Features

- *High Accuracy、Large Current*
  - *0~50A Current Sensor*
  - *Low Primary Impedance: 1.2mΩ*
  - *V_{OE} Temperature Drift: ±5mV*
  - *Sensitivity Temperature Drift: ±1%*
  - *Linearity Error: ±0.2%*
- *High Bandwidth 、 Fast Response*
  - *Bandwidth: 250kHz*
  - *Typical response time: 1.6μs*
- *High Anti-interference、Strengthen Insolution*
  - *Differential Hall effectively resists external magnetic field interference*
  - *High Isolated Voltage: 3kV*
  - *Compatible with 3.3V/5V power supply*
  - *Ratiometric/fixed output*

Description

PIC1400 series is an open loop hall current sensor that set high accuracy、high Bandwith、fast response、high linearity、low temperature drift and others advantage in one. PIC1400 provides 0~50A current measurement range.

Meanwhile, it will keep a low sensitivity drift (±1%@-40℃ ~125℃) at full temperature range with 3σ data. PIC1400 provides a new solution in high performance current sensor area.

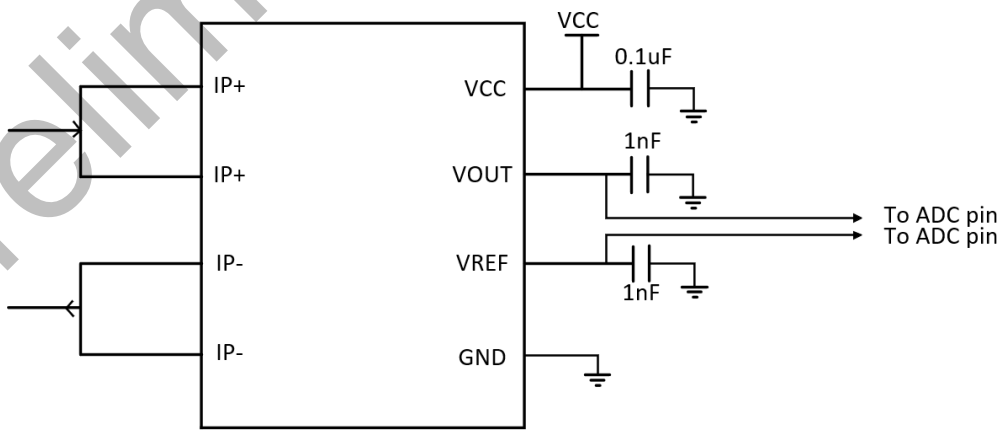
PIC1400 adopts differential hall structure inside, which can effectively suppress the external stray magnetic field, strong anti-interference ability, and ensure accurate measurement under complex magnetic noise environment.

Applications

- *Solar power*
- *Industrial power supply*
- *Motor control*
- *Charging pile*

SOIC-8 Package

Application Circuits



Typical Application Circuit Diagram

Selection Guide

Part Number	Output	I_{PR}(A)	Sensitivity(mV/A)		Temp. Range T_A (°C)	Packing
			VCC=3.3V	VCC=5V		
PIC1400-*A10FB-T	Fixed Output Mode	±10	132	200	–40℃ to 125℃	Reel package, 3000pcs/reel.
PIC1400-*A20FB-T		±20	66	100		
PIC1400-*A30FB-T		±30	44	66.7		
PIC1400-*A30FU-T		30	88	133.3		
PIC1400-*A40FB-T		±40	33	50		
PIC1400-*A50FB-T		±50	26.4	40		
PIC1400-*A10RB-T	Ratiometric Output Mode	±10	132	200		
PIC1400-*A20RB-T		±20	66	100		
PIC1400-*A30RB-T		±30	44	66.7		
PIC1400-*A30RU-T		30	88	133.3		
PIC1400-*A40RB-T		±40	33	50		
PIC1400-*A50RB-T		±50	26.4	40		

The continuous test at 25° C supports 20A. If the current test range is increased, take heat dissipation measures.20A and above have unidirectional output mode,new range will not be notified.

Part Number Specification

PIC1400 - 5 A 50 R B - T

- T: Whether it contains lead
  - T：Lead-free process
- B: Output polarity
  - B：Bipolar
  - U：Unipolar
- R: Output mode
  - F：Fixed
  - R：Ratiometric
- 50: Current sensing range
- A: Pin sequence

Pin sequence	V_{CC}	V_{OUT}	V_{REF}	FILTER	GND
A	Pin8	Pin7	Pin6	---	Pin5
B	Pin8	Pin7	---	Pin6	Pin5

- 5: Supply voltage
  - 3：3.3V
  - 5：5V
- PIC1400: Part Number

Absolute Maximum Rating

Characteristic	Symbol	Unit	Test Conditions	Min.	Typ.	Max.
Supply Voltage	V_{CC}	V	T_A=25°C	-0.3	---	6.5
Output Current	I_{OUTmax}	mA	T_A=25°C	-45	---	45
Proportional output	V_{OUTmax}	V	T_A=25°C	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：Used over Absolute Maximum Rating will destroy the device. Working at Absolute Maximum Rating maybe reduce the device life.

ESD Characteristics

Characteristic	Symbol	Unit	Test Conditions	Min.
Human Body Model	V_{HBM}	kV	ESD between any two pins	±4
Charged Device Model	V_{CDM}	kV		±1

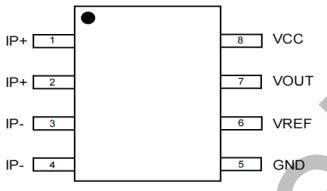
Isolation Characteristics

Characteristic	Symbol	Unit	Test Conditions	Min.
Dielectric Surge Strength Test Voltage	V_{SURGE}	V	Tested ±5 pulses at 2/minute in compliance to IEC 61000-4-5 1.2 µs (rise) / 50 µs (width).	4000
Dielectric Strength Test Voltage	V_{ISO}	V_{RMS}	Agency type-tested for 60 seconds per UL 60950-1. Production tested at 3500 VRMS for 1 second, in accordance with UL 60950-1 .	3500
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 .	600
		V_{RMS}		424
Clearance	D_{CL}	mm	Minimum distance through air from IP leads to signal leads.	4
Creepage	D_{CR}	mm	Minimum distance along package body from IP leads to signal leads	4
Distance Through Insulation	DTI	mm	Minimum internal distance through insulation	90
comparative tracking index	CTI	V	Material Group I	>600

Terminal list & Functional Block

Mode A :

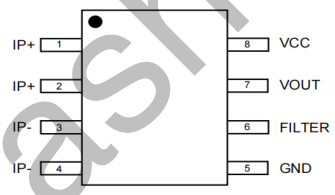
Number	Name	Description
1,2	IP+	Primary current in
3,4	IP-	Primary current out
5	GND	Signal ground terminal
6	VREF	Reference voltage
7	VOUT	Analog output signal
8	VCC	Device power supply terminal



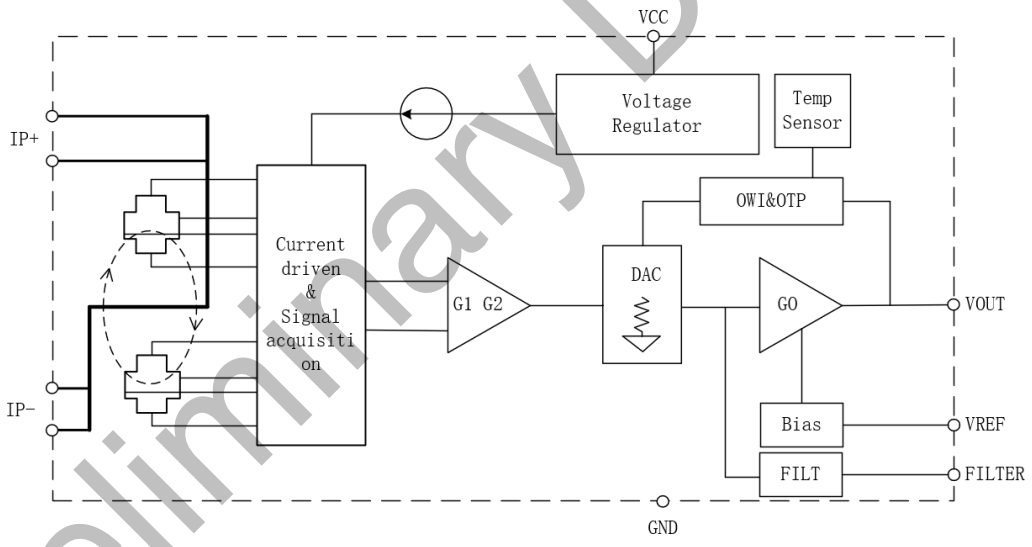
Mode A Pin Diagram

Mode B :

Number	Name	Description
1,2	IP+	Primary current in
3,4	IP-	Primary current out
5	GND	Signal ground terminal
6	FILTER	Bandwidth setting
7	VOUT	Analog output signal
8	VCC	Device power supply terminal



Mode B Pin Diagram



Functional Block Diagram

Common Electrical Characteristics

Unless otherwise specified, refers to general test conditions: T_A=25℃ · V_{CC}=5V · C_L=0.47nF · C_{Vcc}=100nF

Characteristic	Symbol	Unit	Test Conditions	Min.	Typ.	Max.
Supply Voltage	V_{CC}	V	V_{CC}=3.3V	3	3.3	3.6
			V_{CC}=5V	4.5	5	5.5
Supply Current	I_{CC}	mA	no-load,V_{CC}=3.3V	---	7.5	10
			no-load,V_{CC}=5V	---	10	15
Primary Conductor Resistance	R_P	mΩ	---	---	1.2	---
Power-On Time	T_{PO}	ms	Chip power-on（V_{CC}>4.5V）， V_{OUT} and V_{REF} stable time	---	1	---
Output Capacitance Load	C_L	nF	---	---	---	10
Output Resistive Load	R_L	kΩ	---	4.7	---	---
Reference load resistance	R_{LREF}	kΩ	---	10	---	---
Output voltage range	V_S	V	T_A=25°C · C_L=1nF · R_L=10kΩ to V_{CC} orV_{GND}	0.1	---	V_{CC} - 0.1
Common Mode Field Rejection Ratio	CMFR	dB	---	---	40	---
Rise Time	T_R	μs	---	---	1.2	---
Response Time	$T_{RESPONSE}$	μs	---	---	1.6	---
Bandwidth	B_W	kHz	---	---	250	---
Noise	V_N	mVrms	---	---	8	---
Nonlinearity	E_{LIN}	%	---	---	±0.1	---
Reference voltage	V_{REF}	V	Fixed output mode · Bidirectional output · V_{CC}=5V	2.49	2.5	2.51
			Fixed output mode · Bidirectional output · V_{CC}=3.3V	1.64	1.65	1.66
			Fixed output mode · Unbidirectional output · V_{CC}=5V	0.49	0.5	0.51
			Rationmetric output model	---	V_{CC} X 0.5	---
Ratiometric output sensitivity error	S_{ERR}	%	V_{CC}=3.0~3.6V or V_{CC}=4.5~5.5V	---	0.7	---
Sensitivity Error	E_{SENS}	%	I_P=I_{PRmax} · T_A=-40℃ ~ 125℃	–1.5	±0.6	1.5
Voltage Offset Error	V_{OE}	mV	I_P=0A · T_A=-40℃ ~ 125℃	-10	±5	10

Note : The data is obtained from laboratory testing with 3 σ data

PIC1400-*A10FB-T/RB-T Performance Characteristic (I_{PR} = ±10A)

Unless otherwise specified, refers to general test conditions: T_A=25℃ · V_{CC}=5V · C_L=0.47nF · C_{Vcc}=100nF

Characteristic	Symbol	Unit	Test Conditions	Min.	Typ.	Max.
Nominal Performance						
Current Sensing Range	I_{PR}	A	---	-10	---	10
Sensitivity(V_{CC}=3.3V)	Sens	mV/A	$I_{PRmin} < I_{PR} < I_{PRmax}$	---	132	---
Sensitivity(V_{CC}=5V)	Sens	mV/A	$I_{PRmin} < I_{PR} < I_{PRmax}$	---	200	---
Zero Current Output Voltage	$V_{IOUT(Q)}$	V	Bidirectional · I_{PR}=0A · V_{CC}=3.3V · fixed output F	1.64	1.65	1.66
			Bidirectional · I_{PR}=0A · V_{CC}=5V · fixed output F	2.49	2.5	2.51
			Bidirectional · I_{PR}=0A · Ratiometric output R	---	V_{CC} x 0.5	---
Accuracy Performance						
Total Output Error	E_{TOT}	%	$I_P=I_{PRmax}$ · T_A=25℃ ~ 125℃	–2	±0.8	2
			$I_P=I_{PRmax}$ · T_A=-40℃ ~ 25℃	–2	±1	2
Total Output Error Components: $E_{TOT} = (V_{IOUT} - V_{IOUTideal}) / (Sens_{Ideal} \times I_P) \times 100\%$						
Sensitivity Error	E_{SENS}	%	$I_P=I_{PRmax}$ · T_A=25℃ ~ 125℃	–1.5	±0.6	1.5
			$I_P=I_{PRmax}$ · T_A=-40℃ ~ 25℃	–1.5	±0.6	1.5
Voltage Offset Error	V_{OE}	mV	I_P=0A · T_A=25℃ ~ 125℃	---	±8	---
			I_P=0A · T_A=-40℃ ~ 25℃	---	±8	---
Lifetime Drift Characteristics						
Sensitivity Error Lifetime Drift	E_{SENS_drift}	%	After reliability test · T_A=25°C test	---	±1	---
Total Output Error Lifetime Drift	E_{TOT_drift}	%	After reliability test · T_A=25°C test	---	±1	---

PIC1400-*A20FB-T/RB-T Performance Characteristic (I_{PR} = ±20A)

Unless otherwise specified, refers to general test conditions: T_A=25℃ · V_{CC}=5V · C_L=0.47nF · C_{Vcc}=100nF

Characteristic	Symbol	Unit	Test Conditions	Min.	Typ.	Max.
Nominal Performance						
Current Sensing Range	I_{PR}	A	---	-20	---	20
Sensitivity(V_{CC}=3.3V)	Sens	mV/A	I_{PRmin} < I_{PR} < I_{PRmax}	---	66	---
Sensitivity(V_{CC}=5V)	Sens	mV/A	I_{PRmin} < I_{PR} < I_{PRmax}	---	100	---
Zero Current Output Voltage	$V_{IOUT(Q)}$	V	Bidirectional · I_{PR}=0A · V_{CC}=3.3V · fixed output F	1.64	1.65	1.66
			Bidirectional · I_{PR}=0A · V_{CC}=5V · fixed output F	2.49	2.5	2.51
			Bidirectional · I_{PR}=0A · Ratiometric output R	---	V_{CC} x 0.5	---
Accuracy Performance						
Total Output Error	E_{TOT}	%	I_P=I_{PRmax} · T_A=25℃ ~ 125℃	–2	±0.8	2
			I_P=I_{PRmax} · T_A=-40℃ ~ 25℃	–2	±1	2
Total Output Error Components: E_{TOT} = (V_{IOUT} -$V_{IOUTideal}$) /（$Sens_{Ideal}$ × I_P）× 100%						
Sensitivity Error	E_{SENS}	%	I_P=I_{PRmax} · T_A=25℃ ~ 125℃	–1.5	±0.6	1.5
			I_P=I_{PRmax} · T_A=-40℃ ~ 25℃	–1.5	±0.6	1.5
Voltage Offset Error	V_{OE}	mV	I_P=0A · T_A=25℃ ~ 125℃	---	±5	---
			I_P=0A · T_A=-40℃ ~ 25℃	---	±5	---
Lifetime Drift Characteristics						
Sensitivity Error Lifetime Drift	E_{SENS_drift}	%	After reliability test · T_A=25°C test	---	±1	---
Total Output Error Lifetime Drift	E_{TOT_drift}	%	After reliability test · T_A=25°C test	---	±1	---

PIC1400-*A30FB-T/RB-T Performance Characteristic (I_{PR} = ±30A)

Unless otherwise specified, refers to general test conditions: T_A=25℃ · V_{CC}=5V · C_L=0.47nF · C_{Vcc}=100nF

Characteristic	Symbol	Unit	Test Conditions	Min.	Typ.	Max.
Nominal Performance						
Current Sensing Range	I_{PR}	A	---	-30	---	30
Sensitivity(V_{CC}=3.3V)	Sens	mV/A	I_{PRmin} < I_{PR} < I_{PRmax}	---	44	---
Sensitivity(V_{CC}=5V)	Sens	mV/A	I_{PRmin} < I_{PR} < I_{PRmax}	---	66.7	---
Zero Current Output Voltage	$V_{IOUT(Q)}$	V	Bidirectional · I_{PR}=0A · V_{CC}=3.3V · fixed output F	1.64	1.65	1.66
			Bidirectional · I_{PR}=0A · V_{CC}=5V · fixed output F	2.49	2.5	2.51
			Bidirectional · I_{PR}=0A · Ratiometric output R	---	V_{CC} x 0.5	---
Accuracy Performance						
Total Output Error	E_{TOT}	%	I_P=I_{PRmax} · T_A=25℃ ~ 125℃	–2	±0.8	2
			I_P=I_{PRmax} · T_A=-40℃ ~ 25℃	–2	±1	2
Total Output Error Components: E_{TOT} = (V_{IOUT} -$V_{IOUTideal}$) /（$Sens_{Ideal}$ × I_P）× 100%						
Sensitivity Error	E_{SENS}	%	I_P=I_{PRmax} · T_A=25℃ ~ 125℃	–1.5	±0.6	1.5
			I_P=I_{PRmax} · T_A=-40℃ ~ 25℃	–1.5	±0.6	1.5
Voltage Offset Error	V_{OE}	mV	I_P=0A · T_A=25℃ ~ 125℃	---	±5	---
			I_P=0A · T_A=-40℃ ~ 25℃	---	±5	---
Lifetime Drift Characteristics						
Sensitivity Error Lifetime Drift	E_{SENS_drift}	%	After reliability test · T_A=25°C test	---	±1	---
Total Output Error Lifetime Drift	E_{TOT_drift}	%	After reliability test · T_A=25°C test	---	±1	---

PIC1400-*A30FU-T/RU-T Performance Characteristic (I_{PR} = 30A)

Unless otherwise specified, refers to general test conditions: T_A=25℃ · V_{CC}=5V · C_L=0.47nF · C_{Vcc}=100nF

Characteristic	Symbol	Unit	Test Conditions	Min.	Typ.	Max.
Nominal Performance						
Current Sensing Range	I_{PR}	A	---	0	---	30
Sensitivity(V_{CC}=3.3V)	Sens	mV/A	I_{PRmin} < I_{PR} < I_{PRmax}	---	88	---
Sensitivity(V_{CC}=5V)	Sens	mV/A	I_{PRmin} < I_{PR} < I_{PRmax}	---	133.3	---
Zero Current Output Voltage	$V_{IOUT(Q)}$	V	Bidirectional · I_{PR}=0A · V_{CC}=3.3V · fixed output F	0.32	0.33	0.34
			Bidirectional · I_{PR}=0A · V_{CC}=5V · fixed output F	0.49	0.5	0.51
			Bidirectional · I_{PR}=0A · Ratiometric output R	---	V_{CC} x 0.1	---
Accuracy Performance						
Total Output Error	E_{TOT}	%	I_P=I_{PRmax} · T_A=25℃ ~ 125℃	–2	±0.8	2
			I_P=I_{PRmax} · T_A=-40℃ ~ 25℃	–2	±1	2
Total Output Error Components: E_{TOT} = (V_{IOUT} -$V_{IOUTideal}$) /（$Sens_{Ideal}$ × I_P）× 100%						
Sensitivity Error	E_{SENS}	%	I_P=I_{PRmax} · T_A=25℃ ~ 125℃	–1.5	±0.6	1.5
			I_P=I_{PRmax} · T_A=-40℃ ~ 25℃	–1.5	±0.6	1.5
Voltage Offset Error	V_{OE}	mV	I_P=0A · T_A=25℃ ~ 125℃	---	±5	---
			I_P=0A · T_A=-40℃ ~ 25℃	---	±5	---
Lifetime Drift Characteristics						
Sensitivity Error Lifetime Drift	E_{SENS_drift}	%	After reliability test · T_A=25°C test	---	±1	---
Total Output Error Lifetime Drift	E_{TOT_drift}	%	After reliability test · T_A=25°C test	---	±1	---

PIC1400-*A40FB-T/RB-T Performance Characteristic (I_{PR} = ±40A)

Unless otherwise specified, refers to general test conditions: T_A=25℃ · V_{CC}=5V · C_L=0.47nF · C_{Vcc}=100nF

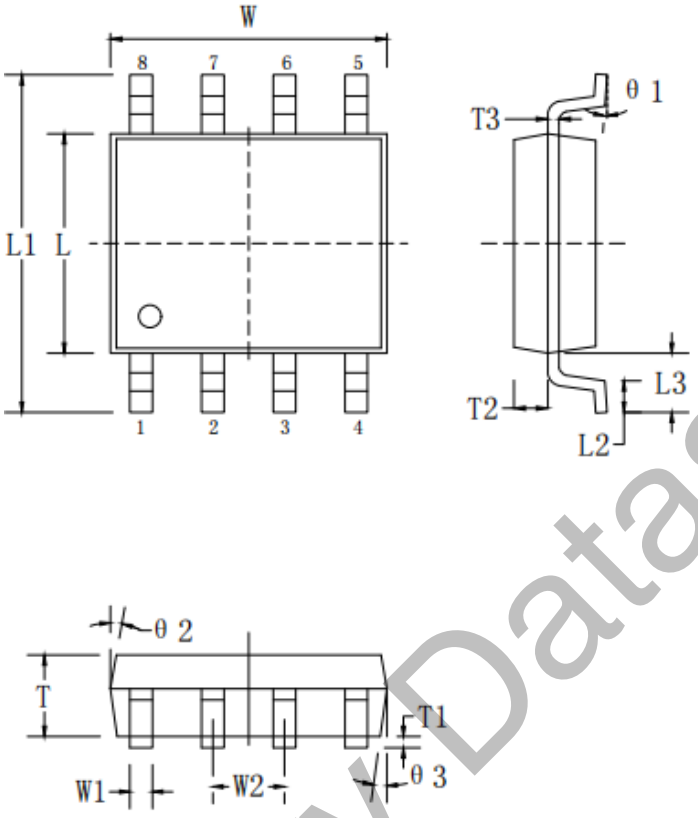
Characteristic	Symbol	Unit	Test Conditions	Min.	Typ.	Max.
Nominal Performance						
Current Sensing Range	I_{PR}	A	---	-40	---	40
Sensitivity(V_{CC}=3.3V)	Sens	mV/A	I_{PRmin} < I_{PR} < I_{PRmax}	---	33	---
Sensitivity(V_{CC}=5V)	Sens	mV/A	I_{PRmin} < I_{PR} < I_{PRmax}	---	50	---
Zero Current Output Voltage	$V_{IOUT(Q)}$	V	Bidirectional · I_{PR}=0A · V_{CC}=3.3V · fixed output F	1.64	1.65	1.66
			Bidirectional · I_{PR}=0A · V_{CC}=5V · fixed output F	2.49	2.5	2.51
			Bidirectional · I_{PR}=0A · Ratiometric output R	---	V_{CC} x 0.5	---
Accuracy Performance						
Total Output Error	E_{TOT}	%	I_P=I_{PRmax} · T_A=25℃ ~ 125℃	–2	±1	2
			I_P=I_{PRmax} · T_A=-40℃ ~ 25℃	–2	±1	2
Total Output Error Components: E_{TOT} = (V_{IOUT} -$V_{IOUTideal}$) /（$Sens_{Ideal}$ × I_P）× 100%						
Sensitivity Error	E_{SENS}	%	I_P=I_{PRmax} · T_A=25℃ ~ 125℃	–1.5	±0.6	1.5
			I_P=I_{PRmax} · T_A=-40℃ ~ 25℃	–1.5	±0.6	1.5
Voltage Offset Error	V_{OE}	mV	I_P=0A · T_A=25℃ ~ 125℃	---	±5	---
			I_P=0A · T_A=-40℃ ~ 25℃	---	±5	---
Lifetime Drift Characteristics						
Sensitivity Error Lifetime Drift	E_{SENS_drift}	%	After reliability test · T_A=25°C test	---	±1	---
Total Output Error Lifetime Drift	E_{TOT_drift}	%	After reliability test · T_A=25°C test	---	±1	---

PIC1400-*A50FB-T/RB-T Performance Characteristic (I_{PR} = ±50A)

Unless otherwise specified, refers to general test conditions: T_A=25℃ · V_{CC}=5V · C_L=0.47nF · C_{Vcc}=100nF

Characteristic	Symbol	Unit	Test Conditions	Min.	Typ.	Max.
Nominal Performance						
Current Sensing Range	I_{PR}	A	---	-50	---	50
Sensitivity(V_{CC}=3.3V)	Sens	mV/A	I_{PRmin} < I_{PR} < I_{PRmax}	---	26.4	---
Sensitivity(V_{CC}=5V)	Sens	mV/A	I_{PRmin} < I_{PR} < I_{PRmax}	---	40	---
Zero Current Output Voltage	$V_{IOUT(Q)}$	V	Bidirectional · I_{PR}=0A · V_{CC}=3.3V · fixed output F	1.64	1.65	1.66
			Bidirectional · I_{PR}=0A · V_{CC}=5V · fixed output F	2.49	2.5	2.51
			Bidirectional · I_{PR}=0A · Ratiometric output R	---	V_{CC} x 0.5	---
Accuracy Performance						
Total Output Error	E_{TOT}	%	I_P=I_{PRmax} · T_A=25℃ ~ 125℃	–2	±1	2
			I_P=I_{PRmax} · T_A=-40℃ ~ 25℃	–2	±1	2
Total Output Error Components: E_{TOT} = (V_{IOUT} -$V_{IOUTideal}$) /（$Sens_{Ideal}$ × I_P）× 100%						
Sensitivity Error	E_{SENS}	%	I_P=I_{PRmax} · T_A=25℃ ~ 125℃	–1.5	±0.8	1.5
			I_P=I_{PRmax} · T_A=-40℃ ~ 25℃	–1.5	±0.8	1.5
Voltage Offset Error	V_{OE}	mV	I_P=0A · T_A=25℃ ~ 125℃	---	±5	---
			I_P=0A · T_A=-40℃ ~ 25℃	---	±5	---
Lifetime Drift Characteristics						
Sensitivity Error Lifetime Drift	E_{SENS_drift}	%	After reliability test · T_A=25°C test	---	±1	---
Total Output Error Lifetime Drift	E_{TOT_drift}	%	After reliability test · T_A=25°C test	---	±1	---

SOIC-8 PACKAGE INFORMATION



Symbol	Dimensions In Millimeters	
	Min	Max
W	4.800	5.000
W1	0.360	0.460
W2	1.170	1.370
L	3.800	4.000
L1	5.800	6.200
L2	0.350	0.850
L3	0.950	1.150
T	1.350	1.550
T1	0.050	0.200
T2	0.550	0.650
T3	0.170	0.250
θ1	0°	8°
θ2	6°	14°
θ3	4°	12°