

uA748C, uA748M GENERAL-PURPOSE OPERATIONAL AMPLIFIERS

SLOS095 – D921, DECEMBER 1970 – REVISED OCTOBER 1990

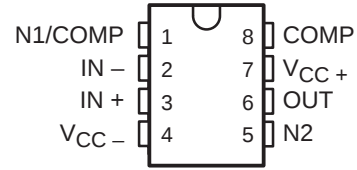
- Frequency and Transient Response Characteristics Adjustable
- Short-Circuit Protection
- Offset-Voltage Null Capability
- Wide Common-Mode and Differential Voltage Ranges
- Low Power Consumption
- No Latch-Up
- Same Pin Assignments as uA709

description

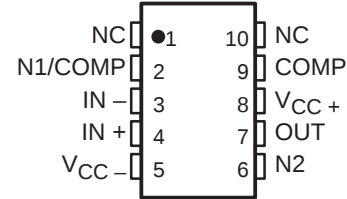
The uA748 is a general-purpose operational amplifier that offers the same advantages and attractive features as the uA741 except for internal compensation. External compensation can be as simple as a 30-pF capacitor for unity-gain conditions and, when the closed-loop gain is greater than one, can be changed to obtain wider bandwidth or higher slew rate. This circuit features high gain, large differential and common-mode input voltage range, and output short-circuit protection. Input offset-voltage adjustment can be provided by connecting a variable resistor between the offset null pins as shown in Figure 12.

The uA748C is characterized for operation from 0°C to 70°C; the uA748M is characterized for operation over the full military temperature range of –55°C to 125°C.

uA748C . . . D OR P PACKAGE
uA748M . . . JG PACKAGE
(TOP VIEW)

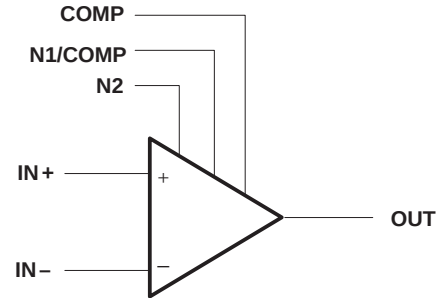


uA748M . . . U FLAT PACKAGE
(TOP VIEW)



NC – No internal connection

symbol



AVAILABLE OPTIONS

T _A	V _{IO} max AT 25°C	PACKAGE			
		8-PIN			10-PIN
		SMALL OUTLINE (D)	CERAMIC DIP (JG)	PLASTIC DIP (P)	FLAT PACK (U)
0°C to 70°C	6 mV	uA748CD	—	uA748CP	—
–55°C to 125°C	5 mV	—	uA748MJG	—	uA747MU

The D package is available taped and reeled. Add the suffix R to the device type, (e.g., uA748CDR).

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The schematic diagram illustrates a 3-stage CMOS op-amp. The first stage is a differential pair with inputs IN+ and IN- and a tail current source N1/COMP. The second stage is a common-source amplifier with input N2 and a load resistor of 50 kΩ. The third stage is a Wilson current mirror load with two 34 Ω resistors and a tail current source. The output OUT is taken from the node between the two 34 Ω resistors. The supply rails are VCC+ and VCC-.

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

		uA748C	uA748M	UNIT
Supply voltage, V_{CC+} (see Note 1)		18	22	V
Supply voltage, V_{CC-} (see Note 1)		−18	−22	V
Differential input voltage (see Note 2)		±30	±30	V
Input voltage (either input, see Notes 1 and 3)		±15	±15	V
Voltage range between either offset null terminal (N1/N2) and V_{CC-}		−0.5 to 2	−0.5	V
Duration of output short circuit (see Note 4)		unlimited	unlimited	
Continuous total power dissipation		See Dissipation Rating Table		
Operating free-air temperature range		0 to 70	−55 to 125	°C
Storage temperature range		−65 to 150	−65 to 150	°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds	JG or U package		300	°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	D or P package	260		°C

4. The output may be shorted to ground or either power supply. For the uA748M only, the unlimited duration of the short circuit applies at (or below) 125°C case temperature or 75°C free-air temperature

PACKAGE	T _A ≤ 25°C POWER RATING	DERATING FACTOR	DERATE ABOVE T _A	T _A = 70°C POWER RATING	T _A = 125°C POWER RATING
D	500 mW	5.8 mW/°C	64°C	464 mW	N/A
JG	500 mW	8.4 mW/°C	90°C	500 mW	210 mW
P	500 mW	N/A	N/A	500 mW	N/A
U	500 mW	5.4 mW/°C	57°C	432 mW	135 mW

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electrical characteristics at specified free-air temperature, $V_{CC} \pm = \pm 15$ V, $C_C = 30$ pF

PARAMETER		TEST CONDITIONS†		uA748C			uA748M			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V _{IO}	Input offset voltage	V _O = 0	25°C	1		6	1		5	mV
			Full range			7.5	6			
I _{IO}	Input offset current	V _O = 0	25°C	20		200	20		200	nA
			Full range			300	500			
I _{IB}	Input bias current	V _O = 0	25°C	80		500	80		500	nA
			Full range			800	1500			
V _{ICR}	Common-mode input voltage range		25°C	±12	±13		±12	±13		V
			Full range	±12			±12			
V _{O(PP)}	Maximum peak output voltage swing	R _L = 10 kΩ	25°C	±12	±14		±12	±14		V
		R _L ≥ 10 kΩ	Full range	±12			±12			
		R _L = 2 kΩ	25°C	±10	±13		±10	±13		
		R _L ≥ 2 kΩ	Full range	±10			±10			
A _{VD}	Large-signal differential voltage amplification	R _L ≥ 2 kΩ, V _O = ± 10 V	25°C	20	200		50	200		V/mV
			Full range	15			25			
r _i	Input resistance		25°C	0.3	2		0.3	2		MΩ
r _o	Output resistance	V _O = 0, See Note 5	25°C	75		75				Ω
C _i	Input capacitance		25°C	1.4		1.4				pF
CMRR	Common-mode rejection ratio	V _{IC} = V _{ICRmin} , V _O = 0	25°C	70	90		70	90		dB
			Full range	70			70			
k _{SVS}	Supply-voltage sensitivity (ΔV _{IO} / ΔV _{CC})	V _{CC} = ± 9 V to ± 15 V, V _O = 0	25°C	30		150	30		150	μV/V
			Full range			150	150			
I _{OS}	Short-circuit output current		25°C	±25		±40	±25		±40	mA
I _{CC}	Supply current	No load, V _O = 0	25°C	1.7		2.8	1.7		2.8	mA
			Full range			3.3	3.3			
P _D	Power dissipation (each amplifier)	No load, V _O = 0	25°C	50		85	50		85	mW
			Full range			100	100			

† All characteristics are measured under open-loop conditions with zero common-mode input voltage unless otherwise specified. Full range for uA748C is 0°C to 70°C and for uA748M is –55°C to 125°C.

NOTE 5: This typical value applies only at frequencies above a few hundred hertz because of the effects of drift and thermal feedback.

operating characteristics, $V_{CC} \pm = \pm 15$ V, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_r Rise time	$V_I = 20$ mV, $R_L = 2$ k Ω , $C_L = 100$ pF, $C_C = 30$ pF, See Figure 1	0.3			μs
Overshoot factor		5%			
SR Slew rate at unity gain	$V_I = 10$ V, $R_L = 2$ k Ω , $C_L = 100$ pF, $C_C = 30$ pF, See Figure 1	0.5			V/ μs

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PARAMETER MEASUREMENT INFORMATION

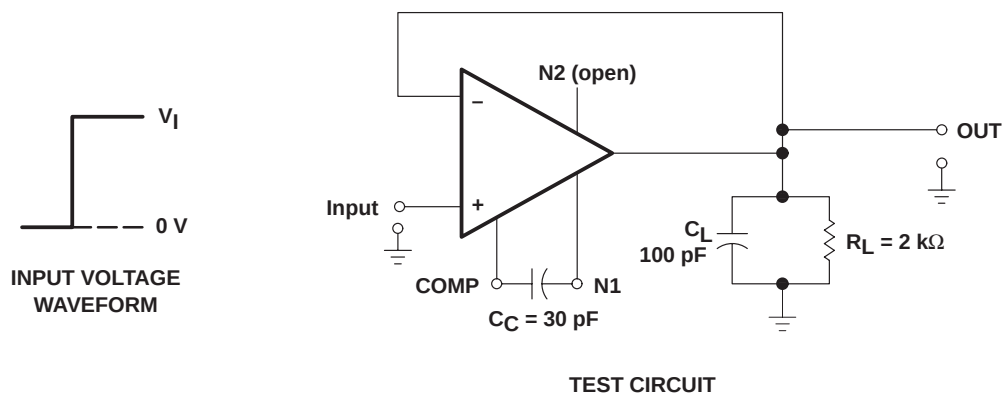


Figure 1. Rise Time, Overshoot, and Slew Rate

TYPICAL CHARACTERISTICS†

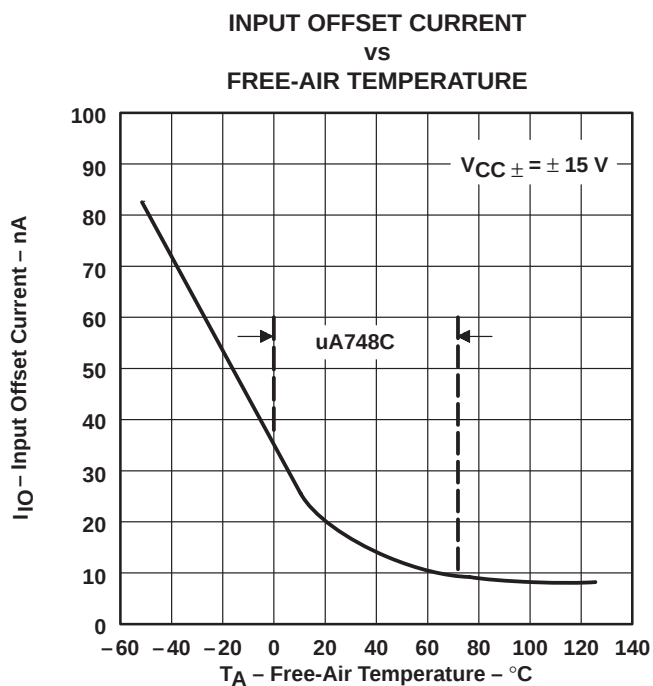


Figure 2

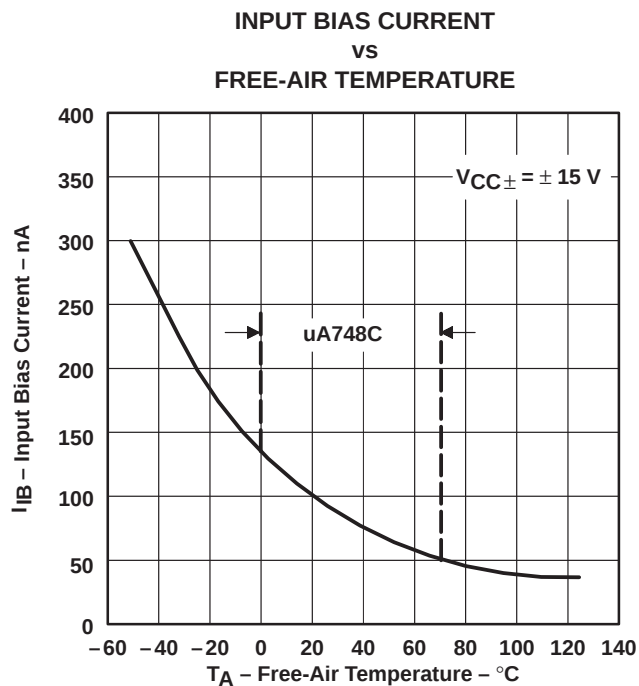


Figure 3

† Data at high and low temperatures are applicable only within the rated operating free-air temperature range of the particular devices.

TYPICAL CHARACTERISTICS

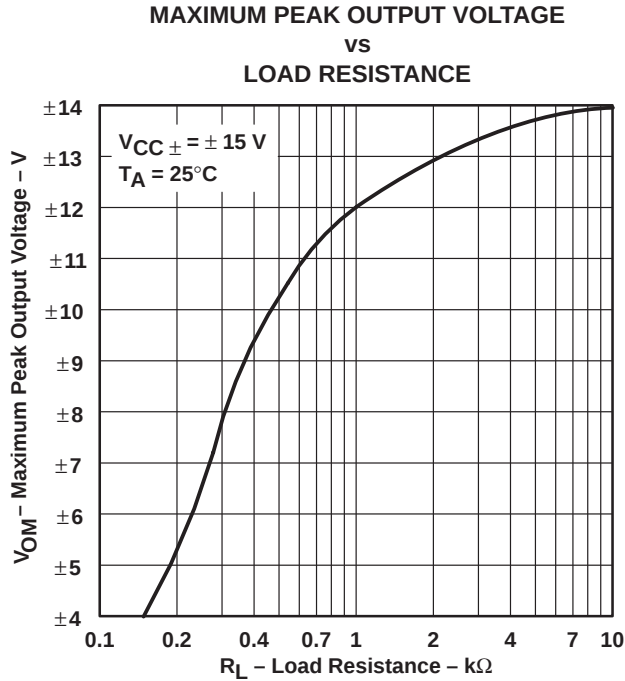


Figure 4

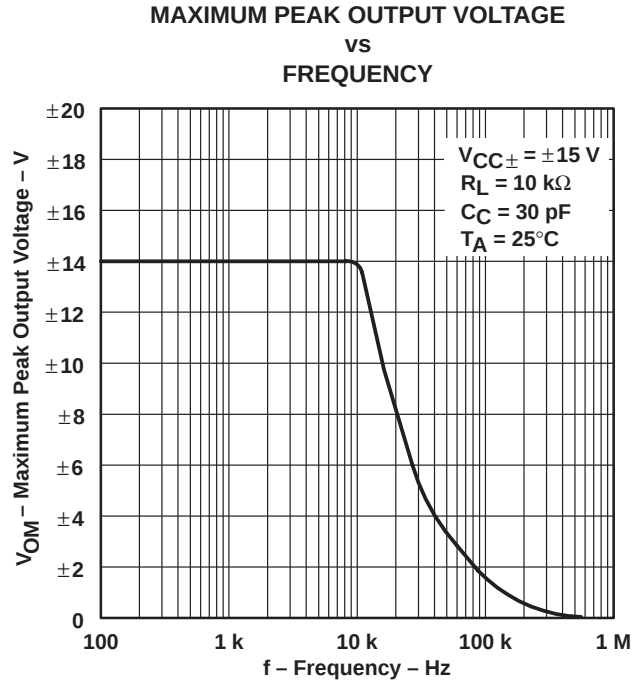


Figure 5

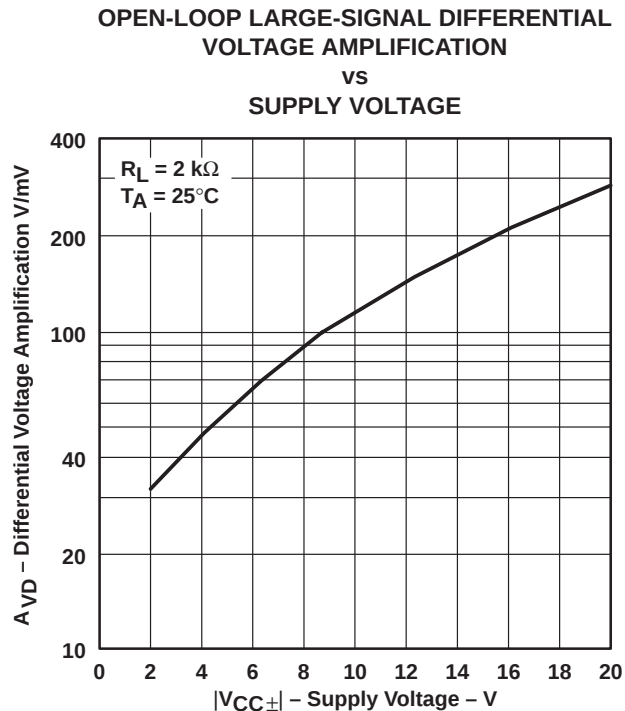


Figure 6

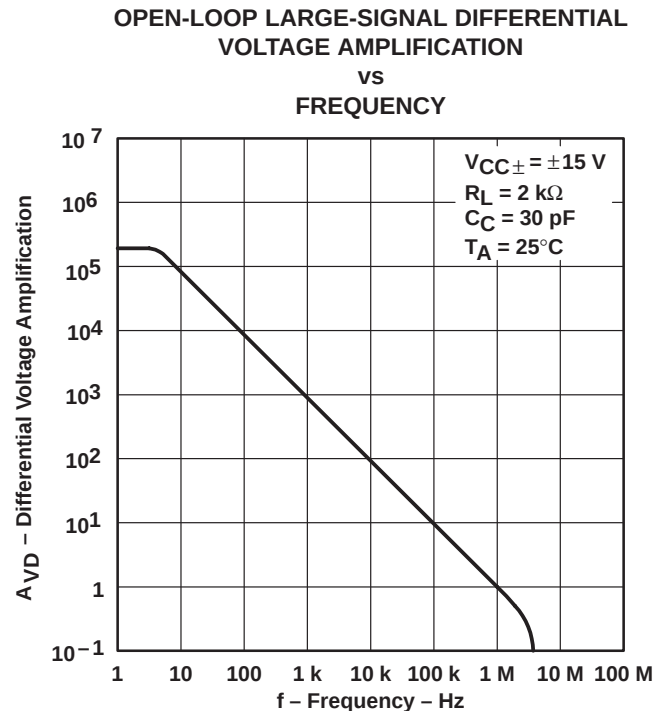


Figure 7

uA748C, uA748M GENERAL-PURPOSE OPERATIONAL AMPLIFIERS

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TYPICAL CHARACTERISTICS

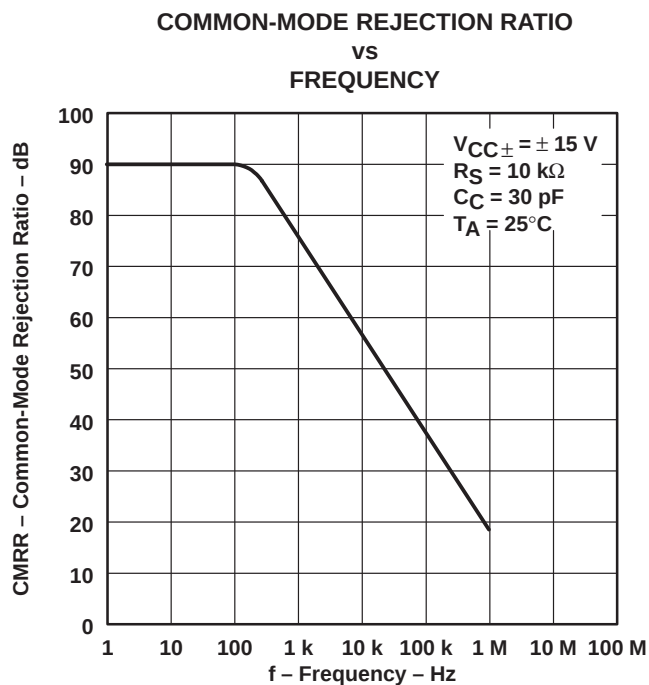


Figure 8

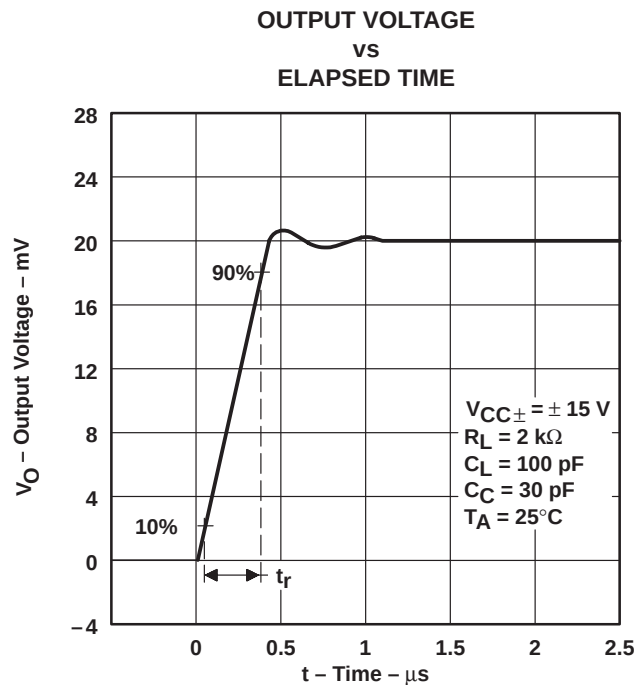


Figure 9

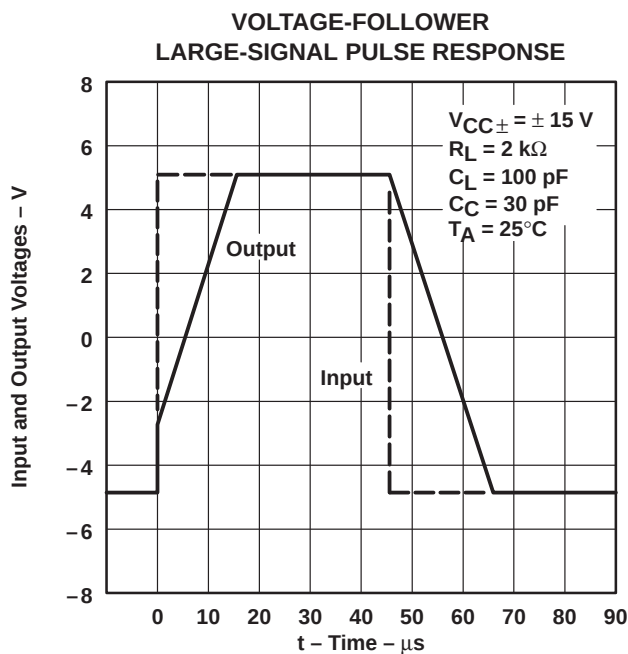


Figure 10

TYPICAL APPLICATION DATA

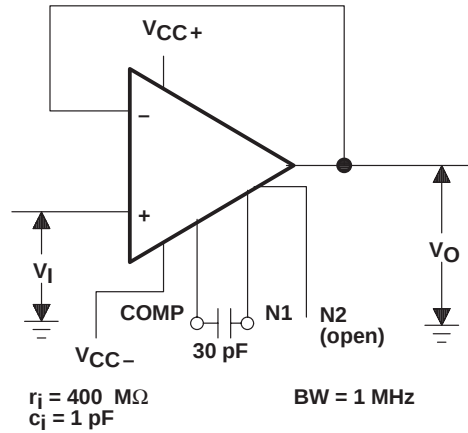


Figure 11. Unity-Gain Voltage Follower

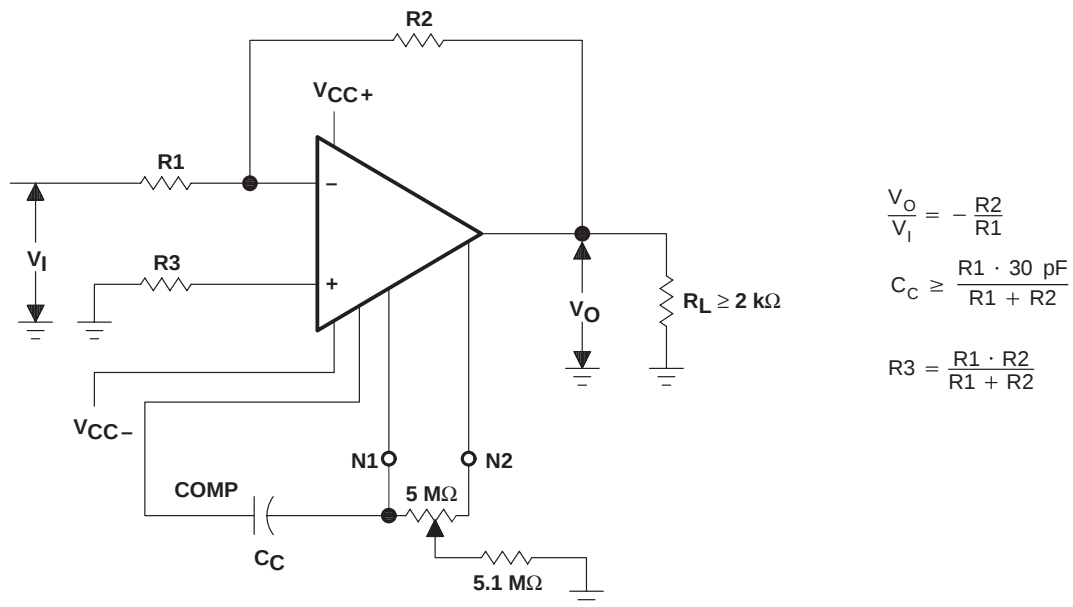


Figure 12. Inverting Circuit With Adjustable Gain Compensation and Offset Adjustment

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Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

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