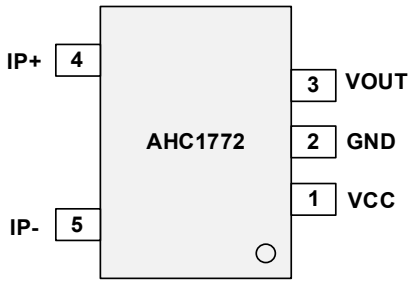
HIGH ACCURACY, LARGE CURRENT, HIGH BANDWIDTH CURRENT SENSOR

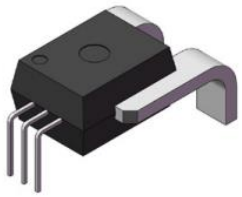
Description

The AHC1772 series is an open-loop Hall current sensing chip that combines high accuracy, high bandwidth, high response, high linearity, and low temperature drift. AHC1772 provides 0 to 200A large current measurement range. AHC1772 can also do -40°C to +125°C 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. AHC1772 adapts to strong electromagnetic and high isolation current detection environment.

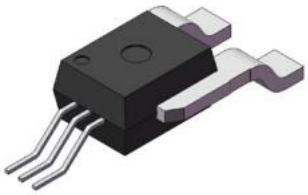
Pin Assignments

(Top View)





PTH5



SMP5

Features

- 5V Supply Operation
- High Accuracy, Large Current
  - 0 to 200A Current Sensor
  - Ultra-Low Primary Conductor Resistance: 100μΩ
  - 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: 200kHz
  - Typical Response Time: 2.0μs
- High Anti-Interference, High Insolation
  - The integrated magnetic core resists stray magnetic field interference
  - Isolated Voltage: 5000Vrms
  - Ratiometric Output
- TUV IEC 62368-1:2018 Certification No. B 133928 0002 Rev. 00
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

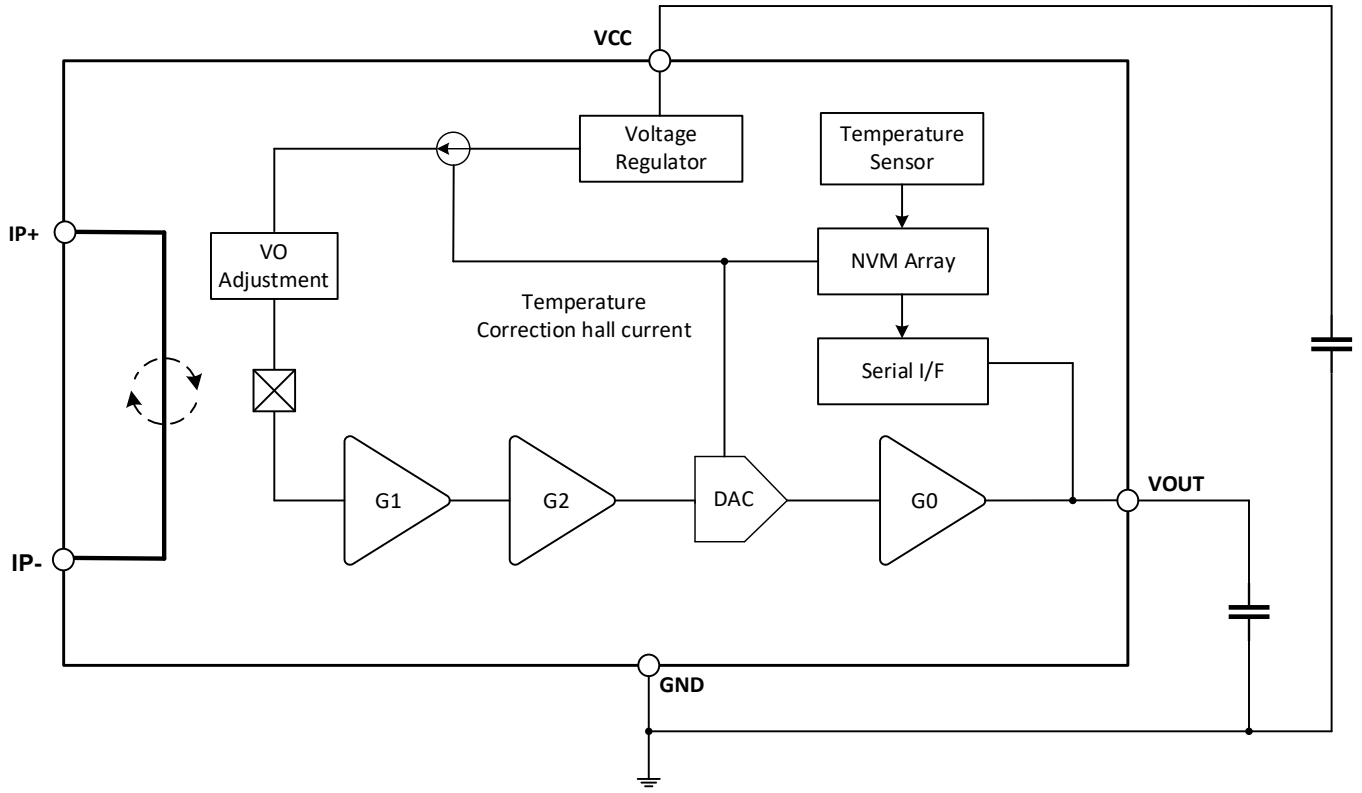
Applications

- Photovoltaic inverters
- Industrial inverters
- Commercial air conditioning
- Charging stations
- Welding machines
- Server power, PSU, PDU, UPS
- Balancing cars

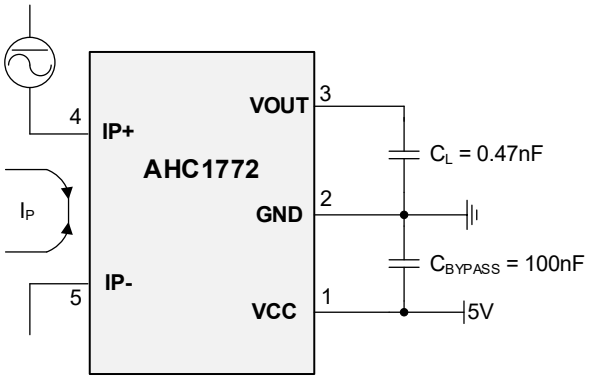
Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

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Functional Block Diagram



Typical Applications Circuit (Note 4)



Note: 4. The AHC1772 outputs an analog signal, VOUT, that changes proportionally with the bi-directional AC or DC primary sensed current, IP, within the specified measurement range.

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Pin Descriptions

Packages: PTH5 and SMP5

Pin Number	Pin Name	Function
1	VCC	Device Power Supply Terminal Pin
2	GND	Signal Ground Terminal
3	VOUT	Analog Output Signal
4	IP+	Terminals for Current Being Sensed
5	IP-	Terminals for Current Being Sensed

Selection Guide

Part Number	I_{PR} (A)	Sens (Typ) at V_{CC} = 5V (mV/A)	Available Package	T_A (°C)	Packing
AHC1772-050U	50	80	PTH5/SMP5	-40 to +125	34 pieces per tube
AHC1772-050B	±50	40	PTH5/SMP5		
AHC1772-100U	100	40	PTH5/SMP5		
AHC1772-100B	±100	20	PTH5/SMP5		
AHC1772-150U	150	26.66	PTH5/SMP5	-40 to +85	
AHC1772-150B	±150	13.33	PTH5/SMP5		
AHC1772-200U	200	20	PTH5/SMP5		
AHC1772-200B	±200	10	PTH5/SMP5		

Absolute Maximum Ratings (T_A = +25°C, unless otherwise specified.)

Symbol	Characteristic	Value	Unit
V_{CC}	Supply Voltage	-0.3 to 6.5	V
V_{OUT}	Output Voltage	-0.3 to V_{CC} + 0.3	V
I_{OUT}	Output Current	-45 to 45	mA
T_A	Operating Ambient Temperature	-40 to +125	°C
$T_{J(max)}$	Junction Temperature	+165	°C
T_{STG}	Storage Temperature	-55 to +155	°C
ESD HBM	Electrostatic Discharge Withstand Capability—Human Body Model	6	kV
ESD CDM	Electrostatic Discharge Withstand Capability—Charged Device Model	1	kV

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Isolation Characteristics

Symbol	Characteristics	Conditions	Rating	Unit
V_{SURGE}	Dielectric Surge Strength Test Voltage	Tested ±5 pulses at 2/minute in compliance to IEC 61000-4-5 1.2μs (rise) / 50μs (width).	8000	V
V_{ISO}	Dielectric Strength Test Voltage	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	V_{RMS}
V_{WVBI}	Working Voltage for Basic Isolation	Maximum approved working voltage for basic (single) isolation according to UL 60950-1 (edition 2).	1800	V_{PK} or VDC
			1272	V_{RMS}
V_{WVRI}	Working Voltage for Reinforced Isolation	Maximum approved working voltage for reinforced isolation according to UL 60950-1 (edition 2).	900	V_{PK} or VDC
			636	V_{RMS}
DTI	Minimum Distance Through Insulation	Minimum distance through insulation from IP leads to signal leads.	4.0	mm

Typical Overcurrent Capability

Symbol	Characteristic	Conditions	Value	Unit
I_{POC}	Maximum Current Test	T_A = +25°C, Current On 1s, off 99s, Apply 100 pulses	1200	A
		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	

Thermal Characteristics

Symbol	Characteristics	Conditions	Rating	Unit
$R_{\theta JA}$	Package Thermal Resistance (Junction to Ambient)	Mounted on the Diodes Incorporated's evaluation board with 1972mm^2 of 4oz. copper on each side, connected to pins 1 and 2, and to pins 3 and 4, with thermal vias connecting the layers. Performance values include the power consumed by the PCB.	17	°C/W
$R_{\theta JL}$	Package Thermal Resistance (Junction to Lead)	Mounted on the Diodes Incorporated's AHC1772 evaluation board.	5.5	°C/W

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Common Electrical Characteristics (Valid through the full range of T_A, V_{CC} = 5V, C_{BYPASS} = 100nF, C_L = 0.47nF, unless otherwise specified.) (Note 5)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_{CC}	Supply Voltage	—	4.5	5	5.5	V
I_{CC}	Supply Current	V_{CC} = 5V, no load	—	7	12	mA
R_P	Primary Conductor Resistance	T_A = +25°C	—	0.1	—	mΩ
t_{PO}	Power-On Time	Chip power-on (V_{CC} > 4.5V)	—	1	—	ms
t_R	Rise Time	The time reaches 10% to 90% of its full-scale value	—	2.0	—	µs
t_{PROP}	Propagation Delay	—	—	1.2	—	µs
$t_{RESPONSE}$	Response Time	—	—	2.0	—	µs
C_L	Output Capacitive Load	V_{OUT} - V_{GND}	—	0.47	10	nF
R_L	Output Resistive Load	—	4.7	—	—	kΩ
R_{OUT}	DC Output Resistance	—	—	1	—	Ω
UVLOD	Undervoltage-Lockout	Undervoltage protection rising threshold	—	2.3	—	V
UVLOE		Undervoltage protection drop threshold	—	2.1	—	V
t_{UVLOD}	Undervoltage-Lockout	Undervoltage protection rise time	—	500	—	µs
t_{UVLOE}		Undervoltage protection drop time	—	50	—	µs
V_S	Output Voltage Range	R_L = 10kΩ to VCC or GND	0.1	—	V_{CC}-0.1	V
BW	Internal Bandwidth	200A range, small-signal measurement	—	200	—	kHz
E_{SYM}	Sensitivity Symmetry Error	—	-0.1	±0.01	0.1	%
S_{ERR}	Ratiometric Output Sensitivity Error	V_{CC} = 4.75V to 5.25V	—	±0.5	—	%
E_{LIN}	Nonlinearity	≤ 100A	-0.8	±0.3	0.8	%
		≤ 200A	-0.9	±0.5	0.9	
dS_{ERR}	Sensitivity Temperature Drift	T_A = +85°C to +125°C	-1.0	±0.2	1.0	%
		T_A = +25°C to +85°C	-0.8	±0.2	0.8	
		T_A = -40°C to +25°C	-1.0	±0.2	1.0	
$V_{OUT(Q)TC}$	Offset Temperature Drift	T_A = +25°C to +125°C	—	±5	—	mV
		T_A = -40°C to +25°C	—	±5	—	

Note: 5. AHC1772 is production tested and guaranteed to T_A = +125°C, maximum junction temperature, $T_{J(MAX)}$, cannot be exceeded. See *Absolute Maximum Ratings* and *Thermal Application Information* for more information.

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AHC1772-050U (T_A = +25°C, V_{CC} = 5V, C_{BYPASS} = 100nF, C_L = 0.47nF, unless otherwise specified.) (Note 6)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
NOMINAL PERFORMANCE						
Current Sensing Range	I_{PR}	—	0	—	50	A
Sensitivity	Sens	$I_{PRmin} < I_{PR} < I_{PRm}$	—	80	—	mV/A
Zero Current Output Voltage	$V_{OUT(Q)}$	Uni-directional, I_{PR} = 0	—	V_{CC}*0.1	—	V
ACCURACY PERFORMANCE						
Noise	V_N	—	—	7	—	mVrms
Magnetic Offset Error	I_{ERROM}	I_P = 0	—	0.4	—	mV
		I_P = 0	—	10	—	mA
Total Output Error	E_{TOT}	$I_P = I_{PRmax}$	-1.2	±0.5	1.2	%
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = (V_{OUT} - V_{OUT\ Ideal}) / (Sens_{Ideal} \times I_P) \times 100\%$						
Sensitivity Error	E_{SENS}	$I_P = I_{PRmax}$, T_A = +25°C to +125°C	-1.5	±0.5	1.5	%
Offset Error	V_{OE}	I_P = 0, T_A = +25°C to +125°C	-10	±0.2	10	mV
		I_P = 0, T_A = +25°C	-5	±0.2	5	
		I_P = 0, T_A = -40°C to +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	—	%

AHC1772-050B (T_A = +25°C, V_{CC} = 5V, C_{BYPASS} = 100nF, C_L = 0.47nF, unless otherwise specified.) (Note 6)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
NOMINAL PERFORMANCE						
Current Sensing Range	I_{PR}	—	-50	—	50	A
Sensitivity	Sens	$I_{PRmin} < I_{PR} < I_{PRm}$	—	40	—	mV/A
Zero Current Output Voltage	$V_{OUT(Q)}$	Bi-directional, I_{PR} = 0	—	V_{CC}*0.5	—	V
ACCURACY PERFORMANCE						
Noise	V_N	—	—	7	—	mVrms
Magnetic Offset Error	I_{ERROM}	I_P = 0	—	0.4	—	mV
		I_P = 0	—	10	—	mA
Total Output Error	E_{TOT}	$I_P = I_{PRmax}$	-1.2	±0.5	1.2	%
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = (V_{OUT} - V_{OUT\ Ideal}) / (Sens_{Ideal} \times I_P) \times 100\%$						
Sensitivity Error	E_{SENS}	$I_P = I_{PRmax}$, T_A = +25°C to +125°C	-1.5	±0.5	1.5	%
Offset Error	V_{OE}	I_P = 0, T_A = +25°C to +125°C	-10	±0.2	10	mV
		I_P = 0, T_A = +25°C	-5	±0.2	5	
		I_P = 0, T_A = -40°C to +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: 6. Typical values are ±3 sigma values.

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AHC1772-100U (T_A = +25°C, V_{CC} = 5V, C_{BYPASS} = 100nF, C_L = 0.47nF, unless otherwise specified.) (Note 6)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
NOMINAL PERFORMANCE						
Current Sensing Range	I_{PR}	—	0	—	100	A
Sensitivity	Sens	$I_{PRmin} < I_{PR} < I_{PRm}$	—	40	—	mV/A
Zero Current Output Voltage	$V_{OUT(Q)}$	Uni-directional, I_{PR} = 0	—	V_{CC}*0.1	—	V
ACCURACY PERFORMANCE						
Noise	V_N	—	—	5	—	mVrms
Magnetic Offset Error	I_{ERROM}	I_P = 0	—	0.6	—	mV
		I_P = 0	—	30	—	mA
Total Output Error	E_{TOT}	$I_P = I_{PRmax}$	-1.2	±0.5	1.2	%
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = (V_{OUT} - V_{OUT\ Ideal}) / (Sens_{Ideal} \times I_P) \times 100\%$						
Sensitivity Error	E_{SENS}	$I_P = I_{PRmax}$, T_A = +25°C to +125°C	-1.5	±0.5	1.5	%
Offset Error	V_{OE}	I_P = 0, T_A = +25°C to +125°C	-10	±0.2	10	mV
		I_P = 0, T_A = +25°C	-5	±0.2	5	
		I_P = 0, T_A = -40°C to +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	—	%

AHC1772-100B (T_A = +25°C, V_{CC} = 5V, C_{BYPASS} = 100nF, C_L = 0.47nF, unless otherwise specified.) (Note 6)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
NOMINAL PERFORMANCE						
Current Sensing Range	I_{PR}	—	-50	—	50	A
Sensitivity	Sens	$I_{PRmin} < I_{PR} < I_{PRm}$	—	20	—	mV/A
Zero Current Output Voltage	$V_{OUT(Q)}$	Bi-directional, I_{PR} = 0	—	V_{CC}*0.5	—	V
ACCURACY PERFORMANCE						
Noise	V_N	—	—	5	—	mVrms
Magnetic Offset Error	I_{ERROM}	I_P = 0	—	0.6	—	mV
		I_P = 0	—	30	—	mA
Total Output Error	E_{TOT}	I_P = IPRmax	-1.2	±0.5	1.2	%
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = (V_{OUT} - V_{OUT\ Ideal}) / (Sens_{Ideal} \times I_P) \times 100\%$						
Sensitivity Error	E_{SENS}	$I_P = I_{PRmax}$, T_A = +25°C to +125°C	-1.5	±0.55	1.5	%
Offset Error	V_{OE}	I_P = 0, T_A = +25°C to +125°C	-10	±0.2	10	mV
		I_P = 0, T_A = +25°C	-5	±0.2	5	
		I_P = 0, T_A = -40°C to +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: 6. Typical values are ±3 sigma values.

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AHC1772-150U (T_A = -25°C, V_{CC} = 5V, C_{BYPASS} = 100nF, C_L = 0.47nF, unless otherwise specified.) (Note 6)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
NOMINAL PERFORMANCE						
Current Sensing Range	I_{PR}	—	0	—	150	A
Sensitivity	Sens	$I_{PRmin} < I_{PR} < I_{PRm}$	—	26.66	—	mV/A
Zero Current Output Voltage	$V_{OUT(Q)}$	Uni-directional, I_{PR} = 0	—	V_{CC}*0.1	—	V
ACCURACY PERFORMANCE						
Noise	V_N	—	—	4	—	mVrms
Magnetic Offset Error	I_{ERROM}	I_P = 0	—	0.8	—	mV
		I_P = 0	—	60	—	mA
Total Output Error	E_{TOT}	$I_P = I_{PRmax}$	-1.2	±0.5	1.2	%
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = (V_{OUT} - V_{OUT\ Ideal}) / (Sens_{Ideal} \times I_P) \times 100\%$						
Sensitivity Error	E_{SENS}	$I_P = I_{PRmax}$, T_A = +25°C to +125°C	-1.5	±0.5	1.5	%
Offset Error	V_{OE}	I_P = 0, T_A = +25°C to +125°C	-10	±0.2	10	mV
		I_P = 0, T_A = +25°C	-5	±0.2	5	
		I_P = 0, T_A = -40°C to +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	—	%

AHC1772-150B (T_A = +25°C, V_{CC} = 5V, C_{BYPASS} = 100nF, C_L = 0.47nF, unless otherwise specified.) (Note 6)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
NOMINAL PERFORMANCE						
Current Sensing Range	I_{PR}	—	-150	—	150	A
Sensitivity	Sens	$I_{PRmin} < I_{PR} < I_{PRm}$	—	13.33	—	mV/A
Zero Current Output Voltage	$V_{OUT(Q)}$	Bi-directional, I_{PR} = 0	—	V_{CC}*0.5	—	V
ACCURACY PERFORMANCE						
Noise	V_N	—	—	4	—	mVrms
Magnetic Offset Error	I_{ERROM}	I_P = 0	—	0.8	—	mV
		I_P = 0	—	60	—	mA
Total Output Error	E_{TOT}	$I_P = I_{PRmax}$	-1.2	±0.5	1.2	%
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = (V_{OUT} - V_{OUT\ Ideal}) / (Sens_{Ideal} \times I_P) \times 100\%$						
Sensitivity Error	E_{SENS}	$I_P = I_{PRmax}$, T_A = +25°C to +125°C	-1.5	±0.5	1.5	%
Offset Error	V_{OE}	I_P = 0, T_A = +25°C to +125°C	-10	±0.2	10	mV
		I_P = 0, T_A = +25°C	-5	±0.2	5	
		I_P = 0, T_A = -40°C to +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: 6. Typical values are ±3 sigma values.

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AHC1772-200U (T_A = +25°C, V_{CC} = 5V, C_{BYPASS} = 100nF, C_L = 0.47nF, unless otherwise specified.) (Note 6)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
NOMINAL PERFORMANCE						
Current Sensing Range	I_{PR}	—	0	—	200	A
Sensitivity	Sens	$I_{PRmin} < I_{PR} < I_{PRm}$	—	20	—	mV/A
Zero Current Output Voltage	$V_{OUT(Q)}$	Uni-directional, I_{PR} = 0	—	V_{CC}*0.1	—	V
ACCURACY PERFORMANCE						
Noise	V_N	—	—	3	—	mVrms
Magnetic Offset Error	I_{ERROM}	I_P = 0	—	1	—	mV
		I_P = 0	—	100	—	mA
Total Output Error	E_{TOT}	$I_P = I_{PRmax}$	-1.2	±0.5	1.2	%
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = (V_{OUT} - V_{OUT\ Ideal}) / (Sens_{Ideal} \times I_P) \times 100\%$						
Sensitivity Error	E_{SENS}	$I_P = I_{PRmax}$, T_A = +25°C to +125°C	-1.5	±0.5	1.5	%
Offset Error	V_{OE}	I_P = 0, T_A = +25°C to +125°C	-10	±0.2	10	mV
		I_P = 0, T_A = +25°C	-5	±0.2	5	
		I_P = 0, T_A = -40°C to +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	—	%

AHC1772-200B (T_A = +25°C, V_{CC} = 5V, C_{BYPASS} = 100nF, C_L = 0.47nF, unless otherwise specified.) (Note 6)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
NOMINAL PERFORMANCE						
Current Sensing Range	I_{PR}	—	-200	—	200	A
Sensitivity	Sens	$I_{PRmin} < I_{PR} < I_{PRm}$	—	10	—	mV/A
Zero Current Output Voltage	$V_{OUT(Q)}$	Bi-directional, I_{PR} = 0	—	V_{CC}*0.5	—	V
ACCURACY PERFORMANCE						
Noise	V_N	—	—	3	—	mVrms
Magnetic Offset Error	I_{ERROM}	I_P = 0	—	1	—	mV
		I_P = 0	—	100	—	mA
Total Output Error	E_{TOT}	$I_P = I_{PRmax}$	-1.2	±0.5	1.2	%
TOTAL OUTPUT ERROR COMPONENTS: $E_{TOT} = (V_{OUT} - V_{OUT\ Ideal}) / (Sens_{Ideal} \times I_P) \times 100\%$						
Sensitivity Error	E_{SENS}	$I_P = I_{PRmax}$, T_A = +25°C to +125°C	-1.5	±0.5	1.5	%
Offset Error	V_{OE}	I_P = 0, T_A = +25°C to +125°C	-10	±0.2	10	mV
		I_P = 0, T_A = +25°C	-5	±0.2	5	
		I_P = 0, T_A = -40°C to +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: 6. Typical values are ±3 sigma values.

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Definitions of Accuracy Characteristics

Sensitivity Sens

The change in sensor IC output in response to a 1 A change through the primary conductor. The sensitivity is the product of the magnetic circuit sensitivity (G / A) (1G = 0.1mT) 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.

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 V_{CC} = 5V,

$$E_{SENS} = \left\{\frac{Sens_{Meas(5V)} - Sens_{Ideal(5V)}}{Sens_{Ideal(5V)}}\right\} \times 100\%$$

The Sensitivity Temperature Drift of dS_{ERR}

Over the entire operating temperature range is defined as:

$$dS_{ERR} = \left\{\frac{Sens_{(TA)} - Sens_{(25\,℃)}}{Sens_{(25\,℃)}}\right\} \times 100\%$$

Saturation Output Voltage $V_{OUT-SAT(H/L)}$

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

$V_{OUT_SAT(L)}$ is the maximum output of the chip under the negative current

Zero Current Output Voltage $V_{OUT(Q)}$

I_P = 0, output voltage of the sensor $V_{OUT(Q)}$.

For bi-directional devices, the output voltage $V_{OUT(Q)} = V_{CC} \times 0.5$,

For uni-directional devices, the output voltage $V_{OUT(Q)} = V_{CC} \times 0.1$

Variation in $V_{OUT(Q)}$ can be attributed to the resolution of the linear IC quiescent voltage trim and thermal drift.

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.

Offset Temperature Drift $V_{OUT(Q)TC}$

$V_{OUT(Q)TC}$ refers to the Temperature Coefficient of the Quiescent Output Voltage $V_{OUT(Q)}$, which is the sensor's output voltage when zero current flows. It measures how the zero-current offset voltage drifts with temperature.

$$V_{OUT(Q)TC} = V_{OUT(Q)(TA)} - V_{OUT(Q)(25\,℃)}$$

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.

Symmetry E_{SYM}

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

$$E_{SYM} = \left\{1 - \left(\frac{V_{OUT-POSHALF} - V_{OUT(Q)}}{V_{OUT(Q)} - V_{OUT-NEGHALF}}\right)\right\} \times 100(\%)$$

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Definitions of Accuracy Characteristics (continued)

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} and I_{NEGx} are positive current and negative current.

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

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

$$E_{LINPOS} = \left\{1 - \left(\frac{V_{OUT(IPOS2)} - V_{OUT(Q)}}{V_{OUT(IPOS1)} - V_{OUT(Q)}}\right)\right\} \times 100(\%)$$

$$E_{LINPOS} = \left\{1 - \left(\frac{V_{OUT(IPOS2)} - V_{OUT(Q)}}{V_{OUT(IPOS1)} - V_{OUT(Q)}}\right)\right\} \times 100(\%)$$

$$E_{LINNEG} = \left\{1 - \left(\frac{V_{OUT(INEGS2)} - V_{OUT(Q)}}{V_{OUT(INEG1)} - V_{OUT(Q)}}\right)\right\} \times 100(\%)$$

Proportional Output Sensitivity Error S_{ERR}

The proportion output sensitivity error S_{ERR} is defined based on the supply voltage VCC.

$$S_{ERR} = \left\{1 - \left(\frac{Sens_{VCC}/Sens_{5V}}{VCC/5V}\right)\right\} \times 100(\%)$$

Proportional Output Error of Static Voltage V_{0zero}

Error between the ratio of VOUT1 and VOUT0 value at VCC = 5V and the theoretical ratio when VCC varies from 4.5V to 5.5V

$$V_{0zero} = \left\{1 - \left(\frac{VOUT1/VOUT0}{VCC/5V}\right)\right\} \times 100(\%)$$

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.

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

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

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.

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Response Characteristics Definitions and Performance Data

Response Time ($t_{RESPONSE}$)

The time interval between a) when the sensed input current reaches 90% of its final value, and b) when the sensor output reaches 90% of its full-scale value.

Propagation Delay (t_{PROD})

The time interval between a) when the sensed input current reaches 20% of its full-scale value, and b) when the sensor output reaches 20% of its full-scale value.

Rise Time (t_R)

The time interval between a) when the sensor reaches 10% of its full-scale value, and b) when it reaches 90% of its full-scale value.

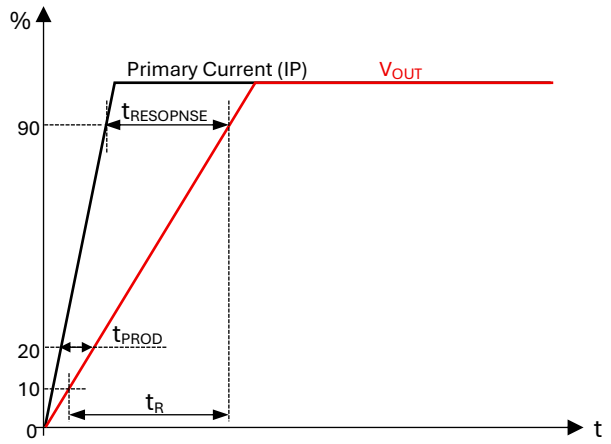


Figure 1. Response Time, Propagation Delay, Rise Time

Power-On Functional Description and Performance Data

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 a) when the power supply has reached its minimum specified operating voltage (VCC(min)), and b) when the sensor output has settled within ±10% of its steady-state value under an applied magnetic field.

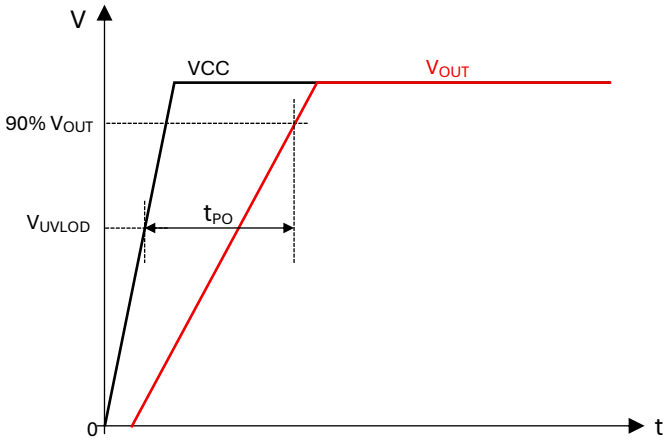


Figure 2. Powe-On Time (t_{PO})

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Thermal Application Information

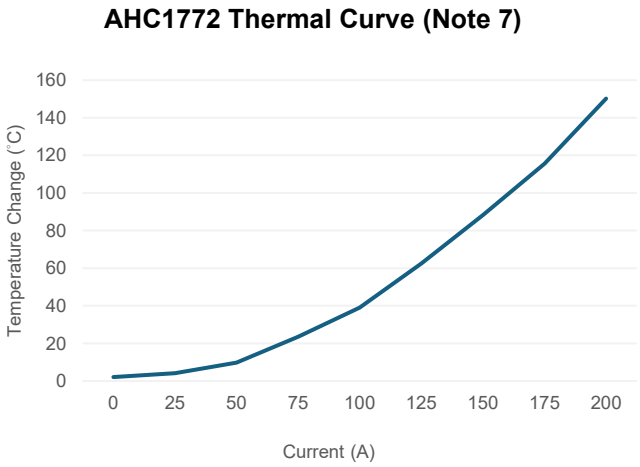


Figure 3. Thermal Curve

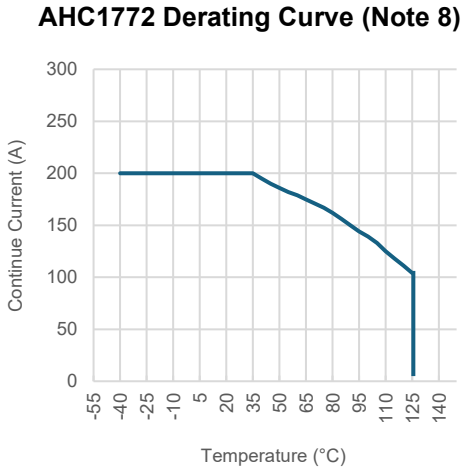


Figure 4. Derating Curve

Notes: 7. This chart shows the measured rise in steady-state die temperature of the AHC1772 versus continuous current at an ambient temperature T_A = +25°C.
8. Products above 200A are only used for transient current detection. If you need to work for a long time, please add additional heat dissipation.

Layout Guidelines

Test information on the demo board.

The capacitors should set the chip pins as close as possible. C_L = 0.47nF, C_{BYPASS} = 100nF.

The IP heat dissipation copper thickness of the demo board is 4oz, the heat dissipation area is 2 x 986 (mm^2), and the test wiring uses Kelvin sense (4-wire measuring) to avoid the voltage drop caused by GND impedance.

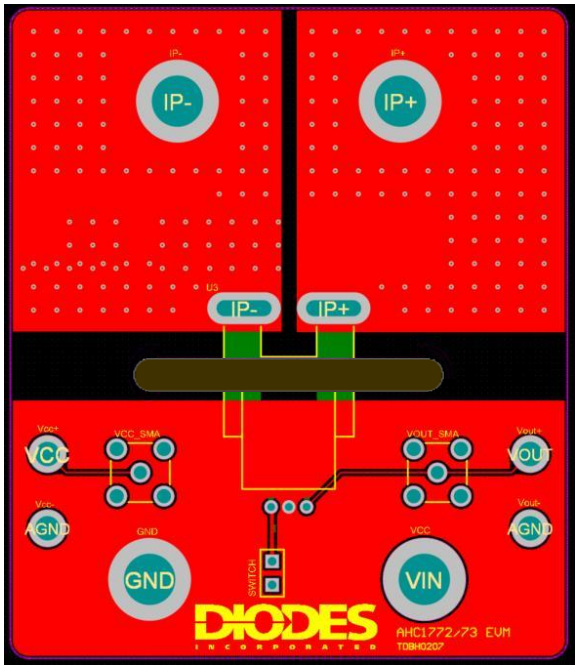


Figure 5. Demo Board (Top Side)

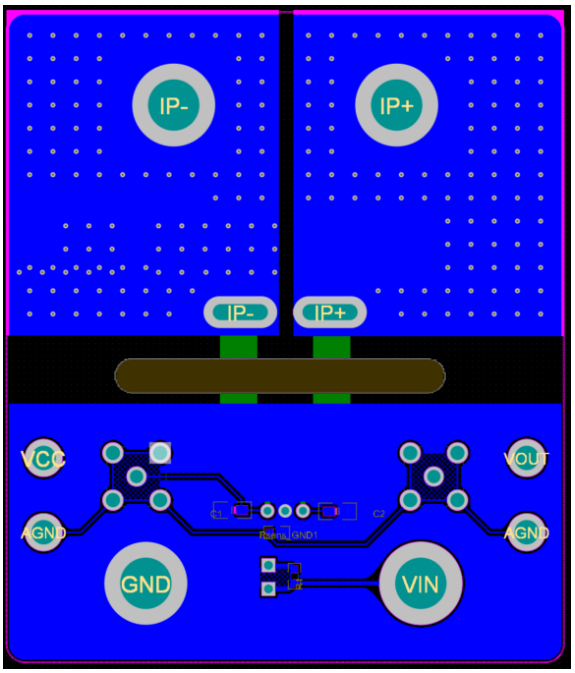
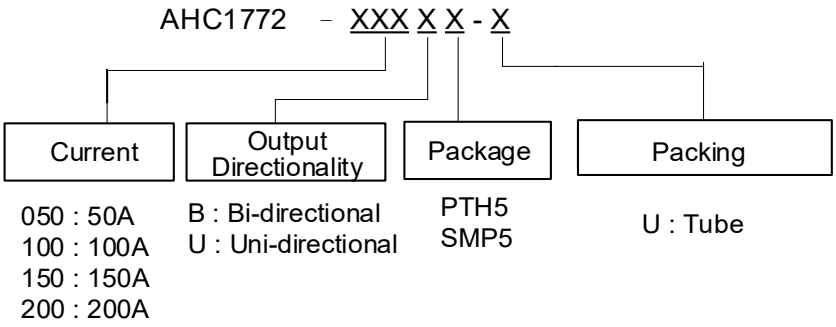


Figure 6. Demo Board (Bottom Side)

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Ordering Information (Note 9)



Orderable Part Number	Package Code	Package	Packing	
			Qty.	Carrier
AHC1772-050UPTH5-U	PTH5	PTH5	34	Tube
AHC1772-050BPTH5-U	PTH5	PTH5	34	Tube
AHC1772-100UPTH5-U	PTH5	PTH5	34	Tube
AHC1772-100BPTH5-U	PTH5	PTH5	34	Tube
AHC1772-150UPTH5-U	PTH5	PTH5	34	Tube
AHC1772-150BPTH5-U	PTH5	PTH5	34	Tube
AHC1772-200UPTH5-U	PTH5	PTH5	34	Tube
AHC1772-200BPTH5-U	PTH5	PTH5	34	Tube
AHC1772-050USMP5-U	SMP5	SMP5	34	Tube
AHC1772-050BSMP5-U	SMP5	SMP5	34	Tube
AHC1772-100USMP5-U	SMP5	SMP5	34	Tube
AHC1772-100BSMP5-U	SMP5	SMP5	34	Tube
AHC1772-150USMP5-U	SMP5	SMP5	34	Tube
AHC1772-150BSMP5-U	SMP5	SMP5	34	Tube
AHC1772-200USMP5-U	SMP5	SMP5	34	Tube
AHC1772-200BSMP5-U	SMP5	SMP5	34	Tube

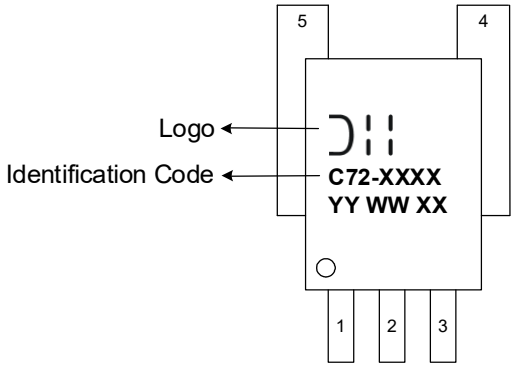
Note: 9. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

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Marking Information

(1) Package Type: PTH5

(Top View)

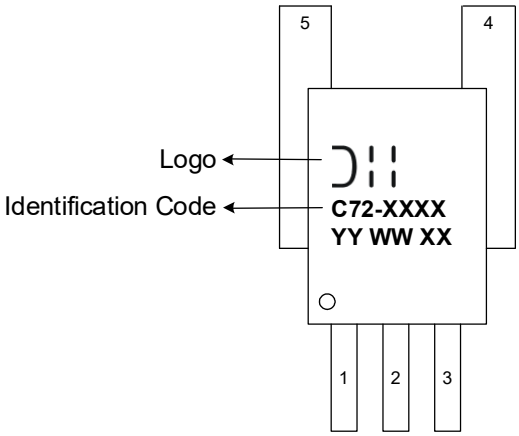


YY : Year : 00 to 99 (ex : 26 = 2026)
WW : Week : 01 to 52, 52 represents week 52 and 53
XX : Internal Code

Orderable Part Number	Package	Identification Code
AHC1772-050UPTH5-U	PTH5	C72-050U
AHC1772-050BPTH5-U	PTH5	C72-050B
AHC1772-100UPTH5-U	PTH5	C72-100U
AHC1772-100BPTH5-U	PTH5	C72-100B
AHC1772-150UPTH5-U	PTH5	C72-150U
AHC1772-150BPTH5-U	PTH5	C72-150B
AHC1772-200UPTH5-U	PTH5	C72-200U
AHC1772-200BPTH5-U	PTH5	C72-200B

(2) Package Type: SMP5

(Top View)



YY : Year : 00 to 99 (ex : 26 = 2026)
WW : Week : 01 to 52, 52 represents week 52 and 53
XX : Internal Code

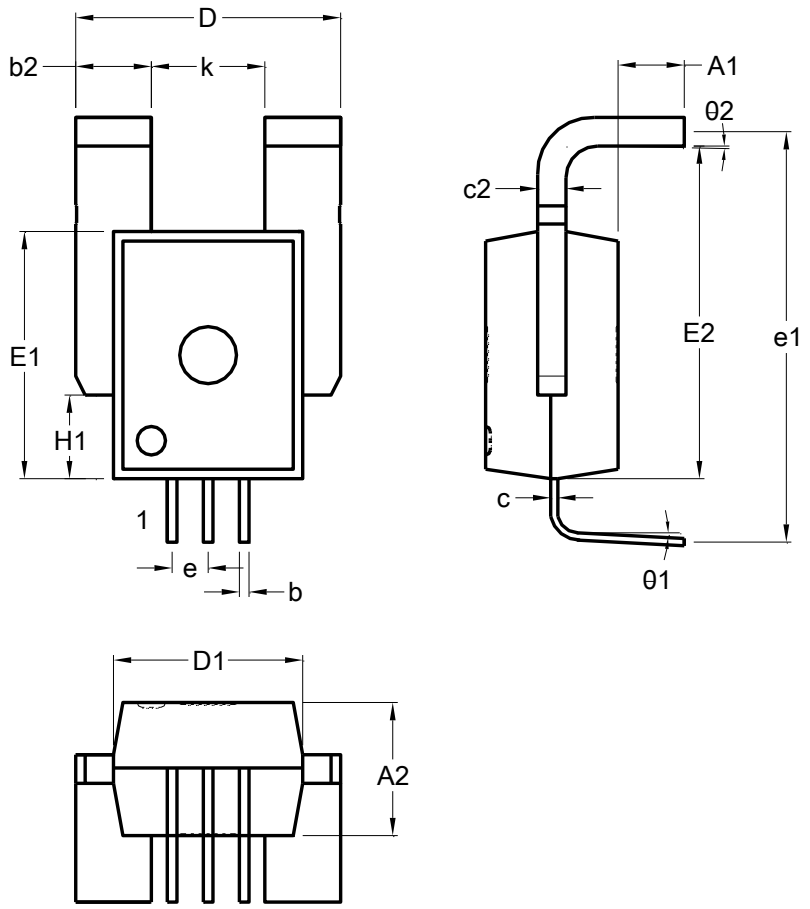
Orderable Part Number	Package	Identification Code
AHC1772-050USMP5-U	SMP5	C72-050U
AHC1772-050BSMP5-U	SMP5	C72-050B
AHC1772-100USMP5-U	SMP5	C72-100U
AHC1772-100BSMP5-U	SMP5	C72-100B
AHC1772-150USMP5-U	SMP5	C72-150U
AHC1772-150BSMP5-U	SMP5	C72-150B
AHC1772-200USMP5-U	SMP5	C72-200U
AHC1772-200BSMP5-U	SMP5	C72-200B

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Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

PTH5



PTH5			
Dim	**Min**	**Max**	**Typ**
A1	3.30	3.70	3.50
A2	6.90	7.10	7.00
b	0.41	0.61	0.51
b2	3.80	4.20	4.00
c	0.33	0.43	0.38
c2	1.40	1.60	1.50
D	13.80	14.20	14.00
D1	9.90	10.10	10.00
E1	12.90	13.10	13.00
E2	17.30	17.70	17.50
e	1.70	2.10	1.90
e1	20.40	22.40	21.40
H1	4.30	4.50	4.40
k	5.80	6.20	6.00
θ1	0°	10°	5°
θ2	-1°	3°	1°
All Dimensions in mm			

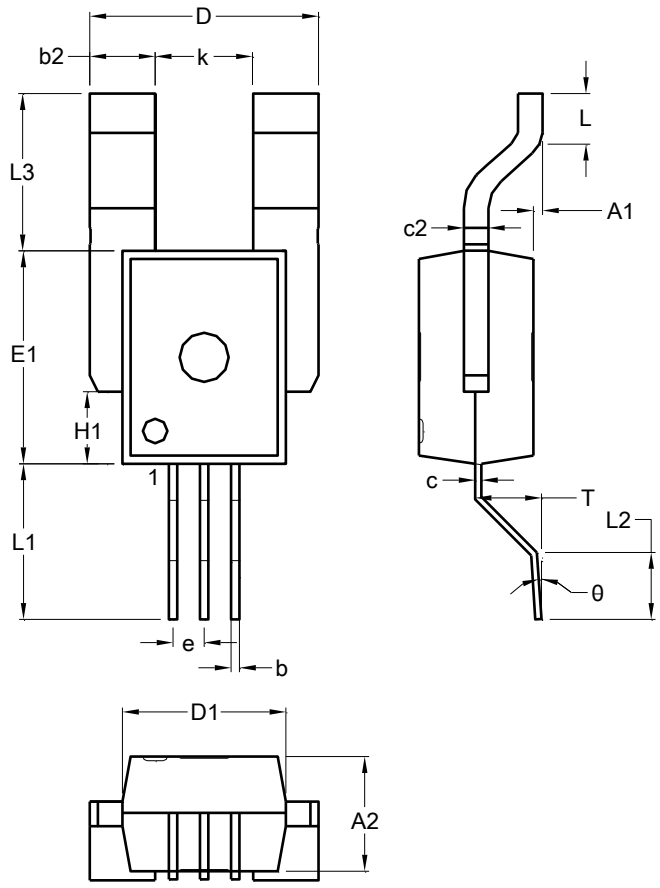
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SMP5



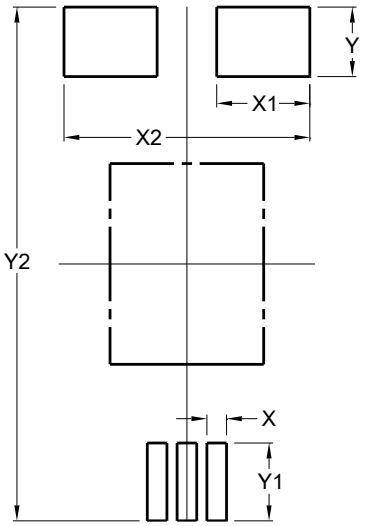
SMP5			
Dim	**Min**	**Max**	**Typ**
A1	0.00	1.00	0.50
A2	6.90	7.10	7.00
b	0.41	0.61	0.51
b2	3.80	4.20	4.00
c	0.33	0.43	0.38
c2	1.40	1.60	1.50
D	13.80	14.20	14.00
D1	9.90	10.10	10.00
E1	12.90	13.10	13.00
e	1.70	2.10	1.90
H1	4.30	4.50	4.40
k	5.80	6.20	6.00
L	1.90	2.90	2.40
L1	9.00	10.00	9.50
L2	3.30	4.30	3.80
L3	9.10	10.10	9.60
T	6.90	7.10	7.00
θ1	0°	8°	4°
All Dimensions in mm			

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Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

SMP5



Dimensions	Value (in mm)
X	1.28
X1	6.05
X2	16.00
Y	4.50
Y1	5.04
Y2	33.27

Mechanical Data

- Moisture Sensitivity: Level per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 e3
- Weight: 4.5 grams (Approximate)

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