

Features

- ◆ High operating bandwidth, up to 350kHz
- ◆ Background dynamic offset compensation and temperature compensation
- ◆ 1.15 mΩ primary conductor resistance for low power loss and high inrush current withstand capability
- ◆ High performance sensor frontend guarantees low noise and high resolution
- ◆ Zero current output voltage is 50% VCC
- ◆ 3500V RMS isolation voltage between pins 1-4 and 5-8
- ◆ Wide temperature range: -40°C to 125°C
- ◆ AEC-Q100 automotive qualified

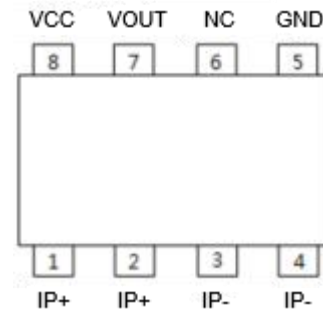
Applications

- ◆ Current sensing in high frequency inverters
- ◆ Brush-less DC motors
- ◆ DC/DC converters
- ◆ Other applications requiring current detection

Description

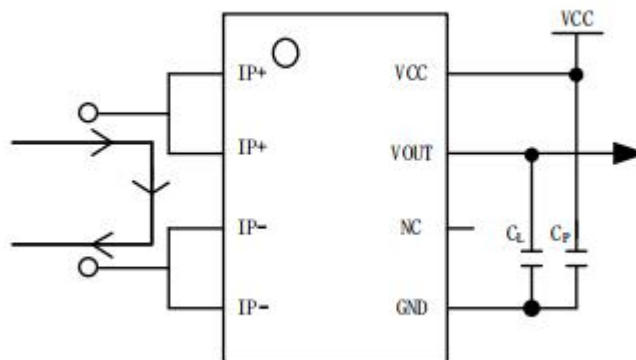
The ITE3921 is a programmable linear Hall-effect sensor IC with on-chip Hall and temperature sensors. It features with temperature stable Hall signal conditioning chains with background dynamic offset and package stress compensation. The sensor offers a high bandwidth up to 350 kHz and a fast response time of 1.0μs. The sensitivity drift is 2.5% over wide temperature range from -40°C to 125°C.

The on-chip Hall sensor converts the magnetic flux through the chip to Hall signal voltage. The internal signal conditioning chain amplifies the voltage with the predefined gain. The undervoltage detection, overvoltage detection, power-on reset, output clamps and build-in diagnostic test make it suitable for safety-critical automotive applications.



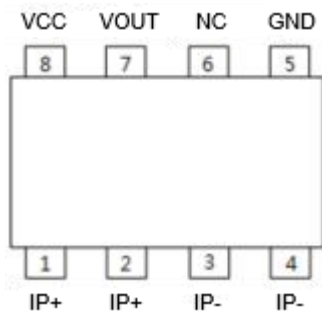
Package Type: SOP-8L

Typical Application



*For hash applications with supply disturbance, a Cp placed close to the IC is recommended (see Fig.3), $C_P=100\text{nF}$, $C_L=1\text{nF}$.

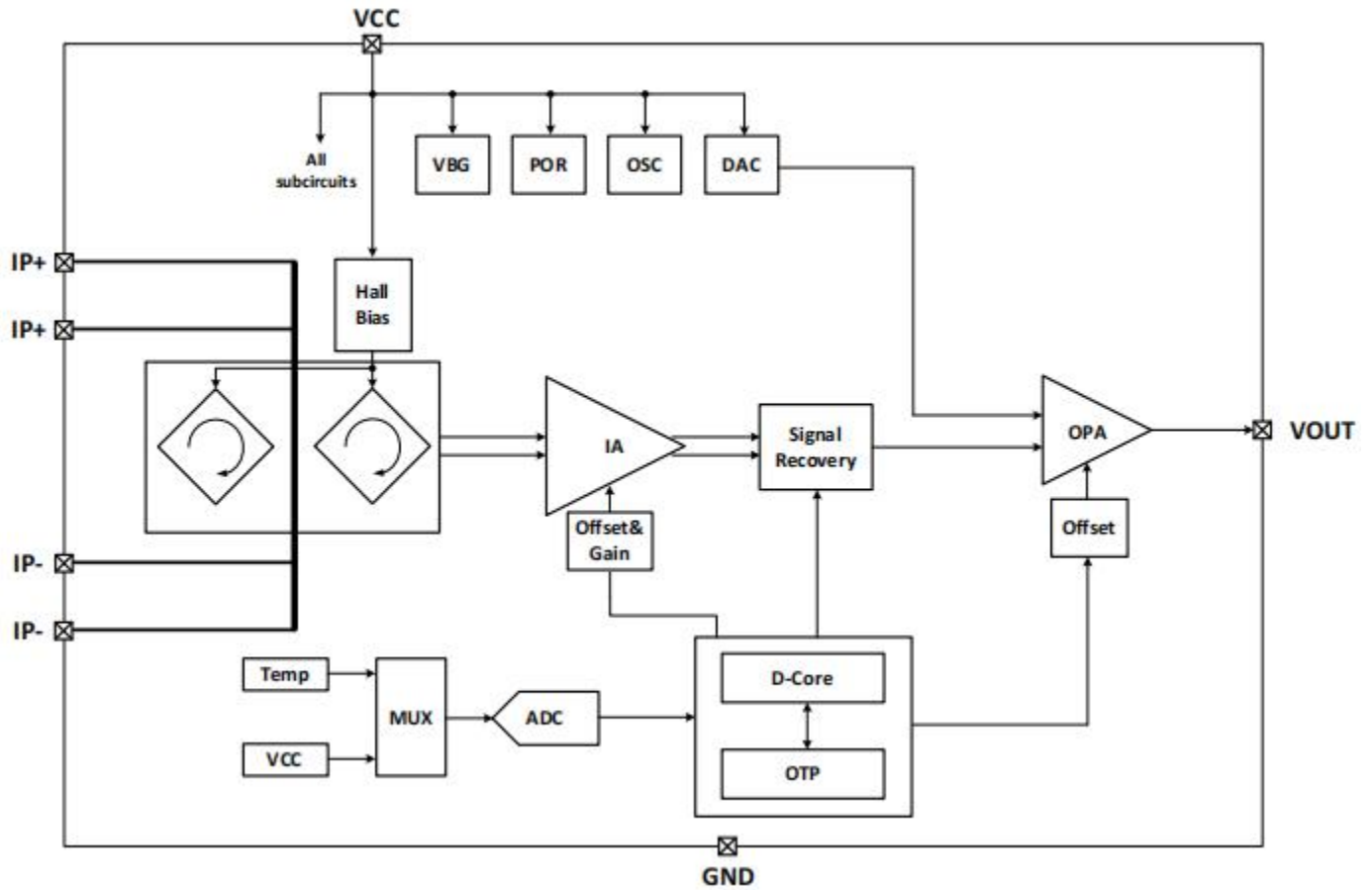
Pin Description



PIN NO.	NAME	DESCRIPTION
1	IP+	Positive power rail
2	IP+	Positive power rail
3	IP-	Negative power rail
4	IP-	Negative power rail
5	GND	Ground
6	NC	Not connected
7	VOUT	Output voltage
8	VCC	Supply voltage

PART NUMBER	I _{PR} (A)	SENSITIVITY (mV/A)
ITE3921SEA-5P0	±5	400mV/A
ITE3921SEA-10P	±10	200mV/A
ITE3921SEA-20P	±20	100mV/A
ITE3921SEA-25P	±25	80mV/A
ITE3921SEA-30P	±30	67mV/A
ITE3921SEA-40P	±40	50mV/A
ITE3921SEA-50P	±50	40mV/A

Functional Block Diagram



Absolute Maximum Ratings

T_A=25°C, all voltages are referenced to GND unless otherwise specified.⁽¹⁾

SYMBOL	PARAMETER	MIN	MAX	UNIT
V _{CC}	Supply voltage	-	7	V
V _{RCC}	Reverse supply voltage	-	-0.5	V
V _{OUT}	Output voltage	-	7	V
V _{REF}	Reference voltage	-	5.5	V
V _{ROUT}	Output reverse voltage	-	-0.5	V
I _O	Output current	-	20	mA
T _J	Junction temperature range	-	150	°C
T _S	Storage temperature	-55	150	°C
R _{thJA(2)}	Package thermal resistance (junction to ambient)	-	24	°C/W
R _{thJL}	Package thermal resistance (junction to lead)	-	5	°C/W

Note:

- Exceeding these ratings may cause permanent damage to the device. Absolute Maximum Ratings do not imply functional operation of the device at these or any other conditions beyond those listed under Recommended Operating Conditions. If outside the Recommended Operating Conditions but within the Absolute Maximum Ratings, the device may not be fully functional, and this may affect device reliability, functionality, performance, and shorten the device lifetime.
- Mounted on the board with 1500 mm² of 4 oz. copper on each side, connected to pins 1 and 2, and to pins 3 and 4 with thermal vias connecting the layers. Performance values include the power consumed by the PCB.

ESD and Latch-up

SYMBOL	PARAMETER	VALUE	UNIT
I _{LU}	Latch-up current, JEDEC78F.02-2023	±200	mA
V _{HBM}	Electrostatic discharge-Human body Model (HBM), JS-001-2017	±4	kV
V _{CDM}	Electrostatic discharge- Charged Device Model (CDM), JS-002-2018	±1	kV

Isolation Characteristics

SYMBOL	PARAMETER	TEST CONDITIONS	VALUE	UNIT
V _{ISO}	Dielectric strength test voltage	Tested at V _{ISO} for 60 second and 1.2V _{ISO} for 1 second in accordance with IEC 62368-1	3500	V _{RMS}
		t=1s (100%production)	3500	VAC
V _{WVBI}	Working voltage for basic isolation	Maximum approved working voltage for basic (single) isolation according to UL 62368-1:2014	600	V _{PK} or VDC
			424	V _{RMS}
V _{IORM}	Maximum repetitive peak isolation voltage	AC voltage(bipolar)	600	V _{PK}
V _{IOWM}	Maximum working isolation voltage	DC voltage	600	V _{DC}
		AC voltage (sinewave)	424	V _{RMS}
V _{IOTM}	Maximum transient isolation voltage	t=60s (qualification)	4949	V _{PK}
V _{TEST}		t=1s (100%production)	5515	V _{PK}
D _{CL}	Clearance	Minimum distance through air from IP leads to signal leads	4	mm
D _{CR}	Creepage	Minimum distance along package body from IP leads to signal leads	4	mm

Operating Range

All voltages are absolute voltages referenced to GND unless otherwise specified. (T_A=25℃)

SYMBOL	PARAMETER	VALUES			UNIT
		MIN	TYP	MAX	
V _{IN}	Input voltage(1)	-600	-	600	V
V _{CC}	Supply voltage	3	3.3	3.6	V
V _{REF}	Reference voltage	-	0.5*V _{CC}	-	V
I _O	Output current(2)	-	11	-	mA
I _{O+_REF}	Reference current(2)	-	10	-	mA
I _{O-_REF}	Reference current(2)	-	1	-	mA
T _A	Operating ambient temperature	-40	-	125	℃

Note:

- V_{IN} is the voltage of the current rail relative to GND (pin5).
- The output current includes sink current and source current, which is guaranteed by R & D.

Electrical Characteristics

All voltages are absolute voltages referenced to GND-potential, $T_A=25^{\circ}\text{C}$ (unless otherwise specified).

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES			UNIT
			MIN	TYP	MAX	
VCC Supply						
Supply current	I _{CC}	VCC=3.3V, output open	-	14	20	mA
Power-on time	t _{PO}	CP=open, CL=1nF, Output rising from 0 to 90% of steady-state	-	15	-	μs
Power on reset	V _{PORH}	VCC=3.3V, VCC rising	-	2.7	-	V
	V _{PORL}	VCC=3.3V, VCC falling	-	2.3	-	V
Input stage						
Current rail resistance	R _{IP}	IIP=2A	-	1.15	-	mΩ
Common mode field rejection ratio	CMFRR	Common Mode Field Rejection Ratio	-	38	-	dB
Output stage						
Output saturation voltage	V _{OH}	VCC=3.3V,R _L =4.7K	-	3	-	V
	V _{OL}	VCC=3.3V,R _L =4.7K	-	0.3	-	V
Zero-current output Voltage	V _{OQ}	I _P =0A	-	0.5*VCC	-	V
Reference output voltage	V _{REF}	VCC=3.3V	1.64	1.65	1.66	V
Output capacitance Load	C _L	VOUT to GND	-	1	10	nF
Output resistive load	R _L	VOUT to GND	4.7	-	-	kΩ
Propagation time	t _{pd}	C _L =1nF, I _{IP} =2A	-	0.5	-	μs
Rise time	t _r	C _L =1nF, I _{IP} =2A	-	1	-	μs
Response time	t _{RESPONSE}	C _L =1nF, I _{IP} =2A	-	1	-	μs
Output slew rate	SR	C _L =1nF, I _{IP} =2A	-	1.5	-	V/μs
Accuracy and Frequency						
Bandwidth	BW	Small signal, -3dB, C _L =1nF		350		kHz
Nonlinearity	E _{LIN}	Through full range of IP	-1.5	-	1.5	%
Symmetry	E _{SYM}	Through full range of IP	-1.5	0.5	1.5	%

Note:

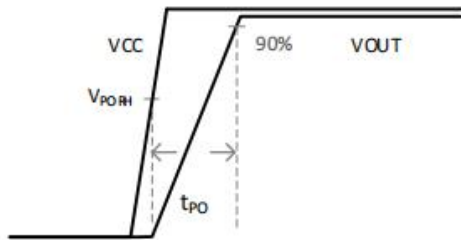
1. The parameter values are obtained under the corresponding test conditions mentioned above.
2. Ensured by design.
3. The sensor IC will continue to respond to currents exceeding the IP range until the high or low saturation voltage is reached; however, the nonlinearity in this region will be worse than in the rest of the measurement range.

Performance Characteristics

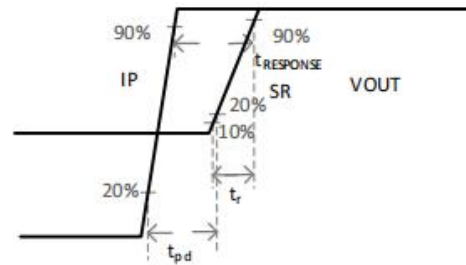
$V_{CC}=3.3V$, $T_A=-25^{\circ}C$, $C_P=0.1\mu F$ (unless otherwise specified).

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES			UNIT
			MIN	TYP	MAX	
20A performance characteristics						
Current-sensing range	I _P	-	-20	-	20	A
Sensitivity	Sens	Through full range of I _P	64	66	68	mV/A
Zero current differential output error	V _{OE}		-10	-	10	mV
Zero current output slope	ΔV _{OUT(Q)}	T _A =-40°C~125°C	-	0.2	-	mV/°C
Sensitivity slope	Δ _{SENS}	T _A =-40°C~125°C	-	0.016	-	mV/A/°C
Noise	V _{N(RMS)}		-	11	-	mV
Total output error	E _{TOT}	I _P =I _{PR(max)} , T _A = 25°C to 125°C	-4	-	4	%
		I _P =I _{PR(max)} , T _A = -40°C to 25°C	-3.5	-	3.5	%

Timing Section

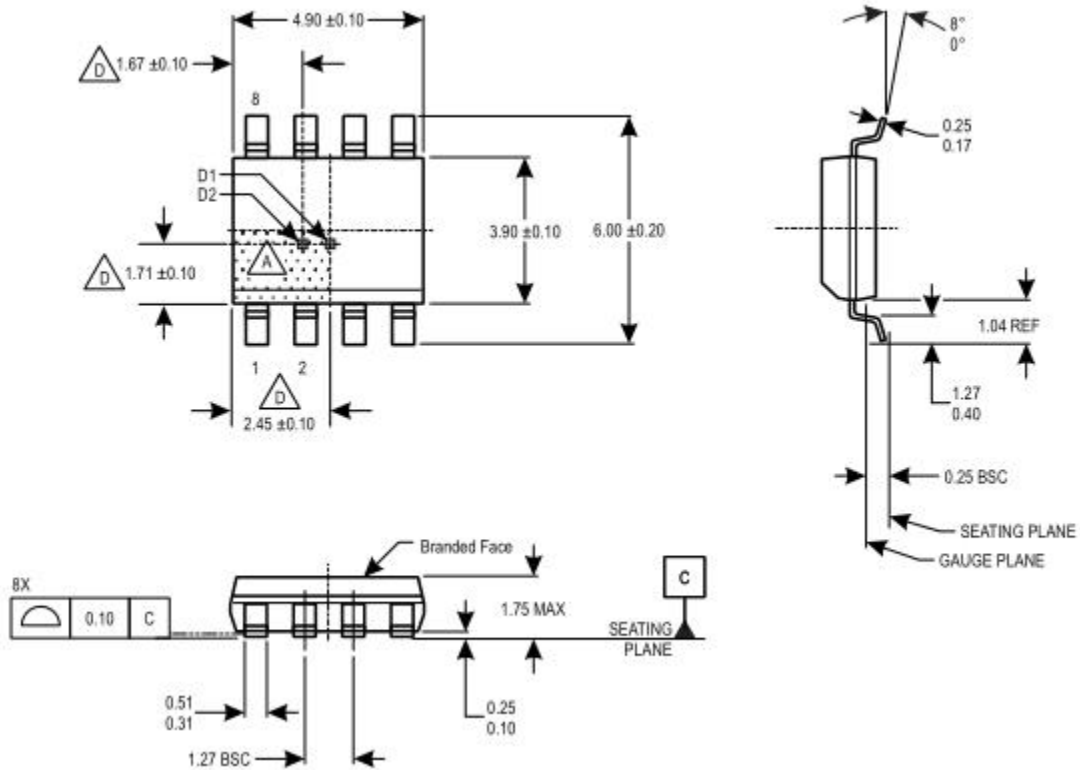
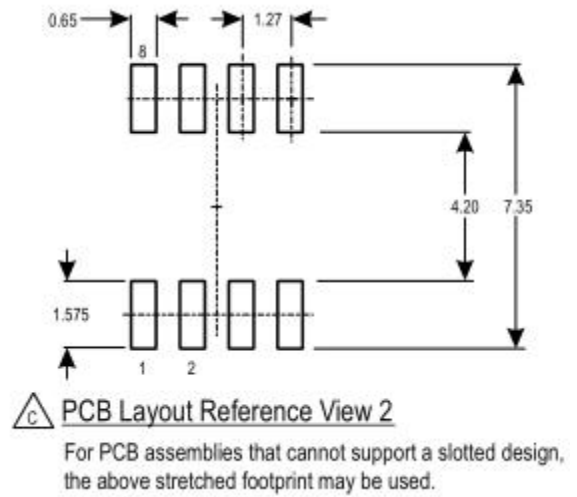
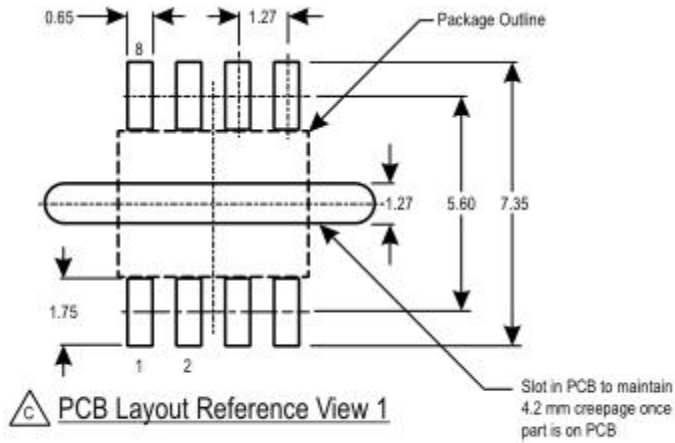


Power on time



Response time& Response Time& Rise Time& SR

Package Outline: SOP-8L



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