



FEATURES

Gain of $\times 20$ Alterable from $\times 1$ to $\times 160$
Input Offset Voltage Over Temperature ± 2 mV
Low Long-Term Drift of Gain and Offset Voltage
Input CMR from Ground to $6 \times (V_S - 1)$ V
Output Span 20 mV to $(V_S - 0.25)$ V
1, 2, 3 Pole Low-Pass Filtering Available
Accurate Midscale Offset Capability
Differential Input Resistance 400 k Ω
Drives 1 k Ω Load to +4 V Using $V_S = +5$ V
Supply Voltage: +3 V to +36 V
Transient Spike Protection and RFI Filters Included
Peak Input Voltage (40 ms): 60 V
Reversed Supply Protection: -34 V
Operating Temperature Range: -40°C to +125°C

APPLICATIONS

Current Sensing
Motor Control
Interface for Accelerometers, Pressure Transducers, Position Indicators, Strain Gages, and Other Low Level Signal Sources

GENERAL DESCRIPTION

The AD22057 is a single supply difference amplifier for the amplification and low-pass filtering of small differential voltages from sources having a large common-mode voltage.

Supply voltages of between +3 V and +36 V can be used. The input common-mode range extends from below ground to 24 V using a +5 V supply with excellent rejection of this common-mode voltage.

***Patents pending.**

FUNCTIONAL BLOCK DIAGRAM

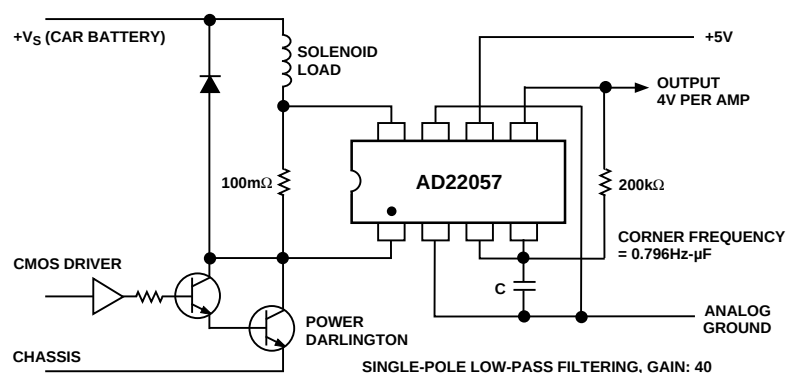
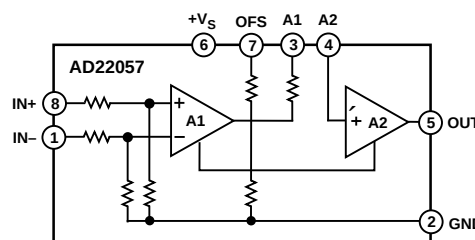


Figure 1. Typical Application Circuit for a Current Sensor Interface

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AD22057—SPECIFICATIONS (@ $T_A = +25^\circ\text{C}$, $V_S = +5\text{ V}$, $V_{CM} = 0$, unless otherwise noted)

Parameter	Comments	Test Conditions	Min	Typ	Max	Units
INPUTS (PINS 1 AND 8)						
+CMR	Positive Common-Mode Range	$T_A = T_{MIN}$ to $+85^\circ\text{C}$			+24	V
CMR	Negative Common-Mode Range		-1.0			V
CMRR _{LF}	Common-Mode Rejection Ratio	$f \leq 10\text{ Hz}$	80	90		dB
CMRR _{HF}	Common-Mode Rejection Ratio	$f = 1\text{ kHz}$	80	90		dB
R _{INCM}	Common-Mode Input Resistance	Pin 1 or Pin 8 to Pin 2	200	250	300	k Ω
R _{MATCH}	Matching of Input Resistances			± 05		%
R _{INDIFF}	Differential Input Resistance	Pin 1 to Pin 8	350	450		k Ω
PREAMPLIFIER						
G _{CL}	Closed-Loop Gain ¹		9.7	10.0	103	V/V
V _O	Output Voltage Range (Pin 3)		+0.01		+4.8	V
R _O	Output Resistance ²		97	100	103	k Ω
OUTPUT BUFFER						
G _{CL}	Closed-Loop Gain ¹	R _{LOAD} $\geq 10\text{ k}\Omega$	1.94	2.0	2.06	V/V
V _O	Output Voltage Range		+0.02		+4.8	V
R _O	Output Resistance (Pin 5)	V _O $\geq 0.1\text{ V dc}$		0.2		Ω
OVERALL SYSTEM						
G _{CL}	Gain ¹	V _O $\geq 0.1\text{ V dc}$	19.9	20.0	20.1	V/V
V _{OS}	Gain Drift	$T_A = T_{MIN}$ to T_{MAX}	-62.5		+62.5	ppm/ $^\circ\text{C}$
	Initial Offset Voltage ³		-1	0.03	1	mV
	Offset Drift	$T_A = T_{MIN}$ to T_{MAX}	-12.5		+12.5	$\mu\text{V}/^\circ\text{C}$
OFS	Midscale Offset (Pin 7) Scaling ⁴		0.49	0.50	0.51	V/V
	Input Resistance	Pin 7 to Pin 2	2.5	3.0		k Ω
IOSC	Short-Circuit Output Current		7	11	25	mA
BW _{-3 dB}	-3 dB Bandwidth	V _O = +1 V dc	20	30		kHz
SR	Slew Rate			0.2		V/ μs
N _{SD}	Noise Spectral Density ³	$f = 100\text{ Hz to }10\text{ kHz}$		0.2		$\mu\text{V}/\sqrt{\text{Hz}}$
POWER SUPPLY						
V _S	Operating Range	$T_A = T_{MIN}$ to T_{MAX}	3	5	36	V
I _S	Quiescent Supply Current ⁵	$T_A = +25^\circ\text{C}$, $V_S = +5\text{ V}$		200	500	μA
TEMPERATURE RANGE						
T _{OP}	Operating Temperature Range		-40		+105	$^\circ\text{C}$
PACKAGE	Plastic Mini-DIP (N-8) SOIC (R-8)			AD22057N AD22057R		

NOTES

¹Specified for default mode i.e., with no external components. The overall gain is trimmed to $\pm 1\%$ while the individual gains of A1 and A2 may be subject to a maximum $\pm 3\%$ tolerance. Note that the actual gain in a particular application can be modified by the use of external resistor networks.

²The actual output resistance of A1 is only a few ohms, but access to this output, via Pin 3, is always through a 100 k Ω resistor, which is trimmed to $\pm 3\%$.

³Referred to the input (Pins 1 and 8).

⁴The midscale offset scaling factor determines the fraction of voltage applied to Pin 7 which appears at the output. For example, with Pin 7 tied to Pin 6 and $V_S = +5\text{ V}$, the output will be offset to $+2.5\text{ V} \pm 50\text{ mV}$. The designer should be aware that the impedance at Pin 7, OFS, is 4 k Ω . Care should be taken so that the steady-state voltage at this pin does not cause the package to dissipate too much power. It is recommended that the continuous V_S stay below +20 V when it is connected to the OFS pin.

⁵With $V_{DM} = 0\text{ V}$. Differential mode signals are referred to as V_{DM} , while V_{CM} refers to common-mode voltages.

All min and max specifications are guaranteed, although only those marked in **boldface** are tested on all production units at final test.

Specifications subject to change without notice.

ABSOLUTE MAXIMUM RATINGS¹

Supply Voltage	+3 V to +36 V
Peak Input Voltage (40 ms)	60 V
Reversed Continuous Supply Voltage	−34 V
Operating Temperature	−40°C to +125°C
Storage Temperature	−65°C to +150°C
Output Short Circuit Duration	Indefinite
Lead Temperature (Soldering, 60 sec)	+300°C

¹Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only; the functional operation of the device at these or any other conditions above those indicated in the operation sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ORDERING GUIDE

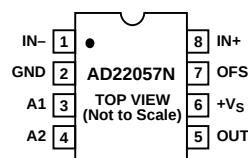
Model	Temperature Range	Package Description	Package Option
AD22057N	−40°C to +105°C	Plastic Mini-DIP	N-8
AD22057R	−40°C to +105°C	SOIC	R-8

CAUTION

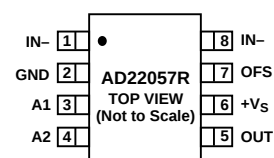
ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although the AD22057 features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

PIN CONFIGURATIONS

Plastic Mini-DIP (N-8)

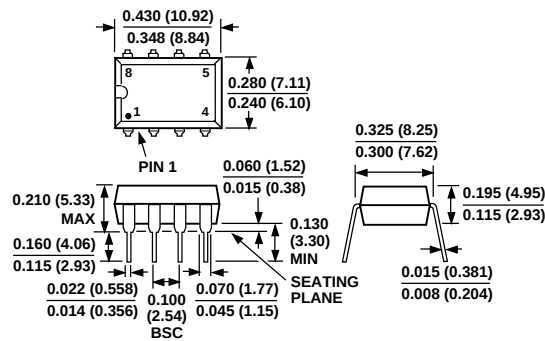


SOIC (R-8)

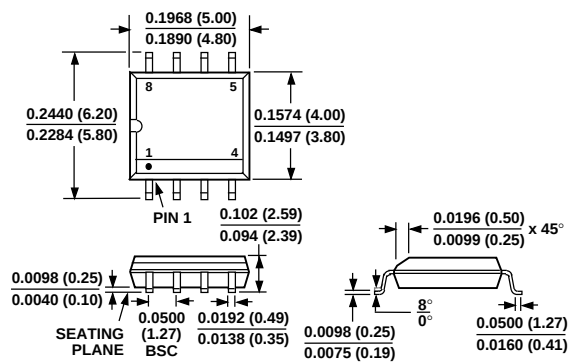


OUTLINE DIMENSIONS
Dimensions shown in inches and (mm).

Plastic Mini-DIP (N-8)



SOIC (R-8)



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