

GENERAL PURPOSE SINGLE OPERATIONAL AMPLIFIERS

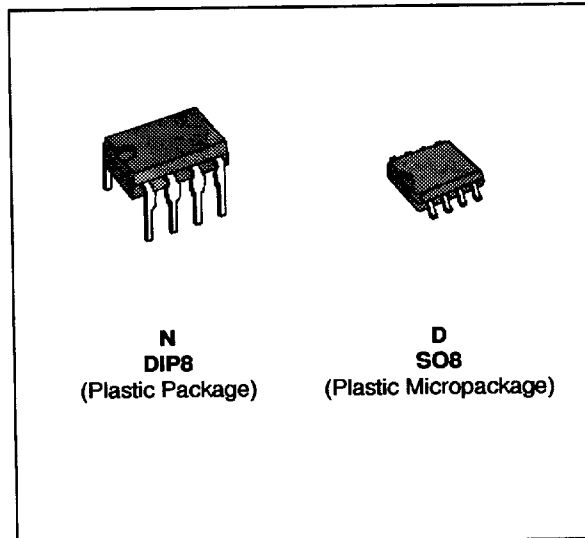
- LARGE INPUT VOLTAGE RANGE
- NO LATCH-UP
- HIGH GAIN
- SHORT-CIRCUIT PROTECTION
- NO FREQUENCY COMPENSATION REQUIRED
- SAME PIN CONFIGURATION AS THE UA709
- ESD INTERNAL PROTECTION

DESCRIPTION

The UA741 is a high performance monolithic operational amplifier constructed on a single silicon chip. It is intended for a wide range of analog applications.

- Summing amplifier
- Voltage follower
- Integrator
- Active filter
- Function generator

The high gain and wide range of operating voltages provide superior performances in integrator, summing amplifier and general feedback applications. The internal compensation network (6dB / octave) insures stability in closed loop circuits.

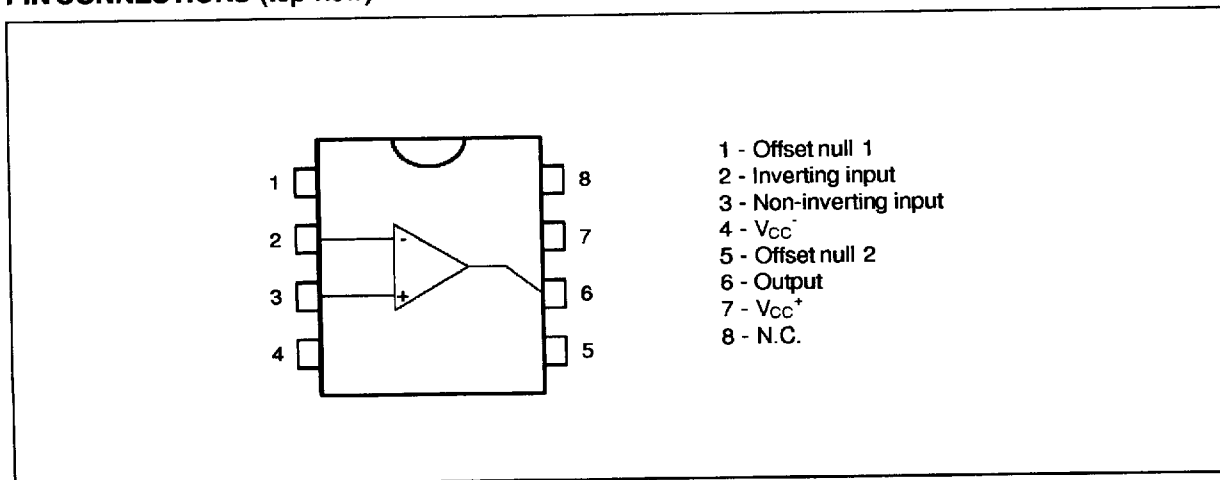


ORDER CODES

| Part Number | Temperature Range | Package | |
|--------------------------|-------------------|---------|---|
| | | N | D |
| UA741C/E | 0°C, +70°C | • | • |
| UA741I | -40°C, +105°C | • | • |
| UA741M/A | -55°C, +125°C | • | • |
| Example : UA741CN | | | |

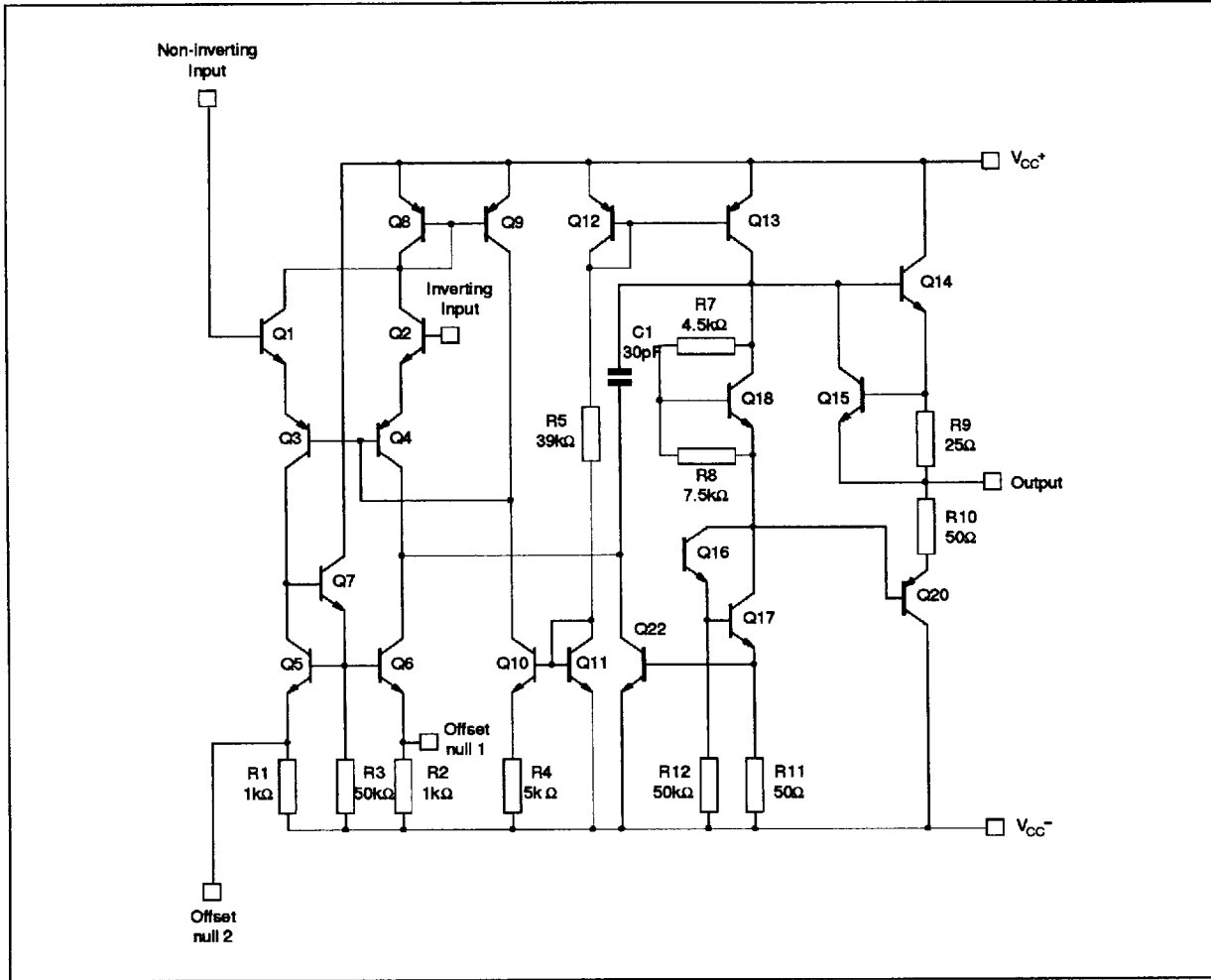
741-01 TBL

PIN CONNECTIONS (top view)



- 1 - Offset null 1
- 2 - Inverting input
- 3 - Non-inverting input
- 4 - V_{CC}^-
- 5 - Offset null 2
- 6 - Output
- 7 - V_{CC}^+
- 8 - N.C.

SCHEMATIC DIAGRAM



741-08 EPS

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | UA741M-A | UA741I | UA741C-E | Unit |
|------------|--------------------------------------|-------------|-------------|-------------|-------------|
| V_{CC} | Supply Voltage | ± 22 | ± 22 | ± 22 | V |
| V_i | Input Voltage - (note1) | ± 15 | ± 15 | ± 15 | V |
| V_{id} | Differential Input Voltage | ± 30 | ± 30 | ± 30 | V |
| P_{tot} | Power Dissipation | 500 | 500 | 500 | mW |
| | Output Short-circuit Duration | Infinite | | | |
| T_{oper} | Operating Free Air Temperature Range | -55 to +125 | -40 to +105 | 0 to +70 | $^{\circ}C$ |
| T_{stg} | Storage Temperature Range | -65 to +150 | -65 to +150 | -65 to +150 | $^{\circ}C$ |

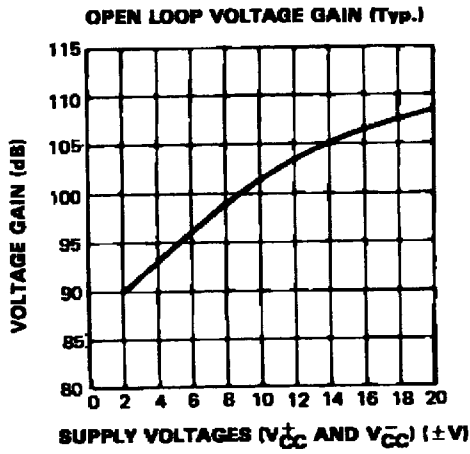
741-02 TB

Note : 1. The magnitude of the input voltage must never exceed the magnitude of the positive and negative supply voltage.

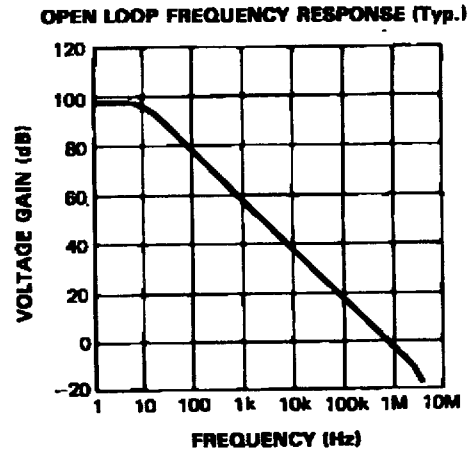
ELECTRICAL CHARACTERISTICS $V_{CC} = \pm 15V$, $T_{amb} = 25^{\circ}C$ (unless otherwise specified)

| Symbol | Parameter | Min. | Typ. | Max. | Unit |
|---------------|---|--|----------------------------------|------------|------------------------|
| V_{io} | Input Offset Voltage ($R_s \leq 10k\Omega$) $T_{amb} = 25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$ UA741E,A $T_{amb} = 25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$ | | 1 | 5 6 | mV |
| I_{io} | Input Offset Current $T_{amb} = 25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$ | | 2 | 30 70 | nA |
| I_{ib} | Input Bias Current $T_{amb} = 25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$ | | 10 | 100 200 | nA |
| A_{vd} | Large Signal Voltage Gain ($V_o = \pm 10V$, $R_L = 2k\Omega$) $T_{amb} = 25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$ | 50 25 | 200 | | V/mV |
| SVR | Supply Voltage Rejection Ratio ($R_s \leq 10k\Omega$) $T_{amb} = 25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$ | 77 77 | 90 | | dB |
| I_{CC} | Supply Current, no load $T_{amb} = 25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$ | | 1 | 2.8 3.3 | mA |
| V_{icm} | Input Common Mode Voltage Range $T_{amb} = 25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$ | ± 12 ± 12 | | | V |
| CMR | Common Mode Rejection Ratio ($R_s \leq 10k\Omega$) $T_{amb} = 25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$ | 70 70 | 90 | | dB |
| I_{os} | Output Short-circuit Current | 10 | 35 | | mA |
| $\pm V_{OPP}$ | Output Voltage Swing $T_{amb} = 25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$ | $R_L = 10k\Omega$ $R_L = 2k\Omega$ $R_L = 10k\Omega$ $R_L = 2k\Omega$ | 12 14 10 13 12 10 | | V |
| SR | Slew Rate ($V_i = \pm 10V$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25^{\circ}C$, unity gain) | 0.25 | 0.5 | | V/ μs |
| t_r | Rise Time ($V_i = \pm 20mV$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25^{\circ}C$, unity gain) | | 0.3 | | μs |
| K_{OV} | Overshoot ($V_i = \pm 20mV$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25^{\circ}C$, unity gain) | | 5 | | % |
| R_i | Input Resistance | 0.3 | 2 | | M Ω |
| GBP | Gain Bandwidth Product ($V_i = 10mV$, $R_L = 2k\Omega$, $C_L = 100pF$, $f = 100kHz$) | 0.7 | 1 | | MHz |
| THD | Total Harmonic Distortion ($f = 1kHz$, $A_V = 20dB$, $R_L = 2k\Omega$, $V_o = 2V_{PP}$, $C_L = 100pF$, $T_{amb} = 25^{\circ}C$) | | 0.06 | | % |
| e_n | Equivalent Input Noise Voltage ($f = 1kHz$, $R_s = 100\Omega$) | | 23 | | $\frac{nV}{\sqrt{Hz}}$ |
| ϕ_m | Phase Margin | | 70 | | Degrees |

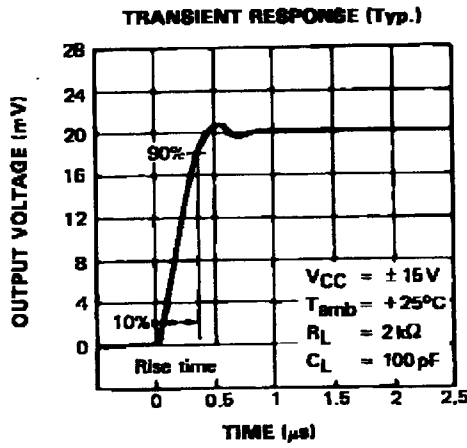
741-03 TBL



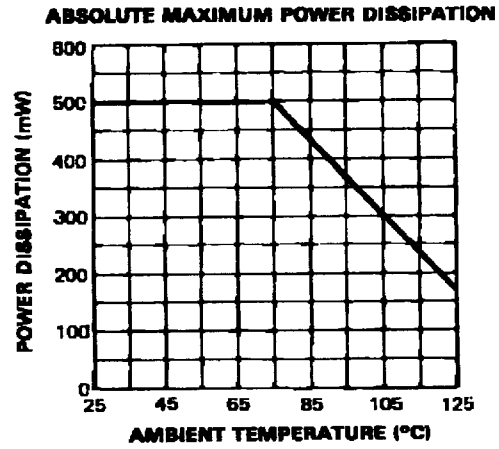
741-04 EPS



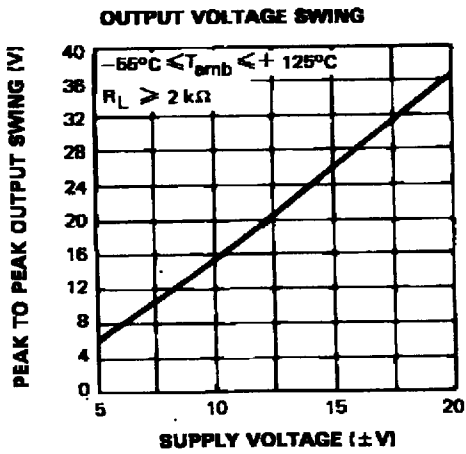
741-05 EPS



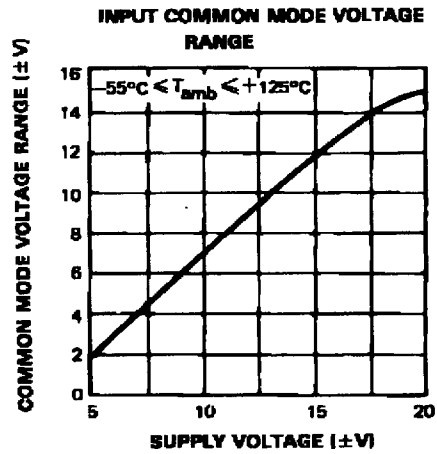
741-06 EPS



741-07 EPS

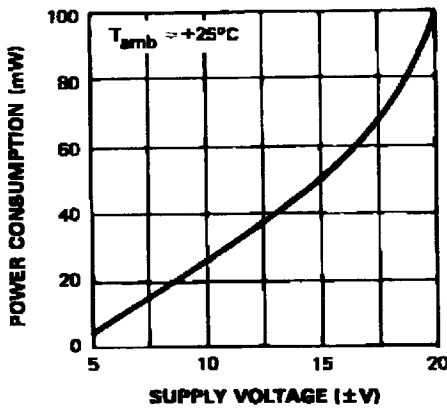


741-08 EPS



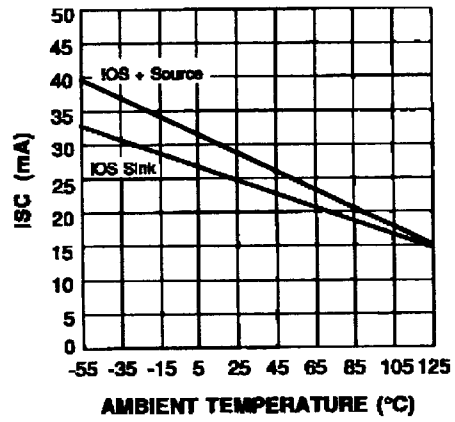
741-09 EPS

POWER CONSUMPTION



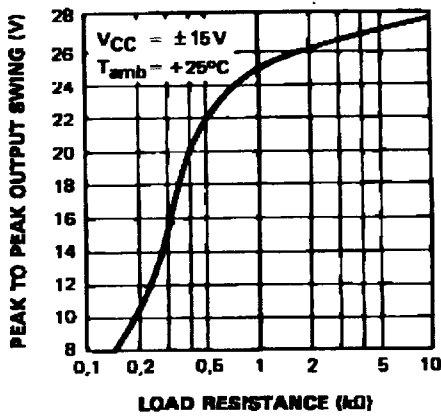
741-10 EPS

OUTPUT CURRENT vs AMBIENT TEMPERATURE



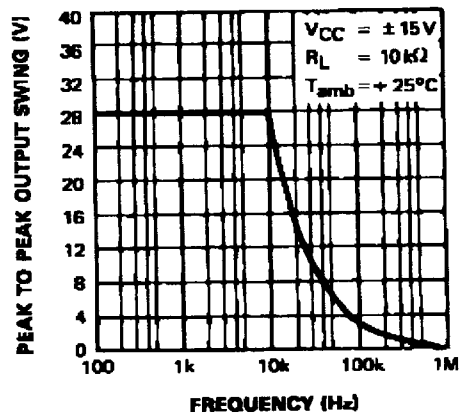
741-11 EPS

OUTPUT VOLTAGE SWING



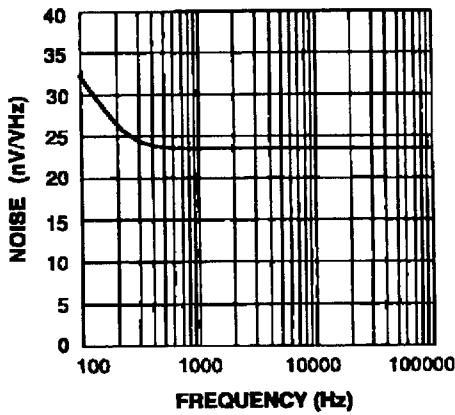
741-12 EPS

OUTPUT VOLTAGE SWING



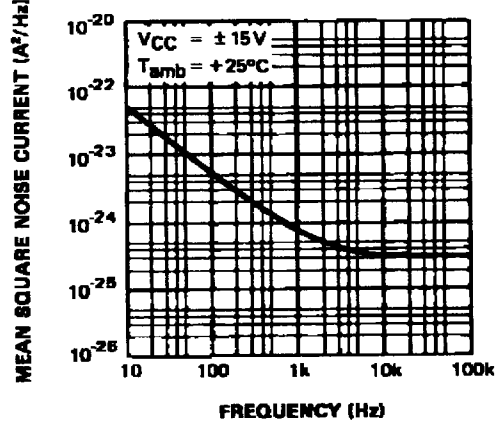
741-13 EPS

EQUIVALENT INPUT NOISE vs FREQUENCY
Rg = 100 Ω



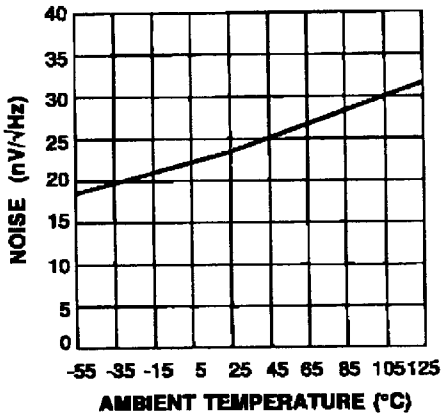
741-14 EPS

INPUT NOISE CURRENT



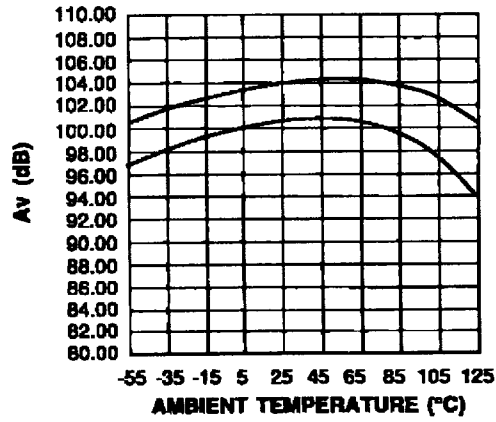
741-15 EPS

EQUIVALENT INPUT NOISE vs AMBIENT TEMPERATURE



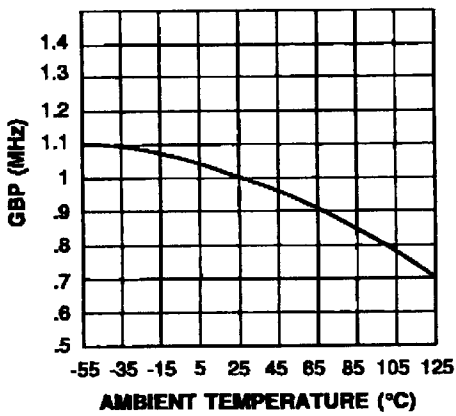
741-16.EPS

LARGE SIGNAL VOLTAGE GAIN vs AMBIENT TEMPERATURE



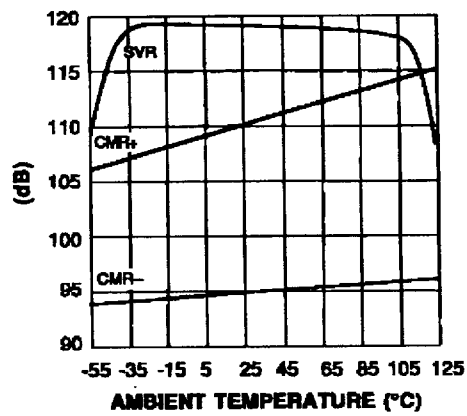
741-17.EPS

GAIN BANDWIDTH PRODUCT vs AMBIENT TEMPERATURE



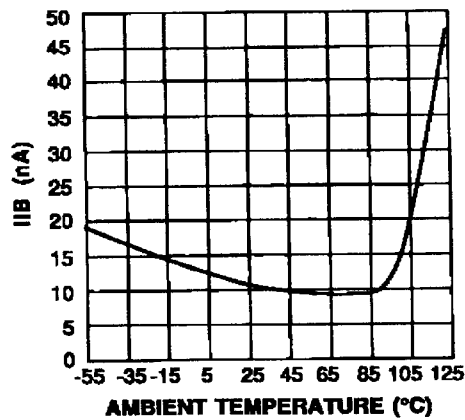
741-18.EPS

POWER SUPPLY & COMMON MODE REJECTION RATIO vs AMBIENT TEMPERATURE



741-19.EPS

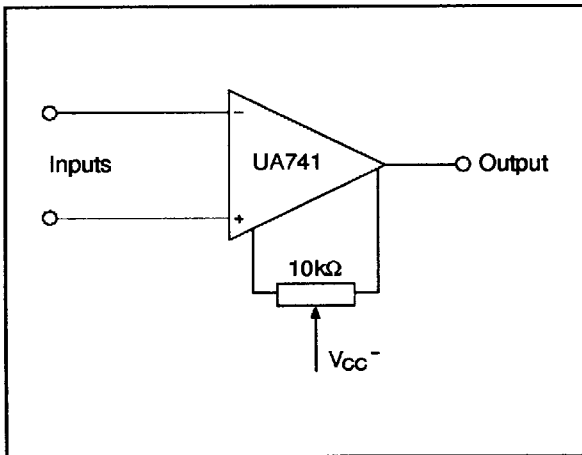
INPUT BIAS CURRENT vs AMBIENT TEMPERATURE



741-20.EPS

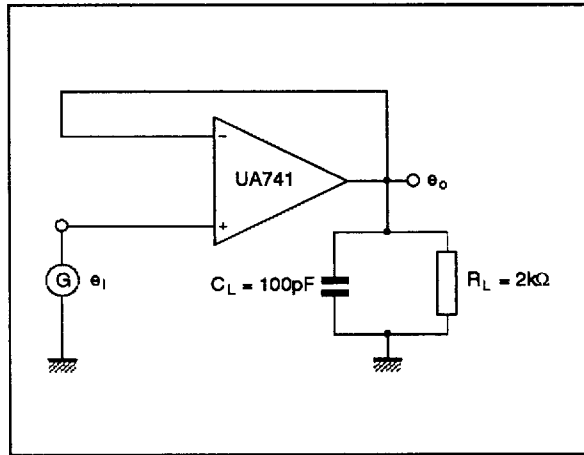
MEASUREMENT DIAGRAMS

OFFSET VOLTAGE NULL CIRCUIT



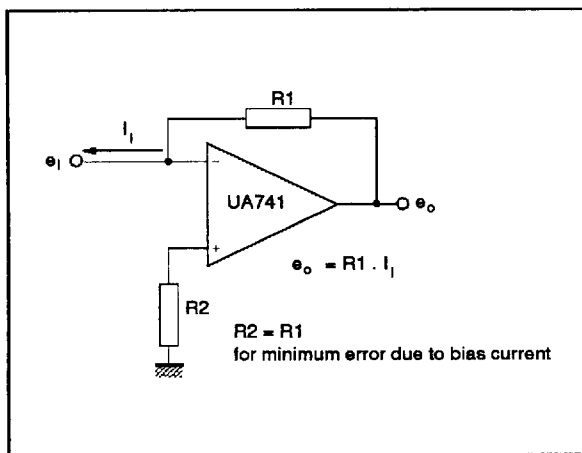
741-21 EPS

TRANSIENT RESPONSE TEST CIRCUIT



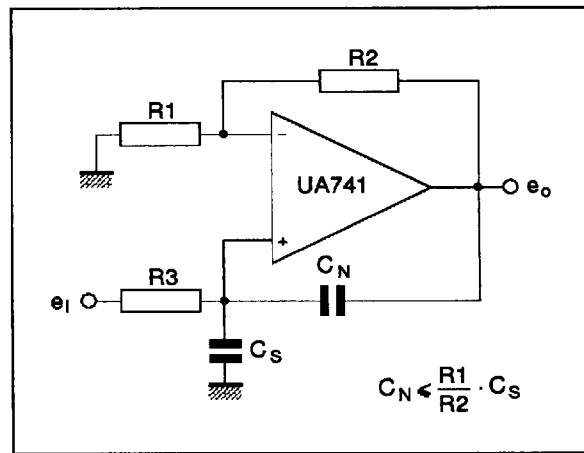
741-22 EPS

CURRENT TO VOLTAGE CONVERTER



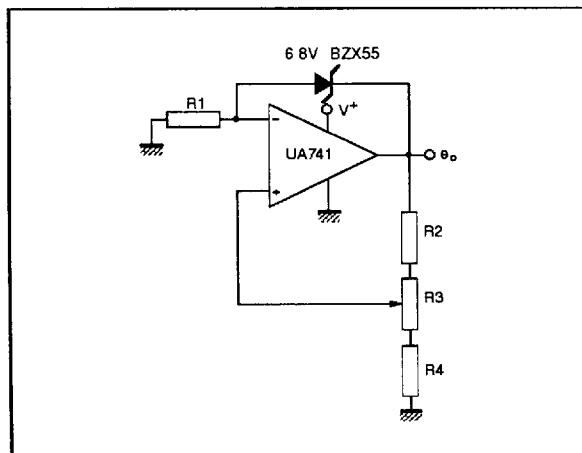
741-23 EPS

NEUTRALIZING INPUT CAPACITANCE TO OPTIMIZE RESPONSE TIME



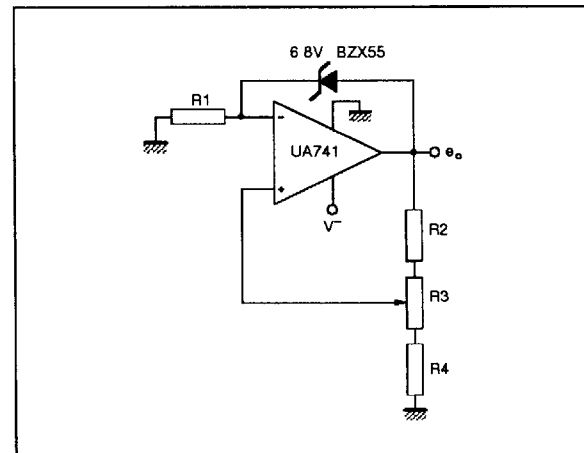
741-24 EPS

POSITIVE VOLTAGE REFERENCE



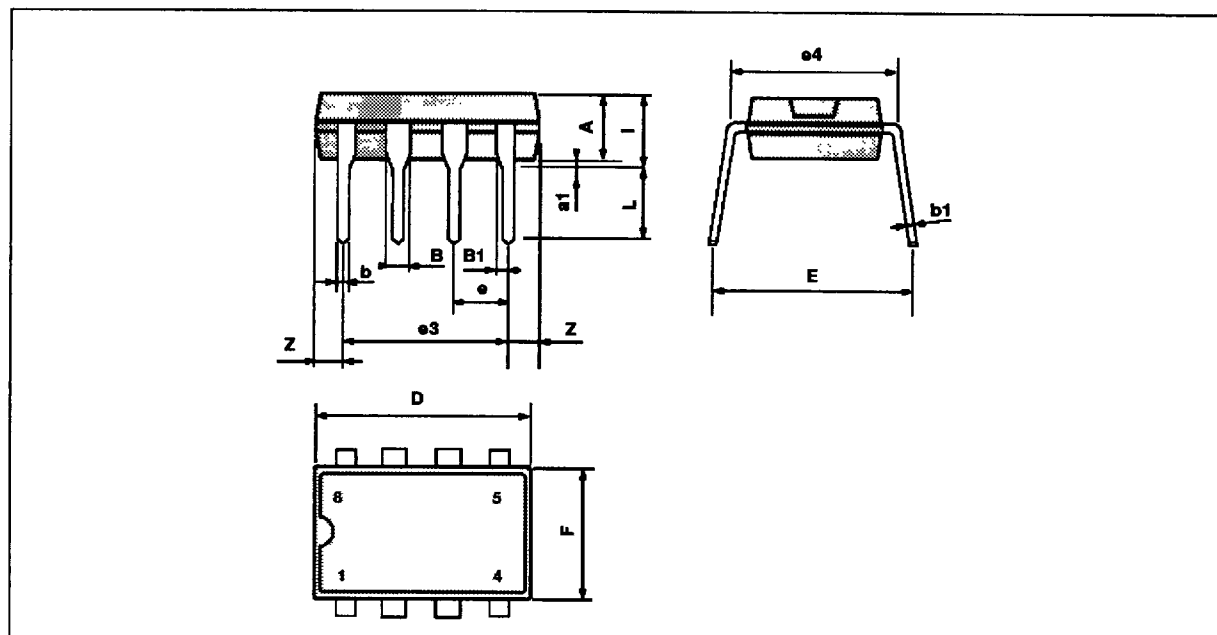
741-25 EPS

NEGATIVE VOLTAGE REFERENCE



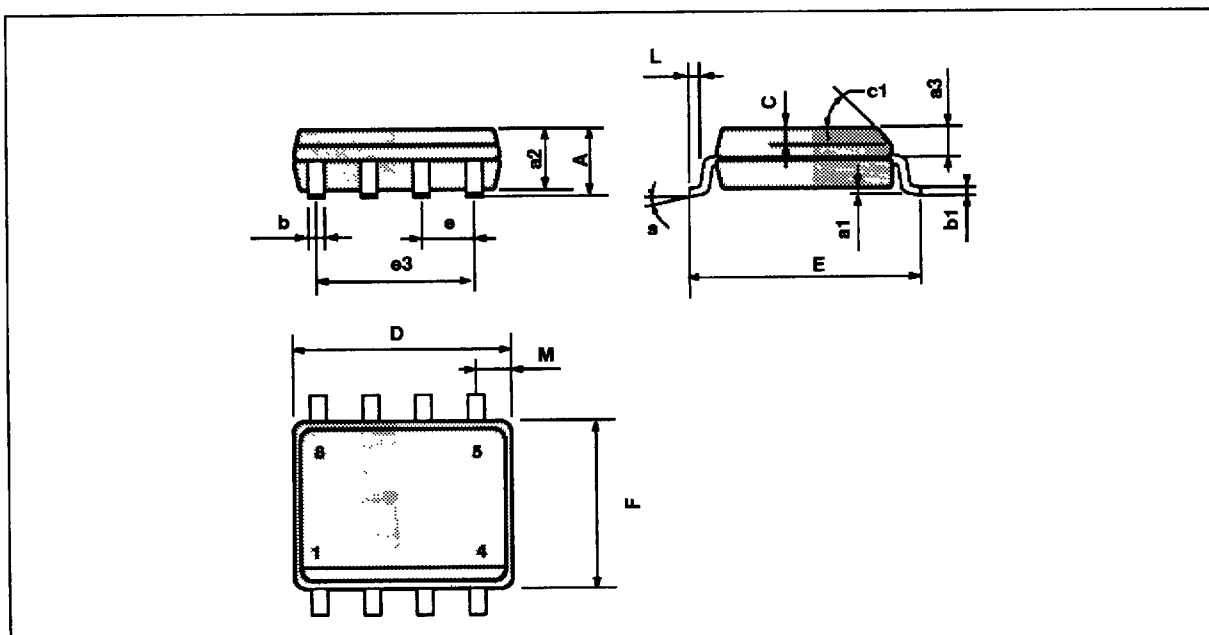
741-26 EPS

PACKAGE MECHANICAL DATA
8 PINS - PLASTIC DIP OR CERDIP



| Dimensions | 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)



PM-SOS EPS

| Dimensions | 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.) | | | | | |

SO8 TBL

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