

μA748C, μA748M GENERAL-PURPOSE OPERATIONAL AMPLIFIERS

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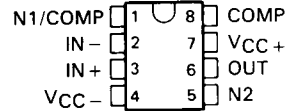
- Frequency and Transient Response Characteristics Adjustable
- Short-Circuit Protection
- Offset-Voltage Null Capability
- Wide Common-Mode and Differential Voltage Ranges
- Low Power Consumption
- No Latch-Up
- Same Pin Assignments as μA709

description

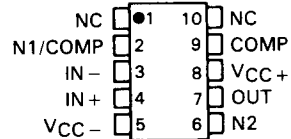
The μA748 is a general-purpose operational amplifier that offers the same advantages and attractive features as the μA741 except for internal compensation. External compensation can be as simple as a 30-pF capacitor for unity-gain conditions and, when the closed-loop gain is greater than one, can be 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 μA748C is characterized for operation from 0°C to 70°C; the μA748M is characterized for operation over the full military temperature range of -55°C to 125°C.

μA748C . . . D OR P PACKAGE
μA748M . . . JG PACKAGE
(TOP VIEW)

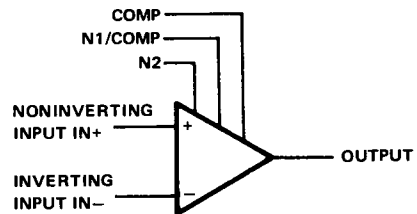


μA748M . . . U FLAT PACKAGE
(TOP VIEW)



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 | μA748CD | — | μA748CP | — |
| -55°C to 125°C | 5 mV | — | μA748MJG | — | μA748MU |

The D package is available taped and reeled. Add the suffix R to the device type, (e.g., μA748CDR).

PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

TEXAS
INSTRUMENTS

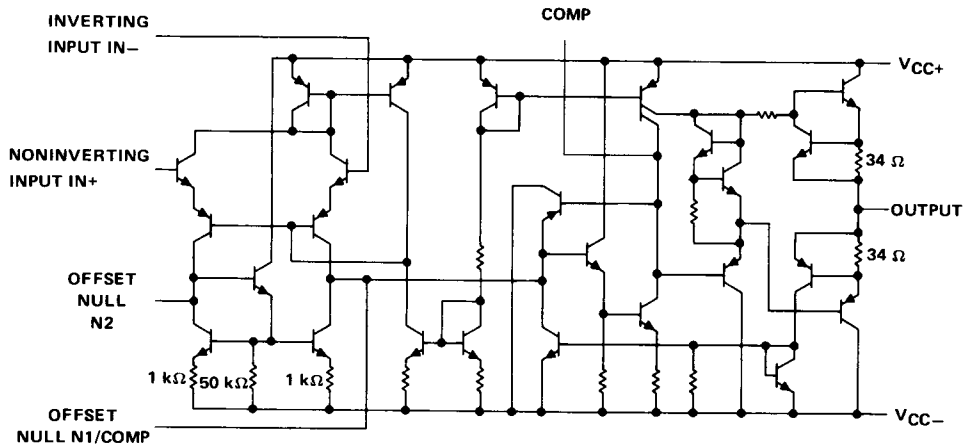
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uA748C, uA748M GENERAL-PURPOSE OPERATIONAL AMPLIFIERS

schematic



Resistor values shown are nominal.

absolute maximum ratings over operating free-air temperature (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 to 2 | 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 |
| 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 15 V, 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

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

| 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_{OM} 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 | | | | | |
| | $R_L = 2\text{ k}\Omega$ | 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 | $V_{IC} = V_{ICR}\text{ min}$, $V_O = 0$ | 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 Total power dissipation | 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, $V_{CC+} = 15\text{ V}$, $V_{CC-} = -15\text{ V}$, $T_A = 25^\circ\text{C}$

| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|----------------------------|--|-----|-----|-----|------------------|
| t_r Rise time | $V_I = 20\text{ mV}$, $R_L = 2\text{ k}\Omega$, $C_L = 100\text{ pF}$, $C_C = 30\text{ pF}$, | | 0.3 | | μs |
| Overshoot factor | See Figure 1 | | 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

PARAMETER MEASUREMENT INFORMATION

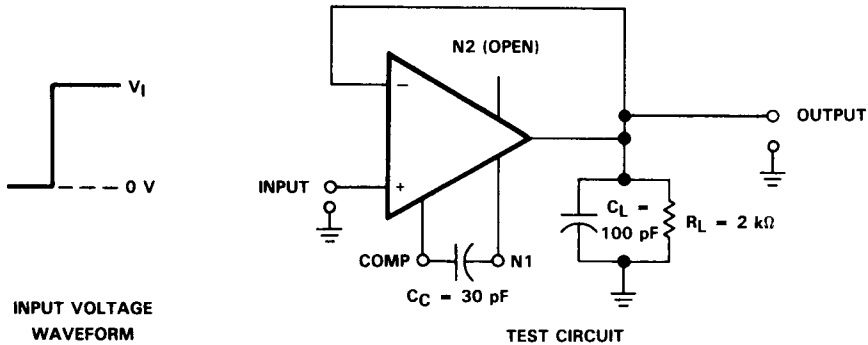


FIGURE 1. RISE TIME, OVERSHOOT, AND SLEW RATE

TYPICAL CHARACTERISTICS

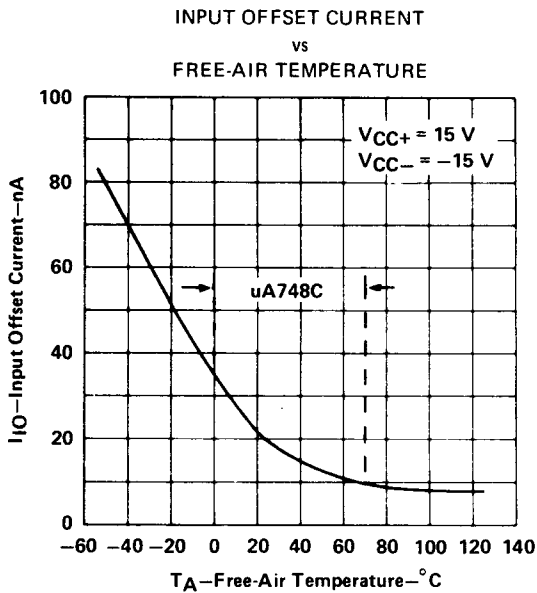


FIGURE 2

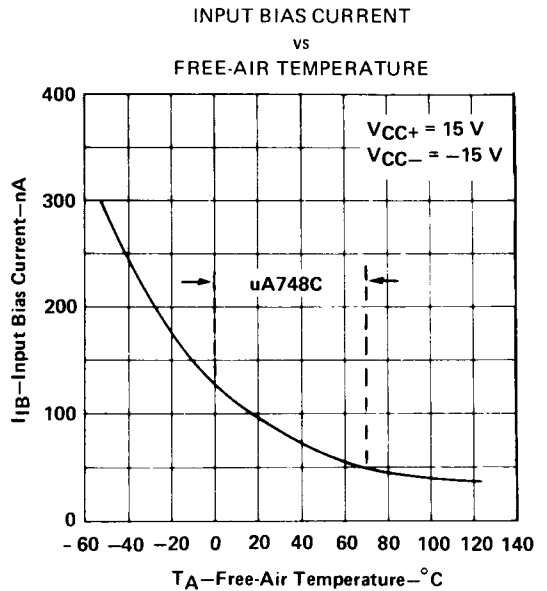


FIGURE 3

TYPICAL CHARACTERISTICS

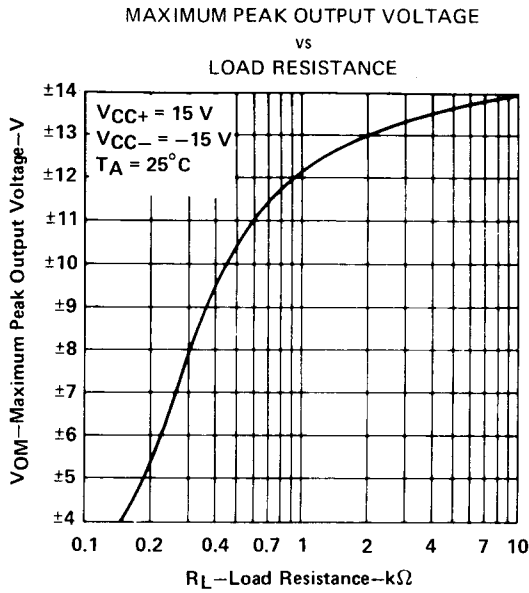


FIGURE 4

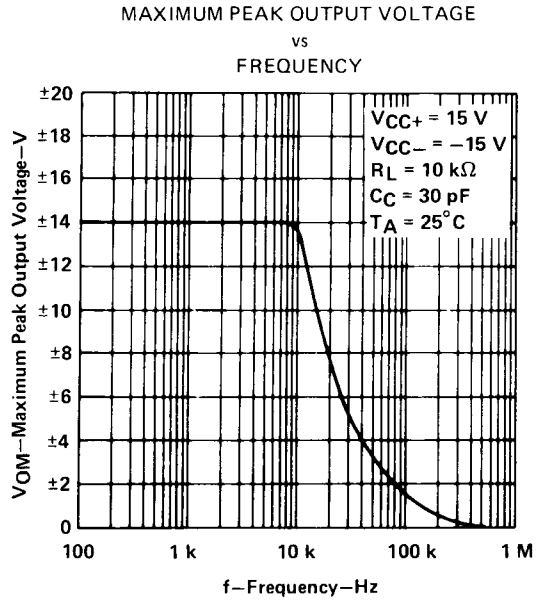


FIGURE 5

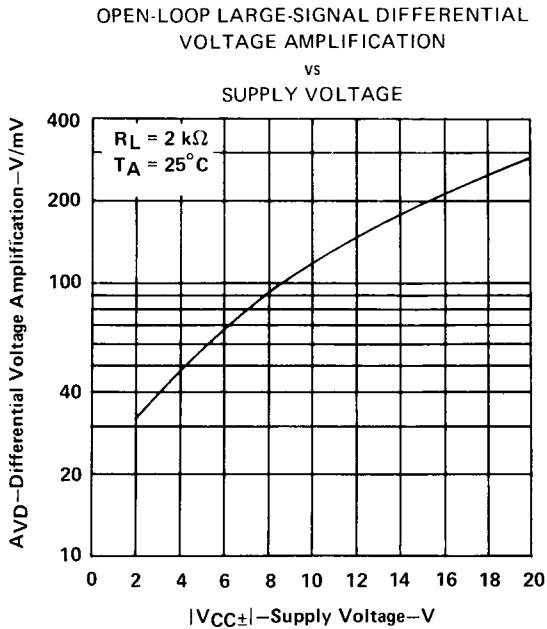


FIGURE 6

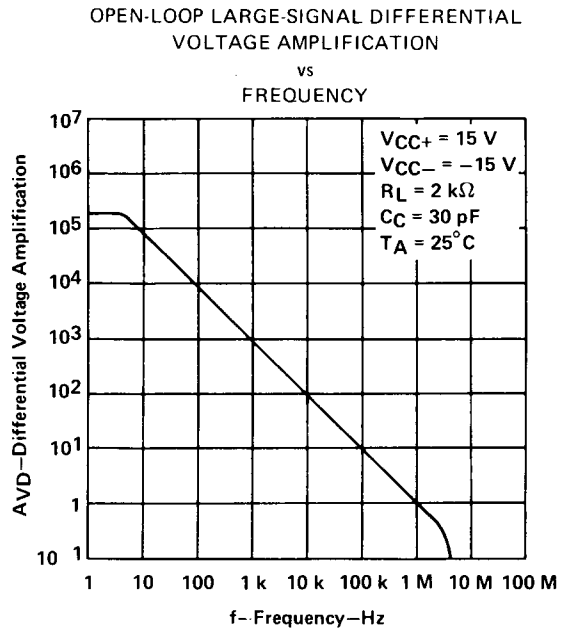


FIGURE 7

TYPICAL CHARACTERISTICS

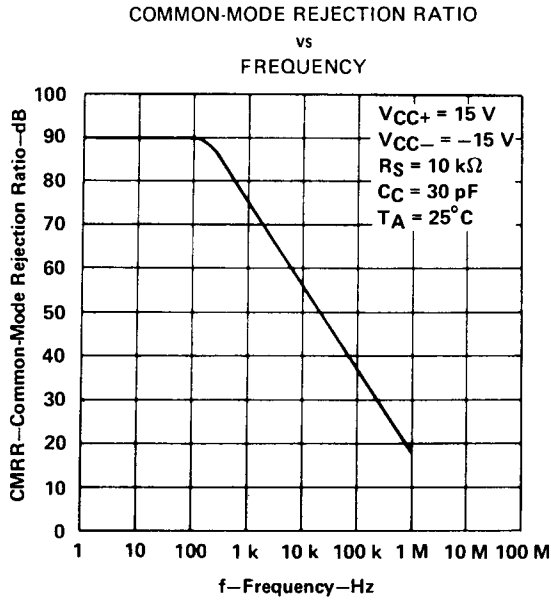


FIGURE 8

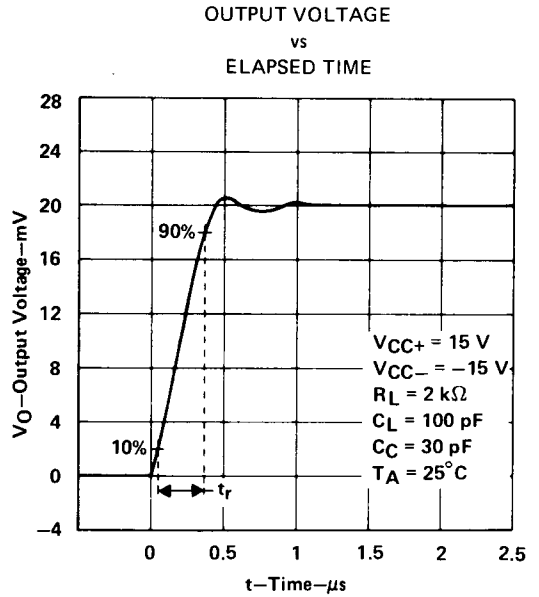


FIGURE 9

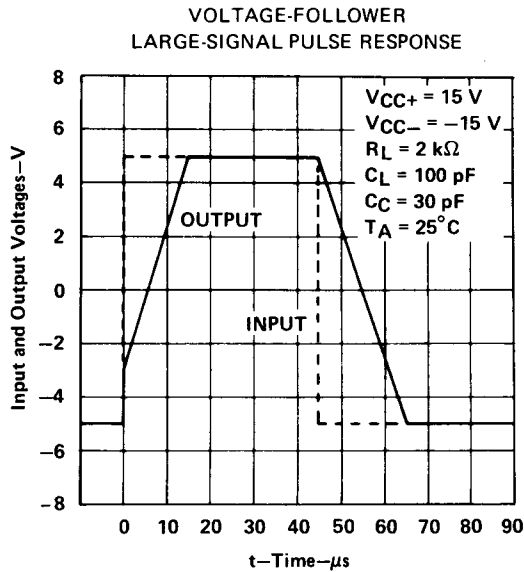


FIGURE 10

TYPICAL APPLICATION DATA

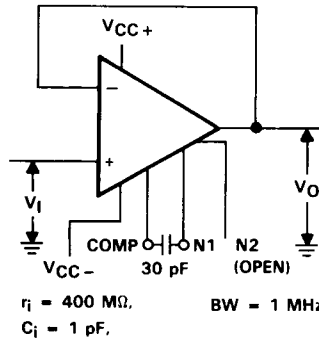
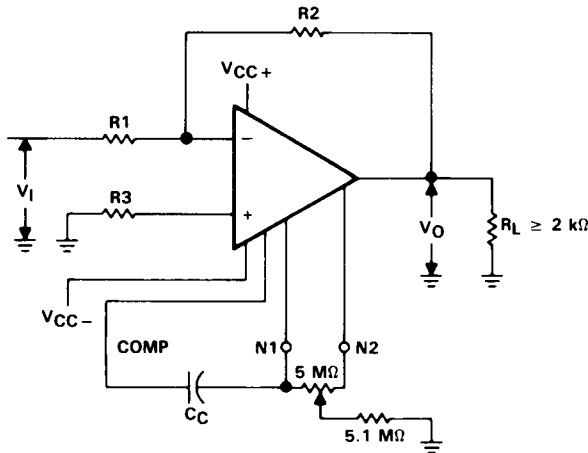


FIGURE 11. UNITY-GAIN VOLTAGE FOLLOWER



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

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

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

FIGURE 12. INVERTING CIRCUIT WITH ADJUSTABLE GAIN
COMPENSATION, AND OFFSET ADJUSTMENT