CC6902

Single chip Hall effect current sensor

5 A/ 5 B/ 1 0 A/ 2 0 A/ 3 0 Aseries

Overview

CC6902 It is a high-performance single-ended output linear current sensor, which can be more effective for AC (AC) Or DC (DC) Current detection solutions are widely used in industrial, consumer and communications equipment.

CC6902 A high-precision, low-noise linear Hall circuit and a low-impedance main current wire are integrated inside. When the sampling current flows through the main current wire, the magnetic field generated by it induces a corresponding electrical signal on the Hall circuit, and the signal processing circuit outputs a voltage signal, making the product easier to use. Linear Hall circuit adopts advancedBiCMOSProcess production, including high-sensitivity Hall sensor, Hall signal pre-amplifier, high-precision Hall temperature compensation unit, oscillator, dynamic offset cancellation circuit and amplifier output module. In the absence of a magnetic field, the static output is 5 0 %VCC.

At power supply voltage 5 V Under conditions,OUT allowable 0 .5~4.5VVaries linearly with the magnetic field, the linearity can reach 0 .4%.CC6902 The internal integrated dynamic offset cancellation circuit enables ICThe spirit Sensitivity is not subject to external pressure and ICThe influence of package stress.

CC6902 provide SOP8 Package, operating temperature range- 4 0 ~125°C.

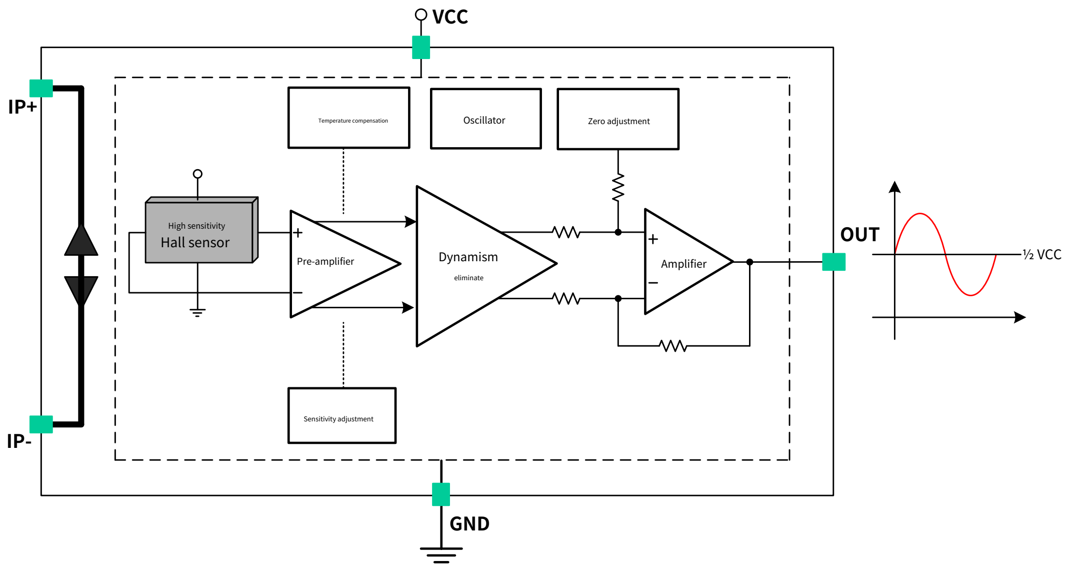
characteristic

- The static common mode output point is 5 0 % VCC
- Wide measuring range, 5 A/ 5 B/ 1 0 A/ 2 0 A/ 3 0 A 1 MHz Chopping frequency,
- high bandwidth, low noise, single-ended analog output wire pin to signal pin
- 2 0 0 0 V_{RMS}Safe isolation voltage and low power consumption
-
- Room temperature error 1 %, Total temperature error 3 %
- The temperature stability is good, and the internal use of the patented Hall signal amplifier circuit and temperature Degree compensation circuit
- Strong anti-interference ability
- Resistance to mechanical stress, magnetic parameters will not deviate due to external pressure
- ESD (HBM) 6 0 0 0 V
- byUL 6 2 3 6 8 -1:2014 test

application

- motor control
- Load monitoring system
- Switching power supply
- Overcurrent fault protection

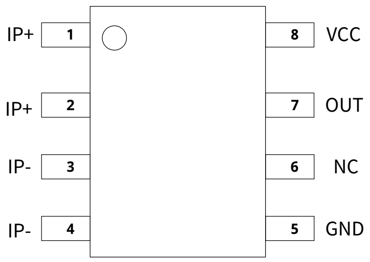
Functional block diagram



Ordering Information

product name	Sensitivity (mV/A)	Package outline	package
CC6902SO-05A	400	SOP8	Taping, 2000 Piece/disk
CC6902SO-05B	185	SOP8	Taping, 2000 Piece/disk
CC6902SO-10A	200	SOP8	Taping, 2000 Piece/disk
CC6902SO-20A	100	SOP8	Taping, 2000 Piece/disk
CC6902SO-30A	67	SOP8	Taping, 2000 Piece/disk

Pin definition



SOP8 Encapsulation

name	Numbering	Features	name	Numbering	Features
IP+	1	Sampling current positive terminal	GND	5	Ground
IP+	2	Sampling current positive terminal	NC	6	Need to be suspended
IP-	3	Sampling current negative terminal	OUT	7	Signal output
IP-	4	Sampling current negative terminal	VCC	8	voltage

Limit parameters

parameter	symbol	Numerical value	unit
voltage	V_{CC}	7	V
The output voltage	V_{OUT}	-0.3~VCC+0.3	V
Output source current	$I_{OUT(SOURCE)}$	400	uA
Output sink current	$I_{OUT(SINK)}$	30	mA
Universal insulation voltage	V_{ISO}	2000	VAC
Working temperature	T_a	-40~125	°C
Maximum junction temperature	T_J	165	°C
Storage temperature	T_S	-55~150	°C
Magnetic field strength	B	Unlimited	mT
Electrostatic protection	ESD(HBM)	6000	V
Transient inrush current at current sampling terminal	IP	1 pulse, 100 ms	100 A

Note: Do not exceed the maximum rating during application to prevent damage. Long-term operation at the maximum rating may affect the reliability of the device.

Isolation characteristics

parameter	symbol	Test conditions/notes	Numerical value	unit
Dielectric strength test voltage *	V_{ISO}	Type testing continues 1 min UL standard 62368-1:2014	2500	V_{DC}
Dielectric strength test voltage *	V_{ISO}	Type testing continues 1 min	2000	V_{RMS}
Basic insulation working voltage	V_{WFSI}	Basic insulation UL standard 62368-1:2014	420	V_{DC} or V_{PEAK}
			297	V_{RMS}
Electrical clearance		Input end to output end, the shortest distance	3.8	mm

Note: * The core is not in progress 1 Minute test, only during type test.

Recommended working environment

parameter	symbol	Minimum	Max	unit
voltage	V_{CC}	4.5	5.5	V
Ambient temperature	T_a	-40	125	°C
DC current capacity	I_P	-30	30	A

Note: The actual current capacity of the chip should be determined according to the thermal resistance of the chip and the actual ambient temperature.

Working characteristics (Unless otherwise specified, V_{CC}= 5 V @ 25 °C)

parameter	symbol	condition	Minimum	Typical value	Max	unit
Electrical characteristics						
Supply voltage	V_{CC}	-	4.5	-	5.5	V
Quiescent Current	I_{CC}	OUT Hang in the air	-	5	8	mA
Output capacitive load	C_L		-	-	1	nF
Output resistance load	R_L		20	-	-	kΩ
Transmission delay time	t_D			1	1.2	us
Rise Time	t_r		-	2	3.6	us
System bandwidth	BW	-3dB	-	80	-	kHz
Linearity error	Lin_{ERR}		-	0.4	1	%
Symmetry error	Sym_{ERR}		-	0.8	1.5	%
Static output point	$V_{OUT(Q)}$		2.48	2.5	2.52	V
PORtime	T_{POR}	Output from 0 To 90%	-	10	-	us
Main current terminal resistance	R_P		-	1.5	1.8	mΩ
Junction to ambient thermal resistance	$θ_{JA}$	Copper foil is connected to 1, 2 Feet and 3, 4 Feet with an area of 1500 mm^2, thickness 2 oz	-	25	-	°C/W

5 Aseries

parameter	symbol	condition	Minimum	Typical value	Max	unit
Electrical characteristics						
Current range	IP	-	-5	-	5	A
Sensitivity	Sens	Full current range	390	400	410	mV/A
Output noise	VNOISE(PP)		-	50	-	mV
Zero current output temperature coefficient	ΔVOUT(Q)		-	0.26	-	mV/°C
Sensitivity temperature coefficient	ΔSens		-	0.054	-	mV/A /°C
Total output error	ETOT		-3.0	-	3.0	%

5 Bseries

parameter	symbol	condition	Minimum	Typical value	Max	unit
Electrical characteristics						
Current range	IP	-	-5	-	5	A
Sensitivity	Sens	Full current range	180	185	190	mV/A
Output noise	VNOISE(PP)		-	30	-	mV
Zero current output temperature coefficient	ΔVOUT(Q)		-	0.29	-	mV/°C
Sensitivity temperature coefficient	ΔSens		-	0.028	-	mV/A /°C
Total output error	ETOT		-3.0	-	3.0	%

10 Aseries

parameter	symbol	condition	Minimum	Typical value	Max	unit
Electrical characteristics						
Current range	IP	-	-10	-	10	A
Sensitivity	Sens	Full current range	195	200	205	mV/A
Output noise	VNOISE(PP)		-	30	-	mV
Zero current output temperature coefficient	ΔVOUT(Q)		-	0.30	-	mV/°C
Sensitivity temperature coefficient	ΔSens		-	0.027	-	mV/A /°C
Total output error	ETOT		-3.0	-	3.0	%

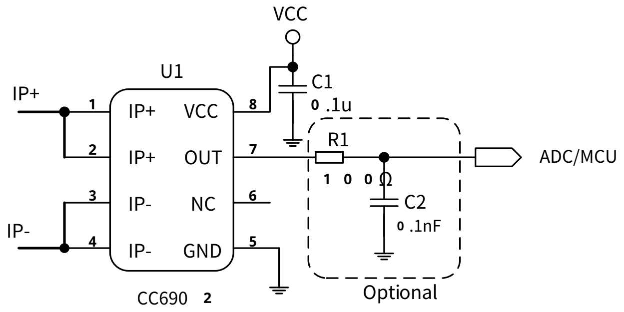
20 Aseries

parameter	symbol	condition	Minimum	Typical value	Max	unit
Electrical characteristics						
Current range	IP	-	-20	-	20	A
Sensitivity	Sens	Full current range	95	100	105	mV/A
Output noise	VNOISE(PP)		-	20	-	mV
Zero current output temperature coefficient	ΔVOUT(Q)		-	0.34	-	mV/°C
Sensitivity temperature coefficient	ΔSens		-	0.017	-	mV/A /°C
Total output error	ETOT		-3.0	-	3.0	%

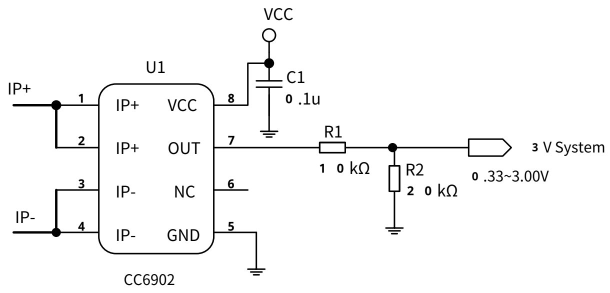
30 Aseries

parameter	symbol	condition	Minimum	Typical value	Max	unit
Electrical characteristics						
Current range	I_P	-	-30	-	30	A
Sensitivity	Sens	Full current range	64	67	70	mV/A
Output noise	$V_{NOISE(PP)}$		-	20	-	mV
Zero current output temperature coefficient	$\Delta V_{OUT(Q)}$		-	0.35	-	mV/°C
Sensitivity temperature coefficient	ΔSens		-	0.010	-	mV/A /°C
Total output error	E_{TOT}		-3.0	-	3.0	%

Typical application circuit

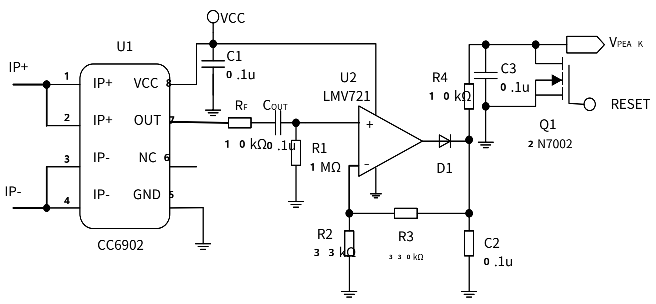


typical application

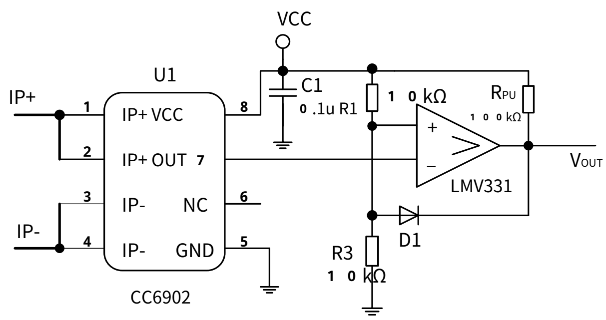


Signal attenuation circuit

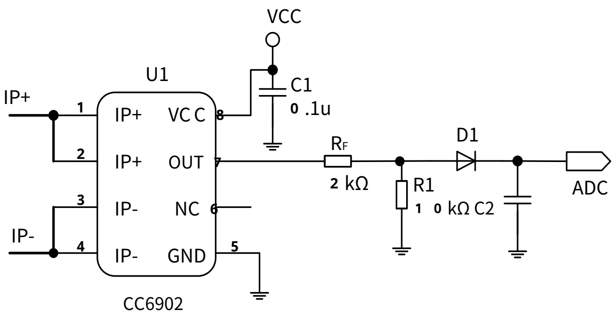
Note: I_{OUT}< 0.3 mA, Drive capacity according to 0.25mA Calculation, sum of resistance (R1+R2) Need to be greater than 20 kΩ



Current peak monitoring application



Overcurrent fault detector



Rectified output, instead of current transformer application

Output characteristics

CC6902 Static output point (IP = 0 A When) isVCC / 2 .

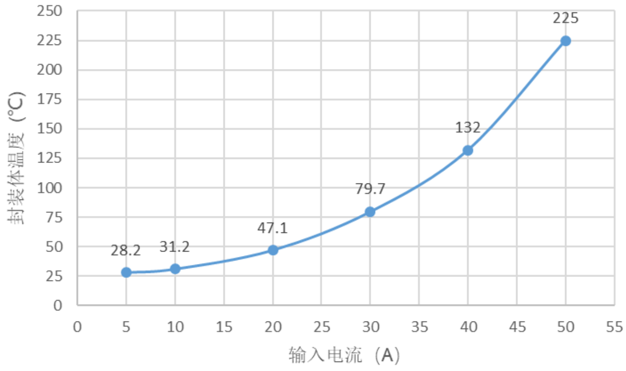
When the current increases,V_{OUT}Increase until the saturation voltage of the output op amp (V_{CC} - Rail voltage); when the current decreases,V_{OUT}Decrease until the saturation voltage of the output op amp (GND + Rail voltage). Core guaranteeV_{OUT} in 0 .5~4.5V In order to ensure the consistency of mass manufacturing, there is a certain margin in this range, but it is not recommended for customers to use this margin.

When the input current exceeds the range,V_{OUT} The output is close to the rail voltage of the power supply. When the input current does not exceed the withstand limit of the chip, the voltage will always be maintained and the input current will return to the range After being within the range,V_{OUT}The output will return to normal without causing any damage to the chip.

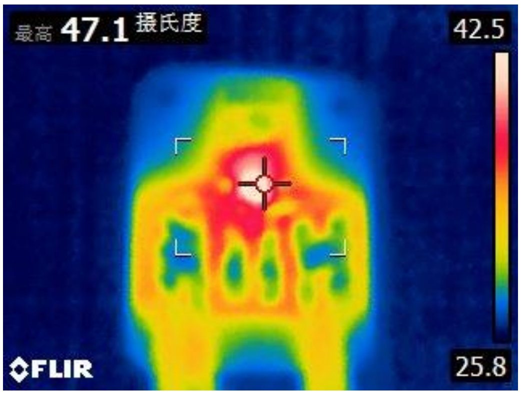
product name	Input Current	Sensitivity (mV/A)	Calculation formula (Note 1)
CC6902SO-05A	-5A ~ +5A	400	V_{OUT} = VCC / 2 + 0 .400 × I_P(A)⋯⋯(V)
CC6902SO-05B	-5A ~ +5A	185	V_{OUT} = VCC / 2 + 0 .185 × I_P(A)⋯⋯(V)
CC6902SO-10A	-10A ~ +10A	200	V_{OUT} = VCC / 2 + 0 .200 × I_P(A)⋯⋯(V)
CC6902SO-20A	-20A ~ +20A	100	V_{OUT} = VCC / 2 + 0 .100 × I_P(A)⋯⋯(V)
CC6902SO-30A	-30A ~ +30A	67	V_{OUT} = VCC / 2 + 0 .067 × I_P(A)⋯⋯(V)

Note 1 : This formula is only applicable to the calculation of DC current, when AC current is applied, please pay attention I_{PEAK} = 1 .414 × I_{RMS}, And pay attention to the positive or negative direction of the current.

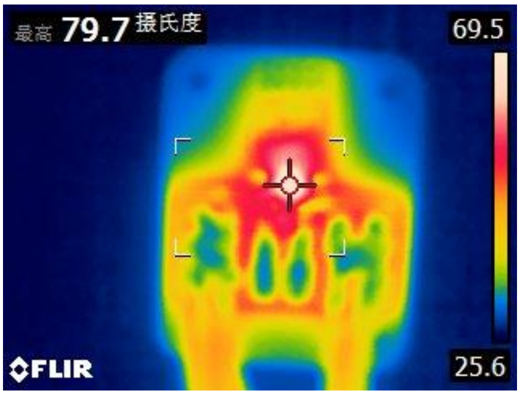
The relationship between package temperature and input current



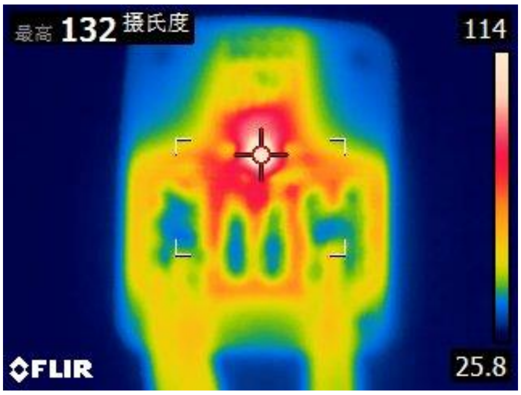
Input Current IP vs. Package temperature



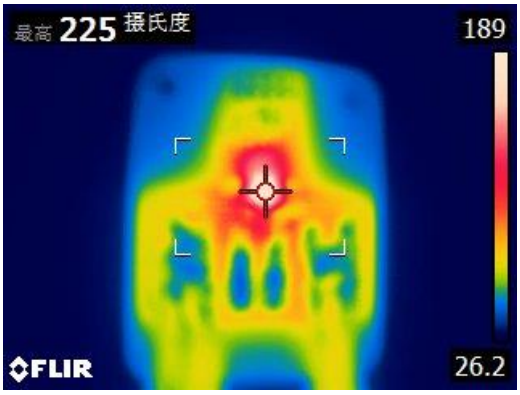
Package body thermal imaging diagram (input current 2 0 A)



Package body thermal imaging diagram (input current 3 0 A)

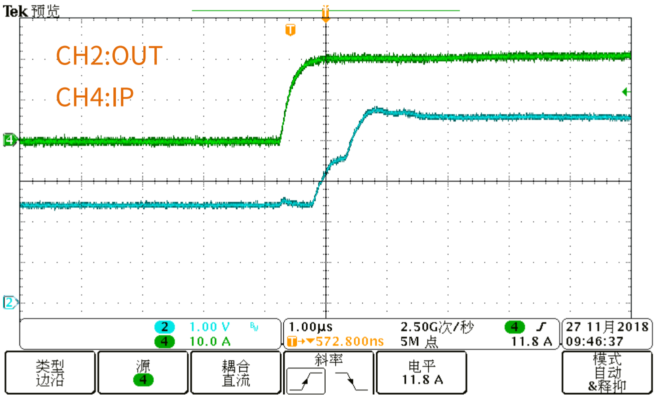


Package body thermal imaging diagram (input current 4 0 A)

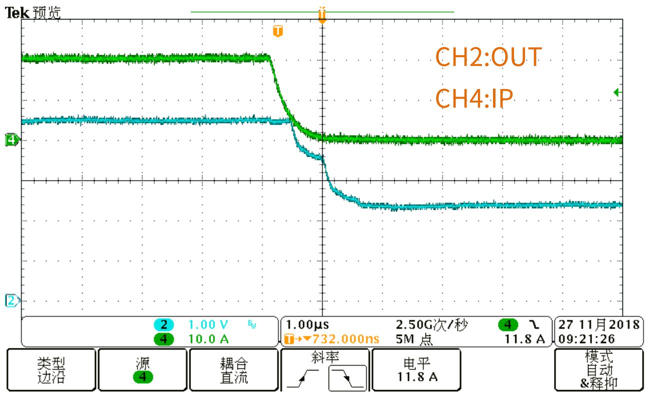


Package body thermal imaging diagram (input current 5 0 A)

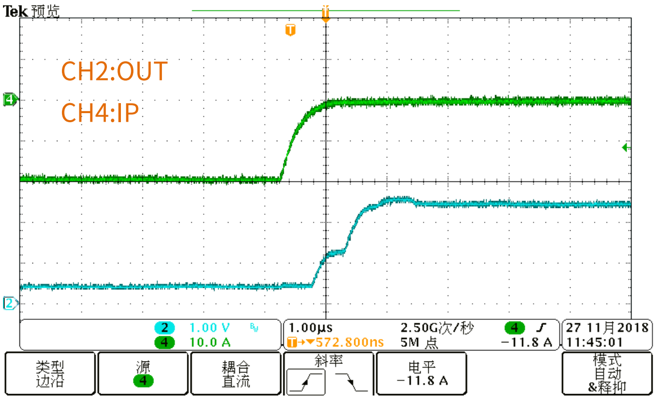
Curve & Wave (Unless otherwise specified, V_{CC}= 5 V @ 25 °C)



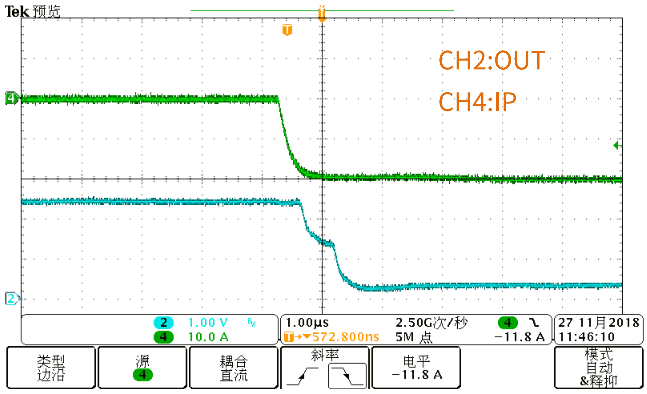
V_{OUT} vs. IP(Forward current rising edge response) (20 A)



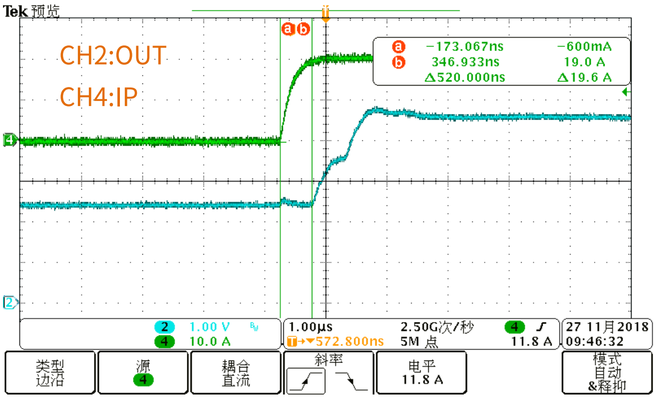
V_{OUT} vs. IP(Forward current falling edge response) (20 A)



V_{OUT} vs. IP(Response to rising edge of negative current) (20 A)

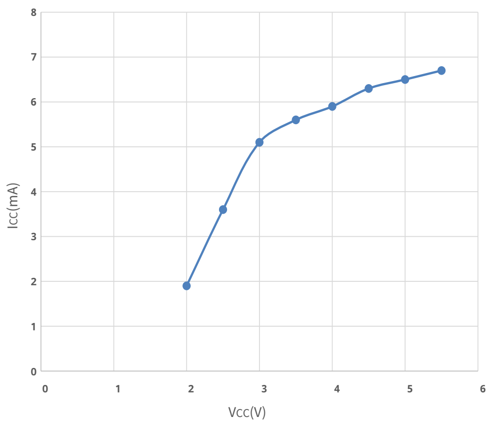


V_{OUT} vs. IP(Response to the falling edge of negative current) (20 A)

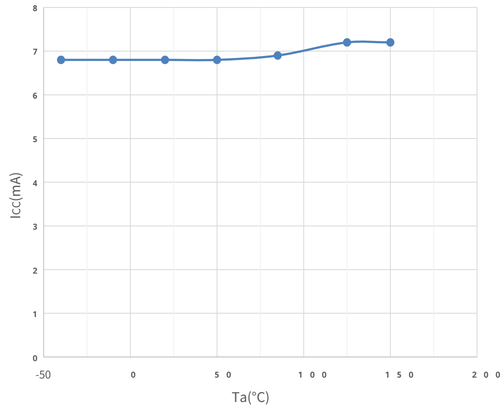


t_D Response time (20 A)

Quiescent Current

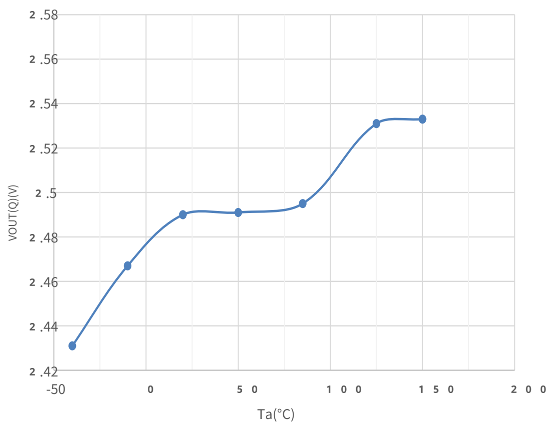


Icc vs. Vcc

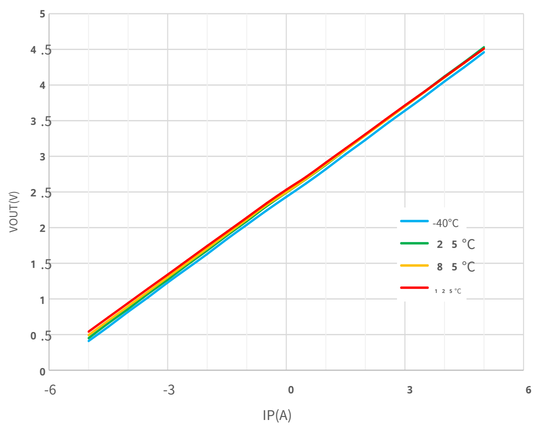


Icc vs. Ta

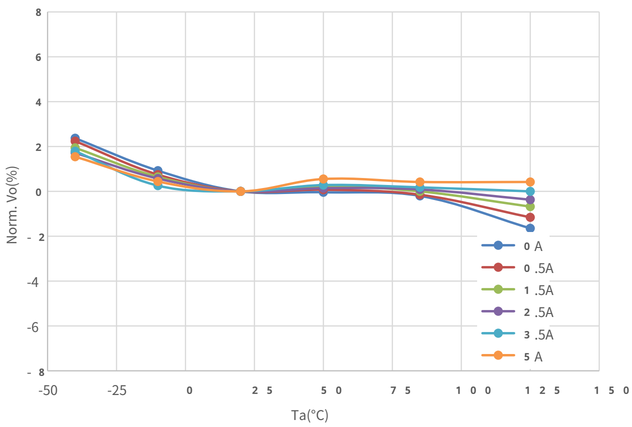
5 Aseries



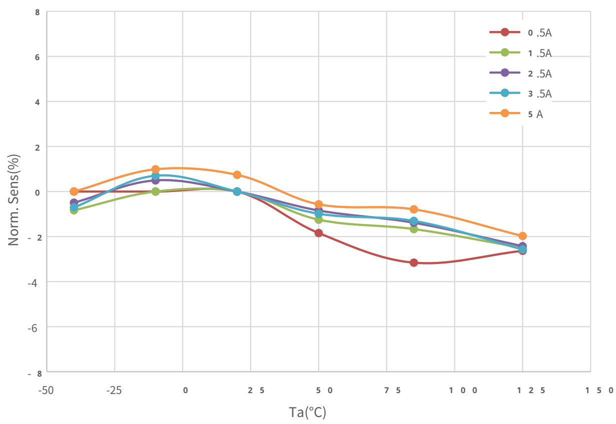
VOUT(Q) vs. Ta (5A)



VOUT vs. IP (5A)

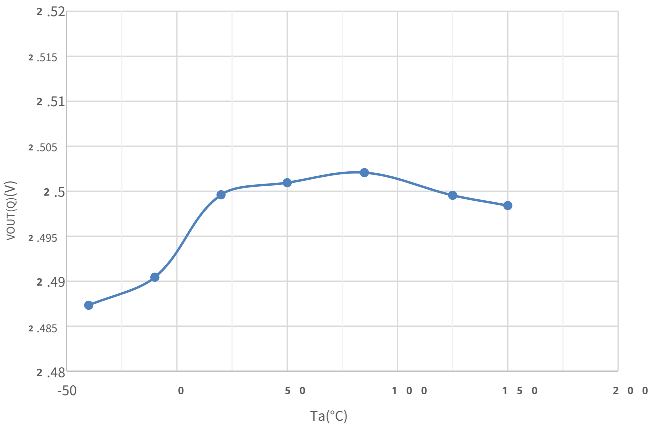


VOUT error vs. Ta (5A)

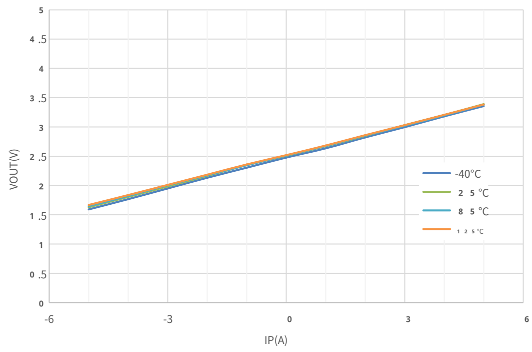


Sens error vs. Ta (5A)

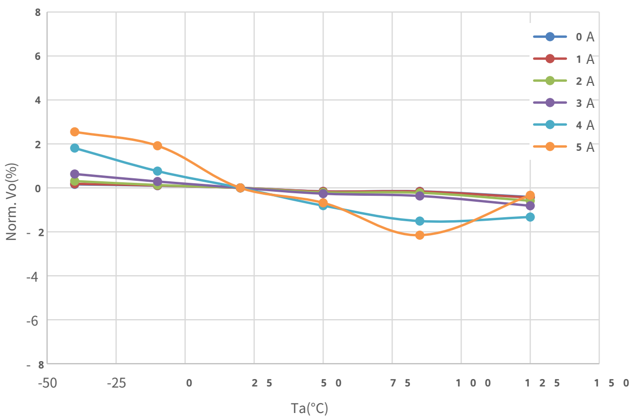
5 Bseries



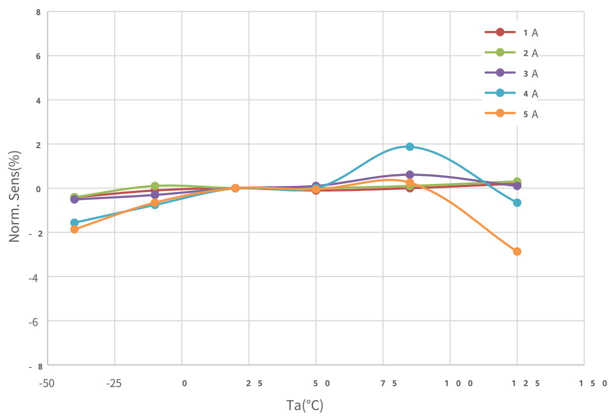
VOUT(Q) vs. Ta (5B)



VOUT vs. IP (5B)

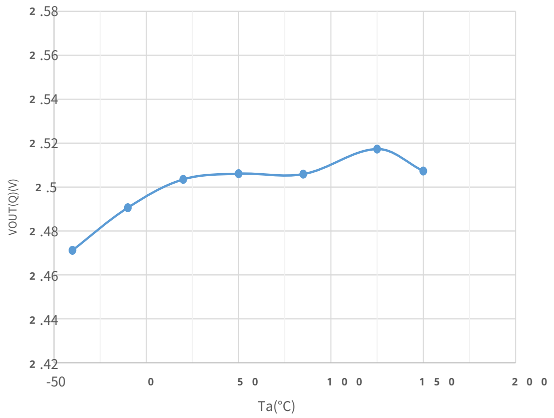


VOUT error vs. Ta (5B)

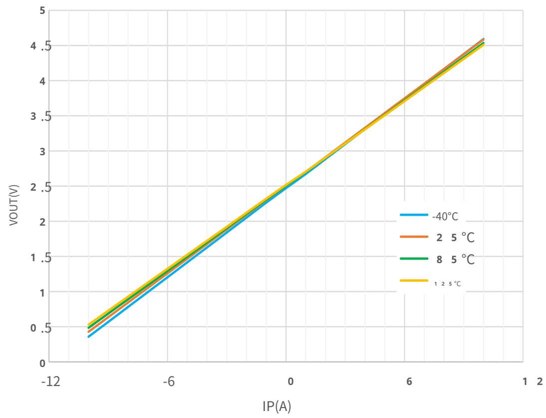


Sens error vs. Ta (5B)

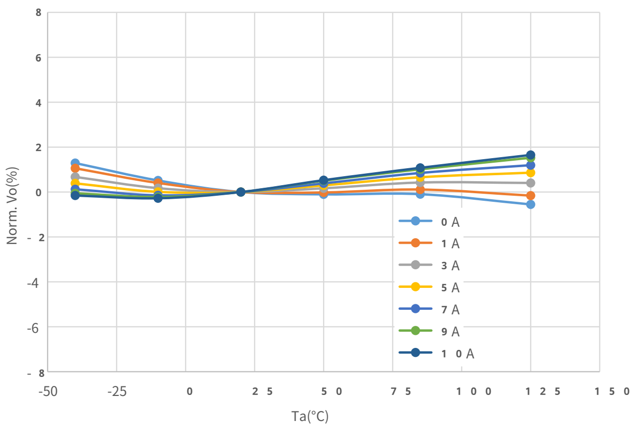
10Aseries



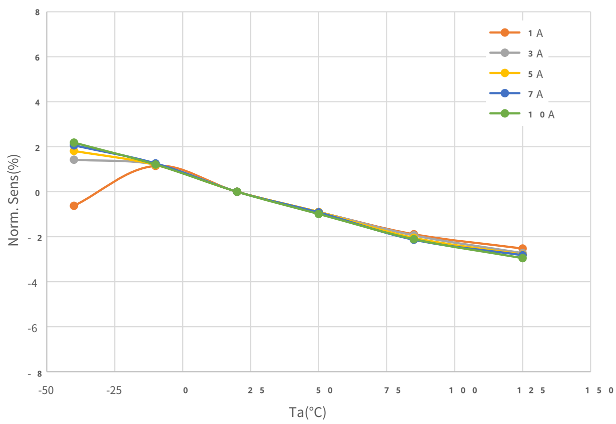
VOUT(Q) vs. Ta (10A)



VOUT vs. IP (10A)

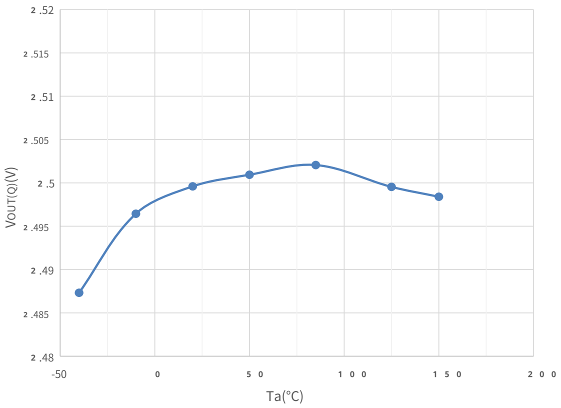


VOUT error vs. Ta (10A)

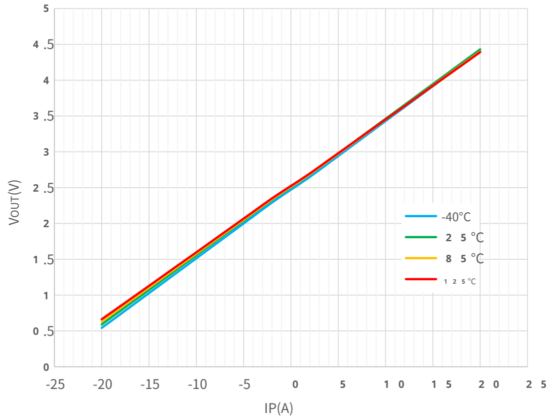


Sens error vs. Ta (10A)

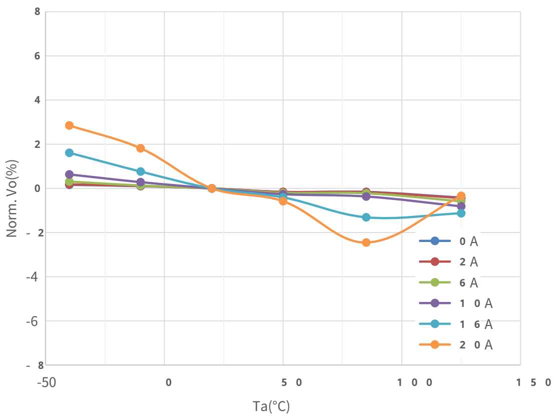
20A series



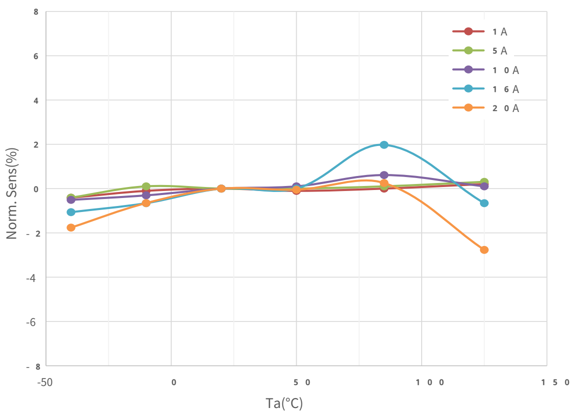
VOUT(Q) vs. Ta (20A)



VOUT vs. IP (20A)

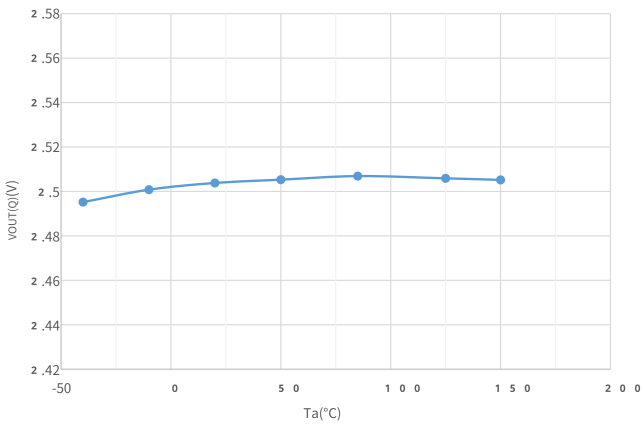


VOUT error vs. Ta (20A)

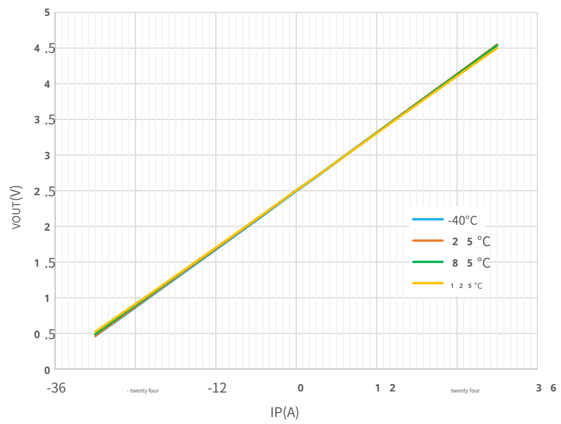


Sens error vs. Ta (20A)

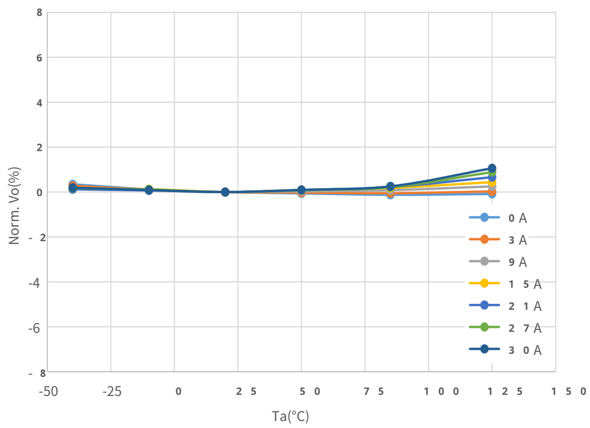
30Aseries



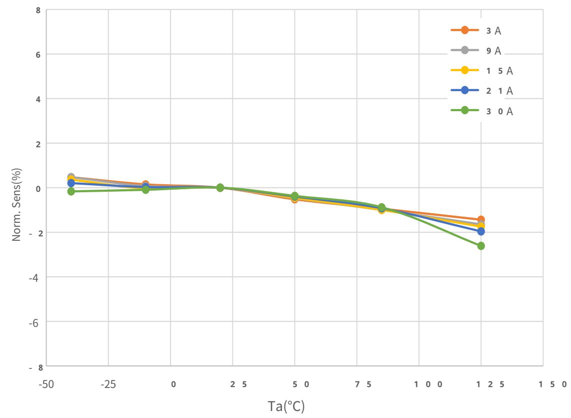
VOUT(Q) vs. Ta (30A)



VOUT vs. IP (30A)



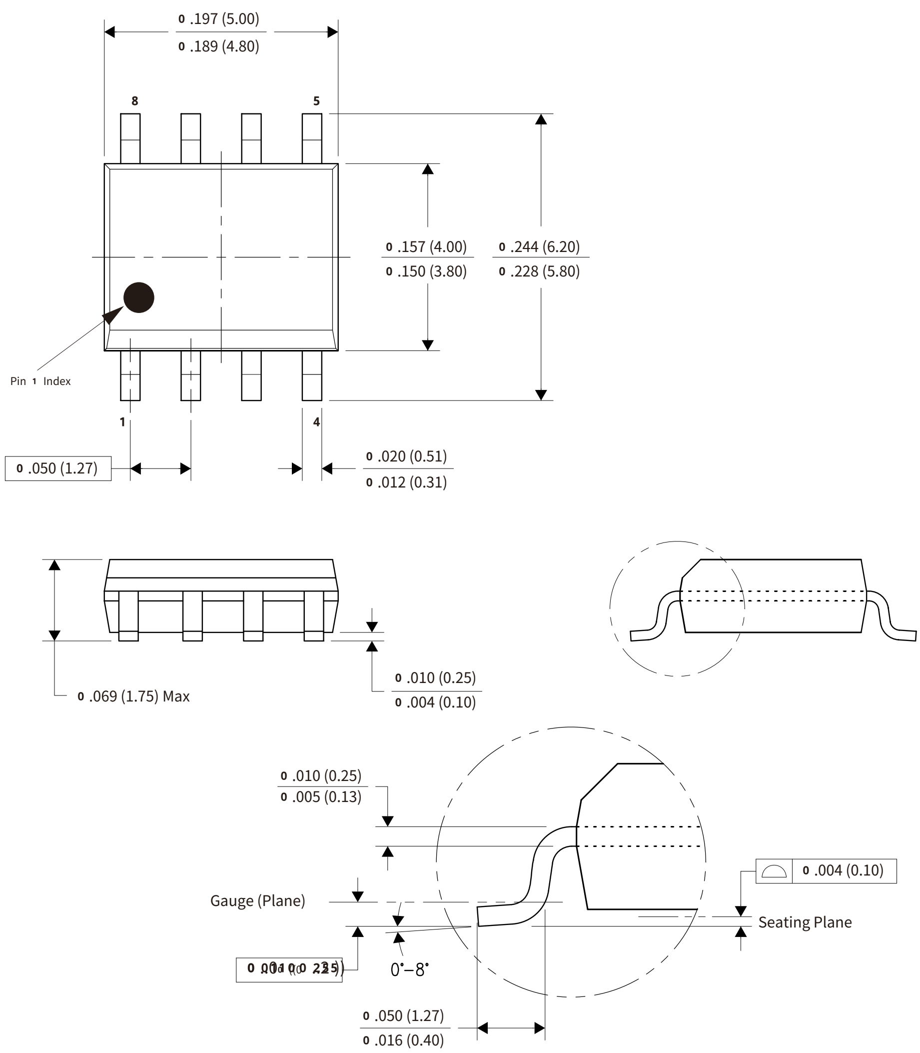
VOUT error vs. Ta (30A)



Sens error vs. Ta (30A)

Dimensions

SOP8 Encapsulation



note:

1 . The dimensions are in inches (millimeters).

Marking:

first row: CC6902SOproduct name

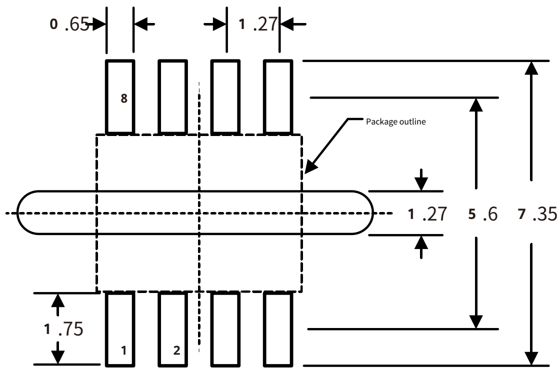
second line:ELC-XXA

- XX: Detection current range

The third row: XXYYWW

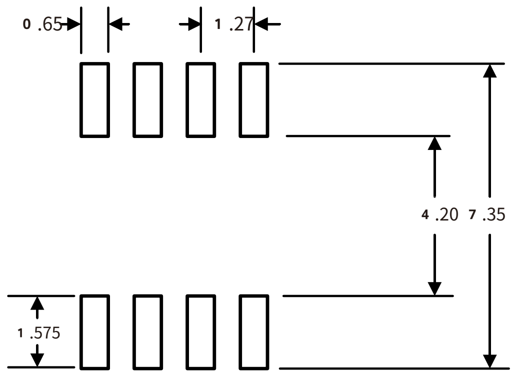
- XX – Code
- YY – Last two digits of the year
- WW – Number of weeks

Package reference



Reference one:PCB Grooving to increase creepage distance

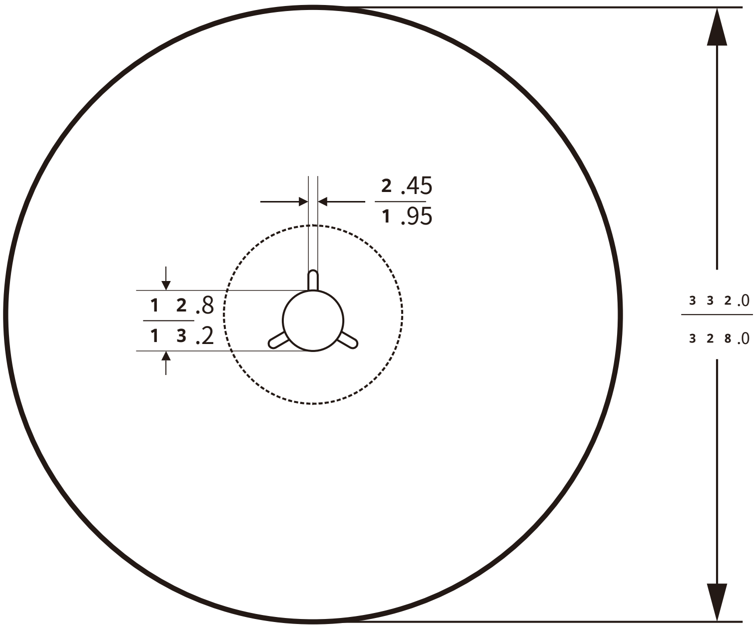
note:layout Layout requirements: under the chip, it is not recommended to wire,ProhibitTake the high current line



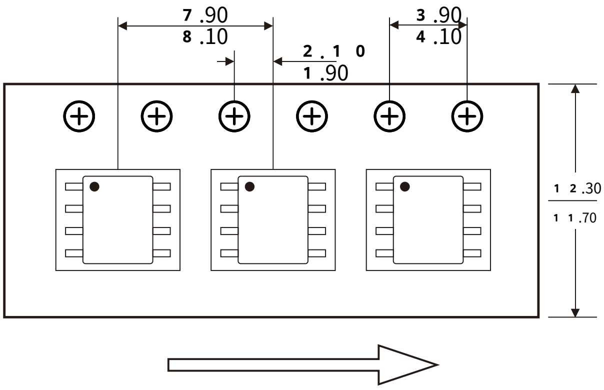
Reference 2 : Shorten the pad length and increase the creepage distance

note:layout Layout requirements: under the chip, it is not recommended to wire,ProhibitTake the high current line

Packaging & Taping



Reel size information



User Direction of Feed

Note: the front and back of each tape is empty 5 0 ±2 grid

About Xinjin

Chengdu Xinjin Electronics Co., Ltd. (CrossChip Microsystems Inc.)was founded in 2013 In 1995, it was a national high-tech enterprise engaged in the design and sales of integrated circuits. The company has strong technical strength and has more than 40 patents of various types, which are mainly used in Hall sensor signal processing. It has the following product lines:

- ✓ High-precision linear Hall sensor
- ✓ Various Hall switches
- ✓ Single-phase motor driver
- ✓ Single chip current sensor
- ✓ AMRMagnetoresistive sensor

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