ITE390X

Hall Effect Switches

Features

- Reverse-supply protection up to -20V
- Open-drain output with current limit
- Low jitter
- High ESD performance of ±4 kV (HBM)
- Background dynamic offset compensation suppressing package stress and lifetime drift
- Wide supply range 3.3V to 24V
- Stable switching points over temperature range: -40℃ to 150℃
- AEC-Q100 automotive qualified

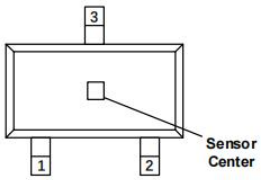
Description

The ITE390X are series of Hall-effect sensor ICs that feature with temperature stable Hall signal conditioning chains with background dynamic offset compensation, a comparator, configurable voltage references and an open-drain output stage.

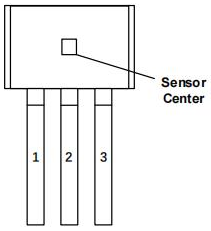
The on-chip Hall sensor converts the magnetic flux through the chip to Hall signal voltage. The internal comparator compares the voltage with the predefined reference voltage. The open-drain output transistor is then switched on and off accordingly.

Applications

- Revolutions related counting: window lifter, sunroof
- Brush less DC motors for commutation
- Position detection: gear shifter lever, electrical parking brake
- Magnetic encoders



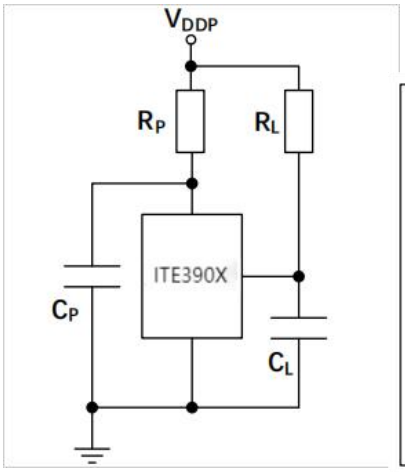
SOT23-3L



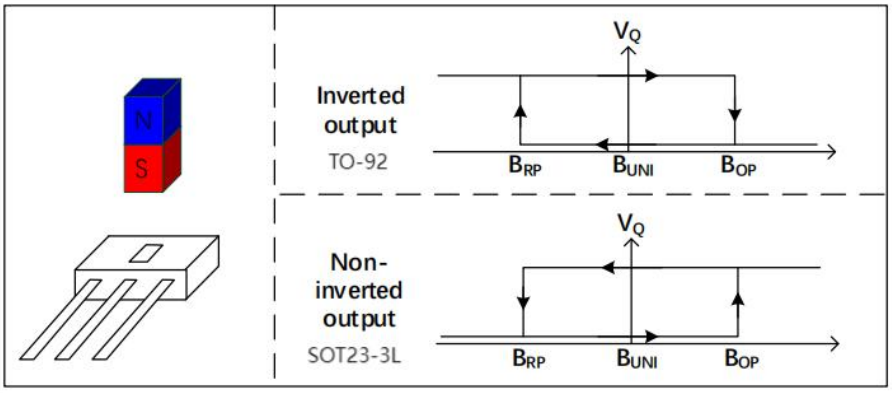
TO-92

Package Type: SOT23-3L, TO-92

Typical Application



Field Direction Definition



Magnetic field and output direction of ITE390X

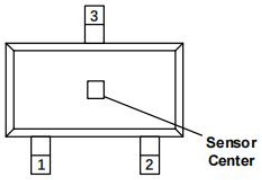
B_{OP}: Operating point of magnetic field B_{RP}: Returning point of magnetic field

B_{UNI}: Unipolar biasing point of magnetic field

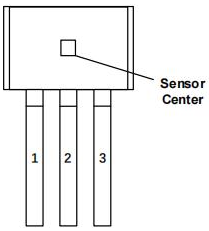
* For hash applications with supply disturbance, a low-pass Rp and Cp placed close to the IC is recommended (1).

R_P = 100Ω, C_P = 10nF, R_L = 1.2kΩ, and C_L = 4.7nF.

Pin Description



SOT23-3L
ITE390XA3L

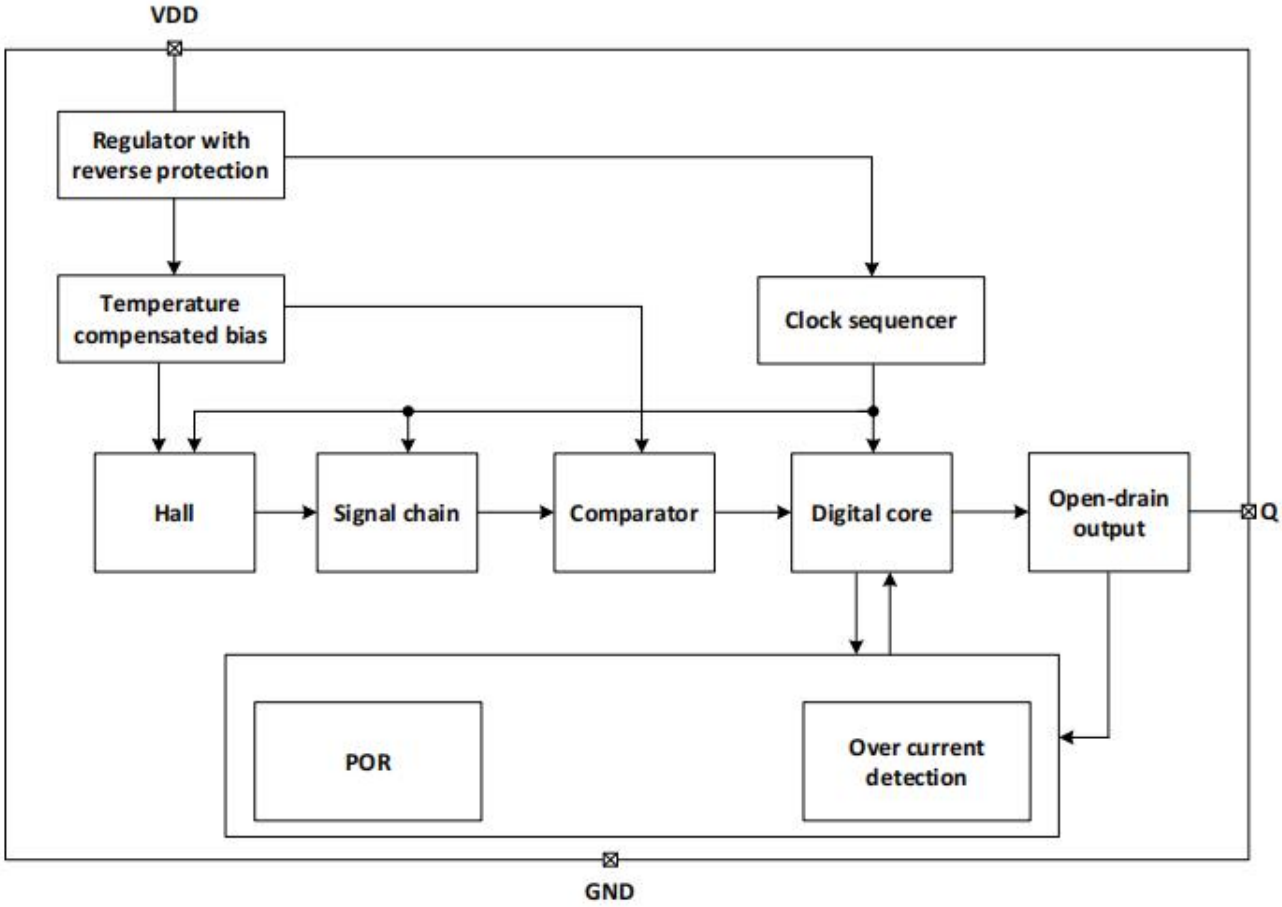


TO-92
ITE390XA3T

PIN No.		Name	Description
ITE390XA3L	ITE390XA3T		
1	1	VIN	Supply voltage
3	2	GND	IC Ground
2	3	Q	Output

Parameter	Operating point			Release point			Hysteresis			Unit
T_J	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
ITE3900										
25℃	-	1.5	-	-	-2.5	-	-	4	-	mT
ITE3901										
25℃	-	4.5	-	-	-4.5	-	-	9	-	mT
ITE3902										
25℃	-	2	-	-	-2	-	-	4	-	mT
ITE3903										
25℃	-	3.5	-	-	-3.5	-	-	7	-	mT
ITE3904										
25°C	-	9	-	-	-9	-	-	18	-	mT
ITE3905										
25°C	-	5	-	-	-5	-	-	10	-	mT
ITE3906										
25°C	-	6	-	-	-6	-	-	12	-	mT
ITE3907										
25°C	-	7	-	-	-7	-	-	14	-	mT
ITE3908										
25°C	-	8	-	-	-8	-	-	16	-	mT
ITE3909										
25°C	-	14	-	-	-14	-	-	28	-	mT

Functional Block Diagram



Absolute Maximum Ratings

Exceeding these ratings may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability. (T_A=25℃)

SYMBOL	PARAMETER	MIN	MAX	UNIT
V_{IN}	Supply Voltage	-20	38	V
V_Q	Output Voltage	-0.6	38	V
I_Q	Output Current		70	mA
T_J	Junction temperature	-	150	ºC
T_S	Storage Temperature	-55	150	ºC
R_{THJA}	Thermal Resistance Junction Ambient		300	K/W
R_{THJL}	Thermal Resistance Junction lead		100	K/W

Recommended Operating Conditions

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

SYMBOL	PARAMETER	MIN	MAX	UNIT
V_{IN}	Supply Voltage	3.0	24	V
V_Q	Output Voltage	-0.6	24	V
I_Q	Output Current		25	mA
T_J	Junction Temperature Range	-40	150	°C

ESD

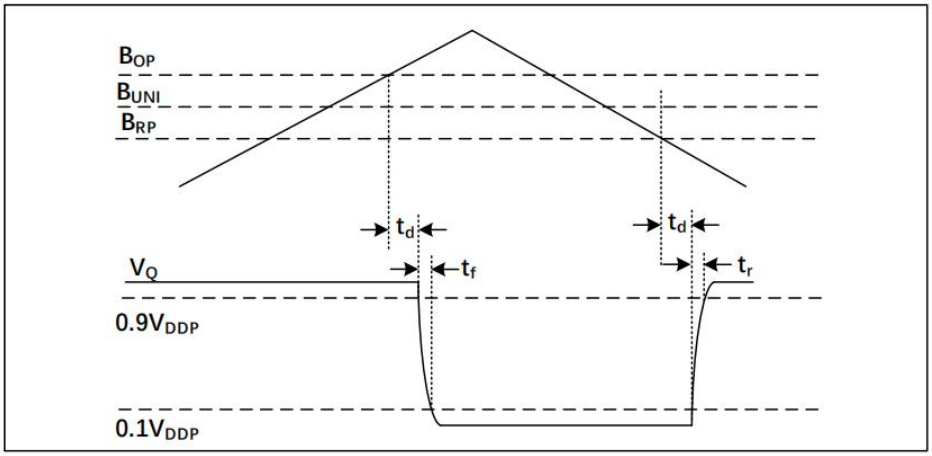
SYMBOL	DEFINITION	VALUE	UNIT
V_{HBM}	Electrostatic discharge-Human body model (HBM), JS-001-2017	±4	KV
V_{CDM}	Electrostatic discharge- Charged Device Model (CDM), JS-002-2018	±1	kV
I_{LU}	Latch-up current, JESD78F.02-2023, T_A=125ºC	±200	mA

Electrical Characteristics

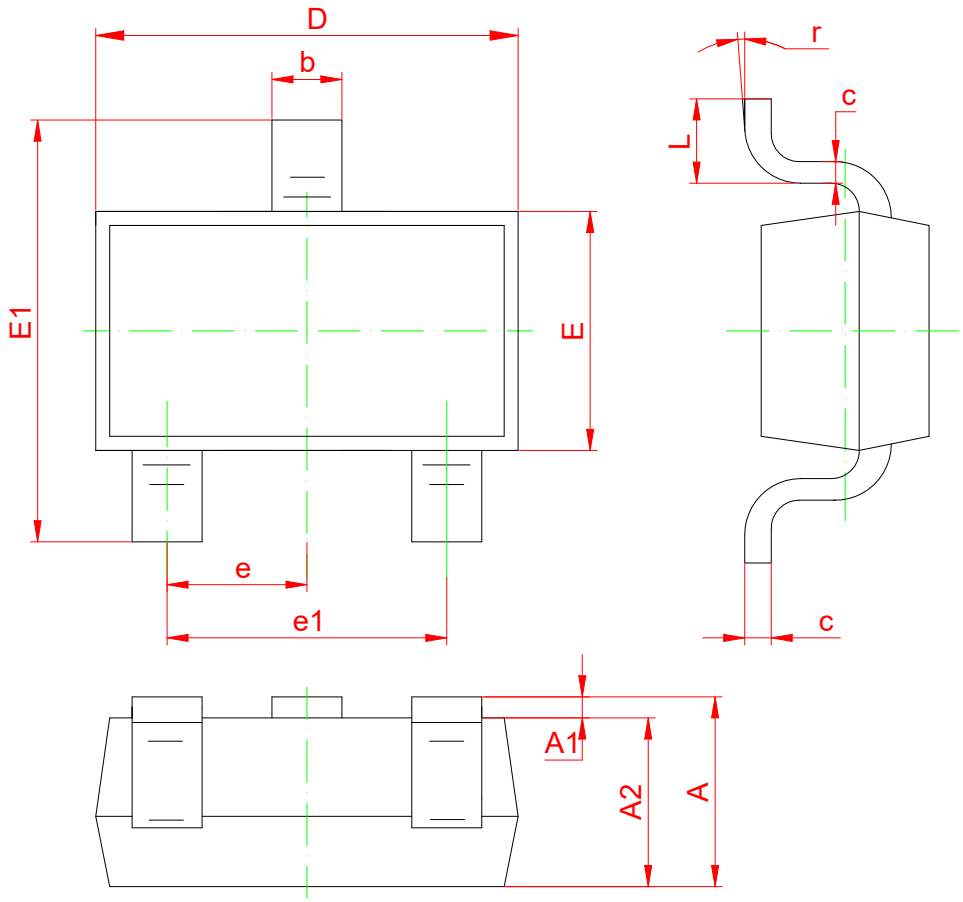
V_{IN}=12V, all voltages are absolute voltages referenced to GND-potential, T_A=25℃, (unless otherwise specified).

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage						
I_S	Supply Current			1.85		mA
I_{SR}	Reverse Current	V_{IN} =-20V			1	mA
V_{UV}	Undervoltage Threshold		1.86		2.60	V
Output Voltage						
V_{QSAT}	Output Saturation Voltage	I_Q=12mA		0.15	0.2	V
I_{QLEAK}	Output leakage Current				1	μA
T_F	Output Fall Time	R_L =0.82kΩ,C_L=20pF,1）			1	μS
T_R	Output Rise Time				1	μS
T_D	Delay	1）		11		μS
T_{EN}	Enable Time Of Output After Exceeding Of Vuv	B≤BRP-2mT, or B≥BOP+2mT		36		μS
T_{CHP}	Output Refresh Period		1.90	2.5	3.30	μS
F_{CHP}	Chopping Frequency	Internal Chopping Frequency	300	400	530	KHz

1）：When the magnetic field ramps up and down, the Q output toggles according to the pre-defined magnetic field threshold (As shown in the following figure).

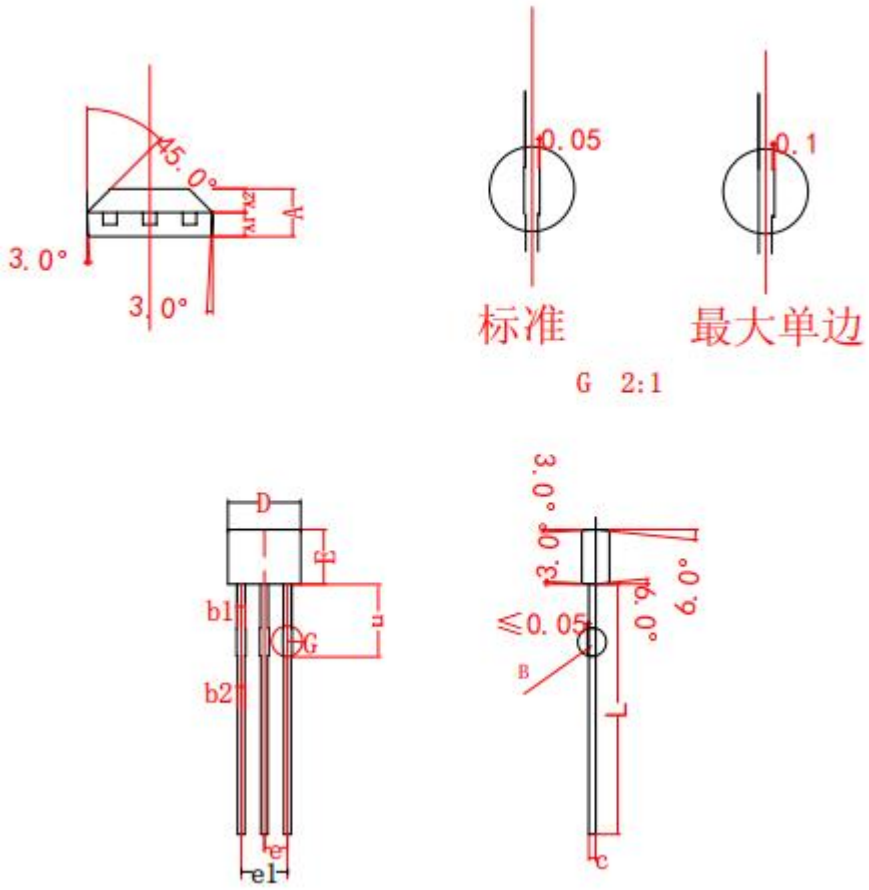


Package : SOT23-3L



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 : TO-92



	COMMON DIMENSIONS UNITS MEASURE=MILLIMETER			
SYMBOL	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

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