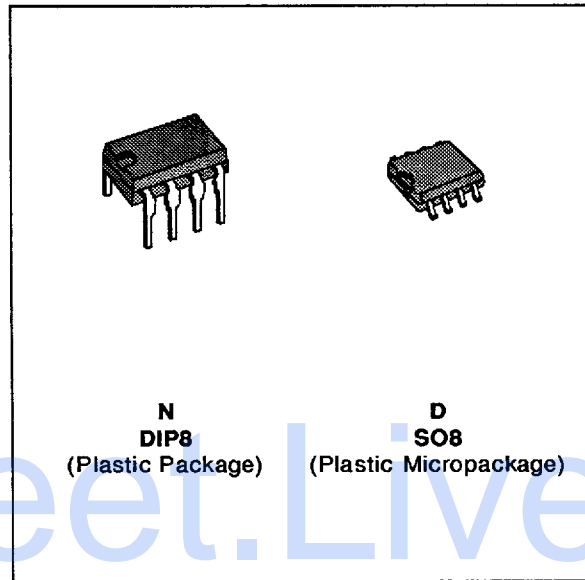




SINGLE OPERATIONAL AMPLIFIERS

| | LM101A LM201A | LM301A |
|---------------------------------------|------------------|--------|
| ■ INPUT OFFSET VOLTAGE | 0.7mV | 2mV |
| ■ INPUT BIAS CURRENT | 25nA | 70nA |
| ■ INPUT OFFSET CURRENT | 1.5nA | 2nA |
| ■ SLEW RATE AS INVERTING AMPLIFIER | 10V/μs | 10V/μs |



DESCRIPTION

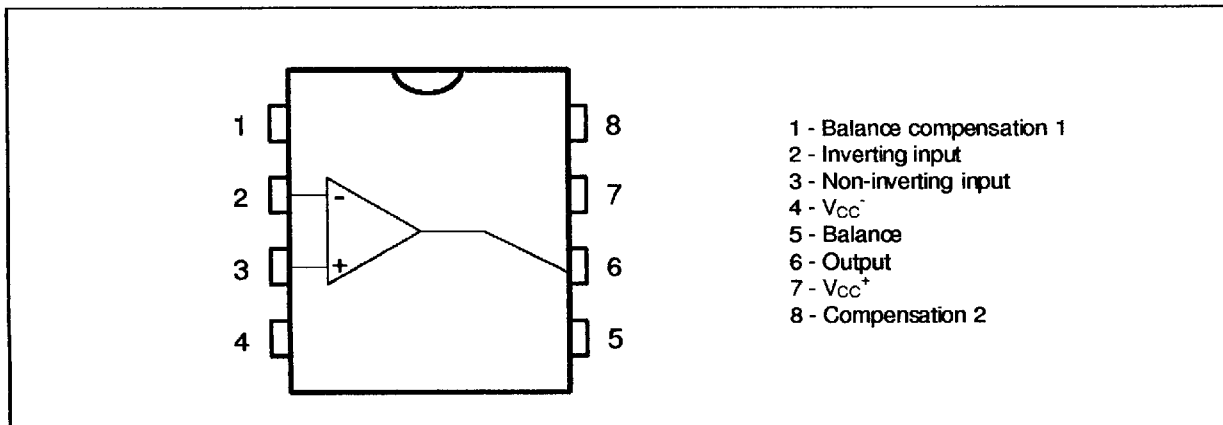
The LM101A is a general-purpose operational amplifier. This amplifier offers many features : supply voltages from ± 5 V to ± 22 V, low current drain, overload protection on the input and output, no latch-up when the common-mode range is exceeded, freedom from oscillations and compensation with a single 30pF capacitor. It has advantages over internally compensated amplifiers in that the compensation can be tailored to the particular application : slew rates of 10 V/μs and bandwidths of 3.5MHz can be easily achieved.

ORDER CODES

| Part Number | Temperature Range | Package | |
|-------------|-------------------|---------|---|
| | | N | D |
| LM101A | -55, +125°C | • | • |
| LM201A | -40, +105°C | • | • |
| LM301A | 0, +70°C | • | • |

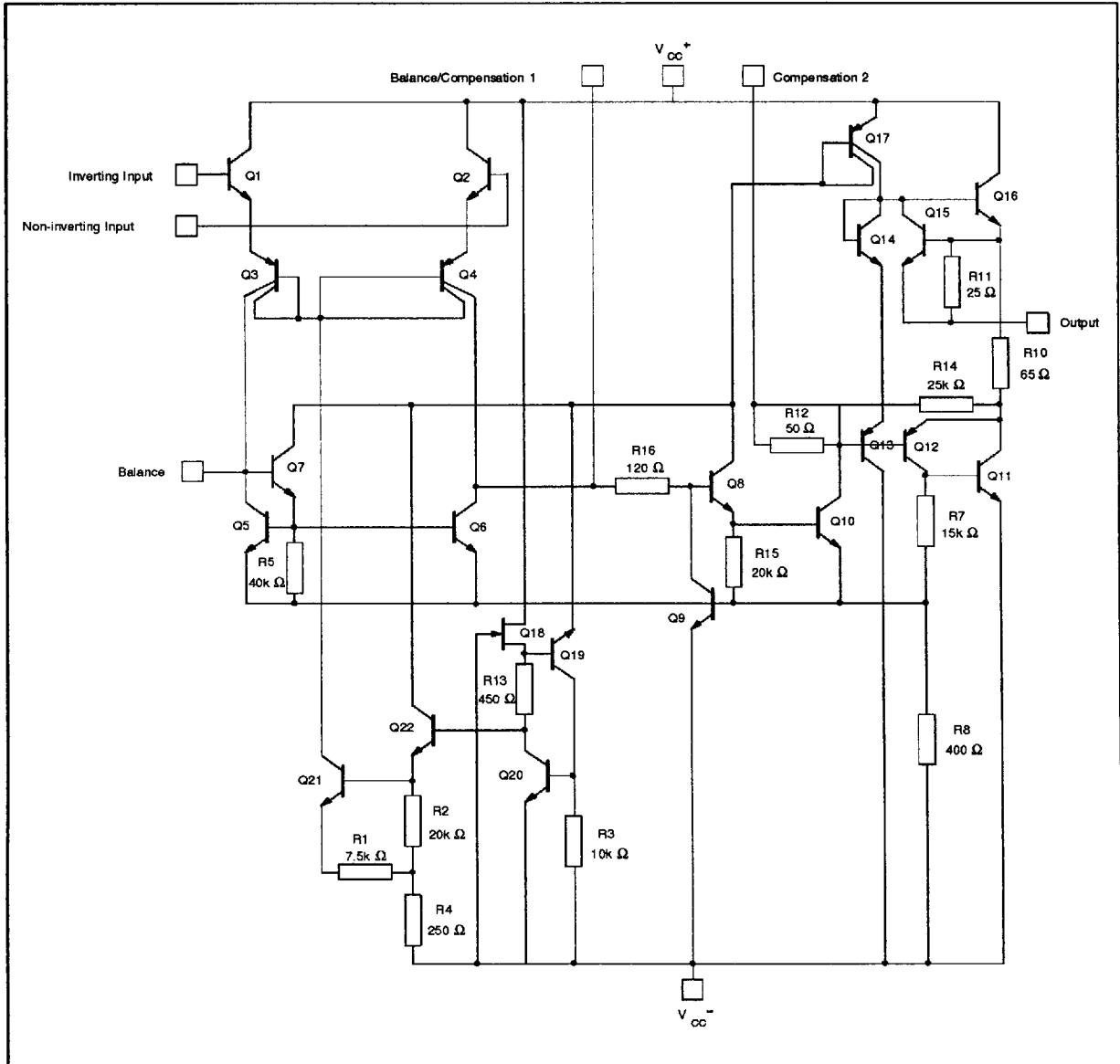
Example : LM201AN

PIN CONNECTIONS (top view)



LM101A - LM201A - LM301A

SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | LM101A | LM201A | LM301A | Unit |
|------------|--------------------------------------|-------------|-------------|-------------|-------------|
| V_{CC} | Supply Voltage | ± 22 | ± 22 | ± 22 | V |
| V_{id} | Differential Input Voltage | ± 30 | ± 30 | ± 30 | V |
| V_i | Input Voltage | ± 15 | ± 15 | ± 15 | V |
| | Output Short-circuit Duration | Infinite | | | |
| P_{tot} | Power Dissipation | 500 300 | | | mW |
| 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 | $^{\circ}C$ |

ELECTRICAL CHARACTERISTICS

LM301A $0^{\circ}\text{C} < T_{\text{amb}} < +70^{\circ}\text{C}$ $\pm 5\text{V} \leq V_{\text{CC}} \leq \pm 20\text{V}$ $C_1 = 30\text{pF}$
LM201A $-40^{\circ}\text{C} < T_{\text{amb}} < +105^{\circ}\text{C}$ $\pm 5\text{V} \leq V_{\text{CC}} \leq \pm 20\text{V}$ $C_1 = 30\text{pF}$
LM101A $-55^{\circ}\text{C} < T_{\text{amb}} < +125^{\circ}\text{C}$ $\pm 5\text{V} \leq V_{\text{CC}} \leq \pm 20\text{V}$ $C_1 = 30\text{pF}$

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

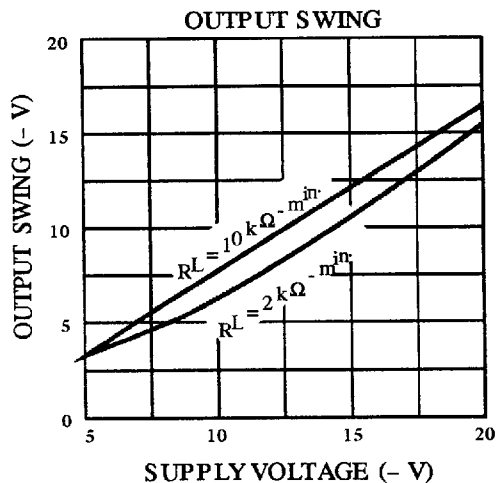
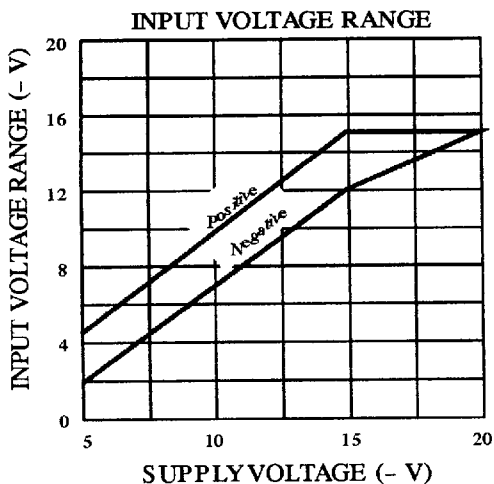
| Symbol | Parameter | LM101A - LM201A | | | LM301A | | | Unit |
|----------------------|---|----------------------|--------------------------|-----------|----------------------|------|------------|------|
| | | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| V_{io} | Input Offset Voltage ($R_S \leq 10\text{k}\Omega$) $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min.}} \leq T_{\text{amb}} \leq T_{\text{max.}}$ | | 0.7 | 2 3 | | 2 | 7.5 10 | mV |
| I_{ib} | Input Bias Current $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min.}} \leq T_{\text{amb}} \leq T_{\text{max.}}$ | | 25 | 75 100 | | 70 | 250 300 | nA |
| I_{io} | Input Offset Current $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min.}} \leq T_{\text{amb}} \leq T_{\text{max.}}$ | | 1.5 | 10 20 | | 2 | 50 70 | nA |
| A_{vd} | Large Signal Voltage Gain * ($V_O = \pm 10\text{V}, R_L = 2\text{k}\Omega$) $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min.}} \leq T_{\text{amb}} \leq T_{\text{max.}}$ | 50 25 | 100 | | 25 15 | 100 | | V/mV |
| SVR | Supply Voltage Rejection Ratio ($R_S \leq 10\text{k}\Omega$) $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min.}} \leq T_{\text{amb}} \leq T_{\text{max.}}$ | 80 80 | 96 | | 70 70 | 96 | | dB |
| I_{CC} | Supply Current no Load $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min.}} \leq T_{\text{amb}} \leq T_{\text{max.}}$ | | 1.8 | 3 3 | | 1.8 | 3 3 | mA |
| V_{icm} | Input Common Mode Voltage Range ($V_{\text{CC}} = \pm 20\text{V}$) $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min.}} \leq T_{\text{amb}} \leq T_{\text{max.}}$ | ± 15 ± 15 | | | ± 15 ± 15 | | | V |
| CMR | Common Mode Rejection Ratio ($R_S \leq 10\text{k}\Omega$) $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min.}} \leq T_{\text{amb}} \leq T_{\text{max.}}$ | 80 80 | 96 | | 70 70 | 96 | | dB |
| I_{OS} | Output Short-circuit Current * $T_{\text{amb}} = 25^{\circ}\text{C}$ | 10 | 30 | 50 | 10 | 30 | 50 | mA |
| $\pm V_{\text{OPP}}$ | Output Voltage Swing * $T_{\text{amb}} = 25^{\circ}\text{C}$ $T_{\text{min.}} \leq T_{\text{amb}} \leq T_{\text{max.}}$ | | | | | | | V |
| | | | $R_L = 10\text{k}\Omega$ | | | | | |
| | | | $R_L = 2\text{k}\Omega$ | | | | | |
| | | | $R_L = 10\text{k}\Omega$ | | | | | |
| | | | $R_L = 2\text{k}\Omega$ | | | | | |

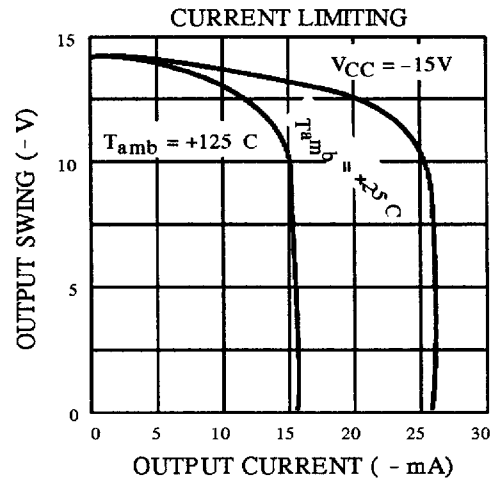
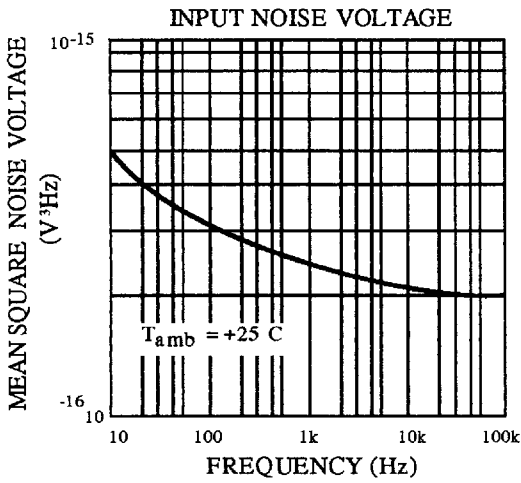
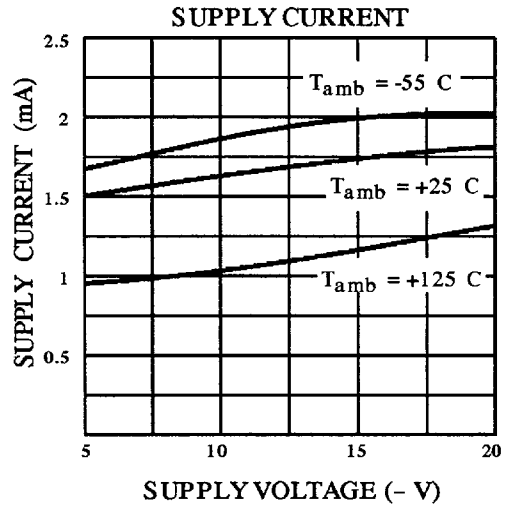
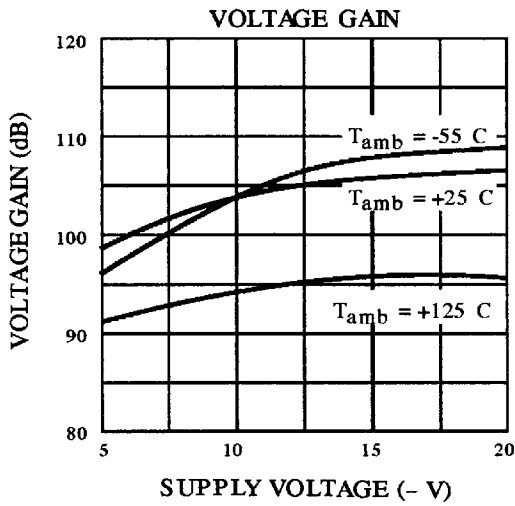
LM101A - LM201A - LM301A

ELECTRICAL CHARACTERISTICS (continued)

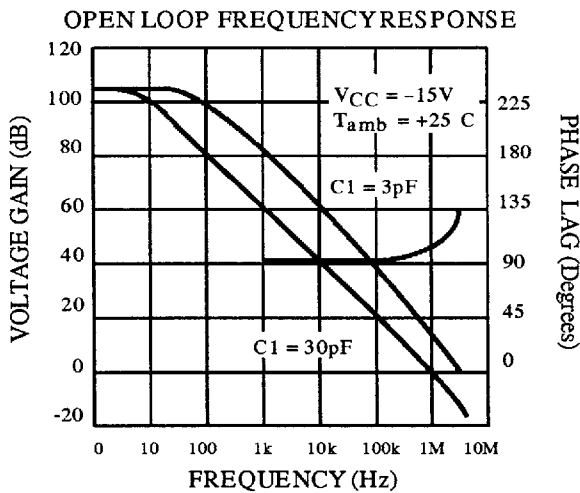
| Symbol | Parameter | LM101A - LM201A | | | LM301A | | | Unit |
|-----------|---|-----------------|----------|------------|--------|----------|------------|------------------------|
| | | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| SR | Slew Rate ($V_I = \pm 10V$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25^\circ C$, unity gain) - (note 1) * | 0.25 | 0.5 | | 0.25 | 0.5 | | V/ μs |
| t_r | Rise Time ($V_I = \pm 20 \mu V$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25^\circ C$, unity gain) * | | 0.3 | | | 0.3 | | μs |
| K_{OV} | Overshoot ($V_I = 20 mV$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25^\circ C$, unity gain) | | 5 | | | 5 | | % |
| Z_I | Input Impedance * | 1.5 | 4 | | 1.5 | 4 | | M Ω |
| R_o | Output Resistance * | | 75 | | | 75 | | Ω |
| GBP | Gain Bandwidth Product * ($V_I = 10mV$, $R_L = 2k\Omega$, $C_L = 100pF$, $f = 100kHz$, $T_{amb} = 25^\circ C$) | 0.5 | 1 | | 0.5 | 1 | | MHz |
| THD | Total Harmonic Distortion ($f = 1kHz$, $A_V = 20dB$, $R_L = 2k\Omega$, $V_O = 2V_{PP}$, $C_L = 100pF$, $T_{amb} = 25^\circ C$) | | 0.015 | | | 0.015 | | % |
| e_n | Equivalent Input Noise Voltage ($f = 1kHz$, $R_s = 100\Omega$) | | 25 | | | 25 | | $\frac{nV}{\sqrt{Hz}}$ |
| DV_{io} | Input Offset Voltage Drift $T_{min.} \leq T_{amb} \leq T_{max.}$ | | 3 | 15 | | 6 | 30 | $\mu V/^\circ C$ |
| DI_{io} | Input Offset Current Drift $25^\circ C \leq T_{amb} \leq T_{max.}$ $T_{min.} \leq T_{amb} \leq 25^\circ C$ | | 10 20 | 100 200 | | 10 20 | 300 600 | $pA/^\circ C$ |

Note :1. May be improved up to 10V/ μs in inverting amplifier configuration (see basic diagram).

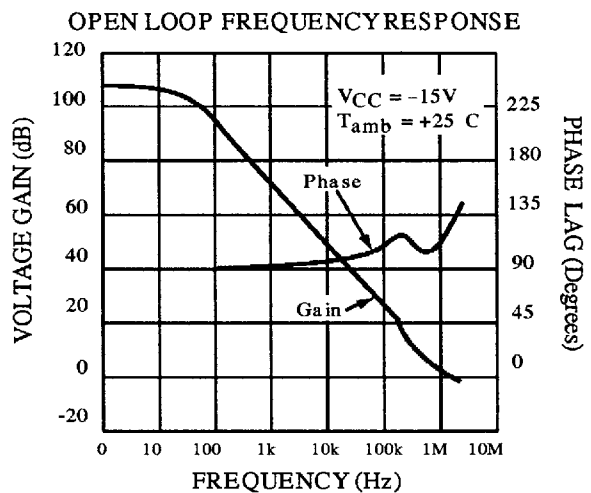




SINGLE POLE COMPENSATION

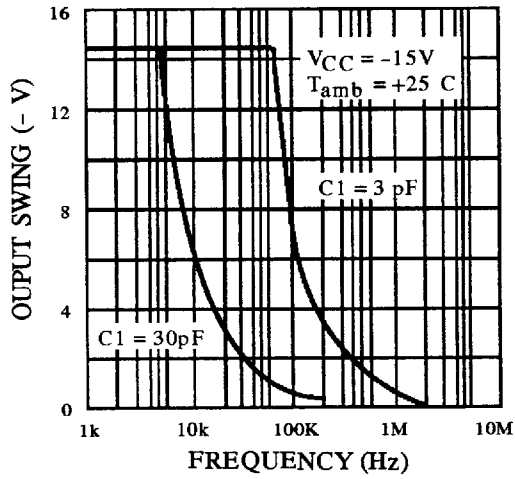


FEED FORWARD COMPENSATION



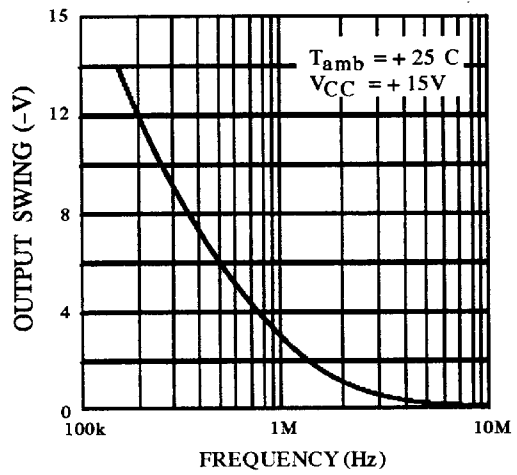
SINGLE POLE COMPENSATION

LARGE SIGNAL FREQUENCY RESPONSE

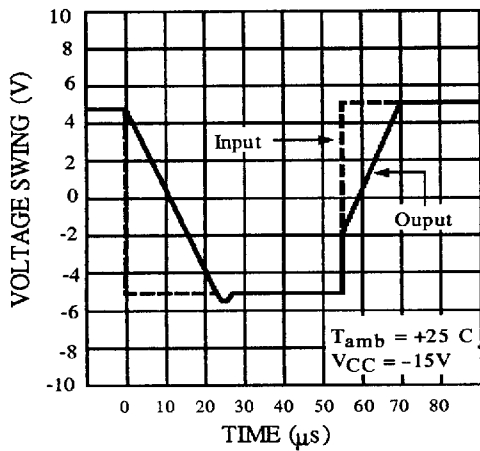


FEED FORWARD COMPENSATION

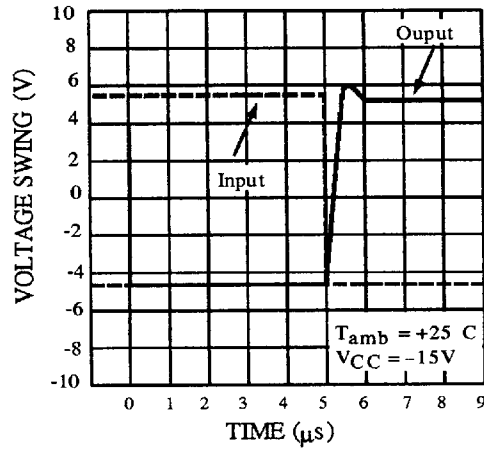
LARGE SIGNAL FREQUENCY RESPONSE



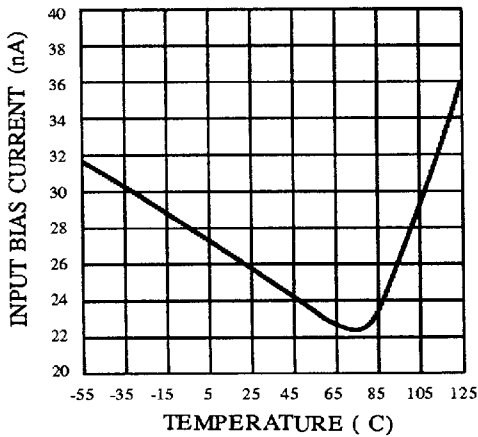
VOLTAGE FOLLOWER PULSE RESPONSE



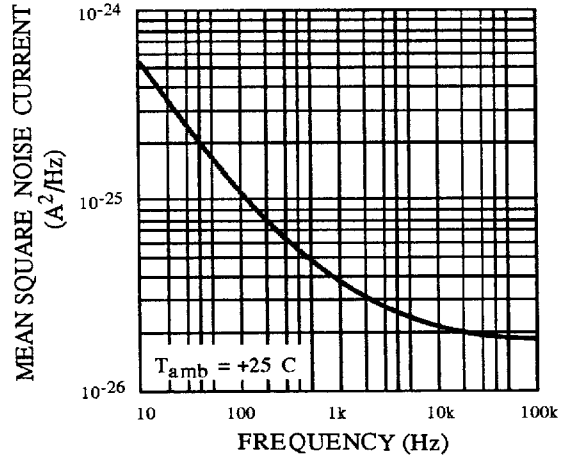
INVERTER PULSE RESPONSE



INPUT BIAS CURRENT vs AMBIENT TEMPERATURE

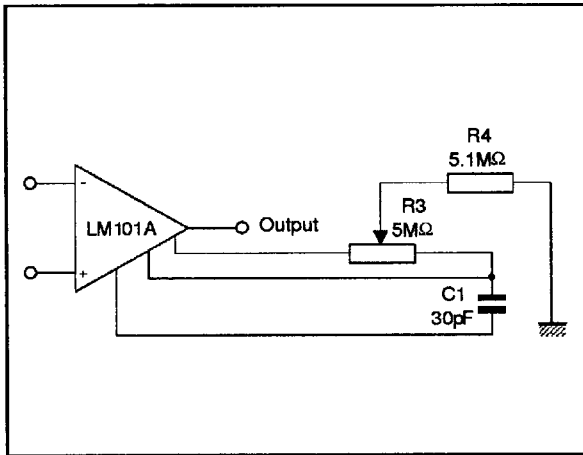


INPUT NOISE CURRENT

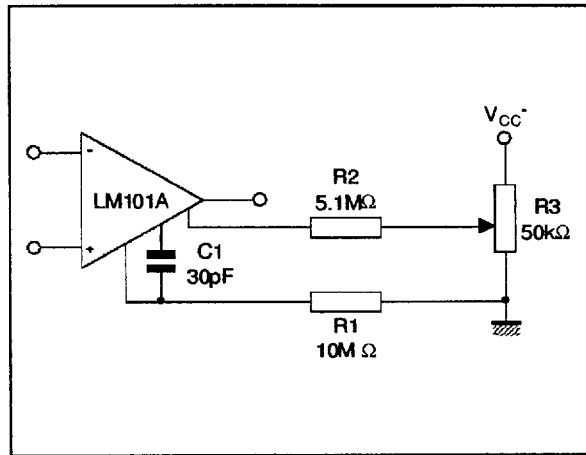


BASIC DIAGRAM

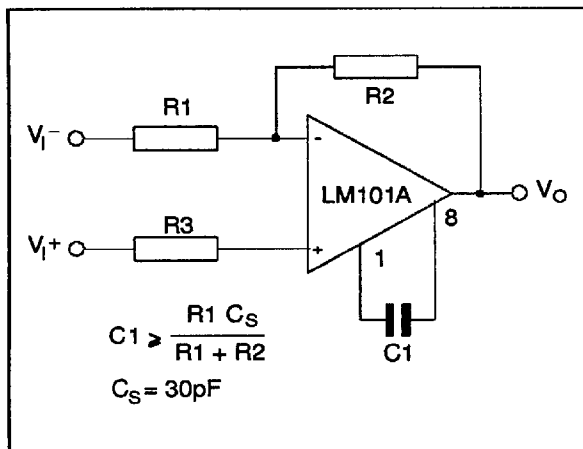
BALANCING CIRCUIT



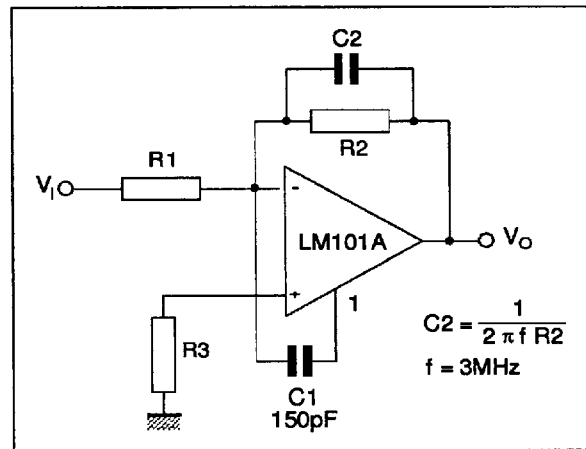
ALTERNATE BALANCING CIRCUIT



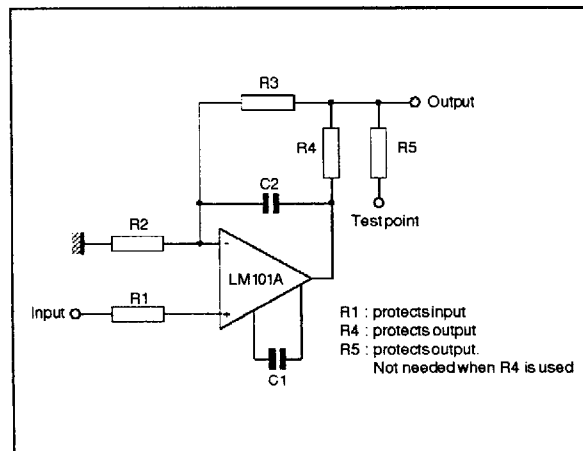
SINGLE POLE COMPENSATION



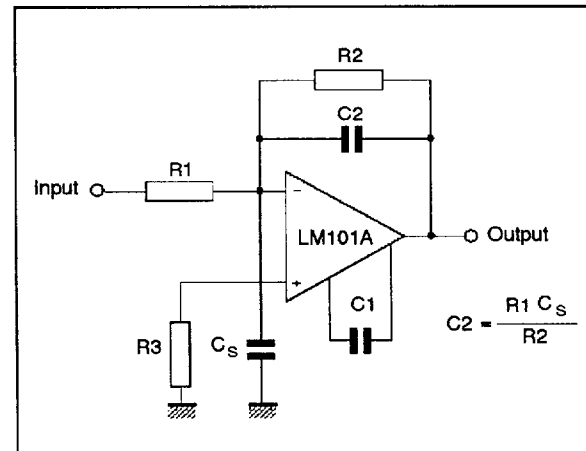
FEEDFORWARD COMPENSATION



PROTECTING AGAINST GROSS FAULT CONDITIONS



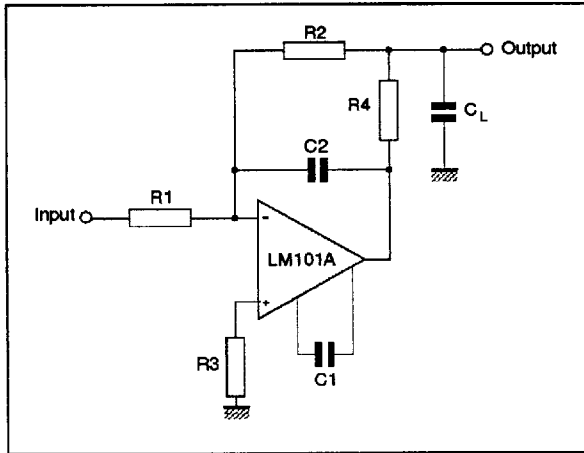
COMPENSATING FOR STRAY INPUT CAPACITANCES OR LARGE FEEDBACK RESISTOR



LM101A - LM201A - LM301A

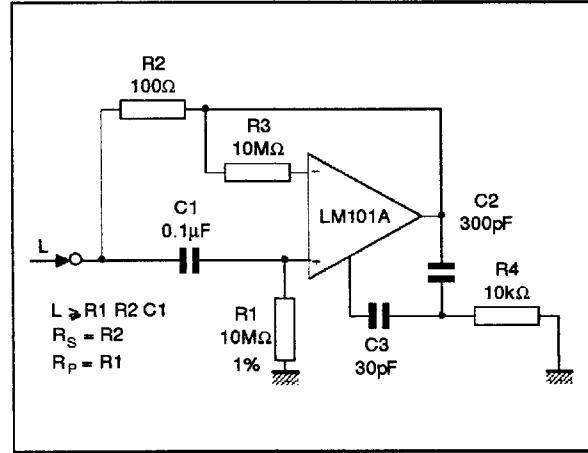
BASIC DIAGRAM (continued)

ISOLATING LARGE CAPACITIVE LOAD

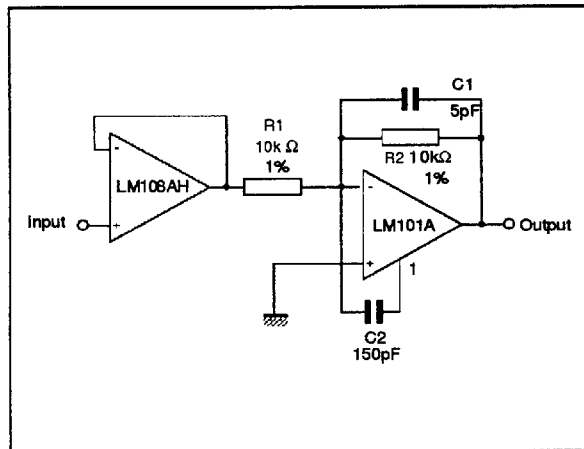


TYPICAL APPLICATIONS

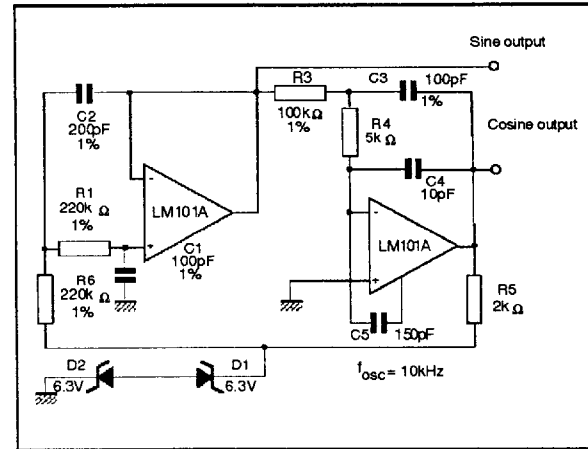
SIMULATED INDUCTOR



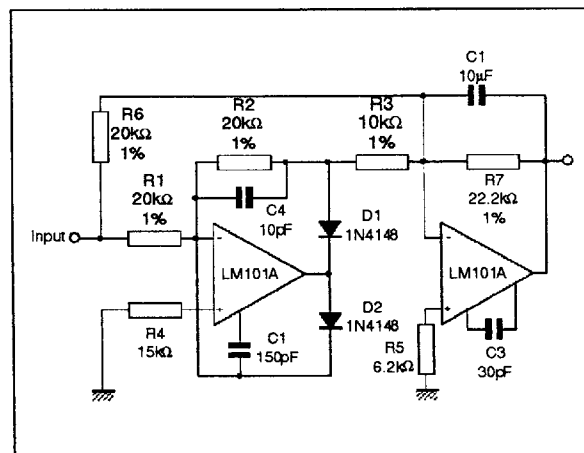
FAST AMPLIFIER WITH HIGH INPUT IMPEDANCE



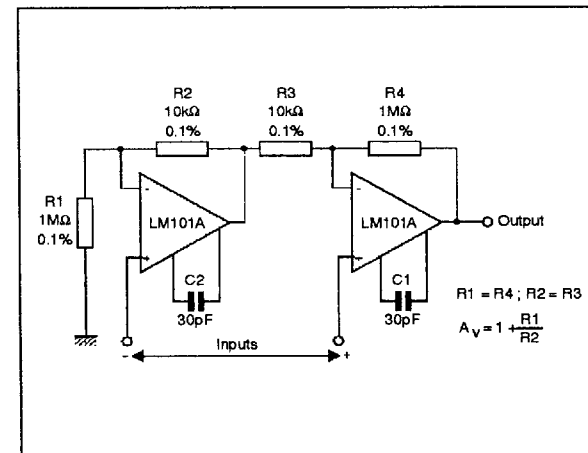
SINE WAVE OSCILLATOR



FAST AC/DC CONVERTER

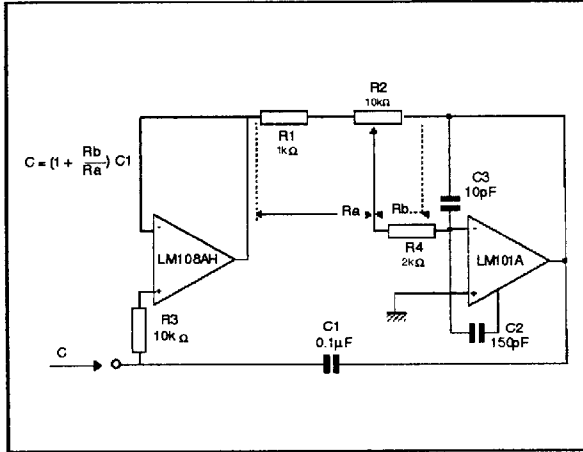


INSTRUMENTATION AMPLIFIER

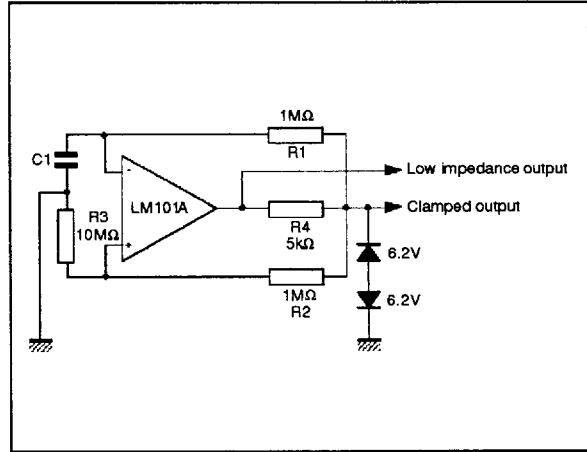


TYPICAL APPLICATIONS (continued)

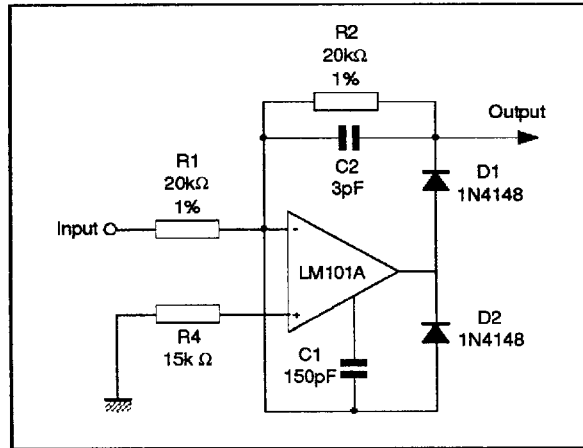
VARIABLE CAPACITANCE MULTIPLIER



LOW FREQUENCY SQUARE WAVE GENERATOR

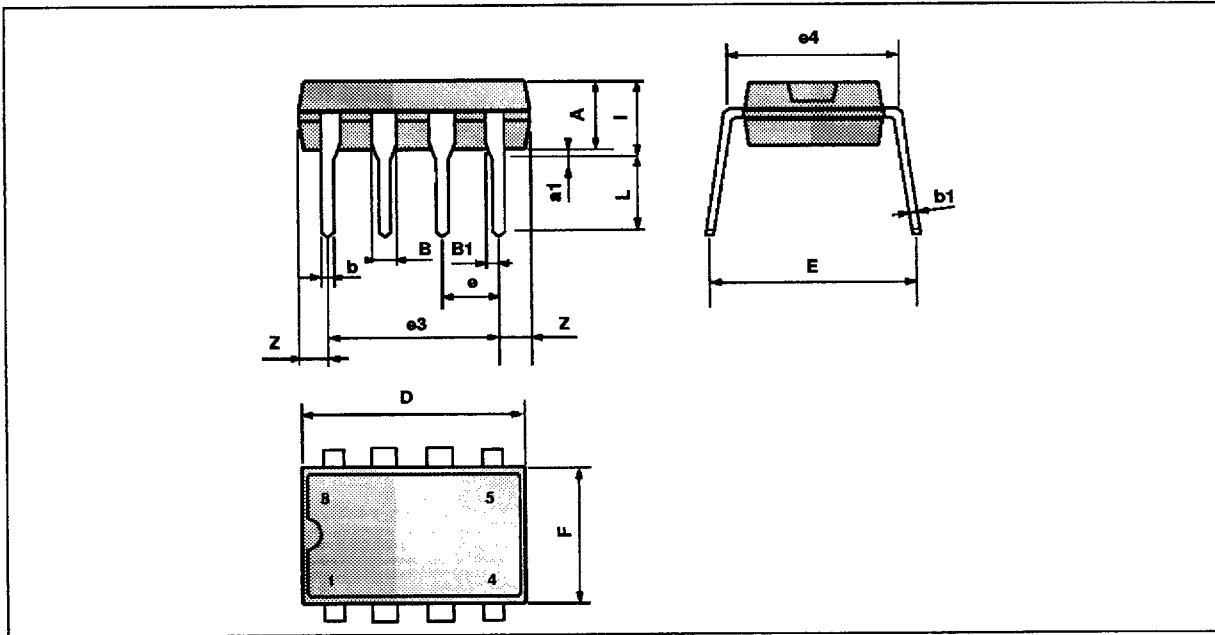


FAST HALF WAVE RECTIFIER



LM101A - LM201A - LM301A

PACKAGE MECHANICAL DATA
8 PINS - PLASTIC DIP OR CERDIP

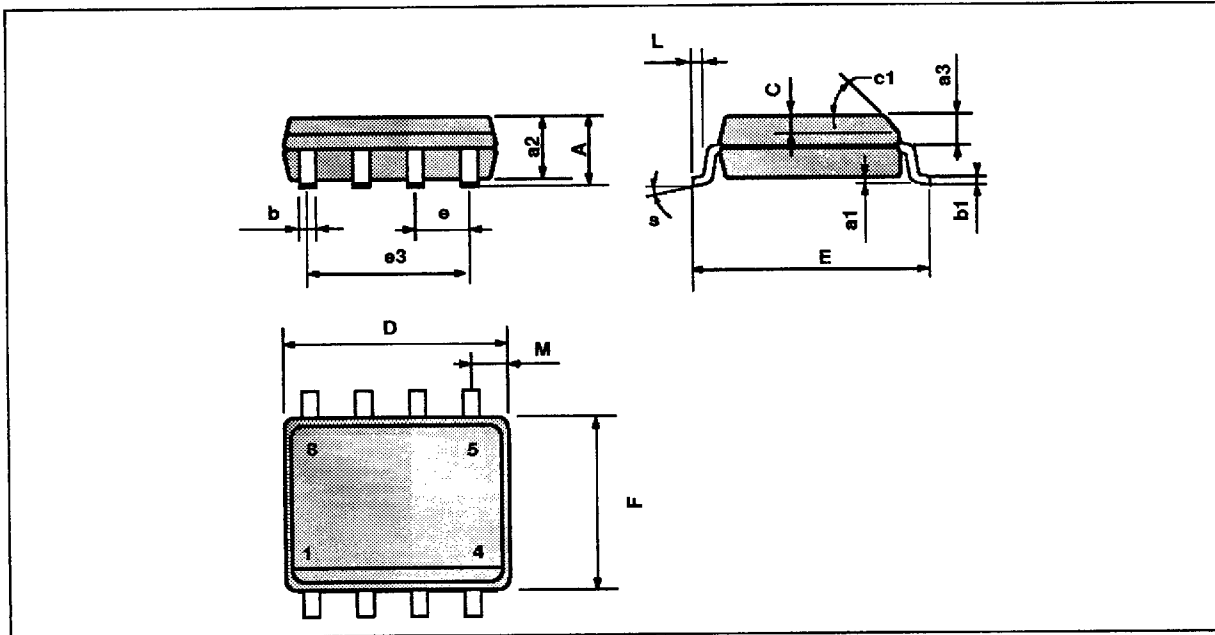


PM-DIP8.EPS

| 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 |

DIP8.TBL

PACKAGE MECHANICAL DATA
8 PINS - PLASTIC MICROPACKAGE (SO)



PM-S014EPS

| 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.) | | | | | |

SO14.TBL

Information furnished is believed to be accurate and reliable. However, SGS-THOMSON Microelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No licence is granted by implication or otherwise under any patent or patent rights of SGS-THOMSON Microelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. SGS-THOMSON Microelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of SGS-THOMSON Microelectronics.

© 1995 SGS-THOMSON Microelectronics - All Rights Reserved

SGS-THOMSON Microelectronics GROUP OF COMPANIES

Australia - Brazil - France - Germany - Hong Kong - Italy - Japan - Korea - Malaysia - Malta - Morocco - The Netherlands
 Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A.

ORDER CODE :

