Differential output ,
High Accuracy, Current Sensor IC

General Description

The Senko Micro's SC810 provides economical and precise solution for differential output mode in industrial, commercial, and communications systems. The superior features of high-sensitivity and wide-dynamic-range bring extra-experience to our customers. Fully integrated SOP-8 package is ideal for space-constrained applications as motor control, load detection and power supplies.

SC810 consists of a precise, low-offset, linear Hall sensor circuit with a copper conduction path located near the surface of the die. Applied current flowing through this copper conduction path generates a magnetic field which is sensed by the Hall IC and converted into a proportional voltage. A precise, proportional voltage is provided by the low-offset, chopper-stabilized Linear Hall IC, which is programmed for accuracy after packaging.

The terminals of the conductive path (from pin1 and 2 to pin 3 and 4) are electrically isolated from the signal leads (pins 5 through 8). This allows the SC810 to be used in applications requiring electrical isolation without the use of opto-isolators or other costly isolation techniques.

Features

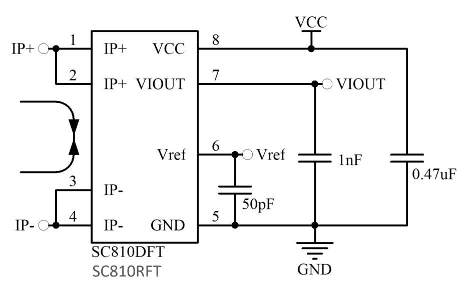
- 3kV RMS minimum isolation voltage
- Output voltage proportional to AC or DC currents
- Lowest current conductor impedance： 0.8mΩ
- Sensitivity up to 1mV/mA
- Support differential output mode
- Internal fixed reference
- Selected Reference voltage mode: fixed 2.5V,0.5*V_{CC},0.1*V_{CC}
- Nearly zero magnetic hysteresis
- 2μs output rise time in response to step input current
- Wide operation temp. range： -40°C~125°C
- Total output error 1% @T_A =25°C, <3% for full temperature range.
- High driving capacity: suit for >2KΩ resistor load.
- Extremely simple peripheral circuit
- IP overcurrent detection output function*not open yet
- Support wave soldering full-automatic patch and tape packaging
- It is not interfered by wire magnetic field, external magnetic field and geomagnetic field
- High PSRR
- Independent copyright of Senko Micro.
- c UL us Certificate Number: E514605-A6002-UL

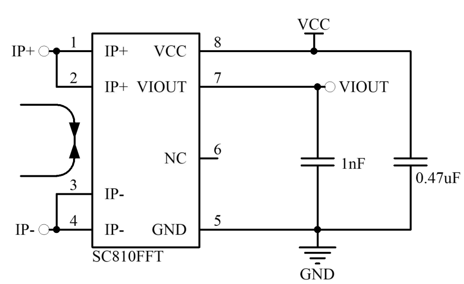
Package: 8-Lead SOP-SC

Top View:

Current Path view:

Typical Application





Order information

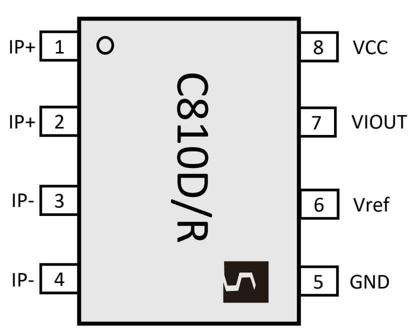
Part Number[1]	Special Code	Temp Range	Packaging	IP(A)	Vout @IP=0A	Sens @ VCC=5V (mV/A)
SC810DFT-2P5F5	D (Differential mode)	F(-40~125˚C)	T (3000pcs/reel)	±2.5	F(2.5V)	800
SC810DFT-05F5				±5		400
SC810DFT-10F5				±10		200
SC810DFT-20F5				±20		100
SC810DFT-25F5				±25		80
SC810DFT-30F5				±30		66
SC810DFT-40F5				±40		50
SC810DFT-50F5				±50		40
SC810DFT-25I5				±25	I[4] (=Vref input	80
SC810DFT-30I5				±30		66
SC810RFT-10U5	R[3]			+10	U(0.1Vcc)	264
SC810FFT-10B5	F (Servo mode)			±10	B(0.5Vcc)	200
SC810FFT-25B5				±25		80
SC810FFT-30B5				±30		66
SC810FFT-40B5				±40		50
SC810FFT-50B5				±50		40

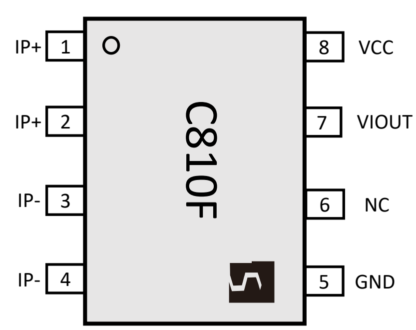
Note1:F,B,I and U types are different in the reference output when IP=0A, and F is recommended by default.

F	when IP=0A,VIOUT@0A=VREF=2.5V,suitable for bidirectional current detection, Zero Current Output and sensitivity do not change with VCC ratio.
B	when IP=0A,VIOUT@0A=VREF=0.5*VCC,suitable for bidirectional current detection, Zero Current Output and sensitivity vary with VCC ratio.
I	when IP=0A,VIOUT@0A=VREF=Vref input voltage(0.5V or 2.6V), Zero Current Output and sensitivity do not change with VCC ratio.
U*2	when IP=0A,VIOUT@0A=VREF=0.1*VCC,suitable for unidirectional current detection, Zero Current Output and sensitivity vary with VCC ratio.

Note2: Model U, Dynamic range x2, sensitivity x2; If there are any different sensitivity requirements, you can contact our FAE or Agent.
Note3:The application information of R signature code is the same as D signature code, D=R, but the difference is that the client procurement code continues.
Note4:Model I,Must contact FAE for confirmation,the input voltage value must be informed with the model to obtain the best precision parameter.E.g. SC810DFT-25I5, I=0.5V.

Pin Configuration

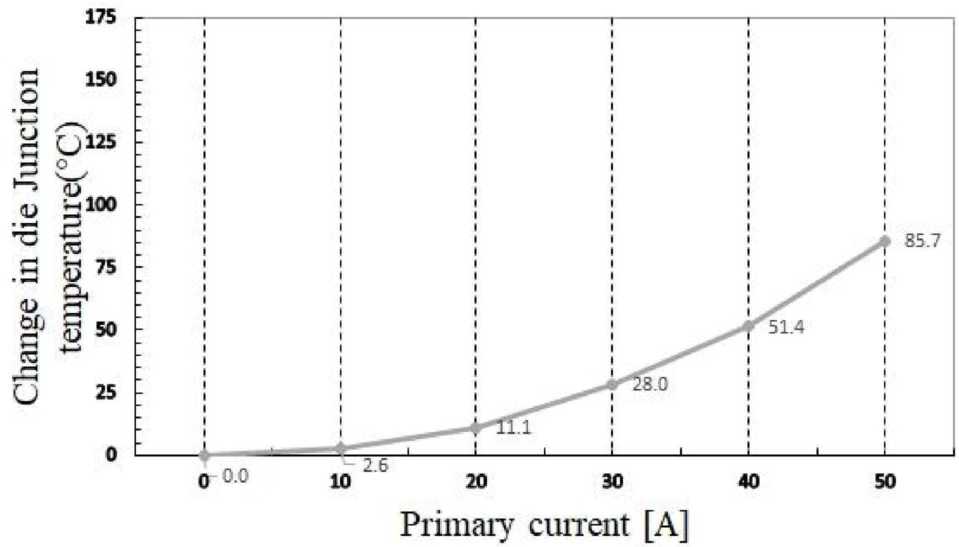




Number	Name	Description
1 and 2	IP+	Terminals for current being sampled; fused internally
3 and 4	IP-	Terminals for current being sampled; fused internally
5	GND	Signal Ground terminal
6	NC(SC810FFT)	NC, support GND connection
	Vref (SC810DFT/RFT)	Reference terminal, supporting input and output.Specifically define Note 1 of the above ordering information VIOUT= Vref (IP=0A)
7	VIOUT	Analog output signal, VIOUT=IP*Sen+Vref
8	VCC	Device power supply terminal

Thermal Rise vs. Primary Current

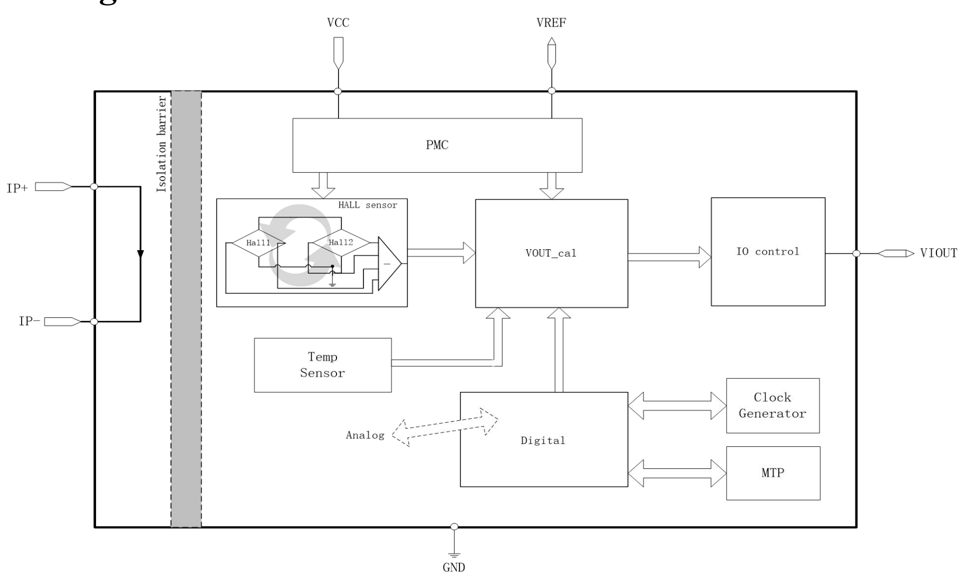
Remark: The relationship between temperature rise (DeltaT) and primary side current is obtained in the whole series of SC810 under the condition of DEMO board of our company at 26℃.



Demo Board information

PCB Name	A10-V2
Layer Number	2
Total Copper size connected to Primary pins (Including all layers)	1224 mm^2
Copper layer thickness	2oz / 70um
Board Thickness	1mm

Functional Block Diagram



Absolute Maximum Ratings

Absolute maximum ratings are limiting values to be applied individually, and beyond which the serviceability of the circuit may be impaired. Functional operability is not necessarily implied. Exposure to absolute maximum rating conditions for an extended period of time may affect device reliability.

Characteristic	Symbol	Notes	Rating	Unit
Supply voltage	V_{CC}		6.0	V
Reverse Supply Voltage	V_{RCC}		-0.1	V
Output voltage	V_{IOUT}		6.0	V
Reverse Output Voltage	V_{RIOUT}		-0.1	V
Nominal Operating Ambient Temperature	T_A	Range F	-40~125	℃
Maximum Junction Temperature	$T_{J (max)}$		165	℃
Storage Temperature	T_{stg}		–65~170	℃
Output Current Source	$I_{OUT(Source)}$	Shorted Output-to-Ground Current	3.43	mA
Output Current Sink	$I_{OUT(Sink)}$	Shorted Output-to-VCC Current	40	mA
REF Current Source	$I_{REF(Source)}$	Shorted REF-to-Ground Current	3.47	mA
REF Current Sink	$I_{REF(Sink)}$	Shorted REF-to-VCC Current	40	mA
The minimum pull-up resistance of the Vfault pin	R_{vfault}	Must not be lower than this value @ pull-up power supply =5V	1	kΩ
Pull-up voltage of Vfault pin	VCC_{fault}	Open-drain output, supporting independent VCC connection, but not higher than this requirement	8	V
Maximum IP value of sustainable loading at ambient temperature	IP_{max}	It is directly related to the heat dissipation capacity of PCB, and this data depends on the demo test board of Senko	50	A
Transient overload IP value of sustainable loading at ambient temperature	IPover	It is directly related to the heat dissipation capacity of PCB, and this data depends on the demo test board of Senko.1pulse,100ms,1% duty cycle	100	A
HBM mode	ESD		4	kV

Isolation Characteristics

Parameter	Symbol	Value	Unit	Comment
RMS voltage for AC insulation test, 50Hz, 1min	V_{ISO}	3000	V_{rms}	Agency type-tested for 60 seconds per UL60950-1
Working Voltage for Basic Isolation	V_{WVBI}	420	V_{Peak}	Maximum working voltage according to UL60950-1
Clearance	D_{cl}	4	mm	Minimum distance through air from IP leads to signal leads
Creepage distance	D_{cr}	4	mm	Minimum distance along package body from IP leads to signal leads
Leakage mark index	CT1	600	V	The electrical breakdown (tracking) properties of an insulating material
1.2/50μs Impulse voltage	Impulse voltage	7	kV	
8/20μs impulse current	Impact of current	/	kA	

Reference application Specification

Symbol	Description	Min	Typ	Max	Unit
C_{VCC}	The filter capacitor of power supply is connected between vcc and gnd	0.1	0.47		uF
C_{VIOUT}	The filter capacitor of Output is connected between Vout and gnd	0	1	1.5	nF
C_{VREF}	The filter capacitor of REF is connected between REF and gnd	0	50	100	pF
R_{Vfault}	The pull up resistor is connected between VCC and Vfault	2	10	100	kΩ

Common Electrical Characteristics

Note: Over full range of T_A=25°C, C_{Bypass}=0.47uF，C_{Load}=1.0nF, V_{CC}=5V,unless otherwise specified.

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Voltage	V_{CC}	Operating	4.5	5	5.5	V
Supply Current	I_{CC}	V_{CC} = 5.0 V, output open		20		mA
Output Capacitance Load	C_L	V_{IOUT} to GND		1	1.5	nF
Output Resistive Load	R_L	V_{IOUT} to GND	2.2			kΩ
REF Capacitance Load	C_{LREF}	V_{REF} to GND		50	100	pF
REF Resistive Load	R_{LREF}	V_{REF} to GND	2.2			kΩ
Hall coupling factor	CF	T_A = 25°C		2.5		G/A
Anti-external magnetic interference	CMFR			-38		dB
Primary Conductor Resistance	$R_{PRIMARY}$	T_A = 25°C		0.8		mΩ
Temperature Coefficient of Primary Conductor Resistance	TC_R	TA=-40~125℃		3365		ppm/℃
Hysteresis	V_{hys}	Viout(Load +20A, return to 0A)-Viout(Load -20A, return to 0A)		1		mV
Rise time	t_r	IP=20A		1.9		uS
Propagation Delay	t_{pd}	IP=20A		1.28		uS
Response Time	$t_{response}$	IP=20A		1.72		uS
Bandwidth	f	–3 dB		120		kHz
Noise Density	I_{ND}	T_A = 25°C ,C_L=1nF		1545		µA(rms)/√Hz
Noise	I_N			0.46		mA(rms)
	I_N	BW=10KHz		0.12		mA(rms)
	I_N	BW=1KHz		0.05		mA(rms)
Nonlinearity	E_{LIN}	-20A<IP<20A			1	%
Proportional coefficient of follow-up sensitivity (applicable to B5 suffix production Product)	S_{coef}	VCC=4.5~5.5V, S_{coef}=Sens(VCC)/Sens(5V)		VCC/5		
Sensitivity under fixed Zero Current Output (applicable to F5 suffix production Product)		VCC=4.5~5.5V, Type selection is xxF5		2000/I_{PR}		mv/A
Zero Current Output under fixed Zero Current Output (applicable to F5 suffix production Product)		VCC=4.5~5.5V, Type selection is xxF5		2.5		V
Peripheral input Zero Current Output range		VCC=4.5~5.5V, Type selection is xxI5		0.5/2.5		V
Linear rail-to-rail output range	Vrail-rail	R_L=4.7kΩ	10		90	%VCC
Power-On Time	t_{PO}	Output reaches 90% of steady-state level, IP=50A		100	200	µS
Zero Current Output of Power supply rejection ratio (applicable to F5 suffix production Product)	$PSRR_Q$			38		dB
Sensitivity of Power supply rejection ratio (applicable to F5 suffix production Product)	$PSRR_S$			31		dB

SC810DFT-2P5F5 Individual Performance Characteristics

Note: Over full range of TA=-40~125°C, C_{Bypass}=0.47uF， C_{Load}=1nF, V_{CC}=5V, unless otherwise specified.

Characteristic	Symbol	Test Conditions	Min	Typ[1]	Max	Unit
NOMINAL PERFORMANCE						
Current-Sensing Range	I_{PR}		-2.5		2.5	A
Zero-Current Output Voltage	Voq	IP=0A, T_A=25°C		2.5		V
VREF output Voltage	V_{REF}	no correlation with IP input		2.5		V
Difference zero deviation	Voq -V_{REF}	IP=0A		±5		mV
Sensitivity	Sens	-2.5A<IP<2.5A		800		mV/A
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = E_{SENS} + V_{OE}$ /(Sens × I_P)						
Sensitivity Error	E_{SENS}	I_P = ±2.5 A, T_A = 25°C		±1		%
		I_P = ±2.5 A, T_A = -40~85°C		±2		%
		I_P = ±2.5 A, T_A = 85~125°C		±3		%
Single end output zero error	V_{OE}	I_P=0A, T_A = 25°C		±15		mV
		I_P=0A, T_A = -40~85°C	-	±65		mV
		I_P=0A, T_A = 85~125°C	-	±81		mV
Differential Output Error	$E_{(Voq\ -VREF)}$	I_P=0A, T_A = 25°C		±5		mV
		I_P=0A, T_A = -40~85°C		±65		mV
		I_P=0A, T_A = 85~125°C		±81		mV
Zero Current Output Ripple	Voq_pp	IP=0A,T_A= 25°C,Output Peak to Peak		350		mV
ACCURACY PERFORMANCE						
Total Output Error[2]	E_{TOT}	I_P = ±2.5 A, T_A=25°C		±1		%
		I_P = ±2.5 A, T_A=-40°C~85°C		±2		%
		I_P = ±2.5 A, T_A= 85°C ~ 125°C		±3		%

[1] Typical values with +/- are 3 sigma values
[2] Percentage of IP , with IP = $I_{PR(max)}$.

SC810DFT-05F5 Individual Performance Characteristics

Note: Over full range of TA=-40~125°C, C_{Bypass}=0.47uF， C_{Load}=1nF, V_{CC}=5V, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ[1]	Max	Unit
NOMINAL PERFORMANCE						
Current-Sensing Range	I_{PR}		-5		5	A
Zero-Current Output Voltage	Voq	IP=0A, T_A=25°C		2.5		V
VREF output Voltage	V_{REF}	no correlation with IP input		2.5		V
Difference zero deviation	Voq -V_{REF}	IP=0A		0		mV
Sensitivity	Sens	-5A<IP<5A		400		mV/A
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = E_{SENS} + V_{OE}$ /(Sens × I_P)						
Sensitivity Error	E_{SENS}	I_P = ±5 A, T_A = 25°C		±1		%
		I_P = ±5 A, T_A = -40~85°C		±1.5		%
		I_P = ±5 A, T_A = 85~125°C		±3		%
Single end output zero error	V_{OE}	I_P=0A, T_A = 25°C		±5		mV
		I_P=0A, T_A = -40~85°C		±20		mV
		I_P=0A, T_A =85~125°C		±35		mV
Differential Output Error	$E_{(Voq\ -VREF)}$	I_P=0A, T_A = 25°C		±5		mV
		I_P=0A, T_A = -40~85°C		±22		mV
		I_P=0A, T_A = 85~125°C		±35		mV
Zero Current Output Ripple	Voq_pp	IP=0A,T_A= 25°C,Output Peak to Peak		230		mV
ACCURACY PERFORMANCE						
Total Output Error[2]	E_{TOT}	I_P = ±5 A, T_A=25°C		±1		%
		I_P = ±5 A, T_A= -40~85°C		±2		%
		I_P = ±5 A, T_A= 85~125°C		±3		%

[1] Typical values with +/- are 3 sigma values
[2] Percentage of IP , with IP = $I_{PR(max)}$.

SC810DFT-10F5 Individual Performance Characteristics

Note: Over full range of TA=-40~125°C, C_{Bypass}=0.47uF， C_{Load}=1nF, V_{CC}=5V, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ[1]	Max	Unit
NOMINAL PERFORMANCE						
Current-Sensing Range	I_{PR}		-10		10	A
Zero-Current Output Voltage	Voq	IP=0A, T_A=25°C		2.5		V
VREF output Voltage	V_{REF}	no correlation with IP input		2.5		V
Difference zero deviation	Voq -V_{REF}	IP=0A		0		mV
Sensitivity	Sens	-10A<IP<10A		200		mV/A
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = E_{SENS} + V_{OE}$ /(Sens × I_P)						
Sensitivity Error	E_{SENS}	I_P = ±10 A, T_A = 25°C		±1		%
		I_P = ±10 A, T_A = -40~85°C		±1.5		%
		I_P = ±10 A, T_A = 85~125°C		±3		%
Single end output zero error	V_{OE}	I_P=0A, T_A = 25°C		±5		mV
		I_P=0A, T_A = -40~85°C		±15		mV
		I_P=0A, T_A = 85~125°C		±20		mV
Differential Output Error	E (Voq -VREF)	I_P=0A, T_A = 25°C		±5		mV
		I_P=0A, T_A = -40~85°C		±15		mV
		I_P=0A, T_A = 85~125°C		±20		mV
Zero Current Output Ripple	Voq_pp	IP=0A,T_A= 25°C,Output Peak to Peak		150		mV
ACCURACY PERFORMANCE						
Total Output Error[2]	E_{TOT}	I_P = ±10 A, T_A=25°C		±1		%
		I_P = ±10 A, T_A= -40~85°C		±2		%
		I_P = ±10 A, T_A= 85~125°C		±3		%

[1] Typical values with +/- are 3 sigma values
[2] Percentage of IP , with IP = $I_{PR(max)}$.

SC810DFT-20F5 Individual Performance Characteristics

Note: Over full range of TA=-40~125°C, C_{Bypass}=0.47uF， C_{Load}=1nF, V_{CC}=5V, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ[1]	Max	Unit
NOMINAL PERFORMANCE						
Current-Sensing Range	I_{PR}		-20		20	A
Zero-Current Output Voltage	Voq	IP=0A, T_A=25°C		2.5		V
VREF output Voltage	V_{REF}	no correlation with IP input		2.5		V
Difference zero deviation	Voq -V_{REF}	IP=0A		0		mV
Sensitivity	Sens	-20A<IP<20A		100		mV/A
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = E_{SENS} + V_{OE}$ /(Sens × I_P)						
Sensitivity Error	E_{SENS}	I_P = ±20 A, T_A = 25°C		±1		%
		I_P = ±20 A, T_A = -40~85°C		±1.5		%
		I_P = ±20 A, T_A = 85~125°C		±3		%
Single end output zero error	V_{OE}	I_P=0A, T_A = 25°C		±5		mV
		I_P=0A, T_A = -40~85°C		±10		mV
		I_P=0A, T_A = 85~125°C		±15		mV
Differential Output Error	E (Voq -VREF)	I_P=0A, T_A = 25°C		±5		mV
		I_P=0A, T_A = -40~85°C		±10		mV
		I_P=0A, T_A = 85~125°C		±15		mV
Zero Current Output Ripple	Voq_pp	IP=0A,T_A= 25°C,Output Peak to Peak		100		mV
ACCURACY PERFORMANCE						
Total Output Error[2]	E_{TOT}	I_P = ±20 A, T_A=25°C		±1		%
		I_P = ±20 A, T_A= -40~85°C		±2		%
		I_P = ±20 A, T_A= 85~125°C		±3		%

[1] Typical values with +/- are 3 sigma values
[2] Percentage of IP , with IP = $I_{PR(max)}$

SC810DFT-25F5 Individual Performance Characteristics

Note: Over full range of TA=-40~125°C, C_{Bypass}=0.47uF， C_{Load}=1nF, V_{CC}=5V, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ[1]	Max	Unit
NOMINAL PERFORMANCE						
Current-Sensing Range	I_{PR}		-25		25	A
Zero-Current Output Voltage	Voq	IP=0A, T_A=25°C		2.5		V
VREF output Voltage	V_{REF}	no correlation with IP input		2.5		V
Difference zero deviation	Voq -V_{REF}	IP=0A		0		mV
Sensitivity	Sens	-25A<IP<25A		80		mV/A
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = E_{SENS} + V_{OE} /(Sens \times I_P)$						
Sensitivity Error	E_{SENS}	I_P = ±25 A, T_A = 25°C		±1		%
		I_P = ±25 A, T_A = -40~85°C		±1.5		%
		I_P = ±25 A, T_A = 85~125°C		±3		%
Single end output zero error	V_{OE}	I_P=0A, T_A = 25°C		±5		mV
		I_P=0A, T_A = -40~85°C		±10		mV
		I_P=0A, T_A = 85~125°C		±15		mV
Differential Output Error	$E_{(Voq\ -VREF)}$	I_P=0A, T_A = 25°C		±5		mV
		I_P=0A, T_A = -40~85°C		±10		mV
		I_P=0A, T_A = 85~125°C		±15		mV
Zero Current Output Ripple	Voq_pp	IP=0A,T_A= 25°C,Output Peak to Peak		85		mV
ACCURACY PERFORMANCE						
Total Output Error[2]	E_{TOT}	I_P = ±25 A, T_A=25°C		±1		%
		I_P = ±25 A, T_A= -40~85°C		±2		%
		I_P = ±25 A, T_A= 85~125°C		±3		%

[1] Typical values with +/- are 3 sigma values
[2] Percentage of IP , with IP = $I_{PR(max)}$.

SC810DFT-30F5 Individual Performance Characteristics

Note: Over full range of TA=-40~125°C, C_{Bypass}=0.47uF， C_{Load}=1nF, V_{CC}=5V, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ[1]	Max	Unit
NOMINAL PERFORMANCE						
Current-Sensing Range	I_{PR}		-30		30	A
Zero-Current Output Voltage	Voq	IP=0A, T_A=25°C		2.5		V
VREF output Voltage	V_{REF}	no correlation with IP input		2.5		V
Difference zero deviation	Voq -V_{REF}	IP=0A		0		mV
Sensitivity	Sens	-30A<IP<30A		66		mV/A
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = E_{SENS} + V_{OE} /(Sens \times I_P)$						
Sensitivity Error	E_{SENS}	I_P = ±30 A, T_A = 25°C		±1		%
		I_P = ±30 A, T_A = -40~85°C		±1.5		%
		I_P = ±30 A, T_A = 85~125°C		±3		%
Single end output zero error	V_{OE}	I_P=0A, T_A = 25°C		±5		mV
		I_P=0A, T_A = -40~85°C		±10		mV
		I_P=0A, T_A = 85~125°C		±15		mV
Differential Output Error	$E_{(Voq\ -VREF)}$	I_P=0A, T_A = 25°C		±5		mV
		I_P=0A, T_A = -40~85°C		±10		mV
		I_P=0A, T_A = 85~125°C		±15		mV
Zero Current Output Ripple	Voq_pp	IP=0A,T_A= 25°C,Output Peak to Peak		80		mV
ACCURACY PERFORMANCE						
Total Output Error[2]	E_{TOT}	I_P = ±30 A, T_A=25°C		±1		%
		I_P = ±30 A, T_A= -40~85°C		±2		%
		I_P = ±30 A, T_A= 85~125°C		±3		%

[1] Typical values with +/- are 3 sigma values
[2] Percentage of IP , with IP = $I_{PR(max)}$.

SC810DFT-40F5 Individual Performance Characteristics

Note: Over full range of TA=-40~125°C, C_{Bypass}=0.47uF， C_{Load}=1nF, V_{CC}=5V, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ[1]	Max	Unit
NOMINAL PERFORMANCE						
Current-Sensing Range	I_{PR}		-40		40	A
Zero-Current Output Voltage	Voq	IP=0A, T_A=25°C		2.5		V
VREF output Voltage	V_{REF}	no correlation with IP input		2.5		V
Difference zero deviation	Voq -V_{REF}	IP=0A		0		mV
Sensitivity	Sens	-40A<IP<40A		50		mV/A
TOTAL OUTPUT ERROR COMPONENTS: E_{TOT} = E_{SENS} + V_{OE} /(Sens × I_P)						
Sensitivity Error	E_{SENS}	I_P = ±40 A, T_A = 25°C		±1		%
		I_P = ±40 A, T_A = -40~85°C		±1.5		%
		I_P = ±40 A, T_A = 85~125°C		±3		%
Single end output zero error	V_{OE}	I_P=0A, T_A = 25°C		±5		mV
		I_P=0A, T_A = -40~85°C		±10		mV
		I_P=0A, T_A = 85~125°C		±15		mV
Differential Output Error	$E_{(Voq\ -VREF)}$	I_P=0A, T_A = 25°C		±5		mV
		I_P=0A, T_A = -40~85°C		±10		mV
		I_P=0A, T_A = 85~125°C		±15		mV
Zero Current Output Ripple	Voq_pp	IP=0A,T_A= 25°C,Output Peak to Peak		60		mV
ACCURACY PERFORMANCE						
Total Output Error[2]	E_{TOT}	I_P = ±40 A, T_A=25°C		±1		%
		I_P = ±40 A, T_A= -40~85°C		±2		%
		I_P = ±40 A, T_A= 85~125°C		±3		%

[1] Typical values with +/- are 3 sigma values
[2] Percentage of IP , with IP = $I_{PR(max)}$.

SC810DFT-50F5 Individual Performance Characteristics

Note: Over full range of TA=-40~125°C, C_{Bypass}=0.47uF， C_{Load}=1nF, V_{CC}=5V, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ[1]	Max	Unit
NOMINAL PERFORMANCE						
Current-Sensing Range	I_{PR}		-50		50	A
Zero-Current Output Voltage	Voq	IP=0A, T_A=25°C		2.5		V
VREF output Voltage	V_{REF}	no correlation with IP input		2.5		V
Difference zero deviation	Voq -V_{REF}	IP=0A		0		mV
Sensitivity	Sens	-50A<IP<50A		40		mV/A
TOTAL OUTPUT ERROR COMPONENTS: E_{TOT} = E_{SENS} + V_{OE} /(Sens × I_P)						
Sensitivity Error	E_{SENS}	I_P = ±50 A, T_A = 25°C		±1		%
		I_P = ±50 A, T_A = -40~85°C		±1.5		%
		I_P = ±50 A, T_A = 85~125°C		±3		%
Single end output zero error	V_{OE}	I_P=0A, T_A = 25°C		±5		mV
		I_P=0A, T_A = -40~85°C		±10		mV
		I_P=0A, T_A = 85~125°C		±15		mV
Differential Output Error	$E_{(Voq\ -VREF)}$	I_P=0A, T_A = 25°C		±5		mV
		I_P=0A, T_A = -40~85°C		±10		mV
		I_P=0A, T_A = 85~125°C		±15		mV
Zero Current Output Ripple	Voq_pp	IP=0A,T_A= 25°C,Output Peak to Peak		60		mV
ACCURACY PERFORMANCE						
Total Output Error[2]	E_{TOT}	I_P = ±50 A, T_A=25°C		±1		%
		I_P = ±50 A, T_A= -40~85°C		±1.5		%
		I_P = ±50 A, T_A= 85~125°C		±3		%

[1] Typical values with +/- are 3 sigma values
[2] Percentage of IP , with IP = $I_{PR(max)}$.

SC810DFT-25I5 Individual Performance Characteristics

Note: Over full range of TA=-40~125°C, C_{Bypass}=0.47uF, C_{Load}=1nF, V_{CC}=5V, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ[1]	Max	Unit
NOMINAL PERFORMANCE						
Current-Sensing Range	I_{PR}		-25		25	A
Zero-Current Output Voltage	Voq	IP=0A, T_A=25°C		=Vref		V
VREF output Voltage	V_{REF}	no correlation with IP input		Pace with input		V
Difference zero deviation	Voq -V_{REF}	IP=0A		0		mV
Sensitivity	Sens	-25A<IP<25A		80		mV/A
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = E_{SENS} + V_{OE}$ /(Sens × I_P)						
Sensitivity Error	E_{SENS}	I_P = ±25 A, T_A = 25°C		±1		%
		I_P = ±25 A, T_A = -40~85°C		±1		%
		I_P = ±25 A, T_A = 85~125°C		±0.5		%
Single end output zero error	V_{OE}	I_P=0A, T_A = 25°C	-10	0	10	mV
		I_P=0A, T_A = -40~85°C		4		mV
		I_P=0A, T_A = 85~125°C		4		mV
Differential Output Error	E (Voq -VREF)	I_P=0A, T_A = 25°C		/		mV
		I_P=0A, T_A = -40~85°C		/		mV
		I_P=0A, T_A = 85~125°C		/		mV
Zero Current Output Ripple	Voq_pp	IP=0A,T_A= 25°C,Output Peak to Peak		85		mV
ACCURACY PERFORMANCE						
Total Output Error[2]	E_{TOT}	I_P = ±25 A, T_A=25°C		±1		%
		I_P = ±25 A, T_A= -40~85°C		±2		%
		I_P = ±25 A, T_A= 85~125°C		±3		%

[1] Typical values with +/- are 3 sigma values
[2] Percentage of IP , with IP = $I_{PR(max)}$.

SC810RFT-10U5 Individual Performance Characteristics

Note: Over full range of TA=-40~125°C, C_{Bypass}=0.47uF, C_{Load}=1nF, V_{CC}=5V, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ[1]	Max	Unit
NOMINAL PERFORMANCE						
Current-Sensing Range	I_{PR}		0		10	A
Zero-Current Output Voltage	Voq	IP=0A, T_A=25°C		0.1Vcc		V
VREF output Voltage	V_{REF}	no correlation with IP input		0.1Vcc		V
Difference zero deviation	Voq -V_{REF}	IP=0A		0		mV
Sensitivity	Sens	-25A<IP<25A		264*S_{coef}		mV/A
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = E_{SENS} + V_{OE}$ /(Sens × I_P)						
Sensitivity Error	E_{SENS}	I_P = 10 A, T_A = 25°C		±1		%
		I_P = 10 A, T_A = -40~85°C		±1.5		%
		I_P = 10 A, T_A = 85~125°C		±3		%
Single end output zero error	V_{OE}	I_P=0A, T_A = 25°C		0		mV
		I_P=0A, T_A = -40~85°C		64		mV
		I_P=0A, T_A = 85~125°C		5		mV
Differential Output Error	E (Voq -VREF)	I_P=0A, T_A = 25°C		0		mV
		I_P=0A, T_A = -40~85°C		17		mV
		I_P=0A, T_A = 85~125°C		5		mV
Zero Current Output Ripple	Voq_pp	IP=0A,T_A= 25°C,Output Peak to Peak		230		mV
ACCURACY PERFORMANCE						
Total Output Error[2]	E_{TOT}	I_P = 10 A, T_A=25°C		±1		%
		I_P = 10 A, T_A= -40~85°C		±1.5		%
		I_P = 10 A, T_A= 85~125°C		±3		%

[1] Typical values with +/- are 3 sigma values
[2] Percentage of IP , with IP = $I_{PR(max)}$.

SC810FFT-10B5 Individual Performance Characteristics

Note: Over full range of TA=-40~125°C, C_{Bypass}=0.47uF, C_{Load}=1nF, V_{CC}=5V, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ[1]	Max	Unit
NOMINAL PERFORMANCE						
Current-Sensing Range	I_{PR}		-10		10	A
Zero-Current Output Voltage	Voq	IP=0A, T_A=25°C		0.5Vcc		V
VREF output Voltage	V_{REF}	no correlation with IP input		/		V
Difference zero deviation	Voq -V_{REF}	IP=0A		/		mV
Sensitivity	Sens	-10A<IP<10A		200*S_{coef}		mV/A
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = E_{SENS} + V_{OE} /(Sens \times I_P)$						
Sensitivity Error	E_{SENS}	I_P = ±10 A, T_A = 25°C		±1		%
		I_P = ±10 A, T_A = -40~85°C		±1.5		%
		I_P = ±10 A, T_A = 85~125°C		±3		%
Single end output zero error	V_{OE}	I_P=0A, T_A = 25°C		±3		mV
		I_P=0A, T_A = -40~85°C		±5		mV
		I_P=0A, T_A = 85~125°C		±15		mV
Zero Current Output Ripple	Voq_pp	IP=0A,T_A= 25°C,Output Peak to Peak		150		mV
ACCURACY PERFORMANCE						
Total Output Error[2]	E_{TOT}	I_P = ±10 A, T_A=25°C		±1		%
		I_P = ±10 A, T_A= -40~85°C		±1.5		%
		I_P = ±10 A, T_A= 85~125°C		±3		%

[1] Typical values with +/- are 3 sigma values
[2] Percentage of IP , with IP = $I_{PR(max)}$.

SC810FFT-25B5 Individual Performance Characteristics

Note: Over full range of TA=-40~125°C, C_{Bypass}=0.47uF, C_{Load}=1nF, V_{CC}=5V, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ[1]	Max	Unit
NOMINAL PERFORMANCE						
Current-Sensing Range	I_{PR}		-25		25	A
Zero-Current Output Voltage	Voq	IP=0A, T_A=25°C		0.5Vcc		V
VREF output Voltage	V_{REF}	no correlation with IP input		/		V
Difference zero deviation	Voq -V_{REF}	IP=0A		/		mV
Sensitivity	Sens	-25A<IP<25A		80*S_{coef}		mV/A
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = E_{SENS} + V_{OE} /(Sens \times I_P)$						
Sensitivity Error	E_{SENS}	I_P = ±25 A, T_A = 25°C		±1		%
		I_P = ±25 A, T_A = -40~85°C		±1.5		%
		I_P = ±25 A, T_A = 85~125°C		±3		%
Single end output zero error	V_{OE}	I_P=0A, T_A = 25°C		±5		mV
		I_P=0A, T_A = -40~85°C		±10		mV
		I_P=0A, T_A = 85~125°C		±15		mV
Zero Current Output Ripple	Voq_pp	IP=0A,T_A= 25°C,Output Peak to Peak		85		mV
ACCURACY PERFORMANCE						
Total Output Error[2]	E_{TOT}	I_P = ±25 A, T_A=25°C		±1		%
		I_P = ±25 A, T_A= -40~85°C		±1.5		%
		I_P = ±25 A, T_A= 85~125°C		±3		%

[1] Typical values with +/- are 3 sigma values
[2] Percentage of IP , with IP = $I_{PR(max)}$.

SC810FFT-50B5 Individual Performance Characteristics

Note: Over full range of TA=-40~125°C, C_{Bypass}=0.47uF, C_{Load}=1nF, V_{CC}=5V, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ[1]	Max	Unit
NOMINAL PERFORMANCE						
Current-Sensing Range	I_{PR}		-50		50	A
Zero-Current Output Voltage	Voq	IP=0A, T_A=25°C		0.5Vcc		V
VREF output Voltage	V_{REF}	no correlation with IP input		/		V
Difference zero deviation	Voq -V_{REF}	IP=0A		/		mV
Sensitivity	Sens	-50A<IP<50A		40*S_{coef}		mV/A
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = E_{SENS} + V_{OE} /(Sens \times I_P)$						
Sensitivity Error	E_{SENS}	I_P = ±50 A, T_A = 25°C		±1		%
		I_P = ±50 A, T_A = -40~85°C		±1.5		%
		I_P = ±50 A, T_A = 85~125°C		±3		%
Single end output zero error	V_{OE}	I_P=0A, T_A = 25°C		±5		mV
		I_P=0A, T_A = -40~85°C		±10		mV
		I_P=0A, T_A = 85~125°C		±15		mV
Zero Current Output Ripple	Voq_pp	IP=0A,T_A= 25°C,Output Peak to Peak		60		mV
ACCURACY PERFORMANCE						
Total Output Error[2]	E_{TOT}	I_P = ±50 A, T_A=25°C		±1		%
		I_P = ±50 A, T_A=-40~85°C		±1.5		%
		I_P = ±50 A, T_A= 85~125°C		±3		%

[1] Typical values with +/- are 3 sigma values
[2] Percentage of IP , with IP = $I_{PR(max)}$.

Accuracy characteristic curve （SC810DFT-20F5）

Fig1：Vref output Error vs.Temp.

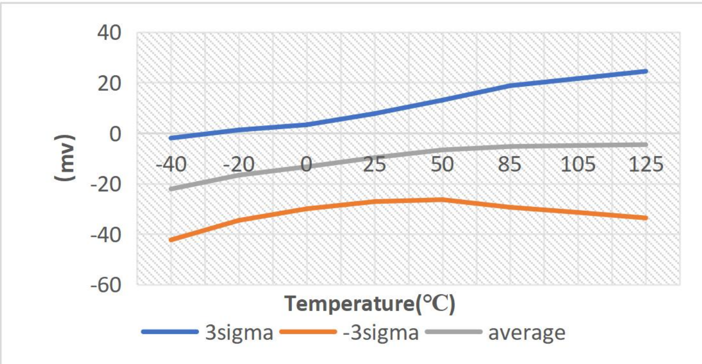


Fig2：Offset Voltage vs. Temp.

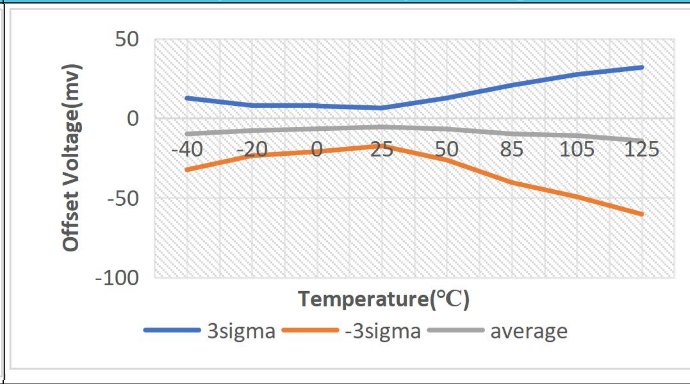


Fig3：Voq vs. Temp.

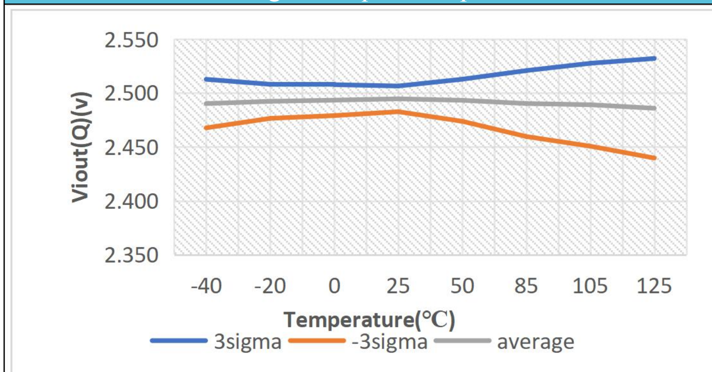


Fig4：Sensitivity Error vs.Temp.

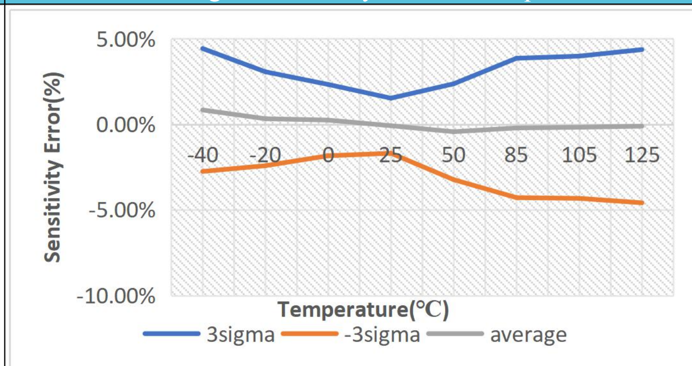


Fig5：Sensitivity Error@XXX-20F5 vs. Temp.

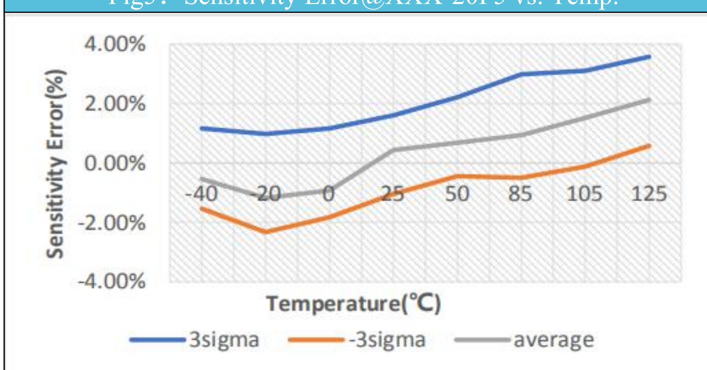


Fig6：Non-linearility vs. Temp.

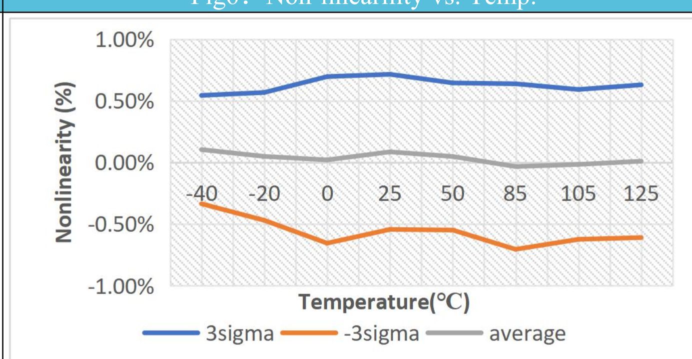


Fig7：Toltal output Error vs. Temp.

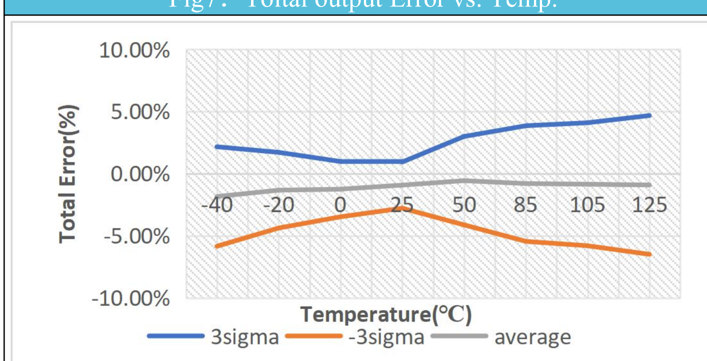
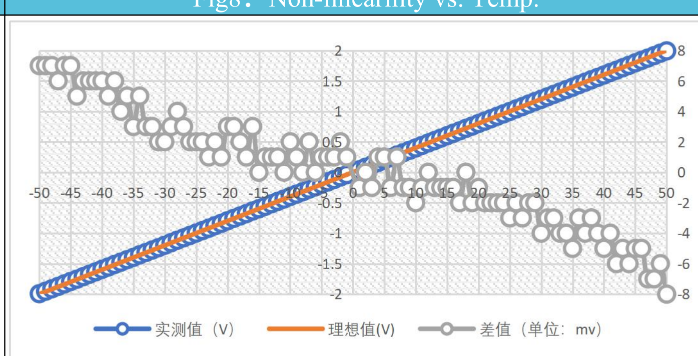


Fig8：Non-linearility vs. Temp.



AC & Dynamic Characteristic Curve

Fig1： Trans. Rising time

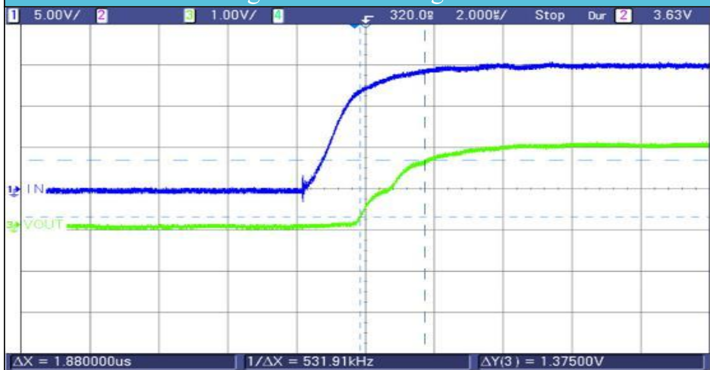


Fig2： Response Time

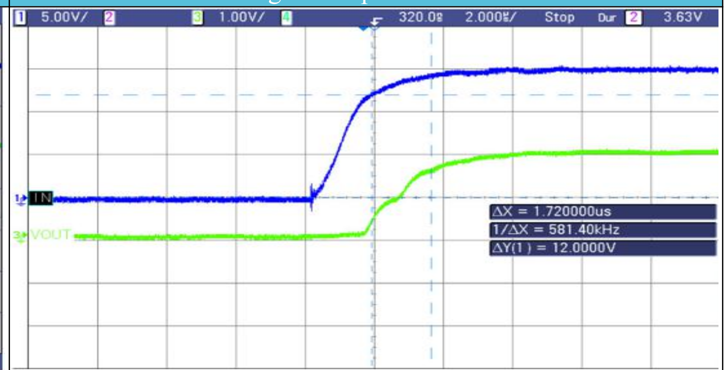


Fig3： Response delay time

Fig4： Noise FFT

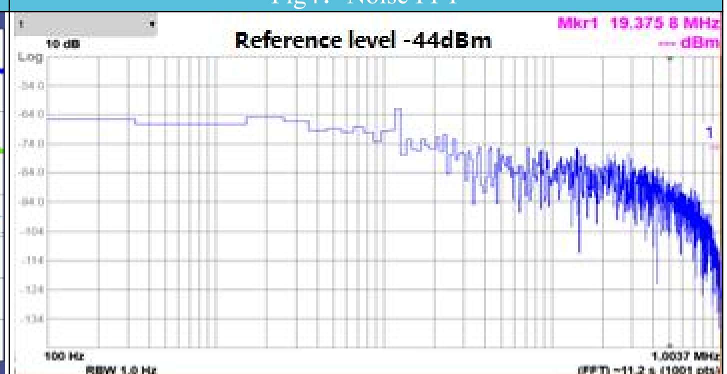


Fig5： Sinwave deltect

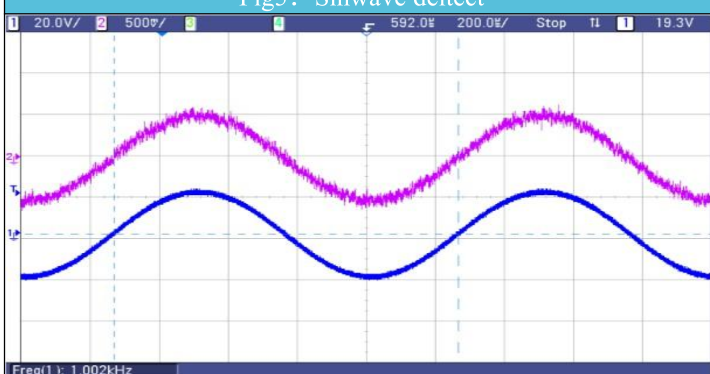


Fig6： Pluse deltect

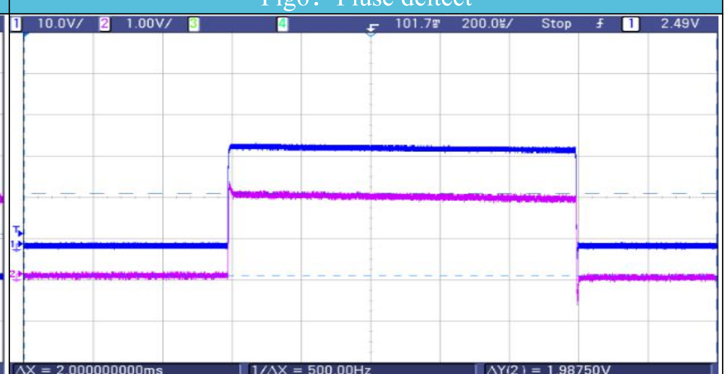


Fig7： Power on time

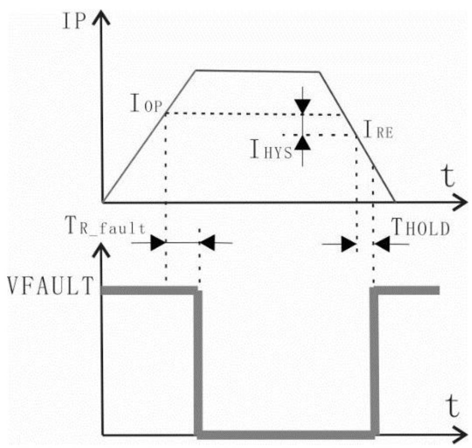
Fig8: MP Yield

Functional Description

◆ Internal Reference Voltage

Vref is always equal to the static bias output value of VIOUT, that is, VIOUT value when IP=0A.
The relationship between VIOUT and Vref obey that following formula:
VIOUT=IP*SENS+Vref,in which IP is the primary current.
When SC810DFT**F5 is used, the constant output of VREF is fixed at 2.5V, and the driving capability is greater than 3mA.
When SC810FFT**B5 is used, VREF constantly outputs 0.5VCC, and has a driving capability of more than 3mA.
When SC810DFT**U5 is used, VREF constantly outputs 0.1VCC, and has a driving capability of more than 3mA.
When SC810DFT**I5 is used, VREF is input mode, and its voltage can be modified to 0.5V or 2.5V by using external input voltage.

◆ Vfault Function (TBD: it is not open to customers at present)



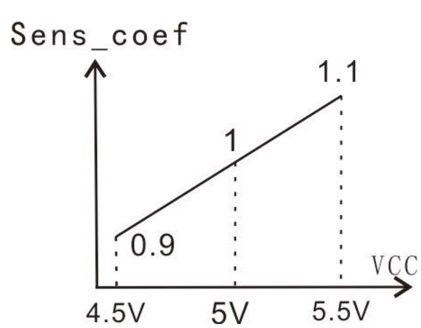
Vfault pin are used as an indicator output in over-current detection after pulling-up to VCC.
When primary current exceeds I_{OP} and after T_{R_fault},Vfault pin will be low;
When primary current is below I_{RE} and after T_{HOLD}, Vfault pin will be high;
Parameter definition:
I_{OP}: Action threashold point,for SC810, I_{OP} =IP×1.3
I_{RE}: Recover threashold point
I_{HYS}: Hysteresis, $I_{HYS} = |I_{OP}| - |I_{RE}|$
T_{R_fault}: The response time of Fault.That is, the delay time from the occurrence of over current to the action of Vfault pin
T_{HOLD}: The hold time of Fault.That is, the delay time from over current recovery to Vault pin recovery.

◆ Proportional Coefficient Of Sensitivity(suitable for products with suffix B or U)

S_{coef}=Sens_coef=$SENS_{VCC}$/$SENS_{VCCN}$

It is the ratio of the sensitivity $SENS_{VCC}$ under the supply voltage Vcc to the sensitivity $SENS_{VCCN}$ under the rated supply voltage VCCN. Through this value, we can get the sensitivity under any supply voltage.

In ideal situation:



◆ Proportional Relationship

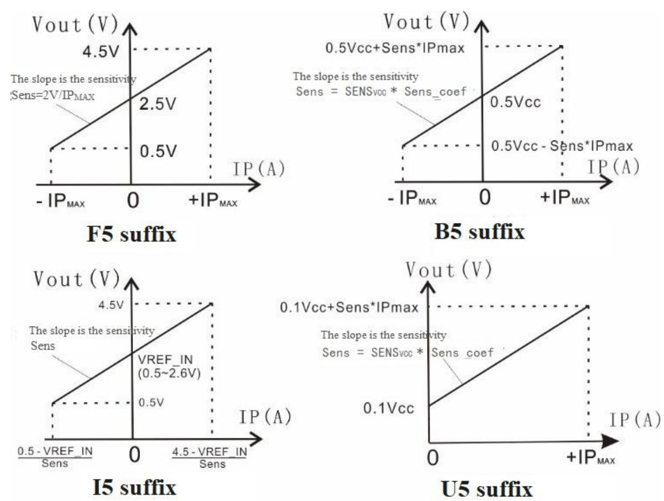
Zero-current voltage is fixed at 2.5V and sensitivity is fixed at $2V/IP_{MAX}$ when VCC change if using SC810**F5. IP_{MAX} is the Maximum current.

Zero-current voltage is fixed at VCC/2 and sensitivity is fixed at $SENS_{VCC}$ ×Sens_coef when VCC change if using SC810**B5.

Zero-current voltage is fixed at VCC/10 and sensitivity is fixed at $SENS_{VCC}$ ×Sens_coef when VCC change if using SC810**U5.

Zero-current voltage is fixed at the VREF input voltage and sensitivity is fixed at 2V/IP,when VCC change if using SC810DFT**I5.IP is the current value in the model.The measurable current range is [$(0.5-VREF\_IN)/Sens$, $(4.5-VREF\_IN)/Sens$].

E.g. SC810DFT-20I5, when the external input voltage VREF_IN=1.65V, the sensitivity is Sens=2*1000/20=100mv/A, and the measurable current range is [-11.5A,28.5A].



F5 suffix B5 suffix I5 suffix U5 suffix

◆ Impact of External Magnetic Fields

CMFR is used to express the ability of sensor resisting impact of external magnetic fields.The larger the absolute value of CMFR,the stronger the ability to resist external magnetic interference is.CMFR is defined as The absolute value of the ratio of the voltage change ACM (in mv/G) caused by external magnetic interference to the sensor itself is 20 times of the common logarithm, and the unit is decibel (dB).

$$CMFR = 20\lg\left|\frac{A_{CM}}{Sens/CF}\right|$$

CF is the coupling factor in G/A,multiplying by the sensitivity of the part(Sens)gives the error in mV.

For example:CMFR= -40dB， Sens = 40mv/A， CF = 10G/A, then A_{CM} is 0.04mv/G.That is, the output changes by 40uv for every 1Guass increase of external magnetic field.

◆ Power Supply Rejection Ratio(suitable for products with suffix F)

Sensitivity power supply rejection ratio($PSRR_S$) It refers to the sensitivity change rate ($SENS_{VCC}$-$SENS_{VCCN}$)/$SENS_{VCCN}$ caused by the power supply change rate(VCC-VCC_N)/VCC_N. The absolute value of the ratio is 20 times of the common logarithm, the unit is dB.

$$PSRR_S = 20\lg\left|\frac{(VCC - VCC_N)/VCC_N}{(SENS_{VCC} - SENS_{VCCN})/SENS_{VCCN}}\right|$$

Zero current power supply rejection ratio($PSRR_Q$) It refers to the zero point change VOE - VOE_N caused by the change of voltage VCC - VCC_N. The absolute value of the ratio is 20 times of the common logarithm, the unit is dB.

$$PSRR_Q = 20\lg\left|\frac{VCC - VCC_N}{VOE - VOE_N}\right|$$

◆ Delay time t_{pd} and Response time $t_{response}$

Both delay time and response time are used to characterize the time difference between primary side and secondary side;

The delay time is the time difference when the secondary output reaches 20% of the steady-state output value and the primary output reaches 20% of the steady-state current;

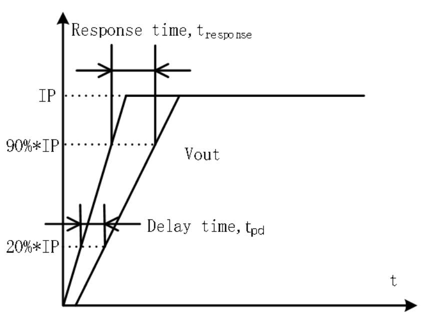
The response time is the time difference when the secondary output reaches 90% of the steady-state output value and the primary output reaches 90% of the steady-state current.

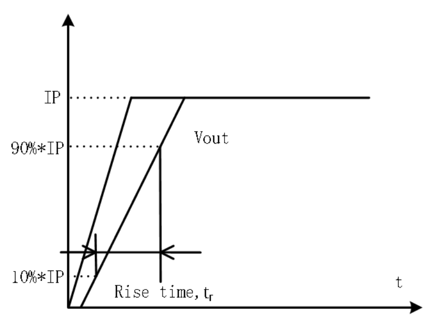
Rise Time t_r

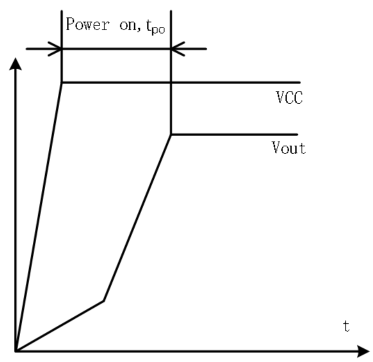
Rise time is used to characterize the time difference of the secondary side itself, that is, the time difference between when the secondary side output reaches 90% of the steady-state output value and when it reaches 10% of the steady-state output value.

Power-On Time t_{po}

The power-on time is used to characterize the time difference between the secondary side and the power supply VCC, that is, the time difference between the secondary side output reaching the steady-state output value and the VCC reaching the steady-state output value.







◆ Thermal resistance $R_{\theta JA}$

Based on a demo board, the thermal resistance is calculated by measuring the chip top temperature and power value. According to the thermal resistance, the junction temperature can be calculated as a reference. The actual surface temperature measurement value is shown in the relationship between the package temperature and the measured current.

$$T_J = T_A + (R_{\theta JA} * POWER) = T_A + (R_{\theta JA} * IP^2 * R_{PRIMARY});$$

Where T_J is junction temperature and T_A is ambient temperature.

◆ Refer to application information

1.Selection of SC810DFT/FFT suffix

DFT:With reference pin (not grounded),support input system synchronization reference,or differential output application mode.
If system synchronization reference or post-differential sampling and amplification is required, DFT is selected.
FFT:There is no reference mode,convenient pin6 grounding application for customers.Make a choice for compatibility.

2.Selection of SC810xxF5/xxB5/xxU5/xxI5 suffix

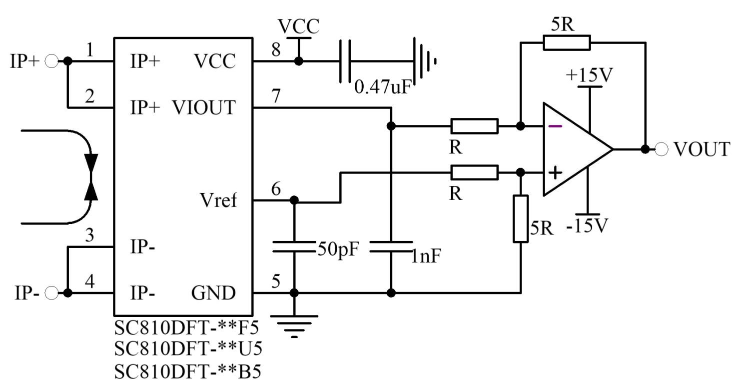
F,B,I and U types are different in the reference output when IP=0A, and F is recommended by default(2.5V fixed zero voltage).

F	Output is not affected by power supply voltage, and has high power supply suppression ability, low output noise and strong anti-interference ability. Especially in the case of high noise of system power supply, to ensure excellent output characteristics. However, it is required that the post-processing is not based on VCC, or when VCC fluctuates very little, so as to obtain high suppression ratio capability.
B	Output varies with VCC ratio, which basically has no ability to suppress high frequency noise of power supply. It is applicable to the system where the power supply voltage fluctuates greatly, and the subsequent MCU or DSP processing adopts 0.5VCC as the reference conversion and sensitivity as the VCC ratio calculation. And the VCC fluctuation error is offset by synchronous calculation.
I	Same as F mode, But the zero point is applied synchronously by external input,So as to offset the error of unsynchronized reference voltages.
U	Same as B mode, but suitable for unidirectional current detection.

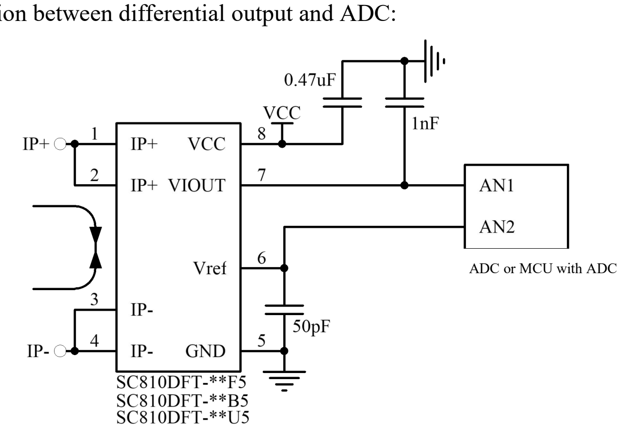
3.Differential output/input application description

1)Schematic diagram of differential amplification mode:

VOUT = IP * Sensitivity * (-5R / R),R>1.3K

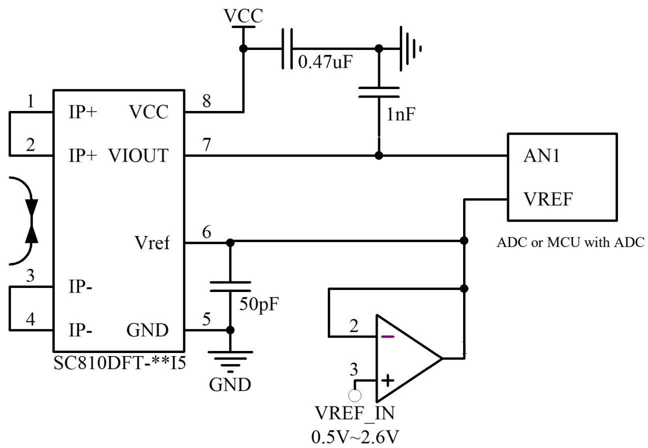


2)Schematic diagram of connection between differential output and ADC:

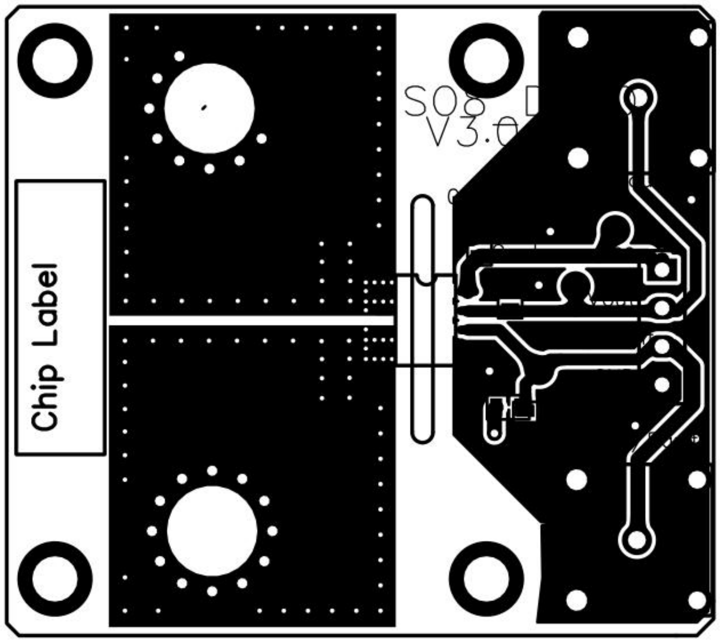


3)Schematic diagram of VREF input synchronization application

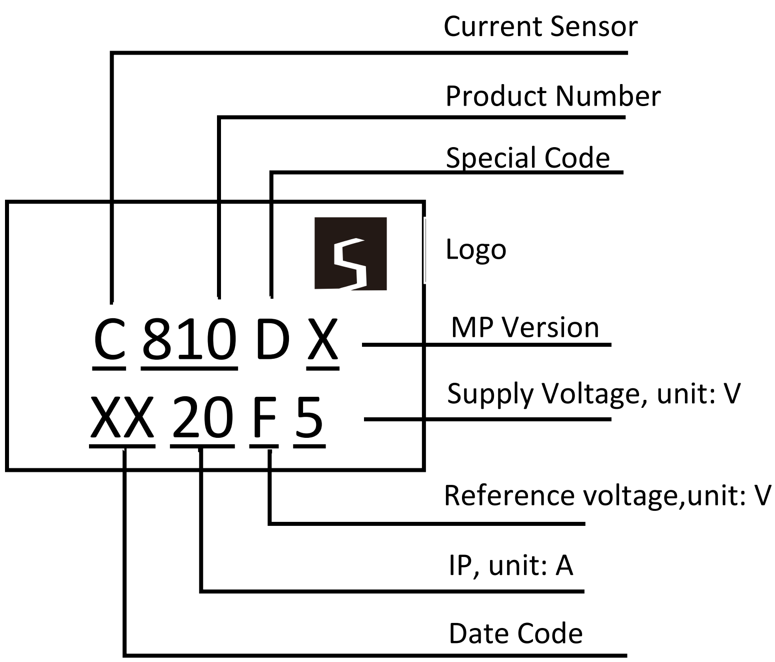
With SC810DFT**I5, VREF is the input mode.The external input voltage can be used to modify its voltage to 0.5v or 2.5v, VIOUT= VREF_IN + Sensitivity * IP,In which VREF_IN should be 0.5v or 2.5v.



Demo Board Layout

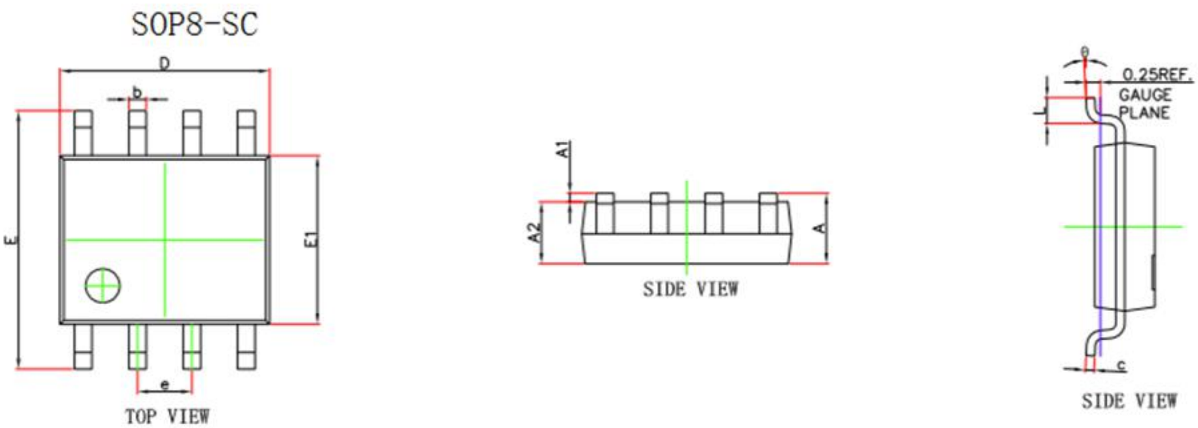


Mark Description

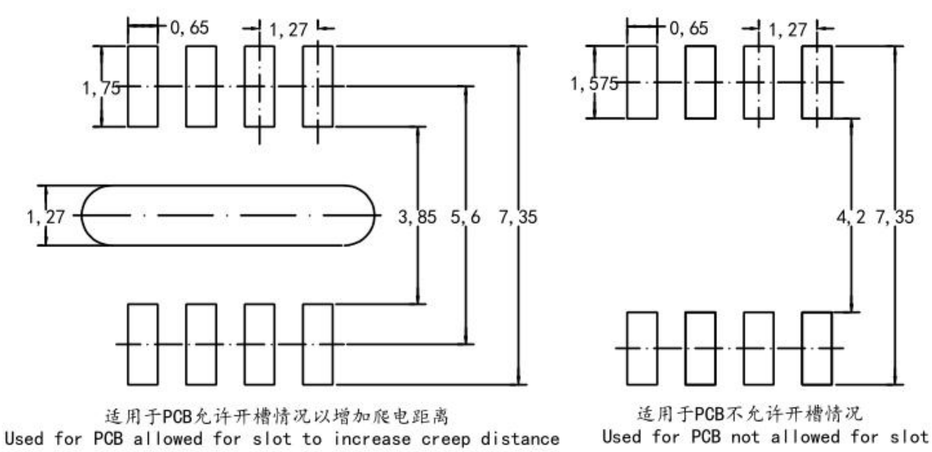


Package Information

Note: Package is SOP8-SC, all dimensions are in millimeters.



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
D	4.700	5.100	0.185	0.201
E1	3.800	4.000	0.150	0.157
E	5.800	6.200	0.228	0.244
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°



PCB Layout Reference View

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Revision Table

Revision	Change	Page	Author	Date
1.0	Initial draft for XG601 version Tom 2020.1		Tom	2020.1
1.1	Revise to new format		Tom	2020.2
1.2	Release to customer for sample and check EC Table		Jon	2020.2
1.3	Increase the code of non-mass-supplied products		Jon	2020.03
1.4	According to customer requirements, add 25I5 models		Jon	2020.03
1.5	According to customer requirements, add 2P5B5 model		Jon	2020.03
1.6	Add RFT-10U5		Jon	2020.03
1.7	Released version		Jon	2020.04
1.8	According to customer requirements, add 40F5 models		Jon	2020.05
1.9	Fill in the frequency bandwidth and modify the description of I series		Emma	2021.01
2.0	Update the function block diagram		Emma	2021.02
2.1	Replace Exterior View		Hy	2021.02
2.2	Add SC810DFT-30I5		Mei	2021.03
2.3	Add UL and environmental protection logo		Emma	2021.05

单击下面可查看定价，库存，交付和生命周期等信息

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