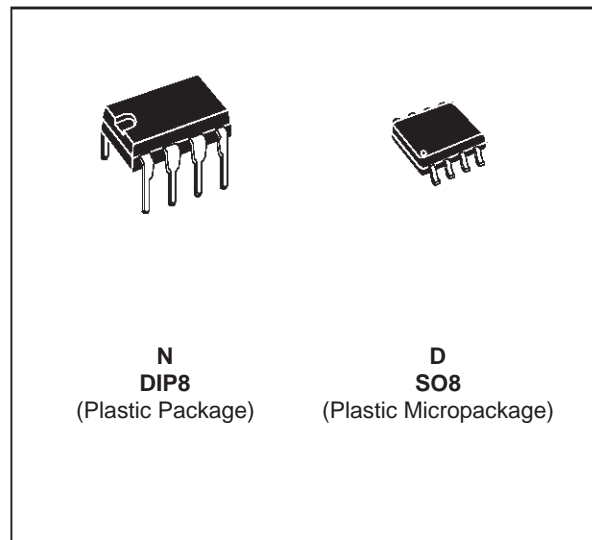


## PRECISION SINGLE OPERATIONAL AMPLIFIER

- INPUT OFFSET VOLTAGE : 3mV max. OVER TEMPERATURE
- FREQUENCY COMPENSATION WITH A SINGLE 30pF CAPACITOR (C1)
- OPERATION FROM  $\pm 5V$  to  $\pm 15V$
- LOW POWER CONSUMPTION : 50mW AT  $\pm 15V$
- CONTINUOUS SHORT-CIRCUIT PROTECTION
- OPERATION AS A COMPARATOR WITH DIFFERENTIAL INPUTS AS HIGH AS  $\pm 30V$
- NO LATCH-UP WHEN COMMON-MODE RANGE IS EXCEEDED
- SAME PIN CONFIGURATION AS THE LM101A



### ORDER CODES

| Part Number | Temperature Range | Package |   |
|-------------|-------------------|---------|---|
|             |                   | N       | D |
| UA748C      | 0°C, +70°C        | •       | • |
| UA748I      | -40°C, +105°C     | •       | • |
| UA748M      | -55°C, +125°C     | •       | • |

**Example :** UA748CN

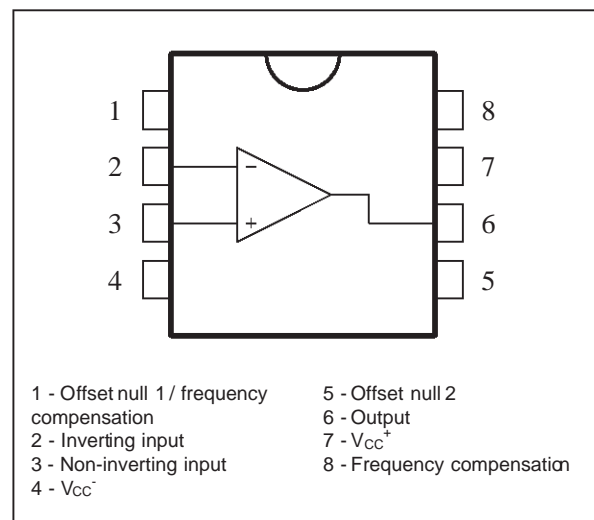
### DESCRIPTION

The UA748 is a general purpose operational amplifier built on a single silicon chip. The resulting close match and tight thermal coupling gives low offsets and temperature drift as well as fast recovery from thermal transients.

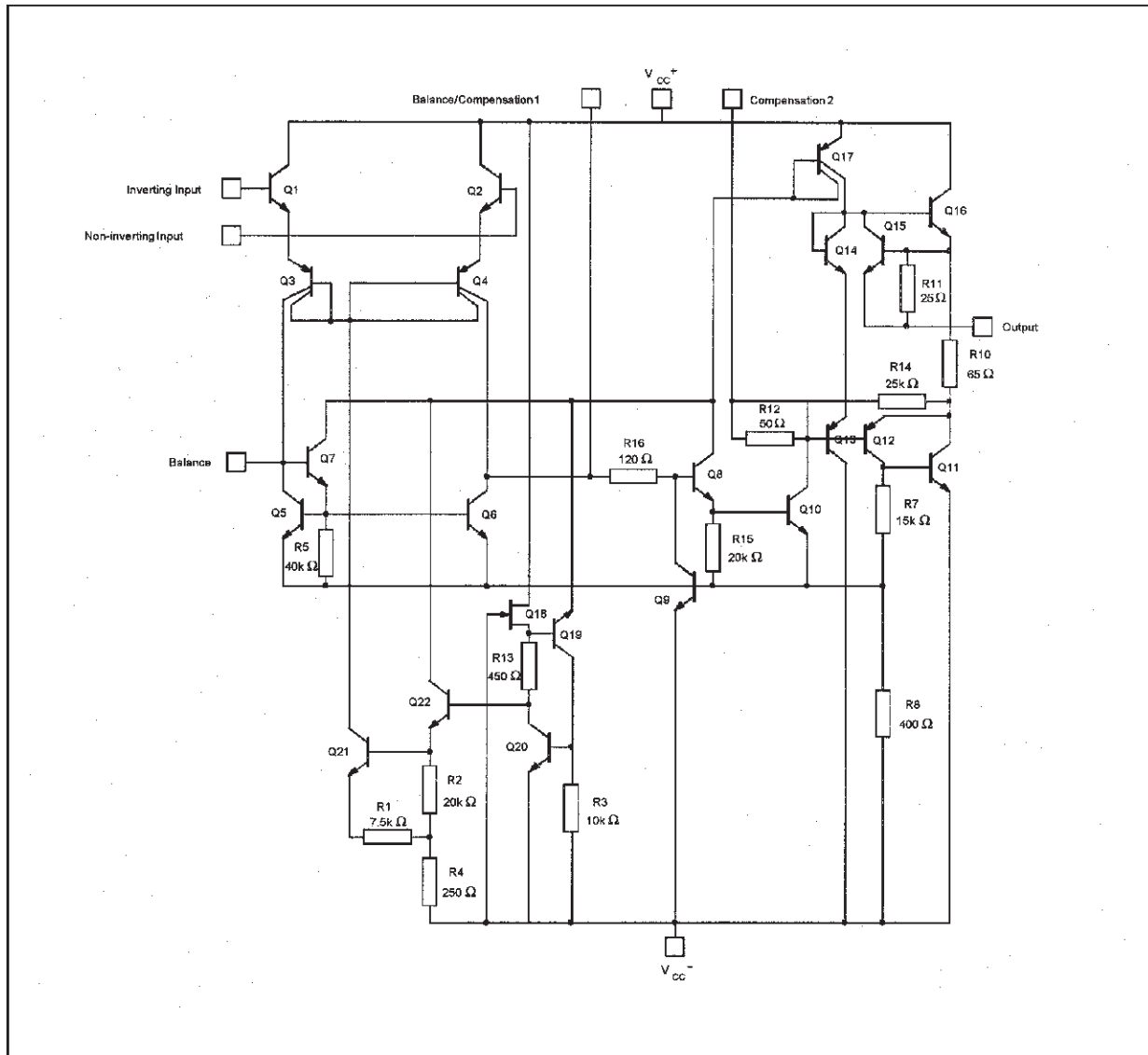
- Short-circuit protection
- Offset voltage null capability
- Large common-mode and differential voltage ranges
- Low power consumption
- No latch-up

The unity-gain compensation specified makes the circuit stable for all feedback configurations, even with capacitive loads. However, it is possible to optimize compensation for best high frequency performance at any gain. The low power dissipation permits high voltage operation and simplifies packaging in full-temperature range systems.

### PIN CONNECTIONS (top view)



**SCHEMATIC DIAGRAM**



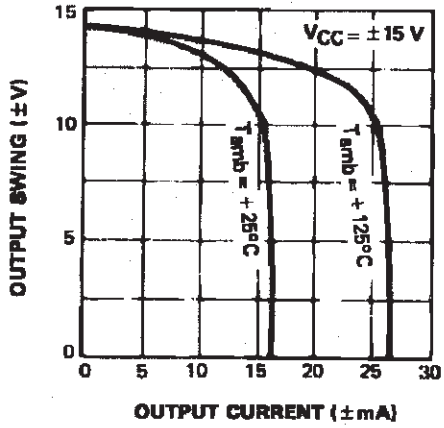
**ABSOLUTE MAXIMUM RATINGS**

| Symbol     | Parameter                            | UA748M      | UA748I      | UA748C      | Unit |
|------------|--------------------------------------|-------------|-------------|-------------|------|
| $V_{cc}$   | Supply Voltage                       | ±22         |             |             | V    |
| $V_{id}$   | Differential Input Voltage           | ±30         |             |             | V    |
| $V_i$      | Input Voltage                        | ±15         |             |             | V    |
| $P_{tot}$  | Power Dissipation                    | 500         |             |             | mW   |
|            | Output Short-circuit Duration        | Infinite    |             |             |      |
| $T_{oper}$ | Operating Free Air Temperature Range | -55 to +125 | -40 to +105 | 0 to +70    | °C   |
| $T_{stg}$  | Storage Temperature Range            | -65 to +150 | -65 to +150 | -65 to +150 | °C   |

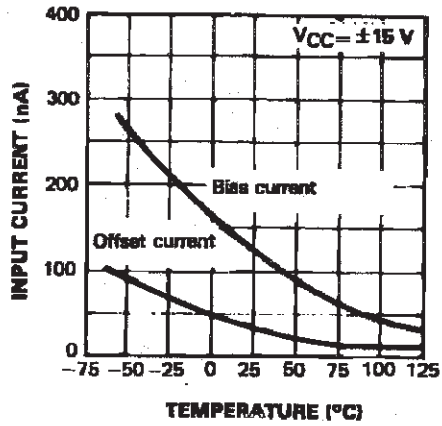
**ELECTRICAL CHARACTERISTICS**
 $\pm 5V \leq V_{CC} \leq \pm 20V$ ,  $C_1 = 30pF$ ,  $T_{amb} = +25^\circ C$  (unless otherwise specified)

| Symbol        | Parameter   | UA748I/M             |          |            | UA748C               |                  |            | Unit             |
|---------------|---|----------------------|----------|------------|----------------------|------------------|------------|------------------|
|               |   | Min.                 | Typ.     | Max.       | Min.                 | Typ.             | Max.       |                  |
| $V_{io}$      | Input Offset Voltage ( $R_S \leq 10k\Omega$ )<br>$T_{amb} = +25^\circ C$<br>$T_{min.} \leq T_{amb} \leq T_{max.}$   |                      | 0.2      | 2<br>3     |                      | 2<br>7.5<br>10   |            | mV               |
| $I_{io}$      | Input Offset Current<br>$T_{amb} = +25^\circ C$<br>$T_{min.} \leq T_{amb} \leq T_{max.}$  |                      | 25       | 75<br>10   |                      | 70<br>250<br>300 |            | nA               |
| $I_{ib}$      | Input Bias Current<br>$T_{amb} = +25^\circ C$<br>$T_{min.} \leq T_{amb} \leq T_{max.}$  |                      | 1.5      | 10<br>20   |                      | 2<br>50<br>70    |            | nA               |
| $A_{vd}$      | Large Signal Voltage Gain *<br>( $V_{CC} = \pm 15V$ , $V_O \pm 10V$ , $R_L = 2k\Omega$ )<br>$T_{amb} = +25^\circ C$<br>$T_{min.} \leq T_{amb} \leq T_{max.}$                                      | 50<br>25             | 100      |            | 25<br>15             | 10               |            | V/mV             |
| SVR           | Supply Voltage Rejection Ratio ( $R_S \leq 10k\Omega$ )<br>$T_{amb} = +25^\circ C$<br>$T_{min.} \leq T_{amb} \leq T_{max.}$   | 80<br>80             | 96       |            | 70<br>70             | 96               |            | dB               |
| $I_{CC}$      | Supply Current, no load<br>$T_{amb} = +25^\circ C$<br>$T_{min.} \leq T_{amb} \leq T_{max.}$   |                      | 1.8      | 3<br>3     |                      | 1.8<br>3<br>3    |            | mA               |
| $V_{icm}$     | Input Common Mode Voltage Range ( $V_{CC} = \pm 20V$ )<br>$T_{amb} = +25^\circ C$<br>$T_{min.} \leq T_{amb} \leq T_{max.}$  | $\pm 15$<br>$\pm 15$ |          |            | $\pm 15$<br>$\pm 15$ |                  |            | V                |
| CMR           | Common-mode Rejection Ratio ( $R_S \leq 10k\Omega$ )<br>$T_{amb} = +25^\circ C$<br>$T_{min.} \leq T_{amb} \leq T_{max.}$  | 80<br>80             | 96       |            | 70<br>70             | 96               |            | dB               |
| $I_{OS}$      | Output Short-circuit Current ( $V_{CC} = \pm 15V$ )   | 10                   | 30       | 50         | 10                   | 30               | 50         | mA               |
| $\pm V_{OPP}$ | Output Voltage Swing ( $V_{CC} = \pm 15V$ )<br>$T_{amb} = +25^\circ C$<br>$R_L = 10k\Omega$<br>$R_L = 2k\Omega$<br>$T_{min.} \leq T_{amb} \leq T_{max.}$<br>$R_L = 10k\Omega$<br>$R_L = 2k\Omega$ | 12<br>10<br>12<br>10 | 14<br>13 |            | 12<br>10<br>12<br>10 | 14<br>13         |            | V                |
| SR            | Slew Rate<br>( $V_i = \pm 10V$ , $R_L = 2k\Omega$ , $C_L = 100pF$ , unity gain)   | 0.25                 | 0.5      |            | 0.25                 | 0.5              |            | V/ $\mu s$       |
| $t_r$         | Rise Time<br>( $V_i = \pm 20mV$ , $R_L = 2k\Omega$ , $C_L = 100pF$ , unity gain)  |                      | 0.3      |            |                      | 0.3              |            | $\mu s$          |
| $K_{OV}$      | Overshoot<br>( $V_i = 20mV$ , $R_L = 2k\Omega$ , $C_L = 100pF$ , unity gain)  |                      | 5        |            |                      | 5                |            | %                |
| $Z_i$         | Input Impedance ( $V_{CC} = \pm 15V$ )  | 1.5                  | 4        |            | 1.5                  | 4                |            | $M\Omega$        |
| $R_o$         | Output Resistance ( $V_{CC} = \pm 15V$ )  |                      | 75       |            |                      | 75               |            | $\Omega$         |
| GBP           | Gain Bandwidth Product<br>( $V_i = 10mV$ , $R_L = 2k\Omega$ , $C_L = 100pF$ , $f = 100kHz$ )  | 0.5                  | 1        |            | 0.5                  | 1                |            | MHz              |
| THD           | Total Harmonic Distortion<br>( $f = 1kHz$ , $A_V = 20dB$ , $R_L = 2k\Omega$ , $V_O = 2V_{PP}$ , $C_L = 100pF$ )   |                      | 0.015    |            |                      | 0.015            |            | %                |
| $DV_{io}$     | Input Offset Current Drift<br>$25^\circ C \leq T_{amb} \leq T_{max.}$<br>$T_{min.} \leq T_{amb} \leq T_{max.}$  |                      | 10<br>20 | 100<br>200 |                      | 10<br>20         | 300<br>600 | $pA/^\circ C$    |
| $DI_{io}$     | Input Offset Voltage Drift<br>$T_{min.} \leq T_{amb} \leq T_{max.}$   |                      | 3        | 15         |                      | 6                | 30         | $\mu V/^\circ C$ |

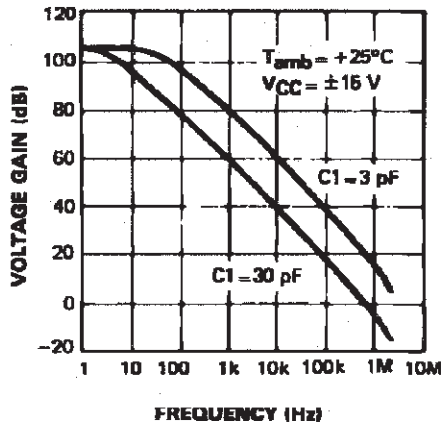
**CURRENT LIMITING**



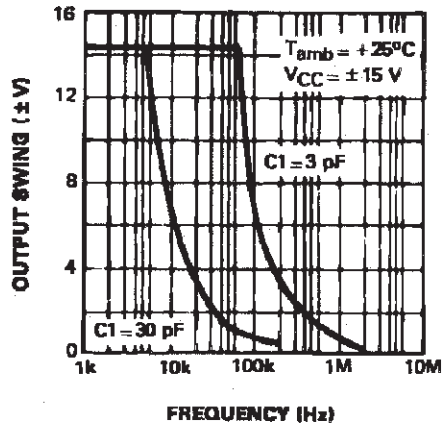
**INPUT CURRENT**



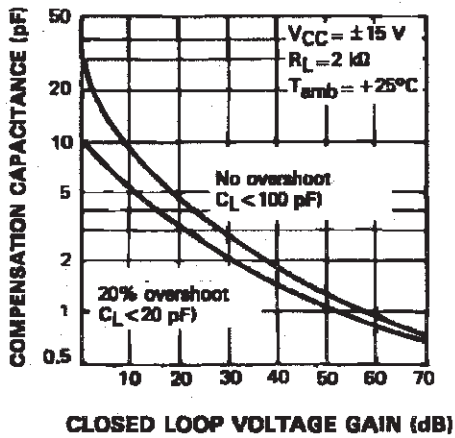
**OPEN LOOP FREQUENCY RESPONSE**



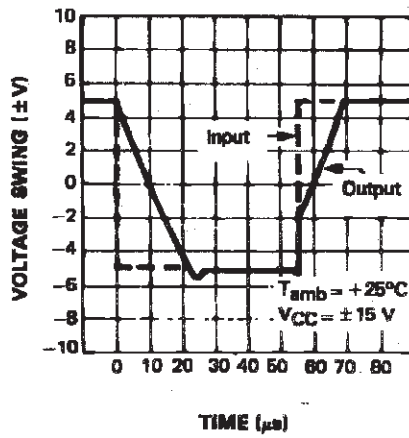
**LARGE SIGNAL FREQUENCY RESPONSE**



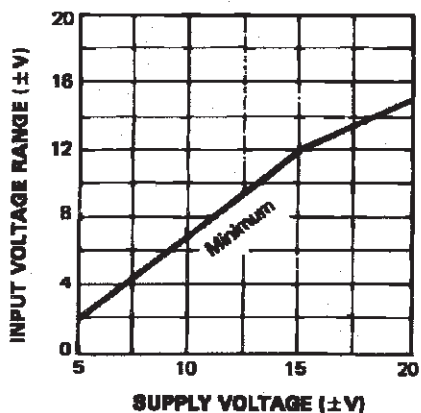
**FREQUENCY COMPENSATION**



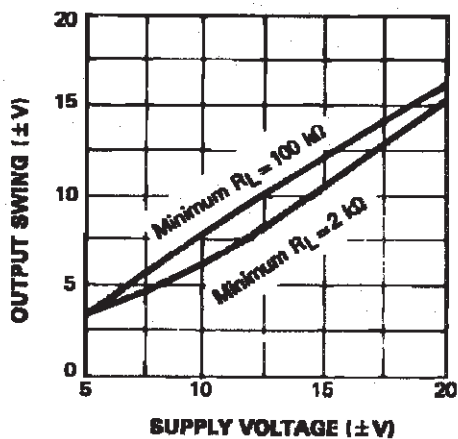
**VOLTAGE FOLLOWER PULSE RESPONSE**



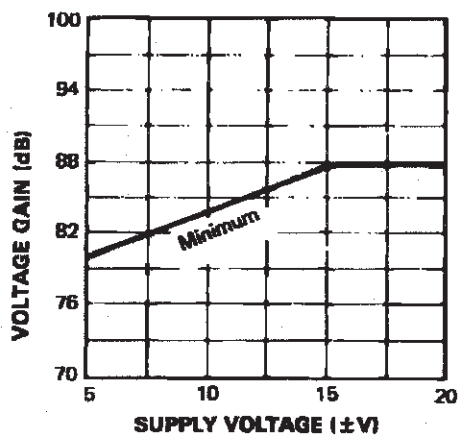
INPUT VOLTAGE RANGE



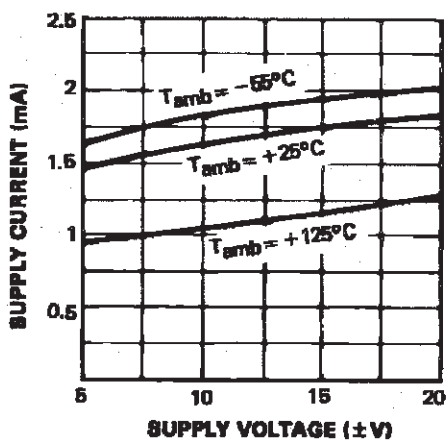
OUTPUT SWING



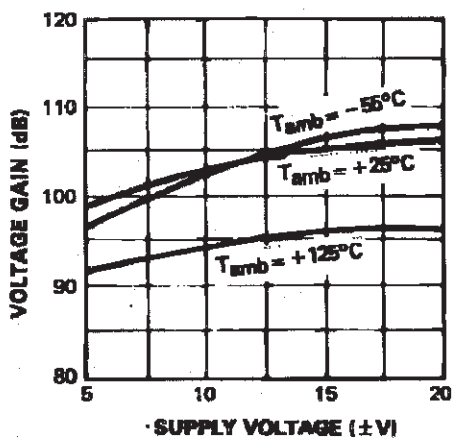
VOLTAGE GAIN



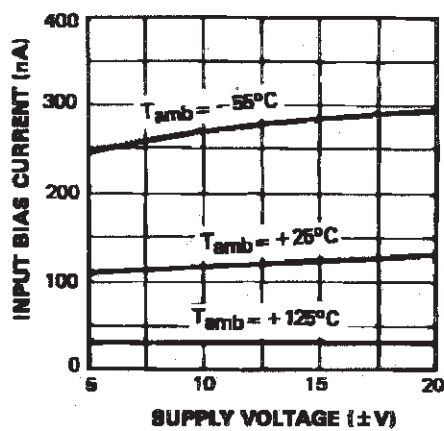
SUPPLY CURRENT



VOLTAGE GAIN

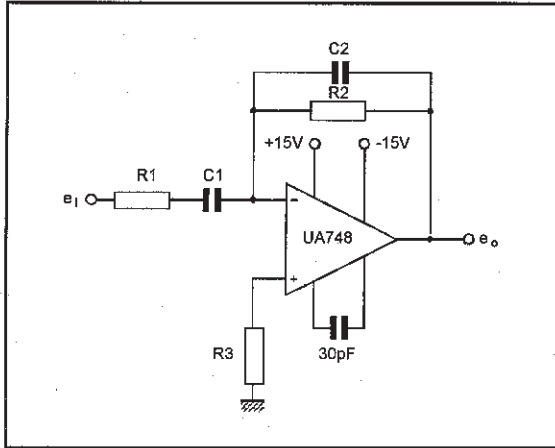


INPUT BIAS CURRENT



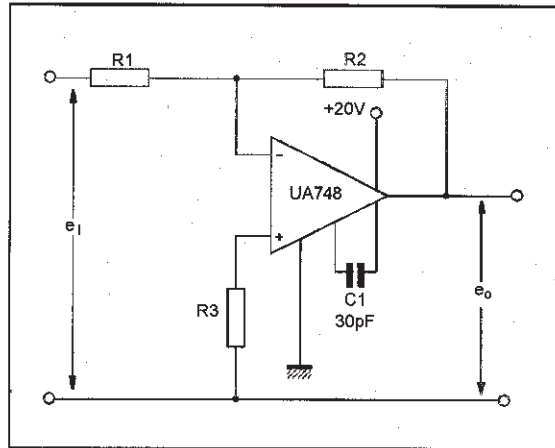
TYPICAL APPLICATIONS

PRACTICAL DIFFERENTIATOR



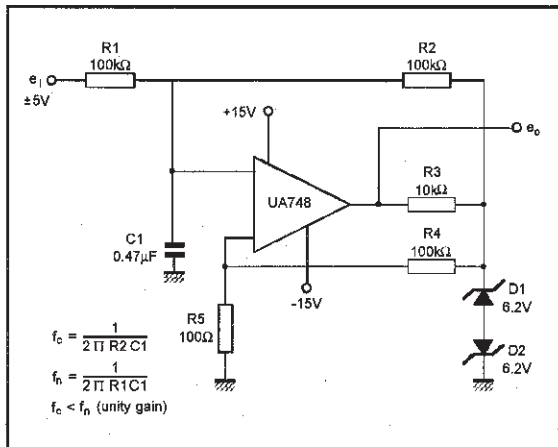
748-16 ERS

SINGLE SUPPLY OPERATION



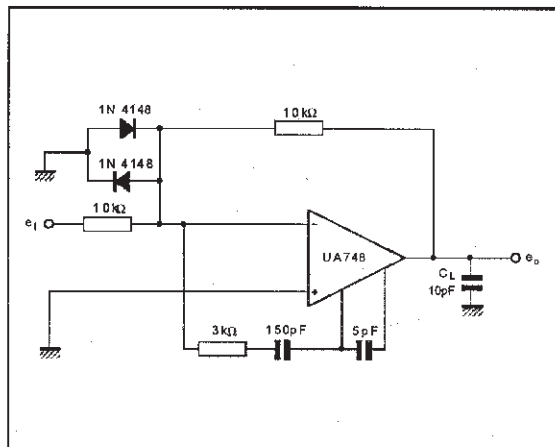
748-17 ERS

PULSE WIDTH MODULATOR



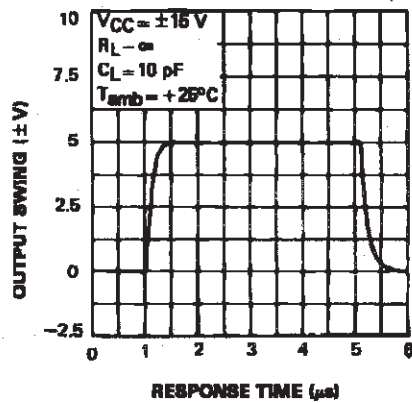
748-18 ERS

FEED-FORWARD COMPENSATION

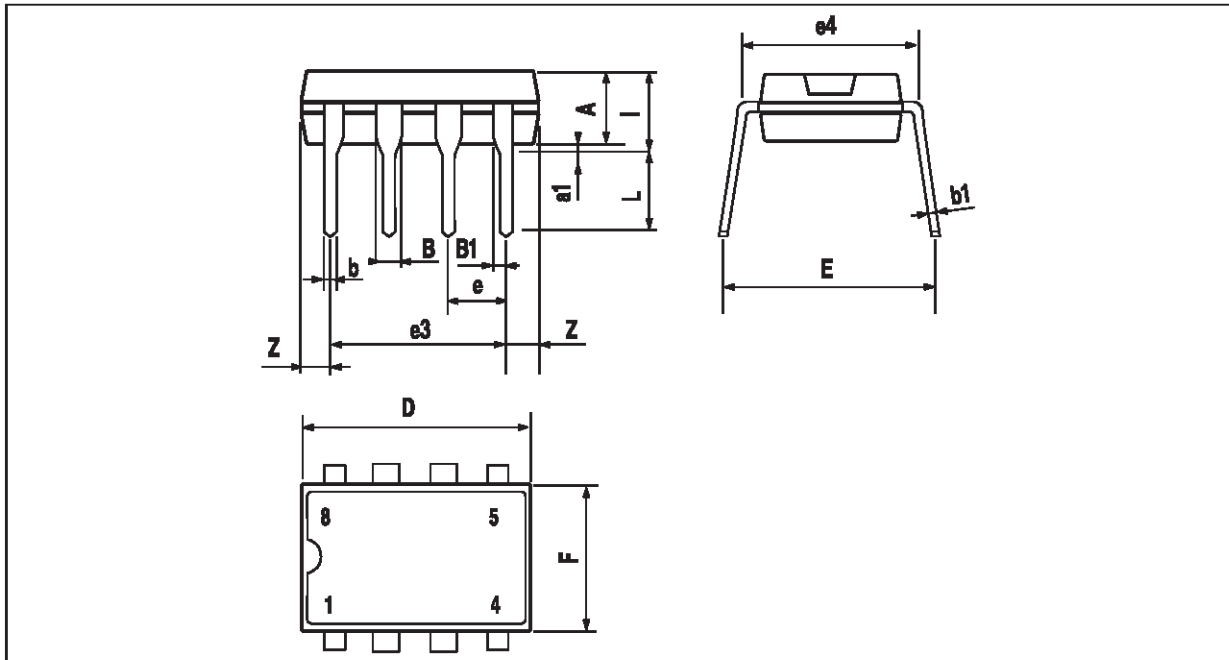


748-19 ERS

LARGE SIGNAL FEED-FORWARD TRANSIENT RESPONSE

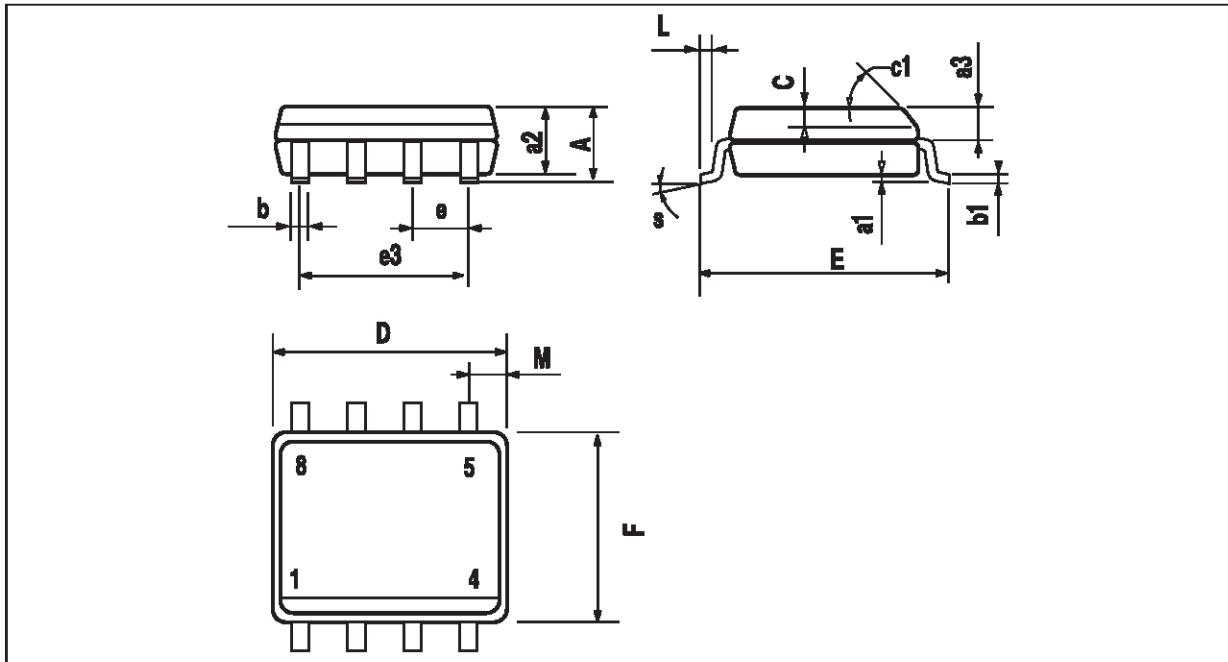


**PACKAGE MECHANICAL DATA**  
8 PINS - PLASTIC DIP



| Dim. | Millimeters |      |       | Inches |       |       |
|------|-------------|------|-------|--------|-------|-------|
|      | Min.        | Typ. | Max.  | Min.   | Typ.  | Max.  |
| A    |             | 3.32 |       |        | 0.131 |       |
| a1   | 0.51        |      |       | 0.020  |       |       |
| B    | 1.15        |      | 1.65  | 0.045  |       | 0.065 |
| b    | 0.356       |      | 0.55  | 0.014  |       | 0.022 |
| b1   | 0.204       |      | 0.304 | 0.008  |       | 0.012 |
| D    |             |      | 10.92 |        |       | 0.430 |
| E    | 7.95        |      | 9.75  | 0.313  |       | 0.384 |
| e    |             | 2.54 |       |        | 0.100 |       |
| e3   |             | 7.62 |       |        | 0.300 |       |
| e4   |             | 7.62 |       |        | 0.300 |       |
| F    |             |      | 6.6   |        |       | 0.260 |
| i    |             |      | 5.08  |        |       | 0.200 |
| L    | 3.18        |      | 3.81  | 0.125  |       | 0.150 |
| Z    |             |      | 1.52  |        |       | 0.060 |

**PACKAGE MECHANICAL DATA**  
 8 PINS - PLASTIC MICROPACKAGE (SO)



| Dim. | Millimeters |      |      | Inches |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    |             |      | 1.75 |        |       | 0.069 |
| a1   | 0.1         |      | 0.25 | 0.004  |       | 0.010 |
| a2   |             |      | 1.65 |        |       | 0.065 |
| a3   | 0.65        |      | 0.85 | 0.026  |       | 0.033 |
| b    | 0.35        |      | 0.48 | 0.014  |       | 0.019 |
| b1   | 0.19        |      | 0.25 | 0.007  |       | 0.010 |
| C    | 0.25        |      | 0.5  | 0.010  |       | 0.020 |
| c1   | 45° (typ.)  |      |      |        |       |       |
| D    | 4.8         |      | 5.0  | 0.189  |       | 0.197 |
| E    | 5.8         |      | 6.2  | 0.228  |       | 0.244 |
| e    |             | 1.27 |      |        | 0.050 |       |
| e3   |             | 3.81 |      |        | 0.150 |       |
| F    | 3.8         |      | 4.0  | 0.150  |       | 0.157 |
| L    | 0.4         |      | 1.27 | 0.016  |       | 0.050 |
| M    |             |      | 0.6  |        |       | 0.024 |
| S    | 8° (max.)   |      |      |        |       |       |

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