ITE591x
Hall Effect Switches

Features

- Wide supply range 2.8V to 5V
- Zero magnetic field output level as low as 300mV
- Operating current<0.7mA
- Wide temperature range: -40℃ to 125℃
- Magnetic sensitivity option:

	Quiescent Output	Sensitivity
ITE5911	V_{CC}-0.3V	3.2mV/Gs@Vdd=3.3V 4.6mV/Gs @Vdd=5V
ITE5912	V_{CC}-0.3V	4.8mV/Gs@Vdd=3.3V 6.7mV/Gs @Vdd=5V
ITE5913	0.5V_{CC}	3.7mV/Gs@Vdd=3.3V 5.3mV/Gs @Vdd=5V
ITE5914	0.5V_{CC}	5.6mV/Gs@Vdd=3.3V 8.0mV/Gs @Vdd=5V

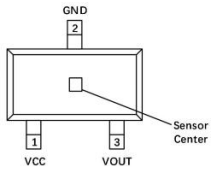
Applications

- Magnetic axis keyboard
- Game pad
- Position sensing
- Human computer interaction

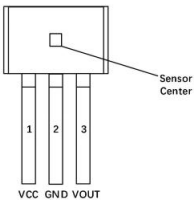
Description

The ITE591x is a linear Hall-effect sensor IC with on-chip Hall and signal conditioning circuit. It integrates on-chip customized Hall devices to ensure low power consumption and high sensitivity performance of the chip. Simultaneously, high-precision signal conditioning circuits ensure parameter consistency and drift across the entire temperature range. The on-chip Hall sensor converts the magnetic flux passing through the chip into Hall signal voltage, and the internal signal conditioning circuit further amplifies the weak Hall signal voltage to the chip output.The S pole is defined as the positive pole. When the S pole of a magnet appears on the chip marking surface, the output voltage will increase as the distance between the magnet and the marking surface decreases (magnetic field increases).

The sensing chip consumes a working current of 0.7mA during operation, and the output level of zero magnetic field can be customized according to the application, with a minimum of 300mV, which can maximize the magnetic field detection range and output voltage swing. The operating temperature range is -40 ℃ to 125 ℃, suitable for various consumer and industrial application environments.



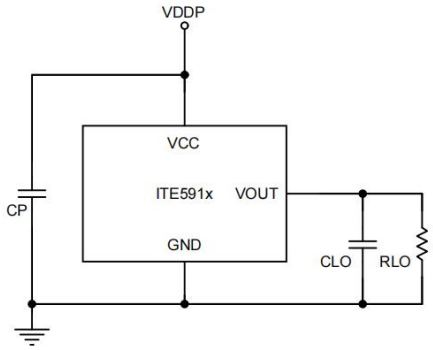
SOT23-3L



TO-92

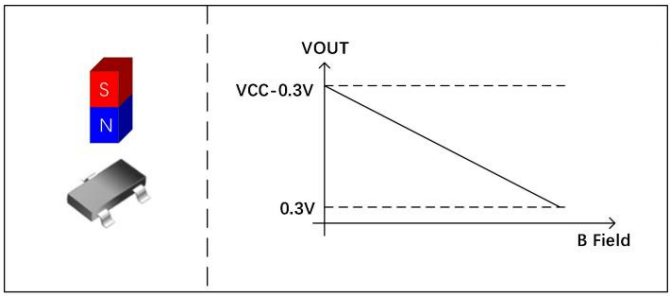
Package Type: SOT23-3L, TO-92

Typical Application



For hash applications with supply disturbance, a Cp placed close to the IC is recommended.
C_P=100nF, R_L=20kΩ, and C_L=1nF.

Field Direction Definition

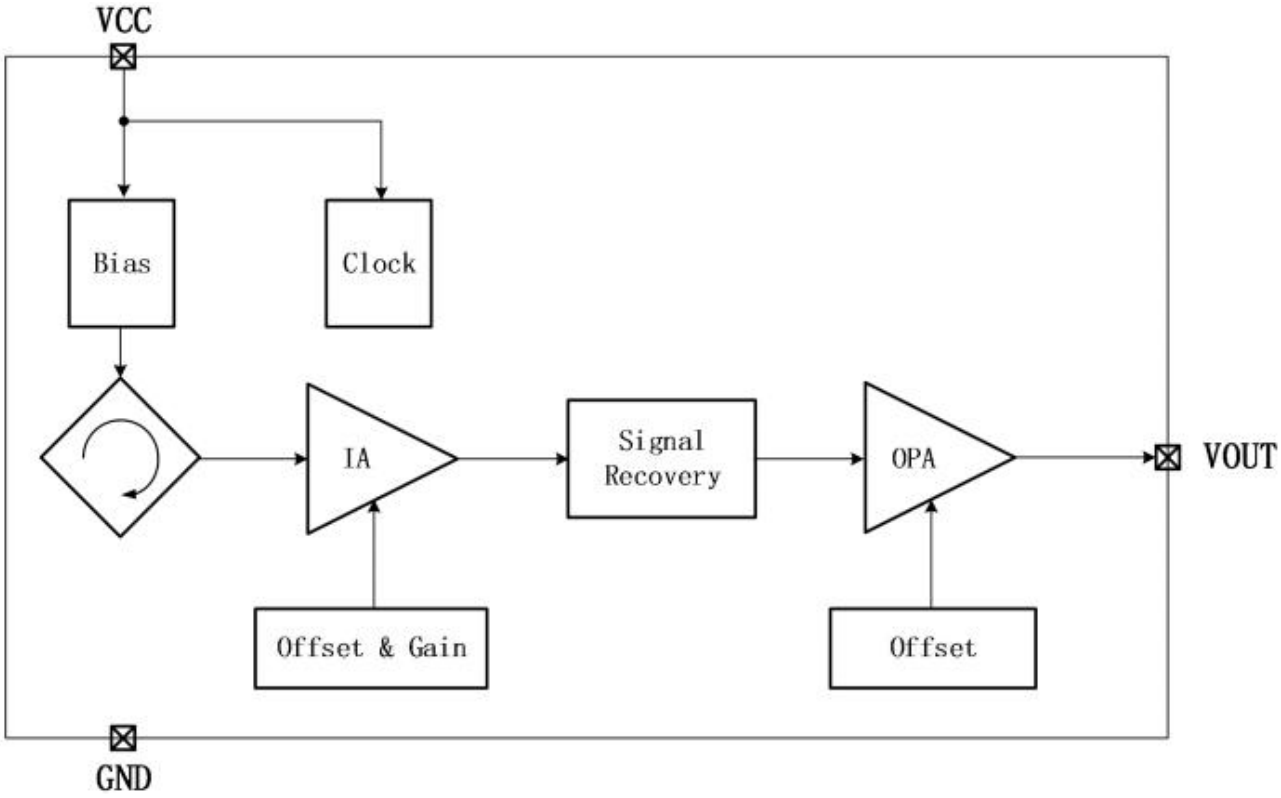


The output of the chip varies with the magnetic field as shown in Figure. When the N pole of the magnet is facing the SOT23-3L packaging chip screen printing surface, the output VOUT voltage decreases as the distance between the magnet and the chip screen printing surface decreases. The voltage of VOUT at zero magnetic field can be customized as needed, with a swing from 0.3V to VCC-0.3V.

Pin Description

PIN NO.	NAME	DESCRIPTION
1	VCC	Supply voltage
2	GND	Ground
3	VOUT	Output voltage

Functional Block Diagram



The main path comprises a Hall probe, signal chain with instrumentation amplifier (IA), signal recovery circuit and operational amplifier (OPA). The background dynamic offset compensation circuits in signal chain and Hall probe continuously null out the Hall offset and circuits offset. The on-chip temperature and VCC sensors ensure the IC accuracy.

Absolute Maximum Ratings

SYMBOL	PARAMETER	MIN	MAX	UNIT	NOTE
V_{CC}	Supply voltage		9	V	t<96h
V_{RCC}	Reverse supply voltage		-0.5	V	
V_{OUT}	Output voltage		9	V	t<96h
V_{ROUT}	Output reverse voltage		-0.5	V	
I_O	Output current	-	1	mA	
T_A	Junction temperature range	-40	190	℃	t<96h
R_{thJA}	Thermal resistance junction ambient	-	300	K/W	
R_{thJL}	Thermal resistance junction lead	-	100	K/W	

Recommended Operating Conditions (Note 4)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT	NOTE
V_{CC}	Supply voltage	2.8	3.3	5	V	
I_O	Output current	-	1	-	mA	Sink or source
T_J	Junction temperature range	-40	-	170	℃	t<1000h

ESD and Latch-up

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT	NOTE
I_{latch}	Latch-up current	-150	-	150	mA	125℃
V_{HBM_VCC}	VCC ESD	-4	-	4	kV	25℃
V_{HBM_VOUT}	VOUT ESD	-4	-	4	kV	25℃
V_{CDM}	CDM	-1		1	kV	25℃

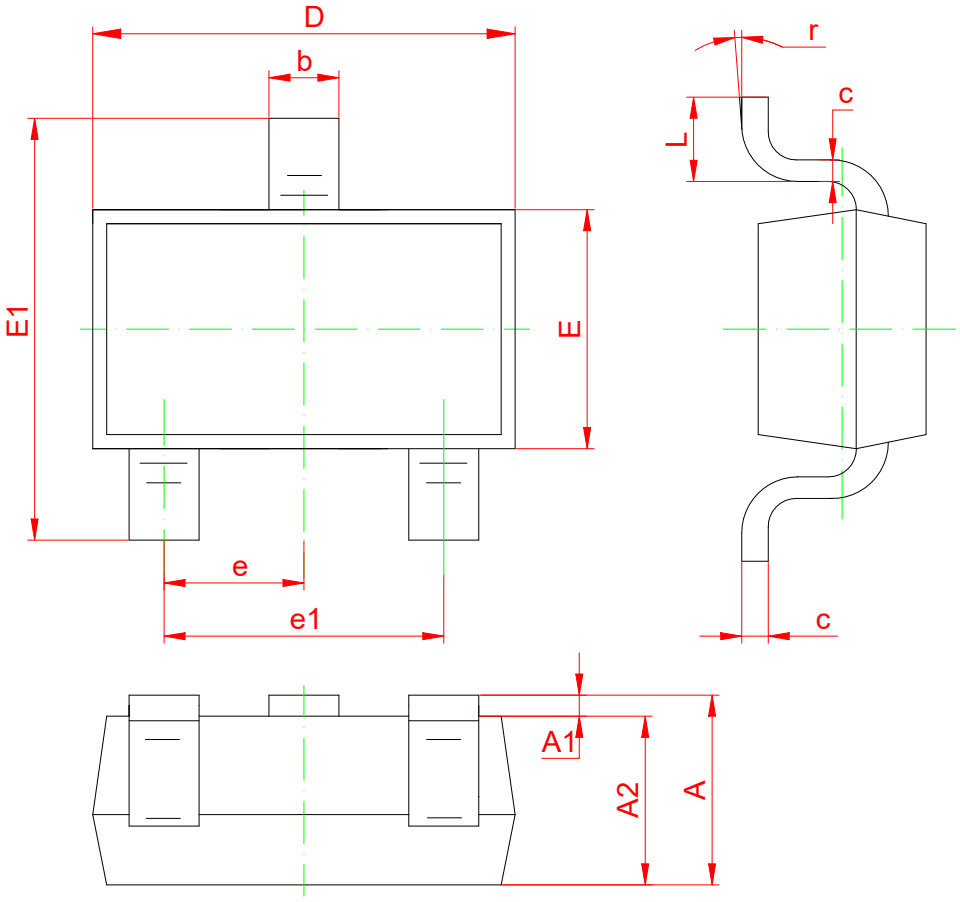
Electrical Characteristics

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply						
I_S	Supply current		-	0.7	-	mA
T_{PO}	Power-on Time			30		uS
Output						
t_D	Output delay	B=B(max step), CL=1nF	-	30	-	uS
V_{Noise}	Output noise	TA =25℃, CL=1nF, SNST=2.7 mV/Gs	-	8	-	mV_{pp}
			-	1	-	mV_{rms}
E_{LIN}	Nonlinearity	B≤1000Gs	-1	-	1	%
BW	Bandwidth	-3dB, CL=1nF		12		kHz
Quiescent output						
V_{OQ0}	Zero magnetic field output voltage	customizable	-	$0.5V_{CC}$	-	V
V_{OQ1}			-	V_{CC}-0.3	-	V
V_{OQ_TC}	Output voltage temperature drift	-40℃ ~ 125℃	-20	-	20	mV
V_{SATH}	Output saturation voltage	VCC=5V	-	4.7	-	V
		VCC=3.3V	-	3	-	
V_{SATL}		VOUT to GND	-	0.3	-	V
R_{LU}	Output load resistance	VOUT to VCC	15	-	-	kΩ
R_{LD}		VOUT to GND	4.7	-	-	kΩ
C_L	Output load capacitance		-	-	1	nF

Magnetic Characteristics

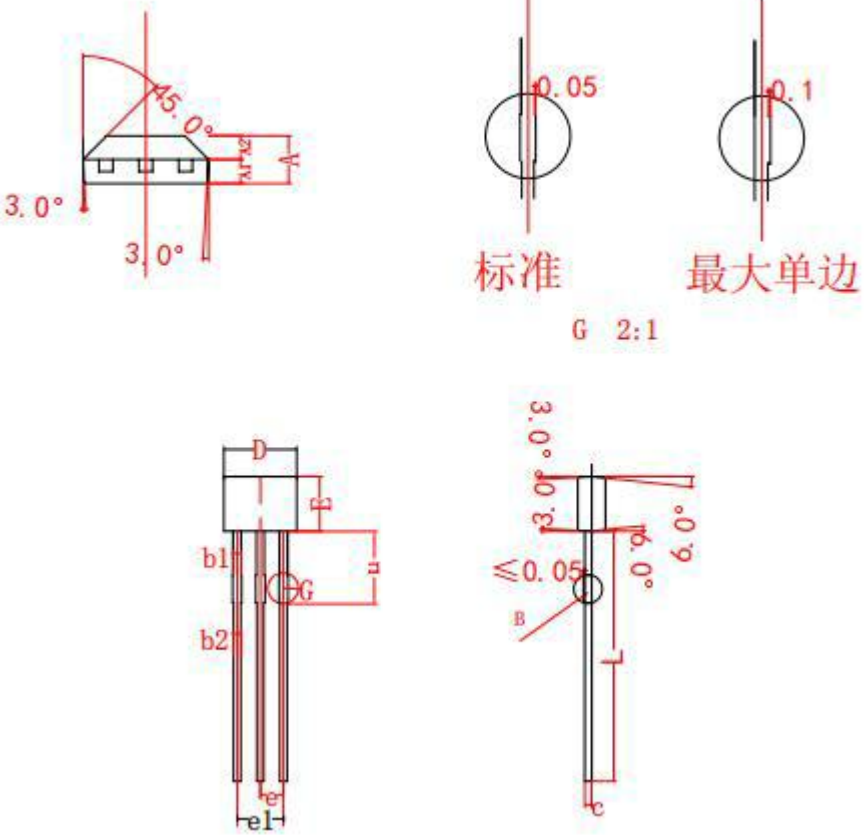
SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Sensitivity						
S_1	Sensitivity	ITE5911@VCC=3.3V	-	3.2	-	mV/Gs
		ITE5911@VCC=5V	-	4.6	-	mV/Gs
S_{ERR}	Sensitivity error	25℃	-3.0	-	3.0	%
S_{TC0}	Sensitivity temperature coefficient	Temperature coefficient is customizable	-	-1100	-	ppm/℃
S_{TC1}			-	0	-	ppm/℃

Package Information: SOT23-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 (BSC)		0.037 (BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
r	0°	8°	0°	8°

Package Information: TO-92



SYMBOL	COMMON DIMENSIONS UNITS MEASURE=MILLIMETER PACKAGE	MIN	MID	MAX
A	TO-92S	1.40	1.50	1.60
	SIP3	1.42	1.52	1.62
	TO-M	1.44	1.54	1.64
A1	ALL	0.70	0.77	0.85
A2	TO-92S	0.63	0.73	0.83
	SIP3	0.65	0.75	0.85
	TO-M	0.67	0.77	0.87
b1	ALL	0.43	0.47	0.51
b2	ALL	0.40	0.44	0.48
c	ALL	0.36	0.38	0.40
D	TO-92S	3.95	4.05	4.15
	SIP3	3.80	3.90	4.00
	TO-M	3.98	4.08	4.18
e	ALL	-	1.27TYP	-
e1	ALL	2.44	2.54	2.64
E	TO-92S	2.90	3.00	3.10
	SIP3	2.90	3.00	3.10
	TO-M	3.10	3.20	3.30
L	ALL	14.0	14.5	15.0
L1	TO-92S	1.50	1.60	1.70
	SIP3	1.50	1.60	1.70
	TO-M	1.43	1.53	1.63

- The information described herein is subject to change without notice.
- CHIPLINK Technology is not responsible for any problems caused by circuits or diagrams described herein whose related industrial properties, patents, or other rights belong to third parties. The application circuit examples explain typical applications of the products, and do not guarantee the success of any specific mass-production design.
- When the products described herein are regulated products subject to the Wassenaar Arrangement or other agreements, they may not be exported without authorization from the appropriate governmental authority.
- Use of the information described herein for other purposes and/or reproduction or copying without the express permission of CHIPLINK Technology is strictly prohibited.
- The products described herein cannot be used as part of any device or equipment affecting the human body, such as exercise equipment, medical equipment, security systems, gas equipment, or any apparatus installed in airplanes and other vehicles, without prior written permission of CHIPLINK Technology
- Although CHIPLINK Technology exerts the greatest possible effort to ensure high quality and reliability, the failure or malfunction of semiconductor products may occur. The user of these products should therefore give thorough consideration to safety design, including redundancy, fire-prevention measures, and malfunction prevention, to prevent any accidents, fires, or community damage that may ensue.