

FEATURES

Voltage noise density: 2.8 nV/√Hz typical

Peak-to-peak noise: 77 nV p-p typical

Gain bandwidth product: 10 MHz

Low input bias current: 14 nA maximum

Low offset voltage: 75 μV maximum

High open-loop gain: 1000 V/mV (120 dB)

Low supply current per amplifier: 3 mA typical

Dual-supply operation: ±5 V to ±15 V

Unity-gain stable

No phase reversal

ENHANCED PRODUCT FEATURES

Supports defense and aerospace applications (AQEC standard)

Extended temperature range: −55°C to +125°C

Controlled manufacturing baseline

One assembly/test site

One fabrication site

Enhanced product change notification

Qualification data available on request

APPLICATIONS

Phase-locked loop (PLL) filters

Filters for GPS

Instrumentation

Sensors and controls

Professional quality audio

PIN CONFIGURATION

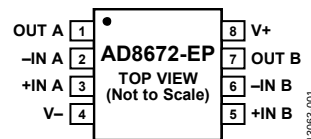


Figure 1.

GENERAL DESCRIPTION

The **AD8672-EP** is a very high precision amplifier featuring very low noise, very low offset voltage and drift, low input bias current, 10 MHz bandwidth, and low power consumption. Outputs are stable with capacitive loads of over 1000 pF. Supply current is less than 3 mA per amplifier at 30 V.

The combination of ultralow noise, high precision, speed, and stability within the **AD8672-EP** is unmatched. Applications for this amplifier include high quality PLL filters, precision filters, medical and analytical instrumentation, precision power supply controls, ATE, data acquisition, and precision controls, as well as professional quality audio.

The **AD8672-EP** is available in an 8-lead SOIC narrow package. It is specified over a −55°C to +125°C temperature range.

Additional application and technical information can be found in the **AD8672** data sheet.

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REVISION HISTORY

9/15—Revision 0: Initial Version

SPECIFICATIONS

ELECTRICAL CHARACTERISTICS, ± 5 V

$V_{SY} = \pm 5.0$ V, $V_{CM} = 0$ V, $T_A = 25^\circ\text{C}$, unless otherwise specified.

Table 1.

Parameter	Symbol	Test Conditions/Comments	Min	Typ	Max	Unit
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}	$-55^\circ\text{C} < T_A < +125^\circ\text{C}$		20	75	μV
		$-55^\circ\text{C} < T_A < +125^\circ\text{C}$		30	125	μV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	$-55^\circ\text{C} < T_A < +125^\circ\text{C}$		0.3	0.8	$\mu\text{V}/^\circ\text{C}$
Input Bias Current	I_B	$25^\circ\text{C} < T_A < 125^\circ\text{C}$	-14	+3	+14	nA
		$-55^\circ\text{C} < T_A < +125^\circ\text{C}$	-20	+5	+20	nA
		$-55^\circ\text{C} < T_A < +125^\circ\text{C}$	-60	+8	+60	nA
Input Offset Current	I_{OS}	$25^\circ\text{C} < T_A < 125^\circ\text{C}$	-14	+6	+14	nA
		$-55^\circ\text{C} < T_A < +125^\circ\text{C}$	-20	+6	+20	nA
		$-55^\circ\text{C} < T_A < +125^\circ\text{C}$	-60	+8	+60	nA
Input Voltage Range			-2.5		+2.5	V
Common-Mode Rejection Ratio	CMRR	$V_{CM} = -2.5$ V to $+2.5$ V	100	120		dB
Large Signal Voltage Gain	A_{VO}	$R_L = 2$ k Ω , $V_O = -3$ V to $+3$ V	1000	6000		V/mV
Input Capacitance						
Common Mode	C_{INCM}			6.25		pF
Differential Mode	C_{INDM}			7.5		pF
Input Resistance						
Common Mode	R_{IN}			3.5		G Ω
Differential Mode	R_{INDM}			15		M Ω
OUTPUT CHARACTERISTICS						
Output Voltage						
High	V_{OH}	$R_L = 2$ k Ω , -55°C to $+125^\circ\text{C}$	+3.8	+4.0		V
		$R_L = 600$ Ω	+3.7	+3.9		V
Low	V_{OL}	$R_L = 2$ k Ω , -55°C to $+125^\circ\text{C}$		-3.9	-3.8	V
		$R_L = 600$ Ω		-3.8	-3.7	V
Output Current	I_{OUT}			± 10		mA
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	$V_S = \pm 4$ V to ± 18 V	110	130		dB
Supply Current per Amplifier	I_{SY}	$V_O = 0$ V		3	3.5	mA
		$-55^\circ\text{C} < T_A < +125^\circ\text{C}$			4.2	mA
DYNAMIC PERFORMANCE						
Slew Rate	SR	$R_L = 2$ k Ω		4		V/ μs
Settling Time	t_S	To 0.1% (4 V step, $G = 1$)		1.4		μs
		To 0.01% (4 V step, $G = 1$)		5.1		μs
Gain Bandwidth Product	GBP			10		MHz
NOISE PERFORMANCE						
Peak-to-Peak Noise	$e_{n\text{ p-p}}$	0.1 Hz to 10 Hz		77	100	nV p-p
Voltage Noise Density	e_n	$f = 1$ kHz		2.8	3.8	nV/ $\sqrt{\text{Hz}}$
Current Noise Density	i_n	$f = 1$ kHz		0.3		pA/ $\sqrt{\text{Hz}}$
Channel Separation	C_S	$f = 1$ kHz		-130		dB
		$f = 10$ kHz		-105		dB

ELECTRICAL CHARACTERISTICS, ± 15 V

$V_S = \pm 15.0$ V, $V_{CM} = 0$ V, $T_A = 25^\circ\text{C}$, unless otherwise specified.

Table 2.

Parameter	Symbol	Test Conditions/Comments	Min	Typ	Max	Unit
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}	$-55^\circ\text{C} < T_A < +125^\circ\text{C}$		20	75	μV
		$-55^\circ\text{C} < T_A < +125^\circ\text{C}$		30	125	μV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	$-55^\circ\text{C} < T_A < +125^\circ\text{C}$		0.3	0.8	$\mu\text{V}/^\circ\text{C}$
Input Bias Current	I_B	$25^\circ\text{C} < T_A < 125^\circ\text{C}$	-14	+3	+14	nA
		$-55^\circ\text{C} < T_A < +125^\circ\text{C}$	-20	+5	+20	nA
		$-55^\circ\text{C} < T_A < +125^\circ\text{C}$	-60	+8	+60	nA
Input Offset Current	I_{OS}	$25^\circ\text{C} < T_A < 125^\circ\text{C}$	-14	+6	+14	nA
		$-55^\circ\text{C} < T_A < +125^\circ\text{C}$	-20	+6	+20	nA
		$-55^\circ\text{C} < T_A < +125^\circ\text{C}$	-60	+8	+60	nA
Input Voltage Range			-12		+12	V
Common-Mode Rejection Ratio	CMRR	$V_{CM} = -12$ V to $+12$ V	100	120		dB
Large Signal Voltage Gain	A_{VO}	$R_L = 2$ k Ω , $V_O = -10$ V to $+10$ V	1000	6000		V/mV
Input Capacitance						
Common Mode	C_{INCM}			6.25		pF
Differential Mode	C_{INDM}			7.5		pF
Input Resistance						
Common Mode	R_{IN}			3.5		G Ω
Differential Mode	R_{INDM}			15		M Ω
OUTPUT CHARACTERISTICS						
Output Voltage						
High	V_{OH}	$R_L = 2$ k Ω , -55°C to $+125^\circ\text{C}$	13.2	13.8		V
		$R_L = 600$ Ω	11	12.3		V
Low	V_{OL}	$R_L = 2$ k Ω , -55°C to $+125^\circ\text{C}$		-13.8	-13.2	V
		$R_L = 600$ Ω		-12.4	-11	V
Output Current	I_{OUT}			± 20		mA
Short Circuit Current	I_{SC}			± 30		mA
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	$V_S = \pm 4$ V to ± 18 V	110	130		dB
Supply Current per Amplifier	I_{SY}	$V_O = 0$ V		3	3.5	mA
		$-55^\circ\text{C} < T_A < +125^\circ\text{C}$			4.2	mA
DYNAMIC PERFORMANCE						
Slew Rate	SR	$R_L = 2$ k Ω		4		V/ μs
Settling Time	t_s	To 0.1% (10 V step, $G = 1$)		2.2		μs
		To 0.01% (10 V step, $G = 1$)		6.3		μs
Gain Bandwidth Product	GBP			10		MHz
NOISE PERFORMANCE						
Peak-to-Peak Noise	$e_{n\text{ p-p}}$	0.1 Hz to 10 Hz		77	100	nV p-p
Voltage Noise Density	e_n	$f = 1$ kHz		2.8	3.8	nV/ $\sqrt{\text{Hz}}$
Current Noise Density	i_n	$f = 1$ kHz		0.3		pA/ $\sqrt{\text{Hz}}$
Channel Separation	C_S	$f = 1$ kHz		-130		dB
		$f = 10$ kHz		-105		dB

ABSOLUTE MAXIMUM RATINGS

Table 3.

Parameter	Rating
Supply Voltage	36 V
Input Voltage	V_{S-} to V_{S+}
Differential Input Voltage	± 0.7 V
Output Short-Circuit Duration	Indefinite
Storage Temperature Range	-65°C to $+150^{\circ}\text{C}$
Operating Temperature Range	-55°C to $+125^{\circ}\text{C}$
Junction Temperature Range	-65°C to $+150^{\circ}\text{C}$
Lead Temperature Range (Soldering, 60 sec)	300°C

Stresses at or above those listed under Absolute Maximum Ratings may cause permanent damage to the product. This is a stress rating only; functional operation of the product at these or any other conditions above those indicated in the operational section of this specification is not implied. Operation beyond the maximum operating conditions for extended periods may affect product reliability.

THERMAL RESISTANCE

θ_{JA} is specified for the worst-case conditions, that is, θ_{JA} is specified for the device soldered on a 4-layer circuit board for surface-mount packages.

Table 4.

Package Type	θ_{JA}	θ_{JC}	Unit
8-Lead SOIC_N (R-8)	120	43	$^{\circ}\text{C}/\text{W}$

ESD CAUTION



ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

TYPICAL PERFORMANCE CHARACTERISTICS

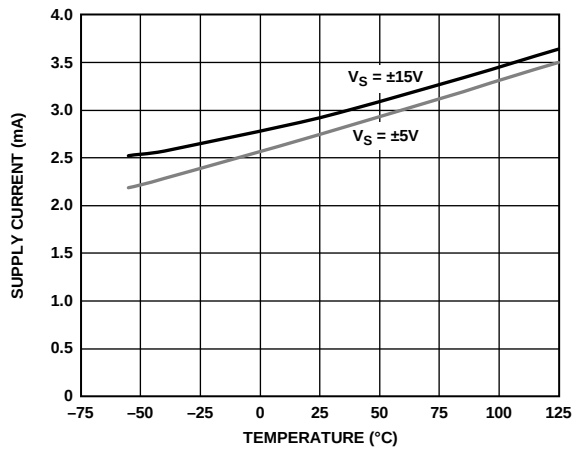


Figure 2. Supply Current vs. Temperature

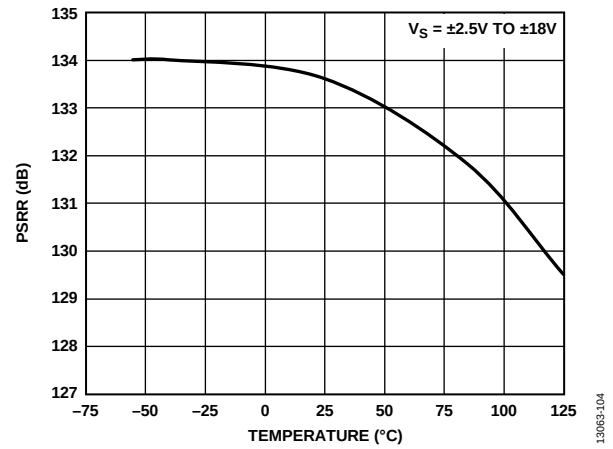
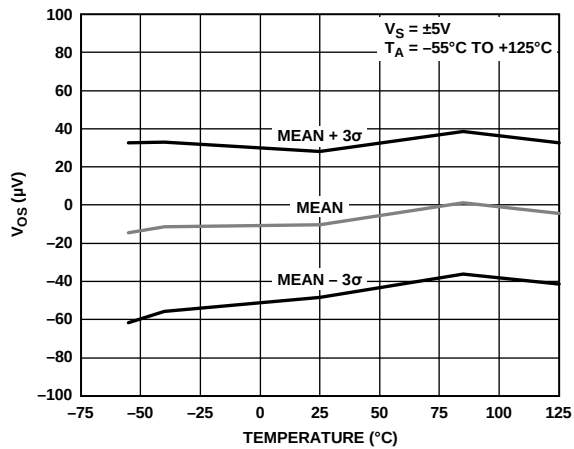
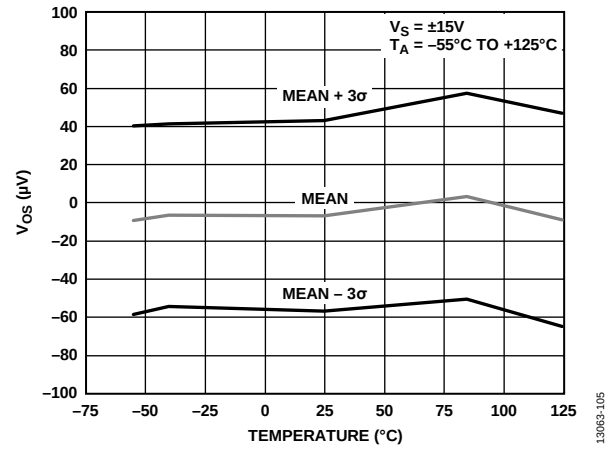
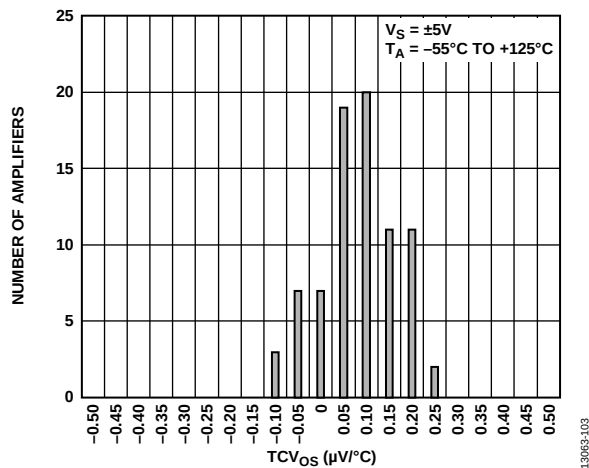
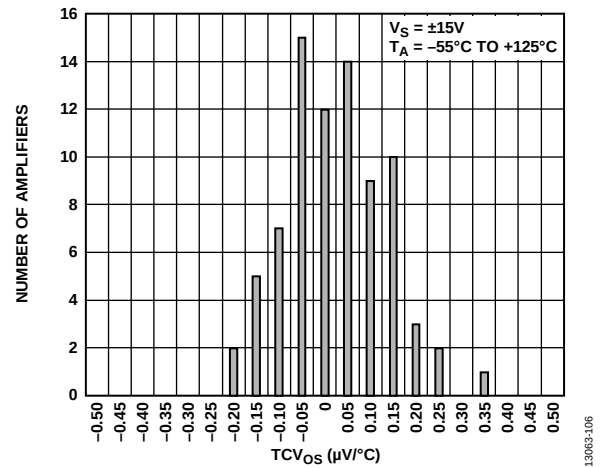


Figure 5. PSRR vs. Temperature

Figure 3. Input Offset Voltage (V_{OS}) vs. Temperature, $V_S = \pm 5 V$ Figure 6. Input Offset Voltage (V_{OS}) vs. Temperature, $V_S = \pm 15 V$ Figure 4. Input Offset Voltage Drift (TCV_{OS}) Distribution, $V_S = \pm 5 V$ Figure 7. Input Offset Voltage Drift (TCV_{OS}) Distribution, $V_S = \pm 15 V$

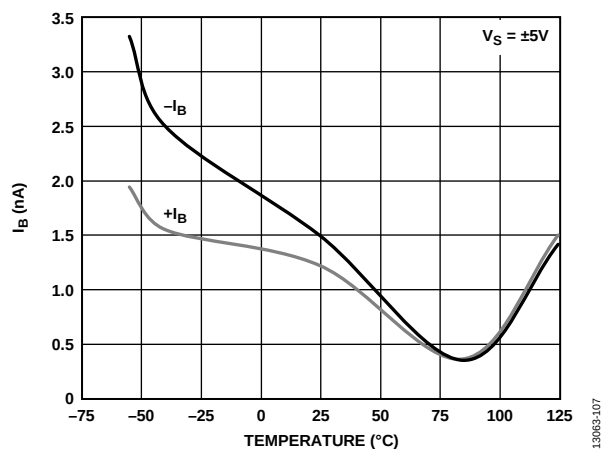
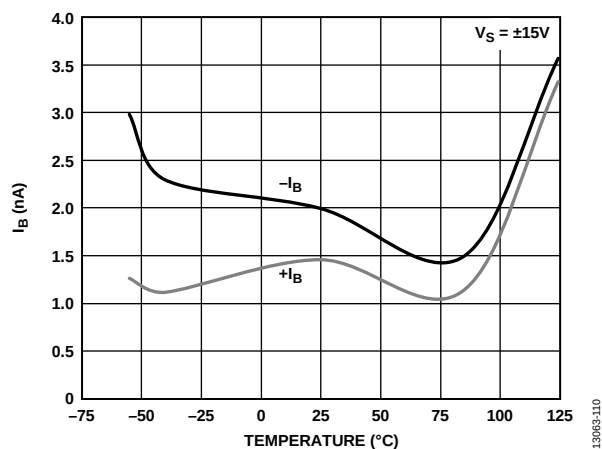
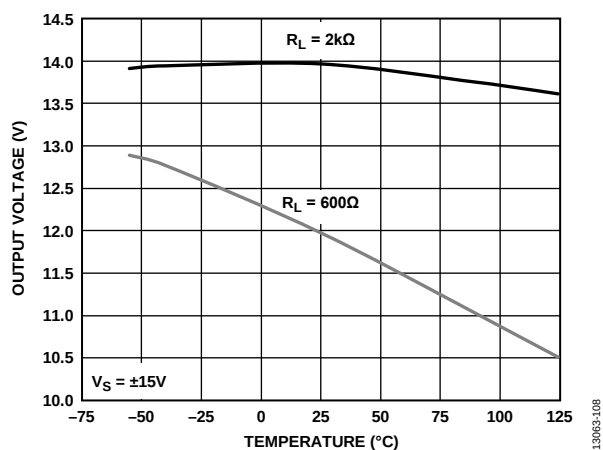
Figure 8. Input Bias Current (I_B) vs. Temperature, $V_S = \pm 5V$ Figure 11. Input Bias Current (I_B) vs. Temperature, $V_S = \pm 15V$ 

Figure 9. Output Voltage High vs. Temperature

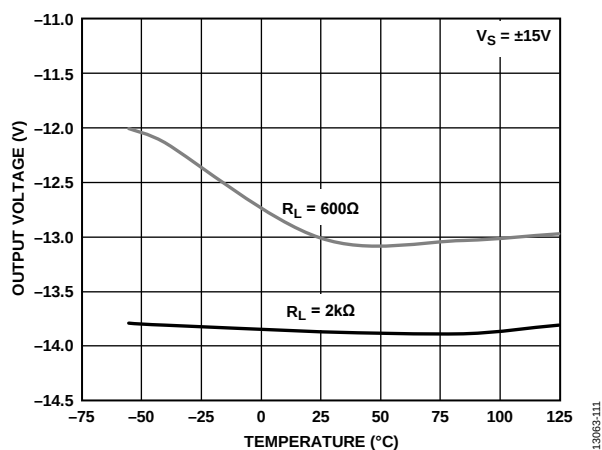
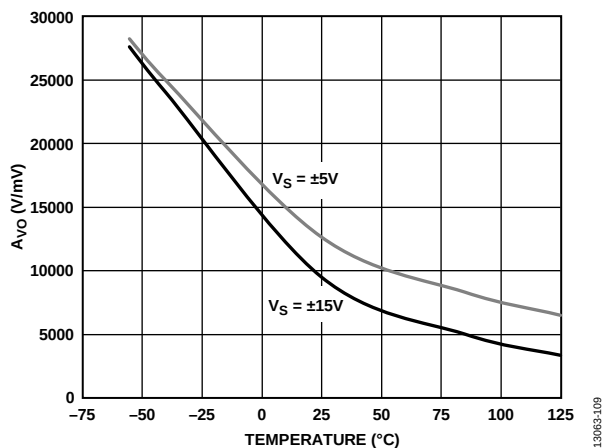
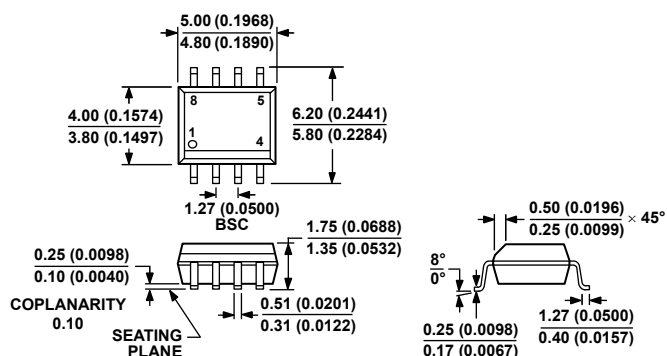


Figure 12. Output Voltage Low vs. Temperature

Figure 10. Open-Loop Gain (A_{vo}) vs. Temperature

OUTLINE DIMENSIONS



COMPLIANT TO JEDEC STANDARDS MS-012-AA
 CONTROLLING DIMENSIONS ARE IN MILLIMETERS; INCH DIMENSIONS
 (IN PARENTHESES) ARE ROUNDED-OFF MILLIMETER EQUIVALENTS FOR
 REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN.

Figure 13. 8-Lead Standard Small Outline Package [SOIC_N]
 Narrow Body (R-8)

Dimensions shown in millimeters and (inches)

012407-A

ORDERING GUIDE

Model ¹	Temperature Range	Package Description	Package Option
AD8672TRZ-EP	−55°C to +125°C	8-Lead Standard Small Outline Package [SOIC_N]	R-8
AD8672TRZ-EP-R7	−55°C to +125°C	8-Lead Standard Small Outline Package [SOIC_N]	R-8

¹ Z = RoHS Compliant Part.