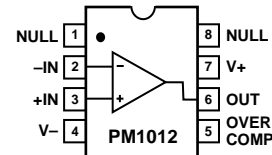


### FEATURES

**Low Supply Current: 600  $\mu$ A Max**  
**Very Low Offset: 35  $\mu$ V Max**  
**Low Drift: 1.5  $\mu$ V/ $^{\circ}$ C Max**  
**Very Low Bias Current**  
**25 $^{\circ}$ C: 100 pA Max**  
**Low Noise: 0.5  $\mu$ V p-p Typ**  
**High Common-Mode Rejection: 114 dB Min**

### PIN CONNECTIONS

**Plastic Mini-DIP (P Suffix)**  
**8-Lead SO (S Suffix)**



### GENERAL DESCRIPTION

The PM1012 is a general purpose, precision operational amplifier. Offering several performance enhancements over industry-standard precision op amps such as the OP07, the PM1012 requires less than 1/6 the supply current. These enhancements include exceptionally low bias currents of only  $\pm 80$  pA, typical, over the full military temperature range, and 132 dB of common-mode rejection and power-supply rejection. The PM1012's low offset voltage of 35  $\mu$ V maximum frees the user from external nulling in most circuits.

An open-loop gain of two million into a 10 k $\Omega$  load ensures that excellent linearity is maintained even in high gain configurations, and 5 mA of output current allows 2 k $\Omega$  loads to be driven with an open-loop gain of one million. The PM1012 offers low noise, especially for a low power amplifier—only 17 nV/ $\sqrt{\text{Hz}}$  at 10 Hz. Exceptionally low current noise minimizes

noise contributions when high source impedances are used. The PM1012 may be overcompensated, using Pin 5 to limit the amplifier's bandwidth, further reducing system noise and increasing stability with large capacitive loads.

The PM1012 conforms to the OP07 pinout with nulling through Pins 1 and 8 to the positive supply. It offers an upgrade to the OP07 in sockets where reduced power dissipation or low bias currents are attractive. It may also be used as an upgrade from the OP12, OP05 and 725 type op amps. The PM1012 may replace 741 type op amps by removing the nulling potentiometer, if used.

### REV. C

Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices.

# PM1012–SPECIFICATIONS

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

Parameter	Symbol	Conditions	PM1012G			Units
			Min	Typ	Max	
Input Offset Voltage	$V_{OS}$	(Note 1)		10 25	50 120	$\mu\text{V}$ $\mu\text{V}$
Long-Term $V_{OS}$ Stability	$\Delta V_{OS}/\text{Time}$			0.3		$\mu\text{V}/\text{Month}$
Input Offset Current	$I_{OS}$	(Note 1)		20 30	150 200	pA pA
Input Bias Current	$I_B$	(Note 1)		$\pm 30$ $\pm 40$	$\pm 150$ $\pm 200$	pA pA
Input Noise Voltage	$e_n$ p-p	0.1 Hz to 10 Hz		0.5		$\mu\text{V p-p}$
Input Noise Voltage Density	$e_n$	$f_O = 10\text{ Hz}^2$ $f_O = 1000\text{ Hz}^3$		17 14	30 22	$\text{nV}/\sqrt{\text{Hz}}$ $\text{nV}/\sqrt{\text{Hz}}$
Input Noise Current Density	$I_n$	$f_O = 10\text{ Hz}$		20		$\text{fA}/\sqrt{\text{Hz}}$
Large-Signal Voltage Gain	$A_{VO}$	$V_O = \pm 12\text{ V}$ ; $R_L = 10\text{ k}\Omega$ $V_O = \pm 10\text{ V}$ ; $R_L = 2\text{ k}\Omega$	200 120	2000 1000		V/mV V/mV
Common-Mode Rejection	CMR	$V_{CM} = \pm 13.5\text{ V}$	110	132		dB
Power-Supply Rejection	PSR	$V_S = \pm 2\text{ V to } \pm 20\text{ V}$	110	132		dB
Input Voltage Range	IVR	(Note 4)	$\pm 13.5$	$\pm 14.0$		V
Output Voltage Swing	$V_O$	$R_L = 10\text{ k}\Omega$	$\pm 13$	$\pm 14$		V
Slew Rate	SR		0.1	0.2		V/ $\mu\text{s}$
Full-Power Bandwidth	$BW_P$			3		kHz
Gain Bandwidth Product	GBW	$A_V = +100$		0.5		MHz
Supply Current	$I_{SY}$	(Note 1)		380	600	$\mu\text{A}$
Supply Voltage	$V_S$	Operating Range	$\pm 2$	$\pm 15$	$\pm 20$	V

### NOTES

<sup>1</sup>These specifications apply for  $\pm 2\text{ V} \leq V_S \leq \pm 20\text{ V}$  and  $-13.5\text{ V} \leq V_{CM} \leq +13.5\text{ V}$  (for  $V_S = \pm 15\text{ V}$ ).

<sup>2</sup>10 Hz noise voltage density is sample tested. Devices 100% tested for noise are available on request.

<sup>3</sup>Sample tested.

<sup>4</sup>Guaranteed by CMR test.

Specifications subject to change without notice.

## ELECTRICAL CHARACTERISTICS (@ $V_S = \pm 15\text{ V}$ , $V_{CM} = 0\text{ V}$ , $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ for PM1012GP, GS, unless otherwise noted)

Parameter	Symbol	Conditions	PM1012G			Units
			Min	Typ	Max	
Input Offset Voltage	$V_{OS}$			20 30	120 200	$\mu\text{V}$ $\mu\text{V}$
Average Temperature Coefficient of $V_{OS}$	$TCV_{OS}$	(Note 1)		0.2	1.5	$\mu\text{V}/^\circ\text{C}$
Input Offset Current	$I_{OS}$	(Note 1)		20 40	230 300	pA pA
Average Temperature Coefficient of $I_{OS}$	$TCI_{OS}$			0.3	2.5	$\text{pA}/^\circ\text{C}$
Input Bias Current	$I_B$	(Note 1)		$\pm 35$ $\pm 50$	$\pm 230$ $\pm 300$	pA pA
Average Temperature Coefficient of $I_B$	$TCI_B$			0.3	2.5	$\text{pA}/^\circ\text{C}$
Large Signal Voltage Gain	$A_{VO}$	$V_O = \pm 12\text{ V}$ ; $R_L = 10\text{ k}\Omega$ $V_O = \pm 10\text{ V}$ ; $R_L = 2\text{ k}\Omega$	150 100	1500 800		V/mV V/mV
Common-Mode Rejection	CMR	$V_{CM} = \pm 13.5\text{ V}$	108	130		dB
Power Supply Rejection	PSR	$V_S = \pm 2.5\text{ V to } \pm 20\text{ V}$	108	128		dB
Input Voltage Range	IVR	(Note 2)	$\pm 13.5$	$\pm 14.0$		V
Output Voltage Swing	$V_O$	$R_L = 10\text{ k}\Omega$	$\pm 13$	$\pm 14$		V
Slew Rate	SR		0.05	0.15		V/ $\mu\text{s}$
Supply Current	$I_{SY}$	(Note 1)		400	800	$\mu\text{A}$
Supply Voltage	$V_S$	Operating Range	$\pm 2.5$	$\pm 15$	$\pm 20$	V

### NOTES

<sup>1</sup>These specifications apply for  $\pm 2.5\text{ V} \leq V_S \leq \pm 20\text{ V}$  and  $-13.5\text{ V} \leq V_{CM} \leq +13.5\text{ V}$  (for  $V_S = \pm 15\text{ V}$ ).

<sup>2</sup>Guaranteed by CMR test.

Specifications subject to change without notice.

**ABSOLUTE MAXIMUM RATINGS<sup>1</sup>**

Supply Voltage	±20 V
Input Voltage <sup>2</sup>	±20 V
Differential Input Voltage <sup>3</sup>	±1 V
Differential Input Current <sup>3</sup>	±10 mA
Output Short-Circuit Duration	Indefinite
Operating Temperature Range	
PM1012G (P, S)	-40°C to +85°C
Storage Temperature Range	-65°C to +150°C
Junction Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 60 sec)	+300°C

Package Type	$\theta_{JA}$ <sup>4</sup>	$\theta_{JC}$	Units
8-Lead Plastic DIP (P)	103	43	°C/W
8-Lead SO (S)	158	43	°C/W

NOTES

- <sup>1</sup>Absolute maximum ratings apply to both DICE and packaged parts, unless otherwise noted.
- <sup>2</sup>For supply voltages less than ±20 V, the absolute maximum input voltage is equal to the supply voltage.
- <sup>3</sup>The PM1012's inputs are protected by back-to-back diodes. Current-limiting resistors are not used in order to achieve low noise. Differential input voltages greater than 1 V will cause excessive current to flow through the input protection diodes unless limiting resistance is used.
- <sup>4</sup> $\theta_{JA}$  is specified for worst case mounting conditions, i.e.,  $\theta_{JA}$  is specified for device in socket for cerdip, and P-DIP packages;  $\theta_{JA}$  is specified for device soldered to printed circuit board for SO package.

**ORDERING GUIDE**

Model	Temperature Range	Package Description	Package Options
PM1012GP	-40°C to +85°C	Plastic DIP	N-8
PM1012GS	-40°C to +85°C	SOIC	SO-8

**CAUTION**

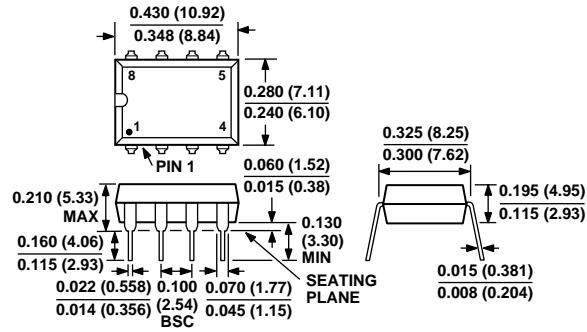
ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although the PM1012 features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.



**OUTLINE DIMENSIONS**

Dimensions shown in inches and (mm).

**8-Lead Plastic DIP  
(N-8)**



**8-Lead SOIC  
(SO-8)**

