

uA748C, uA748M GENERAL-PURPOSE OPERATIONAL AMPLIFIERS

SLOS095 – D921, DECEMBER 1970 – REVISED OCTOBER 1990

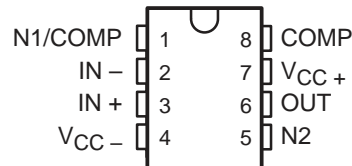
- Frequency and Transient Response Characteristics Adjustable
- Short-Circuit Protection
- Offset-Voltage Null Capability
- Wide Common-Mode and Differential Voltage Ranges
- Low Power Consumption
- No Latch-Up
- Same Pin Assignments as uA709

description

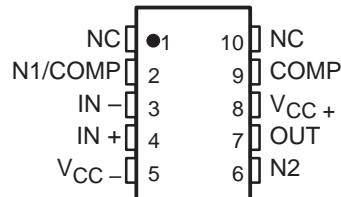
The uA748 is a general-purpose operational amplifier that offers the same advantages and attractive features as the uA741 except for internal compensation. External compensation can be as simple as a 30-pF capacitor for unity-gain conditions and, when the closed-loop gain is greater than one, can be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

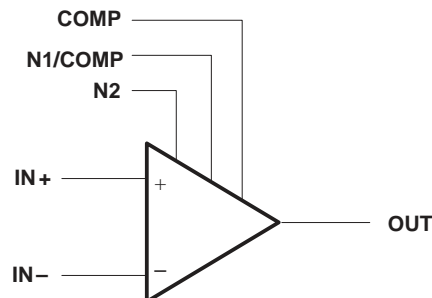


**uA748M . . . U FLAT PACKAGE
(TOP VIEW)**



NC – No internal connection

symbol



AVAILABLE OPTIONS

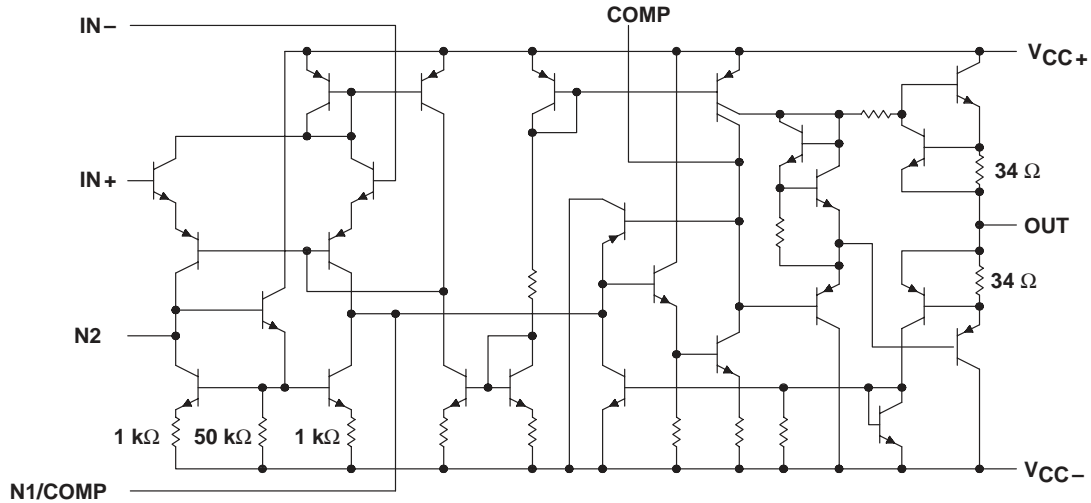
T _A	V _{IO} max AT 25°C	PACKAGE			
		8-PIN			10-PIN
		SMALL OUTLINE (D)	CERAMIC DIP (JG)	PLASTIC DIP (P)	FLAT PACK (U)
0°C to 70°C	6 mV	uA748CD	—	uA748CP	—
–55°C to 125°C	5 mV	—	uA748MJG	—	uA747MU

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	$^{\circ}\text{C}$
Storage temperature range	-65 to 150	-65 to 150	$^{\circ}\text{C}$
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds	JG or U package		300
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	D or P package		260

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 $^{\circ}\text{C}$ case temperature or 75 $^{\circ}\text{C}$ 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/ $^{\circ}\text{C}$	64 $^{\circ}\text{C}$	464 mW	N/A
JG	500 mW	8.4 mW/ $^{\circ}\text{C}$	90 $^{\circ}\text{C}$	500 mW	210 mW
P	500 mW	N/A	N/A	500 mW	N/A
U	500 mW	5.4 mW/ $^{\circ}\text{C}$	57 $^{\circ}\text{C}$	432 mW	135 mW

uA748C, uA748M GENERAL-PURPOSE OPERATIONAL AMPLIFIERS

SLOS095 – D921, DECEMBER 1970 – REVISED OCTOBER 1990

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

PARAMETER	TEST CONDITIONST	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	$R_L = 10 \text{ k}\Omega$	25°C	± 12	± 14	± 12	± 14	V	
	$R_L \geq 10 \text{ k}\Omega$	Full range	± 12		± 12			
	$R_L = 2 \text{ k}\Omega$	25°C	± 10	± 13	± 10	± 13		
	$R_L \geq 2 \text{ k}\Omega$	Full range	± 10		± 10			
A_{VD} Large-signal differential voltage amplification	$R_L \geq 2 \text{ k}\Omega$, $V_O = \pm 10 \text{ V}$	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		70			
k_{SVS} Supply-voltage sensitivity ($\Delta V_{IO} / \Delta V_{CC}$)	$V_{CC} = \pm 9 \text{ V}$ to $\pm 15 \text{ V}$, $V_O = 0$	25°C	30	150	30	150	$\mu\text{V/V}$	
		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, $V_{CC} \pm = \pm 15 \text{ V}$, $T_A = 25^\circ\text{C}$

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

uA748C, uA748M GENERAL-PURPOSE OPERATIONAL AMPLIFIERS

SLOS095 – D921, DECEMBER 1970 – REVISED OCTOBER 1990

PARAMETER MEASUREMENT INFORMATION

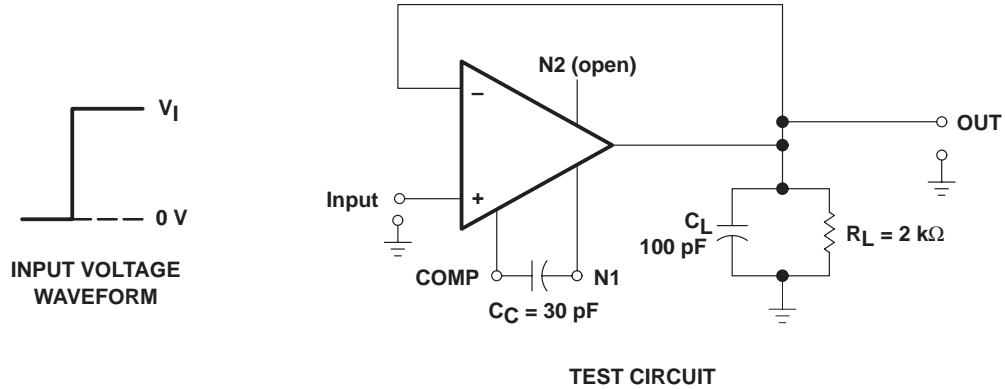


Figure 1. Rise Time, Overshoot, and Slew Rate

TYPICAL CHARACTERISTICS†

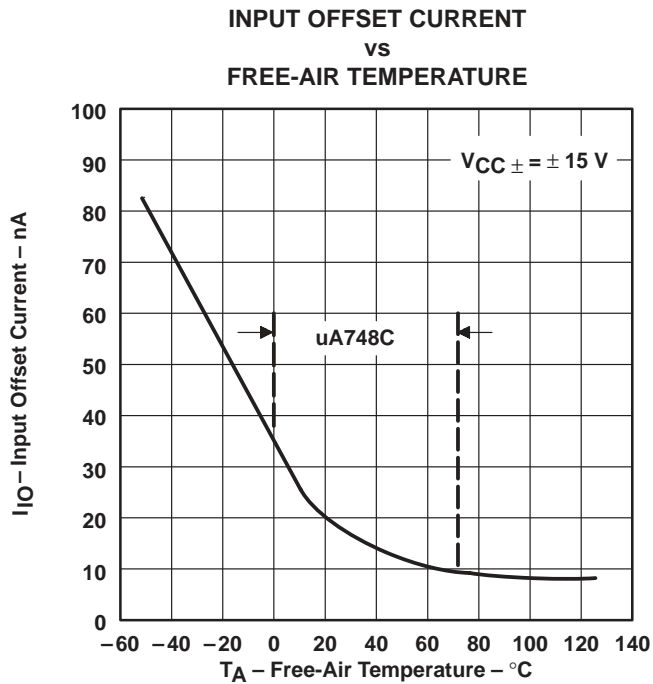


Figure 2

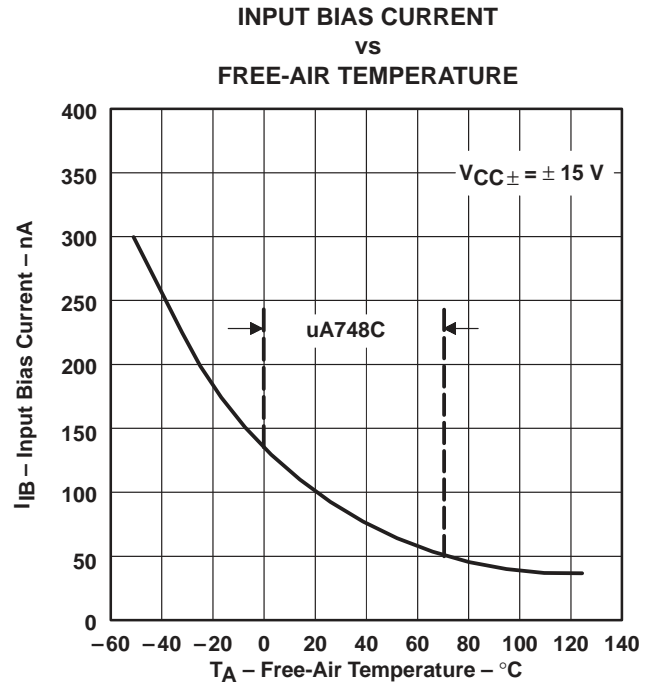


Figure 3

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

TYPICAL CHARACTERISTICS

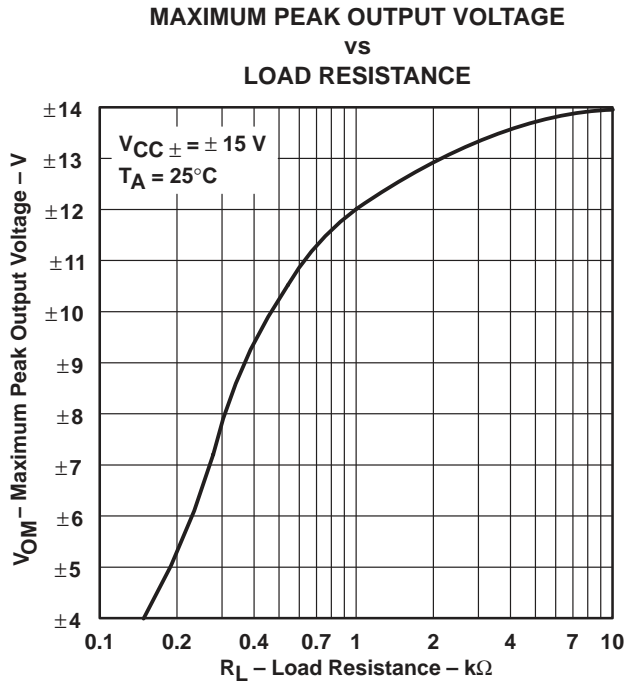


Figure 4

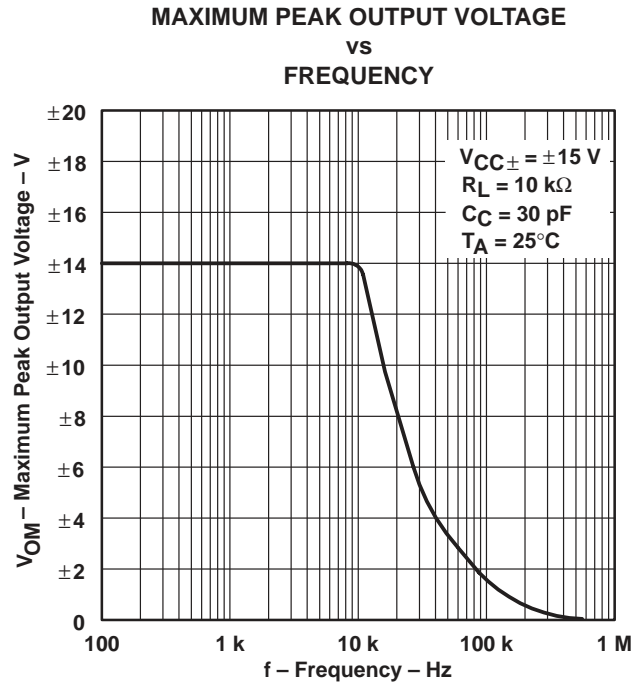


Figure 5

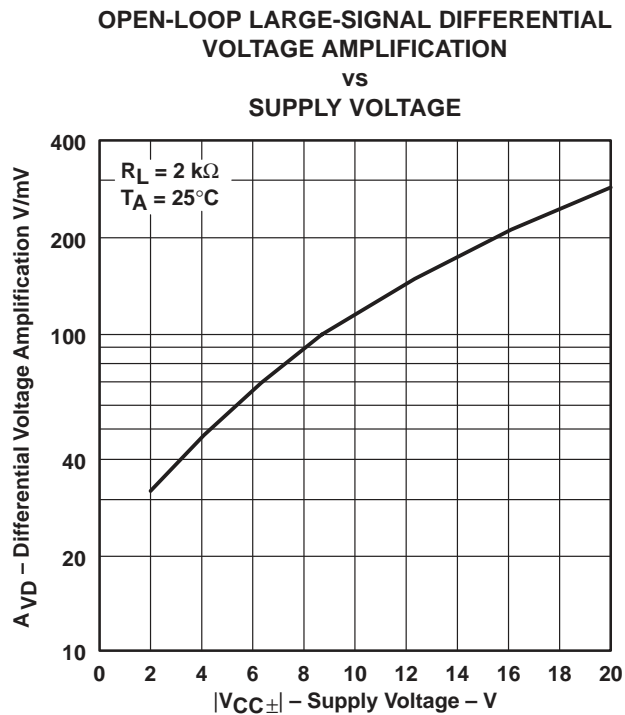


Figure 6

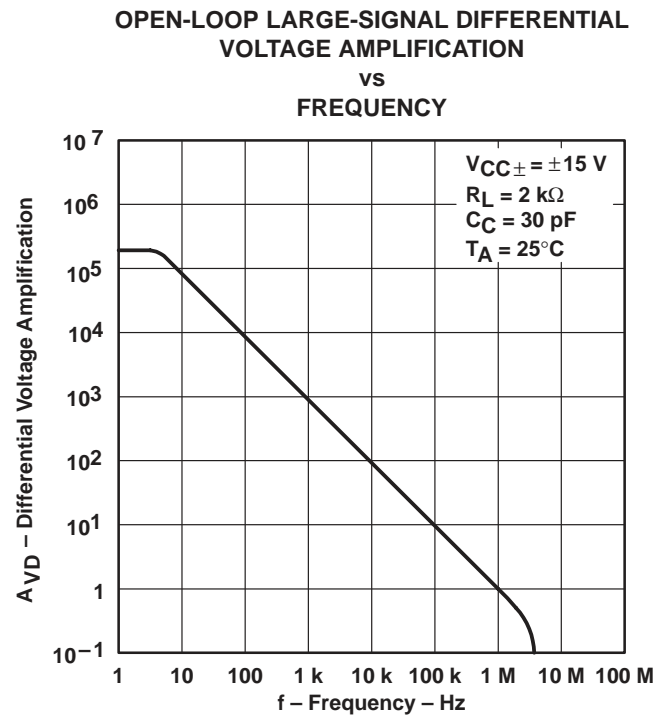


Figure 7

uA748C, uA748M GENERAL-PURPOSE OPERATIONAL AMPLIFIERS

SLOS095 – D921, DECEMBER 1970 – REVISED OCTOBER 1990

TYPICAL CHARACTERISTICS

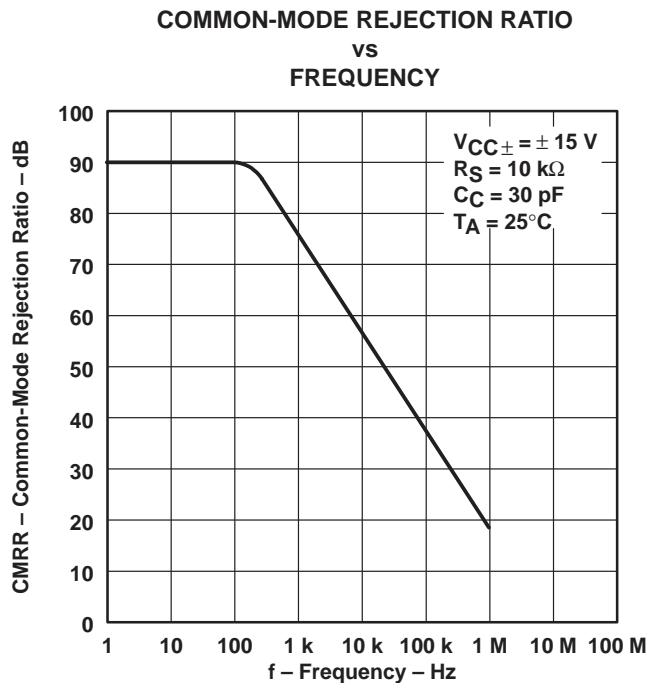


Figure 8

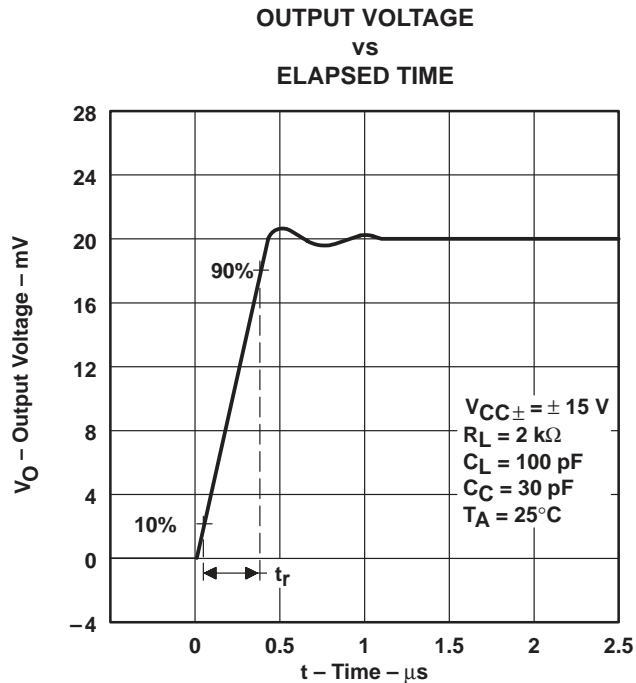


Figure 9

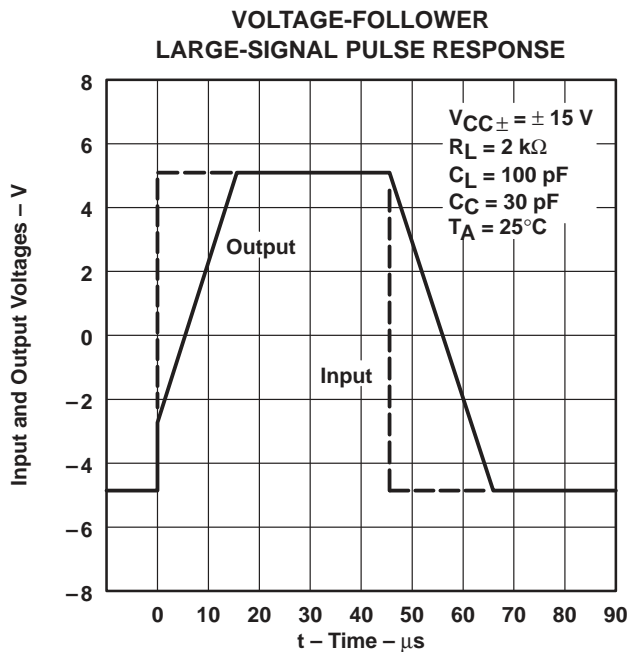


Figure 10

TYPICAL APPLICATION DATA

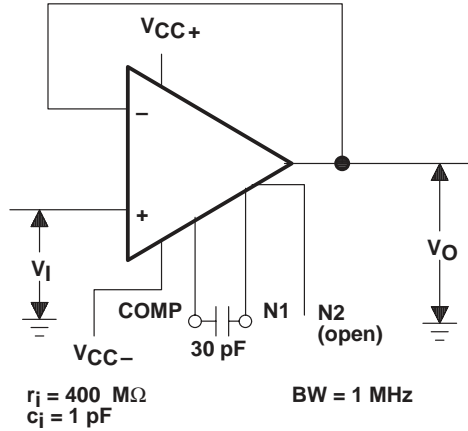


Figure 11. Unity-Gain Voltage Follower

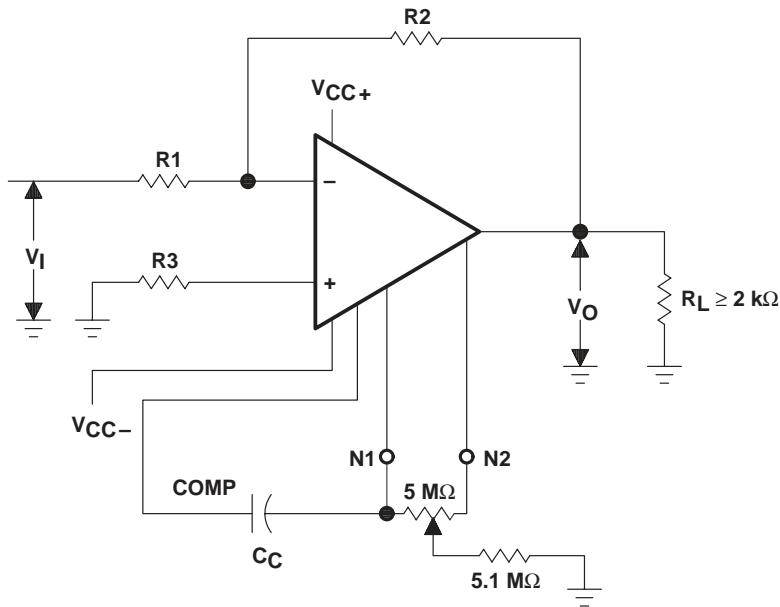


Figure 12. Inverting Circuit With Adjustable Gain Compensation and Offset Adjustment

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
UA748CD	OBSOLETE	SOIC	D	8		TBD	Call TI	Call TI
UA748CDR	OBSOLETE	SOIC	D	8		TBD	Call TI	Call TI
UA748CDR	OBSOLETE	SOIC	D	8		TBD	Call TI	Call TI
UA748CP	OBSOLETE	PDIP	P	8		TBD	Call TI	Call TI
UA748CP	OBSOLETE	PDIP	P	8		TBD	Call TI	Call TI

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

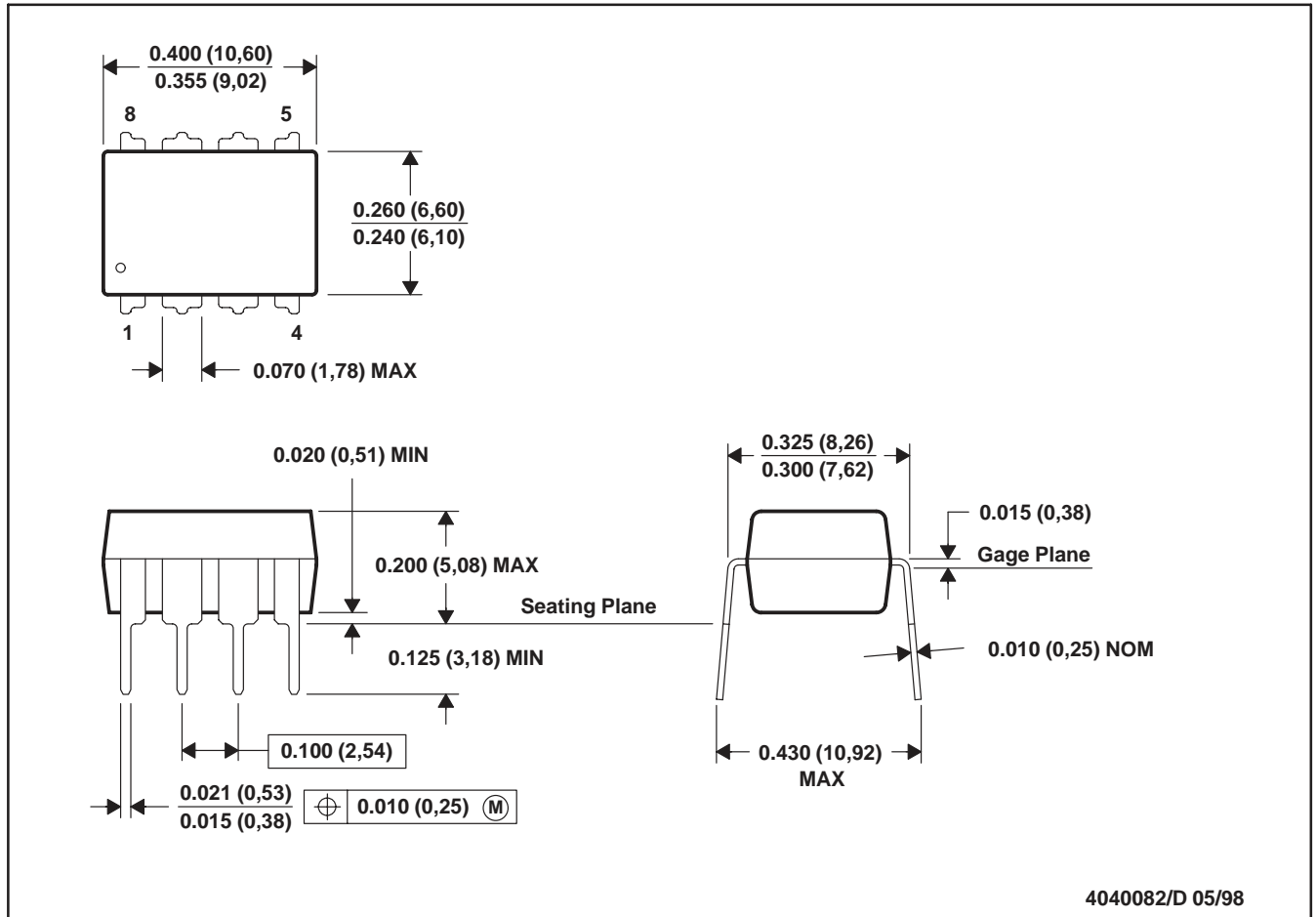
⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

Important Information and Disclaimer:The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE

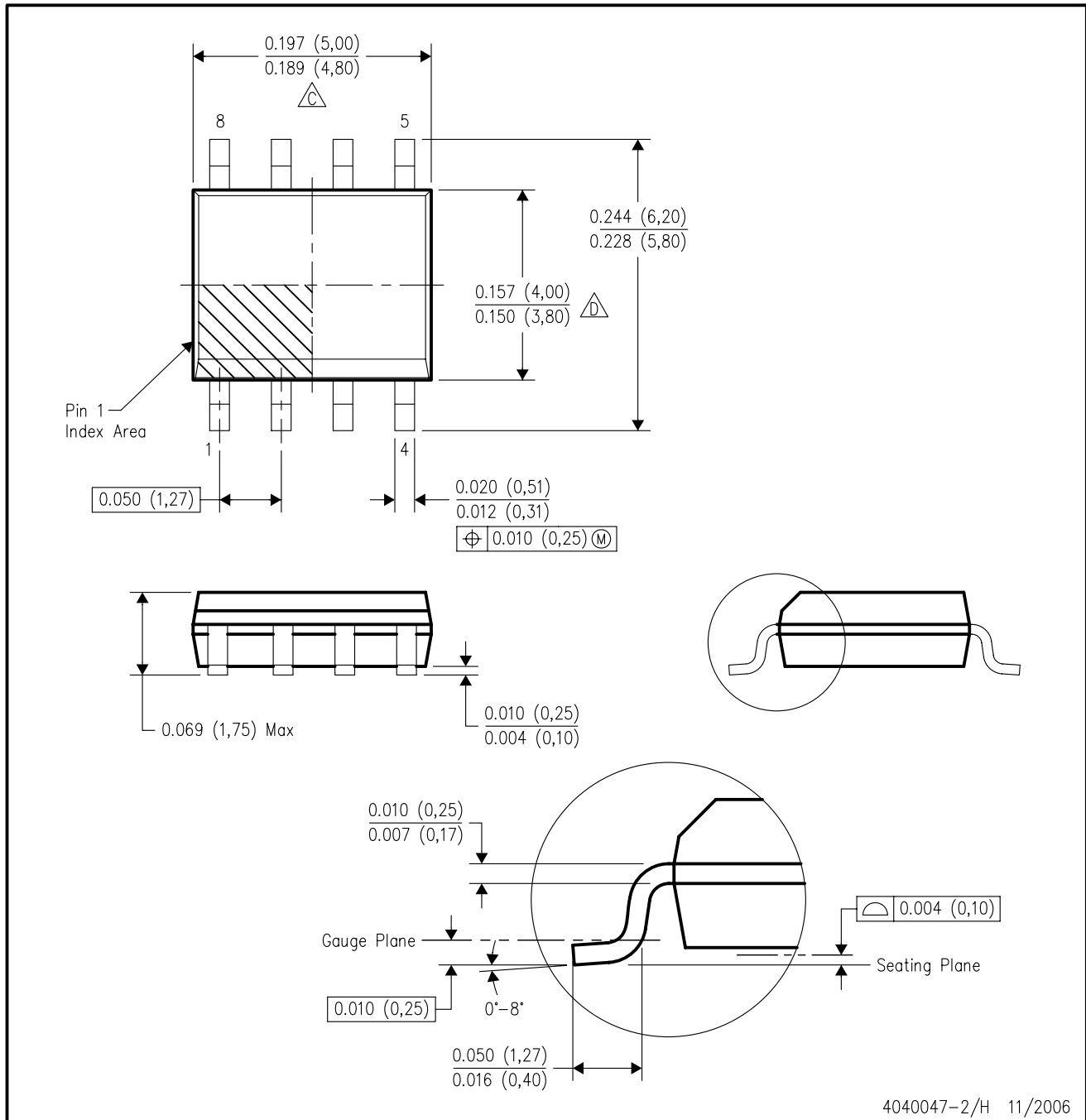


- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. Falls within JEDEC MS-001

For the latest package information, go to http://www.ti.com/sc/docs/package/pkg_info.htm

D (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE



NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
 D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
 E. Reference JEDEC MS-012 variation AA.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

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

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		Applications	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
Low Power Wireless	www.ti.com/lpw	Telephony	www.ti.com/telephony
		Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments
Post Office Box 655303 Dallas, Texas 75265