ANALOG DEVICES

Low-Noise Precision Operational Amplifier

OP-27

1.0 SCOPE

This specification covers the detail requirements for a low-noise precision high speed operational amplifier.

It is highly recommended that this data sheet be used as a baseline for new military or aerospace spec control drawings.

1.2 Part Number. The complete part numbers per Table I of this specification follow:

Device	Part Number	Package
A	OP-27AJ/883	J
B	OP-27BJ/883	J
A	OP-27AZ/883	Z
B	OP-27BZ/883	Z
B	OP-27BRC/883	RC

1.2.3 Case Outline.

Letter	Case Outline (Lead finish per MIL-M-38510)
J	8-lead metal can (TO-99)
Z	8-lead ceramic dual-in-line package (CERDIP)
RC	20-contact hermetic leadless chip carrier (LCC)

1.3 Absolute Maximum Ratings. (T_A = 25°C, unless otherwise noted)

Supply Voltage ..... ±22V
Internal Power Dissipation 500mW
Input Voltage (Note 1) ..... ±22V
Output Short-Circuit Duration ..... Indefinite
Differential Input Voltage (Note 2) ..... ±0.7V
Differential Input Current (Note 2) ..... ±25mA
Storage Temperature Range ..... -65°C to +150°C
Operating Temperature Range ..... -55°C to +125°C
Lead Temperature (Soldering, 60 sec) ..... +300°C
DICE Junction Temperature Range (T_J) ..... -65°C to +150°C

NOTES:
1. For supply voltages less than ±22V, the absolute maximum input voltage is equal to the supply voltages.
2. The OP-27 inputs are protected by back-to-back diodes. Current limiting resistors are not used in order to achieve low noise. If differential input voltage exceeds ±0.7V, the input current should be limited to 25mA.

1.5 **Thermal Characteristics:**

Thermal Resistance, TO-99 (J) package:
Junction-to-Case (Θ_{JC}) = 45°C/W MAX
Junction-to-Ambient (Θ_{JA}) = 150°C/W MAX

Thermal Resistance, CERDIP (Z) package:
Junction-to-Case (Θ_{JC}) = 26°C/W MAX
Junction-to Ambient (Θ_{JA}) = 119°C/W MAX

Thermal Resistance, LCC (RC) package:
Junction-to-Case (Θ_{JC}) = 35°C/W MAX
Junction-to-Ambient (Θ_{JA}) = 110°C/W MAX

TABLE 1

V_S = ±15V; R_S = 50Ω; T_A = 25°C unless otherwise specified.

Characteristics	Symbol	Special Conditions	OP-27/883 LIMITS A Min	LIMITS A Max	LIMITS B Min	LIMITS B Max	Units
Input Offset Voltage	V_{OS}		–	25	–	60	µV
		-55°C ≤ T_A ≤ +125°C	–	60	–	200	µV
Average Input Offset Voltage	TCV_{OS}	Unnulled					
		-55°C ≤ T_A ≤ +125°C	–	0.6	–	1.3	µV/°C
Input Offset Current	I_{OS}		–	35	–	50	nA
		-55°C ≤ T_A ≤ +125°C	–	50	–	85	nA
Average Input Bias Current	I_B		–	±40	–	±55	nA
		-55°C ≤ T_A ≤ +125°C	–	±60	–	±95	nA
Input Voltage Range (Note 1)	IVR		±11	–	±11	–	V
		-55°C ≤ T_A ≤ +125°C	±10.3	–	±10.3	–	V
Common-Mode Rejection	CMR	V_{CM} = IVR = ±11V	114	–	106	–	dB
		V_{CM} = IVR = ±10.3V	108	–	100	–	dB
		-55°C ≤ T_A ≤ +125°C					
Power Supply Rejection Ratio	PSRR	V_S = ±4V to ±18V	–	10	–	10	µV/V
		V_S = ±4.5V to ±18V	–	16	–	20	µV/V
		-55°C ≤ T_A ≤ +125°C					
Large-Signal Voltage Gain	A_{VO}	V_O = ±10V, R_L ≥ 2kΩ	1000	–	1000	–	V/mV
		V_O = ±10V, R_L ≥ 600Ω	800	–	800	–	V/mV
		V_O = ±10V, R_L ≥ 2kΩ	600	–	500	–	V/mV
		-55°C ≤ T_A ≤ +125°C					
Output Voltage Swing	V_O	R_L ≥ 2kΩ	±12	–	±12	–	V
		R_L ≥ 600Ω	±10	–	±10	–	V
		R_L ≥ 2kΩ	±11.5	–	±11.0	–	V
		-55°C ≤ T_A ≤ +125°C					

TABLE 1 (Continued)

V_S = ±15V; R_S = 50Ω; T_A = +25°C unless otherwise specified.

Characteristics	Symbol	Special Conditions	OP-27/883 LIMITS A Min	LIMITS A Max	LIMITS B Min	LIMITS B Max	Units
Supply Current	I_{SY}	No Load	--	4.67	--	4.67	mA
Power Dissipation	P_d	No Load	--	140	--	140	mW
Offset Adjustment Range	$V_{OS}adj$	R_p = 10kΩ	±0.5	--	±0.5	--	mV
Output Short-Circuit Current	I_{SC}^+		--	70	--	70	mA
	I_{SC}^-		-70	--	-70	--	mA
Input Noise Voltage (Note 2)	e_n	f_O = 1Hz to 100Hz	--	50	--	50	nV_{RMS}
Input Noise Current (Note 2)	i_n	f_O = 1Hz to 100Hz	--	40	--	40	pA_{RMS}
Slew Rate	SR	V_O = ±5V, $R_L \geq$ 2kΩ C_L = 100pF	1.7	--	1.7	--	V/μs
Gain Bandwith Product	GBW		5.0	--	5.0	--	MHz

NOTES:
1. IVR is defined as the V_{CM} range used for the CMR test.
2. This parameter is 100% tested.

TABLE 2

OP-27/883

Electrical Test Requirements
For Class B Devices

MIL-STD-883 Test Requirements	Subgroups (see Table 3)
Interim Electrical Parameters (pre Burn-In)	1
Final Electrical Test Parameters	1*, 2, 3, 4, 5, 6
Group A Test Requirements	1, 2, 3, 4, 5, 6, 7, 8

* PDA applies to Subgroup 1 only.
No other Subgroups are included in PDA.
V_{OS} is excluded from PDA calculation.

TABLE 3

Group A Inspection

V_S = ±15V; R_S = 50Ω; T_A = T_J unless otherwise specified.

			OP-27/883				
			LIMITS A		LIMITS B		
Subgroup	Symbol	Special Conditions	Min	Max	Min	Max	Units
Subgroup 1	I_{OS}		–	35	–	50	nA
T_A = +25°C	I_B		–	±40	–	±55	nA
	CMR	V_{CM} = ±11V	114	–	106	–	dB
	PSRR	V_S = ±4V, ±18V	–	10	–	10	µV/V
	A_{VO}	R_L = 2kΩ, V_O = ±10V	1000	–	1000	–	V/mV
	V_O	R_L = 2kΩ	±12.0	–	±12.0	–	V
		R_L = 600Ω	±10.0	–	±10.0	–	V
	P_d	No Load	–	140	–	140	mW
	V_{OS}adj	R_p = 10kΩ	±0.5	–	±0.5	–	mV
	I_{SY}	No Load	–	4.67	–	4.67	mA
	I_{SC}^+		–	70	–	70	mA
	I_{SC}^-		-70	–	-70	–	mA
Subgroup 2	I_{OS}		–	50	–	85	nA
T_A = +125°C	I_B		–	±60	–	±95	nA
	CMR	V_{CM} = ±10.3V	108	–	100	–	dB
	PSRR	V_S = ±4.5V, ±18V	–	16	–	20	µV/V
	A_{VO}	R_L = 2kΩ, V_O = ±10V	600	–	500	–	V/mV
	V_O	R_L = 2kΩ	±11.5	–	±11.0	–	V

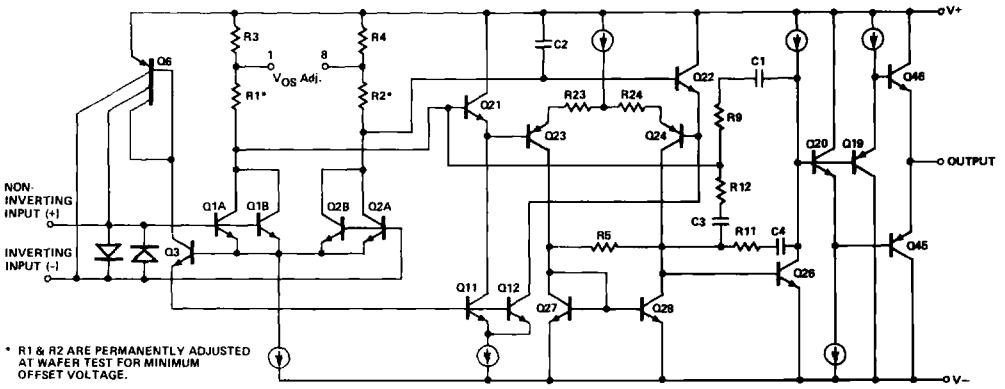
TABLE 3

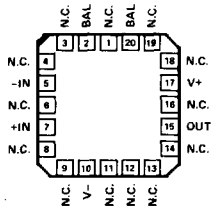
Group A Inspection (Continued)

V_S = ±15V; R_S = 50Ω; T_A = T_J unless otherwise specified.

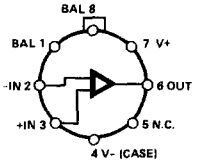
			OP-27/883				
			LIMITS A		LIMITS B		
Subgroup	Symbol	Special Conditions	Min	Max	Min	Max	Units
Subgroup 3 T_A = -55°C		All Tests, Limits, and Conditions are the same as for Subgroup 2.					
Subgroup 4 T_A = +25°C	V_{OS}		–	25	–	60	µV
Subgroup 5 T_A = +125°C	V_{OS}		–	60	–	200	µV
Subgroup 6 T_A = -55°C	V_{OS}		–	60	–	200	µV
Subgroup 7 T_A = +25°C	SR	C_L = 100pF R_L = 2kΩ, V_O = ±5V	1.7	–	1.7	–	V/µs
Subgroup 8 -55°C ≤ T_A ≤ +125°C	TCV_{OS}		–	0.6	–	1.3	µV/°C

3.2.1 Simplified Schematic and Pin Connections.

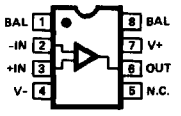




OP-27BRC/883
LCC PACKAGE
(RC-Suffix)



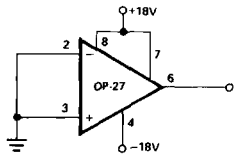
TO-99
(J-Suffix)



8-PIN HERMETIC DIP
(Z-Suffix)

3.2.4 Microcircuit Group Assignment. This microcircuit is covered by microcircuit group 49.

4.2 Life Test/Burn-In Circuit.



J AND Z PACKAGES