ANALOG DEVICES

High-Speed, Precision Operational Amplifier ($A_{VCL} \geq 3$)

OP-44

1.0 SCOPE

This specification covers the detail requirements for a high-speed, precision JFET-input 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-44AJ/883	J
A	OP-44AZ/883	Z
A	OP-44ARC/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 ..... ±20V
Power Dissipation 500mW
Input Voltage (Note 1) ..... ±20V
Differential Input Voltage (Note 1) ..... ±40V
Output Short-Circuit Duration ..... Indefinite
Storage Temperature Range ..... -65°C to +150°C
Lead Temperature (Soldering, 60 sec) ..... +300°C
Operating Temperature Range ..... -55°C to +125°C

NOTES:
1. For supply voltages less than ±20V, the absolute maximum input voltage is equal to the supply voltages.

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}) = 30°C/W MAX
Junction-to-Ambient (Θ_{JA}) = 120°C/W MAX

TABLE 1

V_S = ±15V; R_S = 50Ω; V_{CM} = 0V; $T_A = T_J$ = +25°C unless otherwise specified.

Characteristics	Symbol	Special Conditions	OP-44/883 LIMITS A Min	Max	Units
Input Offset Voltage	V_{OS}		–	1.0	mV
		-55°C ≤ T_A ≤ +125°C	–	2.0	mV
Input Offset Voltage Temperature Coefficient	TCV_{OS}	-55°C ≤ T_A ≤ +125°C	–	10	µV/°C
Input Offset Current	I_{OS}		–	40	pA
		$T_A = T_J$ = +125°C	–	1	nA
Input Bias Current	I_B		–	±200	pA
		$T_A = T_J$ = +125°C	–	±20	nA
Common-Mode Rejection (Note 1)	CMR	V_{CM} = IVR = ±11V	86	–	dB
		V_{CM} = IVR = ±11V -55°C ≤ T_A ≤ +125°C	84	–	dB
Power Supply Rejection Ratio	PSRR	V_S = ±10V to ±20V	–	40	µV/V
		V_S = ±10V to ±20V -55°C ≤ T_A ≤ +125°C	–	50	µV/V
Output Voltage Swing	V_O	R_L = 1kΩ	±11.5	–	V
		R_L = 2kΩ -55°C ≤ T_A ≤ +125°C	±11.0	–	V
Supply Current	I_{SY}	V_O = 0V, No Load	–	7.5	mA
		V_O = 0V, No Load -55°C ≤ T_A ≤ +125°C	–	7.5	mA
Short-Circuit Current Limit	I_{SC}	Output Shorted to Ground	±20	±60	mA
		Output Shorted to Ground -55°C ≤ T_A ≤ +125°C	±8	±60	mA

TABLE 1 (Continued)

V_S = ±15V; R_S = 50Ω; V_{CM} = 0V; T_A = T_J = +25°C unless otherwise specified.

Characteristics	Symbol	Special Conditions	OP-44/883 LIMITS A Min	Max	Units
Slew Rate	SR	A_{VCL} = +3, R_L = 2kΩ	100	–	V/μs
		A_{VCL} = +3, R_L = 2kΩ -55°C ≤ T_A ≤ +125°C	80	–	V/μs
External V_{OS} Trim Range	V_{OS}adj	R_{POT} = 10kΩ	±2.5	±10	mV
Large-Signal Voltage Gain	A_{VO}	V_O = ±10V, T_A = +25°C			
		R_L = 10kΩ	500	–	V/mV
		R_L = 2kΩ	200	–	V/mV
		R_L = 1kΩ	100	–	V/mV
		V_O = ±10V -55°C ≤ T_A ≤ +125°C			
		R_L = 10kΩ	160	–	V/mV
		R_L = 2kΩ	80	–	V/mV
Rise Time (Note 2)	t_r		–	50	ns
Overshoot (Note 2)	OS		–	40	%

NOTES:
1. IVR is defined as the V_{CM} range used for the CMR test.
2. See test conditions and test circuit, Figure 1A and 1B.

TABLE 2

OP-44/883

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, 7, 8
Group A Test Requirements	1, 2, 3, 4, 5, 6, 7, 8, 9

* PDA applies to Subgroup 1 only.
No other Subgroups are included in PDA.

TABLE 3

Group A Inspection

V_S = ±15V; R_S = 50Ω; V_{CM} = 0V; T_A = T_J unless otherwise specified.

			OP-44/883 LIMITS A		
Subgroup	**Symbol**	**Special Conditions**	**Min**	**Max**	**Units**
Subgroup 1	V_{OS}		–	1.0	mV
T_A = +25°C	I_B		–	±200	pA
	I_{OS}		–	40	pA
	CMR	V_{CM} = ±11V	86	–	dB
	PSRR	V_S = ±10V, ±20V	–	40	µV/V
	I_{SC}	Output Shorted to Ground	±20	±60	mA
	I_{SY}	V_O = 0V, No Load	–	7.5	mA
	V_{OS}adj	R_{POT} = 10kΩ	±2.5	±10	mV
Subgroup 2	V_{OS}		–	2.0	mV
T_A = +125°C	TCV_{OS}		–	10	µV/°C
	I_B		–	±20	nA
	I_{OS}		–	1	nA
	CMR	V_{CM} = ±11V	84	–	dB
	PSRR	V_S = ±10V, ±20V	–	50	µV/V
	I_{SC}	Output Shorted to Ground	±8	±60	mA
	I_{SY}	V_O = 0V, No Load	–	7.5	mA
Subgroup 3 **qT_A = -55°C**		All Tests, Limits and Conditions are the same as for Subgroup 2 with the exclusion of I_B and I_{OS} which are not tested at this temperature.			

TABLE 3

Group A Inspection (Continued)

V_S = ±15V; R_S = 50Ω; V_{CM} = 0V; T_A = T_J unless otherwise specified.

			OP-44/883 LIMITS A		
Subgroup	**Symbol**	**Special Conditions**	**Min**	**Max**	**Units**
Subgroup 4	V_O	R_L = 1kΩ	±11.5	–	V
T_A = +25°C	A_{VO}	V_O = ±10V, R_L = 10kΩ	500	–	V/mV
		V_O = ±10V, R_L = 2kΩ	200	–	V/mV
		V_O = ±10V, R_L = 1kΩ	100	–	V/mV
Subgroup 5	V_O	R_L = 2kΩ	±11.0	–	V
T_A = +125°C	A_{VO}	V_O = ±10V, R_L = 10kΩ	160	–	V/mV
		V_O = ±10V, R_L = 2kΩ	80	–	V/mV
Subgroup 6 T_A = -55°C		All Tests, Limits and Conditions are the same as for Subgroup 5.			
Subgroup 7 T_A = +25°C	SR	A_{VCL} = +3, R_L = 2kΩ	100	–	V/μs
Subgroup 8 T_A = -55, +125°C	SR	A_{VCL} = +3, R_L = 2kΩ	80	–	V/μs
Subgroup 9 T_A = +25°C	t_r	See t_r, OS test circuit, Figure 1A, 1B.	–	50	μs
	OS	See t_r, OS test circuit, Figure 1A, 1B.	–	40	%

Rise Time and Overshoot Test Circuit

Figure 1A

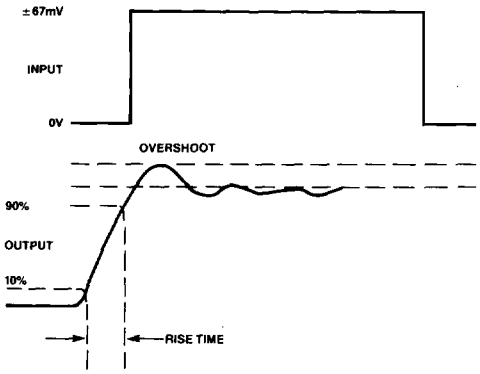
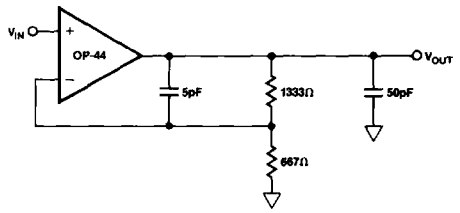
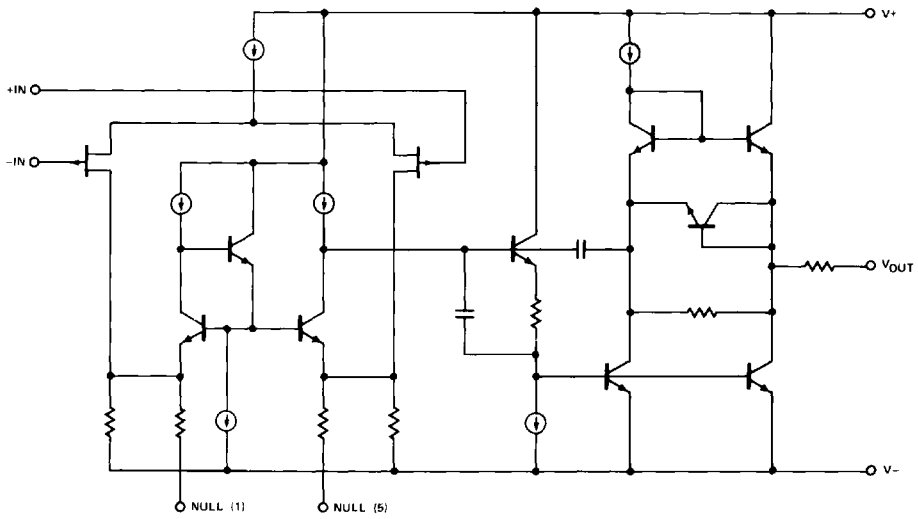
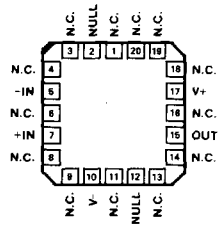


Figure 1B

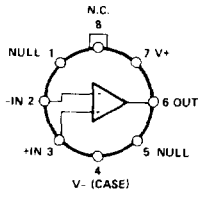


3.2.1 Simplified Schematic and Pin Connections.

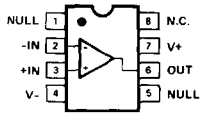




20-CONTACT HERMETIC LCC
(RC-Suffix)



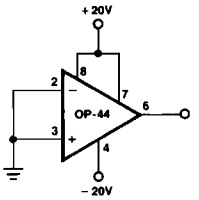
TO-99
(J-Suffix)



8-PIN HERMETIC DIP
(Z-Suffix)

3.2.4 **Microcircuit Group Assignment.** This microcircuit is covered by microcircuit group 61.

4.2 **Life Test/Burn-In Circuit.**



J AND Z PACKAGES