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|---------------|-----------------------|
| Document No.  | 853-1010              |
| ECN No.       | 96898                 |
| Date of Issue | May 11, 1990          |
| Status        | Product Specification |
| ACL Products  |                       |

# AC11239: Product Specification

# ACT11239: Preliminary Specification

## Dual 2-to-4 line decoder/demultiplexer, active-High

### FEATURES

- Demultiplexing capability
- Two independent 1-of-4 decoders
- Non-inverting outputs
- Output capability:  $\pm 24$  mA
- CMOS (AC) and TTL (ACT) voltage level inputs
- 50 $\Omega$  incident wave switching
- Center-pin  $V_{CC}$  and ground configuration to minimize high-speed switching noise
- $I_{CC}$  category: MSI

### DESCRIPTION

The 74AC/ACT11239 high-performance CMOS devices combine very high speed and high output drive comparable to the most advanced TTL families.

The 74AC/ACT11239 has two independent decoders, each accepting two binary weighted inputs ( $nA_0$ ,  $nA_1$ ) and providing four mutually exclusive active-High outputs ( $nY_0$  -  $nY_3$ ). Each decoder has an active-Low Enable ( $n\bar{E}$ ). When  $\bar{E}$  is High, every output is forced Low. The Enable can be used as the Data input for a 1-of-4 demultiplexer application.

### QUICK REFERENCE DATA

| SYMBOL            | PARAMETER                                              | CONDITIONS<br>$T_{amb} = 25^\circ\text{C}; \text{GND} = 0\text{V};$<br>$V_{CC} = 5.0\text{V}$ | TYPICAL |     | UNIT |
|-------------------|--------------------------------------------------------|-----------------------------------------------------------------------------------------------|---------|-----|------|
|                   |                                                        |                                                                                               | AC      | ACT |      |
| $t_{PLH}/t_{PHL}$ | Propagation delay<br>$nA_n$ to $nY_n$                  | $C_L = 50\text{pF}$                                                                           | 3.9     | 5.2 | ns   |
| $C_{PD}$          | Power dissipation capacitance per decoder <sup>1</sup> | $f = 1\text{MHz}; C_L = 50\text{pF}$                                                          | 48      | 50  | pF   |
| $C_{IN}$          | Input capacitance                                      | $V_I = 0\text{V}$ or $V_{CC}$                                                                 | 3.5     | 3.5 | pF   |
| $I_{LATCH}$       | Latch-up current                                       | Per Jeduc JC40.2 Standard 17                                                                  | 500     | 500 | mA   |

#### Note:

1.  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ):

$$P_D = C_{PD} \times V_{CC}^2 \times f_I + \sum (C_L \times V_{CC}^2 \times f_O) \text{ where:}$$

$f_I$  = input frequency in MHz,  $C_L$  = output load capacitance in pF,

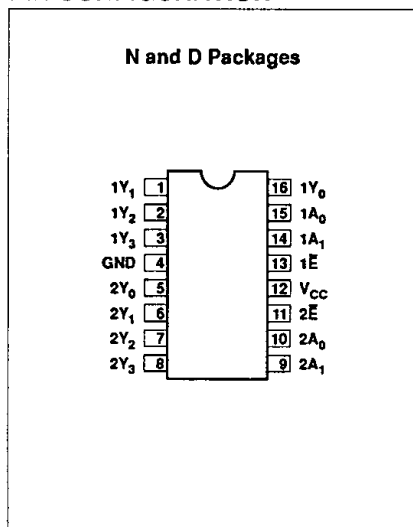
$f_O$  = output frequency in MHz,  $V_{CC}$  = supply voltage in V,

$\sum (C_L \times V_{CC}^2 \times f_O)$  = sum of outputs

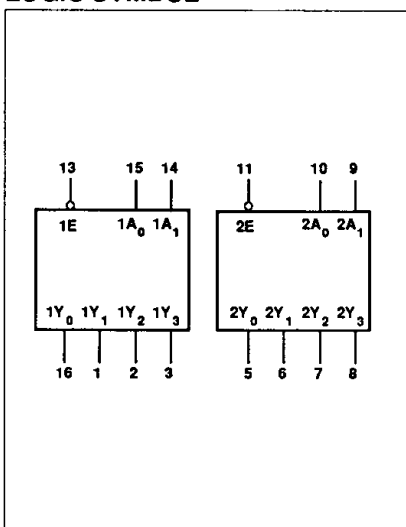
### ORDERING INFORMATION

| PACKAGES                            | TEMPERATURE RANGE | ORDER CODE                |
|-------------------------------------|-------------------|---------------------------|
| 16-pin plastic DIP<br>(300mil-wide) | -40°C to +85°C    | 74AC11239N<br>74ACT11239N |
| 16-pin plastic SO<br>(150mil-wide)  | -40°C to +85°C    | 74AC11239D<br>74ACT11239D |

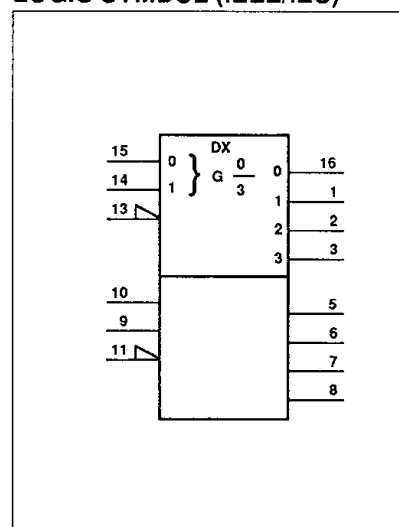
### PIN CONFIGURATION



### LOGIC SYMBOL



### LOGIC SYMBOL (IEEE/IEC)



Dual 2-to-4 line decoder/demultiplexer,  
active-High

74AC/ACT11239

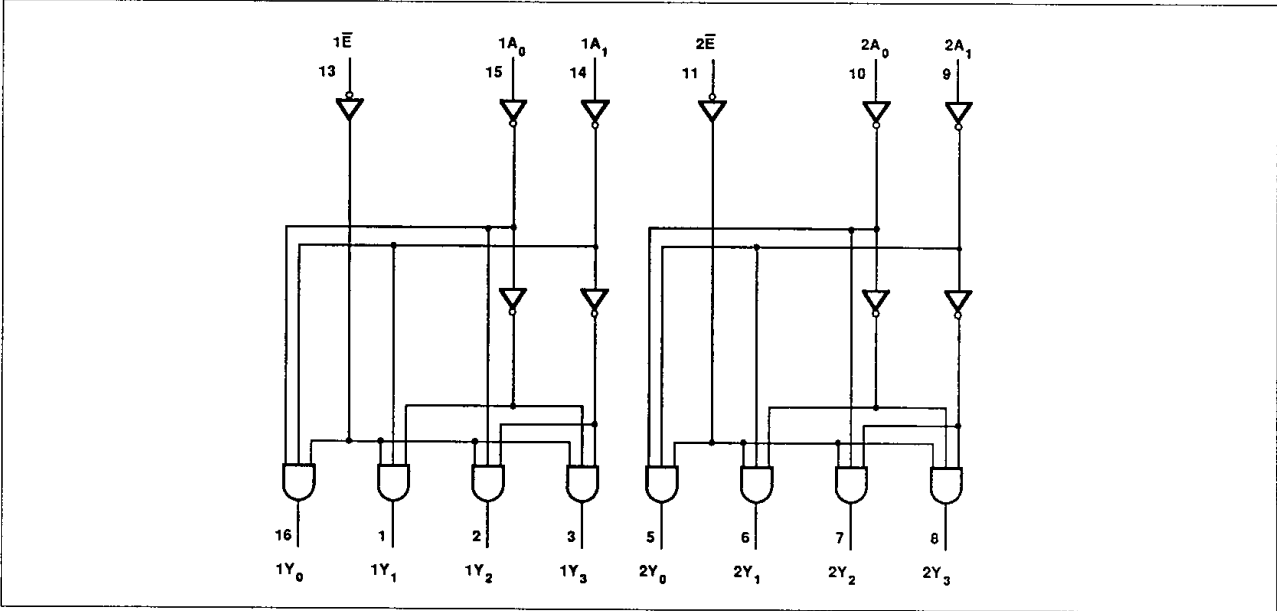
PIN DESCRIPTION

| PIN NUMBER  | SYMBOL                             | NAME AND FUNCTION                    |
|-------------|------------------------------------|--------------------------------------|
| 15, 14      | 1A <sub>0</sub> , 1A <sub>1</sub>  | Address inputs, decoder 1            |
| 13          | 1E                                 | Enable input (active Low), decoder 1 |
| 16, 1, 2, 3 | 1Y <sub>0</sub> to 1Y <sub>3</sub> | Outputs, decoder 1                   |
| 10, 9       | 2A <sub>0</sub> , 2A <sub>1</sub>  | Address inputs, decoder 2            |
| 11          | 2E                                 | Enable input (active Low), decoder 2 |
| 5, 6, 7, 8  | 2Y <sub>0</sub> to 2Y <sub>3</sub> | Outputs, decoder 2                   |
| 4           | GND                                | Ground (0V)                          |
| 12          | V <sub>CC</sub>                    | Positive supply voltage              |

FUNCTION TABLE

| INPUTS |                |                | OUTPUTS        |                |                |                |
|--------|----------------|----------------|----------------|----------------|----------------|----------------|
| E      | A <sub>0</sub> | A <sub>1</sub> | Y <sub>0</sub> | Y <sub>1</sub> | Y <sub>2</sub> | Y <sub>3</sub> |
| H      | X              | X              | L              | L              | L              | L              |
| L      | L              | L              | H              | L              | L              | L              |
| L      | H              | L              | L              | H              | L              | L              |
| L      | L              | H              | L              | L              | H              | L              |
| L      | H              | H              | L              | L              | L              | H              |

LOGIC DIAGRAM



# Dual 2-to-4 line decoder/demultiplexer, active-High

## 74AC/ACT11239

### RECOMMENDED OPERATING CONDITIONS

| SYMBOL              | PARAMETER                            | 74AC11239        |     |          | 74ACT11239 |     |          | UNIT |
|---------------------|--------------------------------------|------------------|-----|----------|------------|-----|----------|------|
|                     |                                      | Min              | Nom | Max      | Min        | Nom | Max      |      |
| $V_{CC}$            | DC supply voltage                    | 3.0 <sup>1</sup> | 5.0 | 5.5      | 4.5        | 5.0 | 5.5      | V    |
| $V_I$               | Input voltage                        | 0                |     | $V_{CC}$ | 0          |     | $V_{CC}$ | V    |
| $V_O$               | Output voltage                       | 0                |     | $V_{CC}$ | 0          |     | $V_{CC}$ | V    |
| $\Delta V/\Delta t$ | Input transition rise or fall rate   | 0                |     | 10       | 0          |     | 10       | ns/V |
| $T_{amb}$           | Operating free-air temperature range | -40              |     | +85      | -40        |     | +85      | °C   |

#### NOTE:

1. No electrical or switching characteristics are specified at  $V_{CC} < 3V$ . Operation between 2V and 3V is not recommended, but within that range, a device output will maintain a previously established logic state.

### ABSOLUTE MAXIMUM RATINGS<sup>1</sup>

| SYMBOL                      | PARAMETER                                                   | TEST CONDITIONS                      | RATING                 | UNIT |
|-----------------------------|-------------------------------------------------------------|--------------------------------------|------------------------|------|
| $V_{CC}$                    | DC supply voltage                                           |                                      | -0.5 TO +7.0           | V    |
| $I_{IK}$<br>or<br>$V_I$     | DC input diode current <sup>2</sup>                         | $V_I < 0$                            | -20                    | mA   |
|                             |                                                             | $V_I > V_{CC}$                       | 20                     |      |
|                             | DC input voltage                                            |                                      | -0.5 to $V_{CC} + 0.5$ | V    |
| $I_{OK}$<br>or<br>$V_O$     | DC output diode current <sup>2</sup>                        | $V_O < 0$                            | -50                    | mA   |
|                             |                                                             | $V_O > V_{CC}$                       | 50                     |      |
|                             | DC output voltage                                           |                                      | -0.5 to $V_{CC} + 0.5$ | V    |
| $I_O$                       | DC output source or sink current per output pin             | $V_O = 0$ to $V_{CC}$                | $\pm 50$               | mA   |
| $I_{CC}$<br>or<br>$I_{GND}$ | DC $V_{CC}$ current                                         |                                      | $\pm 200$              | mA   |
|                             | DC ground current                                           |                                      | $\pm 200$              |      |
| $T_{STG}$                   | Storage temperature                                         |                                      | -65 to 150             | °C   |
| $P_{TOT}$                   | Power dissipation per package                               | Above 70°C; derate linearly by 8mW/K | 500                    | mW   |
|                             | Power dissipation per package<br>Plastic surface mount (SO) | Above 70°C; derate linearly by 8mW/K | 400                    | mW   |

#### NOTES:

1. Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
2. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

# Dual 2-to-4 line decoder/demultiplexer, active-High

74AC/ACT11239

## DC ELECTRICAL CHARACTERISTICS

| SYMBOL           | PARAMETER                                    | TEST CONDITIONS                                               |                                      | V <sub>CC</sub> | 74AC11239                |      |                                   |      | 74ACT11239               |      |                                   |      | UNIT |   |
|------------------|----------------------------------------------|---------------------------------------------------------------|--------------------------------------|-----------------|--------------------------|------|-----------------------------------|------|--------------------------|------|-----------------------------------|------|------|---|
|                  |                                              |                                                               |                                      |                 | T <sub>amb</sub> = +25°C |      | T <sub>amb</sub> = -40°C to +85°C |      | T <sub>amb</sub> = +25°C |      | T <sub>amb</sub> = -40°C to +85°C |      |      |   |
|                  |                                              |                                                               |                                      |                 | Min                      | Max  | Min                               | Max  | Min                      | Max  | Min                               | Max  |      |   |
| V <sub>IH</sub>  | High-level input voltage                     |                                                               |                                      | V               | 3.0                      | 2.10 |                                   | 2.10 |                          |      |                                   |      |      | V |
|                  |                                              |                                                               |                                      | 4.5             | 3.15                     |      | 3.15                              |      | 2.0                      |      | 2.0                               |      |      |   |
|                  |                                              |                                                               |                                      | 5.5             | 3.85                     |      | 3.85                              |      | 2.0                      |      | 2.0                               |      |      |   |
| V <sub>IL</sub>  | Low-level input voltage                      |                                                               |                                      | 3.0             |                          | 0.90 |                                   | 0.90 |                          |      |                                   |      | V    |   |
|                  |                                              |                                                               |                                      | 4.5             |                          | 1.35 |                                   | 1.35 |                          | 0.8  |                                   | 0.8  |      |   |
|                  |                                              |                                                               |                                      | 5.5             |                          | 1.65 |                                   | 1.65 |                          | 0.8  |                                   | 0.8  |      |   |
| V <sub>OH</sub>  | High-level output voltage                    | V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>           | I <sub>OH</sub> = -50μA              | 3.0             | 2.9                      |      | 2.9                               |      |                          |      |                                   |      | V    |   |
|                  |                                              |                                                               |                                      | 4.5             | 4.4                      |      | 4.4                               |      | 4.4                      |      | 4.4                               |      |      |   |
|                  |                                              |                                                               |                                      | 5.5             | 5.4                      |      | 5.4                               |      | 5.4                      |      | 5.4                               |      |      |   |
|                  |                                              |                                                               | I <sub>OH</sub> = -4mA               | 3.0             | 2.58                     |      | 2.48                              |      |                          |      |                                   |      |      |   |
|                  |                                              |                                                               |                                      | 4.5             | 3.94                     |      | 3.8                               |      | 3.94                     |      | 3.8                               |      |      |   |
|                  |                                              |                                                               |                                      | 5.5             | 4.94                     |      | 4.8                               |      | 4.94                     |      | 4.8                               |      |      |   |
|                  |                                              |                                                               | I <sub>OH</sub> = -75mA <sup>1</sup> | 5.5             |                          |      | 3.85                              |      |                          |      | 3.85                              |      |      |   |
| V <sub>OL</sub>  | Low-level output voltage                     | V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>           | I <sub>OL</sub> = 50μA               | 3.0             |                          | 0.1  |                                   | 0.1  |                          |      |                                   |      | V    |   |
|                  |                                              |                                                               |                                      | 4.5             |                          | 0.1  |                                   | 0.1  |                          | 0.1  |                                   | 0.1  |      |   |
|                  |                                              |                                                               |                                      | 5.5             |                          | 0.1  |                                   | 0.1  |                          | 0.1  |                                   | 0.1  |      |   |
|                  |                                              |                                                               | I <sub>OL</sub> = 12mA               | 3.0             |                          | 0.36 |                                   | 0.44 |                          |      |                                   |      |      |   |
|                  |                                              |                                                               |                                      | 4.5             |                          | 0.36 |                                   | 0.44 |                          | 0.36 |                                   | 0.44 |      |   |
|                  |                                              |                                                               |                                      | 5.5             |                          | 0.36 |                                   | 0.44 |                          | 0.36 |                                   | 0.44 |      |   |
|                  |                                              |                                                               | I <sub>OL</sub> = 75mA <sup>1</sup>  | 5.5             |                          |      |                                   | 1.65 |                          |      |                                   | 1.65 |      |   |
| I <sub>I</sub>   | Input leakage current                        | V <sub>I</sub> = V <sub>CC</sub> or GND                       | 5.5                                  |                 | ±0.1                     |      | ±1.0                              |      | ±0.1                     |      | ±1.0                              | μA   |      |   |
| I <sub>CC</sub>  | Quiescent supply current                     | V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0mA | 5.5                                  |                 | 8.0                      |      | 80                                |      | 8.0                      |      | 80                                | μA   |      |   |
| ΔI <sub>CC</sub> | Supply current, TTL inputs High <sup>2</sup> | One input at 3.4V, other inputs at V <sub>CC</sub> or GND     | 5.5                                  |                 |                          |      |                                   |      | 0.9                      |      | 1.0                               | mA   |      |   |

### NOTES:

1. Not more than one output should be tested at a time, and the duration of the test should not exceed 10ms.
2. This is the increase in supply current for each input that is at one of the specified TTL voltage levels rather than 0V or V<sub>CC</sub>.

# Dual 2-to-4 line decoder/demultiplexer, active-High

## 74AC/ACT11239

### AC ELECTRICAL CHARACTERISTICS AT 3.3V $\pm 0.3V$

| SYMBOL                               | PARAMETER                                               | WAVEFORM | 74AC11239                |            |            |                                   |            | UNIT |
|--------------------------------------|---------------------------------------------------------|----------|--------------------------|------------|------------|-----------------------------------|------------|------|
|                                      |                                                         |          | T <sub>amb</sub> = +25°C |            |            | T <sub>amb</sub> = -40°C to +85°C |            |      |
|                                      |                                                         |          | Min                      | Typ        | Max        | Min                               | Max        |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation delay<br>nA <sub>n</sub> to nY <sub>n</sub> | 1 and 2  | 1.5<br>1.5               | 6.2<br>5.6 | 8.5<br>8.0 | 1.5<br>1.5                        | 9.5<br>9.0 | ns   |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation delay<br>nE̅ to nY <sub>n</sub>             | 2        | 1.5<br>1.5               | 5.4<br>5.7 | 7.1<br>7.3 | 1.5<br>1.5                        | 7.9<br>8.1 | ns   |

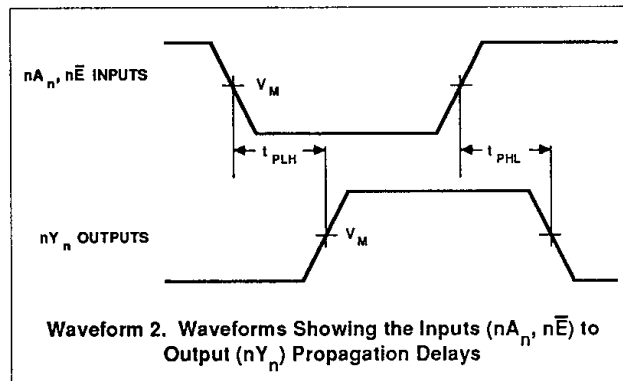
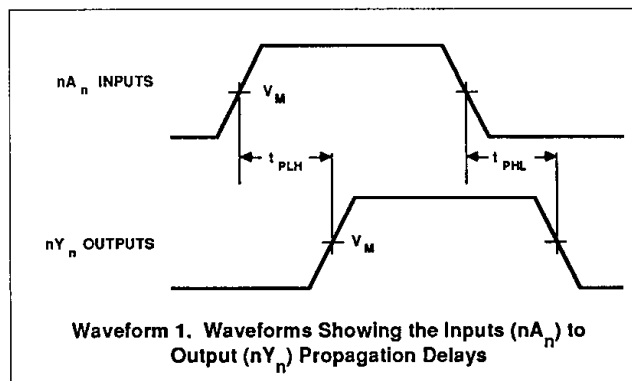
### AC ELECTRICAL CHARACTERISTICS AT 5.0V $\pm 0.5V$

| SYMBOL                               | PARAMETER                                               | WAVEFORM | 74AC11239                |            |            |                                   |            | UNIT |
|--------------------------------------|---------------------------------------------------------|----------|--------------------------|------------|------------|-----------------------------------|------------|------|
|                                      |                                                         |          | T <sub>amb</sub> = +25°C |            |            | T <sub>amb</sub> = -40°C to +85°C |            |      |
|                                      |                                                         |          | Min                      | Typ        | Max        | Min                               | Max        |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation delay<br>nA <sub>n</sub> to nY <sub>n</sub> | 1 and 2  | 1.5<br>1.5               | 4.0<br>3.7 | 6.1<br>6.1 | 1.5<br>1.5                        | 6.7<br>6.8 | ns   |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation delay<br>nE to nY <sub>n</sub>              | 2        | 1.5<br>1.5               | 3.5<br>3.9 | 5.3<br>5.6 | 1.5<br>1.5                        | 5.8<br>6.2 | ns   |

### AC ELECTRICAL CHARACTERISTICS AT 5.0V $\pm 0.5V$

| SYMBOL                               | PARAMETER                                               | WAVEFORM | 74ACT11239               |            |            |                                   |            | UNIT |
|--------------------------------------|---------------------------------------------------------|----------|--------------------------|------------|------------|-----------------------------------|------------|------|
|                                      |                                                         |          | T <sub>amb</sub> = +25°C |            |            | T <sub>amb</sub> = -40°C to +85°C |            |      |
|                                      |                                                         |          | Min                      | Typ        | Max        | Min                               | Max        |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation delay<br>nA <sub>n</sub> to nY <sub>n</sub> | 1 and 2  | 1.7<br>1.5               | 5.0<br>5.4 | 6.7<br>7.2 | 1.7<br>1.5                        | 7.2<br>8.0 | ns   |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation delay<br>nE̅ to nY <sub>n</sub>             | 2        | 1.5<br>2.6               | 3.8<br>5.3 | 5.8<br>7.1 | 1.5<br>2.6                        | 6.2<br>7.8 | ns   |

### AC WAVEFORMS



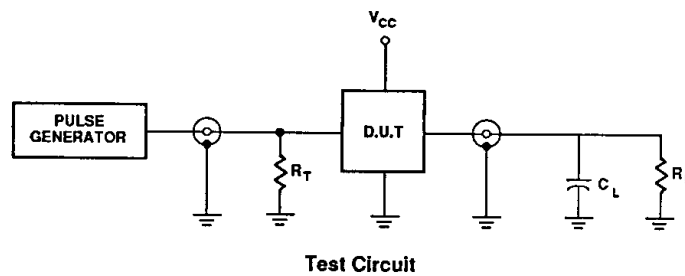
## Dual 2-to-4 line decoder/demultiplexer, active-High

74AC/ACT11239

### WAVEFORM CONDITIONS

|     | INPUTS                                                   | OUTPUTS                                                          |
|-----|----------------------------------------------------------|------------------------------------------------------------------|
| AC  | $V_{IN} = \text{GND to } V_{CC},$<br>$V_M = 50\% V_{CC}$ | $V_{OUT} = V_{OL} \text{ to } V_{OH}$<br><br>$V_M = 50\% V_{CC}$ |
| ACT | $V_{IN} = \text{GND to } 3.0V,$<br>$V_M = 1.5V$          |                                                                  |

### TEST CIRCUIT



#### DEFINITIONS

$C_L$  = Load capacitance, 50pF; includes jig and probe capacitance

$R_L$  = Load resistor, 500 $\Omega$

$R_T$  = Termination resistance should be equal to  $Z_{OUT}$  of pulse generators

Input pulses:  $PRR \leq 10\text{MHz}$

$t_r = t_f = 3\text{ns}$