GC182

High accuracy, Large current, High bandwidth
Current Sensor IC

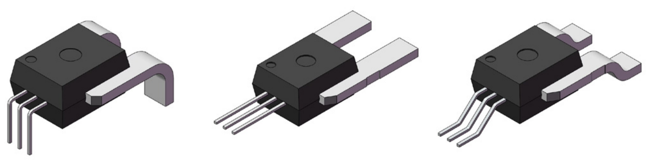
FEATURES

- High Accuracy, Large Current
  - 0~200A Current sensor
  - Offset temperature drift: ±5mV
  - Sensitivity total output error: ±1%
  - Typical sensitivity temperature drift: ±0.2%
  - Typical linearity error: ±0.2%
- High Bandwidth, Fast Response
  - Typical bandwidth: 250kHz
  - Typical response time: 1.5μs
- High Anti-interference, High Isolation
  - The integrated magnetic core resists stray magnetic field interference.
  - Isolated voltage: 5000Vrms

DESCRIPTION

The GC182 series is an open-loop Hall current sensing chip that combines high accuracy, high bandwidth, high response, high linearity, and low temperature drift. GC182 provides 0~200A large current measurement range. GC182 can also do -40 ℃~125 ℃ full temperature range of typical sensitivity temperature drift ±0.2% of the performance indicators. It provides a new solution for the high accuracy and high performance current sensor area.GC182 adapts to strong electromagnetic and high isolation current detection environment. In addition, GC182 series products have passed CE, TUV and other certifications.

PACKAGE



PFF PSS SMT

TYPICAL APPLICATIONS

- Photovoltaic Inverter
- Industrial Inverter
- Commercial Air Conditioning
- Charging Station
- Welding Machine
- Balancing Car
- UPS

TYPICAL APPLICATION CIRCUIT

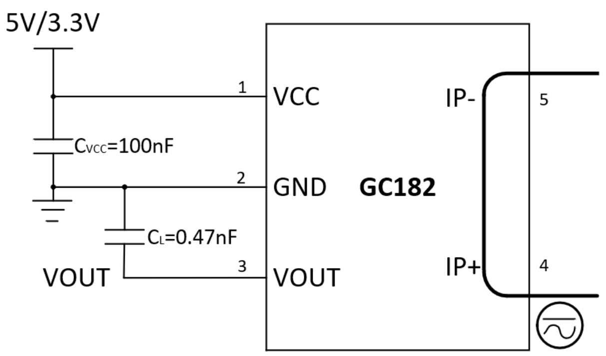


Figure 1. Typical Application Circuit Diagram

THERMAL CURVE

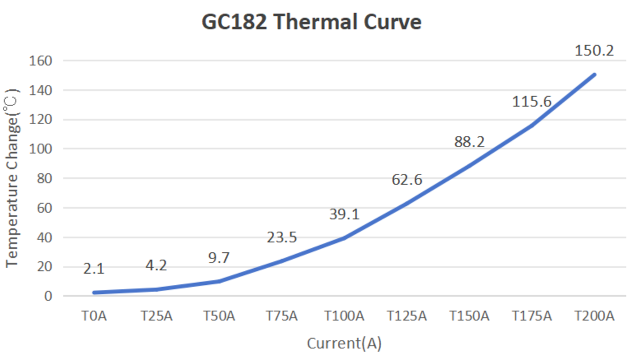


Figure 2. Thermal Curve
(Thermal Curve was measured by Matrixsens using MSEVB0001GC182REVA0 EVM in Zhangjiagang application laboratory at room temperature and no wind.)

SELECTION GUIDE

Part Number	Output Mode	I_{PR}(A)	Sensitivity (mV/A)		Lead Form	Operating Temperature	Packing
			*=3	*=5			
GC182-*KCB050U-PFF-T	Ratiometric Output Mode	50	52.8	80	PFF	-40℃ ～ 125℃	Tube, 34 or 40 pieces per tube
GC182-*KCB050U-PSS-T					PSS		
GC182-*KCB050U-SMT-T					SMT		
GC182-*KCB050B-PFF-T		±50	26.4	40	PFF		
GC182-*KCB050B-PSS-T					PSS		
GC182-*KCB050B-SMT-T					SMT		
GC182-*KCB100U-PFF-T		100	26.4	40	PFF		
GC182-*KCB100U-PSS-T					PSS		
GC182-*KCB100U-SMT-T					SMT		
GC182-*KCB100B-PFF-T		±100	13.2	20	PFF		
GC182-*KCB100B-PSS-T					PSS		
GC182-*KCB100B-SMT-T					SMT		
GC182-*KCB150U-PFF-T		150	17.6	26.66	PFF		
GC182-*KCB150U-PSS-T					PSS		
GC182-*KCB150U-SMT-T					SMT		
GC182-*KCB150B-PFF-T		±150	8.8	13.33	PFF		
GC182-*KCB150B-PSS-T					PSS		
GC182-*KCB150B-SMT-T					SMT		
GC182-*ECB200U-PFF-T		200	13.2	20	PFF	-40℃ ～ 85℃	
GC182-*ECB200U-PSS-T					PSS		
GC182-*ECB200U-SMT-T					SMT		
GC182-*ECB200B-PFF-T		±200	6.6	10	PFF		
GC182-*ECB200B-PSS-T					PSS		
GC182-*ECB200B-SMT-T					SMT		

Note: Changes in ambient temperature may affect the maximum operating current of the product. For specific information, please refer to the derating curve. If you have other range requirements, please contact our sales. New range will be added without notice.

PART NUMBER SPECIFICATION

GC182 - 5 E CB 200 B - PFF - T

Whether it contains lead
- T: Lead-free process

Lead form

Output polarity
- B: Bipolar
- U: Unipolar

Current sensing range

Packing requirement: Tube

Temperature range
- K: -40~125℃
- E: -40~85℃

Supply voltage
- 3: 3.3V
- 5: 5V

Product model

CONTENTS

1. ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Unit	Min.	Typ.	Max.
Supply Voltage	V_{CC}	V	-0.3	/	6.5
Maximun Output Current	I_{OUTmax}	mA	-45	/	45
Maximun Output Voltage	V_{OUTmax}	V	0.1	/	V_{CC}-0.1
Storage Temperature	T_S	℃	-55	/	150
Operating Ambient Temperature	T_A	℃	-40	/	125
Maximum Junction Temperature	T_{Jmax}	℃	/	/	165

Note: Operation outside the absolute maximum ratings may cause permanent device damage. Absolute maximum ratings do not imply functional operation of the device at these or any other conditions beyond those listed under recommended operating conditions. If used outside the recommended operating conditions but within the absolute maximum ratings, the device may not be fully functional, and this may affect device reliability, functionality, performance, and shorten the device lifetime.

2. ESD RATINGS

Characteristic	Symbol	Unit	Notes	Value
Human Body Model	V_{HBM}	kV	ESD between any two pins	±6
Charged Device Model	V_{CDM}	kV		±1

3. ISOLATION CHARACTERISTICS

Characteristic	Symbol	Unit	Notes	Value
Dielectric Surge Voltage	V_{SURGE}	V	Test method refers to IEC61000-4-5, 1.2μs/50μs waveform.	8000
Dielectric Strength Test Voltage	V_{ISO}	V_{RMS}	60s, 50Hz isolation withstand voltage parameters, according to UL62368-1, test 6kV/1s before delivery to verify the insulation performance, and verify the partial discharge is less than 5pc.	5000
Working Voltage for Basic Isolation	V_{WVBI}	V_{PK} or V_{CC}	Maximum approved working voltage for basic (single) isolation according to UL 60950-1 (edition 2).	1800
		V_{RMS}		1272
Working Voltage for Reinforced Isolation	V_{WVRI}	V_{PK} or V_{CC}	Maximum approved working voltage for reinforced isolation according to UL 60950-1 (edition 2).	900
		V_{RMS}		636

4. TYPICAL OVERCURRENT CAPABILITY

Characteristic	Symbol	Unit	Notes	Value
Maximum Current Test	I_{POC}	A	T_A=25°C, Current On 1s, off 99s, Apply 100 pulses	1200
			T_A=85°C, Current On 1s, off 99s, Apply 100 pulses	900
			T_A=125°C, Current On 1s, off 99s, Apply 100 pulses	600

5. PINOUT DIAGRAM & FUNCTIONAL BLOCK DIAGRAM

Number	Name	Description
PIN1	VCC	Device power supply terminal pin
PIN2	GND	Device ground terminal pin
PIN3	VOUT	Analog output signal pin
PIN4	IP+	Current flows into the chip, positive direction
PIN5	IP-	Current flows out of the chip, negative direction

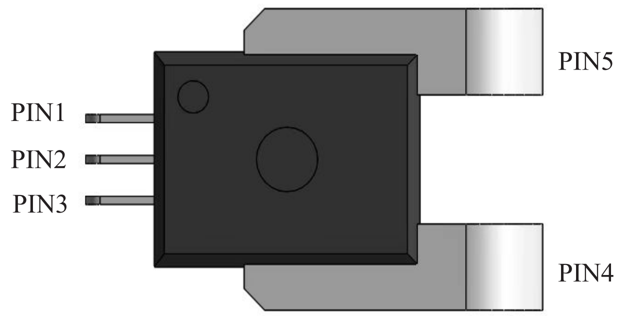


Figure 3. Pinout Diagram

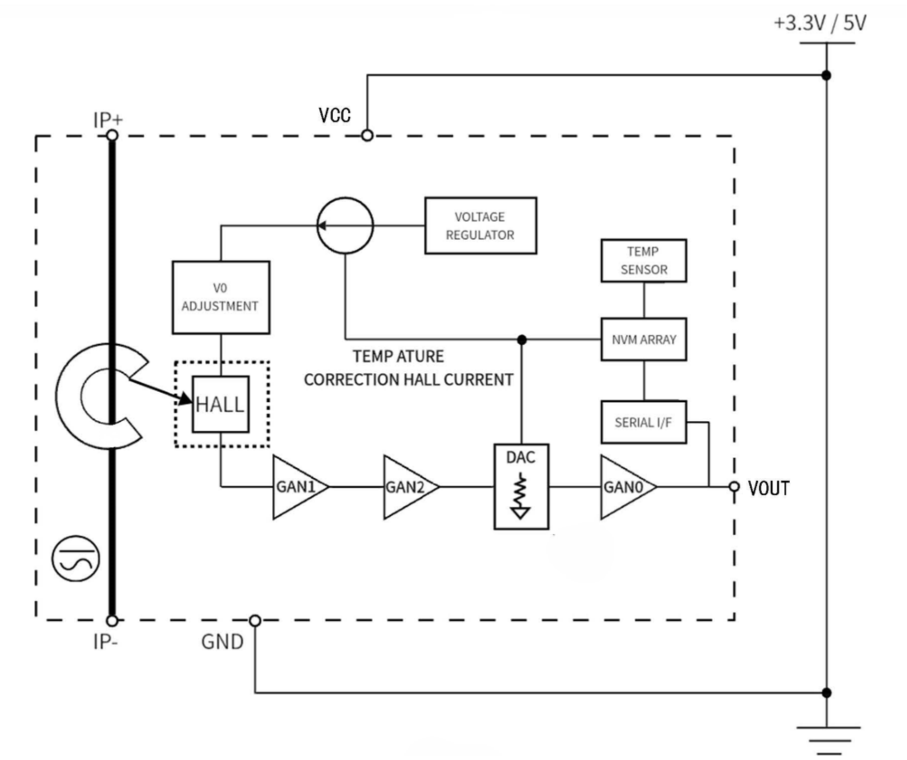


Figure 4. Functional Block Diagram

6. ELECTRICAL CHARACTERISTICS

T_A=25°C, V_{CC}=5V/3.3V, C_L=0.47nF, C_{VCC}=100nF(Unless otherwise noted)

Characteristic	Symbol	Unit	Test Conditions	Min.	Typ.	Max.
Rated Current	I_{PN}	A	GC182-*KCB050U-XXX-T	0	/	50
			GC182-*KCB050B-XXX-T	-50	/	50
			GC182-*KCB100U-XXX-T	0	/	100
			GC182-*KCB100B-XXX-T	-100	/	100
			GC182-*KCB150U-XXX-T	0	/	150
			GC182-*KCB150B-XXX-T	-150	/	150
			GC182-*ECB200U-XXX-T	0	/	200
			GC182-*ECB200B-XXX-T	-200	/	200
Supply Voltage	V_{CC}	V	*=3	3	3.3	3.6
			*=5	4.5	5	5.5
Supply Current[Note1]	I_{CC}	mA	*=3	6	6.5	12
			*=5	6	7.5	12
Primary Conductor Resistance[Note1]	R_P	mΩ	/	/	0.1	/
Power-On Time[Note2]	T_{PO}	ms	Chip power-on（V_{CC}>3.0V）, V_{OUT} stable time	/	1	/
Rise time	T_R	µs	/	/	1	/
Propagation Delay	T_{PROP}	µs	/	/	0.5	/
Response Time	$T_{RESPONSE}$	µs	/	/	1.5	/
Output Capacitive Load[Note2]	C_L	nF	V_{OUT} -V_{GND}	/	0.47	10
Output Resistive Load[Note2]	R_L	kΩ	/	4.7	/	/
DC Output Resistance[Note2]	R_{OUT}	Ω	/	/	1	/
Undervoltage-Lockout[Note1]	$UVLOD$	V	Undervoltage protection rising threshold	/	2.3	/
	$UVLOE$	V	Undervoltage protection drop threshold	/	2.1	/
Undervoltage-Lockout[Note1]	T_{UVLOD}	µs	Undervoltage protection rise time	/	500	/
	T_{UVLOE}	µs	Undervoltage protection drop time	/	50	/
Output Voltage Range	V_S	V	R_L=10kΩ to V_{CC} or GND	0.1	/	V_{CC}-0.1
Internal Bandwidth	BW	kHz	200A range, small signal measurement	/	250	/
Sensitivity Symmetry Error	E_{SYM}	%	/	-0.1	±0.01	0.1
Ratiometric Output Sensitivity Error[Note1]	S_{ERR}	%	V_{CC}=3.15~3.45V	-0.5	0	0.5
			V_{CC}=4.75~5.25V	-0.5	0	0.5
Nonlinearity[Note1]	E_{LIN}	%	≤100A	-0.1	0.03	0.1
			≤200A	-0.2	0.05	0.2
Sensitivity Temperature Drift [Note1]	dS_{ERR}	%	T_A=85°C ~ 125°C	-1.0	±0.2	1.0
			T_A=25°C ~ 85°C	-0.8	±0.2	0.8
			T_A=-40°C ~ 25°C	-1.0	±0.2	1.0
Offset Temperature Drift[Note1]	$V_{IOUT(Q)TC}$	mV	T_A=25°C ~ 125°C	-5	/	5
			T_A=-40°C ~ 25°C	-5	/	5

Note1: These parameters are obtained from laboratory testing with 3σ data.
Note2: These parameters are guaranted by design.

GC182-*KCB050U-XXX-T/GC182-*KCB050B-XXX-T PERFORMANCE CHARACTERISTICS

T_A=25°C, V_{CC}=5V/3.3V, C_L=0.47nF, C_{VCC}=100nF(Unless otherwise noted)

Characteristic	Symbol	Unit	Test Conditions	Min.	Typ.[Note1]	Max.
NOMINAL PERFORMANCE						
Sensitivity (V_{CC}=3.3V)	$Sens$	mV/A	$I_{PRmin} < I_{PR} < I_{PRmax}$ GC182-3KCB050U-XXX-T	/	V_{CC}*52.8 /3.3	/
			$I_{PRmin} < I_{PR} < I_{PRmax}$ GC182-3KCB050B-XXX-T	/	V_{CC}*26.4 /3.3	/
Sensitivity (V_{CC}=5V)	$Sens$	mV/A	$I_{PRmin} < I_{PR} < I_{PRmax}$ GC182-5KCB050U-XXX-T	/	V_{CC}*80/5	/
			$I_{PRmin} < I_{PR} < I_{PRmax}$ GC182-5KCB050B-XXX-T	/	V_{CC}*40/5	/
Zero Current Output Voltage	$V_{IOUT(Q)}$	V	Unipolar, I_{PR}=0A	/	V_{CC}*0.1	/
			Bipolar, I_{PR}=0A	/	V_{CC}*0.5	/
ACCURACY PERFORMANCE						
Noise	V_N	mVrms	/	/	7	/
Magnetic Offset Error	I_{ERROM}	mV	I_P=0A， After I_{PRmax}	/	0.4	/
		mA	I_P=0A， After I_{PRmax}	/	10	/
Total Output Error	E_{TOT}	%	I_P=I_{PRmax}	-1	±0.2	1
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = (V_{IOUT}-V_{IOUT\ Ideal})/(Sens_{Ideal}\times I_P)\times 100\%$						
Sensitivity Error	E_{SENS}	%	I_P=I_{PRmax}, T_A=25°C ~ 125°C	-0.5	±0.2	0.5
Offset Error	V_{OE}	mV	I_P=0A, T_A=25°C ~ 125°C	-10	±0.2	10
			I_P=0A, T_A=25°C	-5	±0.2	5
			I_P=0 A, T_A=-40°C ~ 125°C	-10	±0.2	10
LIFETIME DRIFT CHARACTERISTICS						
Sensitivity Error Lifetime Drift	E_{SENS_drift}	%	After reliability test, T_A=25°C	/	±0.5	/
Total Output Error Lifetime Drift	E_{TOT_drift}	%	After reliability test, T_A=25°C	/	±0.5	/

Note: These parameters are obtained from laboratory testing with 3σ data.

GC182-*KCB0100U-XXX-T/GC182-*KCB100B-XXX-T PERFORMANCE CHARACTERISTIC

T_A=25°C, V_{CC}=5V/3.3V, C_L=0.47nF, C_{VCC}=100nF(Unless otherwise noted)

Characteristic	Symbol	Unit	Test Conditions	Min.	Typ.[Note1]	Max.
NOMINAL PERFORMANCE						
Sensitivity (V_{CC}=3.3V)	*Sens*	mV/A	$I_{PRmin} < I_{PR} < I_{PRmax}$ GC182-3KCB100U-XXX-T	/	V_{CC}*26.4 /3.3	/
			$I_{PRmin} < I_{PR} < I_{PRmax}$ GC182-3KCB100B-XXX-T	/	V_{CC}*13.2 /3.3	/
Sensitivity (V_{CC}=5V)	*Sens*	mV/A	$I_{PRmin} < I_{PR} < I_{PRmax}$ GC182-5KCB100U-XXX-T	/	V_{CC}*40/5	/
			$I_{PRmin} < I_{PR} < I_{PRmax}$ GC182-5KCB100B-XXX-T	/	V_{CC}*20/5	/
Zero Current Output Voltage	$V_{IOUT(Q)}$	V	Unipolar, I_{PR}=0A	/	V_{CC}*0.1	/
			Bipolar, I_{PR}=0A	/	V_{CC}*0.5	/
ACCURACY PERFORMANCE						
Noise	V_N	mVrms	/	/	5	/
Magnetic Offset Error	I_{ERROM}	mV	I_P=0A， After I_{PRmax}	/	0.6	/
		mA	I_P=0A， After I_{PRmax}	/	30	/
Total Output Error	E_{TOT}	%	$I_P=I_{PRmax}$	-1	±0.2	1
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = (V_{IOUT}-V_{IOUT\ Ideal})/(Sens_{Ideal} \times I_P) \times 100\%$						
Sensitivity Error	E_{SENS}	%	$I_P=I_{PRmax}$, T_A=25°C ~ 125°C	-0.5	±0.2	0.5
Offset Error	V_{OE}	mV	I_P=0A, T_A=25°C ~ 125°C	-10	±0.2	10
			I_P=0A, T_A=25°C	-5	±0.2	5
			I_P=0 A, T_A=-40°C ~ 125°C	-10	±0.2	10
LIFETIME DRIFT CHARACTERISTICS						
Sensitivity Error Lifetime Drift	E_{SENS_drift}	%	After reliability test, T_A=25°C	/	±0.5	/
Total Output Error Lifetime Drift	E_{TOT_drift}	%	After reliability test, T_A=25°C	/	±0.5	/

Note: These parameters are obtained from laboratory testing with 3σ data.

GC182-*KCB150U-XXX-T/GC182-*KCB150B-XXX-T PERFORMANCE CHARACTERISTIC

T_A=25°C, V_{CC}=5V/3.3V, C_L=0.47nF, C_{VCC}=100nF(Unless otherwise noted)

Characteristic	Symbol	Unit	Test Conditions	Min.	Typ.[Note1]	Max.
NOMINAL PERFORMANCE						
Sensitivity (V_{CC}=3.3V)	*Sens*	mV/A	$I_{PRmin} < I_{PR} < I_{PRmax}$ GC182-3KCB150U-XXX-T	/	V_{CC}*17.6 /5	/
			$I_{PRmin} < I_{PR} < I_{PRmax}$ GC182-3KCB150B-XXX-T	/	V_{CC}*8.8 /5	/
Sensitivity (V_{CC}=5V)	*Sens*	mV/A	$I_{PRmin} < I_{PR} < I_{PRmax}$ GC182-5KCB150U-XXX-T	/	V_{CC}*26.66 /5	/
			$I_{PRmin} < I_{PR} < I_{PRmax}$ GC182-5KCB150B-XXX-T	/	V_{CC}*13.33 /5	/
Zero Current Output Voltage	$V_{IOUT(Q)}$	V	Unipolar, I_{PR}=0A	/	V_{CC}*0.1	/
			Bipolar, I_{PR}=0A	/	V_{CC}*0.5	/
ACCURACY PERFORMANCE						
Noise	V_N	mVrms	/	/	4	/
Magnetic Offset Error	I_{ERROM}	mV	I_P=0A， After I_{PRmax}	/	0.8	/
		mA	I_P=0A， After I_{PRmax}	/	60	/
Total Output Error	E_{TOT}	%	I_P=I_{PRmax}	-1	±0.2	1
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = (V_{IOUT}-V_{IOUT\,Ideal})/(Sens_{Ideal}\times I_P)\times 100\%$						
Sensitivity Error	E_{SENS}	%	I_P=I_{PRmax}, T_A=25°C ~ 125°C	-0.5	±0.2	0.5
Offset Error	V_{OE}	mV	I_P=0A, T_A=25°C ~ 125°C	-10	±0.2	10
			I_P=0A, T_A=25°C	-5	±0.2	5
			I_P=0 A, T_A=-40°C ~ 125°C	-10	±0.2	10
LIFETIME DRIFT CHARACTERISTICS						
Sensitivity Error Lifetime Drift	E_{SENS_drift}	%	After reliability test, T_A=25°C	/	±0.5	/
Total Output Error Lifetime Drift	E_{TOT_drift}	%	After reliability test, T_A=25°C	/	±0.5	/

Note: These parameters are obtained from laboratory testing with 3σ data.

GC182-*KCB200U-XXX-T/GC182-*KCB200B-XXX-T PERFORMANCE CHARACTERISTIC

T_A=25°C, V_{CC}=5V/3.3V, C_L=0.47nF, C_{VCC}=100nF(Unless otherwise noted)

Characteristic	Symbol	Unit	Test Conditions	Min.	Typ.[Note1]	Max.
NOMINAL PERFORMANCE						
Sensitivity (V_{CC}=3.3V)	*Sens*	mV/A	$I_{PRmin} < I_{PR} < I_{PRmax}$ GC182-3ECB200U-XXX-T	/	V_{CC}*13.2 /3.3	/
			$I_{PRmin} < I_{PR} < I_{PRmax}$ GC182-3ECB200B-XXX-T	/	V_{CC}*6.6 /3.3	/
Sensitivity (V_{CC}=5V)	*Sens*	mV/A	$I_{PRmin} < I_{PR} < I_{PRmax}$ GC182-5ECB200U-XXX-T	/	V_{CC}*20/5	/
			$I_{PRmin} < I_{PR} < I_{PRmax}$ GC182-5ECB200B-XXX-T	/	V_{CC}*10/5	/
Zero Current Output Voltage	$V_{IOUT(Q)}$	V	Unipolar, I_{PR}=0A	/	V_{CC}*0.1	/
			Bipolar, I_{PR}=0A	/	V_{CC}*0.5	/
ACCURACY PERFORMANCE						
Noise	V_N	mVrms	/	/	3	/
Magnetic Offset Error	I_{ERROM}	mV	I_P=0A，After I_{PRmax}	/	1	/
		mA	I_P=0A，After I_{PRmax}	/	100	/
Total Output Error	E_{TOT}	%	$I_P=I_{PRmax}$	-1	±0.2	1
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = (V_{IOUT}-V_{IOUT\ Ideal})/(Sens_{Ideal}\times I_P)\times 100\%$						
Sensitivity Error	E_{SENS}	%	$I_P=I_{PRmax}$, T_A=25°C ~ 125°C	-0.5	±0.2	0.5
Offset Error	V_{OE}	mV	I_P=0A, T_A=25°C ~ 125°C	-10	±0.2	10
			I_P=0A, T_A=25°C	-5	±0.2	5
			I_P=0 A, T_A=-40°C ~ 125°C	-10	±0.2	10
LIFETIME DRIFT CHARACTERISTICS						
Sensitivity Error Lifetime Drift	E_{SENS_drift}	%	After reliability test, T_A=25°C	/	±0.5	/
Total Output Error Lifetime Drift	E_{TOT_drift}	%	After reliability test, T_A=25°C	/	±0.5	/

Note: These parameters are obtained from laboratory testing with 3σ data.

7. PARAMETERS DESCRIPTION

7.1 Sensitivity ***Sens***

The change in sensor IC output in response to a 1A change through the primary conductor. The sensitivity is the product of the magnetic circuit sensitivity (G/A) (1G = 0.1 mT) and the linear IC amplifier gain (mV/G). The linear IC amplifier gain is programmed at the factory to optimize the sensitivity (mV/A) for the full-scale current of the device.

7.2 Sensitivity error E_{SENS}

Sensitivity error E_{SENS} refers to the percentage deviation between the actual measured sensitivity and the ideal sensitivity.

For example, when Vcc = 5V,

$$E_{SENS}=(Sens_{Meas(5V)}-Sens_{Ideal(5V)})/Sens_{Ideal(5V)}\times100\%$$

7.3 The sensitivity temperature drift of dS_{ERR}

Over the entire operating temperature range is defined as:

$$dS_{ERR}=(Sens_{(TA)}-Sens_{(25°C)})/Sens_{(25°C)}\times100\%$$

7.4 Saturation output voltage $V_{OUT\text{-}SAT(H/L)}$

$V_{OUT\text{-}SAT(H)}$ is the maximum output of the chip under the positive current.

$V_{OUT\text{-}SAT(L)}$ is the maximum output of the chip under negative current.

7.5 Zero current output voltage $V_{IOUT(Q)}$

I_p=0, Output voltage of the sensor $V_{IOUT(Q)}$.

For bipolar devices, the output voltage $V_{IOUT(Q)}=V_{CC}\times0.5$,

For unipolar devices, the output voltage $V_{IOUT(Q)}=V_{CC}\times0.1$.
Variation in $V_{IOUT(Q)}$ can be attributed to the resolution of the linear IC quiescent voltage trim and thermal drift.

7.6 Offset voltage V_{OE}

Used to measure the influence of external non-magnetic factors. Under zero-current conditions, in ratiometric output mode, it is the difference between the actual output voltage and the theoretical output voltage.

7.7 Offset temperature drift $V_{IOUT(Q)TC}$

Due to internal circuit tolerance and heat dissipation, static output voltage due to internal circuit tolerance and heat dissipation $V_{OUT(Q)}$ differential static output voltage V_{OE}. May shift with operating temperature $V_{OUT(Q)TC}$.

$$V_{IOUT(Q)TC}=V_{OUT(Q)(TA)}-V_{OUT(25°C)}$$

7.8 Noise V_N

Noise is the macroscopic sum of thermal noise and shot noise inside the current sensor.

Dividing the noise (mV) by the sensitivity (mV/A) gives the smallest current that the device can resolve.

7.9 Symmetry E_{SYM}

Definition: The relationship between the actual output voltage $V_{IOUT(Q)}$ and the forward half-range $V_{IOUT\text{-}POSHALF}$ and reverse half-range $V_{IOUT\text{-}NEGHALF}$ outputs.

The formula is defined as follows:

$$E_{SYM}=(1-(V_{IOUT\text{-}POSHALF}-V_{IOUT(Q)})/(V_{IOUT(Q)}-V_{IOUT\text{-}NEGHALF}))\times100\%$$

7.10 Nonlinearity E_{LIN}

The design output of the device varies linearly with the measured current.

Ideally, under the same supply voltage and ambient temperature conditions, the output sensitivity of the device is the same for two different current sizes I1(half scale current) and I2(full scale current).
In practical application, there is a difference in sensitivity for the measurement of two different current sizes I1 and I2, and nonlinear sensitivity error E_{LIN} describes the difference digitally.
In the chip, positive current nonlinearity E_{LINPOS} and negative current nonlinearity E_{LINNEG} are defined as follows:

I_{POSx}、I_{NEGx} is positive current and negative current

$I_{POS2}=2\times I_{POS1}$

$I_{NEG2}=2\times I_{NEG1}$

$Sens_{Ix}=(V_{IOUT(Ix)}-V_{IOUT(Q)})/Ix$

$E_{LINPOS}=(1-(Sens_{IPOS2}/Sens_{IPOS1}))\times100\%$

$E_{LINNEG}=(1-(Sens_{INEG2}/Sens_{INEG1}))\times100\%$

Due to the hysteresis effect of the internal magnetic core, magnetic saturation exists at high currents. Therefore, the nonlinear error increases when the measured current exceeds 200A. [Specific reference to the sensitivity error E_{SENS}]

7. PARAMETER DESCRIPTION (CONTINUED)

7.11 Proportional output sensitivity error S_{ERR}

The proportional output sensitivity error S_{ERR} is defined based on the supply voltage Vcc:

$$S_{ERR}=(1-(Sens_{Vcc}/Sens_{5V})/(Vcc/5V))\times 100\%$$

$$S_{ERR}=(1-(Sens_{Vcc}/Sens_{3.3V})/(Vcc/3.3V))\times 100\%$$

Proportional output error of static voltage V_{0zero}

Error between the ratio of V_{out1} and V_{out0} value at V_{CC}=5V and the theoretical ratio when Vcc varies from 4.5V to 5.5V, or at V_{CC}=3.3V and the theoretical ratio when V_{CC} varies from 3.0V to 3.6V.

$$V_{0zero}=(1-(Vout1/Vout0)/(V_{CC}/5V))\times 100\%$$

$$V_{0zero}=(1-(Vout1/Vout0)/(V_{CC}/3.3V))\times 100\%$$

7.12 Total output error E_{TOT}

The difference between the current measurement from the sensor IC and the actual current (I_P), relative to the actual current. This is equivalent to the difference between the ideal output voltage and the actual output voltage,divided by the ideal sensitivity, relative to the current flowing through the primary conduction path:

$$E_{TOT}=(V_{IOUT}-V_{IOUTIdeal})/(Sens_{Ideal}\times I_P)\times 100\%$$

At relatively large current, E_{TOT} is mainly sensitivity error, while at relatively small current, E_{TOT} is mainly zero current sensitivity error voltage V_{OE}. As I_P approaches zero, E_{TOT} approaches infinity due to the bias voltage.

$$V_{IOUTIdeal}=V_{IOUT(Q)}+(Sens_{Ideal}\times I_P)$$

7.13 Dynamic response characteristic

7.13.1 Power-on time T_{PO}

When the supply is ramped to its operating voltage, the device requires a finite amount of time to power its internal components before responding to an input magnetic field. Power-On Time (T_{PO}) is defined as the time interval between the power supply has reached its minimum specified operating voltage (V_{UVLOD}) and the sensor output has settled within ±10% of its steady-state value under an applied magnetic field.

7.13.2 Rise time T_R

The time interval between the sensor output voltage reaches 10% of its full-scale value and it reaches 90% of its full-scale value.

7.13.3 Propagation delay T_{PROP}

The time interval between the sensed primary current reaches 20% of its final value and the sensor output voltage reaches 20% of its full-scale value.

7.13.4 Response Time $T_{RESPONSE}$

The time interval between the sensed primary current reaches 90% of its final value and the sensor output voltage reaches 90% of its full-scale value.

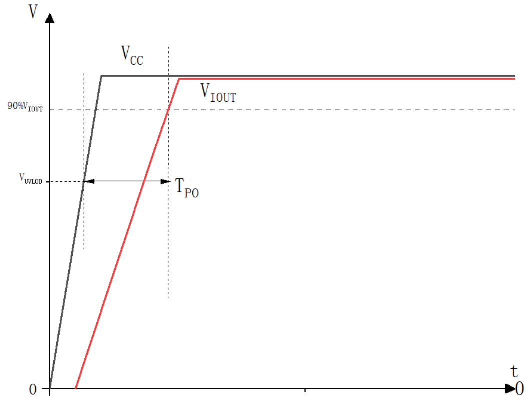


Figure 5. Power-on Time T_{PO}

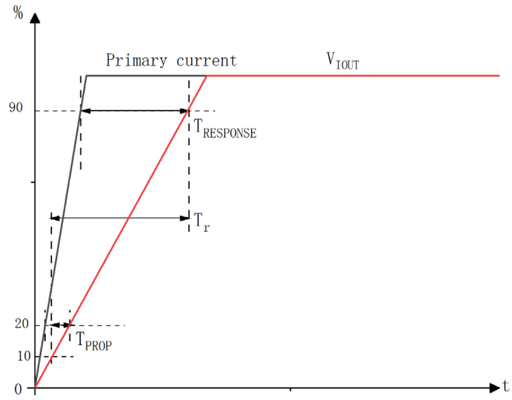


Figure 6. Dynamic Response Time Parameters

8. THERMAL EVALUATION

The product will naturally heat up during useing, and the thermal curve performance of this device was measured in a windless environment at 25±3°C in Zhangjiagang application laboratory using a MSEVB0005GC1868REVA0 EVM.

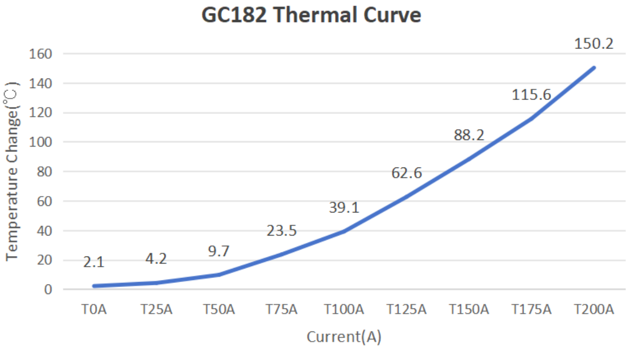
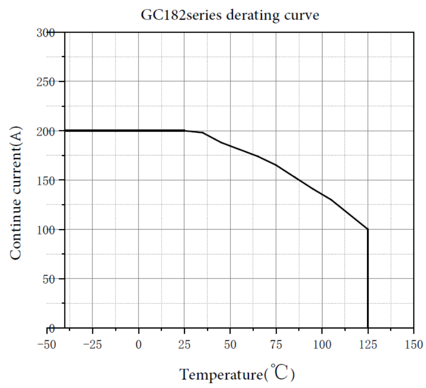


Figure 7. Thermal curve



Products above 200A are only used for transient current detection, if you need to work for a long time, please add additional heat dissipation.

Figure 8. Derating curve

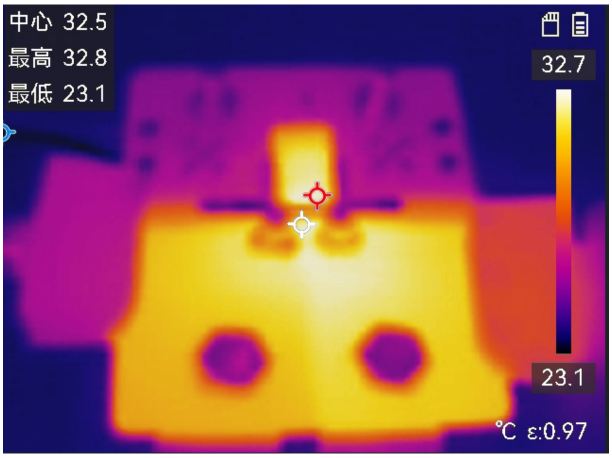


Figure 9. Thermal performance of 50A

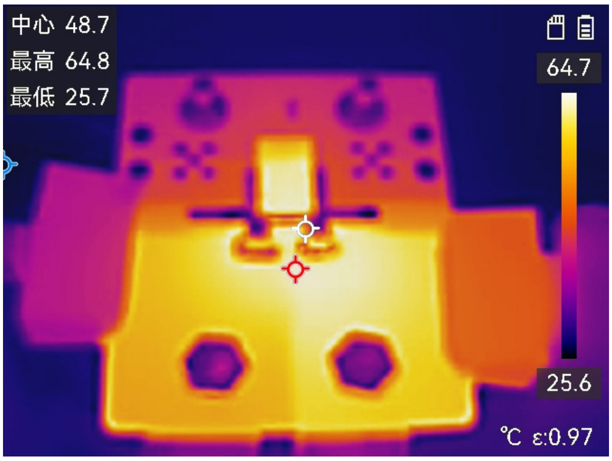


Figure 10. Thermal performance of 100A

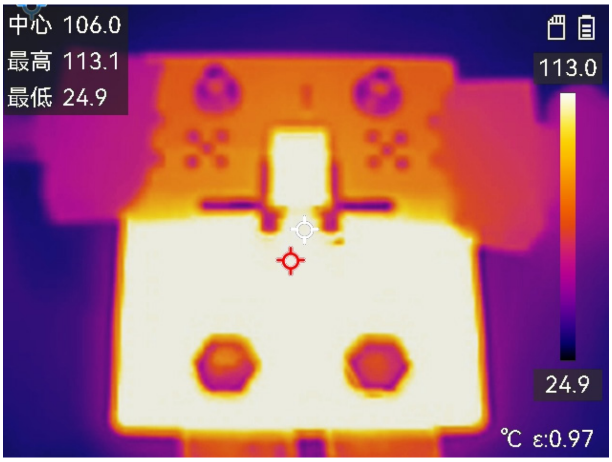


Figure 11. Thermal performance of 150A

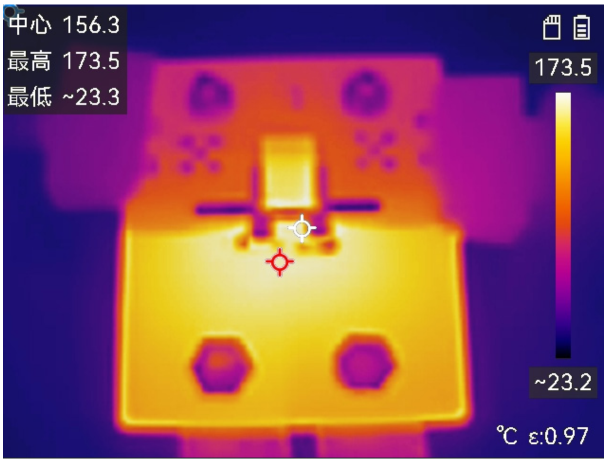


Figure 12. Thermal performance of 200A

9. LAYOUT GUIDELINES

Test information of the demo board

The IP heat dissipation copper thickness of the demo board is 4oz,the heat dissipation area is 2×986 (mm^2),the test wiring uses Kelvin sense to avoid the voltage drop caused by GND impedance, and capacitors should set to the chip pins as close as possible.C_L=0.47nF, C_{VCC}=100nF

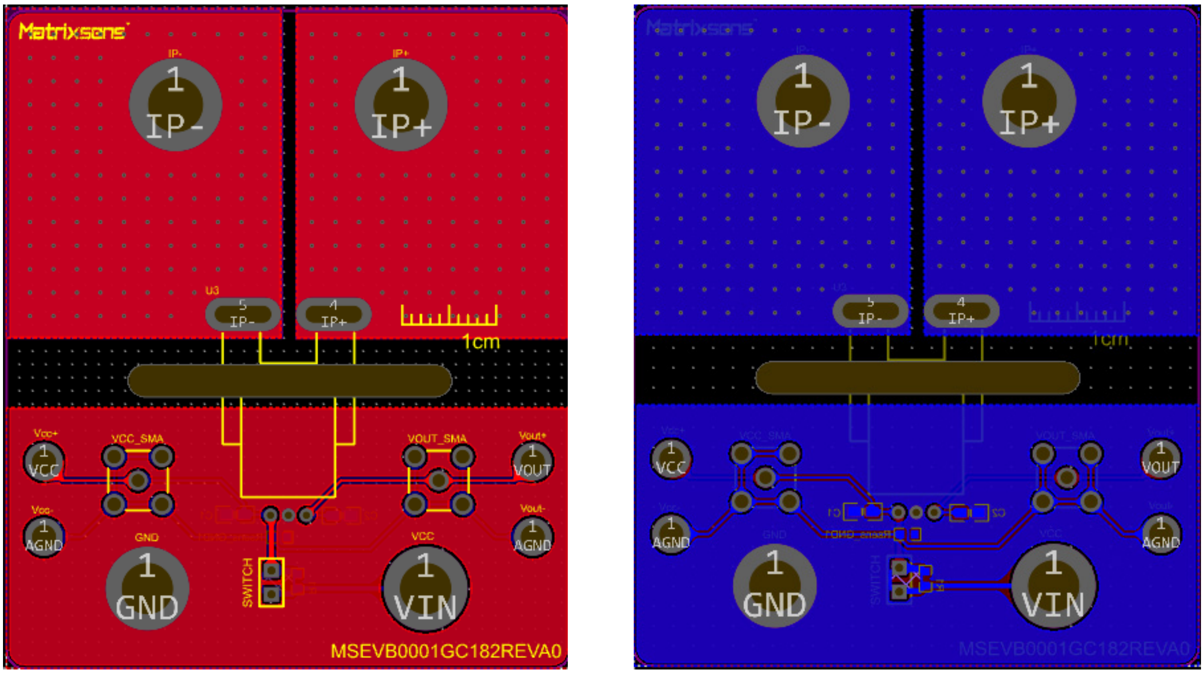
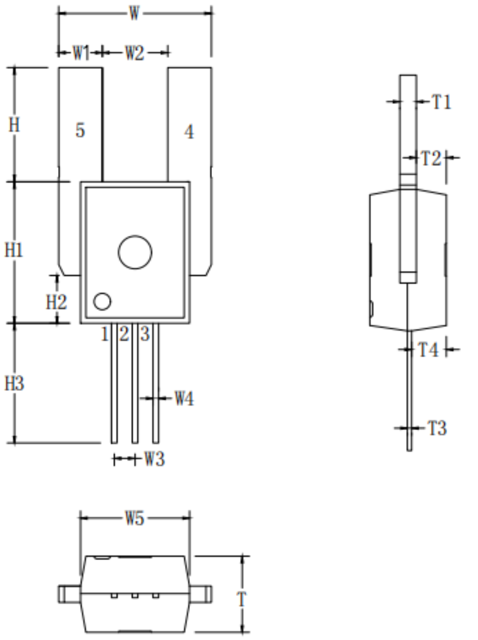


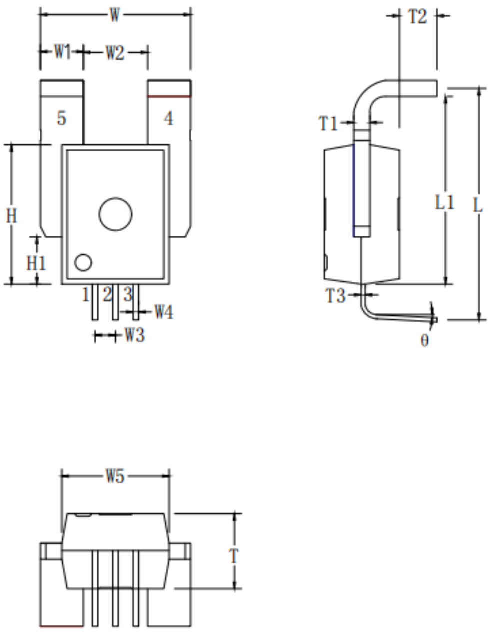
Figure 13. Demo board

10. PACKAGE OUTLINE



NUM	SIZE（mm）			NOTE
	MIN	NOM	MAX	
W	13.80	14.00	14.20	
W1	3.80	4.00	4.20	
W2	5.80	6.00	6.20	
W3	1.70	1.90	2.10	
W4	0.41	0.51	0.61	
W5	9.90	10.00	10.10	
H	10.00	10.50	11.00	
H1	12.90	13.00	13.10	
H2	4.30	4.40	4.50	
H3	10.50	11.00	11.50	
T	6.90	7.00	7.10	
T1	1.40	1.50	1.60	
T2	2.65	2.75	2.85	
T3	0.33	0.38	0.43	
T4	3.08	3.18	3.28	

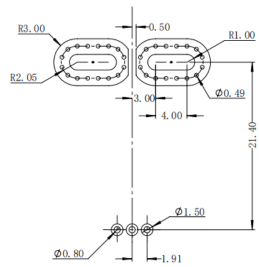
Figure 14. 5PIN-PSS Package



NUM	SIZE（mm）			NOTE
	MIN	NOM	MAX	
W	13.80	14.00	14.20	
W1	3.80	4.00	4.20	
W2	5.80	6.00	6.20	
W3	1.70	1.90	2.10	
W4	0.41	0.51	0.61	
W5	9.90	10.00	10.10	
T	6.90	7.00	7.10	
H	12.90	13.00	13.10	
H1	4.30	4.40	4.50	
T1	1.40	1.50	1.60	
T2	3.30	3.50	3.70	
T3	0.33	0.38	0.43	
L	20.40	21.40	22.40	
L1	17.30	17.50	17.70	
θ1	0°	5°	10°	
θ2	-1°	1°	3°	

Figure 15. 5PIN-PFF Package

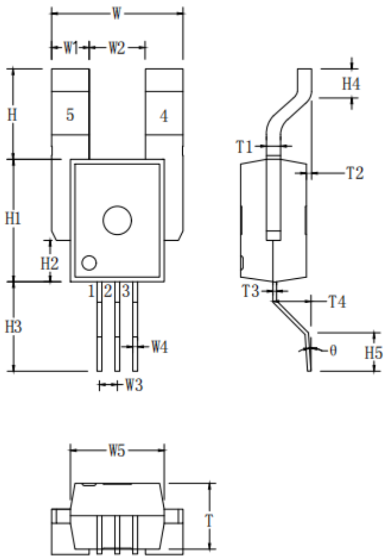
Example Board Layout:



General linear tolerance: ±0.2mm

Figure 16. Recommend pad size

10. PACKAGE OUTLINE(CONTINUED)

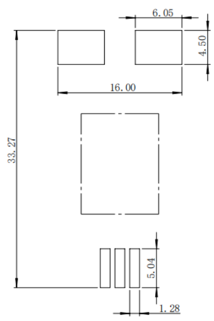


NUM	SIZE (mm)			NOTE
	MIN	NOM	MAX	
W	13.80	14.00	14.20	
W1	3.80	4.00	4.20	
W2	5.80	6.00	6.20	
W3	1.70	1.90	2.10	
W4	0.41	0.51	0.61	
W5	9.90	10.00	10.10	
H	9.10	9.60	10.10	
H1	12.90	13.00	13.10	
H2	4.30	4.40	4.50	
H3	9.00	9.50	10.00	
H4	1.90	2.40	2.90	
H5	3.30	3.80	4.30	
θ	0°	4°	8°	

NUM	SIZE (mm)			NOTE
	MIN	NOM	MAX	
T	6.90	7.00	7.10	
T1	1.40	1.50	1.60	
T2	0.00	0.50	1.00	
T3	0.33	0.38	0.43	
T4	3.20	3.70	4.20	

Figure 17. 5PIN-SMT Package

Example Board Layout:



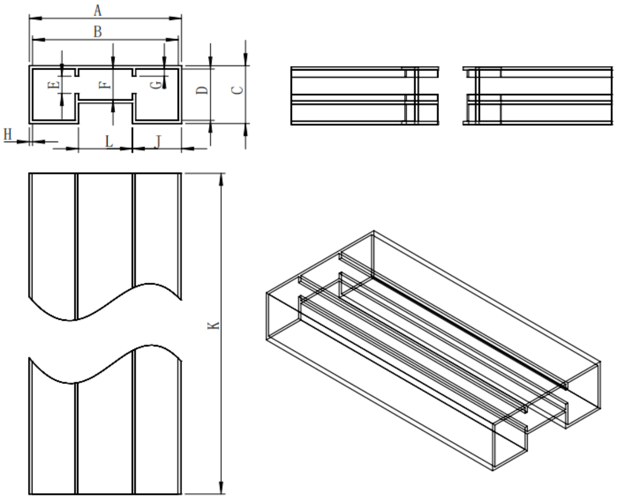
General linear tolerance: ±0.2mm

Figure 18. Recommend pad size

11. PACKING & STORAGE INFORMATION

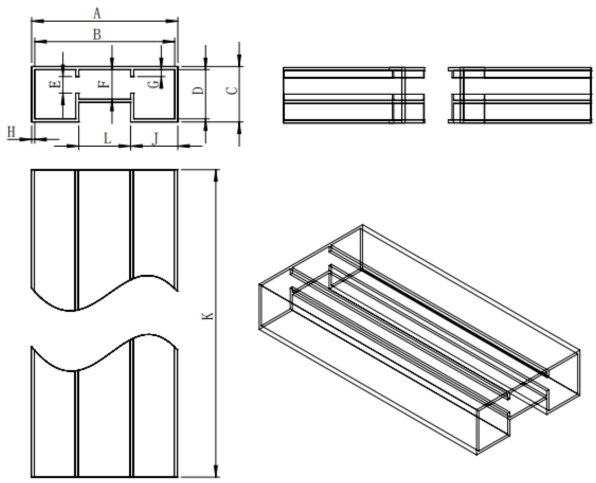
11.1 Packing

Tube, 34/40 pieces per tube



NUM	SIZE（mm）		
	MIN	NOM	MAX
A	37.80	38.00	38.20
B	36.20	36.40	36.60
C	13.80	14.00	14.20
D	12.20	12.40	12.60
E	4.10	4.30	4.50
F	7.50	7.70	7.90
G	1.60	1.80	2.00
H	0.60	0.80	1.00
L	13.50	13.70	13.90
J	11.95	12.15	12.35
K	524.00	525.00	526.00

Figure 19. 34 PCS packing



NUM	SIZE（mm）		
	MIN	NOM	MAX
A	37.80	38.00	38.20
B	36.20	36.40	36.60
C	13.80	14.00	14.20
D	12.20	12.40	12.60
E	4.10	4.30	4.50
F	7.50	7.70	7.90
G	1.60	1.80	2.00
H	0.60	0.80	1.00
L	13.50	13.70	13.90
J	11.95	12.15	12.35
K	589.00	590.00	591.00

Figure 20. 40 PCS packing

11.2 Storage information

11.2.1 The product should be stored at MSL3 standard.

12. SAFETY WARNING

The environmental requirements of this product are as follows:

12.1 ESD control should be done when touching the product.

12.2 The use of this product shall comply with the relevant provisions of local laws and regulations.

13.REVISION HISTORY

Number	Description	Date
V1.1	Chinese version first release	2023-10
V1.2	Update manual metrics from test data	2024-05
V1.2	English version first release	2024-05