5 MHz Single-Supply Operational Amplifier

OP183

FEATURES

Single supply: 3 V to 36 V
Wide bandwidth: 5 MHz
Low offset voltage: 1 mV
High slew rate: 10 V/µs
Low noise: 10 nV/√Hz
Unity gain stable
Input and output range includes GND
No phase reversal

APPLICATIONS

Multimedia
Telecom
ADC buffers
Wide band filters
Microphone preamplifiers

PIN CONNECTION

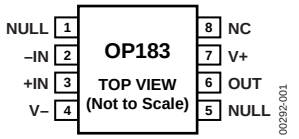


Figure 1. 8-Lead Narrow Body SOIC (S Suffix)

GENERAL DESCRIPTION

The OP183 is a single-supply, 5 MHz bandwidth amplifier with slew rates of 10 V/µs. It can operate from voltages as low as 3 V and up to 36 V. This combination of slew rate and bandwidth yields excellent single-supply ac performance, making this amplifier ideally suited for telecom and multimedia audio applications.

The OP183 also provides good dc performance with guaranteed 1 mV offset. Noise is a respectable 10 nV/√Hz. Supply current is only 1.2 mA per amplifier.

This amplifier is well suited for single-supply applications that require moderate bandwidth even when used in high gain configurations. This makes it useful in filters and instrumentation. The output drive capability and very wide full-power bandwidth of the OP183 make it a good choice for multimedia headphone drivers or microphone input amplifiers.

The OP183 is available in a SO-8 surface-mount package. It is specified over the extended industrial (−40°C to +85°C) temperature range.

SPECIFICATIONS

ELECTRICAL CHARACTERISTICS @ V_S = 5 V

T_A = 25°C, unless otherwise noted.

Table 1.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}	V_{CM} = 2.5 V, V_{OUT} = 2.5 V,		0.025	1.0	mV
		−40°C ≤ T_A ≤ +85°C			1.25	mV
Input Bias Current	I_B	V_{CM} = 2.5 V, V_{OUT} = 2.5 V,		350	600	nA
		−40°C ≤ T_A ≤ +85°C		430	750	nA
Input Offset Current	I_{OS}	V_{CM} = 2.5 V, V_{OUT} = 2.5 V,				nA
		−40°C ≤ T_A ≤ +85°C		11	±50	nA
Input Voltage Range			0		3.5	V
Common-Mode Rejection Ratio	CMRR	V_{CM} = 0 to 3.5 V				
		−40°C ≤ T_A ≤ +85°C	70	104		dB
Large Signal Voltage Gain	A_{VO}	R_L = 2 kΩ, 0.2 ≤ V_O ≤ 3.8 V	100			V/mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$			4		µV/°C
Bias Current Drift	$\Delta I_B/\Delta T$			−1.6		nA/°C
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	R_L = 2 kΩ to GND	4.0	4.22		V
Output Voltage Low	V_{OL}	R_L = 2 kΩ to GND		50	75	mV
Short-Circuit Limit	I_{SC}	Source		25		mA
		Sink		30		mA
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	V_S = 4 V to 6 V,				
		−40°C ≤ T_A ≤ +85°C	70	104		dB
Supply Current/Amplifier	I_{SY}	V_O = 2.5 V,				
		−40°C ≤ T_A ≤ +85°C		1.2	1.5	mA
Supply Voltage Range	V_S		3		±18	V
DYNAMIC PERFORMANCE						
Slew Rate	SR	R_L = 2 kΩ	5	10		V/µs
Full Power Bandwidth	BWp	1% Distortion		>50		kHz
Settling Time	t_S	To 0.01%		1.5		µs
Gain Bandwidth Product	GBP			5		MHz
Phase Margin	ϕm			46		Degrees
NOISE PERFORMANCE						
Voltage Noise	e_n p-p	0.1 Hz to 10 Hz		2		µV p-p
Voltage Noise Density	e_n	f = 1 kHz, V_{CM} = 2.5 V		10		nV/√Hz
Current Noise Density	i_n			0.4		pA/√Hz

ELECTRICAL CHARACTERISTICS @ V_S = 3 V

T_A = 25°C, unless otherwise noted.

Table 2.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}	V_{CM} = 1.5 V, V_{OUT} = 1.5 V,		0.3	1.0	mV
		−40°C ≤ T_A ≤ +85°C			1.25	mV
Input Bias Current	I_B	V_{CM} = 1.5 V, V_{OUT} = 1.5 V,		350	600	nA
		−40°C ≤ T_A ≤ +85°C			750	nA
Input Offset Current	I_{OS}	V_{CM} = 1.5 V, V_{OUT} = 1.5 V,				nA
		−40°C ≤ T_A ≤ +85°C		11	±50	nA
Input Voltage Range			0		1.5	V
Common-Mode Rejection Ratio	CMRR	V_{CM} = 0 V to 1.5 V,				
		−40°C ≤ T_A ≤ +85°C	70	103		dB
Large Signal Voltage Gain	A_{VO}	R_L = 2 kΩ, 0.2 ≤ V_O ≤ 1.8 V	100	260		V/mV
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	R_L = 2 kΩ to GND	2.0	2.25		V
Output Voltage Low	V_{OL}	R_L = 2 kΩ to GND		90	125	mV
Short-Circuit Limit	I_{SC}	Source		25		mA
		Sink		30		mA
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	V_S = 2.5 V to 3.5 V,				
		−40°C ≤ T_A ≤ +85°C	60	113		dB
Supply Current/Amplifier	I_{SY}	−40°C ≤ T_A ≤ +85°C, V_O = 1.5 V		1.2	1.5	mA
DYNAMIC PERFORMANCE						
Gain Bandwidth Product	GBP			5		MHz
NOISE PERFORMANCE						
Voltage Noise Density	e_n	f = 1 kHz, V_{CM} = 1.5 V		10		nV/√Hz

ELECTRICAL CHARACTERISTICS @ V_S = ±15 V

T_A = 25°C, unless otherwise noted.

Table 3.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}			0.01	1.0	mV
		−40°C ≤ T_A ≤ +85°C			1.25	mV
Input Bias Current	I_B			300	600	nA
		−40°C ≤ T_A ≤ +85°C		400	750	nA
Input Offset Current	I_{OS}	−40 ≤ T_A ≤ +85°C		11	±50	nA
Input Voltage Range			−15		+13.5	V
Common-Mode Rejection Ratio	CMRR	V_{CM} = −15 V to +13.5 V,				
		−40°C ≤ TA ≤ +85°C	70	86		dB
Large Signal Voltage Gain	A_{VO}	R_L = 2 kΩ	100	1000		V/mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$			3		µV/°C
Bias Current Drift	$\Delta I_B/\Delta T$			−1.6		nA/°C
Long-Term Offset Voltage	V_{OS}	Note[1]			1.5	mV
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	R_L = 2 kΩ to GND, −40°C ≤ T_A ≤ +85°C	13.9	14.1		V
Output Voltage Low	V_{OL}	R_L = 2 kΩ to GND, −40°C ≤ T_A ≤ +85°C		−14.05	−13.9	V
Short-Circuit Limit	I_{SC}	Source		30		mA
		Sink		50		mA
Open-Loop Output Impedance	Z_{OUT}	f = 1 MHz, A_V = +1		15		Ω
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	V_S = ± 2.5 V to ± 18 V,				
		−40°C ≤ T_A ≤ +85°C	70	112		dB
Supply Current/Amplifier	I_{SY}	V_S = ±18 V, V_O = 0 V,				
		−40°C ≤ T_A ≤ +85°C		1.2	1.75	mA
Supply Voltage Range	V_S		3		±18	V
DYNAMIC PERFORMANCE						
Slew Rate	SR	R_L = 2 kΩ	10	15		V/µs
Full Power Bandwidth	BW_p	1% Distortion		50		kHz
Settling Time	t_S	To 0.01%		1.5		µs
Gain Bandwidth Product	GBP			5		MHz
Phase Margin	ϕm			56		Degrees
NOISE PERFORMANCE						
Voltage Noise	e_n p-p	0.1 Hz to 10 Hz		2		µV p-p
Voltage Noise Density	e_n	f = 1 kHz		10		nV/√Hz
Current Noise Density	i_n			0.4		pA/√Hz

[1] Long-term offset voltage is guaranteed by a 1,000 hour life test performed on three independent lots at 125°C, with an LTPD of 1.3.

ABSOLUTE MAXIMUM RATINGS

Table 4.

Parameter	Rating
Supply Voltage	±18 V
Input Voltage	±18 V
Differential Input Voltage[1]	±7 V
Output Short-Circuit Duration to GND	Indefinite
Storage Temperature Range	
S Package	−65°C to +150°C
Operating Temperature Range	
OP183	−40°C to +85°C
Junction Temperature Range	
S Package	−65°C to +150°C
Lead Temperature Range (Soldering 60 sec)	300°C

[1] For supply voltages less than ±7 V, the absolute maximum input voltage is equal to the supply voltage. Maximum input current should not exceed 2 mA.

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

Absolute maximum ratings apply to packaged parts, unless otherwise noted.

Table 5.

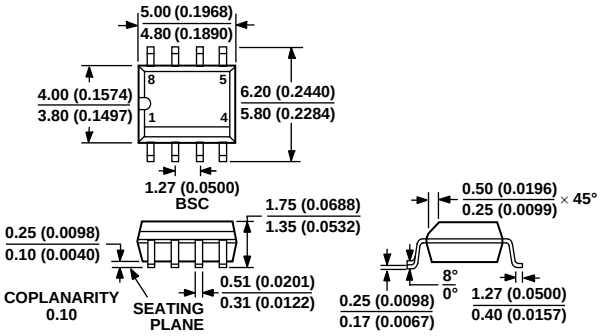
Package Type	θ_{JA}[1]	θ_{JC}	Units
8-Lead SOIC (S)	158	43	°C/W

[1] θ_{JA} is specified for worst-case conditions; in other words, θ_{JA} is specified for device soldered in circuit board for SOIC packages.

ESD 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 this product 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.

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 41. 8-Lead Standard Small Outline Package [SOIC_N]
Narrow Body
(R-8)
S-Suffix
Dimensions shown in millimeters and (inches)

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option
OP183GS	−40°C to +85°C	8-Lead SOIC_N	S-Suffix (R-8)
OP183GS-REEL	−40°C to +85°C	8-Lead SOIC_N	S-Suffix (R-8)
OP183GS-REEL7	−40°C to +85°C	8-Lead SOIC_N	S-Suffix (R-8)
OP183GSZ[1]	−40°C to +85°C	8-Lead SOIC_N	S-Suffix (R-8)
OP183GSZ-REEL[1]	−40°C to +85°C	8-Lead SOIC_N	S-Suffix (R-8)
OP183GSZ-REEL7[1]	−40°C to +85°C	8-Lead SOIC_N	S-Suffix (R-8)

[1]Z = Pb free part.