Precision Micropower Single Supply Operational Amplifiers

Preliminary Technical Data OP777/OP727/OP747

FEATURES
Low Offset Voltage: 100 μV max.
Low Input Bias Current: 10na max.
Single-Supply Operation: 2.7V to 30V
Dual supply operation: ±1.35V to ±15V
Low Supply Current: 300 μA/Amp
Unity Gain Stable
No Phase Reversal

APPLICATIONS
Line or Battery Powered Instrumentation
Remote Sensors
Precision filters

GENERAL DESCRIPTION

The OP777, OP727 and OP747 are precision single, dual and quad rail-to-rail output single supply amplifiers featuring micropower operation and rail to rail output ranges. These amplifiers provide improved performance over the industry standard OP07 with ±15V supplies and offer the further advantages of true single supply operation down to +2.7V and smaller package options than any other high voltage precision bipolar amplifier. Outputs are stable with capacitive loads of over 1000pF. Supply current is less than 300μA per amplifier at 5V. 500Ω series resistors protect the inputs, allowing input signal levels several volts above the positive supply without phase reversal.

Applications for these amplifiers include both line powered and portable instrumentation, remote sensor signal conditioning and precision filters.

The OP777, OP727 and OP747 are specified over the extended industrial (-40° to +85°C) temperature range. The OP777, single, is available in the 8-lead MSOP and 8-lead SOIC packages. The OP727, dual, is available in the 8-lead TSSOP. The OP747, 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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ELECTRICAL CHARACTERISTICS (@ V_S=+5.0V, V_{CM} = 2.5V, T_A=+25°C unless noted

Parameter	Symbol	Conditions	Min	Typ	Max	Units
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}				100	µV
		-40°< T_A < +85°C			200	µV
Input Bias Current	I_B	-40°< T_A < +85°C			11	nA
Input Offset Current	I_{OS}	-40°< T_A < +85°C			2	nA
Input Voltage Range			0		4	V
Common-Mode Rejection Ratio	CMRR	V_{CM} = 0 to 4V	104	110		dB
Large Signal Voltage Gain	A_{VO}	R_L = 10 kΩ , V_O= 0.5 to 4.5V	300	500		V/mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	-40°< T_A < +85°C		1.0	2.0	µV/°C
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	I_L = 1 mA, -40°C to +85°C	4.88			V
Output Voltage Low	V_{OL}	I_L = 1 mA, -40°C to +85°C			140	mV
Output Current	I_{OUT}	$V_{Dropout}$ < 1V		±10		mA
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	V_S = _+3 V to +30 V	120	130		dB
Supply Current/Amplifier	I_{SY}	V_O = 0V			270	µA
		-40°<T_A < +85°C		270	320	µA
DYNAMIC PERFORMANCE						
Slew Rate	SR	R_L =2 kΩ		0.2		V/µs
Gain Bandwidth Product	GBP			.7		MHz
NOISE PERFORMANCE						
Voltage Noise	e_n p-p	0.1 Hz to 10 Hz		0.6		µV p-p
Voltage Noise Density	e_n	f = 1 kHz		15		nV/√Hz
Current Noise Density	i_n	f = 1 kHz		0.13		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}				100	µV
		-40°< T_A < +85°C			200	µV
Input Bias Current	I_B	-40°< T_A < +85°C			10	nA
Input Offset Current	I_{OS}	-40°< T_A < +85°C			2	nA
Input Voltage Range			-15		14	V
Common-Mode Rejection Ratio	CMRR	V_{CM} = -15 to 14V	110	120		dB
Large Signal Voltage Gain	A_{VO}	R_L = 10 kΩ,				
		Vo= -14.5V to 14.5V	1000	2500		V/mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	-40°< T_A < +85°C		1	2.0	µV/°C
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	I_L = 1 mA, -40°C to +85°C	-14.9			V
Output Voltage Low	V_{OL}	I_L = 1 mA, -40°C to +85°C			14.9	V
Output Current	I_{OUT}			±30		mA
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	V_S = ±1.5 V to ±15 V	120	130		dB
Supply Current/Amplifier	I_{SY}	V_O = 0V			35	µA
		-40°<T_A < +85°C		350	400	µA
DYNAMIC PERFORMANCE						
Slew Rate	SR	R_L =2 kΩ		0.2		V/µs
Gain Bandwidth Product	GBP			0.7		MHz
NOISE PERFORMANCE						
Voltage Noise	e_n p-p	0.1 Hz to 10 Hz		0.6		µV p-p
Voltage Noise Density	e_n	f = 1 kHz		15		nV/√Hz
Current Noise Density	i_n	f = 1 kHz		0.13		pA/√Hz

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
OP777/OP727/OP747 ..... -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)	190	44	°C/W
8-Pin TSSOP (RU)	240	43	°C/W
8-Pin SOIC (R)	158	43	°C/W
14-Pin TSSOP (RU)	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.

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option
OP777ARM	-40°C to +85°C	8-Pin MSOP	RM-8
OP777AR	-40°C to +85°C	8-Pin SOIC	R-8
OP727ARU	-40°C to +85°C	8-Pin TSSOP	RU-8
OP747ARU	-40°C to +85°C	14-Pin TSSOP	RU-14
OP747AR	-40°C to +85°C	14-Pin SOIC	R-14

OP777/OP727/OP747 Application Section

Theory of Operation