensor is temperature-stable and provides an open-loop Hall-effect solution with positive and negative output signals to compete with more expensive sensor modules.

The sensor is available in an ultra-thin (1.6 mm thick) through-hole single in-line package (TO94).

Features

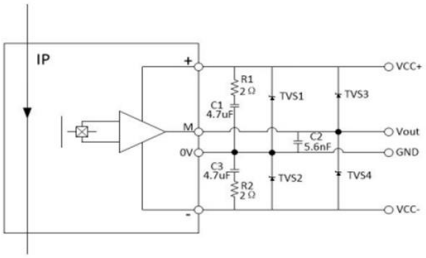
- Programmable accuracy error <1.5%
- High sensitivity Hall element, low noise and high resolution
- Fast response time<5μS
- Customer-programmable, high-resolution offset and sensitivity adjustments
- Sensitivity TC has stable temperature performance
- Supply voltage range:±18V;Voltage gain:±12V,The zero quiescent voltage level is 0V
- Customer programmable sensitivity range:1.4 ~ 20 mV/G
- Accuracy is recoverable after temperature cycling
- Wide ambient temperature range:-40°C~105°C
- Extremely thin package: 1.6mm thickness of the case

Package View

TO94

Typical Application

- ✧ Support 0~±1000A dynamic range
- ✧ R1/C1 R2/C3 is necessary to reduce hot-swap damage;
- ✧ TVS is designed to limit inrush current/voltage surges.

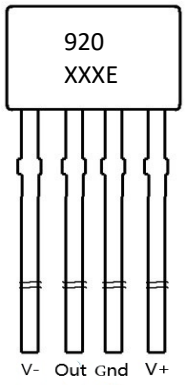


Order information

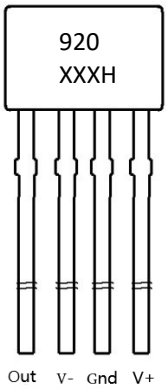
Part Number	Special Code	Package type	Temperature range	Packing	Selection guide
SL920-BEE	B	TO94 (E)	E(-40~105℃)	1k/包	
SL920-BHE	B	TO94 (H)			Lower lifetime drift

Pin definition

Package E

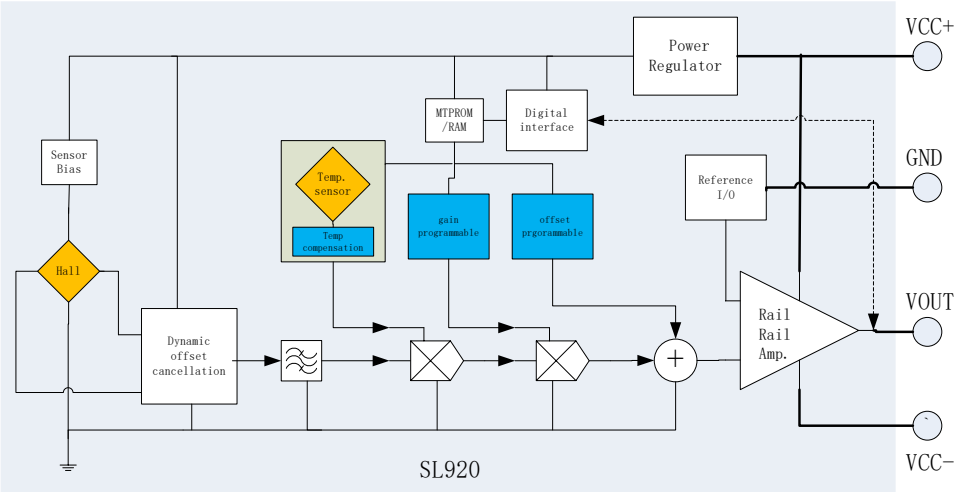


Package H



E-Packing	H-Packing	Pin name	Description
1	2	V-	Negative power
2	1	VIOUT	Output signals and digital I/O
3	3	GND[1]	GND
4	4	V+	Positive power

Functional block diagram



Absolute maximum rating

The absolute maximum rating is the limit value applied individually, and beyond which the maintainability of the circuit may be compromised. Functional operability is not necessarily implicit. Prolonged exposure to absolute maximum rating conditions can affect device reliability.

Symbol	Parameter	Notes	Rating	Unit
Positive supply voltage	V_+–V_-		36	V
Output voltage	VOUT		-18 ~ +18	V
Output source current	IOUT(SOURCE)	VOUT 至 GND	7	mA
Output sink current	IOUT(SINK)	VOUT 至 GND	-7	mA
Operating ambient temperature	TA		-40 ~ 105	°C
Storage temperature	Tstg		-65 ~ 165	°C
Maximum junction temperature	T_J(max)		165	°C
ESD		HBM	4	kv

Common Operating Characteristics

Note: Over full range of T_A=-40°C ~ 105°C, C_{Bypass}=4.7uf, C_{Load}=5.6nF, V_{CC}=±15V

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Units
Supply voltage	V_+-V_-		22	30	36	V
Positive current of the power supply	I_{CCV+}			10	12	mA
Negative current of the power supply	I_{CCV-}			-5	-7	mA
Output capacitive load	C_{LOAD}	V_{IOUT} to GND		5.6		nF
Output resistive load	R_{LOAD}	V_{IOUT} to GND	10			kΩ
Response time	t_r	I_P = I_P(max), T_A = 25°C, C_{OUT} open		4.0	5	μS
Frequency bandwidth	f	–3 dB, T_A=25°C; I_P=50 A peak-to-peak		120		KHz
nonlinear	E_{LIN}	IP full-scale		0.3	1	%
Power-on time	T_{po}	The output reaches 90% of the steady-state level; TJ = 25°C 3 A		100	500	uS
Power bypass capacitors	C_{bypass}	Normal operation	4.7	4.7	10	uF

SL920-BEE Characteristic parameter table

Note: Over full range of TA=-40°C ~ 105°C, C_{Bypass}=4.7uF, C_{Load}=5.6nF, VCC=±15V

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Units
Voltage range	Vip		-4		4	V
Linearity range			-12		+12	
V_{IOUT}	V_{OQ}	IP=0mT, T_A=25°C		0		V
Sensitivity range	Sens	full-scale, T_A=25°C	1.4		20	mV/mT
Zero current output error	$\Delta I_{OUT(Q)}$	T_A = -40~25°C		±40		mV
		T_A = 25~105°C		±30		mV
Sensitivity error	ΔSens	T_A = -40~25°C		±1.6		%
		T_A = 25~105°C		±2		%
Total output error	E_{TOT}	T_A=25°C		±1		%
		T_A=-40°C ~ 105°C		3		%
Thermal stress and lifetime drift			-1		+1	%

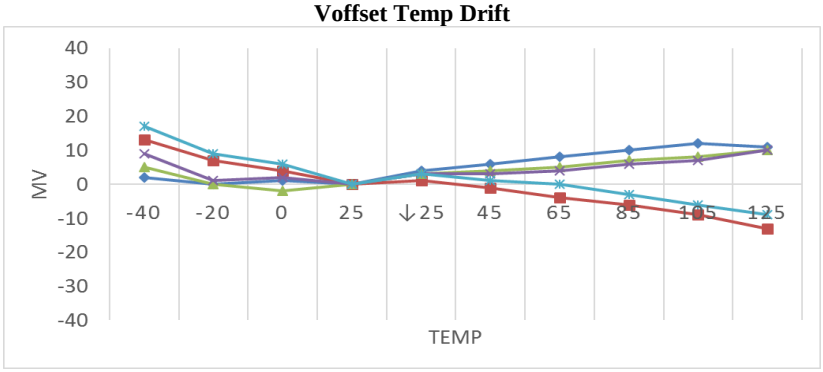
SL920-BHE Characteristic parameter table

Note: Over full range of TA=-40°C ~ 105°C, C_{Bypass}=4.7uF, C_{Load}=5.6nF, VCC=±15V

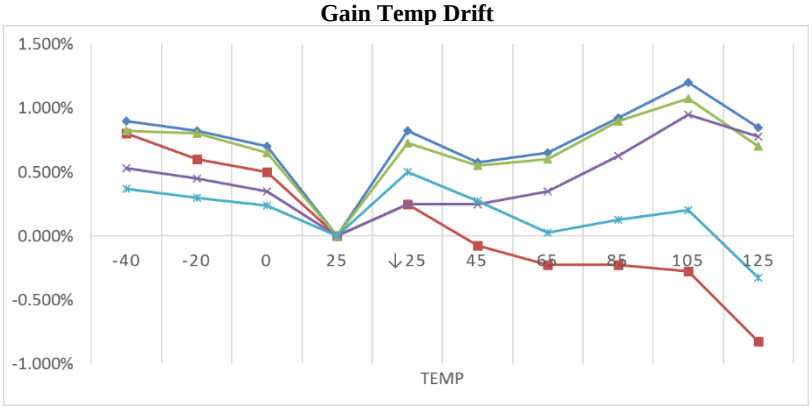
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Units
Voltage range	Vip		-4		4	V
Linearity range			-12		+12	
V_{IOUT}	V_{OQ}	IP=0mT, T_A=25°C		0		V
Sensitivity range	Sens	full-scale,T_A=25°C	1.4		20	mV/mT
Zero current output error	$\Delta I_{OUT(Q)}$	T_A = -40~25°C		±40		mV
		T_A = 25~105°C		±30		mV
Sensitivity error	ΔSens	T_A = -40~25°C		±1.6		%
		T_A = 25~105°C		2		%
Total output error	E_{TOT}	T_A=25°C		±1		%
		T_A=-40°C ~ 105°C		3		%
Thermal stress and lifetime drift			-0.3		+0.3	%

Characteristic curve diagram

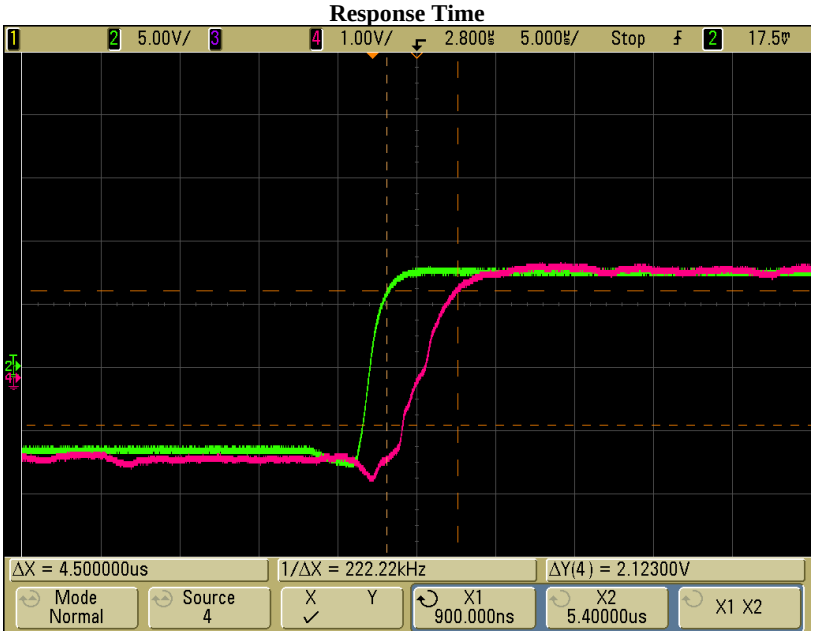
Voffset Temp Drift



Gain Temp Drift



Response Time



Serial interface programming

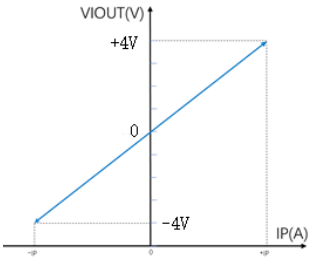
The SL920 integrates a serial interface that allows an external controller (SP102) to read and write registers in ROM and volatile memory. The auto-calibration software can be contacted by contacting FAE support.

The following parameters of the SL920 are programmed by the user：

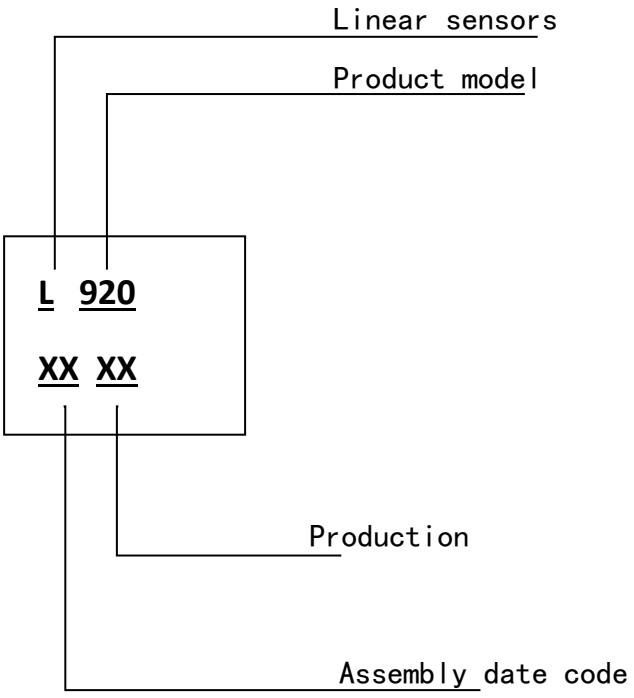
- Sensitivity （mV/G）
- Zero-field output voltage
- Output polarity
- TC temperature compensation

Typical I/O curves

Input Current vs. output Voltage

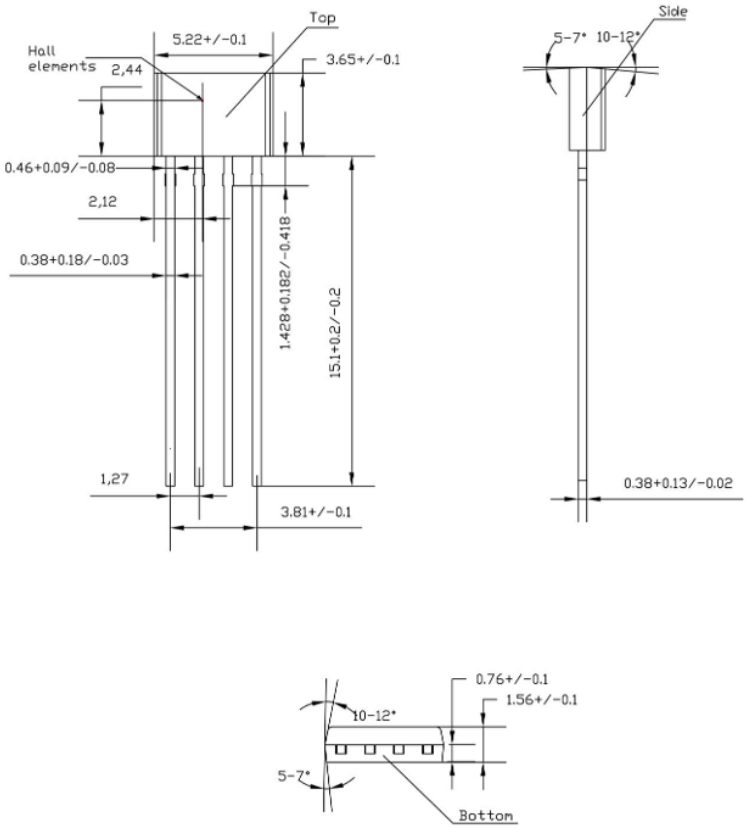


Silk screen description



Package information

Note: All dimensions are in millimeters.



A

The exact circumstances and lead configurations within the limits shown at the discretion of the supplier
Effective Area Depth, 0.28mm REF

B

Refer to The LAND PATTERN layout
All pads are at least 0.20 mm away from all adjacent pads; Adjust as needed to meet application process requirements and PCB layout tolerances

C

Silk screen printing and appearance are at the discretion of the supplier

D

Silk screen printing and appearance are at the discretion of the supplier

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Revision History

Revision	Change	Author	Date
1.0	Initial draft	Jon	2017. 01
2.0	Add application note; Update application circuit; Add package type and selection guide;Update the parameters;	MWJ	2024.06.21