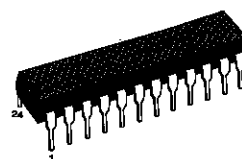
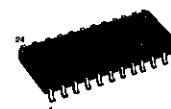


## 4 TO 16 LINE DECODER/DEMULTIPLEXER

- HIGH SPEED
- $t_{PD} = 15 \text{ ns}$  (TYP.) at  $V_{CC} = 5 \text{ V}$
- LOW POWER DISSIPATION  
 $I_{CC} = 4 \mu\text{A}$  (MAX.) at  $T_A = 25^\circ\text{C}$
- HIGH NOISE IMMUNITY  
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (MIN.)
- OUTPUT DRIVE CAPABILITY  
15 LSTTL LOADS
- SYMMETRICAL OUTPUT IMPEDANCE  
 $|I_{OH}| = I_{OL} = 4 \text{ mA}$  (MIN.)
- BALANCED PROPAGATION DELAYS  
 $t_{PLH} = t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE  
 $V_{CC}$  (OPR) = 2 V to 6 V
- PIN AND FUNCTION COMPATIBLE  
WITH 54/74LS154



**B1R**  
(Plastic Package)



**M1R**  
(Micro Package)

**ORDER CODES :**  
M74HC154B1R      M74HC154M1R

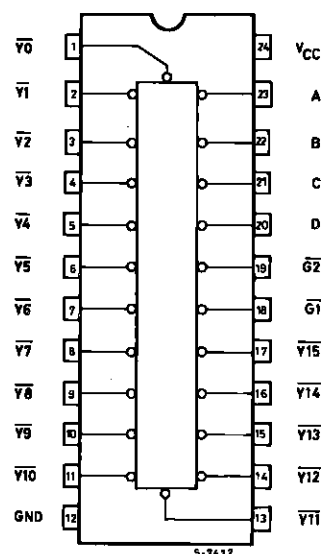
### DESCRIPTION

The 74HC154 is a high speed CMOS 4 TO 16-LINE DECODER/DEMULTIPLEXER fabricated in silicon gate  $C^2$ MOS technology. It has the same high speed performance of LSTTL combined with true CMOS low power consumption.

A binary code applied to the four inputs (A to D) provides a low level at the selected one of sixteen outputs, when both the strobe inputs,  $\overline{G1}$  and  $\overline{G2}$ , are held low. When either strobe input is held high, the decoding function is inhibited to keep all outputs high. The strobe function makes it easy to expand the decoding lines through cascading, and simplifies the design of address decoding circuits in memory control systems.

All inputs are equipped with protection circuits against static discharge and transient excess voltage.

### PIN CONNECTIONS (top view)



NC =  
No Internal  
Connection

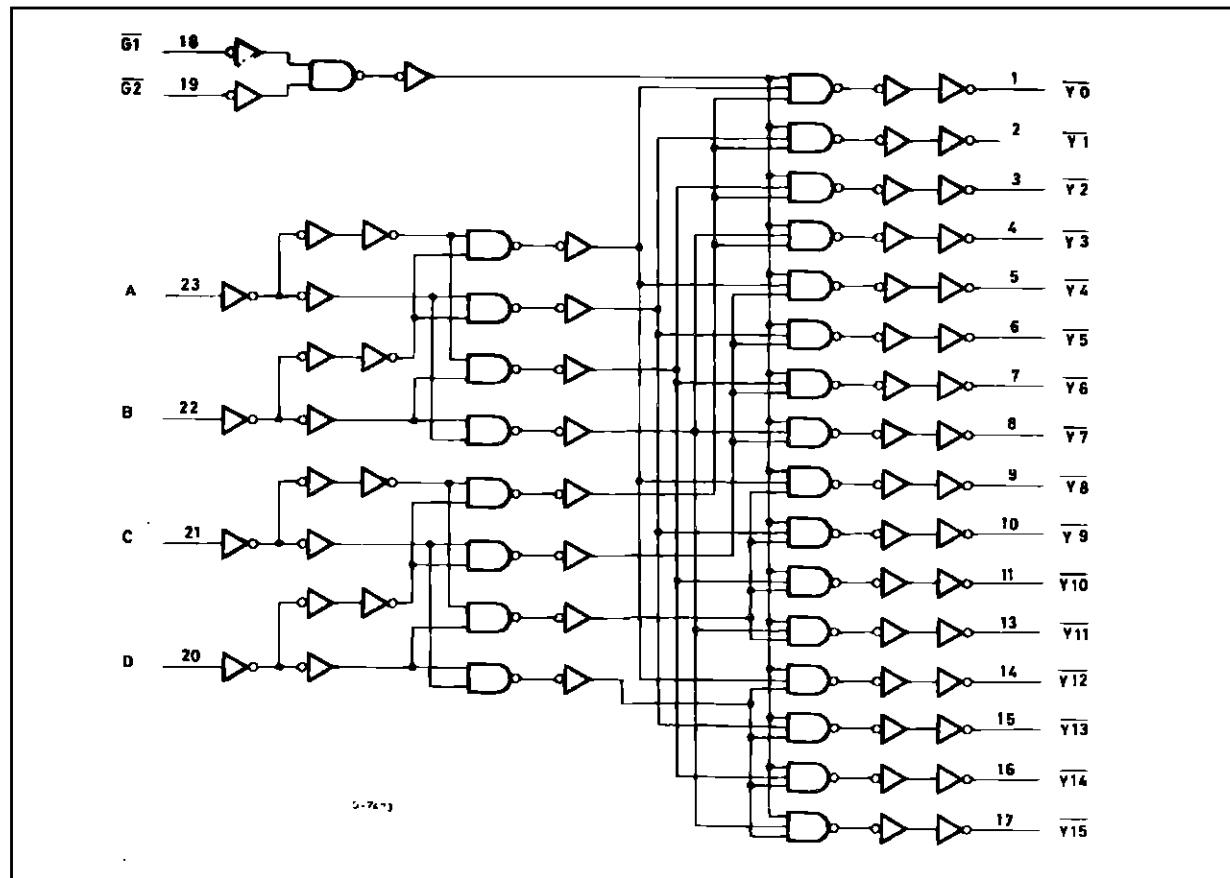
## M74HC154

### TRUTH TABLE

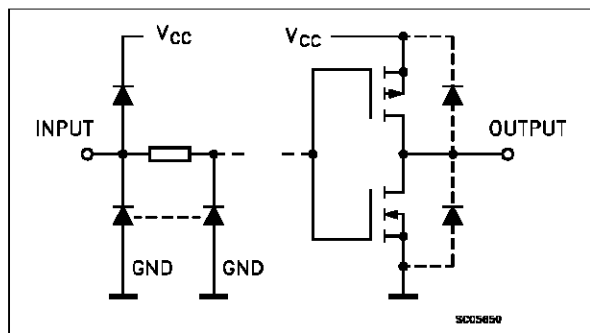
| INPUTS          |                 |   |   |   |   | SELECTED<br>OUTPUT (L) |
|-----------------|-----------------|---|---|---|---|------------------------|
| $\overline{G1}$ | $\overline{G2}$ | D | C | B | A |                        |
| L               | L               | L | L | L | L | $\overline{Y0}$        |
| L               | L               | L | L | L | H | $\overline{Y1}$        |
| L               | L               | L | L | H | L | $\overline{Y2}$        |
| L               | L               | L | L | H | H | $\overline{Y3}$        |
| L               | L               | L | H | L | L | $\overline{Y4}$        |
| L               | L               | L | H | L | H | $\overline{Y5}$        |
| L               | L               | L | H | H | L | $\overline{Y6}$        |
| L               | L               | L | H | H | H | $\overline{Y7}$        |
| L               | L               | H | L | L | L | $\overline{Y8}$        |
| L               | L               | H | L | L | H | $\overline{Y9}$        |
| L               | L               | H | L | H | L | $\overline{Y10}$       |
| L               | L               | H | L | H | H | $\overline{Y11}$       |
| L               | L               | H | H | L | L | $\overline{Y12}$       |
| L               | L               | H | H | L | H | $\overline{Y13}$       |
| L               | L               | H | H | H | L | $\overline{Y14}$       |
| L               | L               | H | H | H | H | $\overline{Y15}$       |
| X               | H               | X | X | X | X | NONE                   |
| H               | X               | X | X | X | X | NONE                   |

X: Don't Care

### LOGIC DIAGRAM



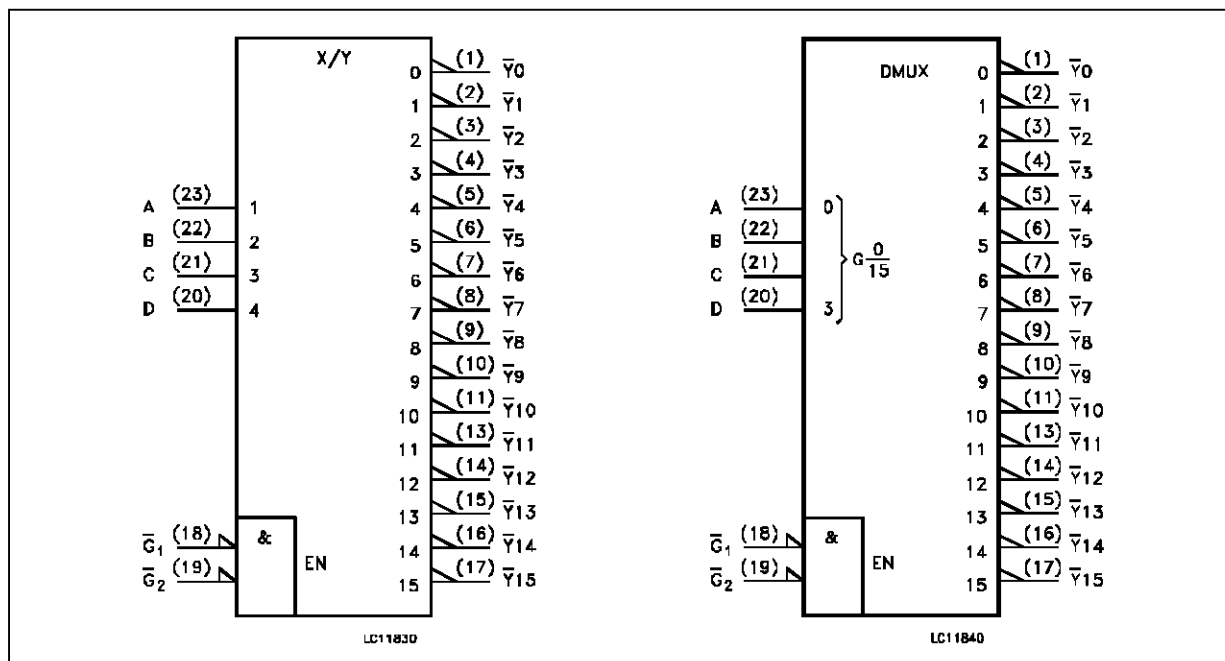
## INPUT AND OUTPUT EQUIVALENT CIRCUIT



## PIN DESCRIPTION

| PIN No                                                | SYMBOL                    | NAME AND FUNCTION          |
|-------------------------------------------------------|---------------------------|----------------------------|
| 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17 | $\bar{Y}0$ to $\bar{Y}15$ | Outputs (Active LOW)       |
| 18, 19                                                | $\bar{G}1, \bar{G}2$      | Enable Inputs (Active LOW) |
| 23, 22, 21, 20                                        | A to D                    | Address Inputs             |
| 12                                                    | GND                       | Ground (0V)                |
| 24                                                    | Vcc                       | Positive Supply Voltage    |

## IEC LOGIC SYMBOLS



## ABSOLUTE MAXIMUM RATINGS

| Symbol                | Parameter                                    | Value                  | Unit        |
|-----------------------|----------------------------------------------|------------------------|-------------|
| $V_{CC}$              | Supply Voltage                               | -0.5 to +7             | V           |
| $V_I$                 | DC Input Voltage                             | -0.5 to $V_{CC} + 0.5$ | V           |
| $V_O$                 | DC Output Voltage                            | -0.5 to $V_{CC} + 0.5$ | V           |
| $I_{IK}$              | DC Input Diode Current                       | $\pm 20$               | mA          |
| $I_{OK}$              | DC Output Diode Current                      | $\pm 20$               | mA          |
| $I_O$                 | DC Output Source Sink Current Per Output Pin | $\pm 25$               | mA          |
| $I_{CC}$ or $I_{GND}$ | DC $V_{CC}$ or Ground Current                | $\pm 50$               | mA          |
| $P_D$                 | Power Dissipation                            | 500 (*)                | mW          |
| $T_{stg}$             | Storage Temperature                          | -65 to +150            | $^{\circ}C$ |
| $T_L$                 | Lead Temperature (10 sec)                    | 300                    | $^{\circ}C$ |

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

(\*) 500 mW:  $\pm 65^{\circ}C$  derate to 300 mW by 10mW/ $^{\circ}C$ :  $65^{\circ}C$  to  $85^{\circ}C$

## M74HC154

### RECOMMENDED OPERATING CONDITIONS

| Symbol     | Parameter                |                         | Value         | Unit |
|------------|--------------------------|-------------------------|---------------|------|
| $V_{CC}$   | Supply Voltage           |                         | 2 to 6        | V    |
| $V_I$      | Input Voltage            |                         | 0 to $V_{CC}$ | V    |
| $V_O$      | Output Voltage           |                         | 0 to $V_{CC}$ | V    |
| $T_{op}$   | Operating Temperature:   |                         | -40 to +85    | °C   |
| $t_r, t_f$ | Input Rise and Fall Time | $V_{CC} = 2\text{ V}$   | 0 to 1000     | ns   |
|            |                          | $V_{CC} = 4.5\text{ V}$ | 0 to 500      |      |
|            |                          | $V_{CC} = 6\text{ V}$   | 0 to 400      |      |

### DC SPECIFICATIONS

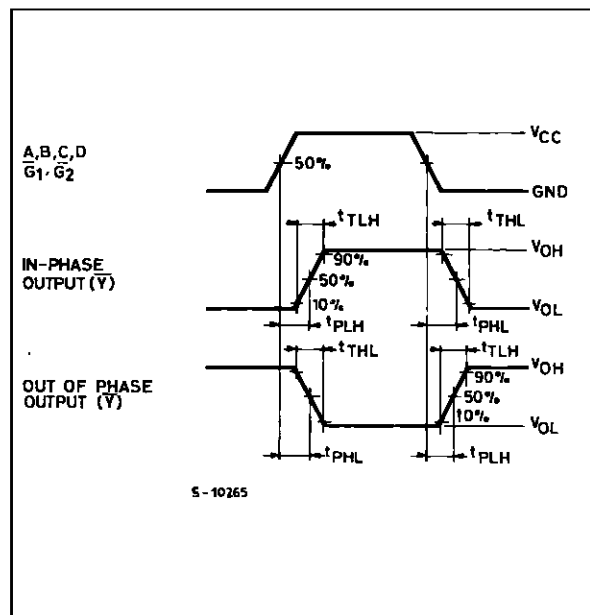
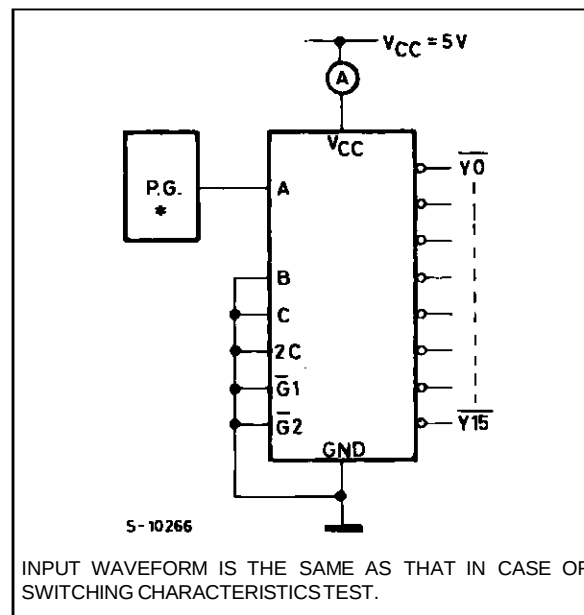
| Symbol          | Parameter                 | Test Conditions        |                                                              |                         | Value |      |              |      |      | Unit |
|-----------------|---------------------------|------------------------|--------------------------------------------------------------|-------------------------|-------|------|--------------|------|------|------|
|                 |                           | V <sub>CC</sub><br>(V) |                                                              | T <sub>A</sub> = 25 °C  |       |      | -40 to 85 °C |      |      |      |
|                 |                           |                        |                                                              | Min.                    | Typ.  | Max. | Min.         | Max. |      |      |
| V <sub>IH</sub> | High Level Input Voltage  | 2.0                    |                                                              | 1.5                     |       |      | 1.5          |      | V    |      |
|                 |                           | 4.5                    |                                                              | 3.15                    |       |      | 3.15         |      |      |      |
|                 |                           | 6.0                    |                                                              | 4.2                     |       |      | 4.2          |      |      |      |
| V <sub>IL</sub> | Low Level Input Voltage   | 2.0                    |                                                              |                         |       | 0.5  |              | 0.5  | V    |      |
|                 |                           | 4.5                    |                                                              |                         |       | 1.35 |              | 1.35 |      |      |
|                 |                           | 6.0                    |                                                              |                         |       | 1.8  |              | 1.8  |      |      |
| V <sub>OH</sub> | High Level Output Voltage | 2.0                    | V <sub>I</sub> =<br>V <sub>IH</sub><br>or<br>V <sub>IL</sub> | I <sub>O</sub> =-20 μA  | 1.9   | 2.0  |              | 1.9  | V    |      |
|                 |                           | 4.4                    |                                                              |                         | 4.5   |      | 4.4          |      |      |      |
|                 |                           | 5.9                    |                                                              |                         | 6.0   |      | 5.9          |      |      |      |
|                 |                           | 4.5                    |                                                              | I <sub>O</sub> =-4.0 mA | 4.18  | 4.31 |              | 4.13 |      |      |
|                 |                           | 6.0                    |                                                              | I <sub>O</sub> =-5.2 mA | 5.68  | 5.8  |              | 5.63 |      |      |
| V <sub>OL</sub> | Low Level Output Voltage  | 2.0                    | V <sub>I</sub> =<br>V <sub>IH</sub><br>or<br>V <sub>IL</sub> | I <sub>O</sub> = 20 μA  |       | 0.0  | 0.1          |      | 0.1  | V    |
|                 |                           |                        |                                                              |                         | 0.0   | 0.1  |              | 0.1  |      |      |
|                 |                           |                        |                                                              |                         | 0.0   | 0.1  |              | 0.1  |      |      |
|                 |                           | 4.5                    |                                                              | I <sub>O</sub> = 4.0 mA |       | 0.17 | 0.26         |      | 0.33 |      |
|                 |                           | 6.0                    |                                                              | I <sub>O</sub> = 5.2 mA |       | 0.18 | 0.26         |      | 0.33 |      |
| I <sub>I</sub>  | Input Leakage Current     | 6.0                    | V <sub>I</sub> = V <sub>CC</sub> or GND                      |                         |       | ±0.1 |              | ±1   | μA   |      |
| I <sub>CC</sub> | Quiescent Supply Current  | 6.0                    | V <sub>I</sub> = V <sub>CC</sub> or GND                      |                         |       | 4    |              | 40   | μA   |      |

AC ELECTRICAL CHARACTERISTICS ( $C_L = 50 \text{ pF}$ , Input  $t_r = t_f = 6 \text{ ns}$ )

| Symbol                               | Parameter                                  | Test Conditions        |  | Value                  |      |      |              |      | Unit |
|--------------------------------------|--------------------------------------------|------------------------|--|------------------------|------|------|--------------|------|------|
|                                      |                                            | V <sub>CC</sub><br>(V) |  | T <sub>A</sub> = 25 °C |      |      | -40 to 85 °C |      |      |
|                                      |                                            |                        |  | Min.                   | Typ. | Max. | Min.         | Max. |      |
| t <sub>TLH</sub><br>t <sub>THL</sub> | Output Transition Time                     | 2.0                    |  |                        | 30   | 75   |              | 95   | ns   |
|                                      |                                            | 4.5                    |  |                        | 8    | 15   |              | 19   |      |
|                                      |                                            | 6.0                    |  |                        | 7    | 13   |              | 16   |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay Time<br>(A, B, C, D - Y) | 2.0                    |  |                        | 65   | 175  |              | 220  | ns   |
|                                      |                                            | 4.5                    |  |                        | 19   | 35   |              | 44   |      |
|                                      |                                            | 6.0                    |  |                        | 16   | 30   |              | 37   |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay Time<br>(G1, G2 - Y)     | 2.0                    |  |                        | 55   | 160  |              | 200  | ns   |
|                                      |                                            | 4.5                    |  |                        | 17   | 32   |              | 40   |      |
|                                      |                                            | 6.0                    |  |                        | 15   | 27   |              | 34   |      |
| C <sub>IN</sub>                      | Input Capacitance                          |                        |  |                        | 5    | 10   |              | 10   | pF   |
| C <sub>PD</sub> (*)                  | Power Dissipation Capacitance              |                        |  |                        | 57   |      |              |      | pF   |

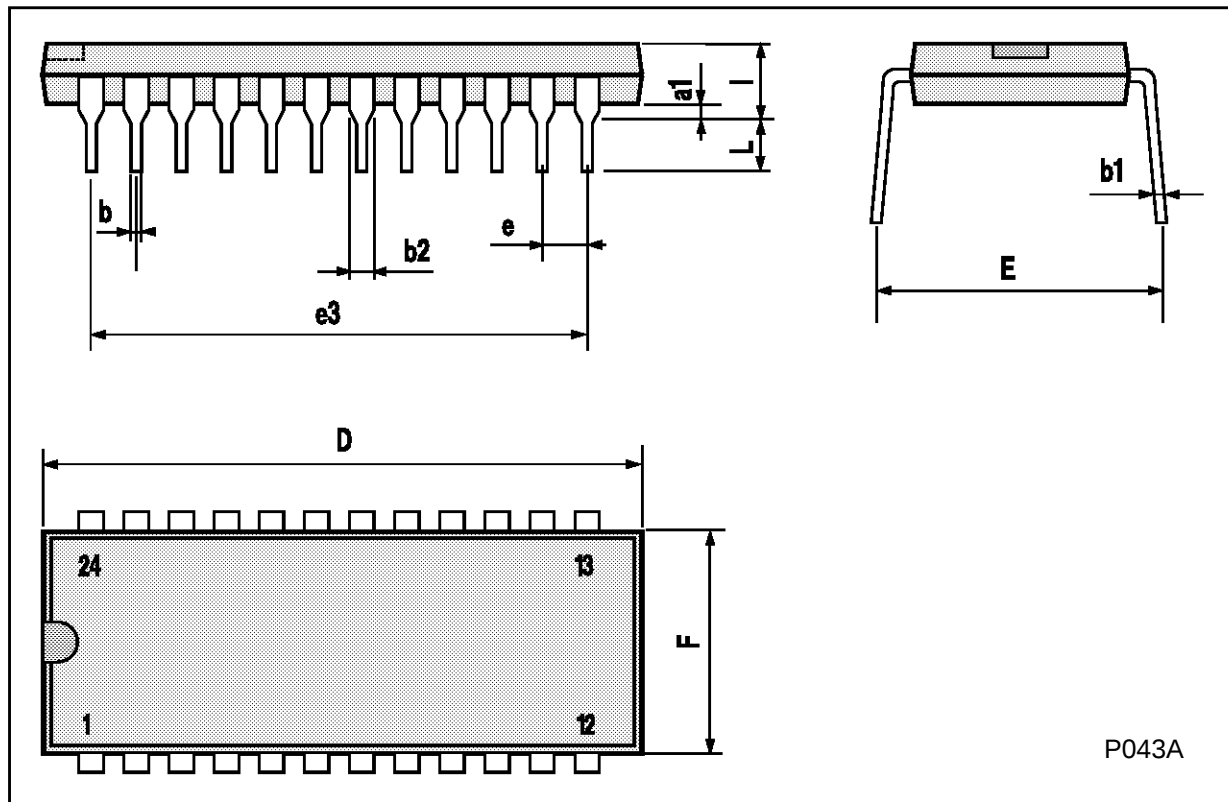
(\*)  $C_{PD}$  is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation.  $I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$

## SWITCHING CHARACTERISTICS TEST CIRCUIT

TEST CIRCUIT  $I_{CC}$  (Opr.)

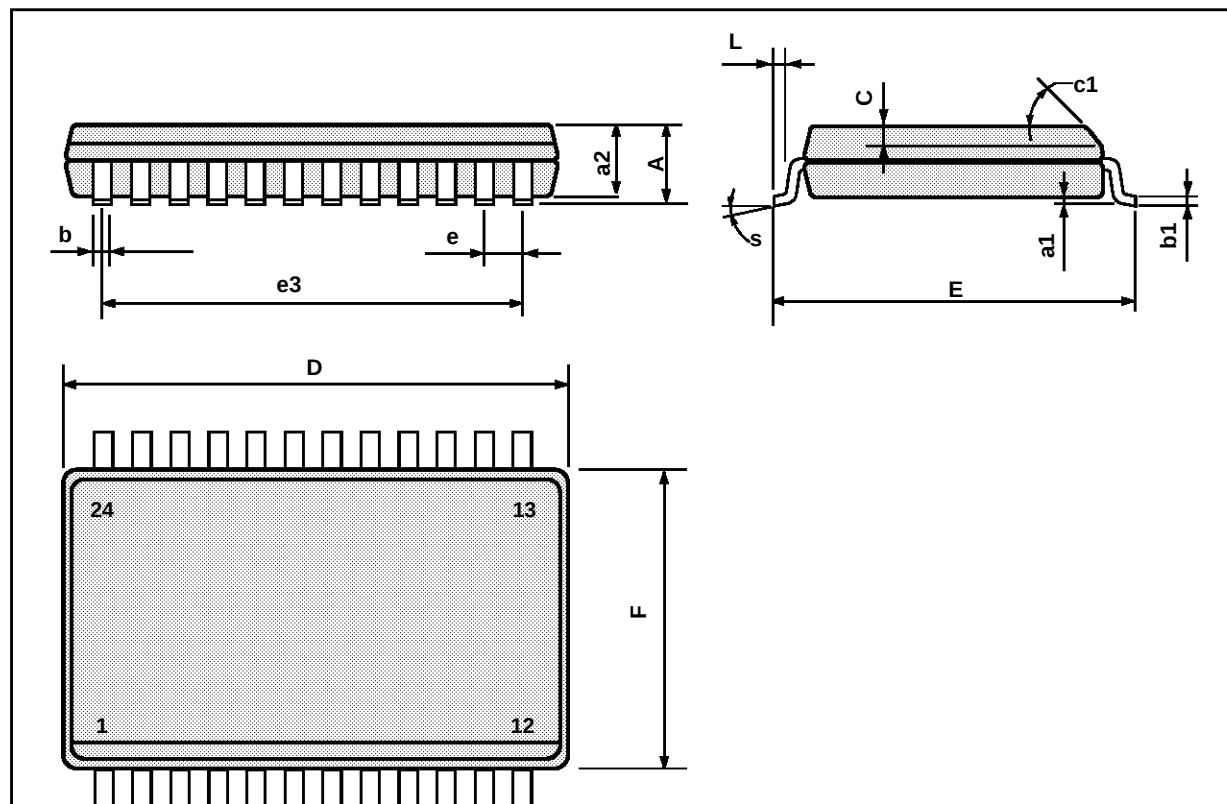
## Plastic DIP24 (0.25) MECHANICAL DATA

| DIM. | mm   |       |       | inch  |       |       |
|------|------|-------|-------|-------|-------|-------|
|      | MIN. | TYP.  | MAX.  | MIN.  | TYP.  | MAX.  |
| a1   |      | 0.63  |       |       | 0.025 |       |
| b    |      | 0.45  |       |       | 0.018 |       |
| b1   | 0.23 |       | 0.31  | 0.009 |       | 0.012 |
| b2   |      | 1.27  |       |       | 0.050 |       |
| D    |      |       | 32.2  |       |       | 1.268 |
| E    | 15.2 |       | 16.68 | 0.598 |       | 0.657 |
| e    |      | 2.54  |       |       | 0.100 |       |
| e3   |      | 27.94 |       |       | 1.100 |       |
| F    |      |       | 14.1  |       |       | 0.555 |
| l    |      | 4.445 |       |       | 0.175 |       |
| L    |      | 3.3   |       |       | 0.130 |       |



## SO24 MECHANICAL DATA

| DIM. | mm         |       |       | inch  |       |       |
|------|------------|-------|-------|-------|-------|-------|
|      | MIN.       | TYP.  | MAX.  | MIN.  | TYP.  | MAX.  |
| A    |            |       | 2.65  |       |       | 0.104 |
| a1   | 0.10       |       | 0.20  | 0.004 |       | 0.007 |
| a2   |            |       | 2.45  |       |       | 0.096 |
| b    | 0.35       |       | 0.49  | 0.013 |       | 0.019 |
| b1   | 0.23       |       | 0.32  | 0.009 |       | 0.012 |
| C    |            | 0.50  |       |       | 0.020 |       |
| c1   | 45° (typ.) |       |       |       |       |       |
| D    | 15.20      |       | 15.60 | 0.598 |       | 0.614 |
| E    | 10.00      |       | 10.65 | 0.393 |       | 0.420 |
| e    |            | 1.27  |       |       | 0.05  |       |
| e3   |            | 13.97 |       |       | 0.55  |       |
| F    | 7.40       |       | 7.60  | 0.291 |       | 0.299 |
| L    | 0.50       |       | 1.27  | 0.19  |       | 0.050 |
| S    | 8° (max.)  |       |       |       |       |       |



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