ANALOG DEVICES

Quad Matched 741-Type Operational Amplifier

OP-11

1.0 SCOPE

This specification covers the detail requirements for a quad 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-11AY/883	Y
B	OP-11BY/883	Y
C	OP-11CY/883	Y
A	OP-11ARC/883	RC

1.2.3 Case Outline.

Letter	Case Outline (Lead finish per MIL-M-38510)
Y	14-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
Power Dissipation 800mW
Differential Input Voltage ..... ±30V
Input Voltage ..... Supply Voltage
Output Short-Circuit Duration ..... Continuous
Operating Temperature Range ..... -55°C to +125°C
Storage Temperature Range ..... -65°C to +150°C
Lead Temperature (Soldering, 60 sec) ..... +300°C

1.5 Thermal Characteristics:

Thermal Resistance, CERDIP (Y) package:
Junction-to-Case (Θ_{JC}) = 29°C/W MAX
Junction-to-Ambient (Θ_{JA}) = 91°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; V_{CM} = 0V; T_A = 25°C unless otherwise specified.

Characteristics	Symbol	Special Conditions	OP-11/883 LIMITS A Min	LIMITS A Max	LIMITS B Min	LIMITS B Max	Units
Input Offset Voltage	V_{OS}	$R_S \le 10k\Omega$	–	0.5	–	2.5	mV
		$R_S \le 10k\Omega$, -55°C ≤ T_A ≤ +125°C	–	1.0	–	3.5	mV
Input Offset Current	I_{OS}		–	20	–	50	nA
		-55°C ≤ T_A ≤ +125°C	–	40	–	80	nA
Input Bias Current	I_B		–	±300	–	±500	nA
		-55°C ≤ T_A ≤ +125°C	–	±375	–	±650	nA
Input Voltage Range (Note 1)	IVR	-55°C ≤ T_A ≤ +125°C	±12	–	±12	–	V
Common-Mode Rejection	CMR	V_{CM} = IVR = ±12V, $R_S \le 10k\Omega$, -55°C ≤ T_A ≤ +125°C	100	–	100	–	dB
Power Supply Rejection Ratio	PSRR	V_S = ±5V to ±15V, $R_S \le 10k\Omega$, -55°C ≤ T_A ≤ +125°C	–	32	–	32	µV/V
Output Voltage Swing	V_O	$R_L \ge 2k\Omega$, -55°C ≤ T_A ≤ +125°C	±11	–	±11	–	V
Large-Signal Voltage Gain	A_{VO}	V_O = ±10V, $R_L \ge 2k\Omega$	100	–	100	–	V/mV
		V_O = ±10V, $R_L \ge 2k\Omega$, -55°C ≤ T_A ≤ +125°C	50	–	50	–	V/mV
Power Consumption (All 4 Amplifiers)	P_d	V_O = 0V	–	180	–	180	mW
		V_O = 0V, -55°C ≤ T_A ≤ +125°C	–	200	–	200	mW

TABLE 1 (Continued)

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

Characteristics	Symbol	Special Conditions	OP-11/883 LIMITS A Min	LIMITS A Max	LIMITS B Min	LIMITS B Max	Units
Supply Current (All 4 Amplifiers)	I_{SY}	V_O = 0V	–	6	–	6	mA
		V_O = 0V, -55°C ≤ T_A ≤ +125°C	–	6.66	–	6.66	mA
Input Offset Voltage Match	ΔV_{OS}		–	0.75	–	2.0	mV
		-55°C ≤ T_A ≤ +125°C	–	1.0	–	2.5	mV
Common-Mode Rejection Match	ΔCMR	V_{CM} = IVR = ±12V, -55°C ≤ T_A ≤ +125°C	94	–	94	-	dB
Risetime	t_r	A_{VCL} = +1, V_{IN} = 50mV	–	145	–	145	ns
Overshoot	OS		–	25	–	25	%
Closed-Loop Bandwidth (Note 2)	BW	A_{VCL} = +1	2.4	–	2.4	–	MHz
Channel Separation	CS		100	–	100	–	dB
Input Resistance Differential Mode (Note 3)	R_{IN}		173	–	100	–	kΩ
Large-Signal Bandwidth (Note 4)	LSBW	V_O = $20V_{p-p}$	11	–	11	–	kHz
Slew Rate	SR	A_{VCL} = +1	0.7	–	0.7	–	V/μs

NOTES:
1. IVR is defined as the V_{CM} range used for the CMR test.
2. Bandwidth (BW) is derived from t_r by the relationship $BW = \frac{0.35}{t_r}$
3. R_{IN} is derived from I_B by the relationship $R_{IN} = \frac{2kT}{qI_B}$, where $\frac{kT}{q} = 0.026V$ @ +25°C
4. LSBW is derived from SR by the relationship $LSBW = \frac{SR}{2\Pi V_{peak}}$

TABLE 1 (Continued)

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

Characteristics	Symbol	Special Conditions	OP-11/883 LIMITS C Min	Max	Units
Input Offset Voltage	V_{OS}	$R_S \leq 10k\Omega$	–	5	mV
		$R_S \leq 10k\Omega$ $-55°C \leq T_A \leq +125°C$	–	6	mV
Input Offset Current	I_{OS}		–	200	nA
		$-55°C \leq T_A \leq +125°C$	–	300	nA
Input Bias Current	I_B		–	±500	nA
		$-55°C \leq T_A \leq +125°C$	–	±800	nA
Input Voltage Range (Note 1)	IVR	$-55°C \leq T_A \leq +125°C$	±12	–	V
Common-Mode Rejection	CMR	V_{CM} = IVR = ±12V $R_S \leq 10k\Omega$ $-55°C \leq T_A \leq +125°C$	70	–	dB
Power Supply Rejection Ratio	PSRR	V_S = ±5V to ±15V $R_S \leq 10k\Omega$ $-55°C \leq T_A \leq +125°C$	–	100	μV/V
Output Voltage Swing	V_O	$R_L \geq 2k\Omega$ $-55°C \leq T_A \leq +125°C$	±11	–	V
Large-Signal Voltage Gain	A_{VO}	V_O = ±10V, $R_L \geq 2k\Omega$	50	–	V/mV
		V_O = ±10V, $R_L \geq 2k\Omega$ $-55°C \leq T_A \leq +125°C$	25	–	V/mV
Power Consumption (All 4 Amplifiers)	P_d	V_O = 0V	–	340	mW
		V_O = 0V $-55°C \leq T_A \leq +125°C$	–	400	mW

TABLE 1 (Continued)

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

Characteristics	Symbol	Special Conditions	OP-11/883 LIMITS C Min	Max	Units
Supply Current (All 4 Amplifiers)	I_{SY}	V_O = 0V	–	11.33	mA
		V_O = 0V, -55°C ≤ T_A ≤ +125°C	–	13.33	mA
Risetime	t_r	A_{VCL} = +1, V_{IN} = 50mV	–	145	ns
Overshoot	OS		–	25	%
Closed-Loop Bandwidth (Note 2)	BW	A_{VCL} = +1	2.4	–	MHz
Input Resistance Differential Mode (Note 3)	R_{IN}		100	–	kΩ
Large-Signal Bandwidth (Note 4)	LSBW	V_O = 20V_{p-p}	11	–	kHz
Slew Rate	SR	A_{VCL} = +1	0.7	–	V/μs

NOTES:
1. IVR is defined as the V_{CM} range used for the CMR test.
2. Bandwidth (BW) is derived from t_r by the relationship $BW = \frac{0.35}{t_r}$
3. R_{IN} is derived from I_B by the relationship $R_{IN} = \frac{2kT}{qI_B}$, where $\frac{kT}{q} = 0.026V$ @ +25°C
4. LSBW is derived from SR by the relationship $LSBW = \frac{SR}{2\Pi V_{peak}}$

TABLE 2

OP-11/883

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, 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-11/883				
			LIMITS A		LIMITS B		
Subgroup	**Symbol**	**Special Conditions**	**Min**	**Max**	**Min**	**Max**	**Units**
Subgroup 1	V_{OS}	R_S = 50Ω, 10kΩ	–	0.5	–	2.5	mV
T_A = +25°C	I_{OS}		–	20	–	50	nA
	I_B		–	±300	–	±500	nA
	CMR	V_{CM} = ±12V; R_S = 50Ω, 10kΩ	100	–	100	–	dB
	PSRR	V_S = ±5V, ±15V R_S = 50Ω, 10kΩ	–	32	–	32	μV/V
	P_d	V_O = 0V	–	180	–	180	mW
	ΔV_{OS}		–	0.75	–	2.0	mV
	ΔCMR	V_{CM} = ±12V	94	–	94	–	dB
Subgroup 2	V_{OS}	R_S = 50Ω, 10kΩ	–	1	–	3.5	mV
T_A = +125°C	I_{OS}		–	40	–	80	nA
	I_B		–	±375	–	±650	nA
	CMR	V_{CM} = ±12V; R_S = 50Ω, 10kΩ	100	–	100	–	dB
	PSRR	V_S = ±5V, ±15V R_S = 50Ω, 10kΩ	–	32	–	32	μV/V
	P_d	V_O = 0V	–	200	–	200	mW
	ΔV_{OS}		–	1	–	2.5	mV
	ΔCMR	V_{CM} = ±12V	94	–	94	–	dB
Subgroup 3 **T_A = -55°C**		All Tests, Limits and Conditions are the same as for Subgroup 2.					

TABLE 3

Group A Inspection (Continued)

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

			OP-11/883				
			LIMITS A		LIMITS B		
Subgroup	Symbol	Special Conditions	Min	Max	Min	Max	Units
Subgroup 4	V_O	R_L = 2kΩ	±11	–	±11	-	V
T_A = +25°C	A_{VO}	V_O = ±10V, R_L = 2kΩ	100	–	100	–	V/mV
	CS		100	–	100	–	dB
Subgroup 5	V_O	R_L = 2kΩ	±11	–	±11	–	V
T_A = +125°C	A_{VO}	V_O = ±10V, R_L = 2kΩ	50	–	50	–	V/mV
Subgroup 6 T_A = -55°C		All Tests, Limits and Conditions are the same as for Subgroup 5.					
Subgroup 9	SR	A_{VCL} = +1	0.7	–	0.7	-	V/μs
T_A = +25°C	t_r	A_{VCL} = +1, V_{IN} = 50mV	–	145	–	145	ns
	OS		–	25	–	25	%

TABLE 3

Group A Inspection (Continued)

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

			OP-11/883 LIMITS C		
Subgroup	**Symbol**	**Special Conditions**	**Min**	**Max**	**Units**
Subgroup 1	V_{OS}	R_S = 50Ω, 10kΩ	–	5	mV
T_A = +25°C	I_{OS}		–	200	nA
	I_B		–	±500	nA
	CMR	V_{CM} = ±12V; R_S = 50Ω, 10kΩ	70	–	dB
	PSRR	V_S = ±5V, ±15V R_S = 50Ω, 10kΩ	–	100	μV/V
	P_d	V_O = 0V	–	340	mW
Subgroup 2	V_{OS}	R_S = 50Ω, 10kΩ	–	6	mV
T_A = +125°C	I_{OS}		–	300	nA
	I_B		–	±800	nA
	CMR	V_{CM} = ±12V; R_S = 50Ω, 10kΩ	70	–	dB
	PSRR	V_S = ±5V, ±15V R_S = 50Ω, 10kΩ	–	100	μV/V
	P_d	V_O = 0V	–	400	mW
Subgroup 3 T_A = -55°C		All Tests, Limits and Conditions are the same as for Subgroup 2.			
Subgroup 4	V_O	R_L = 2kΩ	±11	–	V
T_A = +25°C	A_{VO}	V_O = ±10V, R_L = 2kΩ	50	–	V/mV

TABLE 3

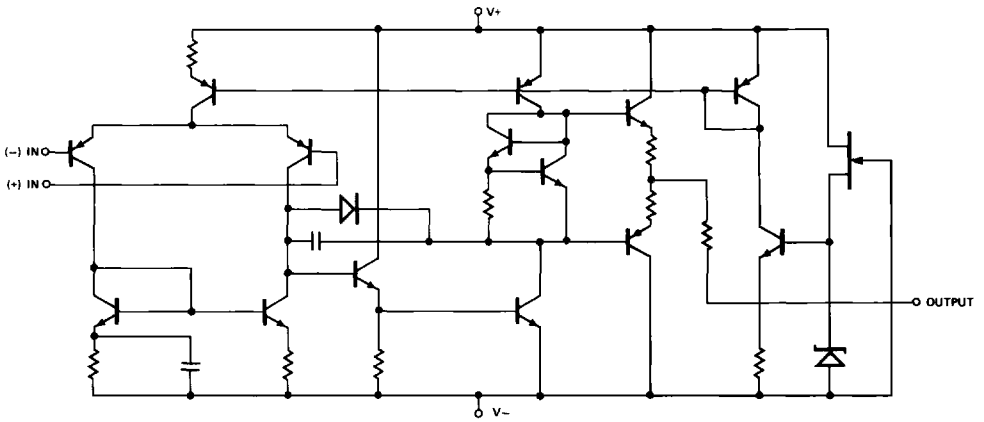
Group A Inspection (Continued)

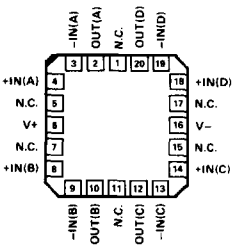
V_S = ±15V; R_S = 50Ω; V_{CM} = 0V; T_A = T_J unless otherwise specified.

			OP-11/883 LIMITS C		
Subgroup	**Symbol**	**Special Conditions**	**Min**	**Max**	**Units**
Subgroup 5	V_O	R_L = 2kΩ	±11	–	V
T_A = +125°C	A_{VO}	V_O = ±10V, R_L = 2kΩ	25	–	V/mV
Subgroup 6 T_A = -55°C		All Tests, Limits and Conditions are the same as for Subgroup 5.			
Subgroup 9	SR	A_{VCL} = +1	0.7	–	V/μs
T_A = +25°C	t_r	A_{VCL} = +1, V_{IN} = 50mV	–	145	ns
	OS		–	25	%

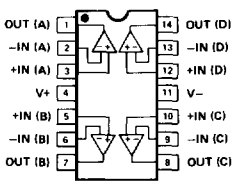
3.2.1 Simplified Schematic and Pin Connections.

(One of Four Amplifiers Shown)





OP-11ARC/883
LCC
(RC-Suffix)



14-PIN HERMETIC DIP
(Y-Suffix)

3.2.4 Microcircuit Group Assignment.

This microcircuit is covered by microcircuit group 49.

4.2 Life Test/Burn-In Circuit.