T-79-05-10

## ORDERING INFORMATION

| Device | Temperature Range | Package |
|---|---|---|
| MC1748G | −55°C to +125°C | Metal Can |
| MC1748U | −55°C to +125°C | Ceramic DIP |
| MC1748CG | 0°C to +70°C | Metal Can |
| MC1748CP1 | 0°C to +70°C | Plastic DIP |
| MC1748CU | 0°C to +70°C | Ceramic DIP |

# MC1748
# MC1748C

## HIGH PERFORMANCE OPERATIONAL AMPLIFIER

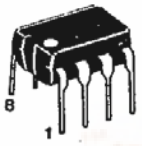
. . . designed for use as a summing amplifier, integrator, or amplifier with operating characteristics as a function of the external feedback components.

- Noncompensated MC1741
- Single 30 pF Capacitor Compensation Required For Unity Gain
- Short-Circuit Protection
- Offset Voltage Null Capability
- Wide Common-Mode and Differential Voltage Ranges
- Low-Power Consumption
- No Latch Up

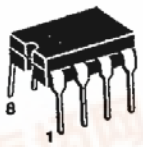
## OPERATIONAL AMPLIFIER

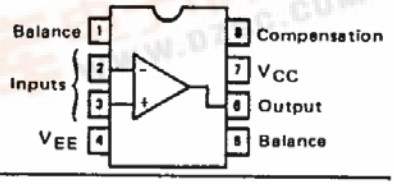
SILICON MONOLITHIC INTEGRATED CIRCUIT

**P1 SUFFIX**
PLASTIC PACKAGE
CASE 626-05
(MC1748C Only)

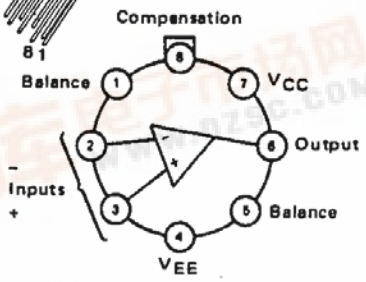


**U SUFFIX**
CERAMIC PACKAGE
CASE 693-02

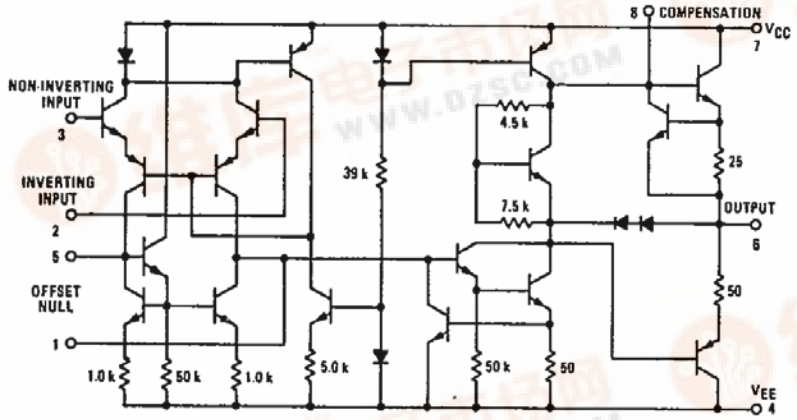





**G SUFFIX**
METAL PACKAGE
CASE 601-04

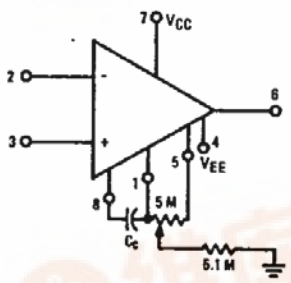



### FIGURE 1 – CIRCUIT SCHEMATIC

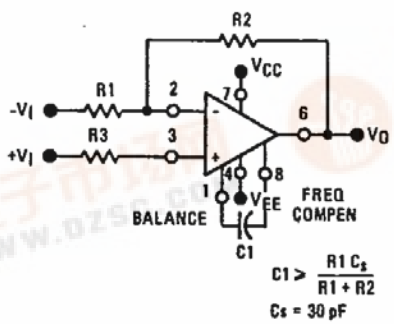



## TYPICAL COMPENSATION CIRCUITS

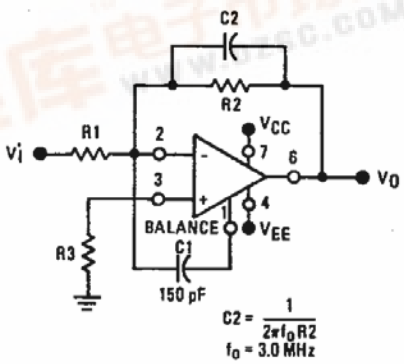
### FIGURE 2 – OFFSET ADJUST AND FREQUENCY COMPENSATION




### FIGURE 3 – SINGLE-POLE COMPENSATION




### FIGURE 4 – FEEDFORWARD COMPENSATION



**MAXIMUM RATINGS** ($T_A$ = +25°C unless otherwise noted)

| Rating | Symbol | MC1748 | MC1748C | Unit |
|---|---|---|---|---|
| Power Supply Voltage | $V_{CC}$<br>$V_{EE}$ | +22<br>-22 | +18<br>-18 | Vdc |
| Differential Input Signal | $V_{in}$ | ±30 | | Volts |
| Common-Mode Input Swing ① | $V_{ICR}$ | ±15 | | Volts |
| Output Short Circuit Duration | $t_s$ | Continuous | | |
| Power Dissipation (Package Limitation)<br>Derate above $T_A$ = +25°C | $P_D$ | 680<br>4.6 | | mW<br>mW/°C |
| Operating Temperature Range | $T_A$ | -55 to +125 | 0 to +70 | °C |
| Storage Temperature Range | $T_{stg}$ | -65 to +150 | -65 to +150 | °C |

**ELECTRICAL CHARACTERISTICS** ($V_{CC}$ = +15 Vdc, $V_{EE}$ = -15 Vdc, $T_A$ = +25°C unless otherwise noted.)

| Characteristics | Symbol | MC1748 | | | MC1748C | | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Typ | Max | |
| Input Bias Current | $I_{IB}$ | | | | | | | μAdc |
| $T_A$ = +25°C | | – | 0.08 | 0.5 | – | 0.08 | 0.5 | |
| $T_A$ = $T_{low}$ to $T_{high}$ ② | | – | 0.3 | 1.5 | – | – | 0.8 | |
| Input Offset Current | $\|I_{IO}\|$ | | | | | | | μAdc |
| $T_A$ = +25°C | | – | 0.02 | 0.2 | – | 0.02 | 0.2 | |
| $T_A$ = $T_{low}$ to $T_{high}$ | | – | 0.08 | 0.5 | – | – | 0.3 | |
| Input Offset Voltage ($R_S \leq 10$ k Ω) | $\|V_{IO}\|$ | | | | | | | mVdc |
| $T_A$ = +25°C | | – | 1.0 | 5.0 | – | 1.0 | 6.0 | |
| $T_A$ = $T_{low}$ to $T_{high}$ | | – | – | 6.0 | – | – | 7.5 | |
| Differential Input Impedance (Open-Loop, f = 20 Hz) | | | | | | | | |
| Parallel Input Resistance | $R_p$ | 0.3 | 2.0 | – | 0.3 | 2.0 | – | Megohm |
| Parallel Input Capacitance | $C_p$ | – | 1.4 | – | – | 1.4 | – | pF |
| Common-Mode Input Impedance (f 20 Hz) | $z_{in}$ | – | 200 | – | – | 200 | | Megohms |
| Common-Mode Input Voltage Swing | $V_{ICR}$ | ±12 | ±13 | – | ±12 | ±13 | – | $V_{pk}$ |
| Common-Mode Rejection Ratio (f = 100 Hz) | CMRR | 70 | 90 | – | 70 | 90 | – | dB |
| Open-Loop Voltage Gain, ($V_o$ = ±10 V, $R_L$ = 2.0 k ohms) | $A_{vol}$ | | | | | | | V/V |
| $T_A$ = +25°C | | 50,000 | 200,000 | – | 20,000 | 200,000 | – | |
| $T_A$ = $T_{low}$ to $T_{high}$ | | 25,000 | – | – | 15,000 | – | – | |
| Step Response ($V_{in}$ = 20 mV, $C_c$ = 30 pF, $R_L$ = 2 kΩ, $C_L$ = 100 pF) | | | | | | | | |
| Rise Time | $t_r$ | – | 0.3 | – | – | 0.3 | – | μs |
| Overshoot Percentage | | – | 5.0 | – | – | 5.0 | – | % |
| Slew Rate | $dV_{out}/dt$ | – | 0.8 | – | – | 0.8 | – | V/μs |
| Output Impedance (f = 20 Hz) | $z_o$ | – | 75 | – | – | 75 | – | ohms |
| Short-Circuit Output Current | $I_{sc}$ | – | 25 | – | – | 25 | – | mAdc |
| Output Voltage Swing ($R_L$ = 10 k ohms) | $V_O$ | ±12 | ±14 | – | ±12 | ±14 | – | Vpk |
| $R_L$ = 2 k ohms ($T_A$ = $T_{low}$ to $t_{high}$) | | ±10 | ±13 | – | ±10 | ±13 | – | |
| Power Supply Sensitivity | | | | | | | | μV/V |
| $V_{EE}$ = constant, $R_s$ < 10 k ohms | S+ | – | 30 | 150 | – | 30 | 150 | |
| $V_{CC}$ = constant, $R_s$ < 10 k ohms | S- | – | 30 | 150 | – | 30 | 150 | |
| Power Supply Current | $I_D^+$ | – | 1.67 | 2.83 | – | 1.67 | 2.83 | mAdc |
| | $I_D^-$ | – | 1.67 | 2.83 | – | 1.67 | 2.83 | |
| DC Quiescent Power Dissipation ($V_o$ = 0) | $P_D$ | – | 50 | 85 | – | 50 | 85 | mW |

① For supply voltages less than ±15 V, the Maximum Input Voltage is equal to the Supply Voltage.

② $T_{low}$: 0°C for MC1748C
-55°C for MC1748
$T_{high}$: +70° for MC1748C
+125°C for MC1748

## TYPICAL CHARACTERISTICS

($V_{CC}$ = +15 V, $V_{EE}$ = −15 V, $T_A$ = +25°C unless otherwise noted.)

FIGURE 5 – MINIMUM INPUT VOLTAGE RANGE

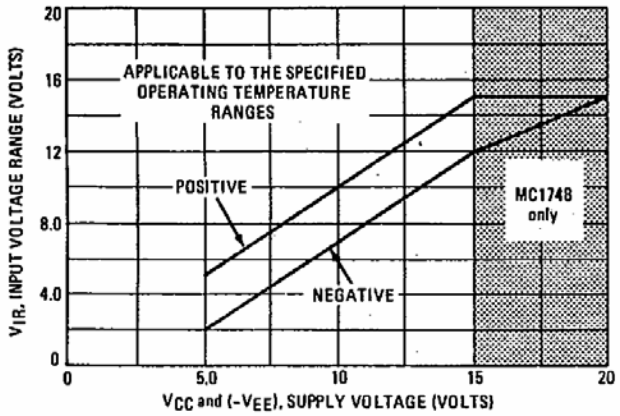



FIGURE 6 – MINIMUM OUTPUT VOLTAGE SWING

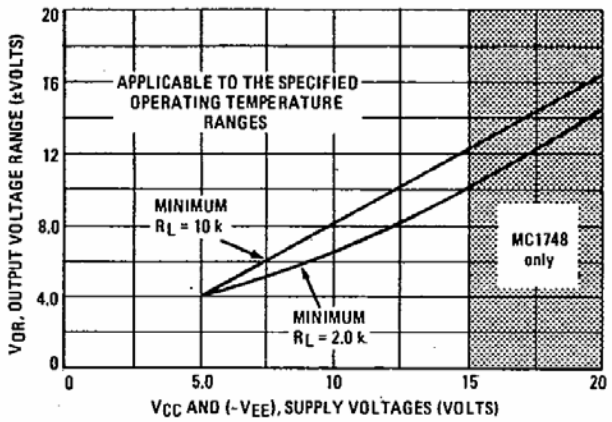



FIGURE 7 – MINIMUM VOLTAGE GAIN

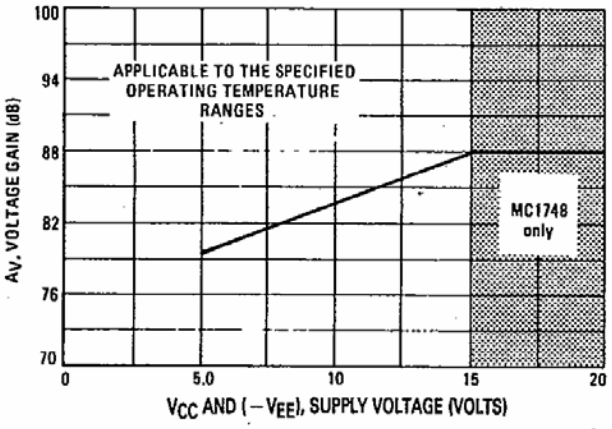



FIGURE 8 – TYPICAL SUPPLY CURRENTS

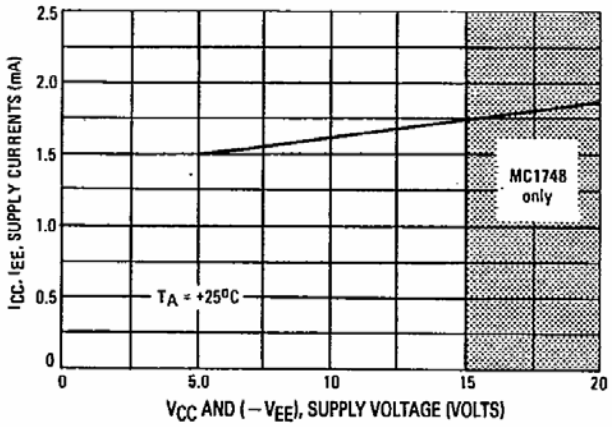



FIGURE 9 – OPEN-LOOP FREQUENCY RESPONSE

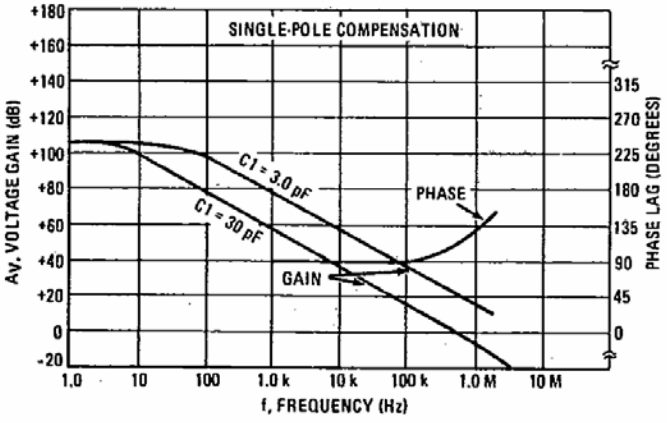
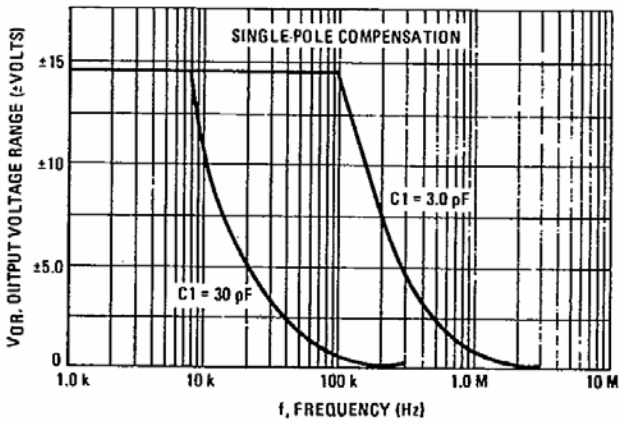



FIGURE 10 – LARGE-SIGNAL FREQUENCY RESPONSE



## TYPICAL CHARACTERISTICS (continued)

($V_{CC}$ = +15 V, $V_{EE}$ = -15 V, $T_A$ = +25°C unless otherwise noted.)

FIGURE 11 – VOLTAGE FOLLOWER PULSE RESPONSE

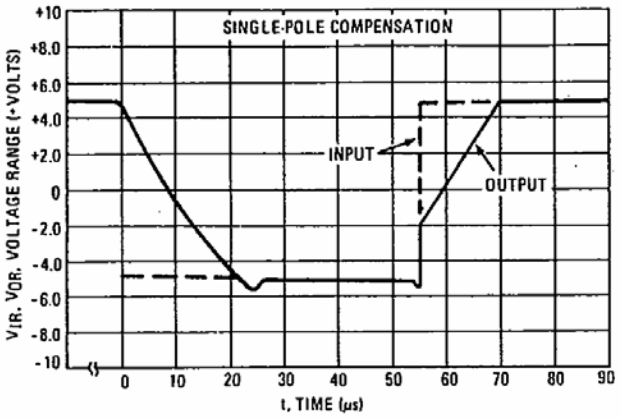



FIGURE 12 – OPEN-LOOP FREQUENCY RESPONSE

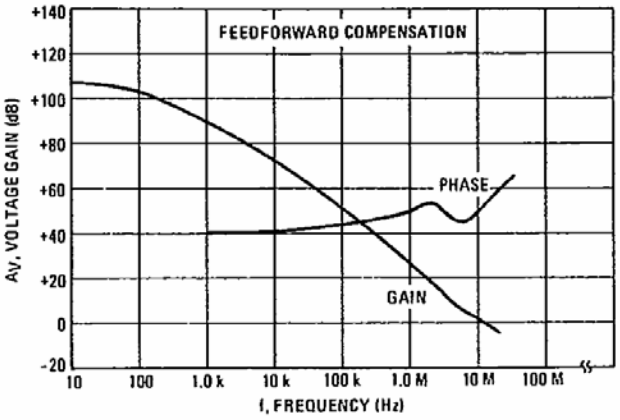



FIGURE 13 – LARGE-SIGNAL FREQUENCY RESPONSE

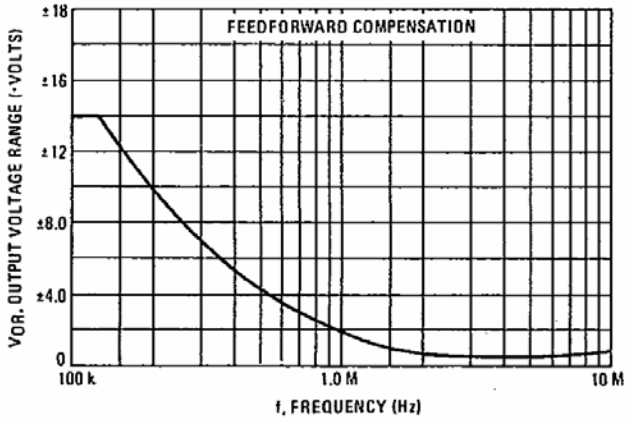



FIGURE 14 – INVERTER PULSE RESPONSE