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Precision Low Noise Low Input Bias Current Operational Amplifiers

Preliminary OP1177/OP2177/OP4177

FEATURES
Dual supply operation: ±2.5V to ±15V
Low Supply Current: 550 μA/Amp
Low Offset Voltage: 50 μV max.
Unity Gain Stable
No Phase Reversal

APPLICATIONS
Instrumentation
Sensors and Controls
Precision filters

GENERAL DESCRIPTION

The OP1177, OP2177 and OP4177 are precision single, dual and quad amplifiers 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 4000pF. Supply current is less than 600μA per amplifier at 30V. 500Ω series resistors protect the inputs, allowing input signal levels over a volt above the positive supply without phase reversal.

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

The OP1177, OP2177 and OP4177 are specified over the extended industrial (-40° to +85°C) temperature range. The OP1177, single, is available in the 8-lead MSOP and 8-lead SOIC packages. The OP2177, dual, is available in the 8-lead MSOP and 8-lead SOIC packages. The OP4177, quad, is available in 14-lead TSSOP and narrow 14-lead SO packages. Surface mount devices in TSSOP and MSOP packages are available in tape and reel only.

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OP1177/OP2177/OP4177

ELECTRICAL CHARACTERISTICS (@ V_S= ±5.0V, V_{CM} = 0V, T_A=+25°C unless noted

Parameter	Symbol	Conditions	Min	Typ	Max	Units
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}				50	µV
		-40°< T_A < +85°C			100	µV
Input Bias Current	I_B	-40°< T_A < +85°C	-2		2	nA
Input Offset Current	I_{OS}	-40°< T_A < +85°C	-2		2	nA
Input Voltage Range			-4		4	V
Common-Mode Rejection Ratio	CMRR	V_{CM} = -4V to 4V	120	140		dB
Large Signal Voltage Gain	A_{VO}	R_L = 2 kΩ , Vo= -4V to 4V	1000	2000		V/mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	-40°< T_A < +85°C		0.3	1	µV/°C
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	I_L = 1 mA, -40°C to +85°C	4			V
Output Voltage Low	V_{OL}	I_L = 1 mA, -40°C to +85°C			-4	V
Output Current	I_{OUT}	$V_{Dropout}$ < 1.2V		±10		mA
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	V_S = ±2.5 V to ±15 V	120	130		dB
Supply Current/Amplifier	I_{SY}	V_O = 0V			600	µA
		-40°<T_A < +85°C			800	µA
DYNAMIC PERFORMANCE						
Slew Rate	SR	R_L =2 kΩ		0.6		V/µs
Gain Bandwidth Product	GBP			1.8		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/√Hz
Current Noise Density	i_n	f = 1 kHz		0.2		pA/√Hz

ELECTRICAL CHARACTERISTICS (@ V_S= ±15V, V_{CM} = 0V, T_A=+25°C unless noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}				50	µV
		-40°< T_A < +85°C			100	µV
Input Bias Current	I_B	-40°< T_A < +85°C	-2		2	nA
Input Offset Current	I_{OS}	-40°< T_A < +85°C	-2		2	nA
Input Voltage Range			-14		14	V
Common-Mode Rejection Ratio	CMRR	V_{CM} = -14 to 14V	120	140		dB
Large Signal Voltage Gain	A_{VO}	R_L = 2 kΩ , Vo= -14V to 14V	1000	3000		V/mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	-40°< T_A < +85°C		0.3	1	µV/°C
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	I_L = 1 mA, -40°C to +85°C	-14			V
Output Voltage Low	V_{OL}	I_L = 1 mA, -40°C to +85°C			14	V
Output Current	I_{OUT}			±10		mA
Short Circuit Current	I_{SC}			±35		mA
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	V_S = ±2.5 V to ±15 V	120	130		dB
Supply Current/Amplifier	I_{SY}	V_O = 0V			600	µA
		-40°<T_A < +85°C			800	µA
DYNAMIC PERFORMANCE						
Slew Rate	SR	R_L =2 kΩ		0.6		V/µs
Gain Bandwidth Product	GBP			1.8		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/√Hz
Current Noise Density	i_n	f = 1 kHz		0.2		pA/√Hz

OP1177/OP2177/OP4177

ABSOLUTE MAXIMUM RATINGS[1]

Supply voltage 36V
Input Voltage ..... Vs- to Vs+
Differential Input Voltage ..... ±Supply Voltage
Output Short-Circuit Duration ..... Indefinite
Storage Temperature Range
RM, R, RU Package ..... -65°C to +150°C
Operating Temperature Range
OP1177/OP2177/OP4177 ..... -40°C to +85°C
Junction Temperature Range
RM, R, RU Package ..... -65°C to +150°C
Lead Temperature Range (Soldering, 60 Sec) ..... +300°C

Package Type	θ_{JA}	θ_{JC}	Units
8-pin MSOP (RM)[3]	190	44	°C/W
8-Pin SOIC (R)	158	43	°C/W
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., $\theta_{JA}$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
OP1177ARM	-40°C to +85°C	8-Pin MSOP	RM-8
OP1177AR	-40°C to +85°C	8-Pin SOIC	R-8
OP2177ARM	-40°C to +85°C	8-Pin MSOP	RM-8
OP2177AR	-40°C to +85°C	8-Pin SOIC	R-8
OP4177ARU	-40°C to +85°C	14-Pin TSSOP	RU-14
OP4177AR	-40°C to +85°C	14-Pin SOIC	R-14