TYPE uA777C
HIGH-PERFORMANCE OPERATIONAL AMPLIFIER

BULLETIN NO. DL-S 12307, SEPTEMBER 1973—REVISED OCTOBER 1979

- Low Input Currents
- Low Input Offset Parameters
- Frequency and Transient Response Characteristics Adjustable
- Short-Circuit Protection
- Offset-Voltage Null Capability
- No Latch-Up
- Wide Common-Mode and Differential Voltage Ranges
- Same Pin Assignments as uA748, uA709, LM101A/LM301 except U Package

description

The uA777 is a precision operational amplifier. Low offset and bias currents improve system accuracy when used in applications such as long-term integrators, sample-and-hold circuits, and high-source-impedance summing amplifiers. This device is an excellent choice where a performance between that of super-beta-and general purpose operational amplifiers is required.

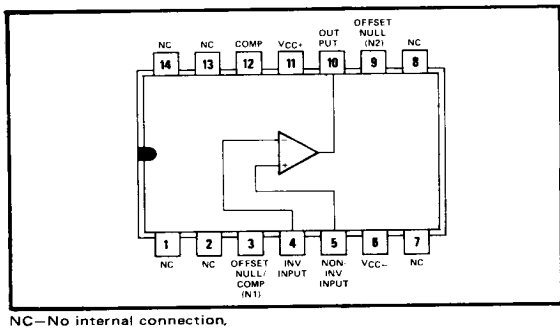
External compensation of the uA777 may be implemented in either normal or feed-forward configuration to satisfy bandwidth and slew-rate requirements. This circuit features high gain, wide differential and common-mode input voltage range, output short-circuit protection, and null capability.

The uA777C is characterized for operation from 0°C to 70°C.

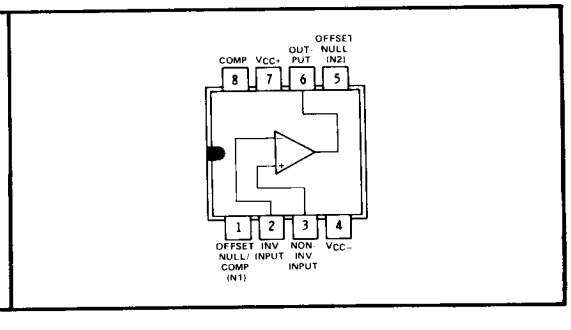
4

terminal assignments

JG OR P DUAL-IN-LINE PACKAGE (TOP VIEW)

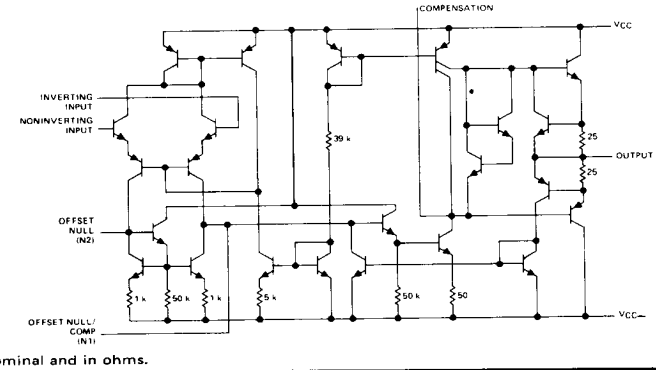


J OR N DUAL-IN-LINE PACKAGE (TOP VIEW)



NC—No internal connection.

schematic



Resistor values shown are nominal and in ohms.

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absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

		uA777C	UNIT
Supply voltage V_{CC+} (see Note 1)		22	V
Supply voltage V_{CC-} (see Note 1)		−22	V
Differential input voltage (see Note 2)		±30	V
Input voltage (either input, see Notes 1 and 3)		±15	V
Voltage between either offset null terminal (N1/N2) and V_{CC-}		−0.5 to 2	V
Duration of output short-circuit (see Note 4)		unlimited	
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 5)		500	mW
Operating free-air temperature range		0 to 70	°C
Storage temperature range		−65 to 150	°C
Lead temperature 1/16 inch (1,6 mm) from case for 60 seconds	J or JG package	300	°C
Lead temperature 1/16 inch (1,6 mm) from case for 10 seconds	N or P package	260	°C

NOTES: 1. All voltage values, unless otherwise noted, are with respect to the midpoint between V_{CC+} and V_{CC-}.
2. Differential voltages are at the noninverting input terminal with respect to the inverting input terminal.
3. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 volts, whichever is less.
4. The output may be shorted to ground or either power supply.
5. For operation above 25°C free-air temperature, refer to Dissipation Derating Table. In the J and JG package, uA777C chips are glass-mounted.

electrical characteristics at specified free-air temperature, V_{CC+} = 15 V, V_{CC-} = −15 V, C_C = 30 pF (unless otherwise noted)

PARAMETER		TEST CONDITIONS†		MIN	TYP	MAX	UNIT
V_{IO}	Input offset voltage	$R_S \leq 50\ k\Omega$	25°C		0.7	5	mV
			0°C to 70°C			5	
α_{VIO}	Average temperature coefficient of input offset voltage	$R_S \leq 50\ k\Omega$	0°C to 70°C		4	30	μV/°C
I_{IO}	Input offset current		25°C		0.7	20	nA
			0°C to 70°C			40	
α_{IIO}	Average temperature coefficient of input offset current		0°C to 25°C		20	600	pA/°C
			25°C to 70°C		10	300	
I_{IB}	Input bias current		25°C		25	100	nA
			0°C to 70°C			200	
V_{ICR}	Common-mode input voltage range		0°C to 70°C	±12	±13		V
V_{OPP}	Maximum peak-to-peak output voltage swing	R_L = 10 kΩ	0°C to 70°C	24	28		V
		R_L = 2 kΩ	0°C to 70°C	20	26		
A_{VD}	Large-signal differential voltage amplification	V_O = ±10 V, $R_L \geq 2\ k\Omega$	25°C	25	250		V/mV
			0°C to 70°C	15			
r_i	Input resistance		25°C	1	2		MΩ
r_o	Output resistance		25°C		100		Ω
C_i	Input capacitance		25°C		3		pF
CMRR	Common-mode rejection ratio	R_S = 50 kΩ	0°C to 70°C	70	95		dB
k_{SVR}	Supply voltage rejection ratio ($\Delta V_{CC}/\Delta V_{IO}$)	$R_S \leq 50\ k\Omega$	0°C to 70°C		15	150	μV/V
I_{OS}	Short-circuit output current		25°C		±25		mA
I_{CC}	Supply current	No load, No signal	25°C		1.9	3.3	mA
			0°C			3.3	
			70°C			3.3	

†All characteristics are specified under open-loop operation.

1079

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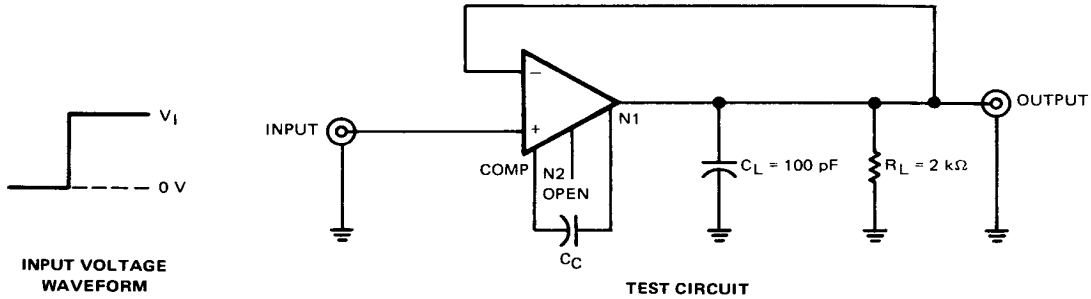
operating characteristics, V_{CC+} = 15 V, V_{CC-} = −15 V, T_A = 25°C

PARAMETER		TEST CONDITIONS			uA777C MIN	uA777C TYP	uA777C MAX	UNIT
t_r	Rise time	V_I = 20 mV, R_L = 2 kΩ, C_L = 100 pF	A_V = 1,	C_C = 30 pF		0.3		μs
			A_V = 10,	C_C = 3.5 pF		0.2		
	Overshoot factor	V_I = 20 mV, R_L = 2 kΩ, C_L = 100 pF	A_V = 1,	C_C = 30 pF		5%		
			A_V = 10,	C_C = 3.5 pF		5%		
SR	Slew rate	R_L = 2 kΩ, C_L = 100 pF	A_V = 1,	C_C = 30 pF		0.5		V/μs
			A_V = 10,	C_C = 3.5 pF		5.5		

PARAMETER MEASUREMENT INFORMATION



INPUT VOLTAGE WAVEFORM

TEST CIRCUIT

FIGURE 1–RISE TIME, OVERSHOOT, AND SLEW RATE

DISSIPATION DERATING TABLE

PACKAGE	POWER RATING	DERATING FACTOR	ABOVE T_A
J (Alloy-Mounted Chip)	500 mW	11.0 mW/°C	105°C
J (Glass-Mounted Chip)	500 mW	8.2 mW/°C	89°C
JG (Alloy-Mounted Chip)	500 mW	8.4 mW/°C	90°C
JG (Glass-Mounted Chip)	500 mW	6.6 mW/°C	74°C
N	500 mW	9.2 mW/°C	96°C
P	500 mW	8.0 mW/°C	87°C

Also see Dissipation Derating Curves, Section 2.

TYPICAL CHARACTERISTICS

PULSE RESPONSE WITH
FEED-FORWARD COMPENSATION

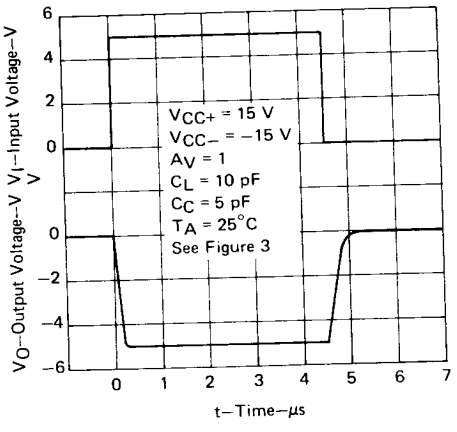


FIGURE 2

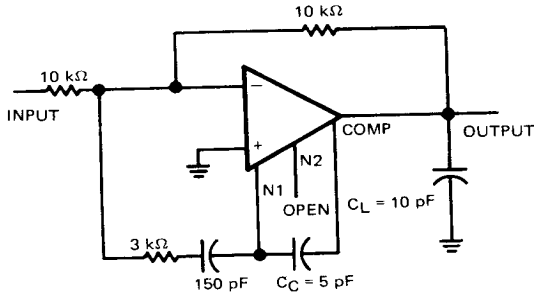
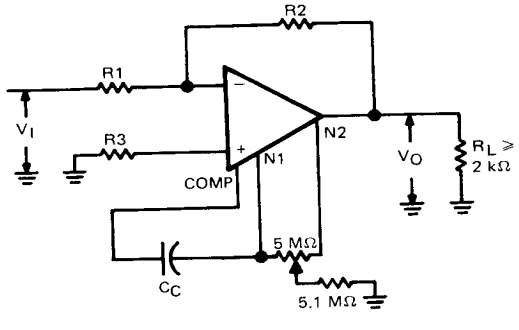


FIGURE 3—INVERTING CIRCUIT WITH UNITY GAIN AND FEED-FORWARD COMPENSATION

TYPICAL APPLICATION DATA



$$\frac{V_O}{V_I} = -\frac{R2}{R1}$$

$$C_C \geq \frac{R1 \cdot 30\ pF}{R1+R2}$$

$$R_3 = \frac{R1 \cdot R2}{R1+R2}$$

FIGURE 4—INVERTING CIRCUIT WITH ADJUSTABLE GAIN, SINGLE-POLE COMPENSATION, AND OFFSET ADJUSTMENT

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