PMI

JM38510/13503

LOW-NOISE PRECISION OPERATIONAL AMPLIFIER

Precision Monolithics Inc.

T-79-06-10

FEATURES

- Low V_{OS} 25µV
- Low V_{OS} Drift .... 0.6µV/°C
- High Speed 1.7V/µs
- Low Noise .... $0.18\mu V_{p-p}$
- High Gain .... 1.0 Million
- Wide Supply Voltage Range .... ±4.5V to ± 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.

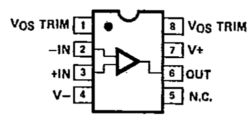
GENERIC CROSS-REFERENCE INFORMATION

This cross-reference information is presented for the convience 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

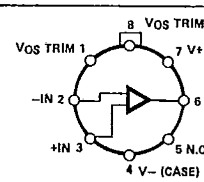
For an 833-processed device with improved electrical specifications, review the OP-27 data sheet.

PIN CONNECTIONS



8-PIN HERMETIC DIP
TIN REFLOW LEAD TYPE
(Z2-Suffix)

SOLDER DIPPED
LEAD TYPE
(Z5-Suffix)



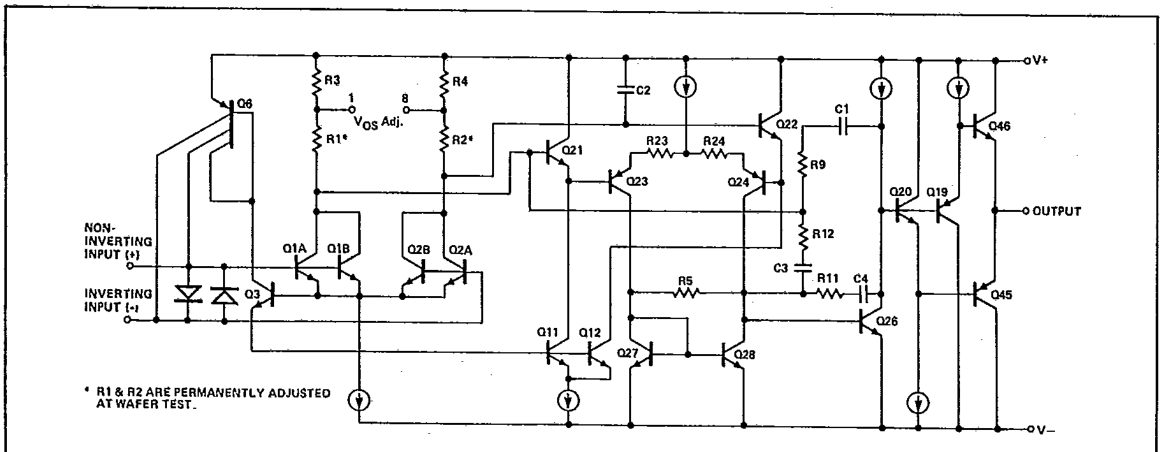
TO-99
GOLD PLATE LEAD TYPE
(J1-Suffix)

SOLDER DIPPED
LEAD TYPE
(J5-Suffix)

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°C	50°C/W	120°C/W
G	8-Lead CAN	167mW @ T_A = 125°C	40°C/W	150°C/W

SIMPLIFIED SCHEMATIC



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ABSOLUTE MAXIMUM RATINGS

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

NOTES:
1. Output may be shorted to ground indefinitely at V_S = ±15V, T_A = 25°C. Temperature and/or supply voltages must be limited to ensure dissipation rating is not exceeded.
2. Maximum power dissipation versus ambient temperature.

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range ....±4.5V to ±18V
Ambient Temperature Range .... −55°C to +125°C

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

PARAMETER	SYMBOL	CONDITIONS	03 LIMITS MIN	03 LIMITS MAX	UNITS
Input Offset Voltage	V_{IO}	T_A = 25°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	µV/°C
Input Bias Current	$+I_{IB}$	T_A = 25°C (Note 1)	−40 −60	40 60	nA
	$-I_{IB}$	T_A = 25°C (Note 1)	−40 −60	40 60	
Input Offset Current	I_{IO}	T_A = 25°C (Note 1)	−35 −50	35 50	nA
Power Supply Rejection Ratio	+PSRR	$+V_{CC}$ = 18V to 5V, $-V_{CC}$ = −15V T_A = 25°C	—	10	µV/V
	−PSRR	$+V_{CC}$ = 15V, $-V_{CC}$ = −18V to −5V T_A = 25°C	—	10	
	+PSRR	$+V_{CC}$ = 18V to 5V, $-V_{CC}$ = −15V	—	16	
	−PSRR	$+V_{CC}$ = 15V, $-V_{CC}$ = −18V to −5V	—	16	
	PSRR	V_{CC} = ±4.5V to ±18V T_A = 25°C	—	10	
		V_{CC} = ±4.5V to ±18V	—	16	

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

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ELECTRICAL CHARACTERISTICS at $\pm4.5V \le V_{CC} \le \pm20V$ and $-55°C \le T_A \le +125°C$, $R_S = 50\Omega$ unnulled, unless otherwise noted. *Continued*

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PARAMETER	SYMBOL	CONDITIONS	03 LIMITS MIN	MAX	UNITS
Common-Mode Rejection Ratio	CMRR	$V_{CM} = \pm11V$, $T_A = +25°C$, $V_{CC} = \pm15V$	114	—	dB
		$V_{CM} = \pm10V$, $V_{CC} = \pm15V$	108	—	
Adjustment for Input Offset	V_{IO} Adj (+)	$T_A = +25°C$, (Note 1)	0.5	—	mV
	V_{IO} Adj (−)	$T_A = +25°C$, (Note 1)	—	−0.5	
Output Short-Circuit Current	$I_{OS(+)}$	$t \le 25ms$, (Notes 1,3)	−70	—	mA
	$I_{OS(-)}$	$t \le 25ms$, (Notes 1,3)	—	70	
Supply Current	I_{CC}	$T_A = +25°C$ (Note 1)	—	5	mA
			—	6	
Output Voltage Swing (Minimum)	V_{OP}	$R_L = 600\Omega$, (Note 1)	−10	10	V
		$R_L = 2k\Omega$, (Note 1)	−11.5	11.5	
Open Loop Voltage Gain (Single Ended)	A_{VS}	$T_A = +25°C$ (Note 2)	1000	—	V/mV
			600	—	
Slew Rate	SR(+), SR(−)	$V_{IN} = 10V$, $T_A = +25°C$, (Note 1)	1.7	—	V/µs
Input Noise Voltage Density	e_n	$f_O = 10Hz$	—	5.5	$nV/\sqrt{Hz}$
		$f_O = 100Hz$ TA = +25°C, (Note1)	—	4.0	
		$f_O = 1kHz$	—	3.8	
Low Frequency Input Noise Voltage	$e_{np\text{-}p}$	f = 0.1Hz to 10Hz, $T_A = +25°C$, (Note 1)	—	0.18	$\mu V_{p\text{-}p}$
Input Noise Current Density	i_n	$f_O = 10Hz$	—	5.66	$pA/\sqrt{Hz}$
		$f_O = 100Hz$ TA = +25°C, (Note1)	—	1.88	
		$f_O = 1kHz$	—	0.84	

NOTES:

1. Tested at $V_{CM} = 0$, $V_{CC} = \pm15V$.
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

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