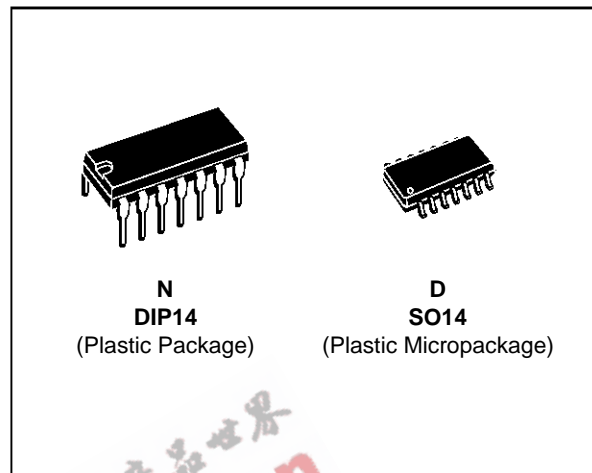


## HIGH SPEED CMOS QUAD OPERATIONAL AMPLIFIERS

- OUTPUT VOLTAGE CAN SWING TO GROUND
- EXCELLENT PHASE MARGIN ON CAPACITIVE LOADS
- GAIN BANDWIDTH PRODUCT : 3.5MHz
- STABLE AND LOW OFFSET VOLTAGE
- THREE INPUT OFFSET VOLTAGE SELECTIONS



### ORDER CODES

| Part Number  | Temperature Range | Package |   |
|--------------|-------------------|---------|---|
|              |                   | N       | D |
| TS274C/AC/BC | 0°C, +70°C        | ●       | ● |
| TS274I/AI/BI | -40°C, +125°C     | ●       | ● |
| TS274M/AM/BM | -55°C, +125°C     | ●       | ● |

**Example :** TS274ACN

### DESCRIPTION

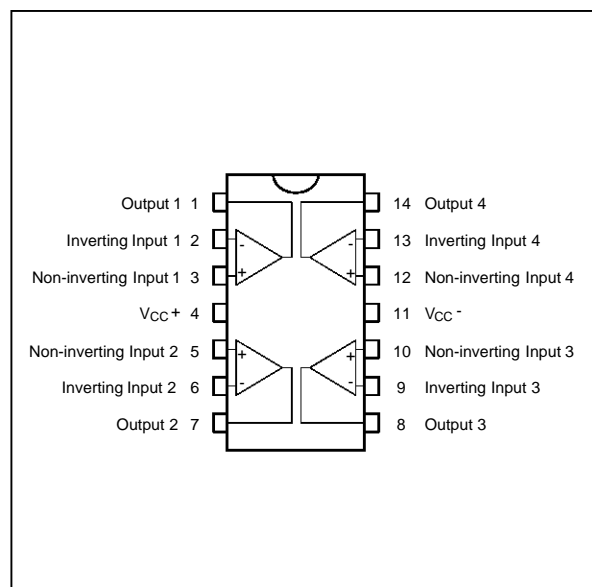
The TS274 series are low cost, low power quad operational amplifiers designed to operate with single or dual supplies. These operational amplifiers use the SGS-THOMSON silicon gate CMOS process allowing an excellent consumption-speed ratio. These series are ideally suited for low consumption applications.

Three power consumptions are available allowing to have always the best consumption-speed ratio :

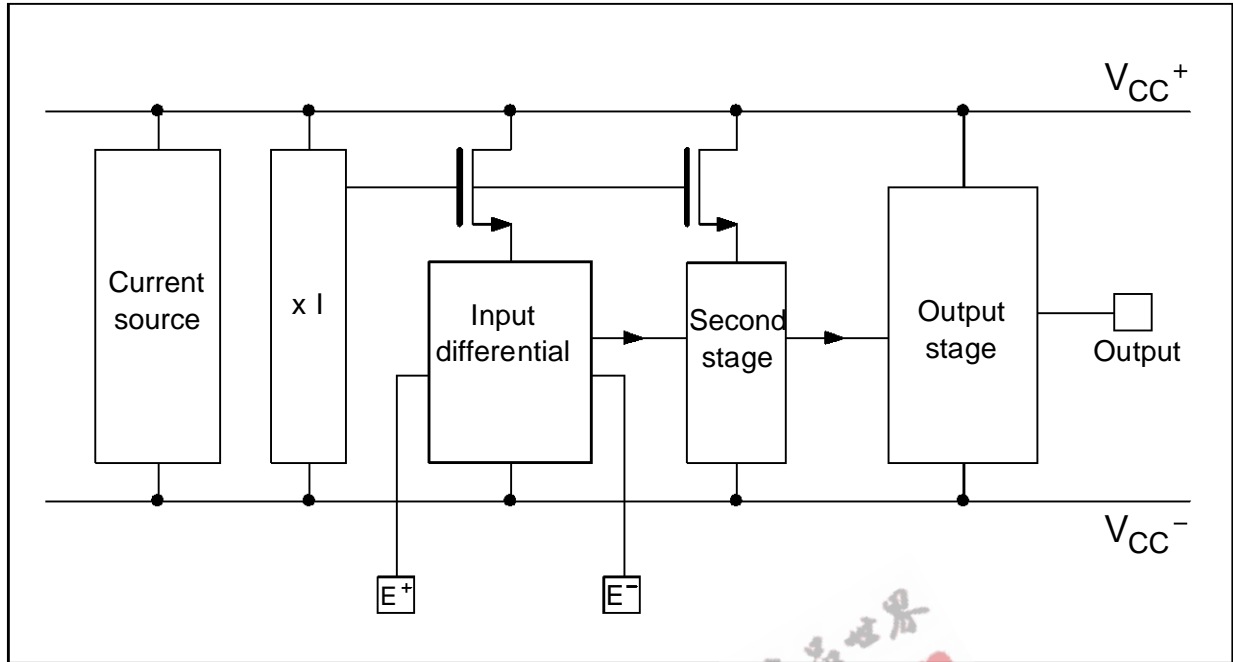
- $I_{CC} = 10\mu\text{A}/\text{amp.}$  : TS27L4 (very low power)
- $I_{CC} = 150\mu\text{A}/\text{amp.}$  : TS27M4 (low power)
- $I_{CC} = 1\text{mA}/\text{amp.}$  : TS274 (high speed)

These CMOS amplifiers offer very high input impedance and extremely low input currents. The major advantage versus JFET devices is the very low input currents drift with temperature (see figure 2).

### PIN CONNECTIONS (top view)



**BLOCK DIAGRAM**



**MAXIMUM RATINGS**

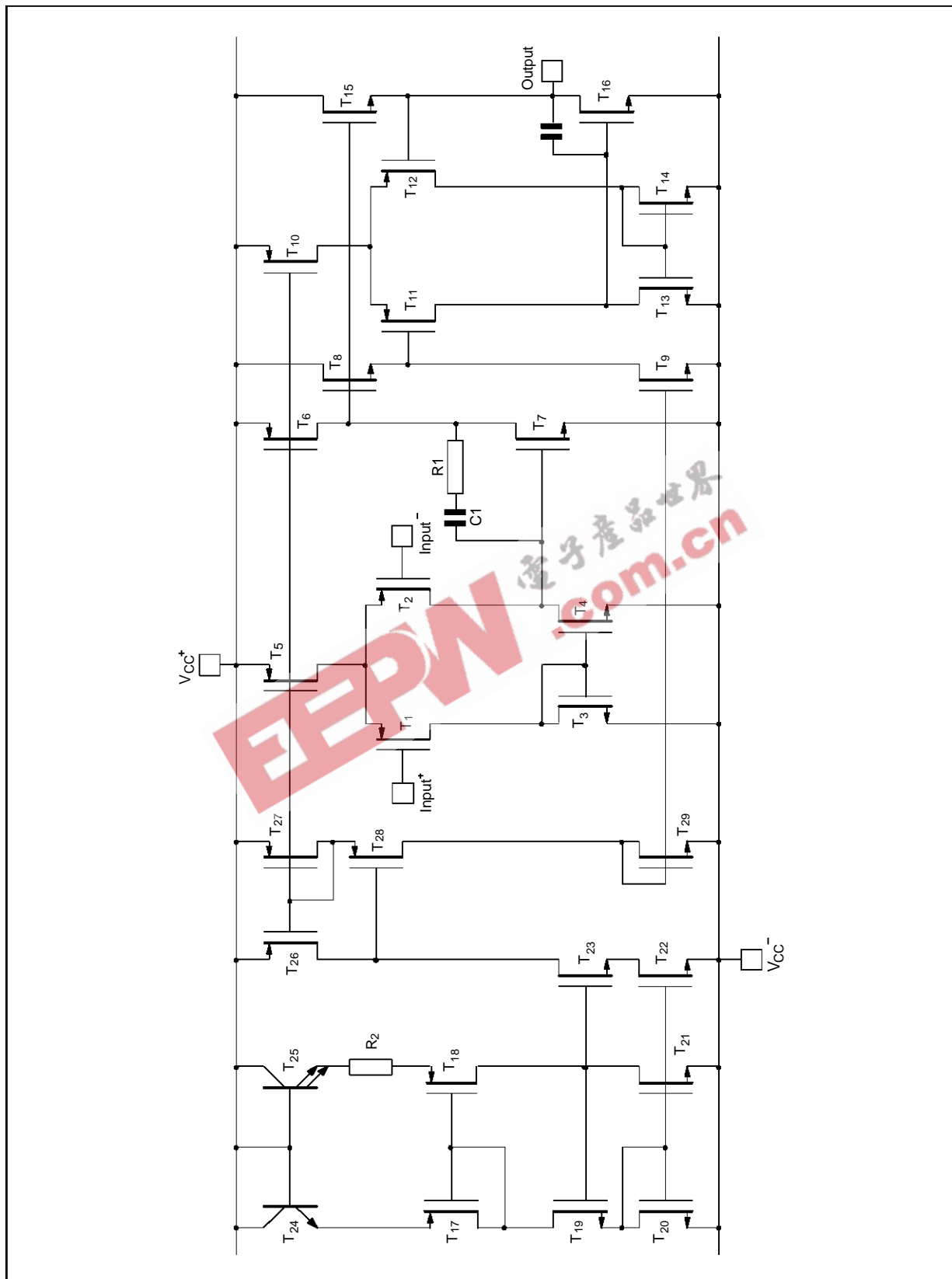
| Symbol     | Parameter                              | Value  | Unit        |
|------------|--|--|-------------|
| $V_{CC}^+$ | Supply Voltage - (note 1)              | 18   | V           |
| $V_{id}$   | Differential Input Voltage - (note 2)  | $\pm 18$                                     | V           |
| $V_i$      | Input Voltage - (note 3)               | -0.3 to 18                                   | V           |
| $I_O$      | Output Current for $V_{CC}^+ \geq 15V$ | $\pm 30$                                     | mA          |
| $I_{in}$   | Input Current                          | $\pm 5$                                      | mA          |
| $T_{oper}$ | Operating Free-Air Temperature Range   | TS274C/AC/BC<br>TS274I/AI/BI<br>TS274M/AM/BM | $^{\circ}C$ |
| $T_{stg}$  | Storage Temperature Range              | -65 to +150                                  | $^{\circ}C$ |

**Notes :** 1. All voltage values, except differential voltage, are with respect to network ground terminal.  
 2. Differential voltages are at the non-inverting input terminal with respect to the inverting input terminal.  
 3. The magnitude of the input and the output voltages must never exceed the magnitude of the positive supply voltage.

**OPERATING CONDITIONS**

| Symbol     | Parameter                       | Value                 | Unit |
|------------|---------------------------------|-----------------------|------|
| $V_{CC}^+$ | Supply Voltage                  | 3 to 16               | V    |
| $V_{icm}$  | Common Mode Input Voltage Range | 0 to $V_{CC}^+ - 1.5$ | V    |

**SCHEMATIC DIAGRAM** (for 1/4 TS274)



# TS274C,I,M

## ELECTRICAL CHARACTERISTICS

$V_{CC}^+ = +10V$ ,  $V_{CC}^- = 0V$ ,  $T_{amb} = 25^{\circ}C$  (unless otherwise specified)

| Symbol          | Parameter   | TS274C/AC/BC |                    |                                | TS274I/AI/BI<br>TS274M/AM/BM |                    |                                  | Unit                   |
|-----------------|---|--------------|--------------------|--------------------------------|------------------------------|--------------------|----------------------------------|------------------------|
|                 |   | Min.         | Typ.               | Max.                           | Min.                         | Typ.               | Max.                             |                        |
| $V_{io}$        | Input Offset Voltage<br>$V_O = 1.4V$ , $V_{ic} = 0V$<br>TS274C/I/M<br>TS274AC/AI/AM<br>TS274BC/BI/BM<br>$T_{min.} \leq T_{amb} \leq T_{max.}$<br>TS274C/I/M<br>TS274AC/AI/AM<br>TS274BC/BI/BM |              | 1.1<br>0.9<br>0.25 | 10<br>5<br>2<br>12<br>6.5<br>3 |                              | 1.1<br>0.9<br>0.25 | 10<br>5<br>2<br>12<br>6.5<br>3.5 | mV                     |
| $DV_{io}$       | Input Offset Voltage Drift  |              | 2                  |                                |                              | 2                  |                                  | $\mu V/^{\circ}C$      |
| $I_{io}$        | Input Offset Current - (note 1)<br>$V_{ic} = 5V$ , $V_O = 5V$<br>$T_{min.} \leq T_{amb} \leq T_{max.}$  |              | 1                  | 100                            |                              | 1                  | 200                              | pA                     |
| $I_{ib}$        | Input Bias Current - (note 1)<br>$V_{ic} = 5V$ , $V_O = 5V$<br>$T_{min.} \leq T_{amb} \leq T_{max.}$  |              | 1                  | 150                            |                              | 1                  | 300                              | pA                     |
| $V_{OH}$        | High Level Output Voltage<br>$V_{id} = 100mV$ , $R_L = 10k\Omega$<br>$T_{min.} \leq T_{amb} \leq T_{max.}$  | 8.2<br>8.1   | 8.4                |                                | 8.2<br>8                     | 8.4                |                                  | V                      |
| $V_{OL}$        | High Level Output Voltage<br>$V_{id} = -100mV$  |              |                    | 50                             |                              |                    | 50                               | mV                     |
| $A_{vd}$        | Large Signal Voltage Gain<br>$V_O = 1V$ to $6V$ , $R_L = 10k\Omega$ , $V_{ic} = 5V$<br>$T_{min.} \leq T_{amb} \leq T_{max.}$  | 10<br>7      | 15                 |                                | 10<br>6                      | 15                 |                                  | V/mV                   |
| GBP             | Gain Bandwidth Product<br>$A_v = 40dB$ , $R_L = 10k\Omega$ , $C_L = 100pF$<br>$f_{in} = 100kHz$   |              | 3.5                |                                |                              | 3.5                |                                  | MHz                    |
| CMR             | Common Mode Rejection Ratio<br>$V_O = 1.4V$ , $V_{ic} = 1V$ to $7.4V$   | 65           | 80                 |                                | 65                           | 80                 |                                  | dB                     |
| SVR             | Supply Voltage Rejection Ratio<br>$V_{CC}^+ = 5V$ to $10V$ , $V_O = 1.4V$   | 60           | 70                 |                                | 60                           | 70                 |                                  | dB                     |
| $I_{CC}$        | Supply Current (per amplifier)<br>$A_v = 1$ , no load, $V_O = 5V$<br>$T_{min.} \leq T_{amb} \leq T_{max.}$  |              | 1000               | 1500<br>1600                   |                              | 1000               | 1500<br>1700                     | $\mu A$                |
| $I_o$           | Output Short Circuit Current<br>$V_{id} = 100mV$ , $V_O = 0V$   |              | 60                 |                                |                              | 60                 |                                  | mA                     |
| $I_{sink}$      | Output Sink Current<br>$V_{id} = -100mV$ , $V_O = V_{CC}$   |              | 45                 |                                |                              | 45                 |                                  | mA                     |
| SR              | Slew-Rate at Unity Gain<br>$R_L = 10k\Omega$ , $C_L = 100pF$ , $V_i = 3$ to $7V$  |              | 5.5                |                                |                              | 5.5                |                                  | $V/\mu s$              |
| $\phi_m$        | Phase Margin at Unity Gain<br>$A_v = 40dB$ , $R_L = 10k\Omega$ , $C_L = 100pF$  |              | 40                 |                                |                              | 40                 |                                  | Degrees                |
| $K_{OV}$        | Overshoot Factor  |              | 30                 |                                |                              | 30                 |                                  | %                      |
| $e_n$           | Equivalent Input Noise Voltage<br>$f = 1kHz$ , $R_s = 100\Omega$  |              | 30                 |                                |                              | 30                 |                                  | $\frac{nV}{\sqrt{Hz}}$ |
| $V_{O1}/V_{O2}$ | Channel Separation  |              | 120                |                                |                              | 120                |                                  | dB                     |

Note : 1. Maximum values including unavoidable inaccuracies of the industrial test.

TYPICAL CHARACTERISTICS

Figure 1 : Supply Current (each amplifier) versus Supply Voltage

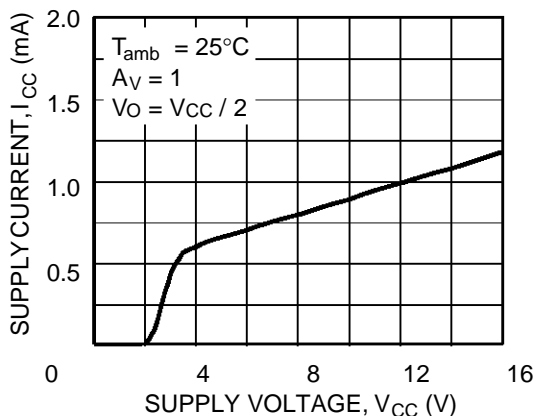


Figure 2 : Input Bias Current versus Free Air Temperature

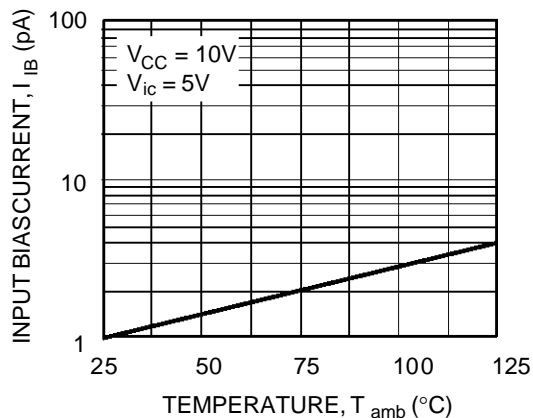


Figure 3a : High Level Output Voltage versus High Level Output Current

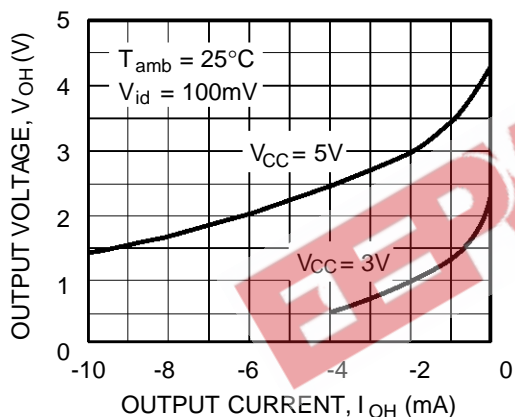


Figure 3b : High Level Output Voltage versus High Level Output Current

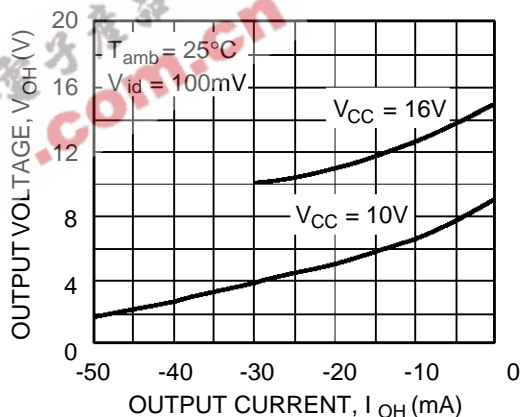


Figure 4a : High Level Output Voltage versus High Level Output Current

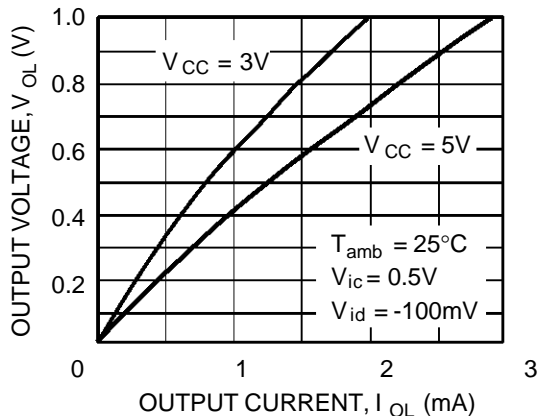
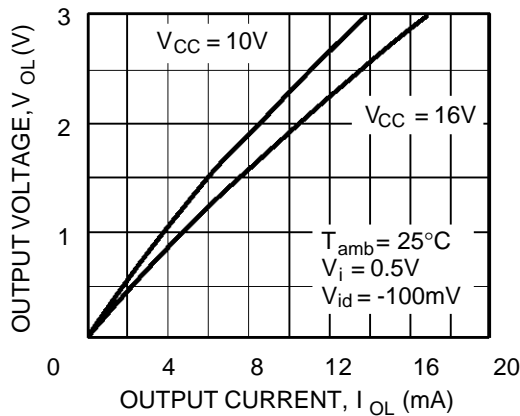


Figure 4b : High Level Output Voltage versus High Level Output Current



TYPICAL CHARACTERISTICS (continued)

Figure 5 : Open Loop Frequency Response and Phase Shift

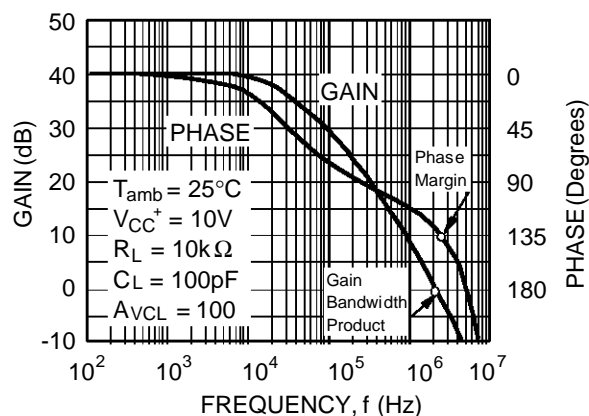


Figure 6 : Gain Bandwidth Product versus Supply Voltage

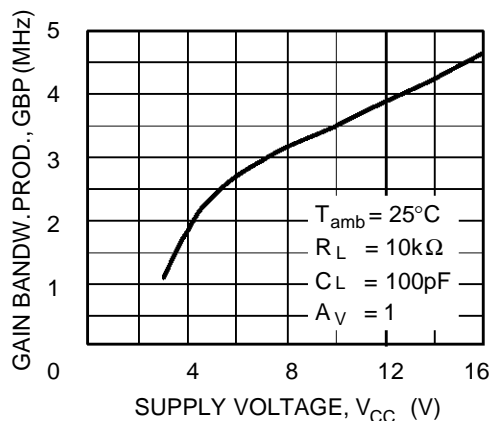


Figure 7 : Phase Margin versus Supply Voltage

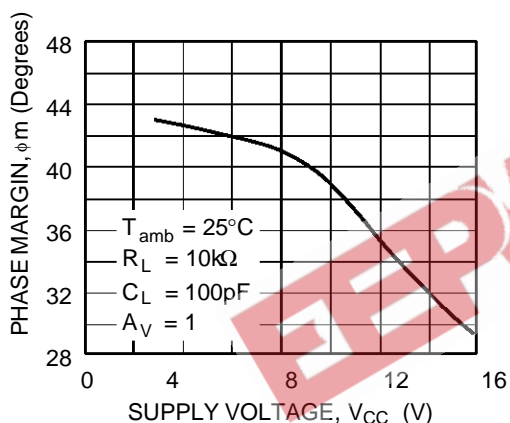


Figure 8 : Phase Margin versus Capacitive Load

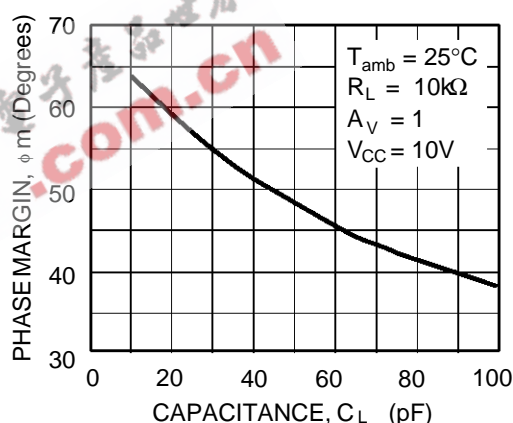


Figure 9 : Slew Rates versus Supply Voltage

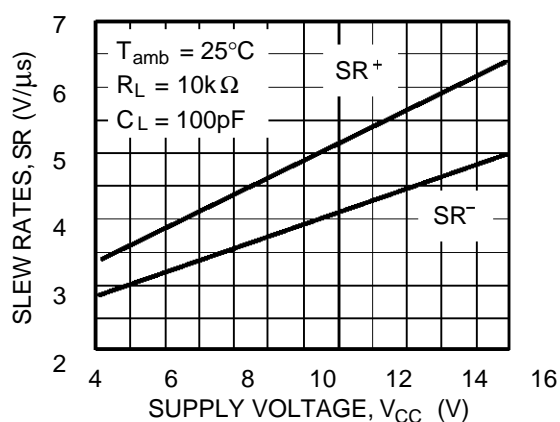
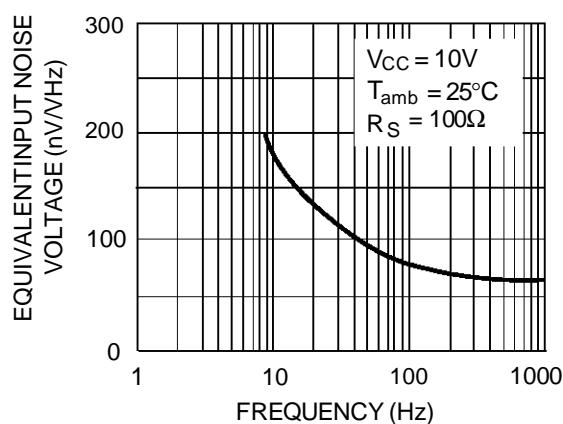
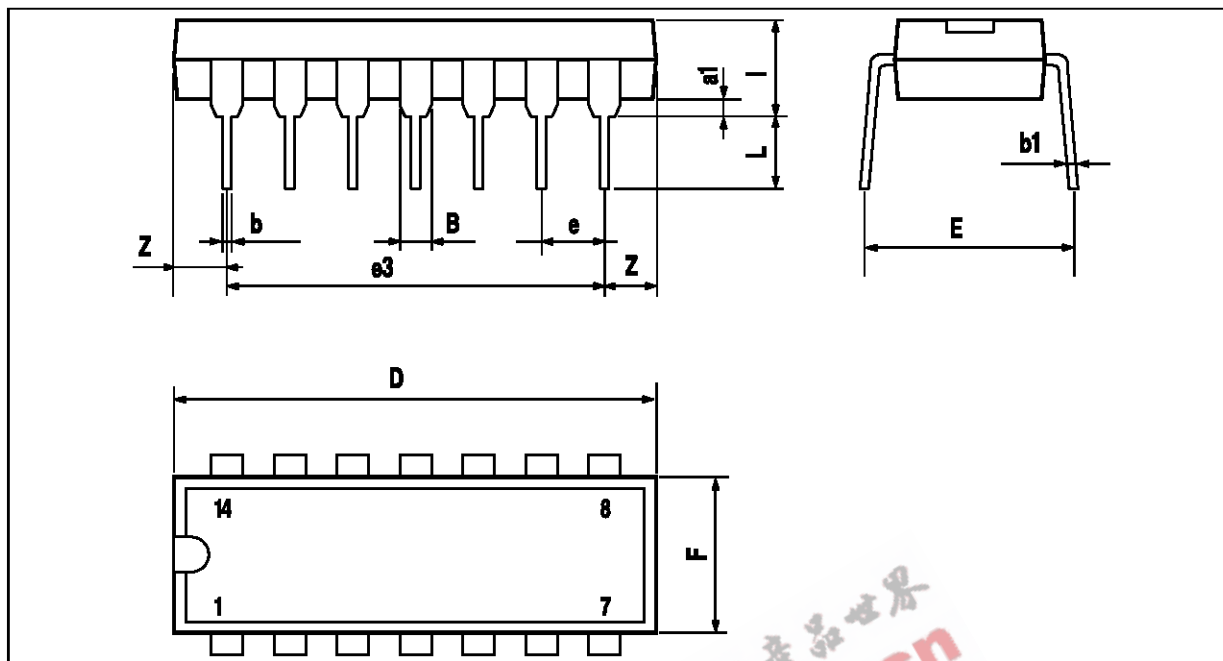


Figure 10 : Input Voltage Noise versus Frequency



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



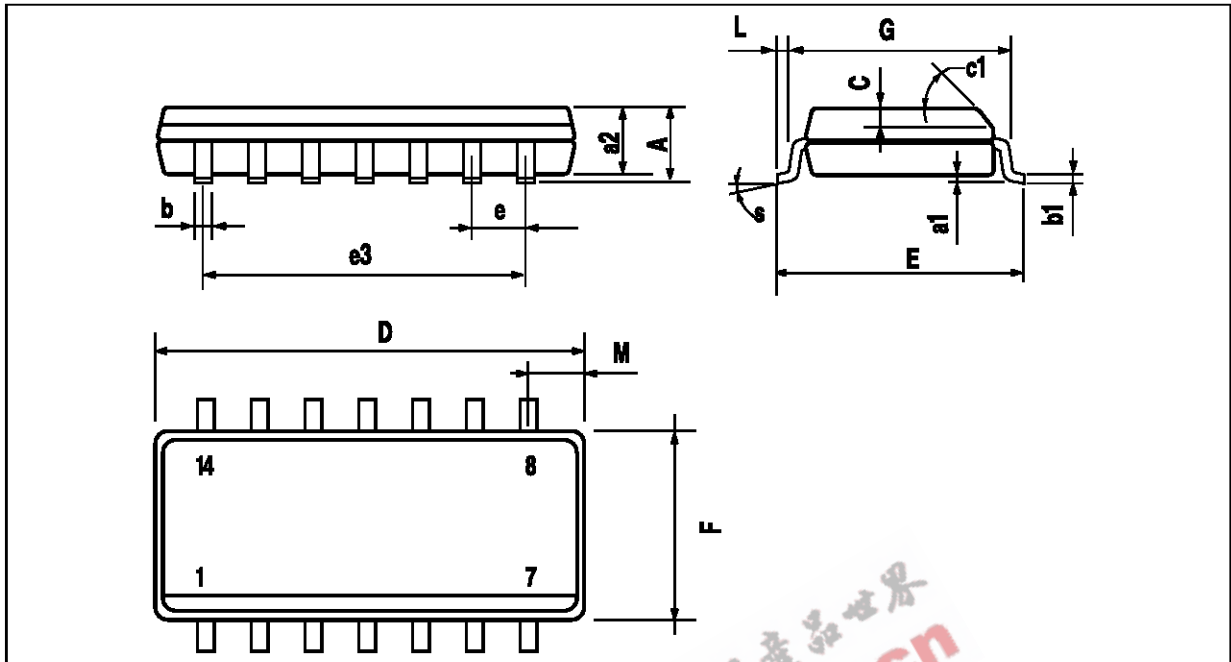
PM-DIP14,EPS

| Dimensions | Millimeters |       |      | Inches |       |       |
|------------|-------------|-------|------|--------|-------|-------|
|            | Min.        | Typ.  | Max. | Min.   | Typ.  | Max.  |
| a1         | 0.51        |       |      | 0.020  |       |       |
| B          | 1.39        |       | 1.65 | 0.055  |       | 0.065 |
| b          |             | 0.5   |      |        | 0.020 |       |
| b1         |             | 0.25  |      |        | 0.010 |       |
| D          |             |       | 20   |        |       | 0.787 |
| E          |             | 8.5   |      |        | 0.335 |       |
| e          |             | 2.54  |      |        | 0.100 |       |
| e3         |             | 15.24 |      |        | 0.600 |       |
| F          |             |       | 7.1  |        |       | 0.280 |
| i          |             |       | 5.1  |        |       | 0.201 |
| L          |             | 3.3   |      |        | 0.130 |       |
| Z          | 1.27        |       | 2.54 | 0.050  |       | 0.100 |

DIP14,TBL

**TS274C,I,M**

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



PM-SO14LEPS

| Dimensions | Millimeters |      |      | Inches |       |       |
|------------|-------------|------|------|--------|-------|-------|
|            | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A          |             |      | 1.75 |        |       | 0.069 |
| a1         | 0.1         |      | 0.2  | 0.004  |       | 0.008 |
| a2         |             |      | 1.6  |        |       | 0.063 |
| b          | 0.35        |      | 0.46 | 0.014  |       | 0.018 |
| b1         | 0.19        |      | 0.25 | 0.007  |       | 0.010 |
| C          |             | 0.5  |      |        | 0.020 |       |
| c1         | 45° (typ.)  |      |      |        |       |       |
| D          | 8.55        |      | 8.75 | 0.336  |       | 0.334 |
| E          | 5.8         |      | 6.2  | 0.228  |       | 0.244 |
| e          |             | 1.27 |      |        | 0.050 |       |
| e3         |             | 7.62 |      |        | 0.300 |       |
| F          | 3.8         |      | 4.0  | 0.150  |       | 0.157 |
| G          | 4.6         |      | 5.3  | 0.181  |       | 0.208 |
| L          | 0.5         |      | 1.27 | 0.020  |       | 0.050 |
| M          |             |      | 0.68 |        |       | 0.027 |
| S          | 8° (max.)   |      |      |        |       |       |

SO14.TBL

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