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Precision Low Noise Low Input Bias Current Operational Amplifiers

Preliminary Technical Data

OP4177

FEATURES

- Low Offset Voltage: 75 μ V Max.
- Very Low Offset Voltage Drift: 0.7 μ V/°C Max
- Low Noise: 8nV/ $\sqrt{\text{Hz}}$
- CMRR, PSRR and $A_{VO} > 120$ dB
- Dual supply operation: ± 2.5 V to ± 15 V
- Low Supply Current: 400 μ A/Amp
- Unity Gain Stable
- No Phase Reversal
- Inputs Internally Protected Beyond Supply Voltage

APPLICATIONS

- Instrumentation
- Sensors and Controls
- Precision filters

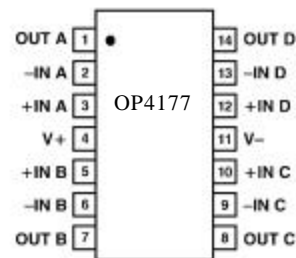
GENERAL DESCRIPTION

The OP4177 is a quad amplifier featuring very low offset voltage and drift, low input bias current, low noise and low power consumption. Outputs are stable with capacitive loads of over 1000pF. Supply current is less than 500 μ A per amplifier at 30V. 500 Ω series resistors protect the inputs, allowing input signal levels over a volt beyond either supply without phase reversal.

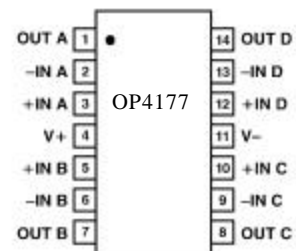
Applications for these amplifiers include both line powered and portable instrumentation and control--thermocouple, RTD, strain-bridge and other sensor signal conditioning--and precision filters.

The OP4177 is specified over the extended industrial (-40° to $+125^{\circ}$ C) temperature range. The OP4177, quad amplifier, is available in 14-lead TSSOP and narrow 14-lead SO packages. Surface mount devices in TSSOP packages are available in tape and reel only.

14-Lead SO
(R-14)



14-Lead TSSOP
(RU-14)



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PRELIMINARY TECHNICAL DATA

OP4177

ELECTRICAL CHARACTERISTICS (@ $V_S = \pm 5.0V$, $V_{CM} = 0V$, $T_A = +25^\circ C$ unless noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}	$-40^\circ C < T_A < +125^\circ C$		15	75	μV
				25	100	μV
Input Bias Current	I_B	$-40^\circ C < T_A < +125^\circ C$	-2	0.5	2	nA
Input Offset Current	I_{OS}	$-40^\circ C < T_A < +125^\circ C$	-1	0.2	1	nA
Input Voltage Range			-3.5		3.5	V
Common-Mode Rejection Ratio	CMRR	$V_{CM} = -4V$ to $4V$	120	126		dB
		$-40^\circ C < T_A < +125^\circ C$	118	125		dB
Large Signal Voltage Gain	A_{VO}	$R_L = 2 k\Omega$, $V_O = -4V$ to $4V$	1000	2000		V/mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	$-40^\circ C < T_A < +125^\circ C$		0.2	0.7	$\mu V/^\circ C$
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	$I_L = 1 mA$, $-40^\circ C < T_A < +125^\circ C$	4	4.1		V
Output Voltage Low	V_{OL}	$I_L = 1 mA$, $-40^\circ C < T_A < +125^\circ C$		-4.1	-4	V
Output Current	I_{OUT}	$V_{Dropout} < 1.2V$		± 10		mA
POWER SUPPLY						
Power Supply Rejection Ratio		$V_S = \pm 2.5 V$ to $\pm 15 V$	118	121		dB
		$-40^\circ C < T_A < +125^\circ C$	114	120		dB
Supply Current/Amplifier	I_{SY}	$V_O = 0V$		400	500	μA
		$-40^\circ C < T_A < +125^\circ C$		500	600	μA
DYNAMIC PERFORMANCE						
Slew Rate	SR	$R_L = 2 k\Omega$		0.7		V/ μs
Gain Bandwidth Product	GBP			1.3		MHz
NOISE PERFORMANCE						
Voltage Noise	e_n p-p	0.1 Hz to 10 Hz		0.4		μV p-p
Voltage Noise Density	e_n	$f = 1 kHz$		8		nV/ \sqrt{Hz}
Current Noise Density	i_n	$f = 1 kHz$		0.2		pA/ \sqrt{Hz}
CHANNEL SEPARATION						
	CS	DC		0.01		$\mu V/V$
		$f = 100kHz$		-120		dB

PRELIMINARY TECHNICAL DATA

OP4177

ELECTRICAL CHARACTERISTICS (@ $V_S = \pm 15V$, $V_{CM} = 0V$, $T_A = +25^\circ C$ unless noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
INPUT CHARACTERISTICS						
Offset Voltage				15	75	μV
Offset Voltage		$-40^\circ C < T_A < +125^\circ C$		25	100	μV
Input Bias Current	I_B	$-40^\circ C < T_A < +125^\circ C$	-2	0.5	2	nA
Input Offset Current	I_{OS}	$-40^\circ C < T_A < +125^\circ C$	-1	0.2	1	nA
Input Voltage Range			-13.5		13.5	V
Common-Mode Rejection Ratio	CMRR	$V_{CM} = -14$ to 14V	120	126		dB
		$-40^\circ C < T_A < +125^\circ C$	118	125		dB
Large Signal Voltage Gain	A_{VO}	$R_L = 2\text{ k}\Omega$, $V_o = -14V$ to 14V	1000	3000		V/mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	$-40^\circ C < T_A < +125^\circ C$		0.2	0.6	$\mu V/^\circ C$
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	$I_L = 1\text{ mA}$, $-40^\circ C < T_A < +125^\circ C$	14	14.1		V
Output Voltage Low	V_{OL}	$I_L = 1\text{ mA}$, $-40^\circ C < T_A < +125^\circ C$		-14.1	-14	V
Output Current	I_{OUT}			± 10		mA
Short Circuit Current	I_{SC}			± 35		mA
POWER SUPPLY						
Power Supply Rejection Ratio		$V_S = \pm 2.5\text{ V}$ to $\pm 15\text{ V}$	118	121		dB
		$-40^\circ C < T_A < +125^\circ C$	114	120		dB
Supply Current/Amplifier	I_{SY}	$V_O = 0V$		400	500	μA
		$-40^\circ C < T_A < +125^\circ C$		500	600	μA
DYNAMIC PERFORMANCE						
Slew Rate	SR	$R_L = 2\text{ k}\Omega$		0.7		V/ μs
Gain Bandwidth Product	GBP			1.3		MHz
NOISE PERFORMANCE						
Voltage Noise	e_n p-p	0.1 Hz to 10 Hz		0.4		μV p-p
Voltage Noise Density	e_n	$f = 1\text{ kHz}$		8		nV/ \sqrt{Hz}
Current Noise Density	i_n	$f = 1\text{ kHz}$		0.2		pA/ \sqrt{Hz}
CHANNEL SEPARATION						
	CS	DC		0.01		$\mu V/V$
		$F = 100\text{ kHz}$		-120		dB

PRELIMINARY TECHNICAL DATA

OP4177

ABSOLUTE MAXIMUM RATINGS¹

Supply voltage.....	36V
Input Voltage	Vs- to Vs+
Differential Input Voltage.....	±Supply Voltage
Output Short-Circuit Duration.....	Indefinite
Storage Temperature Range	
R, RU Package.....	-65°C to +150°C
Operating Temperature Range	
OP4177	-40°C to +125°C
Junction Temperature Range	
R, RU Package.....	-65°C to +150°C
Lead Temperature Range (Soldering, 60 Sec).....	+300°C

Package Type	θ_{JA}	θ_{JC}	Units
14-Pin TSSOP (RU) ³	180	35	°C/W
14-Pin SOIC (R)	120	36	°C/W

NOTES

¹ Absolute maximum ratings apply at 25°C, unless otherwise noted.

² θ_{JA} is specified for the worst-case conditions, i.e., θ_{JA} is specified for device soldered in circuit board for surface mount packages.

³ MSOP and TSSOP packages are only offered in tape and reel.

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option	Marking Code
OP4177ARU	-40°C to +125°C	14-Pin TSSOP	RU-14	
OP4177AR	-40°C to +125°C	14-Pin SOIC	R-14	