

uA748C, uA748M GENERAL-PURPOSE OPERATIONAL AMPLIFIERS

SLOS095 – D921, DECEMBER 1970 – REVISED OCTOBER 1990

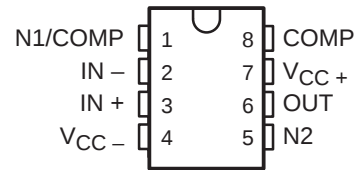
- Frequency and Transient Response Characteristics Adjustable
- Short-Circuit Protection
- Offset-Voltage Null Capability
- Wide Common-Mode and Differential Voltage Ranges
- Low Power Consumption
- No Latch-Up
- Same Pin Assignments as uA709

description

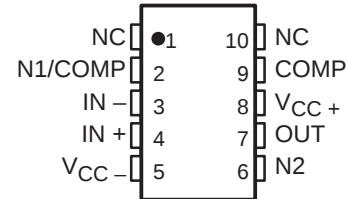
The uA748 is a general-purpose operational amplifier that offers the same advantages and attractive features as the uA741 except for internal compensation. External compensation can be as simple as a 30-pF capacitor for unity-gain conditions and, when the closed-loop gain is greater than one, can be 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)

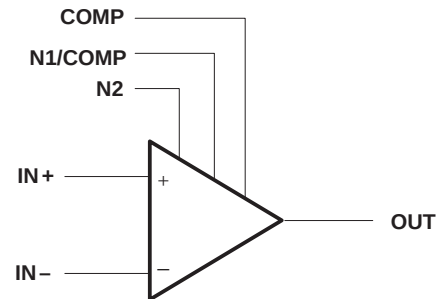


uA748M . . . U FLAT PACKAGE
(TOP VIEW)



NC – No internal connection

symbol



AVAILABLE OPTIONS

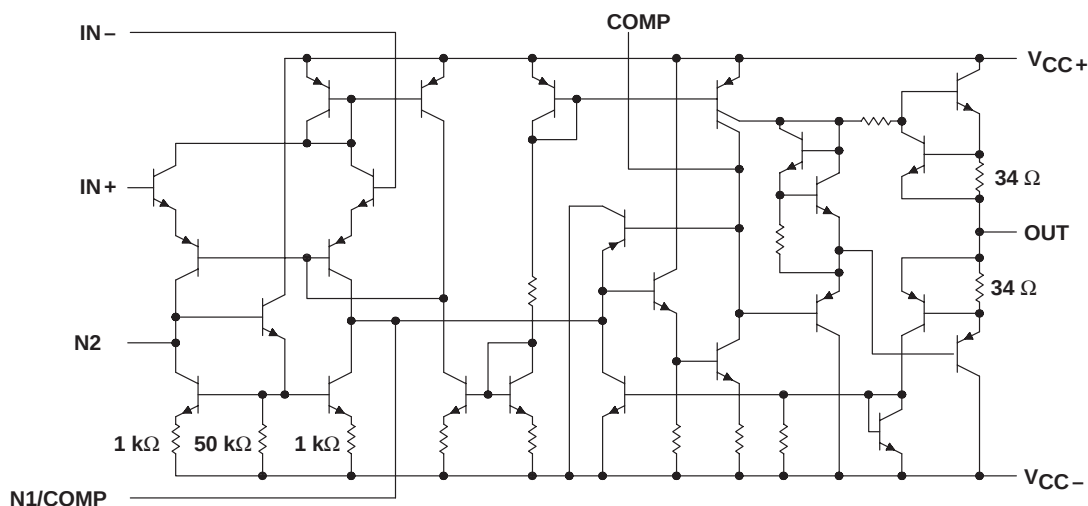
T _A	V _{IO} max AT 25°C	PACKAGE			
		8-PIN			10-PIN
		SMALL OUTLINE (D)	CERAMIC DIP (JG)	PLASTIC DIP (P)	FLAT PACK (U)
0°C to 70°C	6 mV	uA748CD	—	uA748CP	—
–55°C to 125°C	5 mV	—	uA748MJG	—	uA747MU

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

uA748C, uA748M GENERAL-PURPOSE OPERATIONAL AMPLIFIERS

SLOS095 – D921, DECEMBER 1970 – REVISED OCTOBER 1990

schematic



Resistor values shown are nominal.

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

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 15V, whichever is less.
 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

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR	DERATE ABOVE T_A	$T_A = 70^\circ\text{C}$ POWER RATING	$T_A = 125^\circ\text{C}$ 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

uA748C, uA748M
GENERAL-PURPOSE OPERATIONAL AMPLIFIERS

SLOS095 – D921, DECEMBER 1970 – REVISED OCTOBER 1990

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			6	
I_{IO} Input offset current	$V_O = 0$ 25°C		20	200		20	200	nA
				Full range			500	
I_{IB} Input bias current	$V_O = 0$ 25°C		80	500		80	500	nA
				Full range			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	$R_L = 10$ k Ω 25°C	± 12	± 14		± 12	± 14		V
	$R_L \geq 10$ k Ω Full range	± 12			± 12			
	$R_L = 2$ k Ω 25°C	± 10	± 13		± 10	± 13		
	$R_L \geq 2$ k Ω Full range	± 10			± 10			
A_{VD} Large-signal differential voltage amplification	$R_L \geq 2$ k Ω , $V_O = \pm 10$ 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		M Ω
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	
k_{SVS} Supply-voltage sensitivity ($\Delta V_{IO} / \Delta V_{CC}$)	$V_{CC} = \pm 9$ V to ± 15 V, $V_O = 0$ 25°C		30	150		30	150	μ V/V
				Full range			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	
P_D Power dissipation (each amplifier)	No load, $V_O = 0$ 25°C		50	85		50	85	mW
				Full range			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		μ s
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/ μ s



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

uA748C, uA748M GENERAL-PURPOSE OPERATIONAL AMPLIFIERS

SLOS095 – D921, DECEMBER 1970 – REVISED OCTOBER 1990

PARAMETER MEASUREMENT INFORMATION

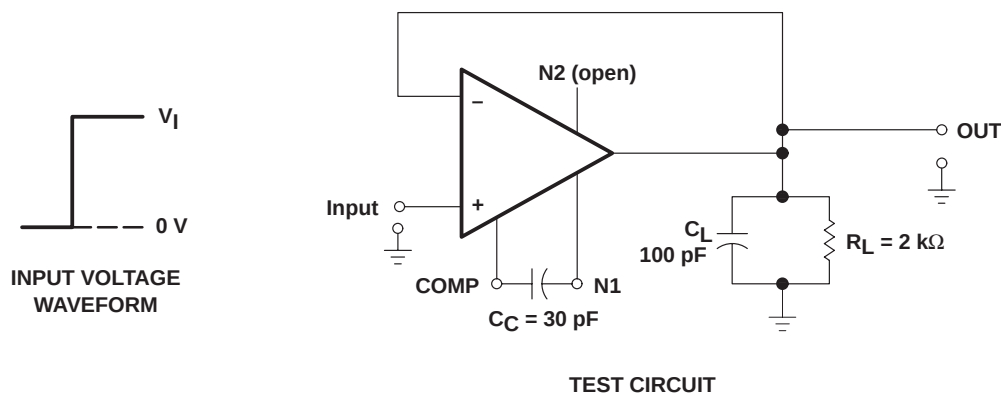


Figure 1. Rise Time, Overshoot, and Slew Rate

TYPICAL CHARACTERISTICS†

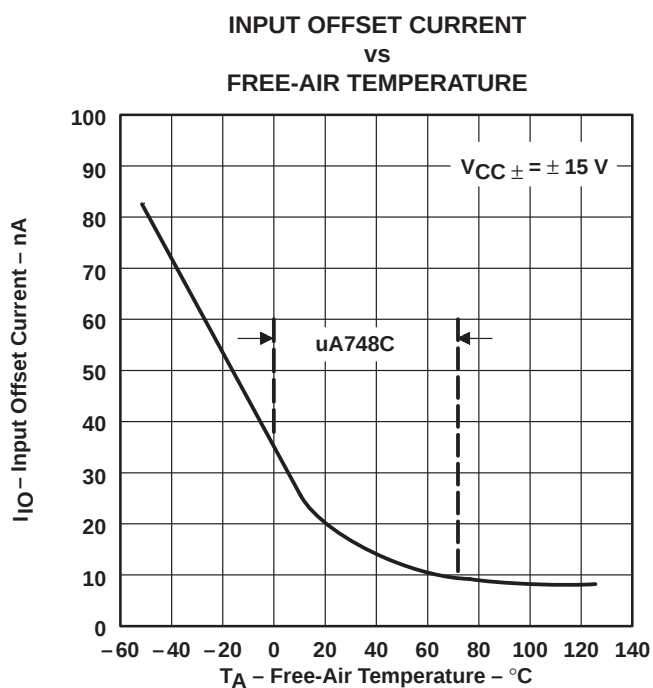


Figure 2

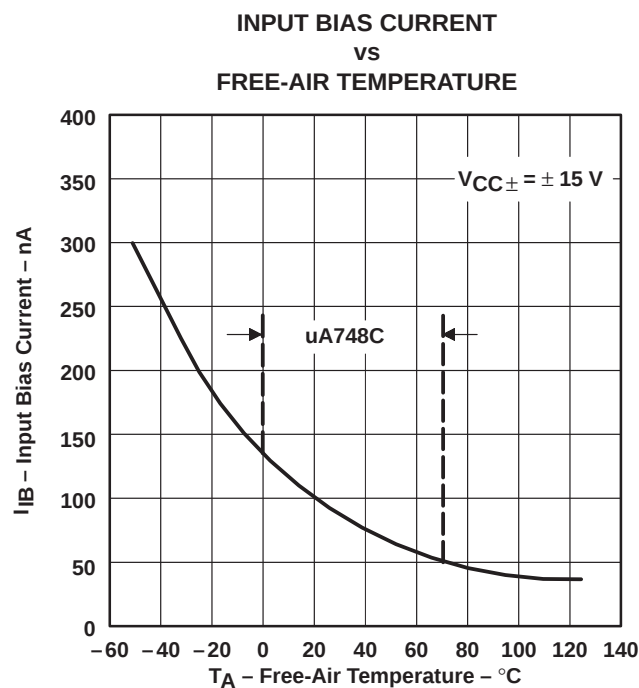


Figure 3

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

TYPICAL CHARACTERISTICS

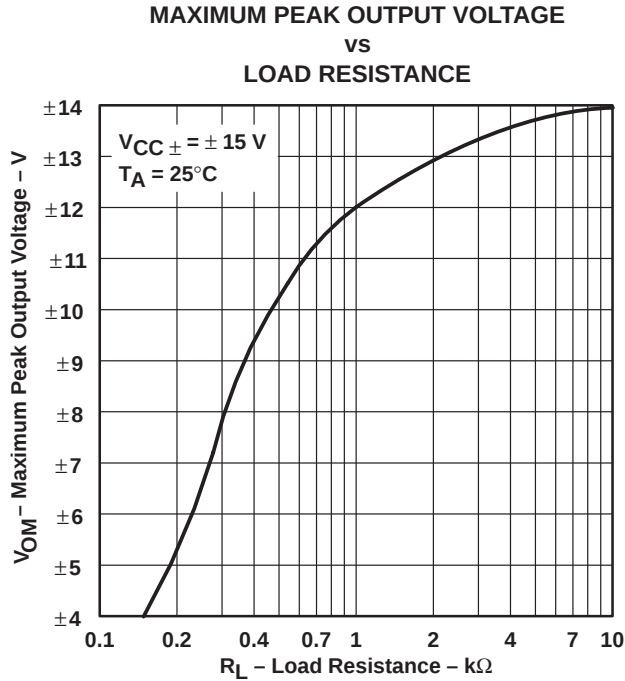


Figure 4

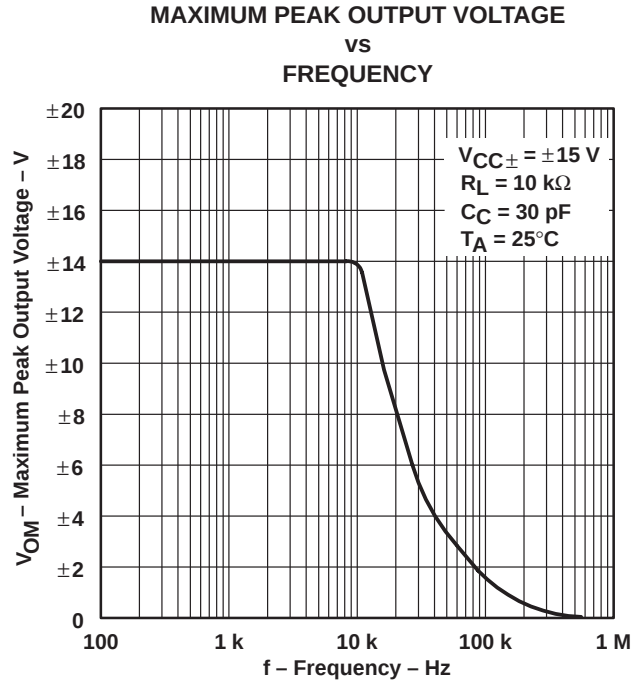


Figure 5

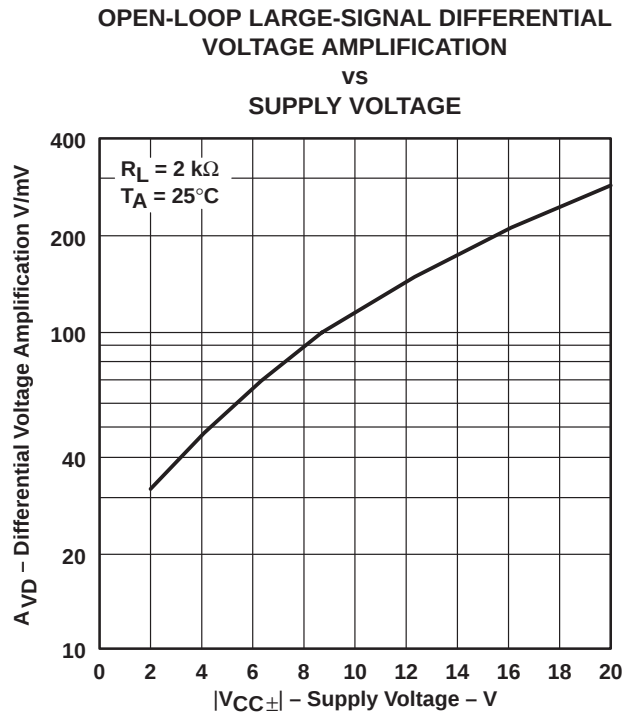


Figure 6

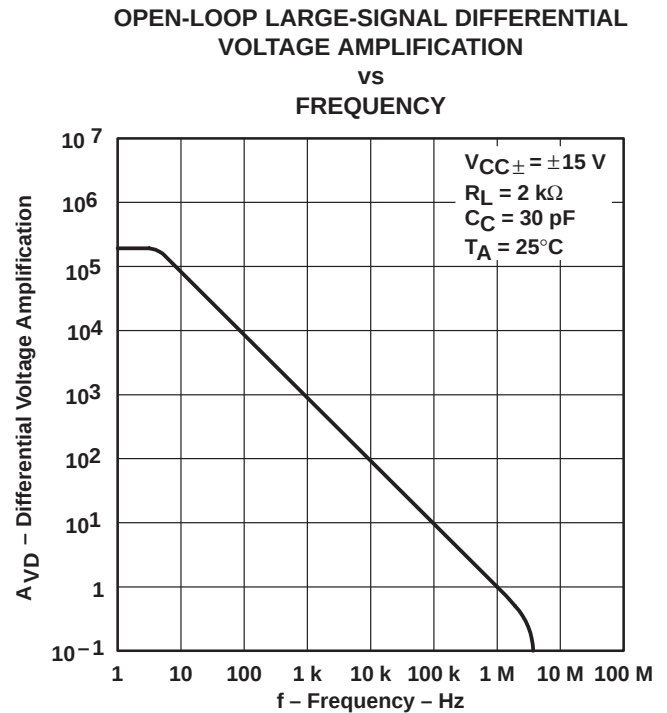


Figure 7

uA748C, uA748M GENERAL-PURPOSE OPERATIONAL AMPLIFIERS

SLOS095 – D921, DECEMBER 1970 – REVISED OCTOBER 1990

TYPICAL CHARACTERISTICS

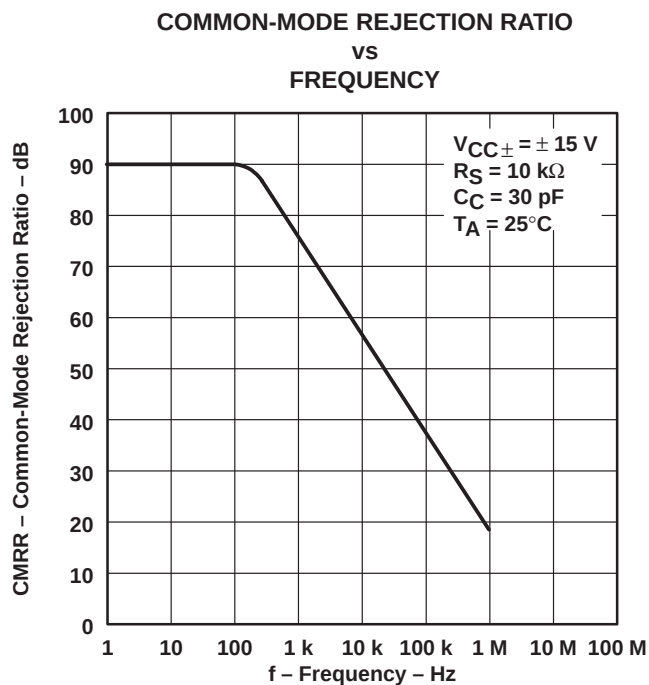


Figure 8

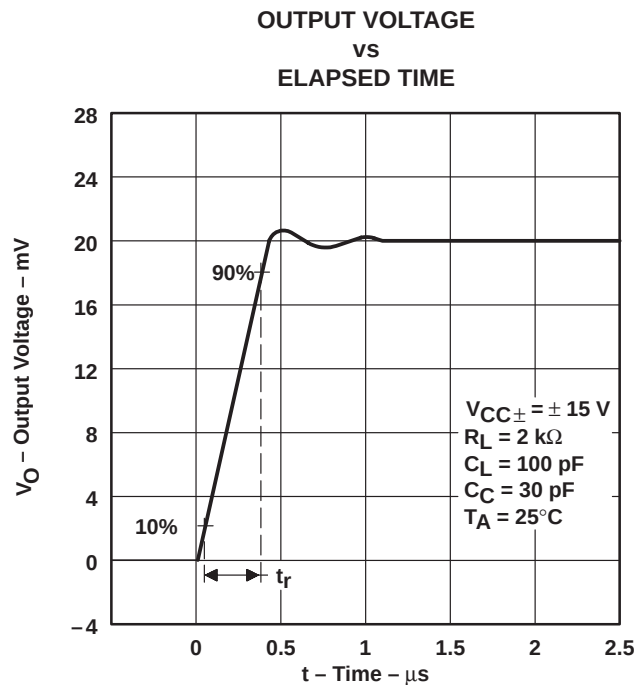


Figure 9

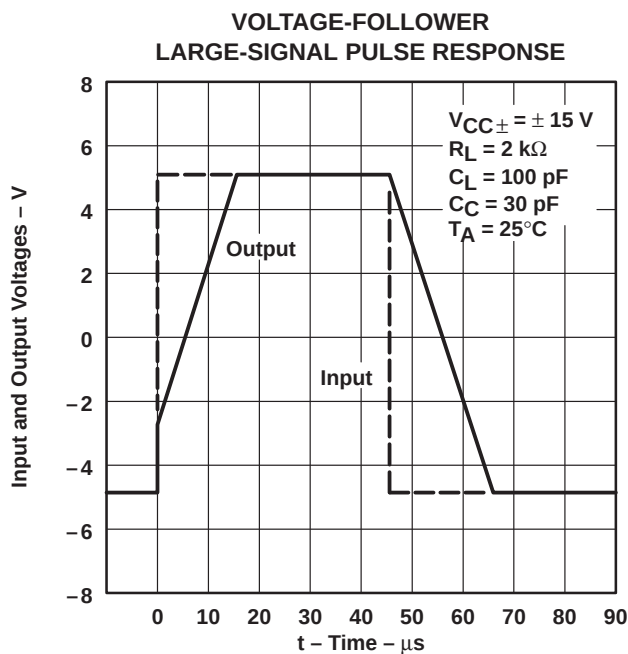


Figure 10

TYPICAL APPLICATION DATA

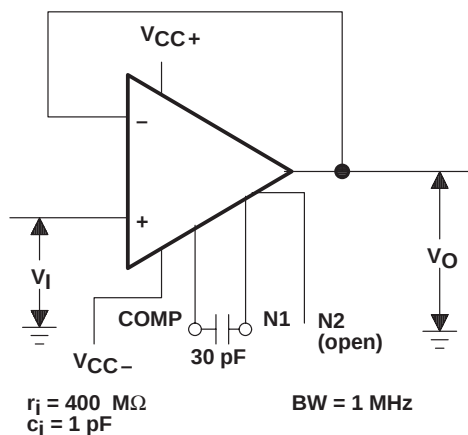
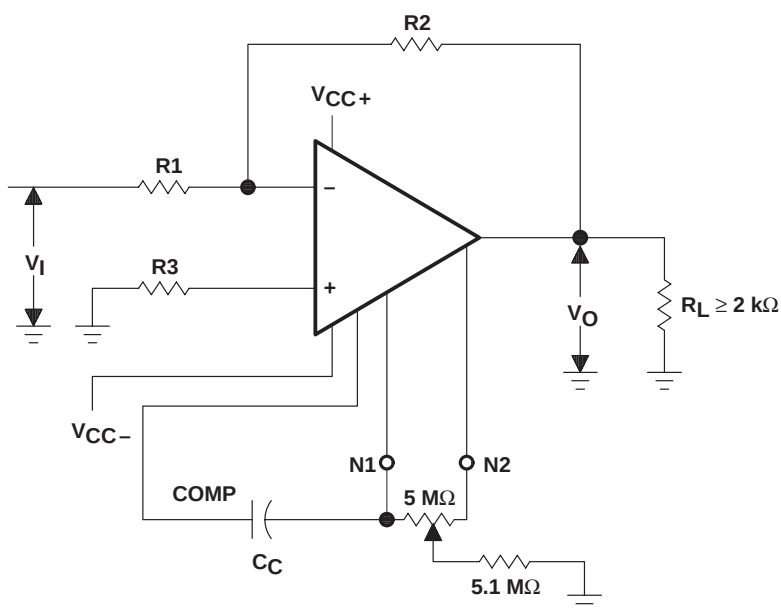


Figure 11. Unity-Gain Voltage Follower



$$\frac{V_O}{V_I} = -\frac{R_2}{R_1}$$

$$C_C \geq \frac{R_1 \cdot 30 \text{ pF}}{R_1 + R_2}$$

$$R_3 = \frac{R_1 \cdot R_2}{R_1 + R_2}$$

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

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.

Copyright © 1998, Texas Instruments Incorporated