Up to 200A, Full automatic encapsulation assembly, Isolated Current Sensor

Description:

The SC780 is a member of SENK SEMI integrated current sensor product line, the industry's first fully automatic plastic seal assembly of fully integrated current detection module, the industry's first from chip design to module assembly process development of fully autonomous and controlled open-loop Hall-type current sensor module.

This product enables current conductor impedance as low as 0.08mΩ in the semiconductor sealing process, making it suitable for use in power systems that require continuous operation in measuring up to 180A, with the integration of low impedance side conductors, low hysteresis cores and self-developed linear Hall IC.

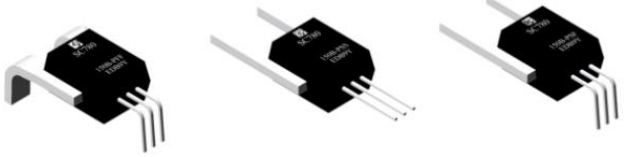
The SC780 series of SENK SEMI are isolated current detection chips that operate on the principle of open-loop Hall sensor detection. By introducing high side current conductor encapsulated in the body, based on the magnetic current, amount of geometric magnetic field generated around the conductor to be tested by core polymerization, the built-in chip magnetic sensor after induction, converted to can handle the geometric voltage signals, the voltage signal through the built-in high resolution ADC read amplifier, with digital calibration techniques, to get rid of such as temperature, noise, hysteresis and nonlinearity of environment variables, such as the final output and the measured current value into an almost ideal than voltage value, realize the isolation type current measurements.

SC780 adopts automatic production and processing, can bring customers incomparable consistency, high quality and high reliability of module technology. The product can be used for AC or DC current measurement, used in UPS, charging piles, frequency converters, white goods and other industrial, commercial and communication systems.

Features

- 5 kV RMS minimum isolation voltage
- Can measure DC and AC current
- Lowest Current conductor impedance :0.08mΩ
- 20kA 8/20uS surge current bearing capacity
- Response time as low as 4uS
- Optional unidirectional current detection mode
- Wide operation temp. range:-40℃~125℃
- Wide range of measured current :50A~280A
- Total output error <1% @TA =25 ℃, <3% for full temperature range.
- Strong driving ability, support the output port to connect to the load as low as 3k
- Extremely simple peripheral circuit
- It is not interfered by wire magnetic field, external magnetic field and geomagnetic field
- High PSRR
- From chip to assembly, independent research and development, no technical dependence
- Certificate Number: E514605-A6002-UL

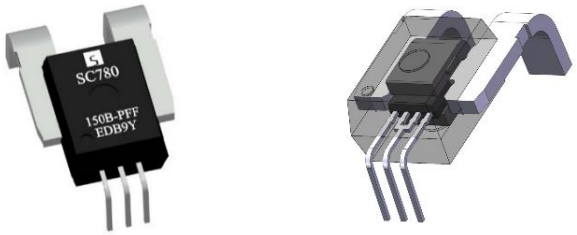
Package Type



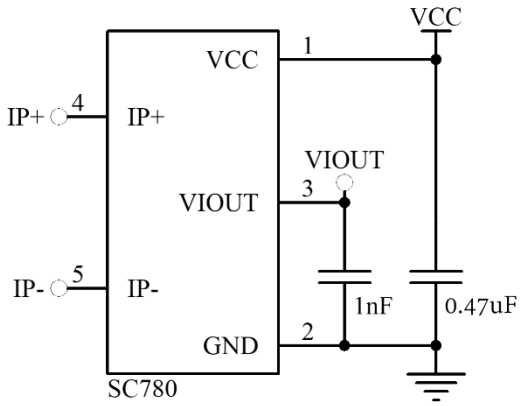
FF SS SF

Package

Top View: Inside view:



Typical Application



Note: It is recommended to use 0.47 power filter capacitor f or filtering effect

Order information

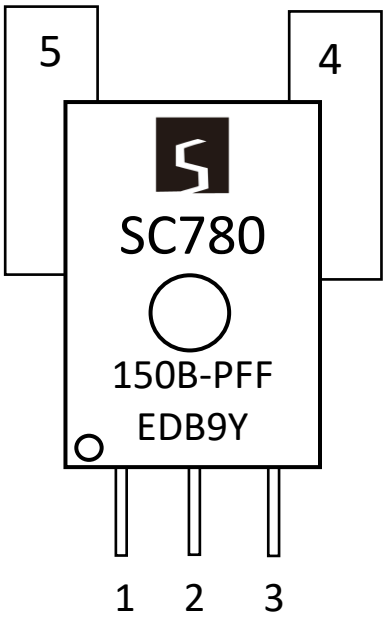
Part Number	Temp Range (℃)	IP(A)	Vout[*1] @IP=0A(V)	Packaging	Number of packages	Sens[*2]@ VCC=5V (mV/A)
SC780-050B-PFF	-40 to 125	±50	B(0.5Vcc)	PFF	40 Pcs/pipe 14pipes/inner box	40
SC780-060B-PFF		±60	B(0.5Vcc)			33.33
SC780-100B-PFF		±100	B(0.5Vcc)			20
SC780-150B-PFF		±150	B(0.5Vcc)	PFF	40 Pcs/pipe 10pipes/packaging bag	13.33
SC780-200B-PFF	-40 to 85	±200	B(0.5Vcc)	PFF	40 Pcs/pipe 14pipes/inner box	10
SC780-250B-PFF		±250	B(0.5Vcc)			8
SC780-280B-PFF		±280	B(0.5Vcc)			7.14
SC780-050U-PFF	-40 to 125	50	U(0.1Vcc)			80
SC780-100U-PFF		100	U(0.1Vcc)			40
SC780-150U-PFF		150	U(0.1Vcc)			26.66
SC780-200U-PFF	-40 to 85	200	U(0.1Vcc)			20
SC780-250U-PFF		250	U(0.1Vcc)			16
SC780-100B-PSF	-40 to 125	±100	B(0.5Vcc)	PSF		20
SC780-150B-PSF		±150	B(0.5Vcc)			13.33
SC780-200B-PSF	40 to 85	±200	B(0.5Vcc)			10
SC780-250B-PSF		±250	B(0.5Vcc)			8
SC780-280B-PSF		±280	B(0.5Vcc)			7.14

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

B	When IP=0A,VIOUT@0A=0.5*VCC, suitable for bidirectional current detection, Zero Current Output and sensitivity vary with VCC ratio.
U*[2]	When IP=0A,VIOUT@0A=0.1*VCC, suitable for unidirectional current detection, Zero Current Output and sensitivity vary with VCC ratio.

Note 2: Model U, dynamic range x2 sensitivity x2; if there is any other sensitivity requirement, can connect our FAE or agent.

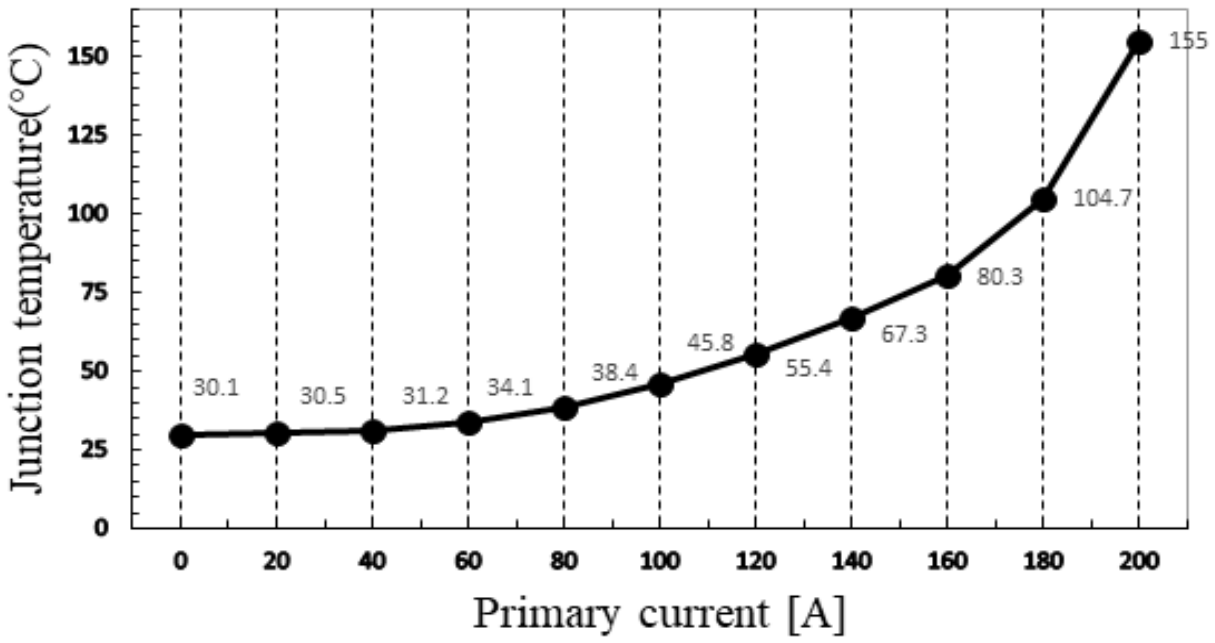
Pin Configuration



Number	Name	Description
1	VCC	Device power supply terminal, default 5V
2	GND	Signal Ground terminal
3	VIOUT	Analog output signal, VIOUT=IP*Sens+ VIout @ IP=0A
4	IP+	Primary current input positive terminal
5	IP-	Primary current input negative terminal

Thermal Rise vs. Primary Current

Typical junction temperature [℃] of SC780 vs Primary current [A] based on Demo Board

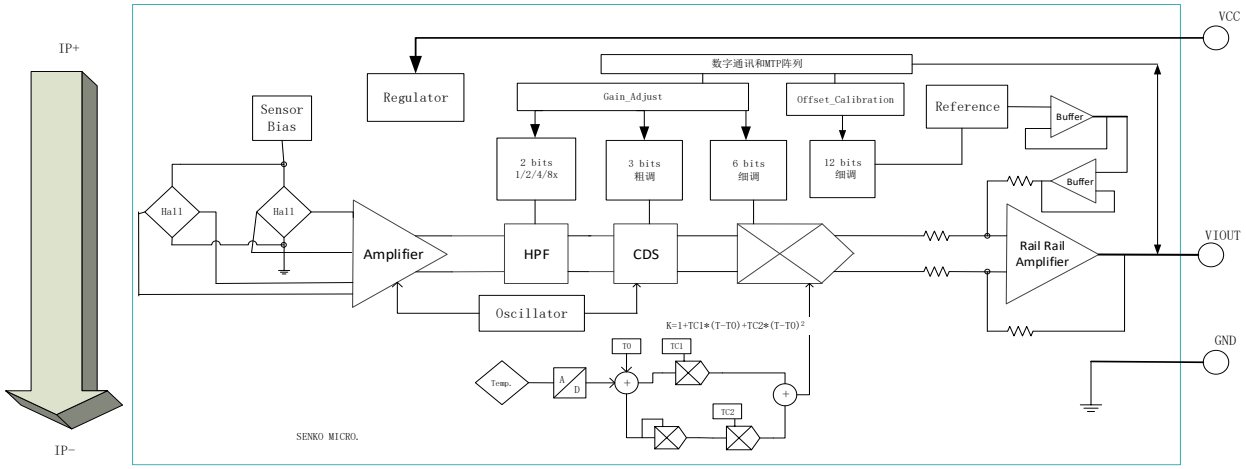


Note: The temperature data is that the current lasts for > 20min and is recorded after the temperature is constant.

Demo Board information

	DEMO	Units
The layer number of PCB	2	
Single layer copper-clad PCB thickness	4	Oz
Area of copper sheet connected to original edge pin (including all layers)	4581	mm^2
Board Thickness	1.6	mm

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. Exposure to absolute maximum rating conditions for an extended period of time may affect device reliability.

Symbol	Characteristic	Notes	Rating	Unit
V_{CC}	Supply voltage		6.0	V
V_{RCC}	Reverse Supply Voltage		-0.1	V
V_{IOUT}	Output voltage		6.0	V
V_{RIOUT}	Reverse Output Voltage		-0.1	V
T_A	Nominal Operating Ambient Temperature	<200A	-40~125	℃
		>200A	-40~85	
$T_{J\ (max)}$	Maximum Junction Temperature		165	℃
T_{stg}	Nominal Operating Ambient Temperature		–65~165	℃
$I_{OUT(Source)}$	Output Current Source	Shorted Output-to-Ground Current	4	mA
$I_{OUT(Sink)}$	Output Current Sink	Shorted Output-to-VCC Current	67	mA
IP_{max}	Maximum IP value of sustainable loading at ambient temperature	It is directly related to the heat dissipation capacity of PCB, and this data depends on the demo test board of SENK	180	A
IPover	Transient overload IP value of sustainable loading at ambient temperature	It is directly related to the heat dissipation capacity of PCB, and this data depends on the demo test board of SENK.1pulse,100ms,1% duty cycle	1000	A
ESD	HBM mode		4	kV

Isolation Characteristics

Symbol	Parameter	Comment	Value	Unit
V_{ISO}	RMS voltage for AC insulation test,50Hz,1min	Agency type-tested for 60 seconds per UL60950-1	5000	Vrms
V_{WVRI}	Working Voltage for Basic Isolation	Maximum working voltage according to UL60950-1	990	V_{Peak}
Dcl	Clearance	Minimum distance through air from IP leads to signal leads	7.25	mm
Dcr	Creepage distance	Minimum distance along package body from IP leads to signal leads	7.25	mm
CTI	Leakage mark index	the electrical breakdown (tracking) properties of an insulating material	600	V
Impulse Voltage	1.2/50μs Impulse voltage		10	kV
Impact of Current	8/20μs impulse current		20	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	1	1	1.5	nF

Common Electrical Characteristics

Note: Over full range of T_A=25 ℃, 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} = 4.5~5.5V, output open		12		mA
Output Capacitance Load	C_L	V_{IOUT} to GND	1	1	1.5	nF
Output Resistive Load	R_L	V_{IOUT} to GND	3			kΩ
Primary Conductor Resistance	$R_{PRIMARY}$	T_A = 25℃		0.08		mΩ
Temperature Coefficient of Primary Conductor Resistance	TC_R	T_A=-40~125℃		3274.12		ppm/℃
Hysteresis	V_{hys}	Viout(load +50A and return to 0A)-Viout(load -50A and return to 0A)		1		mV
Rise time	t_r	IP=50A（50A/us）		2.88		uS
Propagation Delay	t_{pd}	IP=50A（50A/us）		1.88		uS
Response Time	$t_{response}$	IP=50A（50A/us）		3.64		μS
Bandwidth	f	Small signal–3 dB,		80		kHz
Noise Density	I_{ND}	T_A = 25℃ ,C_L=1nF		1654		μA(rms)/√Hz
Noise	I_N			0.133		mA(rms)
	I_N	BW=10KHz		0.051		mA(rms)
	I_N	BW=1KHz		0.027		mA(rms)
Proportional coefficient of servo sensitivity(suitable for product with suffix B5)	S_{coef}	VCC=4.5~5.5V, S_{coef}=Sens (VCC) / Sens (5V)		VCC/5		
VIOUT LinearRail to Rail Output Range	Vrail-rail	R_L=4.7kΩ	10		90	%VCC
Power-On Time	t_{PO}	Output reaches steady state level, TJ = 25 ℃		100	200	μS

SC780-050U Individual Performance Characteristics

Note: Over full range of T_A=-40~125 ℃, C_{Bypass}=0.47uF, C_{Load}=1.0nF, V_{CC}=5V, unless otherwise specified.

Characteristic	Symbol	Test Conditions	Min	Typ[1]	Max	Unit
NOMINAL PERFORMANCE						
Current-Sensing Range	I_{PR}		0		50	A
Zero-Current Output Voltage	Voq	IP=0A		0.1Vcc		V
Sensitivity	Sens	0A<IP<50A		80* S_{coef}		mV/A
ACCURACY PERFORMANCE						
Sensitivity Error	E_{SENS}	I_P = 50 A, T_A = 25℃	-2		2	%
		I_P = 50 A, T_A = 25~125℃	-4.7		4.7	%
		I_P = 50 A, T_A = -40~25℃	-4.6		4.6	%
Offset Voltage	V_{OE}	I_P=0A, T_A = 25℃	-37		37	mV
		I_P=0A, T_A = 25~125℃	-60		60	mV
		I_P=0A, T_A = -40~25℃	-41		41	mV
Nonlinearity	E_{LIN}	Measured using full-scale and half-scale I_P	-3		3	%
Zero ripple	Voq_pp	IP=0A, TA = 25 ℃, Output ripple peak		57.5		mV
TOTAL OUTPUT ERROR COMPONENTS: E_{TOT} = E_{SENS} + V_{OE} /(Sens × I_P)						
Total Output Error[2]	E_{TOT}	I_P = 50 A, T_A=25℃	-2		2	%
		I_P = 50 A, T_A=25℃~125℃	-4		4	%
		I_P = 50 A, T_A= -40℃~25℃	-5		5	%

[1] Typical value is +/-1 sigma value, and 68.27% of products fall within this range;
The maximum/minimum value is +/-3 sigma, and 99.73% of products fall within this range.
[2] Based on the percentage value of peak current IP conditions.

SC780-050B Individual Performance Characteristics

Note: Over full range of T_A=-40~125 ℃, C_{Bypass}=0.47uF, C_{Load}=1.0nF, V_{CC}=5V, unless otherwise specified.

Characteristic	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		0.5Vcc		V
Sensitivity	Sens	-50A<IP<50A		40* S_{coef}		mV/A
ACCURACY PERFORMANCE						
Sensitivity Error	E_{SENS}	I_P = ±50 A, T_A = 25℃	-2.1		2.1	%
		I_P = ±50 A, T_A = 25~125℃	-3.5		3.5	%
		I_P = ±50 A, T_A = -40~25℃	-2.2		2.2	%
Offset Voltage	V_{OE}	I_P=0A, T_A = 25℃	-20		20	mV
		I_P=0A, T_A = 25~125℃	-30		30	mV
		I_P=0A, T_A = -40~25℃	-25		25	mV
Nonlinearity	E_{LIN}	Measured using full-scale and half-scale I_P	-0.8		0.8	%
Zero ripple	Voq_pp	IP=0A, TA = 25 ℃, Output ripple peak		42.5		mV
TOTAL OUTPUT ERROR COMPONENTS: E_{TOT} = E_{SENS} + V_{OE} /(Sens × I_P)						
Total Output Error[2]	E_{TOT}	I_P = ±50 A, T_A=25℃	-2.1		2.1	%
		I_P = ±50 A, T_A=25℃~125℃	-3.7		3.7	%
		I_P = ±50 A, T_A= -40℃ ~ 25℃	-2.5		2.5	%

[1] Typical value is +/-1 sigma value, and 68.27% of products fall within this range;
The maximum/minimum value is +/-3 sigma, and 99.73% of products fall within this range.
[2] Based on the percentage value of peak current IP conditions.

SC780-100B Individual Performance Characteristics

Note: Over full range of T_A=-40~125 ℃, C_{Bypass}=0.47uF, C_{Load}=1.0nF, V_{CC}=5V, unless otherwise specified.

Characteristic	Symbol	Test Conditions	Min	Typ[1]	Max	Unit
NOMINAL PERFORMANCE						
Current-Sensing Range	I_{PR}		-100		100	A
Zero-Current Output Voltage	Voq	IP=0A		0.5Vcc		V
Sensitivity	Sens	-100A<IP<100A		20* S_{coef}		mV/A
ACCURACY PERFORMANCE						
Sensitivity Error	E_{SENS}	I_P = ±100 A, T_A = 25℃	-2.1		2.1	%
		I_P = ±100 A, T_A = 25~125℃	-3.5		3.5	%
		I_P = ±100 A, T_A = -40~25℃	-2.2		2.2	%
Offset Voltage	V_{OE}	I_P=0A, T_A = 25℃	-20		20	mV
		I_P=0A, T_A = 25~125℃	-30		30	mV
		I_P=0A, T_A = - 40~25℃	-25		25	mV
Nonlinearity	E_{LIN}	Measured using full-scale and half-scale I_P	-0.8		0.8	%
Zero ripple	Voq_pp	IP=0A, TA = 25 ℃, Output ripple peak		36.3		mV
TOTAL OUTPUT ERROR COMPONENTS: E_{TOT} = E_{SENS} + V_{OE} /(Sens × I_P)						
Total Output Error[2]	E_{TOT}	I_P = ±100 A, T_A=25℃	-2.1		2.1	%
		I_P = ±100 A, T_A=25℃~125℃	-3.7		3.7	%
		I_P = ±100 A, T_A= -40℃~25℃	-2.5		2.5	%

[1] Typical value is +/-1 sigma value, and 68.27% of products fall within this range;
The maximum/minimum value is +/-3 sigma, and 99.73% of products fall within this range.
[2]Based on the percentage value of peak current IP conditions.

SC780-100U Individual Performance Characteristics

Note: Over full range of T_A=-40~125 ℃, C_{Bypass}=0.47uF, C_{Load}=1.0nF, V_{CC}=5V, unless otherwise specified.

Characteristic	Symbol	Test Conditions	Min	Typ[1]	Max	Unit
NOMINAL PERFORMANCE						
Current-Sensing Range	I_{PR}		0		100	A
Zero-Current Output Voltage	Voq	IP=0A		0.1Vcc		V
Sensitivity	Sens	0<IP<100A		40* S_{coef}		mV/A
ACCURACY PERFORMANCE						
Sensitivity Error	E_{SENS}	I_P = 100 A, T_A = 25℃	-0.8		0.8	%
		I_P = 100 A, T_A = 25~125℃	-3.3		3.3	%
		I_P = 100 A, T_A = -40~25℃	-4.8		4.8	%
Offset Voltage	V_{OE}	I_P=0A, T_A = 25℃	-12		12	mV
		I_P=0A, T_A = 25~125℃	-24		24	mV
		I_P=0A, T_A = -40~25℃	-15		15	mV
Nonlinearity	E_{LIN}	Measured using full-scale and half-scale I_P	-1		1	%
Zero ripple	Voq_pp	IP=0A, TA = 25 ℃, Output ripple peak		40.6		mV
TOTAL OUTPUT ERROR COMPONENTS: E_{TOT} = E_{SENS} + V_{OE} /(Sens × I_P)						
Total Output Error[2]	E_{TOT}	I_P = 100 A, T_A=25℃	-0.5		0.5	%
		I_P = 100 A, T_A=25℃~125℃	-3.6		3.6	%
		I_P = 100 A, T_A= -40℃~25℃	-4.7		4.7	%

[1] Typical value is +/-1 sigma value, and 68.27% of products fall within this range;
The maximum/minimum value is +/-3 sigma, and 99.73% of products fall within this range.
[2] Based on the percentage value of peak current IP conditions.

SC780-150B Individual Performance Characteristics

Note: Over full range of T_A=-40~125 ℃, C_{Bypass}=0.47uF, C_{Load}=1.0nF, V_{CC}=5V, unless otherwise specified.

Characteristic	Symbol	Test Conditions	Min	Typ[1]	Max	Unit
NOMINAL PERFORMANCE						
Current-Sensing Range	I_{PR}		-150		150	A
Zero-Current Output Voltage	Voq	IP=0A		0.5Vcc		V
Sensitivity	Sens	-150A<IP<150A		13.33* S_{coef}		mV/A
ACCURACY PERFORMANCE						
Sensitivity Error	E_{SENS}	I_P = ±150 A, T_A = 25℃	-0.9		0.9	%
		I_P = ±150 A, T_A = 25~125℃	-3		3	%
		I_P = ±150 A, T_A = -40~25℃	-1.9		1.9	%
Offset Voltage	V_{OE}	I_P=0A, T_A = 25℃	-10		10	mV
		I_P=0A, T_A = 25~125℃	-16		16	mV
		I_P=0A, T_A = -40~25℃	-9		9	mV
Nonlinearity	E_{LIN}	Measured using full-scale and half-scale I_P	-0.8		0.8	%
Zero ripple	Voq_pp	IP=0A, TA = 25 ℃, Output ripple peak		27.5		mV
TOTAL OUTPUT ERROR COMPONENTS: E_{TOT} = E_{SENS} + V_{OE} /(Sens × I_P)						
Total Output Error[2]	E_{TOT}	I_P = ±150 A, T_A=25℃	-0.75		0.75	%
		I_P = ±150 A, T_A=25℃~125℃	-3.4		3.4	%
		I_P = ±150 A, T_A= -40℃~25℃	-2.1		2.1	%

[1] Typical value is +/-1 sigma value, and 68.27% of products fall within this range;
The maximum/minimum value is +/-3 sigma, and 99.73% of products fall within this range.
[2] Based on the percentage value of peak current IP conditions.

SC780-150U Individual Performance Characteristics

Note: Over full range of T_A=-40~125 ℃, C_{Bypass}=0.47uF, C_{Load}=1.0nF, V_{CC}=5V, unless otherwise specified.

Characteristic	Symbol	Test Conditions	Min	Typ[1]	Max	Unit
NOMINAL PERFORMANCE						
Current-Sensing Range	I_{PR}		0		150	A
Zero-Current Output Voltage	Voq	IP=0A		0.1Vcc		V
Sensitivity	Sens	0<IP<150A		26.66* S_{coef}		mV/A
ACCURACY PERFORMANCE						
Sensitivity Error	E_{SENS}	I_P = 150 A, T_A = 25℃	-0.8		0.8	%
		I_P = 150 A, T_A = 25~125℃	-3.3		3.3	%
		I_P = 150 A, T_A = -40~25℃	-4.8		4.8	%
Offset Voltage	V_{OE}	I_P=0A, T_A = 25℃	-12		12	mV
		I_P=0A, T_A = 25~125℃	-24		24	mV
		I_P=0A, T_A = - 40~25℃	-15		15	mV
Nonlinearity	E_{LIN}	Measured using full-scale and half-scale I_P	-1		1	%
Zero ripple	Voq_pp	IP=0A, TA = 25 ℃, Output ripple peak		30		mV
TOTAL OUTPUT ERROR COMPONENTS: E_{TOT} = E_{SENS} + V_{OE} /(Sens × I_P)						
Total Output Error[2]	E_{TOT}	I_P = 150 A, T_A=25℃	-0.5		0.5	%
		I_P = 150 A, T_A=25℃~125℃	-3.6		3.6	%
		I_P = 150 A, T_A= -40℃~25℃	-4.7		4.7	%

[1] Typical value is +/-1 sigma value, and 68.27% of products fall within this range;
The maximum/minimum value is +/-3 sigma, and 99.73% of products fall within this range.
[2] Based on the percentage value of peak current IP conditions.

SC780-200B Individual Performance Characteristics

Note: Over full range of T_A=-40~85 ℃, C_{Bypass}=0.47uF, C_{Load}=1.0nF, V_{CC}=5V, unless otherwise specified.

Characteristic	Symbol	Test Conditions	Min	Typ[1]	Max	Unit
NOMINAL PERFORMANCE						
Current-Sensing Range	I_{PR}		-200		200	A
Zero-Current Output Voltage	Voq	IP=0A		0.5Vcc		V
Sensitivity	Sens	-200A<IP<200A		10* S_{coef}		mV/A
ACCURACY PERFORMANCE						
Sensitivity Error	E_{SENS}	I_P = ±200 A, T_A = 25℃	-0.9		0.9	%
		I_P = ±200 A, T_A = 25~85℃	3		3	%
		I_P = ±200 A, T_A = -40~25℃	-1.9		1.9	%
Offset Voltage	V_{OE}	I_P=0A, T_A = 25℃	-10		10	mV
		I_P=0A, T_A = 25~85℃	-16		16	mV
		I_P=0A, T_A = -40~25℃	-9		9	mV
Nonlinearity	E_{LIN}	Measured using full-scale and half-scale I_P	-0.8		0.8	%
Zero ripple	Voq_pp	IP=0A, TA = 25 ℃, Output ripple peak		25		mV
TOTAL OUTPUT ERROR COMPONENTS: E_{TOT} = E_{SENS} + V_{OE} /(Sens × I_P)						
Total Output Error[2]	E_{TOT}	I_P = ±200 A, T_A=25℃	-0.75		0.75	%
		I_P = ±200 A, T_A=25℃~85℃	-3.4		3.4	%
		I_P = ±200 A, T_A= -40℃~25℃	-2.1		2.1	%

[1] Typical value is +/-1 sigma value, and 68.27% of products fall within this range;
The maximum/minimum value is +/-3 sigma, and 99.73% of products fall within this range.
[2] Based on the percentage value of peak current IP conditions.

SC780-200U Individual Performance Characteristics

Note: Over full range of T_A=-40~85 ℃, C_{Bypass}=0.47uF, C_{Load}=1.0nF, V_{CC}=5V, unless otherwise specified.

Characteristic	Symbol	Test Conditions	Min	Typ[1]	Max	Unit
NOMINAL PERFORMANCE						
Current-Sensing Range	I_{PR}		0		200	A
Zero-Current Output Voltage	Voq	IP=0A		0.1Vcc		V
Sensitivity	Sens	0A<IP<200A		20* S_{coef}		mV/A
ACCURACY PERFORMANCE						
Sensitivity Error	E_{SENS}	I_P = 200 A, T_A = 25℃	-0.8		0.8	%
		I_P = 200 A, T_A = 25~85℃	-3.3		3.3	%
		I_P = 200 A, T_A = -40~25℃	-4.8		4.8	%
Offset Voltage	V_{OE}	I_P=0A, T_A = 25℃	-12		12	mV
		I_P=0A, T_A = 25~85℃	-24		24	mV
		I_P=0A, T_A = -40~25℃	-15		15	mV
Nonlinearity	E_{LIN}	Measured using full-scale and half-scale I_P	-1		1	%
Zero ripple	Voq_pp	IP=0A, TA = 25 ℃, Output ripple peak		26.9		mV
TOTAL OUTPUT ERROR COMPONENTS: E_{TOT} = E_{SENS} + V_{OE} /(Sens × I_P)						
Total Output Error[2]	E_{TOT}	I_P = 200 A, T_A=25℃	-0.5		0.5	%
		I_P = 200 A, T_A=25℃~85℃	-3.6		3.6	%
		I_P = 200 A, T_A= -40℃~25℃	-4.7		4.7	%

[1] Typical value is +/-1 sigma value, and 68.27% of products fall within this range;
The maximum/minimum value is +/-3 sigma, and 99.73% of products fall within this range.
[2] Based on the percentage value of peak current IP conditions.

Accuracy characteristic curve

SC780-050U-PFF

Fig1:Offset Voltage vs. Temp.

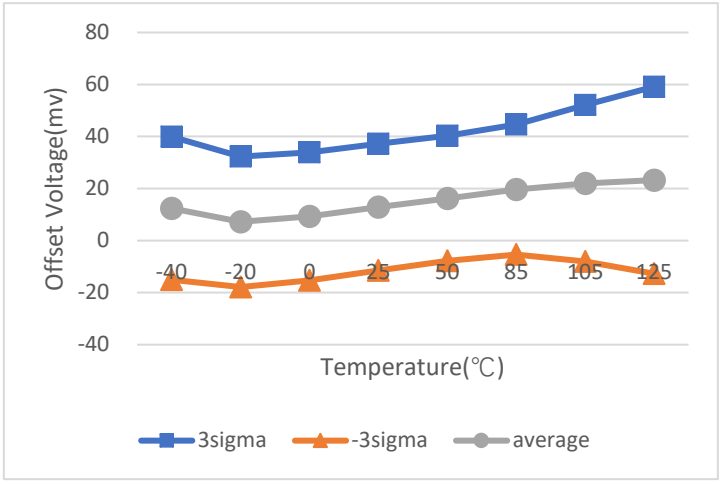


Fig2:Magnetic migration Error vs. Temp.

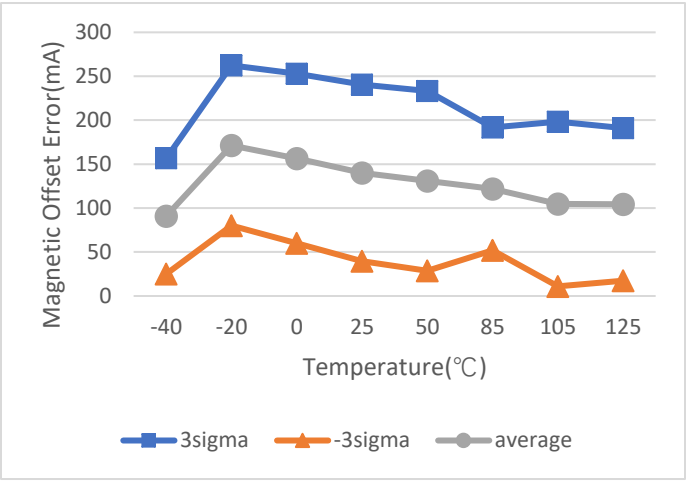


Fig3: Sensitivity vs.Temp.

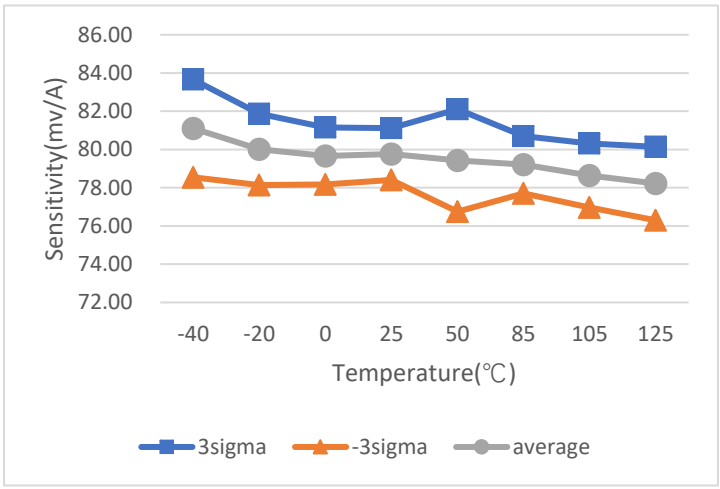


Fig4: Sensitivity Error vs.Temp.

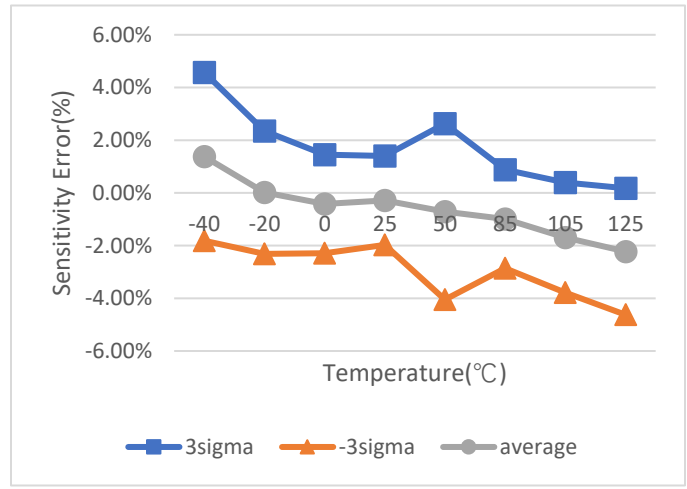


Fig5: Non-linearity vs. Temp.

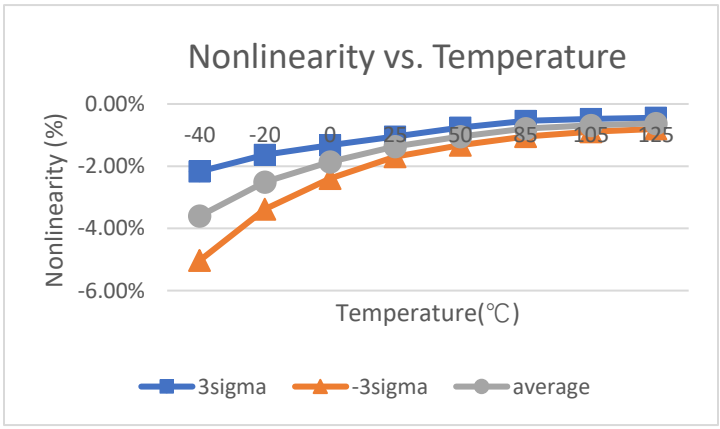
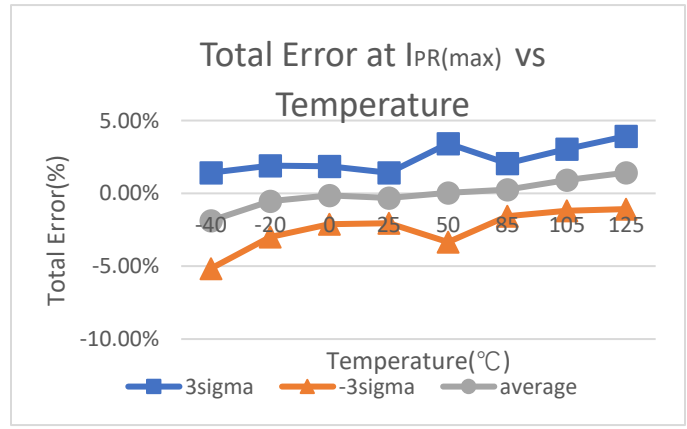


Fig6: Total output Error vs. Temp.



Accuracy characteristic curve

SC780-050B-PFF

Fig1:Offset Voltage vs. Temp.

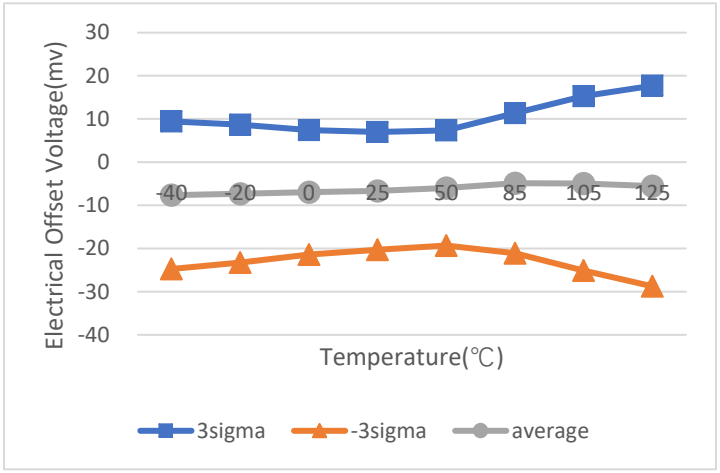


Fig2:Magnetic migration Error vs. Temp.

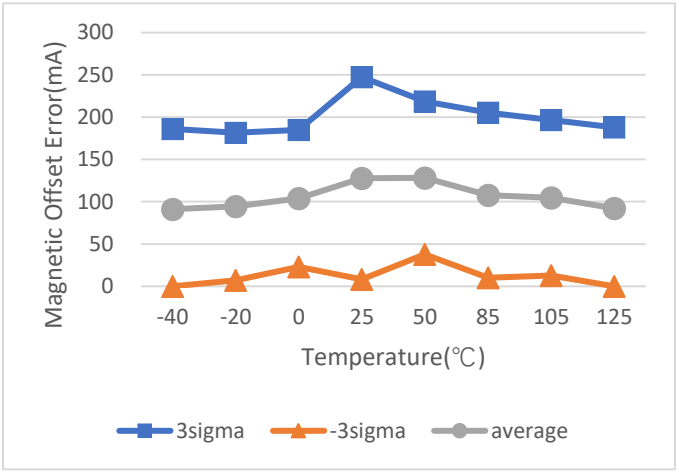


Fig3: Sensitivity vs.Temp.

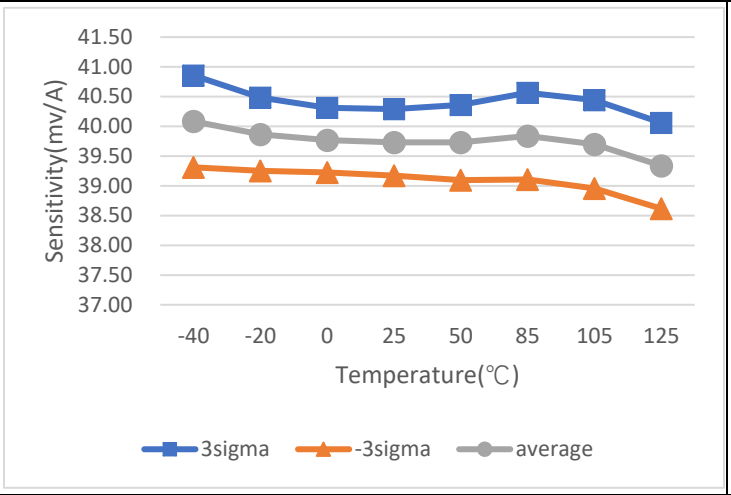


Fig4: Sensitivity Error vs.Temp.

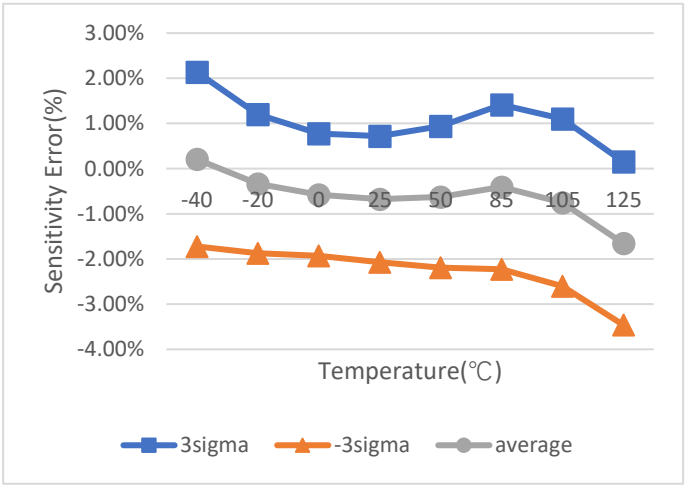


Fig5: Non-linearity vs. Temp.

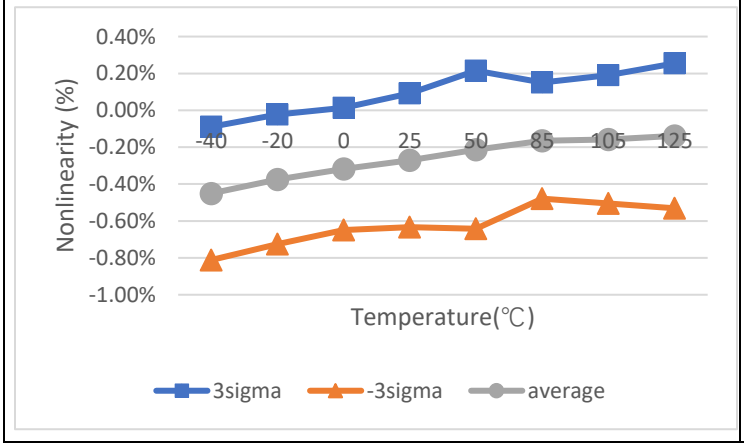
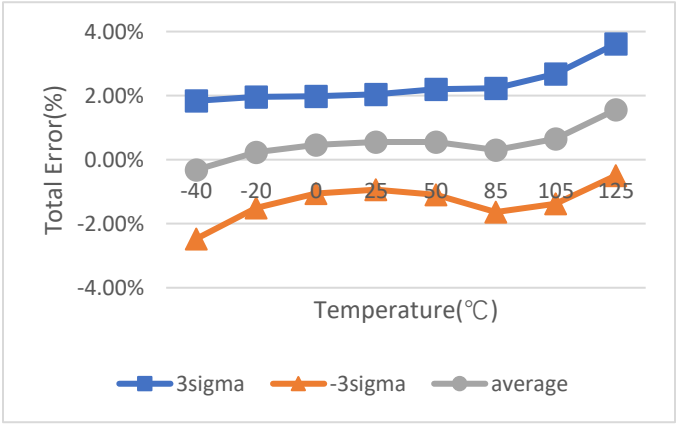


Fig6: Total output Error vs. Temp.



Accuracy characteristic curve

Based on SC780-150B-PFF

Fig1:Offset Voltage vs. Temp.

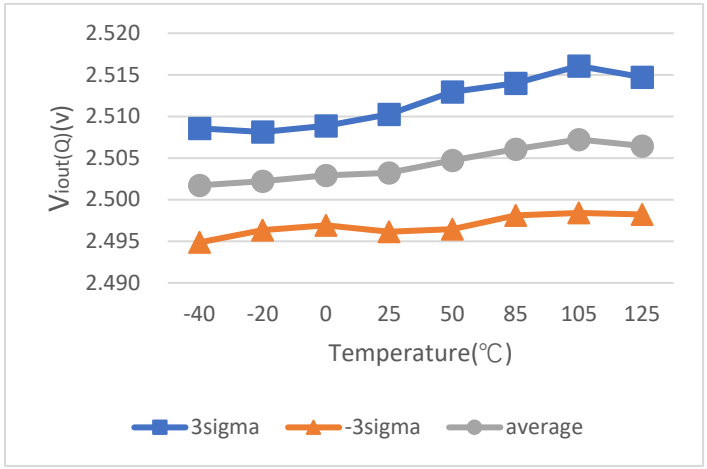


Fig2:Magnetic migration Error vs. Temp.

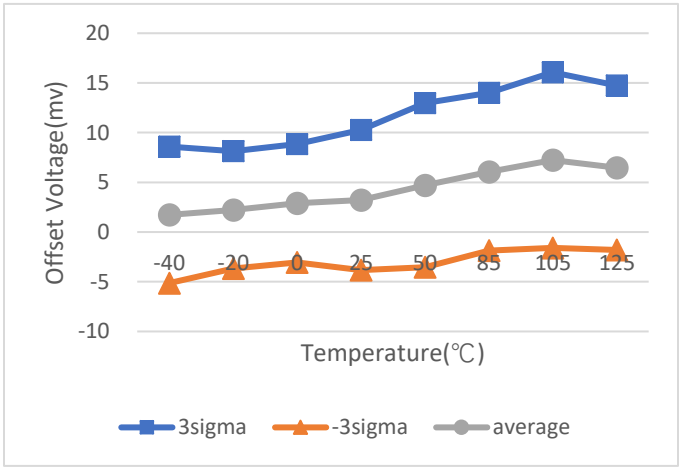


Fig3: Sensitivity vs.Temp.

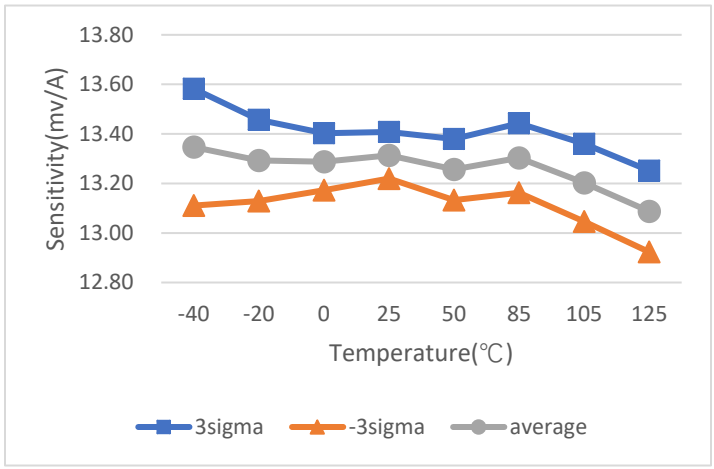


Fig4: Sensitivity Error vs.Temp.

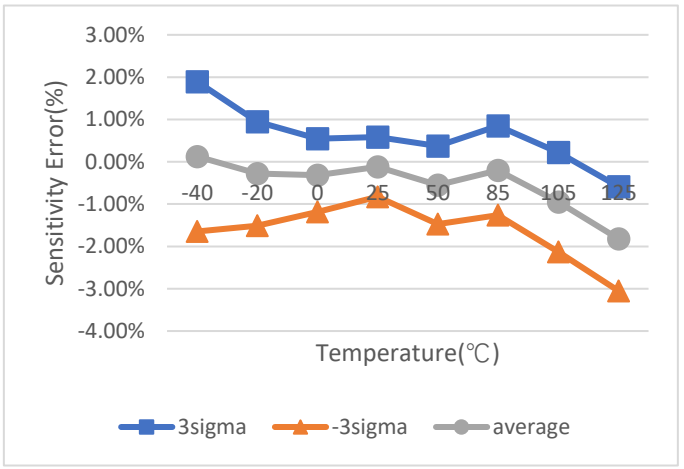


Fig5: Non-linearility vs. Temp.

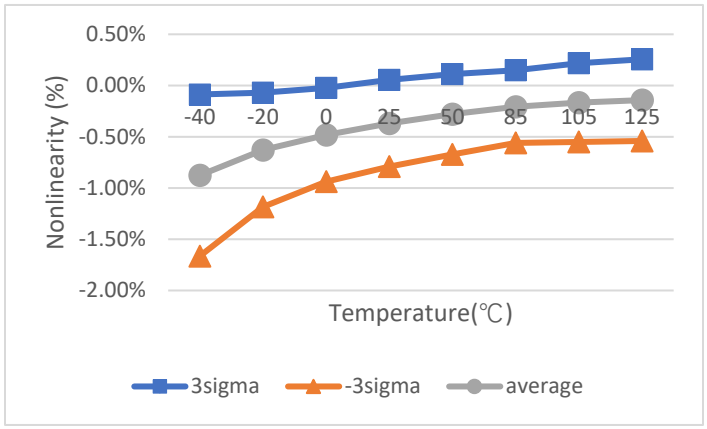
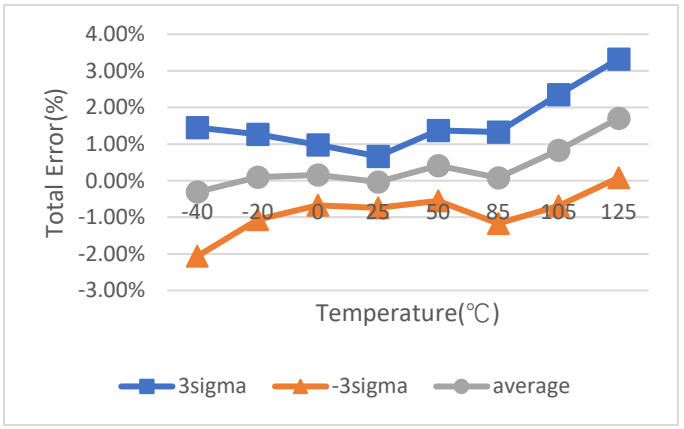


Fig6: Total output Error vs. Temp.



AC & Dynamic Characteristic Curve

Fig1:Trans. Rising time

Fig2:Response Time

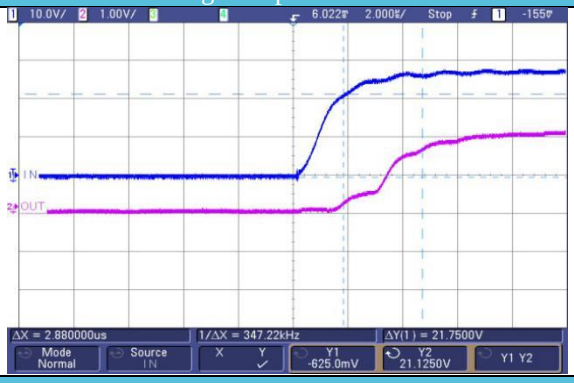


Fig3:Propagation delay time

Fig4:Noise FFT

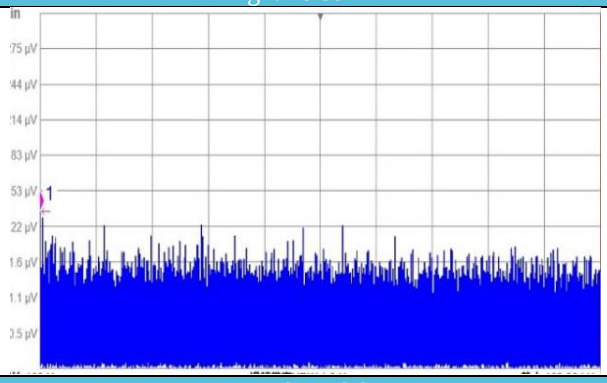


Fig5:Sinwave deltect

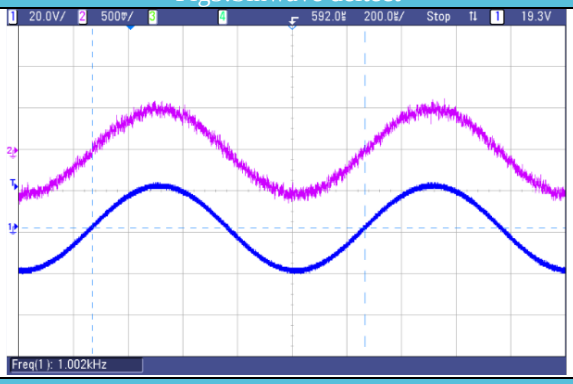


Fig6:Pluse deltect

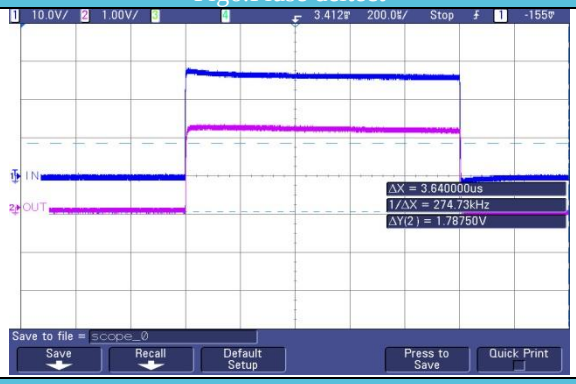
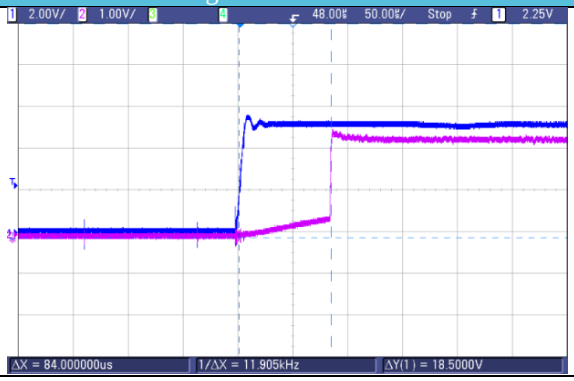


Fig7:Power on time



Characteristic parameter definition description

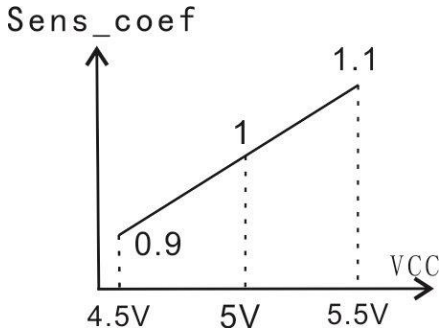
◆ Proportional Coefficient Of Sensitivity(suitable for products with suffix B or U)

Sensitivity ratio coefficient (sens_coef), which defines the coefficient proportional to the sensitivity and VCC. The ideal coefficient is 1. If the VCC increases by 10%, the sensitivity will increase by 10%. At this time, the coefficient is 1.1, which means that the sensitivity increases by 10% compared with the ideal proportion. The relationship between the scale coefficient is described by the following equation:

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

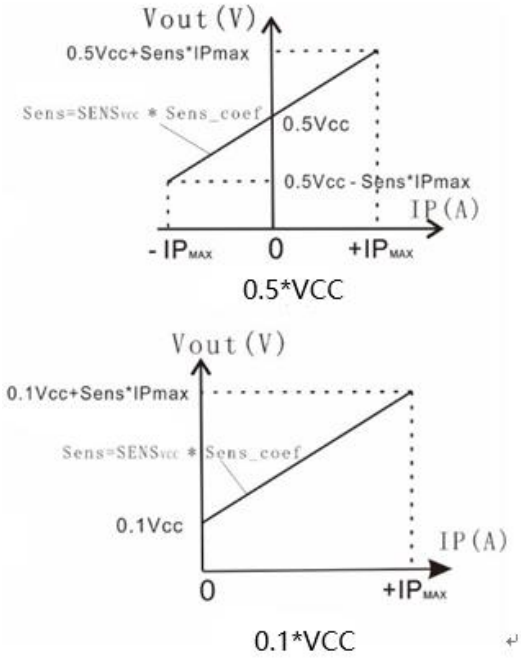
It is the ratio of the sensitivity $SENS_{VCC}$ under the supply voltage Vcc to the sensitivity $SENS_{VCCN}$ under the rated supply voltage VCCN. Through this value, we can get the sensitivity under any supply voltage.

In ideal situation:



◆ Proportional Relationship

- Using SC780-xxxB-PFF, sensitivity and zero voltage are changing with VCC proportion, zero for the VCC / 2, sensitivity to $SENS_{VCC}$* Sens_coef.
- Using SC780-xxxU-PFF, sensitivity and zero voltage are changing with VCC proportion, zero for the VCC / 2, sensitivity to $SENS_{VCC}$* Sens_coef.



◆ 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;

Propagation delay time(t_{pd})

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 ($t_{RESPONSE}$)

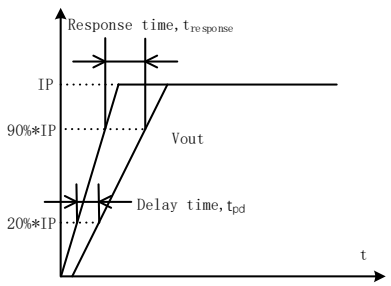
The response time is the time difference when the secondary output reaches 90% of the steady-state output value and when the primary output reaches 90% of the steady-state current.

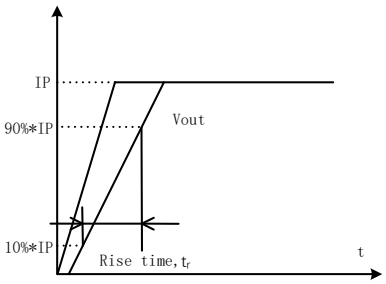
Rise Time (t_r)

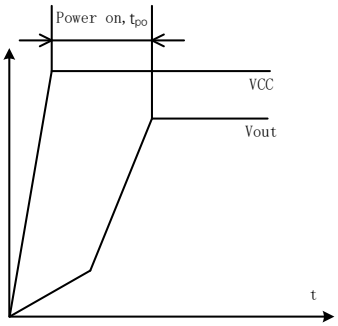
The rising time is used to represent the time difference of the secondary side itself, that is, the time difference between the time when the output of the secondary side reaches 90% of the steady-state output value and 10% of the steady-state output value.

Power-On Time (t_{PO})

Power on time is used to represent 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.







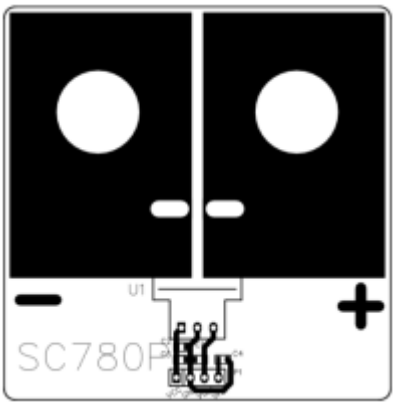
◆ Thermal resistance $R_{\theta JA}$

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.

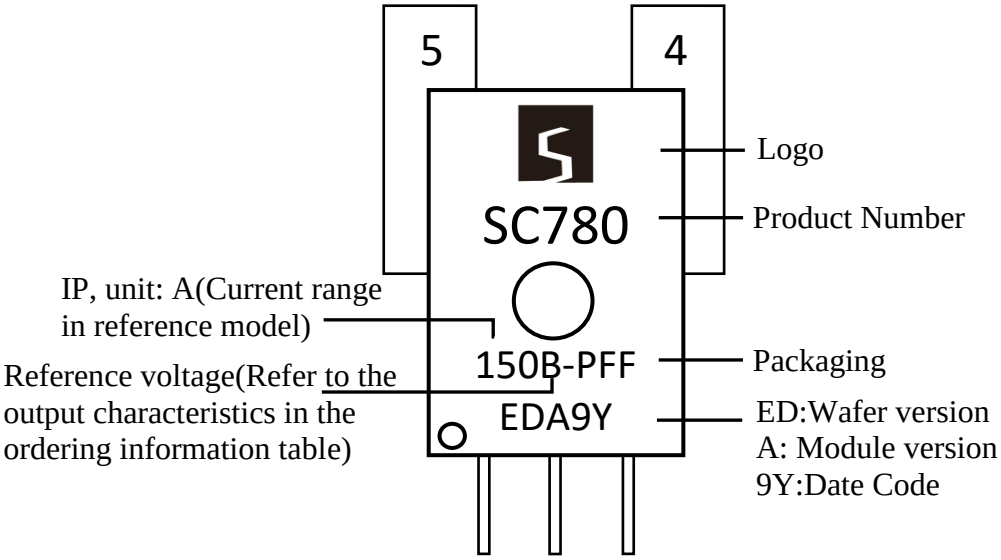
$T_J = T_A + (R_{\theta JA} * POWER) = T_A + (R_{\theta JA} * IP^2 * R_{PRIMARY})$;

Where TJ is junction temperature and TA is ambient temperature.

Demo Board Layout



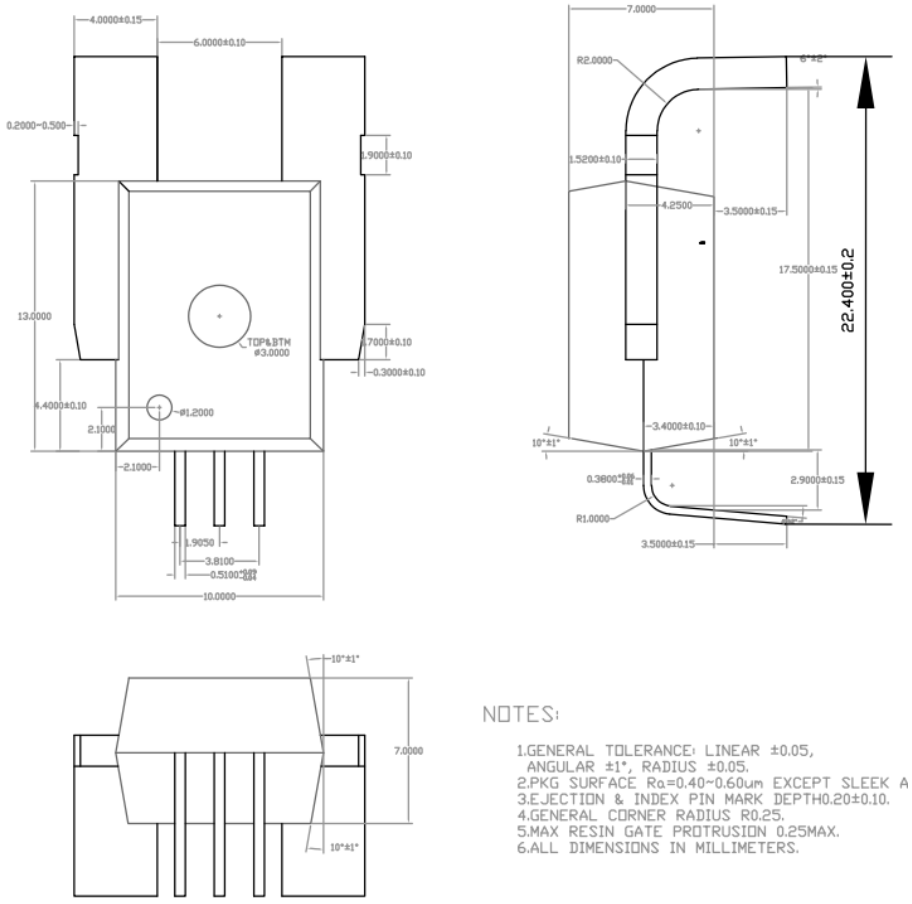
Mark Description



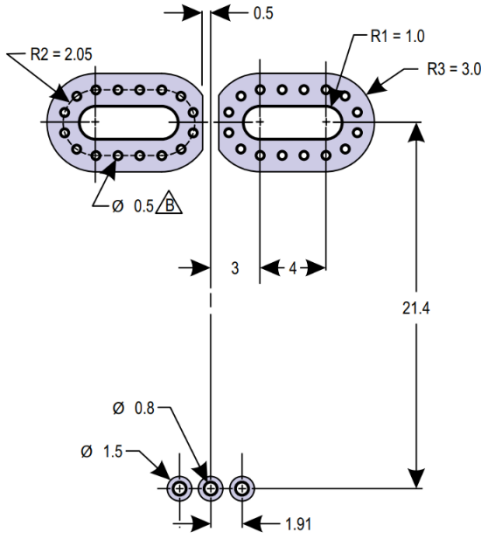
Package Information

Note:all dimensions are in millimeters.

SC780-PFF



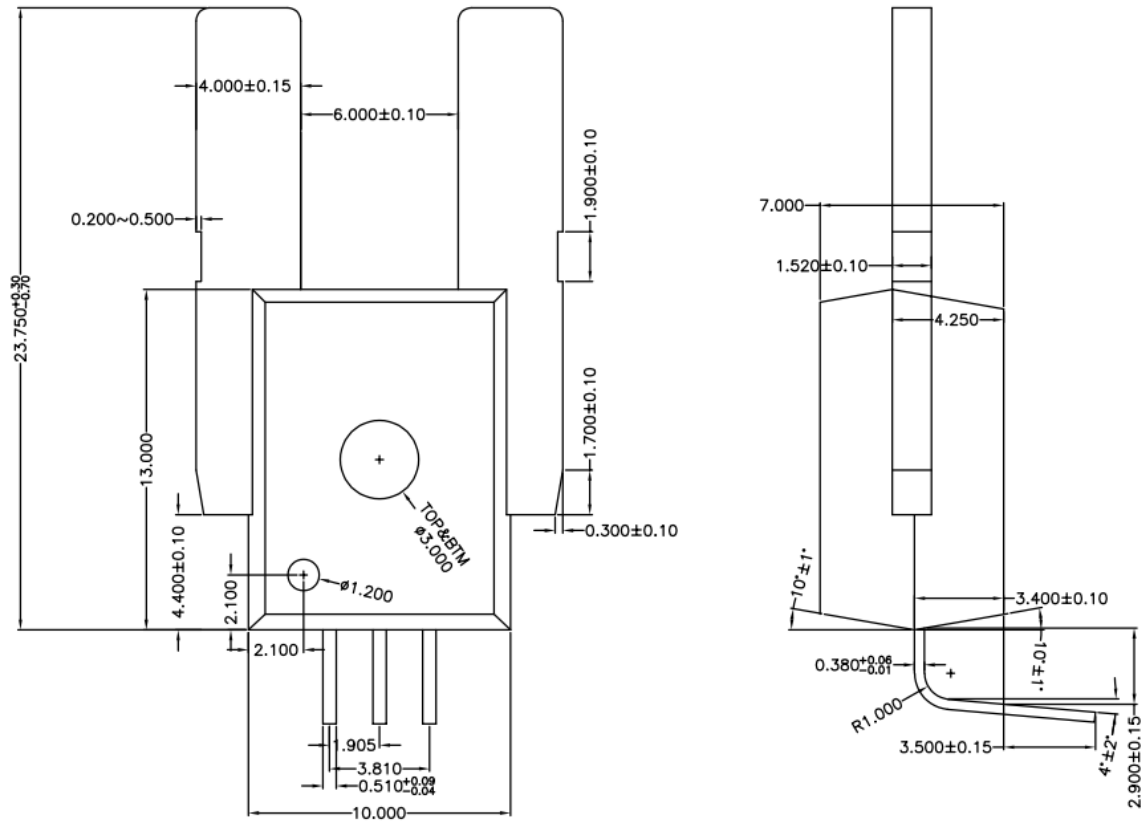
PCB Layout Reference View

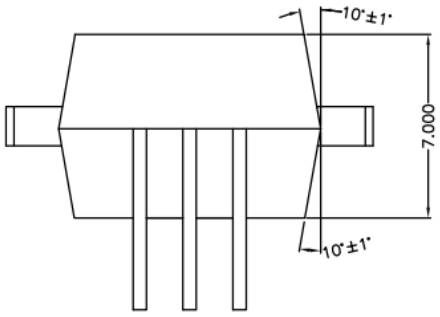


Package Information

Note:all dimensions are in millimeters.

SC780-PSF

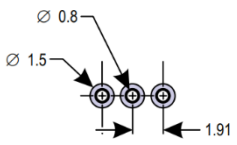




NOTES:

1.GENERAL TOLERANCE: LINEAR ±0.05,
ANGULAR ±1°, RADIUS ±0.05.
2.PKG SURFACE Ra=0.70~0.90um EXCEPT SLEEK AREAS.
3.EJECTION & INDEX PIN MARK DEPTH0.20±0.10.
4.GENERAL CORNER RADIUS R0.15.
5.MAX RESIN GATE PROTRUSION 0.25MAX.
6.ALL DIMENSIONS IN MILLIMETERS.

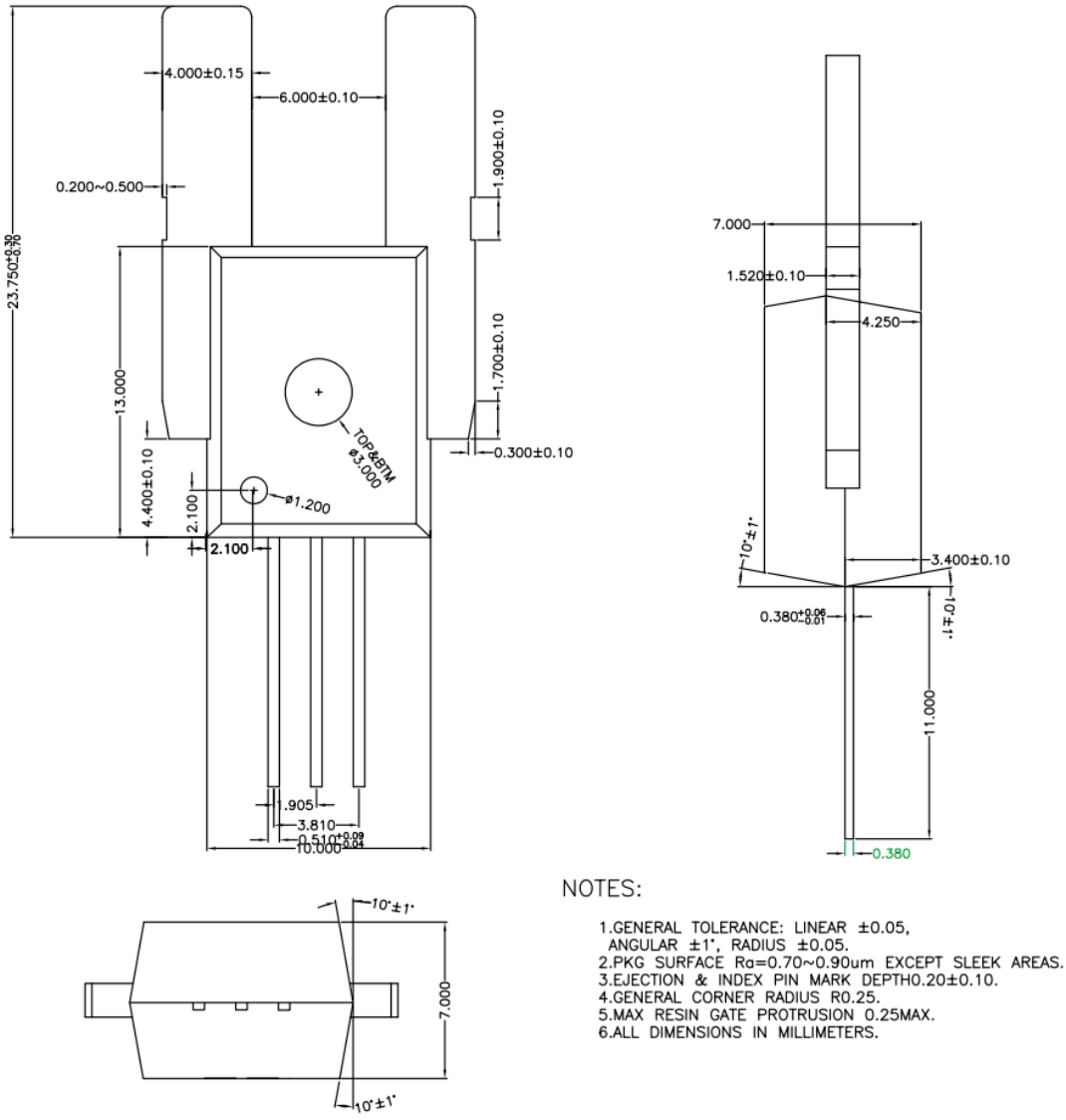
PCB Lavout Reference View



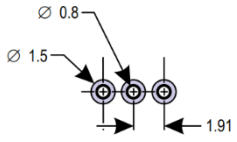
Package Information

Note:all dimensions are in millimeters.

SC780-PSS



PCB Layout Reference View



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Revision History

Revision	Change	Page	Author	Date
1.0	Initial draft		Tom	2018.09.03
2.0	Add SC780-050U/ SC780-050B/ SC780-150B/ SC780-100U individual data; Corrected the content of PAGE4; Add UL and environmental protection logo		Emma	2020.05.01
3.0	Add SC780-250B-PFF/ SC780-100B-PSF/150B-PSF/ 200B-PSF/ 250B-PSF/ 280B-PSF; Modify part of the data and description; Modify VCC filter capacitor; Update SC780-PFF POD; Update the number of packages; Update PFF&PSF&PSS POD; Add SC780-060B-PFF;Add PCB layout reference view; Add SC780-250U-PFF		LEC	2023.12.26