PM-108A/PM-2108A

LOW-INPUT-CURRENT OPERATIONAL AMPLIFIERS

PM-108A/PM-208A/PM-308A/PM-108/PM-208/PM-308/PM-2108A/PM-2108

FEATURES

- **Low Offset Current** ..... **200pA Max**
- **Low Bias Current** ..... **2nA Max**
- **Low Power Consumption** ..... **18mW Max @ ±15V**
- **Wide Supply Range** ..... **±3V to ±20V**
- **High Power-Supply Rejection Ratio** ..... **96dB Min**
- **Low Offset Voltage Drift** ..... **5μV/°C Max**
- **High Common-Mode Input Range** ..... **±13.5V Min**
- **High Common-Mode Rejection Ratio** ..... **96dB Min**
- **MIL-STD-883 Processing Models Available**
- **Silicon-Nitride Passivation**

GENERAL DESCRIPTION

The PM-108A series of precision operational amplifiers feature very low input offset and bias currents. Although directly interchangeable with industry-standard types, Precision Monolithics' advanced processing provides the PM-108A series with a significant improvement in input noise voltage. Low supply current drain over a wide power-supply range makes the PM-108A attractive in battery operated and other low-power applications. The low bias current provides excellent performance with piezoelectric and capacitive transducers and in such high-impedance circuits as long-period integrators and sample-and-holds. For improved performance see OP-08, OP-12, OP-20, OP-21, and OP-22.

The PM-2108A contains two superbeta, PM-108A op amps in a single 16-pin DIP. Compared to the single PM-108A types, this model offers higher packaging density, closer thermal tracking between the two amplifiers, and reduced insertion cost.

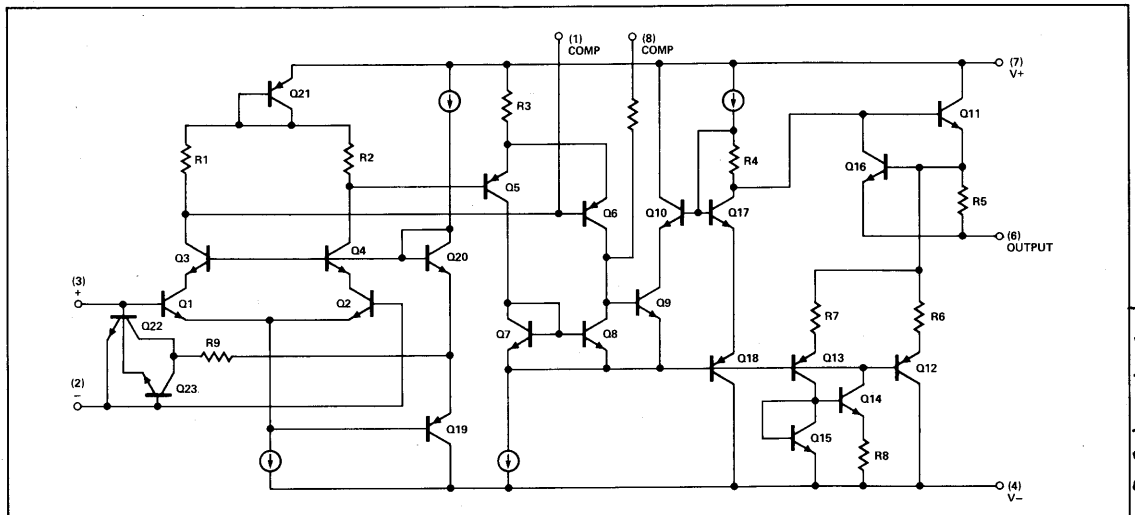
ORDERING INFORMATION†

$T_A = 25°C$ V_{OS} MAX (mV)	PACKAGE: HERMETIC: TO-99 8-PIN	HERMETIC: DIP 8-PIN	HERMETIC: DIP 16-PIN	HERMETIC: LCC	PLASTIC DIP 8-PIN	OPERATING TEMPERATURE RANGE
0.5	PM108AJ/883	PM108AZ*	PM2108AQ	PM108ARC/883	—	MIL
0.5	PM208AJ	PM208AZ	—	—	—	IND
0.5	PM308AJ	PM308AZ	—	—	PM308AP	COM
2.0	PM108J/883	PM108Z*	PM2108Q	—	—	MIL
2.0	PM208J	PM208Z	—	—	—	IND
7.5	PM308J	PM308Z	—	—	—	COM

* For devices processed in total compliance to MIL-STD-883, add /883 after part number. Consult factory for 883 data sheet.

† Burn-in is available on commercial and industrial temperature range parts in cerdip, plastic dip, and TO-can packages. For ordering information, see 1988 Data Book, Section 2.

SIMPLIFIED SCHEMATIC (Pin numbers for PM-108 only. Circuit is 1/2 2108)



ABSOLUTE MAXIMUM RATINGS

Supply Voltage
- PM-108A, PM-108, PM-208A, PM-208, PM-2108A, PM-2108, PM-108ARC ..... ±20V
- PM-308A, PM-308 ..... ±18V

Internal Power Dissipation (Note 1) 500mW
Differential Input Current (Note 2) ..... ±10mA
Input Voltage (Note 3) ..... ±15V
Output Short-Circuit Duration ..... Indefinite
Operating Temperature Range
- PM-108A, PM-108, PM-2108A, PM-2108, PM-108ARC ..... −55°C to +125°C
- PM-208A, PM-208 ..... −25°C to +85°C
- PM-308A, PM-308 ..... 0°C to +70°C

Storage Temperature Range
- (Q-, J-, Z- or ARC-Package) ..... −65°C to +150°C
- (P-Package) ..... −65°C to +125°C

Lead Temperature Range (Soldering, 60 sec) ..... 300°C

NOTES:
1. Maximum package power dissipation vs. ambient temperature.

PACKAGE TYPE	MAXIMUM AMBIENT TEMPERATURE FOR RATING	DERATE ABOVE MAXIMUM AMBIENT TEMPERATURE
TO-99 (J)	80°C	7.1mW/°C
Plastic 8-Pin DIP (P)	36°C	5.6mW/°C
Hermetic 8-Pin DIP (Z)	75°C	6.7mW/°C
Hermetic 16-Pin DIP (Q)	100°C	10.0mW/°C
LCC (RC)	80°C	7.8mW/°C

2. The inputs are shunted with back-to-back diodes for overvoltage protection. Therefore, if a differential input voltage in excess of 1V is applied between the inputs, excessive current will flow, unless some limiting resistance is provided.
3. For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.

ELECTRICAL CHARACTERISTICS at $\pm 5V \le V_S \le \pm 20V$ and $T_A = 25°C$, unless otherwise noted.

PARAMETER	SYMBOL	CONDITIONS	PM-108A/PM-2108A PM-208A MIN	TYP	MAX	PM-108/PM-2108 PM-208 MIN	TYP	MAX	UNITS
Input Offset Voltage	V_{OS}		—	0.3	0.5	—	0.7	2.0	mV
Input Offset Current	I_{OS}		—	0.05	0.2	—	0.05	0.2	nA
Input Bias Current	I_B		—	0.8	2.0	—	0.8	2.0	nA
Input Resistance	R_{IN}	(Note 1)	30	70	—	30	70	—	MΩ
Large-Signal Voltage Gain	A_{VO}	$V_S = \pm 15V$, $V_{OUT} = \pm 10V$, $R_L \ge 10k\Omega$	80	300	—	50	300	—	V/mV
Supply Current	I_{SY}	$I_{OUT} = 0$, $V_{OUT} = 0$, Each Amplifier	—	0.3	0.6	—	0.3	0.6	mA

ELECTRICAL CHARACTERISTICS at $\pm 5V \le V_S \le \pm 20V$, $-55°C \le T_A \le +125°C$ for PM-108A, PM-108, PM-2108A and PM-2108, $-25°C \le T_A \le +85°C$ for PM-208A, PM-208, unless otherwise noted.

PARAMETER	SYMBOL	CONDITIONS	PM-108A/PM-2108A PM-208A MIN	TYP	MAX	PM-108/PM-2108 PM-208 MIN	TYP	MAX	UNITS
Input Offset Voltage	V_{OS}		—	0.4	1.0	—	1.0	3.0	mV
Average Input Offset Voltage Drift	TCV_{OS}	(Note 2)	—	1	5	—	3	15	µV/°C
Input Offset Current	I_{OS}		—	0.1	0.4	—	0.1	0.4	nA
Average Input Offset Current Drift	TCI_{OS}	(Note 2)	—	0.5	2.5	—	0.5	2.5	pA/°C
Input Bias Current	I_B		—	1	3	—	1	3	nA
Large-Signal Voltage Gain	A_{VO}	$V_S = \pm 15V$, $V_{OUT} = \pm 10V$, $R_L \ge 10k\Omega$	40	200	—	25	200	—	V/mV
Output Voltage Swing	V_O	$V_S = \pm 15V$, $R_L = 10k\Omega$	±13	±14	—	±13	±14	—	V
Input Voltage Range	IVR	$V_S = \pm 15V$	±13.5	—	—	±13.5	—	—	V
Common-Mode Rejection Ratio	CMRR	$V_S = \pm 15V$, $V_{CM} = \pm 13.5V$	96	110	—	85	100	—	dB
Power-Supply Rejection Ratio	PSRR	$V_S = \pm 5V$ to $\pm 20V$	—	3	15	—	15	100	µV/V
Supply Current	I_{SY}	$V_{OUT} = 0$, T_A = MAX, Each Amplifier	—	0.15	0.4	—	0.15	0.4	mA

NOTES:
1. Guaranteed by input bias current.
2. Sample tested.

ELECTRICAL CHARACTERISTICS at $\pm5V \le V_S \le \pm15V$ and $T_A = 25°C$, unless otherwise noted.

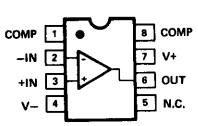
PARAMETER	SYMBOL	CONDITIONS	PM-308A MIN	PM-308A TYP	PM-308A MAX	PM-308 MIN	PM-308 TYP	PM-308 MAX	UNITS
Input Offset Voltage	V_{OS}		—	0.3	0.5	—	2.0	7.5	mV
Input Offset Current	I_{OS}		—	0.2	1.0	—	0.2	1.0	nA
Input Bias Current	I_B		—	1.5	7.0	—	1.5	7.0	nA
Input Resistance	R_{IN}	(Note 1)	10	40	—	10	40	—	MΩ
Large-Signal Voltage Gain	A_{VO}	$V_S = \pm15V$, $V_{OUT} = \pm10V$, $R_L \ge 10k\Omega$	80	300	—	25	300	—	V/mV
Supply Current	I_{SY}	$I_{OUT} = 0$, $V_{OUT} = 0$, Each Amplifier	—	0.3	0.8	—	0.3	0.8	mA

ELECTRICAL CHARACTERISTICS at $\pm5V \le V_S \le \pm15V$ and $0°C \le T_A \le +70°C$, unless otherwise noted.

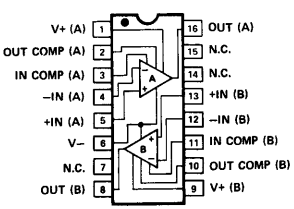
PARAMETER	SYMBOL	CONDITIONS	PM-308A MIN	PM-308A TYP	PM-308A MAX	PM-308 MIN	PM-308 TYP	PM-308 MAX	UNITS
Input Offset Voltage	V_{OS}		—	0.4	0.73	—	3.0	10.0	mV
Average Input Offset Voltage Drift	TCV_{OS}	(Note 1)	—	1	5	—	6	30	µV/°C
Input Offset Current	I_{OS}		—	0.3	1.5	—	0.3	1.5	nA
Average Input Offset Current Drift	TCI_{OS}	(Note 1)	—	2	10	—	2	10	pA/°C
Input Bias Current	I_B		—	2	10	—	2	10	nA
Large-Signal Voltage Gain	A_{VO}	$V_S = \pm15V$, $V_{OUT} = \pm10V$, $R_L \ge 10k\Omega$	60	200	—	15	100	—	V/mV
Output Voltage Swing	V_O	$V_S = \pm15V$, $R_L = 10k\Omega$	±13	±14	—	±13	±14	—	V
Input Voltage Range	IVR	$V_S = \pm15V$	±14	—	—	±13	—	—	V
Common-Mode Rejection Ratio	CMRR	$V_{CM} = \pm13.5V$	96	110	—	80	100	—	dB
Power-Supply Rejection Ratio	PSRR	$V_S = \pm5V$ to $\pm15V$	—	3	15	—	15	100	µV/V
Supply Current	I_{SY}	$V_{OUT} = 0$, $T_A = MAX$, Each Amplifier	—	0.23	—	—	0.23	—	mA

NOTE:
1. Guaranteed by input bias current.

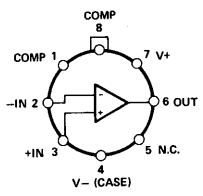
PIN CONNECTIONS



EPOXY MINI-DIP (P-Suffix) AND 8-PIN HERMETIC DIP (Z-Suffix)

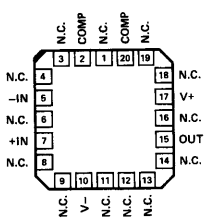


16-PIN HERMETIC DIP (Q-Suffix)



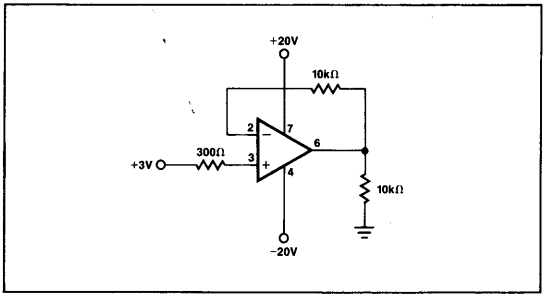
TO-99 (J-Suffix)

PM-108ARC/883



LCC PACKAGE (RC-Suffix)

BURN-IN CIRCUIT

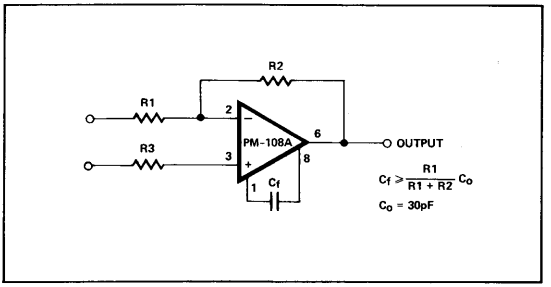


APPLICATIONS INFORMATION

The PM-108A series has very low input offset and bias currents; the user is cautioned that printed circuit board leakages can produce significant errors, especially at high board temperatures. Careful attention to board layout and cleaning procedure is required to achieve the PM-108A's rated performance. It is suggested that board leakage be minimized by encircling the input pins with a guard ring maintained at a potential close to that of the inputs. The guard ring should be driven by a low impedance source such as an amplifier's output or ground.

COMPENSATION CIRCUITS

STANDARD



ALTERNATE