CC6920B

High Performance Hall Effect Current Sensor

5A/10A/20A/25A/30A/40A/50A

overview

CC6920B is a high-performance Hall-effect current sensor, which can measure DC or AC current more effectively, and has high precision, excellent linearity and temperature stability, and is widely used

Used in industrial, consumer and communication equipment.

CC6920B integrates a high-precision, low-noise linear Hall circuit and a low-impedance main current wire inside. The input current flows through the internal 0.9mÿ wire, which generates a magnetic field at

The corresponding electrical signal is induced on the Hall circuit, and the voltage signal is output by the internal processing circuit, making the product easy to use. Low-impedance wires minimize power loss and heat dissipation, and the internal

Internal intrinsic insulation provides a basic working isolation voltage of 600V and an insulation withstand voltage of 3500VRMS between the input current path and the secondary circuit . The linear Hall circuit is made of advanced BiCMOS

Process production, including high-sensitivity Hall sensor components, Hall signal pre-amplifier, common-mode magnetic field suppression circuit, temperature compensation unit, oscillator, dynamic offset elimination circuit and amplifier output

module. In the case of no current, the static output is 50% VCC.

Under the condition of power supply voltage 3.3V, the output can vary linearly with the magnetic field between 0.33V and 2.97V, and the linearity can reach 0.1%. The differential common-mode rejection circuit integrated inside CC6920B can

The chip output is not affected by external interference magnetic signals; the integrated dynamic offset elimination circuit makes the sensitivity of IC not affected by external pressure and IC package stress.

The CC6920B is available in a SOP8 package with an operating temperature range of -40 to +125°C and is RoHS compliant.

characteristic

ÿ Provide 0.5VCC zero-current reference output, providing more flexible application mode

ÿ Wide measurement range, 5A, 10A, 20A, 25A, 30A, 40A, 50A, various ranges are optional

ÿ High isolation withstand voltage, safe isolation voltage of 3500VRMS from wire pin to signal pin

ÿ Low loss, wire resistance 0.9mÿ

ÿ High bandwidth, up to 250kHz, step response time 1.2ÿs

ÿ Normal temperature error 0.5%, full temperature range error ± 3%

ÿ Good temperature stability, using patented Hall signal amplifier circuit and temperature compensation circuit

ÿ Differential Hall structure, strong ability to resist external magnetic interference

ÿ Anti-mechanical stress, magnetic parameters will not shift due to external pressure

ÿ ESD (HBM) 4000V

application

ÿ Motor control

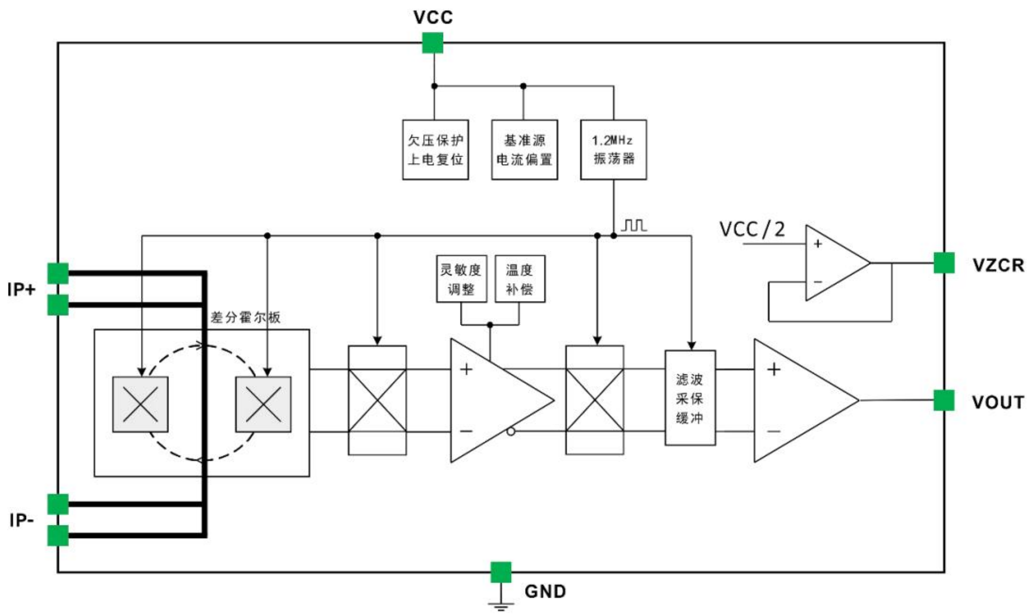
ÿ Load monitoring system

ÿ Switching power supply

ÿ Overcurrent fault protection

ÿ Other applications requiring current detection

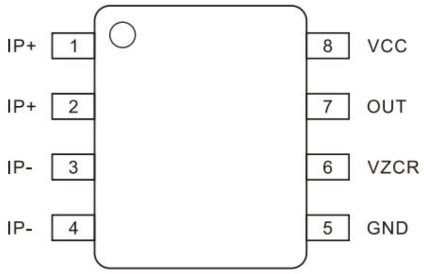
Functional block diagram



Ordering Information

product name	Sensitivity (mV/A)	Package Outline	Package
CC6920BSO-05A	264	SOP8	Tape, 2000pcs/roll
CC6920BSO-10A	132	SOP8	Tape, 2000pcs/roll
CC6920BSO-20A	66	SOP8	Tape, 2000pcs/roll
CC6920BSO-25A	52.8	SOP8	Tape, 2000pcs/roll
CC6920BSO-30A	44	SOP8	Tape, 2000pcs/roll
CC6920BSO-40A	33	SOP8	Tape, 2000pcs/roll
CC6920BSO-50A	26.4	SOP8	Tape, 2000pcs/roll

Pin definition



SOP8 package

name	Numbering	Function	name	Numbering	Function
IP+	1	Sampling current positive terminal	GND	5	land
IP+	2	Sampling current positive terminal	VZCR	6	Zero current reference signal output
IP-	3	Sampling current negative terminal	OUT	7	signal output port
IP-	4	Sampling current negative terminal	VCC	8	voltage

Limit parameter

parameter	symbol	value	unit
voltage	VCC	7	IN
The output voltage	VOUT	-0.3~VCC+0.3	IN
output source current	IOUT(SOURCE)	6	mA
Output sink current	IOUT(SINK)	30	mA
Universal insulation voltage	TOTAL	3500	VRMS
Input current peak current (3 seconds)	IPEAK	100	A
Input current Continuous current	ICON	40	A
Working temperature	PER	-40~125	°C
maximum junction temperature	TJ	165	°C
storage ambient temperature	TS	-55~150	°C
Magnetic field strength	B	unlimited	mT
Static protection	ESD(HBM)	4000	IN

CAUTION: Do not exceed maximum ratings when applying to prevent damage. Exposure to maximum ratings for extended periods of time may affect device reliability.

isolation characteristics

parameter	symbol	Test Conditions/Comments	Numerical unit	
Dielectric strength test voltage	TOTAL	Type test 50/60Hz, 1min	3500	VRMS
	VTEST	t = 1s (100% production)	3900	VRMS
Basic insulation working voltage VWFSI		basic insulation	600	VPK
		UL standard 62368-1:2014	424	VRMS
Electrical clearance		Input to output, minimum distance	3.8	mm
Maximum repetitive peak isolation voltage VIORM		AC voltage (bipolar)	600	VPK
Maximum working isolation voltage VIOWM		AC voltage (sine wave)	424	VRMS
		DC voltage	600	VDC
Maximum Transient Isolation Voltage	VIOTM	Type test, t = 60s	4949	VPK
	VTEST	t = 1s (100% production)	5515	
Maximum Surge Isolation Voltage (Note 1)	VIOSM	Type test VTEST = 1.3×VIOSM IEC 62368-1, 1.2/50µs waveform	6000	VPK

Note 1: Test in air or oil to determine the anti-surge capability of the chip itself.

Recommended working environment (unless otherwise specified, open environment, still air)

	symbol	minimum value	maximum value	unit
Input voltage(Note 1)	VIN+,VIN–(Note 1)	-600	600	VPK
Input current (DC/AC RMS) (Note2)	IP	-50	50	A
voltage	VCC	3.0	3.6	IN
ambient temperature	PER	-40	125	°C

Note 1: VIN+, VIN– refer to the voltage of current input pins IP+ and IP-, relative to pin 5 (GND).

Note 2: Decrease due to increase in ambient temperature.

Operating Characteristics (VCC=3.3V @ 25°C unless otherwise specified)

parameter	symbol	condition	Min Typ Max Unit			
electrical characteristics						
supply voltage	VCC	-	3.0	-	3.6	IN
Quiescent Current	ICC	OUT floating	-	20	25	mA
internal benchmark	VZCR		-	1.65	-	IN
Static output voltage	VOUTQ	IP=0	-	1.65	-	IN
Output capacitive load	CL		-	-	1	nF
Output resistive load	RL		1.5	-	-	kÿ
Main current terminal resistance	RP	IP=2A	-	0.9	1.2	mÿ
transmission delay time	tD			1	2	ÿs
Rise Time	tr		-	1	2.2	ÿs
Common Mode Rejection Ratio	CMRR		38	-	-	dB
system bandwidth	BW	-3dB	250	-	-	kHz
Reference output source current	IZCR(SOURCE)		-	-	400	ÿA

Continuing from the table

parameter	symbol	condition	Min Typ Max Unit			
electrical characteristics						
Reference output sinking current	IZCR(SINK)		·	·	3000	ÿA
Linearity error	LinERR		·	0.1	0.5	%
Symmetry error	SymERR		·	0.5	1.5	%
POR time	TPOR	output from 0 to 90%	·	10	-	ÿs

5A series

parameter	symbol	condition	Min Typ Max Unit			
current range	IP	·	-5	·	5	A
sensitivity	Meaning	full current range	258	264	270	mV/A
Zero Current Differential Output Error	fly		-30		30	mV
output noise	VN(P-P)		·	47	·	mV
Zero current output temperature coefficient	ÿVOUT(Q)		·	0.22	·	mV/ÿ
Sensitivity Temperature Coefficient	ÿSENS		·	0.020	·	mV/A/ÿ
total output error	ETOT		-2.0	-	2.0	%

10A series

parameter	symbol	condition	Min Typ Max Unit			
current range	IP	·	-10	·	10	A
sensitivity	Meaning	full current range	127	132	135	mV/A
Zero Current Differential Output Error	fly		-27		27	mV
output noise	VN(P-P)		·	37	·	mV
Zero current output temperature coefficient	ÿVOUT(Q)		·	0.22	·	mV/ÿ
Sensitivity Temperature Coefficient	ÿSENS		·	0.020	·	mV/A/ÿ
total output error	ETOT		-2.0	-	2.0	%

20A series

parameter	symbol	condition	Min Typ Max Unit			
current range	IP	·	-20	·	20	A
sensitivity	Meaning	full current range	63	66	69	mV/A
Zero Current Differential Output Error	fly		-17		17	mV
output noise	VN(P-P)		·	24	·	mV
Zero current output temperature coefficient	ÿVOUT(Q)		·	0.22	·	mV/ÿ
Sensitivity Temperature Coefficient	ÿSENS		·	0.013	·	mV/A/ÿ
total output error	ETOT		-2.0	-	2.0	%

25A series

parameter	symbol	condition	Min Typ Max Unit			
current range	IP	·	-25	·	25	A
sensitivity	Meaning	full current range	51	52.8	54	mV/A
Zero Current Differential Output Error	fly		-14		14	mV
output noise	VN(P-P)		·	20	·	mV
Zero current output temperature coefficient ÿVOUT(Q)			·	0.22	·	mV/ÿ
Sensitivity Temperature Coefficient	ÿSENS		·	0.011	·	mV/A/ÿ
total output error	ETOT		-2.0	-	2.0	%

30A series

parameter	symbol	condition	Min Typ Max Unit			
current range	IP	·	-30	·	30	A
sensitivity	Meaning	full current range	42	44	46	mV/A
Zero Current Differential Output Error	fly		-10		10	mV
output noise	VN(P-P)		·	20	·	mV
Zero current output temperature coefficient ÿVOUT(Q)			·	0.18	·	mV/ÿ
Sensitivity Temperature Coefficient	ÿSENS		·	0.010	·	mV/A/ÿ
total output error	ETOT		-2.0	-	2.0	%

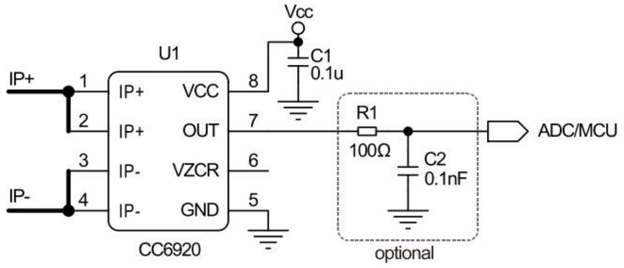
40A series

parameter	symbol	condition	Min Typ Max Unit			
current range	IP	·	-40	·	40	A
sensitivity	Meaning	full current range	32	33	34	mV/A
Zero Current Differential Output Error	fly		-7		7	mV
output noise	VN(P-P)		·	17	·	mV
Zero current output temperature coefficient ÿVOUT(Q)			·	0.14	·	mV/ÿ
Sensitivity Temperature Coefficient	ÿSENS		·	0.007	·	mV/A/ÿ
total output error	ETOT		-2.0	-	2.0	%

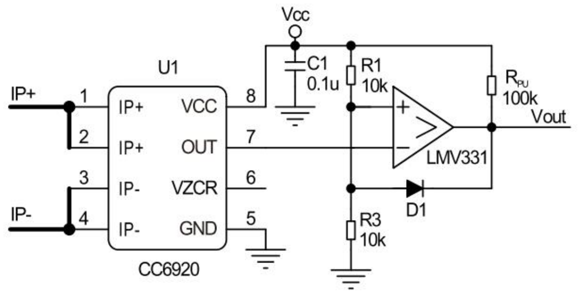
50A series

parameter	symbol	condition	Min Typ Max Unit			
current range	IP	·	-50	·	50	A
sensitivity	Meaning	full current range	25	26.4	27	mV/A
Zero Current Differential Output Error	fly		-7		7	mV
output noise	VN(P-P)		·	17	·	mV
Zero current output temperature coefficient ÿVOUT(Q)			·	0.11	·	mV/ÿ
Sensitivity Temperature Coefficient	ÿSENS		·	0.007	·	mV/A/ÿ
total output error	ETOT		-2.0	-	2.0	%

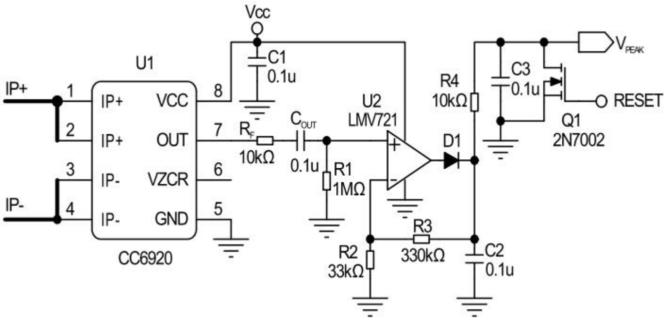
Typical Application Circuit



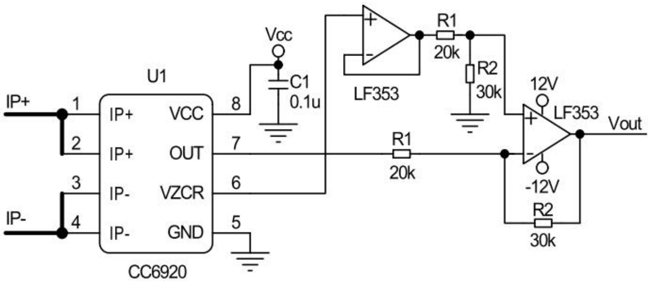
typical application



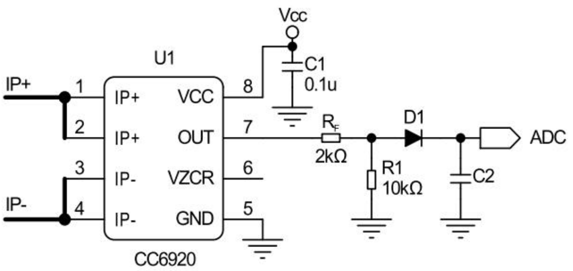
Overcurrent Fault Detector



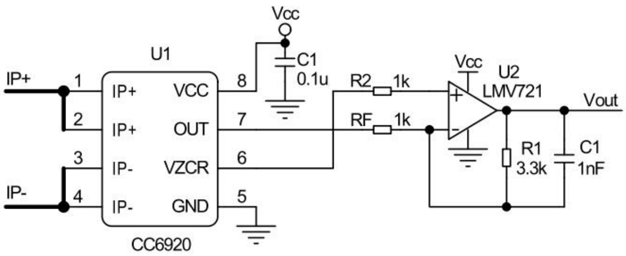
Current Peak Monitoring Applications



Zero Migration Application

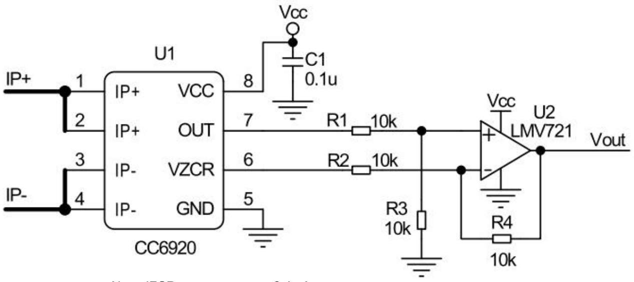


Rectified output, instead of current transformer application



Note: The output direction of VOUT

Gain Amplification Applications



Note: IZCR output current < 0.4mA

It is recommended to reserve a margin of 0.3mA when designing

Unidirectional Current Single Supply Zero Migration Application

Functional description

The CC6920B is a Hall sensor based precision current sensor with a basic isolated operating voltage of 600V, <3% full-scale error and zero-current reference signal over the entire temperature range. No. output, which can realize unidirectional or bidirectional current detection. The input current flows through a wire between the isolated input current pins, which has a resistance of 1mÿ at room temperature to reduce insertion loss. The magnetic field generated by the input current is sensed by Hall sensors and amplified by a sophisticated signal chain. Available for AC and DC current measurements with a bandwidth of 250kHz. Measuring current 5-50A, there are 7 kinds of electricity The flow range is selectable and can operate from a single 3.0V to 3.6V supply. Optimized for high accuracy and temperature stability, the CC6920B compensates for offset and sensitivity over the entire range.

The input current of CC6920B flows through the primary side of the package through the IP+ and IP- pins, and the current flowing through the chip will generate a magnetic field proportional to the input current, which is controlled by the isolated precision Hall The sensor IC performs the measurement. The low impedance leadframe path reduces power dissipation compared to other current measurement methods and does not require any external components on the primary side. In addition, the poor integration of internal The split common-mode suppression circuit can prevent the chip output from being affected by external interference magnetic signals, and only measures the magnetic field generated by the input current, thereby suppressing the interference of external magnetic fields.

The typical resistance of the primary current input leads is 0.9mÿ at 25°C. The lead frame is made of copper, the temperature coefficient of the input wire is positive, and the resistance of the wire increases with temperature, typically Its temperature coefficient is 3300ppm/°C, and the resistance of the primary side will increase by 33% for every 100°C increase in temperature.

Input Current

When in use, the primary side of the chip (package pins 1-4) is connected in series anywhere in the entire circuit. The input current flows from IP+ (package pin 1-2) to IP- (package pin 3-4) is positive, and vice versa burden. Do not connect resistors in parallel between IP+ and IP-, unless there are very special reasons - such as minimizing insertion loss - this will reduce the current flowing through the chip and reduce the resistance of the wires. It will be affected by temperature drift, and external temperature and accuracy corrections for the entire system are required.

output characteristics

The static output point of CC6920B (when IP = 0A) is VCC / 2.

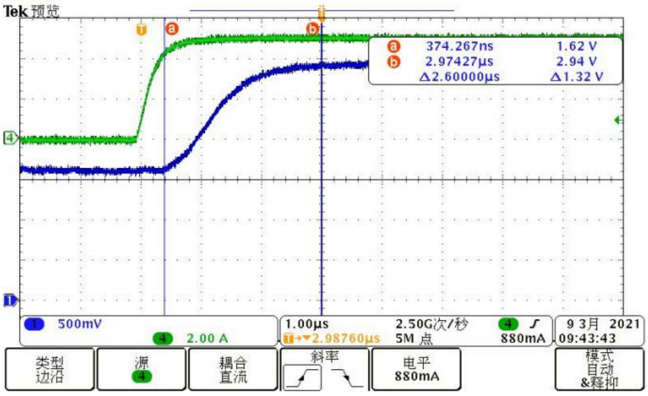
When the current increases, VOUT increases until the saturation voltage of the output op amp (VCC – rail voltage); when the current decreases, VOUT decreases until the saturation voltage of the output op amp (GND + rail voltage pressure). Xinjin guarantees the accuracy and linearity of VOUT within 0.33~2.97V. In order to ensure the consistency of mass production, there is a certain margin in this range, but customers are not recommended to use this margin.

When the input current exceeds the range, the output of VOUT tends to the rail voltage of the power supply. When the input current does not exceed the tolerance limit of the chip, the voltage will always be maintained, and the input current returns to the range. Within the range, the output of VOUT will return to normal without causing any damage to the chip.

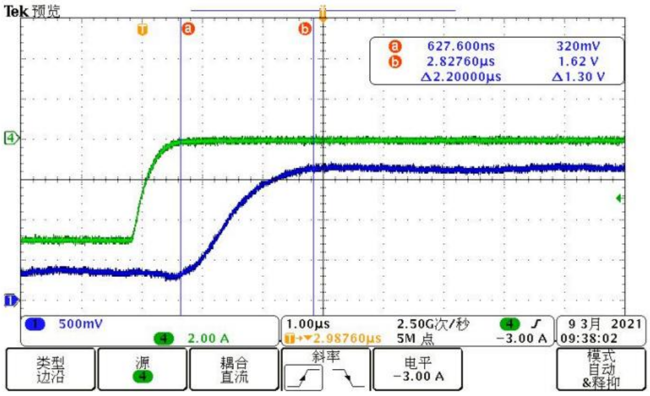
product name	Input current	sensitivity (mV/A)	Calculation formula (Note 1)
CC6920BSO-05A	-5A ~ +5A	264	VOUT = VCC / 2 + 0.264 × IP(A)……(V)
CC6920BSO-10A	-10A ~ +10A	132	VOUT = VCC / 2 + 0.132 × IP(A)……(V)
CC6920BSO-20A	-20A ~ +20A	66	VOUT = VCC / 2 + 0.066 × IP(A)……(V)
CC6920BSO-25A	-25A ~ +25A	52.8	VOUT = VCC / 2 + 0.0528 × IP(A)……(V)
CC6920BSO-30A	-30A ~ +30A	44	VOUT = VCC / 2 + 0.044 × IP(A)……(V)
CC6920BSO-40A	-40A ~ +40A	33	VOUT = VCC / 2 + 0.033 × IP(A)……(V)
CC6920BSO-50A	-50A ~ +50A	26.4	VOUT = VCC / 2 + 0.0264 × IP(A)……(V)

Note 1: This formula is only applicable to the calculation of DC current. When applying AC current, attention should be paid to IPEAK = 1.414 × IRMS, and attention should be paid to the positive and negative of the current direction.

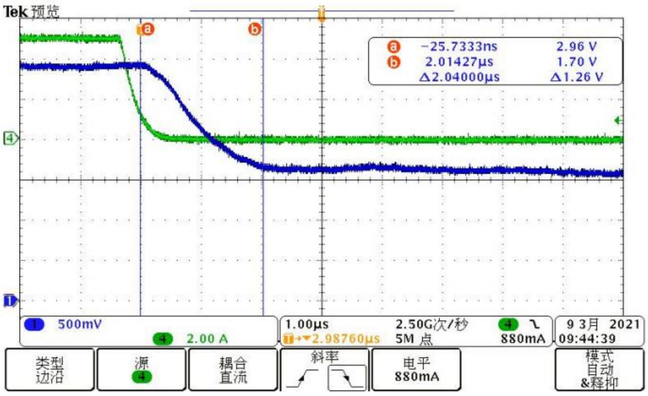
Curve & Waveform



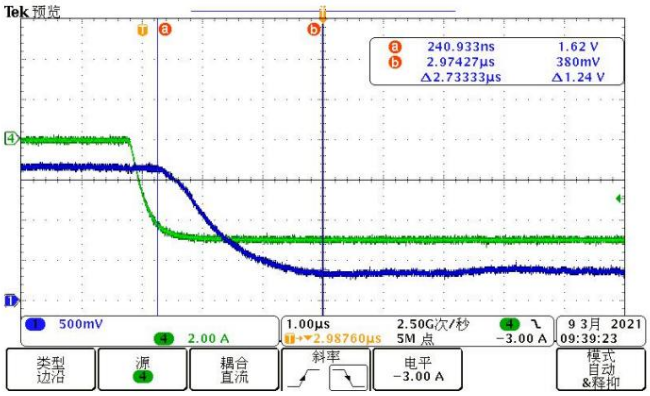
VOUT vs IP (Forward Current Rising Edge Step Response) (5A)



VOUT vs IP (Negative Current Rising Edge Step Response) (5A)

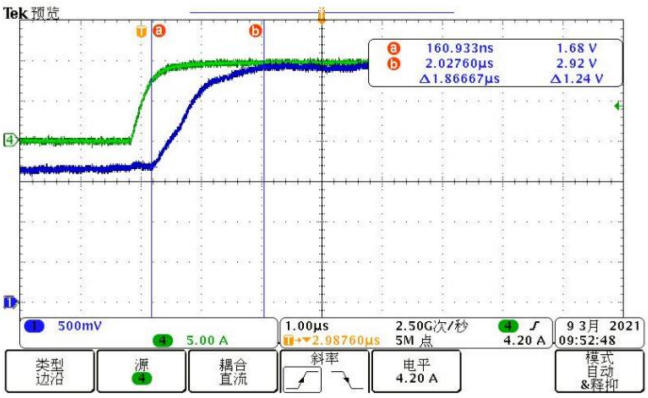


VOUT vs IP (Forward Current Falling Edge Step Response) (5A)

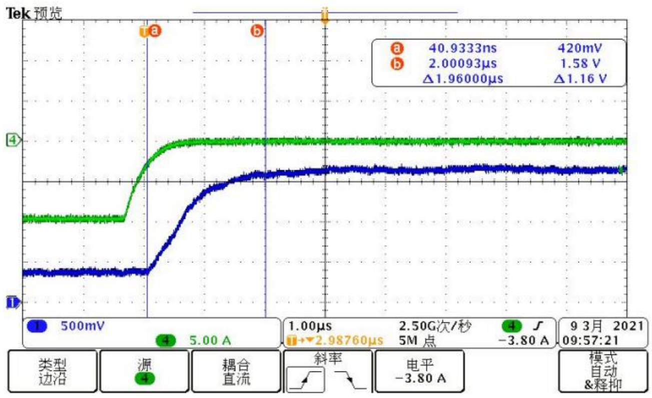


VOUT vs IP (Negative Current Falling Edge Step Response) (5A)

Curve & Waveform



VOUT vs IP (Forward Current Rising Edge Step Response) (10A)



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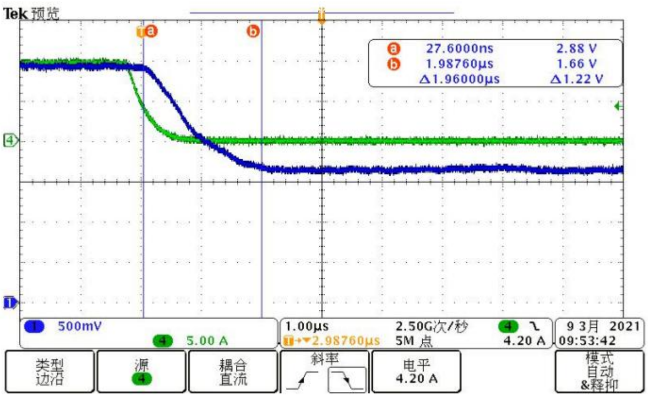

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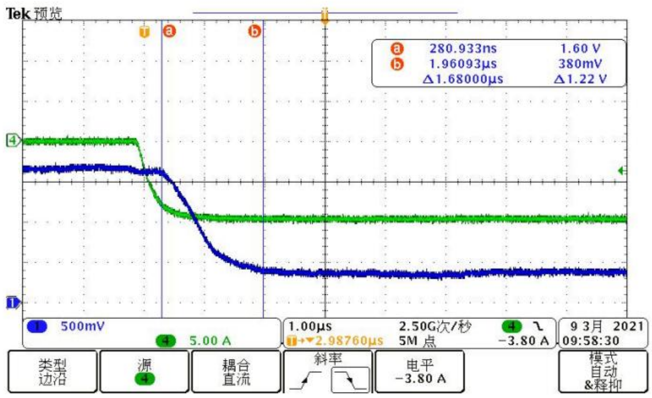
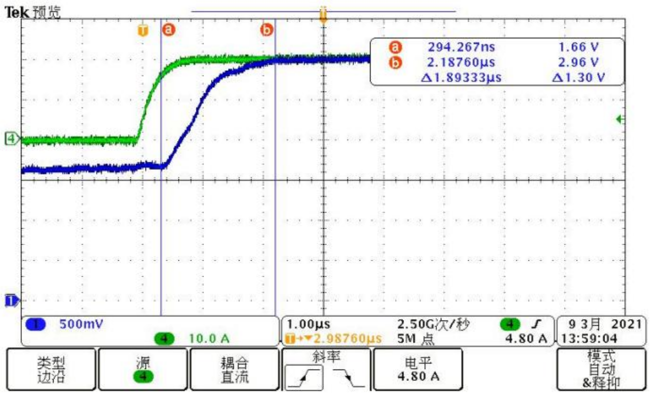
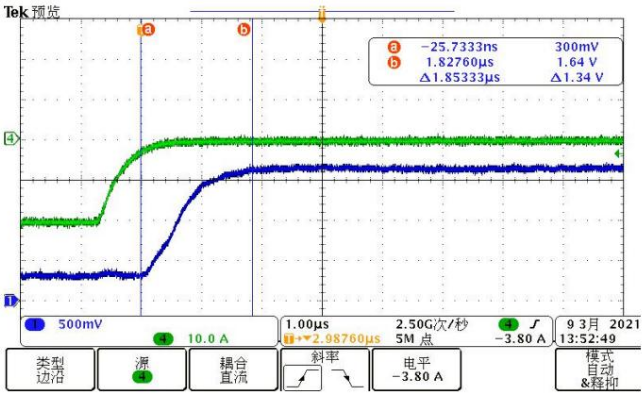


VOUT vs IP (Negative Current Falling Edge Step Response) (10A)

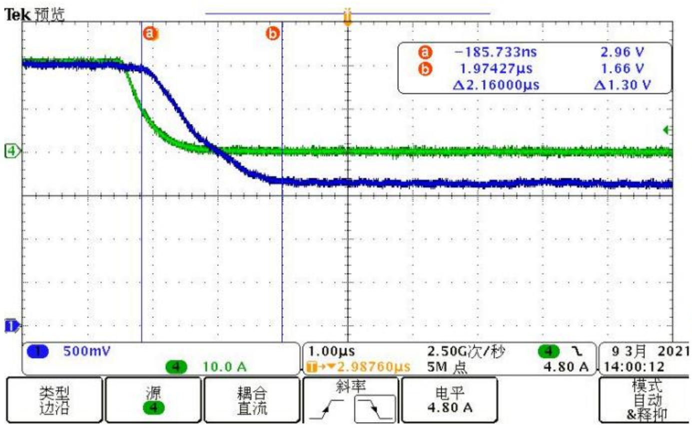
Curve & Waveform



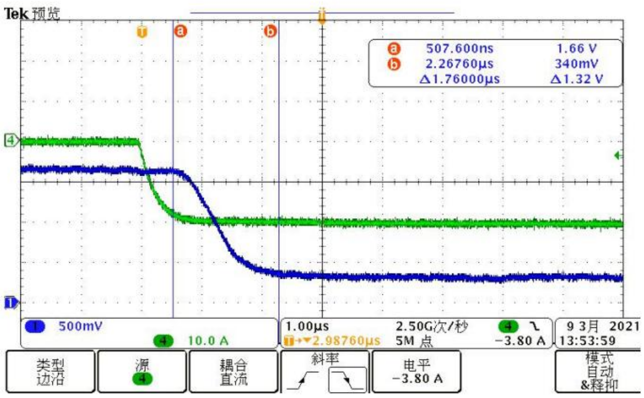
VOUT vs IP (Forward Current Rising Edge Step Response) (20A)



VOUT vs IP (Negative Current Rising Edge Step Response) (20A)

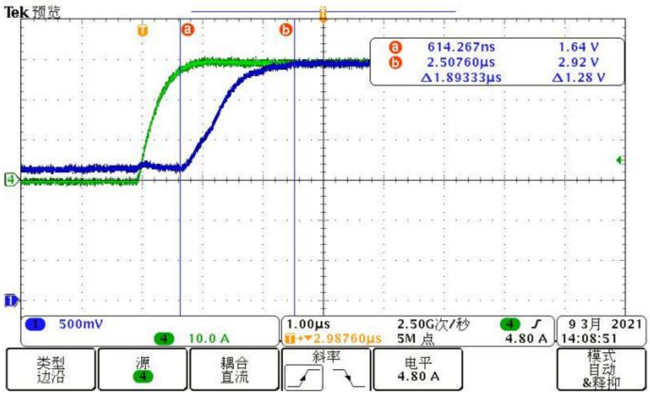


VOUT vs IP (Forward Current Falling Edge Step Response) (20A)

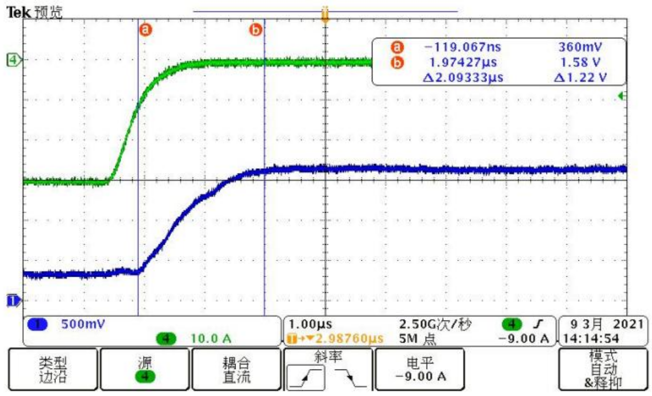


VOUT vs IP (Negative Current Falling Edge Step Response) (20A)

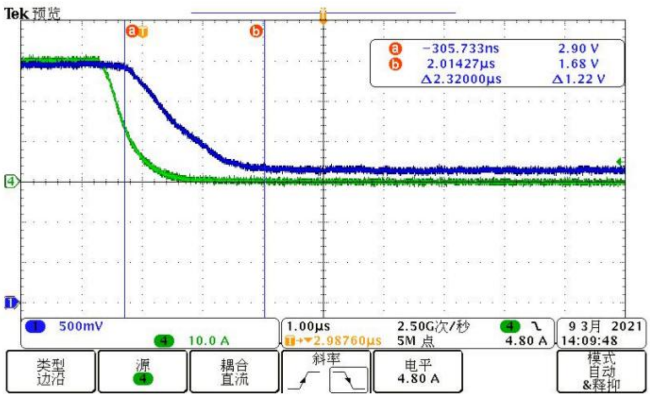
Curve & Waveform



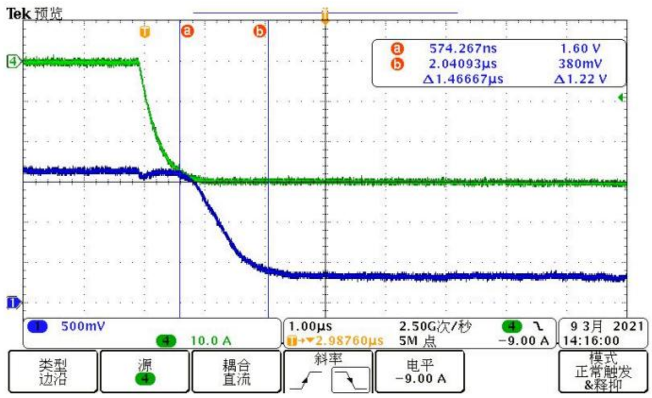
VOUT vs IP (Forward Current Rising Edge Step Response) (30A)



VOUT vs IP (Negative Current Rising Edge Step Response) (30A)

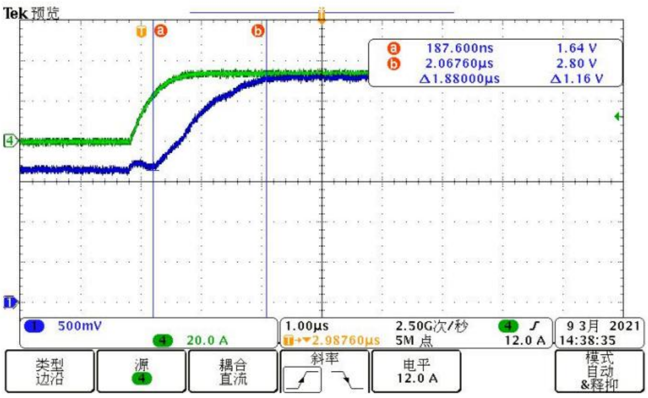


VOUT vs IP (Forward Current Falling Edge Step Response) (30A)

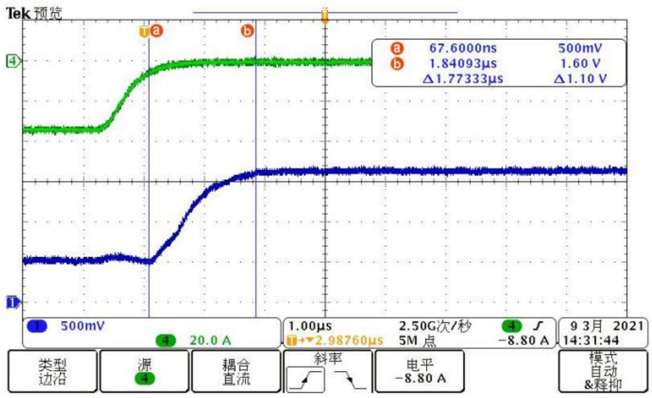


VOUT vs IP (Negative Current Falling Edge Step Response) (30A)

Curve & Waveform



VOUT vs IP (Forward Current Rising Edge Step Response) (40A)



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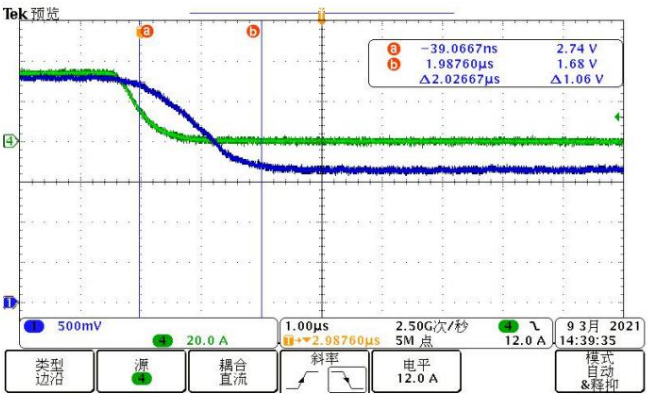
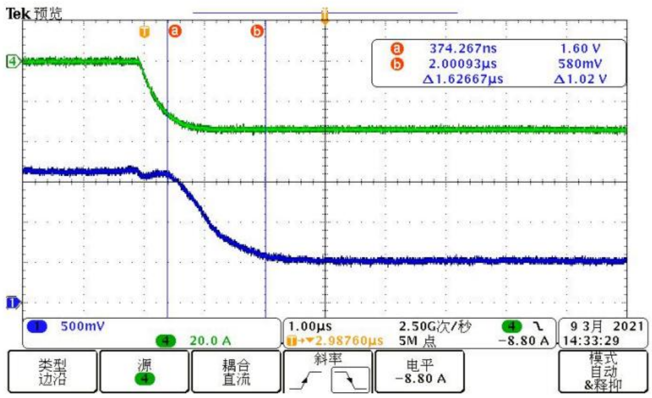
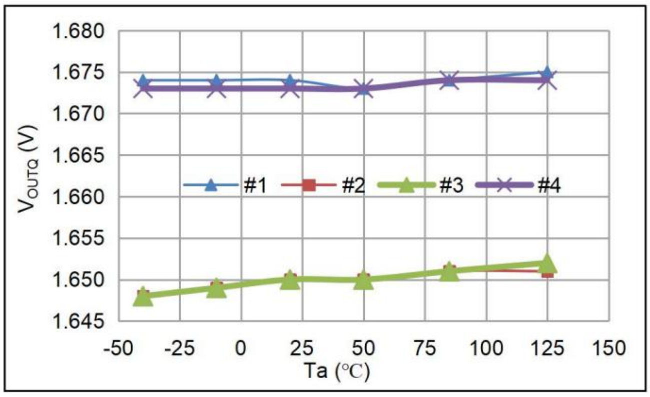


VOUT vs IP (Forward Current Falling Edge Step Response) (40A)

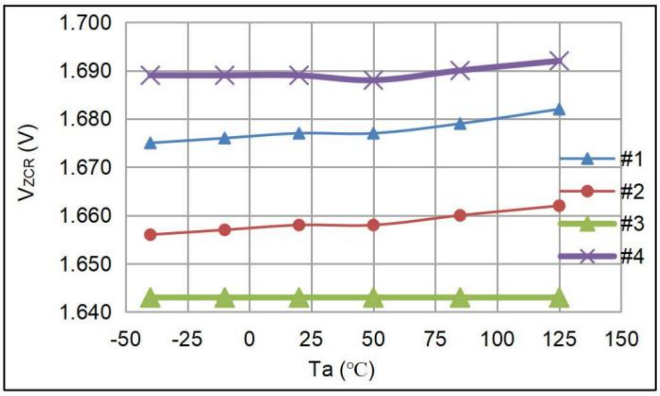


VOUT vs IP (Negative Current Falling Edge Step Response) (40A)

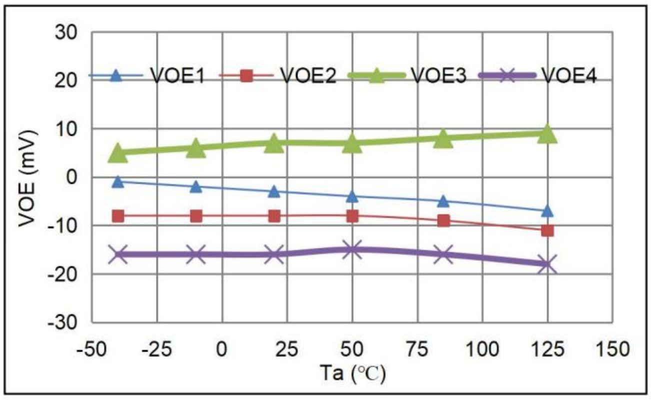
10A series



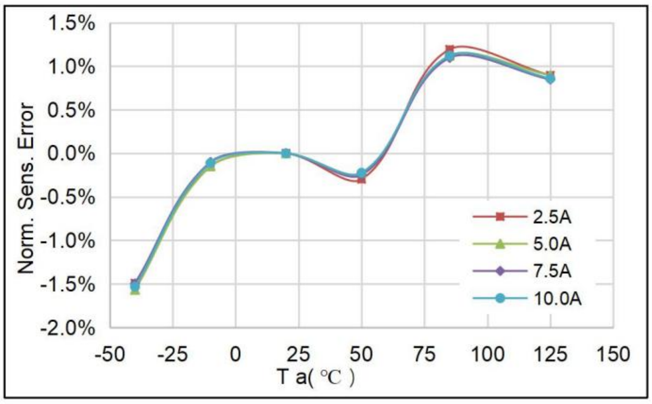
VOUTQ vs. Ta



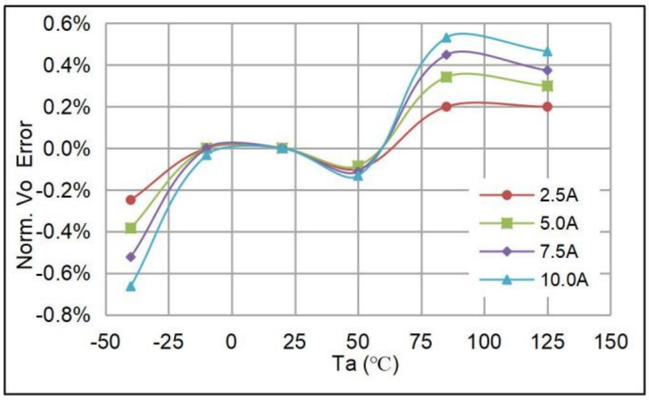
VZCR vs. Ta



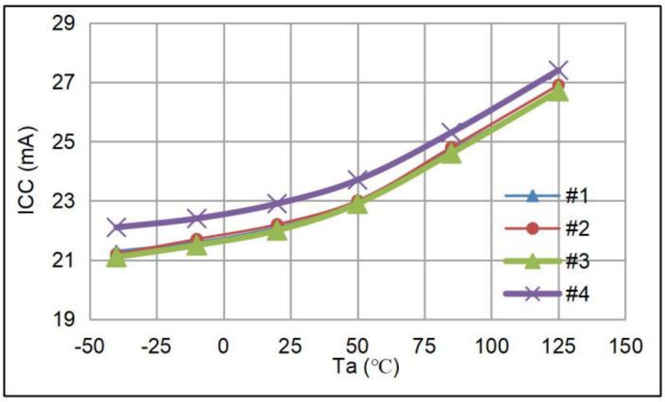
VOE vs. Ta



Sensing error vs. Ta

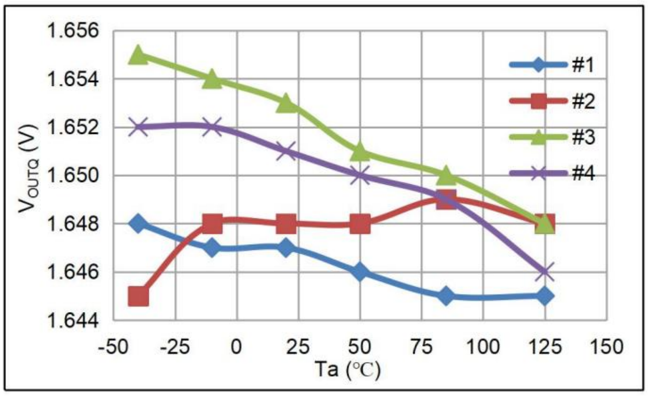


VOUT error vs. Ta

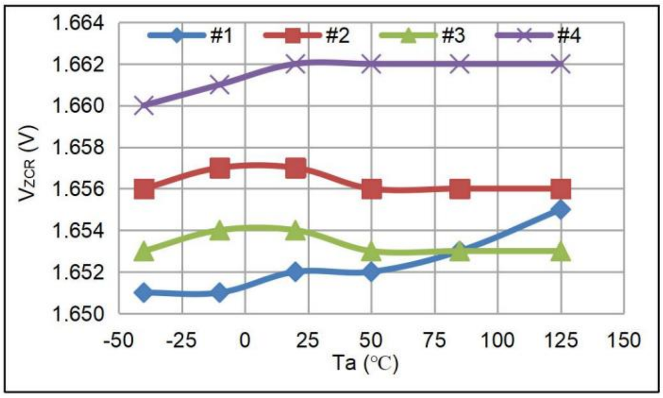


ICC vs. Ta

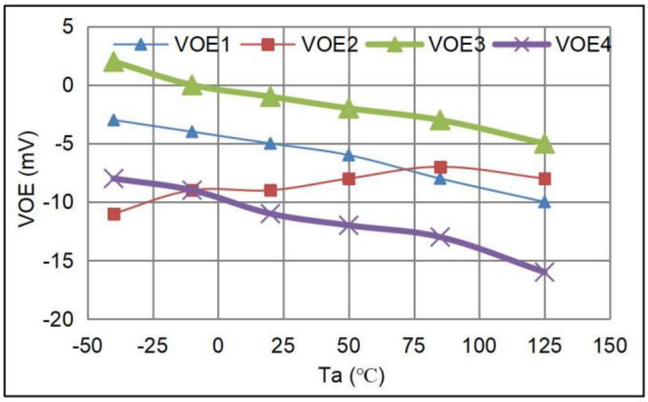
20A series



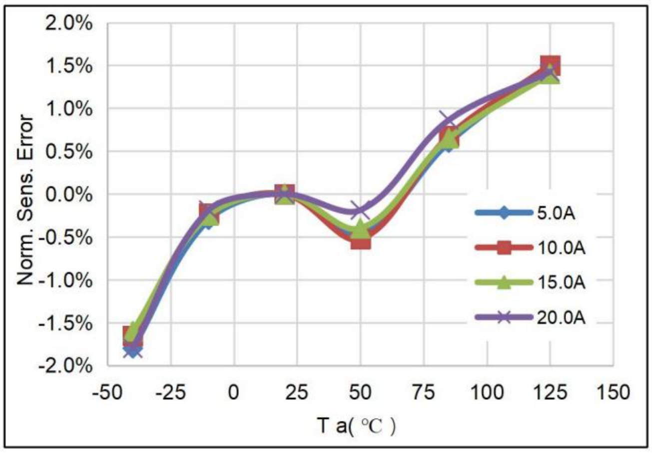
VOUTQ vs. Ta



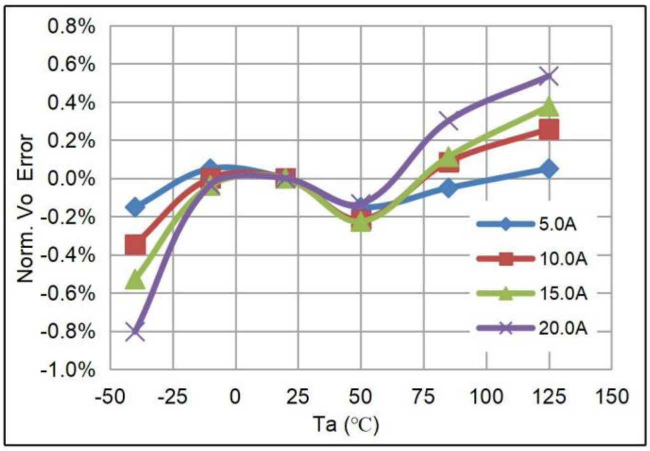
VZCR vs. Ta



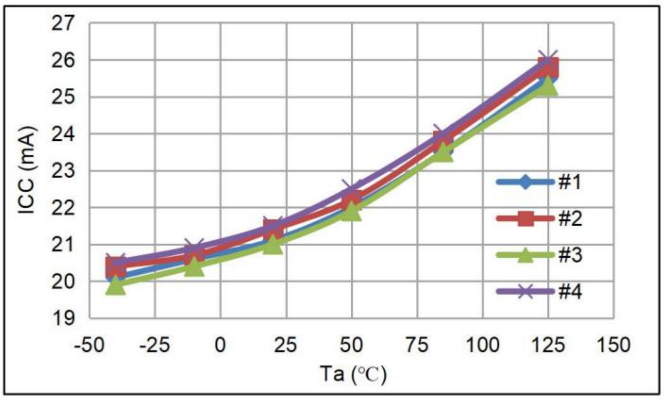
VOE vs. Ta



Sensing error vs. Ta

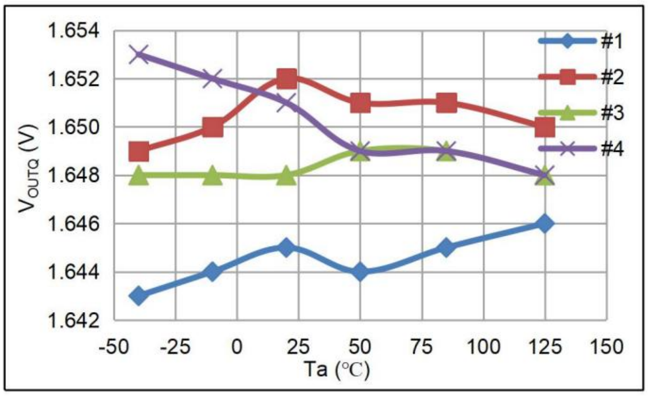


VOUT error vs. Ta

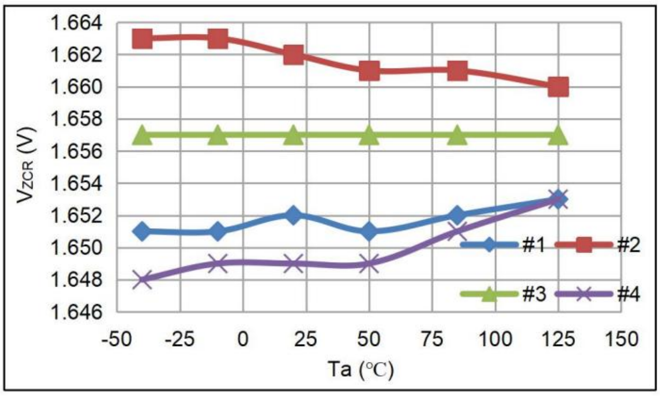


ICC vs. Ta

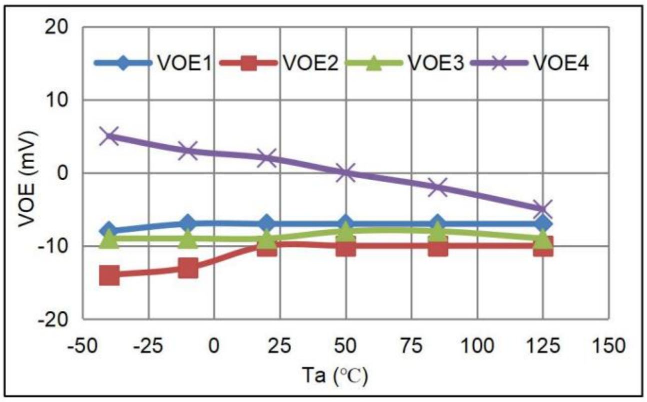
30A series



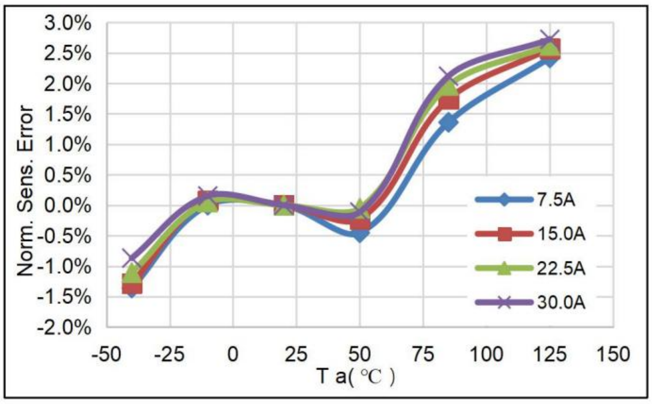
VOUTQ vs. Ta



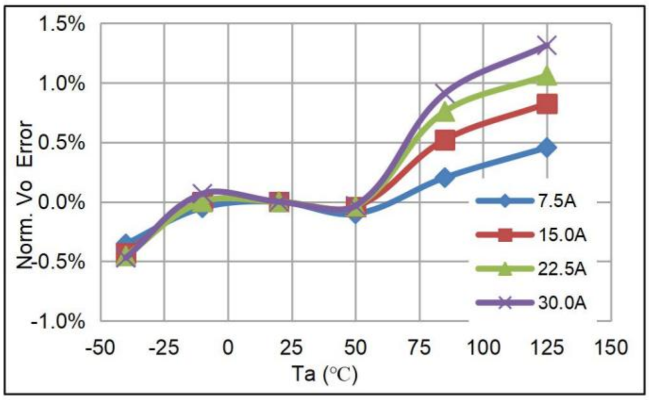
VZCR vs. Ta



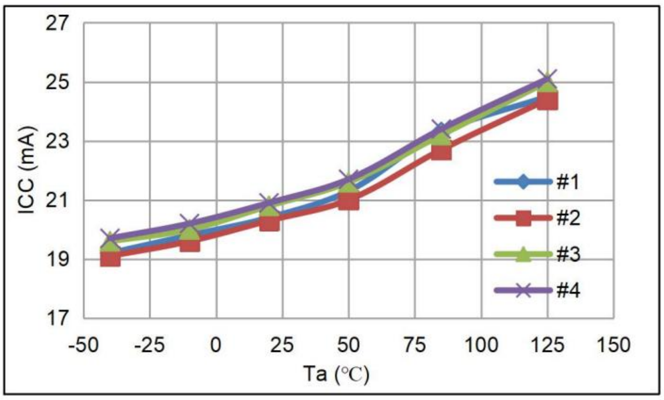
VOE vs. Ta



Sensing error vs. Ta

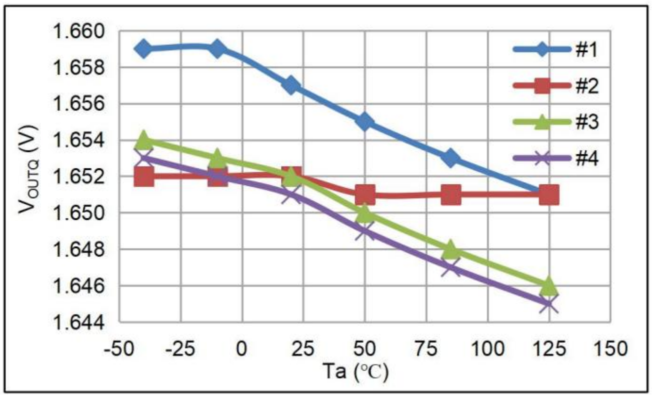


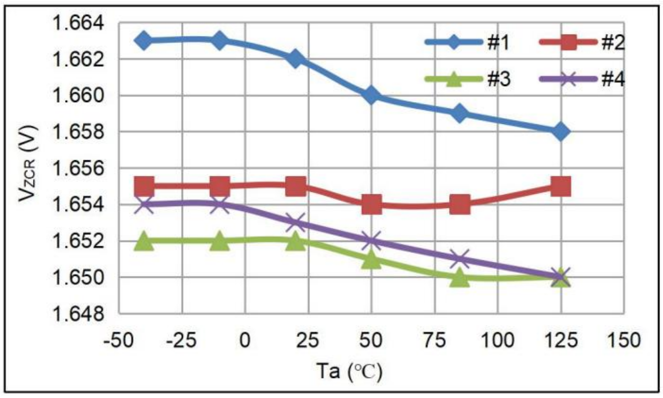
VOUT error vs. Ta



ICC vs. Ta

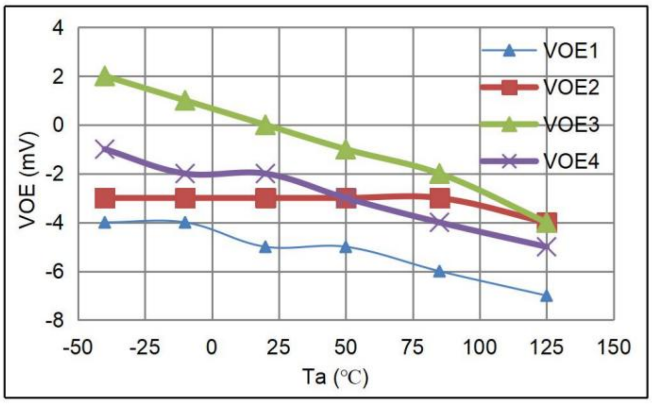
40A series

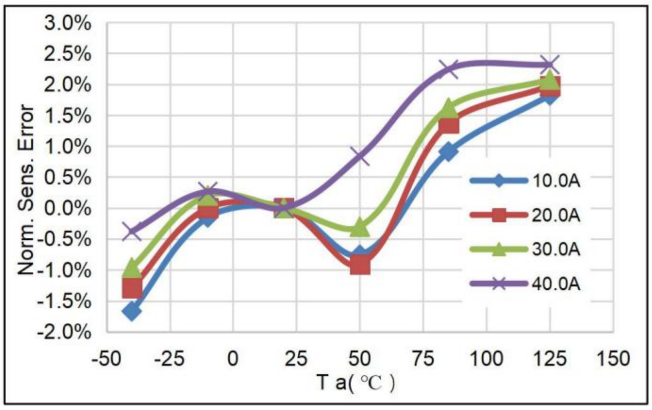




VOUTQ vs. Ta

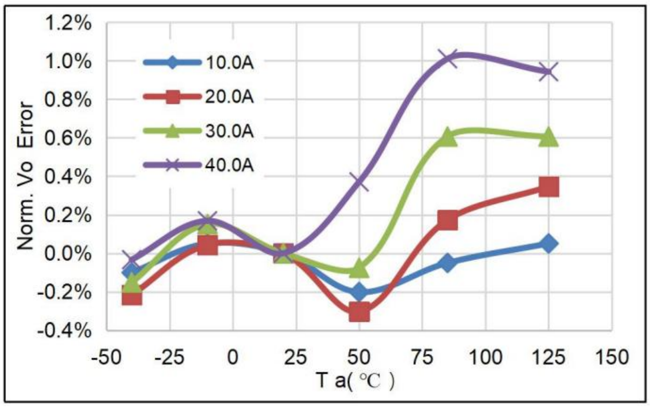
VZCR vs. Ta

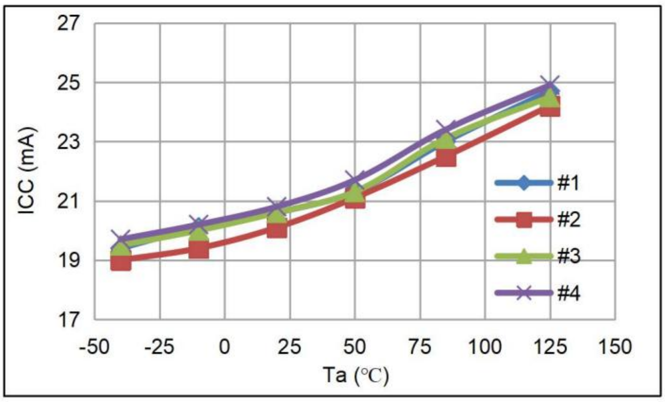




VOE vs. Ta

Sensing error vs. Ta



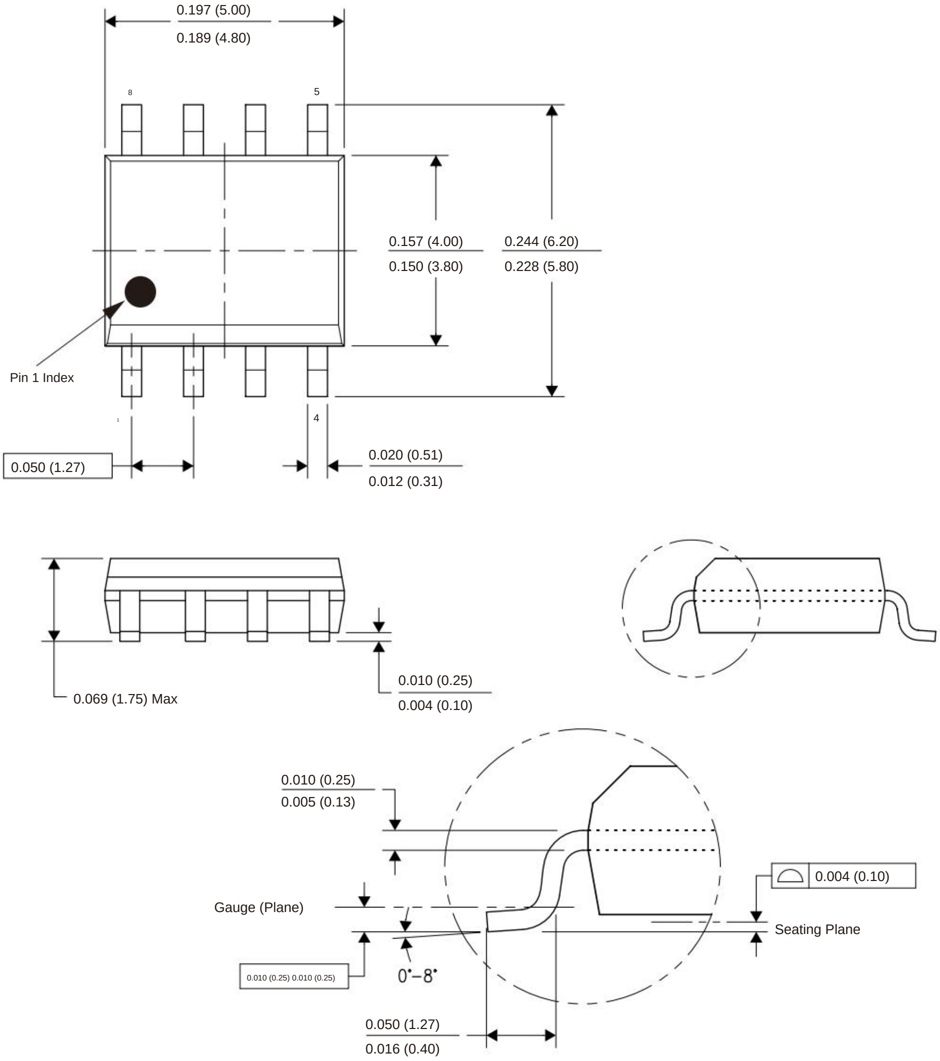


VOUT error vs. Ta

ICC vs. Ta

Dimensions

SOP8 package



Notice:

1. Dimensions are in inches (millimeters).

Marking:

First line: CC6920BSO– product name

Second row: ELC-XXA

ÿ XX: detection current range

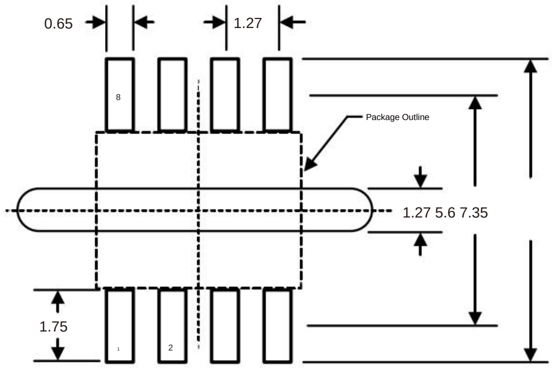
Third line: XXYYWW

ÿ XX – Code

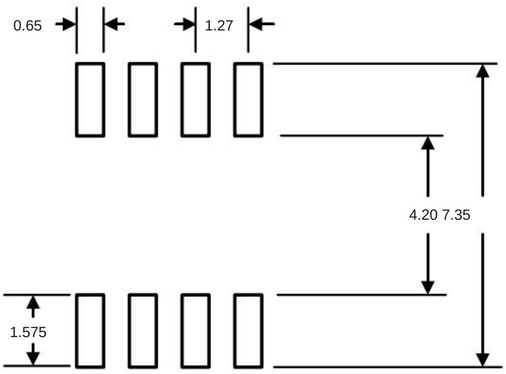
ÿ YY – the last two digits of the year

ÿ WW – week number

Package Reference

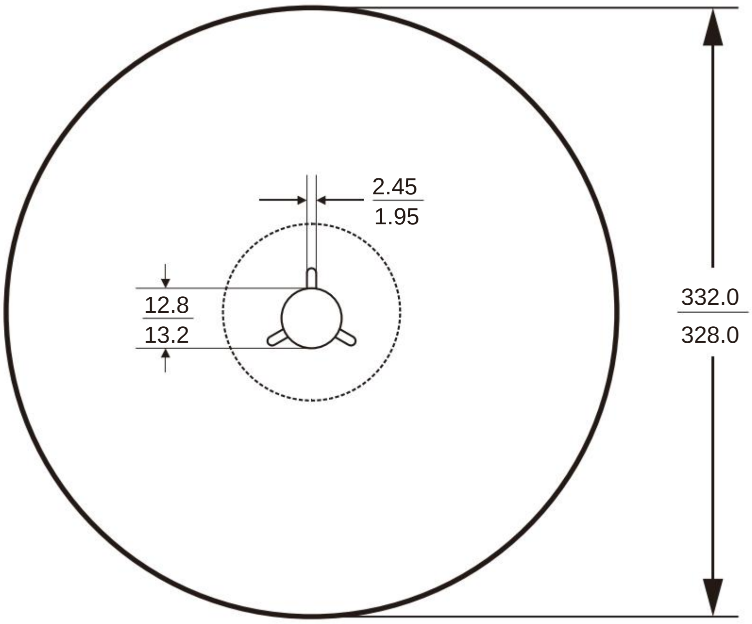


Reference 1: PCB slotting increases creepage distance

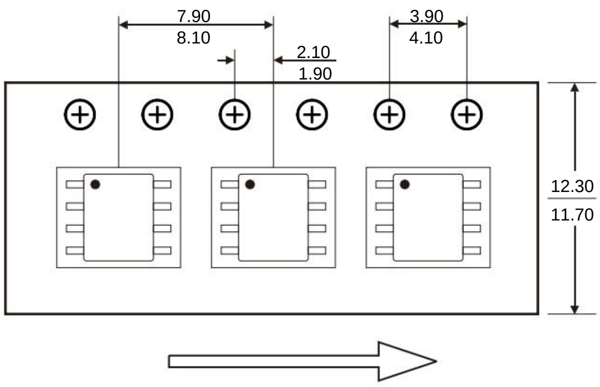


Reference 2: Shorten the length of the pad to increase the creepage distance

Packaging & Taping



Reel Size Information



User Direction of Feed

Note: 50±2 grids before and after each carrier tape

About Xinjin

Established in 2013, CrossChip Microsystems Inc. is a national high-tech enterprise engaged in the design and sales of integrated circuits. company technology

Strong strength, with more than 40 various patents, mainly used in Hall sensor signal processing, with the following product lines:

ÿ High precision linear hall sensor

ÿ Various Hall switches

ÿ Single-phase motor driver

ÿ Single chip current sensor

ÿ AMR magnetoresistive sensor

contact us

Chengdu

Address: 4th Floor, Unit 2, Building 3, No. 88, Tianchen Road, Gaoxin West District, Chengdu City, Sichuan Province

Tel: +86-28-87787685

Email: support@crosschipmicro.com

URL: http://www.crosschipmicro.com

Shenzhen

Address: A1001, Skyworth Building, Gaoxin South Road, Nanshan District, Shenzhen

Shanghai

Address: Maker Workshop, 3rd Floor, Mofang Community, No. 4476 Huyi Road, Jiading District, Shanghai