



JM38510/13503

LOW-NOISE PRECISION OPERATIONAL AMPLIFIER

Precision Monolithics Inc.

T-79-06-10

FEATURES

- Low V_{OS} $25\mu V$
- Low V_{OS} Drift $0.6\mu V/^\circ C$
- High Speed $1.7V/\mu s$
- Low Noise $0.18\mu V_{p-p}$
- High Gain 1.0 Million
- Wide Supply Voltage Range $\pm 4.5V$ to $\pm 18V$

ORDERING INFORMATION

JAN SLASH SHEET	PMI DEVICE
JM38510/13503BGC	OP27AJ1/38510
JM38510/13503BGA	OP27AJ5/38510
JM38510/13503SGA	OP27SAJ5/38510
JM38510/13503BPB	OP27AZ2/38510
JM38510/13503BPA	OP27AZ5/38510
JM38510/13503SPA	OP27SAJ5/38510

GENERAL DESCRIPTION

This data sheet covers the electrical requirements for a monolithic, low offset voltage, internally-compensated operational amplifier as specified in MIL-M-38510/135 for device type 03. Devices supplied to this data sheet are manufactured and tested at PMI's MIL-M-38510 certified facility and are listed in QPL-38510.

Complete device requirements will be found in MIL-M-38510 and MIL-M-38510/135 for Class B and Class S processed devices.

GENERIC CROSS-REFERENCE INFORMATION

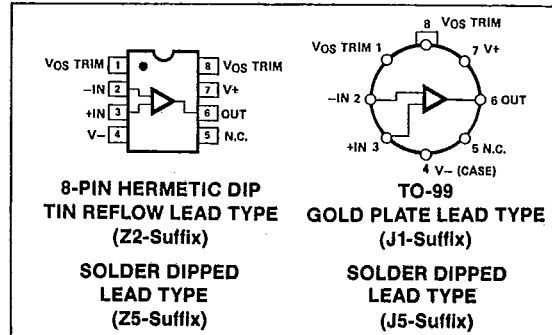
This cross-reference information is presented for the convenience of the user. The generic-industry types listed may not have identical operational performance characteristics across the military

temperature range or reliability factors equivalent to the MIL-M-38510 device.

MILITARY DEVICE TYPE	GENERIC-INDUSTRY TYPE
03	OP27A

For an 833-processed device with improved electrical specifications, review the OP-27 data sheet.

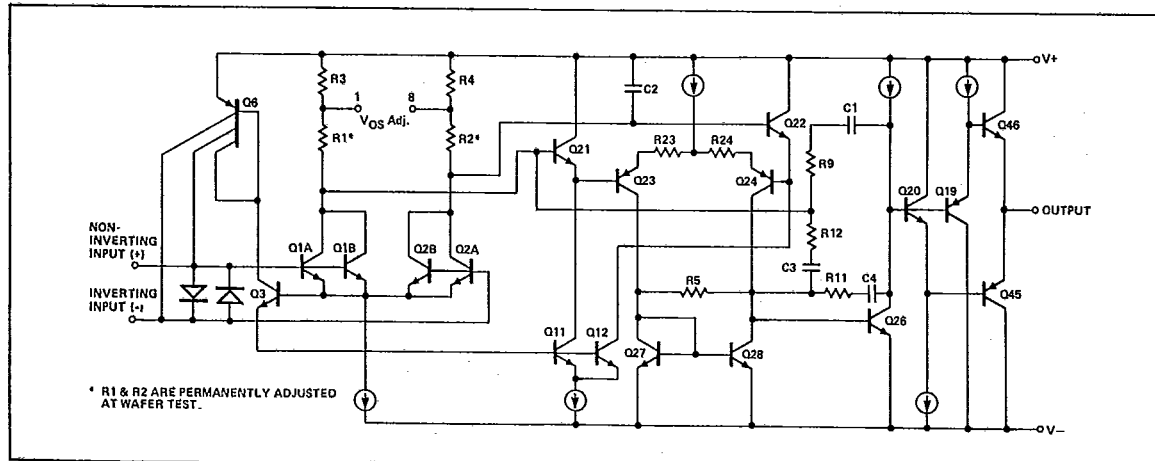
PIN CONNECTIONS



POWER AND THERMAL CHARACTERISTICS

Case Outline	Package	Maximum Allowable Power Dissipation	Maximum θ_{JC}	Maximum θ_{JA}
P	Dual-In-Line	208mW @ $T_A = 125^\circ C$	50°C/W	120°C/W
G	8-Lead CAN	167mW @ $T_A = 125^\circ C$	40°C/W	150°C/W

SIMPLIFIED SCHEMATIC



5-601

8/89, Rev. A3

OPERATIONAL AMPLIFIERS/BUFFERS

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ABSOLUTE MAXIMUM RATINGS

Supply Voltage (V_{CC}) $\pm 22V$
 Input Voltage Range (V_{IN}) $\pm V_{CC}$
 Differential Input Voltage Range $\pm 0.7V$
 Output Short-Circuit Duration (Note 1)
 Lead Temperature (Soldering, 60 sec) $+300^{\circ}C$
 Storage Temperature Range $-65^{\circ}C$ to $+150^{\circ}C$
 Junction Temperature (T_J) $+150^{\circ}C$
 Maximum Power Dissipation (P_D) (Note 2) 500mW

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range $\pm 4.5V$ to $\pm 18V$
 Ambient Temperature Range $-55^{\circ}C$ to $+125^{\circ}C$

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NOTES:

- Output may be shorted to ground indefinitely at $V_S = \pm 15V$, $T_A = 25^{\circ}C$. Temperature and/or supply voltages must be limited to ensure dissipation rating is not exceeded.
- Maximum power dissipation versus ambient temperature.

ELECTRICAL CHARACTERISTICS at $\pm 4.5V \leq V_{CC} \leq \pm 20V$ and $-55^{\circ}C \leq T_A \leq 125^{\circ}C$, $R_S = 50\Omega$ unnullled, unless otherwise noted.

PARAMETER	SYMBOL	CONDITIONS	03 LIMITS		UNITS
			MIN	MAX	
Input Offset Voltage	V_{IO}	$T_A = 25^{\circ}C$ (Notes 1, 2)	-25 -60	25 60	μV
Input Offset Voltage Temperature Sensitivity	$\Delta V_{IO}/\Delta T$	(Note 1)	-0.6	0.6	$\mu V/^{\circ}C$
Input Bias Current	$+I_{IB}$	$T_A = 25^{\circ}C$ (Note 1)	-40 -60	40 60	nA
	$-I_{IB}$	$T_A = 25^{\circ}C$ (Note 1)	-40 -60	40 60	
Input Offset Current	I_{IO}	$T_A = 25^{\circ}C$ (Note 1)	-35 -50	35 50	nA
	$+PSRR$	$+V_{CC} = 18V$ to $5V$, $-V_{CC} = -15V$ $T_A = 25^{\circ}C$	—	10	
Power Supply Rejection Ratio	$-PSRR$	$+V_{CC} = 15V$, $-V_{CC} = -18V$ to $-5V$ $T_A = 25^{\circ}C$	—	10	$\mu V/V$
	$+PSRR$	$+V_{CC} = 18V$ to $5V$, $-V_{CC} = -15V$	—	16	
	$-PSRR$	$+V_{CC} = 15V$, $-V_{CC} = -18V$ to $-5V$	—	16	
	$PSRR$	$V_{CC} = \pm 4.5V$ to $\pm 18V$ $T_A = 25^{\circ}C$	—	10	
		$V_{CC} = \pm 4.5V$ to $\pm 18V$	—	16	

NOTES:

- Tested at $V_{CM} = 0$, $V_{CC} = \pm 15V$.
- Due to the inherent warm-up drift, testing shall occur no sooner than three (3) minutes after application of power.

ELECTRICAL CHARACTERISTICS at $\pm 4.5V \leq V_{CC} \leq \pm 20V$ and $-55^{\circ}C \leq T_A \leq +125^{\circ}C$, $R_S = 50\Omega$ unnull'd, unless otherwise noted. *Continued*

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PARAMETER	SYMBOL	CONDITIONS	03 LIMITS		UNITS
			MIN	MAX	
Common-Mode Rejection Ratio	CMRR	$V_{CM} = \pm 11V$, $T_A = +25^{\circ}C$, $V_{CC} = \pm 15V$ $V_{CM} = \pm 10V$, $V_{CC} = \pm 15V$	114 108	—	dB
Adjustment for Input Offset	V_{IO} Adj (+) V_{IO} Adj (-)	$T_A = +25^{\circ}C$, (Note 1) $T_A = +25^{\circ}C$, (Note 1)	0.5 —	— -0.5	mV
Output Short-Circuit Current	$I_{OS}(+)$ $I_{OS}(-)$	$t \leq 25ms$, (Notes 1,3) $t \leq 25ms$, (Notes 1,3)	-70 —	— 70	mA
Supply Current	I_{CC}	$T_A = +25^{\circ}C$ (Note 1)	— —	5 6	mA
Output Voltage Swing (Minimum)	V_{OP}	$R_L = 600\Omega$, (Note 1) $R_L = 2k\Omega$, (Note 1)	-10 -11.5	10 11.5	V
Open Loop Voltage Gain (Single Ended)	A_{VS}	$T_A = +25^{\circ}C$ (Note 2)	1000 600	—	V/mV
Slew Rate	SR(+), SR(-)	$V_{IN} = 10V$, $T_A = +25^{\circ}C$, (Note 1)	1.7	—	V/ μs
Input Noise Voltage Density	e_n	$f_O = 10Hz$ $f_O = 100Hz$ $T_A = +25^{\circ}C$, (Note 1) $f_O = 1kHz$	— — —	5.5 4.0 3.8	nV/ $\sqrt{Hz}$
Low Frequency Input Noise Voltage	e_{np-p}	$f = 0.1Hz$ to $10Hz$ $T_A = +25^{\circ}C$, (Note 1)	—	0.18	μV_{p-p}
Input Noise Current Density	i_n	$f_O = 10Hz$ $f_O = 100Hz$ $T_A = +25^{\circ}C$, (Note 1) $f_O = 1kHz$	— — —	5.66 1.88 0.84	pA/ $\sqrt{Hz}$

- NOTES:**
1. Tested at $V_{CM} = 0$, $V_{CC} = \pm 15V$.
2. $V_{OUT} = 0$ to $+10$ for $A_{VS}(+)$ and $V_{OUT} = 0$ to $-10V$ for $A_{VS}(-)$. $R_L = 2,000\Omega$.
3. Continuous short-circuit limits are considerably less than the indicated test limits, since maximum power dissipation cannot be exceeded.

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OPERATIONAL AMPLIFIERS/BUFFERS