

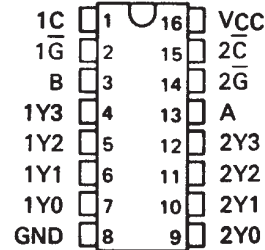
# SN54155, SN54156, SN54LS155A, SN54LS156, SN74155, SN74156, SN74LS155A, SN74LS156 DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

SDLS057 - MARCH 1974 - REVISED MARCH 1988

- **Applications:**  
Dual 2-to 4-Line Decoder  
Dual 1-to 4-Line Demultiplexer  
3-to 8-Line Decoder  
1-to 8-Line Demultiplexer
- **Individual Strobes Simplify Cascading for Decoding or Demultiplexing Larger Words**
- **Input Clamping Diodes Simplify System Design**
- **Choice of Outputs:**  
Totem Pole ('155, 'LS155A)  
Open-Collector ('156, 'LS156)

SN54155, SN54156, SN54LS155A,  
SN54LS156 . . . J OR W PACKAGE  
SN74155, SN74156 . . . N PACKAGE  
SN74LS155A, SN74LS156 . . . D OR N PACKAGE

(TOP VIEW)



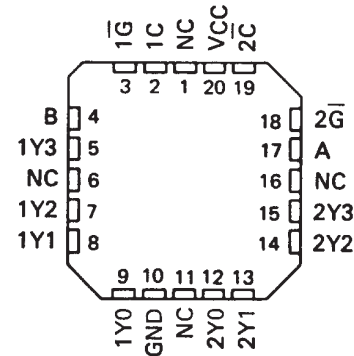
| TYPES      | TYPICAL AVERAGE<br>PROPAGATION DELAY<br>3 GATE LEVELS | TYPICAL<br>POWER<br>DISSIPATION |
|------------|-------------------------------------------------------|---------------------------------|
| '155, '156 | 21 ns                                                 | 125 mW                          |
| 'LS155A    | 18 ns                                                 | 31 mW                           |
| 'LS156     | 32 ns                                                 | 31 mW                           |

## description

These monolithic transistor-transistor-logic (TTL) circuits feature dual 1-line-to-4-line demultiplexers with individual strobes and common binary-address inputs in a single 16-pin package. When both sections are enabled by the strobes, the common binary-address inputs sequentially select and route associated input data to the appropriate output of each section. The individual strobes permit activating or inhibiting each of the 4-bit sections as desired. Data applied to input 1C is inverted at its outputs and data applied at 2C is not inverted through its outputs. The inverter following the 1C data input permits use as a 3-to-8-line decoder or 1-to-8-line demultiplexer without external gating. Input clamping diodes are provided on all of these circuits to minimize transmission-line effects and simplify system design.

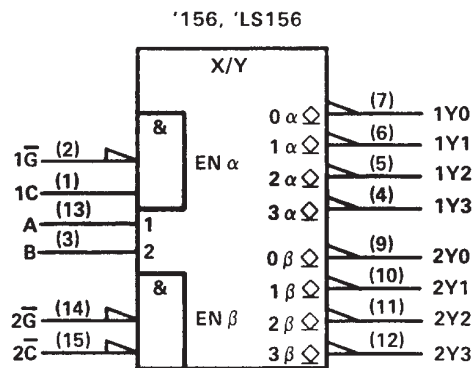
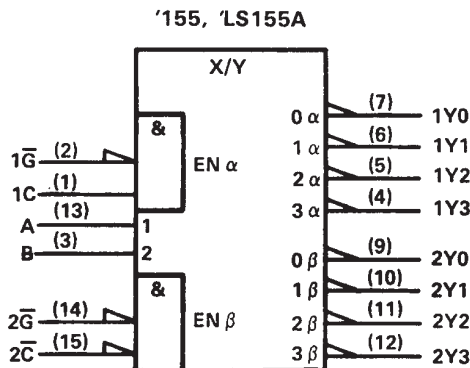
SN54LS155A, SN54LS156 . . . FK PACKAGE

(TOP VIEW)



NC - No internal connection

## logic symbols (2-line to 4-line decoder)<sup>†</sup>



<sup>†</sup>These symbols are in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12. For alternative symbols for other applications, see the following page.

Pin numbers shown are for D, J, N, and W packages.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS  
INSTRUMENTS**

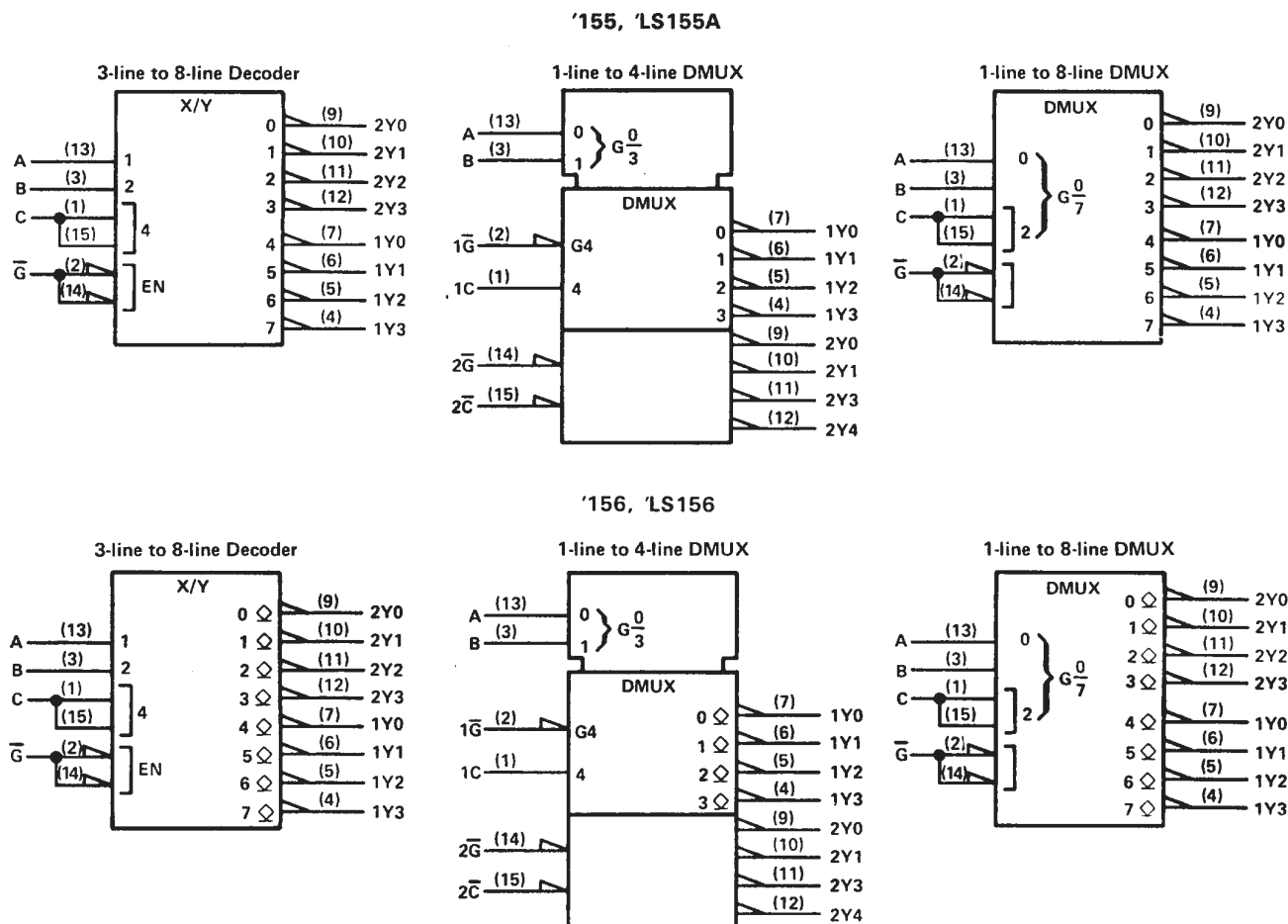
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# SN54155, SN54156, SN54LS155A, SN54LS156, SN74155, SN74156, SN74LS155A, SN74LS156 DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

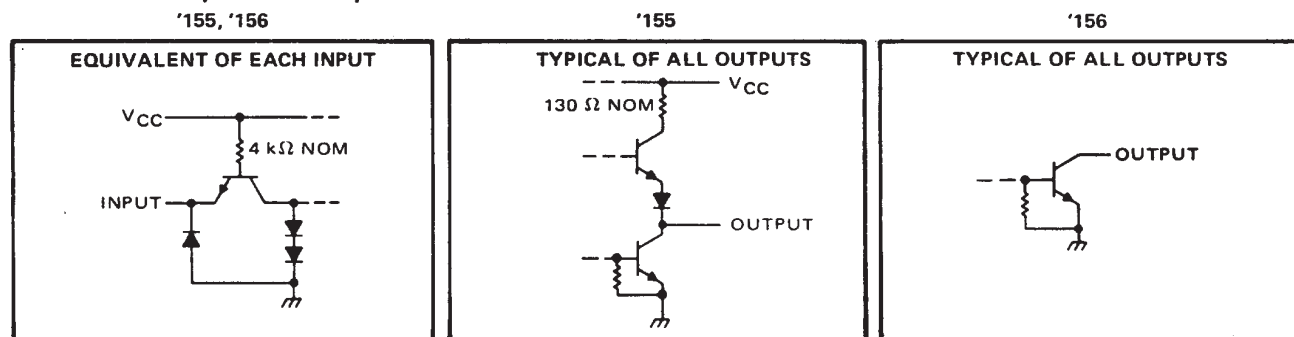
SDLS057 – MARCH 1974 – REVISED MARCH 1988

## additional logic symbols (alternatives)<sup>†</sup>



<sup>†</sup>These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for D, J, N, and W packages.

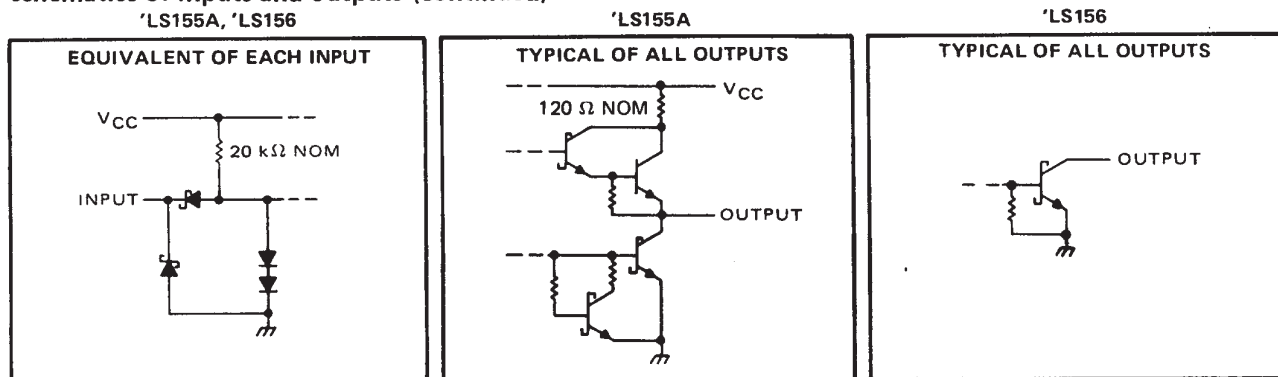
## schematics of inputs and outputs



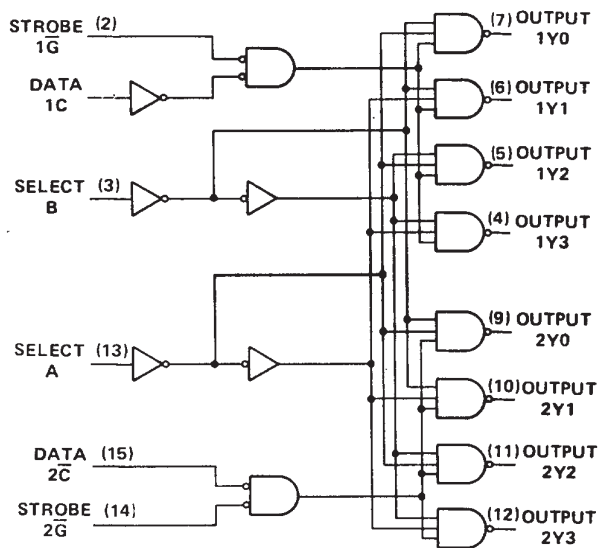
# SN54155, SN54156, SN54LS155A, SN54LS156, SN74155, SN74156, SN74LS155A, SN74LS156 DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

SDLS057 – MARCH 1974 – REVISED MARCH 1988

## schematics of inputs and outputs (continued)



## logic diagram (positive logic)



## FUNCTION TABLES

### 2-LINE-TO-4-LINE DECODER

#### OR 1-LINE-TO-4-LINE DEMULTIPLEXER

| INPUTS |        |      |    | OUTPUTS |     |     |     |
|--------|--------|------|----|---------|-----|-----|-----|
| SELECT | STROBE | DATA |    | 1Y0     | 1Y1 | 1Y2 | 1Y3 |
| B      | A      | 1G   | 1C |         |     |     |     |
| X      | X      | H    | X  | H       | H   | H   | H   |
| L      | L      | L    | H  | L       | H   | H   | H   |
| L      | H      | L    | H  | H       | L   | H   | H   |
| H      | L      | L    | H  | H       | H   | L   | H   |
| H      | H      | L    | H  | H       | H   | H   | L   |
| X      | X      | X    | L  | H       | H   | H   | H   |

| INPUTS |        |      |    | OUTPUTS |     |     |     |
|--------|--------|------|----|---------|-----|-----|-----|
| SELECT | STROBE | DATA |    | 2Y0     | 2Y1 | 2Y2 | 2Y3 |
| B      | A      | 2G   | 2C |         |     |     |     |
| X      | X      | H    | X  | H       | H   | H   | H   |
| L      | L      | L    | L  | L       | H   | H   | H   |
| L      | H      | L    | L  | H       | L   | H   | H   |
| H      | L      | L    | L  | H       | H   | L   | H   |
| H      | H      | L    | L  | H       | H   | H   | L   |
| X      | X      | X    | H  | H       | H   | H   | H   |

## FUNCTION TABLE

### 3-LINE-TO-8-LINE DECODER

#### OR 1-LINE-TO-8-LINE DEMULTIPLEXER

| INPUTS |        |         |    | OUTPUTS |     |     |     |     |     |     |     |
|--------|--------|---------|----|---------|-----|-----|-----|-----|-----|-----|-----|
| SELECT | STROBE | OR DATA |    | (0)     | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| C†     | B      | A       | G‡ | 2Y0     | 2Y1 | 2Y2 | 2Y3 | 1Y0 | 1Y1 | 1Y2 | 1Y3 |
| X      | X      | X       | H  | H       | H   | H   | H   | H   | H   | H   | H   |
| L      | L      | L       | L  | L       | H   | H   | H   | H   | H   | H   | H   |
| L      | L      | H       | L  | H       | L   | H   | H   | H   | H   | H   | H   |
| L      | H      | L       | L  | H       | H   | L   | H   | H   | H   | H   | H   |
| L      | H      | H       | L  | H       | H   | H   | L   | H   | H   | H   | H   |
| H      | L      | L       | L  | H       | H   | H   | H   | L   | H   | H   | H   |
| H      | L      | H       | L  | H       | H   | H   | H   | H   | L   | H   | H   |
| H      | H      | L       | L  | H       | H   | H   | H   | H   | H   | L   | H   |
| H      | H      | H       | L  | H       | H   | H   | H   | H   | H   | H   | L   |

†C = inputs 1C and 2C connected together

‡G = inputs 1G and 2G connected together

H = high level, L = low level, X = irrelevant

# SN54155, SN54156, SN54LS155A, SN54LS156, SN74155, SN74156, SN74LS155A, SN74LS156 DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

SDLS057 – MARCH 1974 – REVISED MARCH 1988

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

|                                                               |                |
|---------------------------------------------------------------|----------------|
| Supply voltage, $V_{CC}$ (see Note 1)                         | 7 V            |
| Input voltage: '155, '156                                     | 5.5 V          |
| 'LS155A, 'LS156                                               | 7 V            |
| Off-state output voltage: '156                                | 5.5 V          |
| 'LS156                                                        | 7 V            |
| Operating free-air temperature range: SN54', SN54LS' Circuits | –55°C to 125°C |
| SN74', SN74LS' Circuits                                       | 0°C to 70°C    |
| Storage temperature range                                     | –65°C to 150°C |

NOTE 1: Voltage values are with respect to network ground terminal.

recommended operating conditions

|                                       | SN54155 |     |      | SN74155 |     |      | UNIT    |
|---------------------------------------|---------|-----|------|---------|-----|------|---------|
|                                       | MIN     | NOM | MAX  | MIN     | NOM | MAX  |         |
| Supply voltage, $V_{CC}$              | 4.5     | 5   | 5.5  | 4.75    | 5   | 5.25 | V       |
| High-level output current, $I_{OH}$   |         |     | –800 |         |     | –800 | $\mu$ A |
| Low-level output current, $I_{OL}$    |         |     | 16   |         |     | 16   | mA      |
| Operating free-air temperature, $T_A$ | –55     |     | 125  | 0       |     | 70   | °C      |

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER                                    | TEST CONDITIONS†                                                                                    | SN54155<br>SN74155 |      |      | UNIT    |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------|--------------------|------|------|---------|
|                                              |                                                                                                     | MIN                | TYP‡ | MAX  |         |
| $V_{IH}$ High-level input voltage            |                                                                                                     | 2                  |      |      | V       |
| $V_{IL}$ Low-level input voltage             |                                                                                                     |                    |      | 0.8  | V       |
| $V_{IK}$ Input clamp voltage                 | $V_{CC} = \text{MIN}, I_I = -8 \text{ mA}$                                                          |                    |      | –1.5 | V       |
| $V_{OH}$ High-level output voltage           | $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$<br>$V_{IL} = 0.8 \text{ V}, I_{OH} = -800 \mu\text{A}$ | 2.4                | 3.4  |      | V       |
| $V_{OL}$ Low-level output voltage            | $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$<br>$V_{IL} = 0.8 \text{ V}, I_{OL} = 16 \text{ mA}$    |                    | 0.2  | 0.4  | V       |
| $I_I$ Input current at maximum input voltage | $V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$                                                          |                    |      | 1    | mA      |
| $I_{IH}$ High-level input current            | $V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$                                                          |                    |      | 40   | $\mu$ A |
| $I_{IL}$ Low-level input current             | $V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$                                                          |                    |      | –1.6 | mA      |
| $I_{OS}$ Short-circuit output current§       | $V_{CC} = \text{MAX}$                                                                               | SN54155            | –20  | –55  | mA      |
|                                              |                                                                                                     | SN74155            | –18  | –57  |         |
| $I_{CC}$ Supply current                      | $V_{CC} = \text{MAX},$<br>See Note 2                                                                | SN54155            | 25   | 35   | mA      |
|                                              |                                                                                                     | SN74155            | 25   | 40   |         |

†For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡All typical values are at  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$ .

§Not more than one output should be shorted at a time.

NOTE 2:  $I_{CC}$  is measured with outputs open, A, B, and 1C inputs at 4.5 V, and 2C, 1G, and 2G inputs grounded.

switching characteristics,  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$

| PARAMETER | FROM<br>(INPUT)        | TO<br>(OUTPUT) | LEVELS<br>OF LOGIC | TEST CONDITIONS                                             | SN54155<br>SN74155 |     |     | UNIT |
|-----------|------------------------|----------------|--------------------|-------------------------------------------------------------|--------------------|-----|-----|------|
|           |                        |                |                    |                                                             | MIN                | TYP | MAX |      |
| $t_{PLH}$ | A, B, 2C,<br>1G, or 2G | Y              | 2                  | $C_L = 15 \text{ pF},$<br>$R_L = 400 \Omega,$<br>See Note 3 |                    | 13  | 20  | ns   |
| $t_{PHL}$ | A, B, 2C,<br>1G, or 2G | Y              | 2                  |                                                             |                    | 18  | 27  | ns   |
| $t_{PLH}$ | A or B                 | y              | 3                  |                                                             |                    | 21  | 32  | ns   |
| $t_{PHL}$ | A or B                 | Y              | 3                  |                                                             |                    | 21  | 32  | ns   |
| $t_{PLH}$ | 1C                     | Y              | 3                  |                                                             |                    | 16  | 24  | ns   |
| $t_{PHL}$ | 1C                     | Y              | 3                  |                                                             |                    | 20  | 30  | ns   |

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



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# SN54155A, SN74155A

## DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

SDLS057 – MARCH 1974 – REVISED MARCH 1988

### recommended operating conditions

|                                       | SN54156 |     |     | SN74156 |     |      | UNIT |
|---------------------------------------|---------|-----|-----|---------|-----|------|------|
|                                       | MIN     | NOM | MAX | MIN     | NOM | MAX  |      |
| Supply voltage, $V_{CC}$              | 4.5     | 5   | 5.5 | 4.75    | 5   | 5.25 | V    |
| High-level output voltage, $V_{OH}$   |         |     | 5.5 |         |     | 5.5  | V    |
| Low-level output current, $I_{OL}$    |         |     | 16  |         |     | 16   | mA   |
| Operating free-air temperature, $T_A$ | –55     |     | 125 | 0       |     | 70   | °C   |

### electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER       |                                        | TEST CONDITIONS†                                                                                  |                    | SN54156<br>SN74156 |          | UNIT |
|-----------------|----------------------------------------|---------------------------------------------------------------------------------------------------|--------------------|--------------------|----------|------|
|                 |                                        |                                                                                                   |                    | MIN                | TYP‡     |      |
| V <sub>IH</sub> | High-level input voltage               |                                                                                                   |                    | 2                  |          | V    |
| V <sub>IL</sub> | Low-level input voltage                |                                                                                                   |                    |                    | 0.8      | V    |
| V <sub>IK</sub> | Input clamp voltage                    | V <sub>CC</sub> = MIN, I <sub>I</sub> = −8 mA                                                     |                    |                    | −1.5     | V    |
| I <sub>OH</sub> | High-level output current              | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V,<br>V <sub>IL</sub> = 0.8 V, V <sub>OH</sub> = 5.5 V |                    |                    | 250      | μA   |
| V <sub>OL</sub> | Low-level output voltage               | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V,<br>V <sub>IL</sub> = 0.8 V, I <sub>OL</sub> = 16 mA |                    | 0.2                | 0.4      | V    |
| I <sub>I</sub>  | Input current at maximum input voltage | V <sub>CC</sub> = MAX, V <sub>I</sub> = 5.5 V                                                     |                    |                    | 1        | mA   |
| I <sub>IH</sub> | High-level input current               | V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.4 V                                                     |                    |                    | 40       | μA   |
| I <sub>IL</sub> | Low-level input current                | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V                                                     |                    |                    | −1.6     | mA   |
| I <sub>CC</sub> | Supply current                         | V <sub>CC</sub> = MAX,<br>See Note 2                                                              | SN54156<br>SN74156 | 25<br>25           | 35<br>40 | mA   |

†For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡All typical values are at  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$ .

NOTE 2:  $I_{CC}$  is measured with outputs open, A, B, and 1C inputs at 4.5 V, and 2C, 1G, and 2G inputs grounded.

### switching characteristics, $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$

| PARAMETER <sup>§</sup> | FROM<br>(INPUT)                                                    | TO<br>(OUTPUT) | LEVELS<br>OF LOGIC | TEST CONDITIONS                                                          | SN54156<br>SN74156 |     |     | UNIT |
|------------------------|--------------------------------------------------------------------|----------------|--------------------|--------------------------------------------------------------------------|--------------------|-----|-----|------|
|                        |                                                                    |                |                    |                                                                          | MIN                | TYP | MAX |      |
| t <sub>PLH</sub>       | A, B, 2 $\overline{C}$ ,<br>1 $\overline{G}$ , or 2 $\overline{G}$ | Y              | 2                  | C <sub>L</sub> = 15 pF,<br>R <sub>L</sub> = 400 $\Omega$ ,<br>See Note 3 |                    | 15  | 23  | ns   |
| t <sub>PHL</sub>       | A, B, 2 $\overline{C}$ ,<br>1 $\overline{G}$ , or 2 $\overline{G}$ | Y              | 2                  |                                                                          |                    | 20  | 30  | ns   |
| t <sub>PLH</sub>       | A or B                                                             | Y              | 3                  |                                                                          |                    | 23  | 34  | ns   |
| t <sub>PHL</sub>       | A or B                                                             | Y              | 3                  |                                                                          |                    | 23  | 34  | ns   |
| t <sub>PLH</sub>       | 1C                                                                 | Y              | 3                  |                                                                          |                    | 18  | 27  | ns   |
| t <sub>PHL</sub>       | 1C                                                                 | Y              | 3                  |                                                                          |                    | 22  | 33  | ns   |

§ $t_{PLH}$  = propagation delay time, low-to-high-level output

$t_{PHL}$  = propagation delay time, high-to-low-level output

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



# SN54LS155A, SN74LS155A DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

SDLS057 – MARCH 1974 – REVISED MARCH 1988

## recommended operating conditions

|                                       | SN54LS155A |     |      | SN74LS155A |     |      | UNIT         |
|---------------------------------------|------------|-----|------|------------|-----|------|--------------|
|                                       | MIN        | NOM | MAX  | MIN        | NOM | MAX  |              |
| Supply voltage, $V_{CC}$              | 4.5        | 5   | 5.5  | 4.75       | 5   | 5.25 | V            |
| High-level output current, $I_{OH}$   |            |     | –400 |            |     | –400 | $\mu$ A      |
| Low-level output current, $I_{OL}$    |            |     | 4    |            |     | 8    | mA           |
| Operating free-air temperature, $T_A$ | –55        |     | 125  | 0          |     | 70   | $^{\circ}$ C |

## electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER                                             | TEST CONDITIONS†                                                                                                   | SN54LS155A             |          | SN74LS155A |          | UNIT |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|------------------------|----------|------------|----------|------|
|                                                       |                                                                                                                    | MIN                    | TYP‡ MAX | MIN        | TYP‡ MAX |      |
| V <sub>IH</sub> High-level input voltage              |                                                                                                                    | 2                      |          | 2          |          | V    |
| V <sub>IL</sub> Low-level input voltage               |                                                                                                                    | 0.7                    |          | 0.8        |          | V    |
| V <sub>IK</sub> Input clamp voltage                   | V <sub>CC</sub> = MIN, I <sub>I</sub> = −18 mA                                                                     | −1.5                   |          | −1.5       |          | V    |
| V <sub>OH</sub> High-level output voltage             | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V,<br>V <sub>IL</sub> = V <sub>IL max</sub> , I <sub>OH</sub> = −400 μA | 2.5                    | 3.4      | 2.7        | 3.4      | V    |
| V <sub>OL</sub> Low-level output voltage              | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V,<br>V <sub>IL</sub> = V <sub>IL max</sub>                             | I <sub>OL</sub> = 4 mA |          | 0.25       | 0.4      | V    |
|                                                       |                                                                                                                    | I <sub>OL</sub> = 8 mA |          |            | 0.35 0.5 |      |
| I <sub>I</sub> Input current at maximum input voltage | V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V                                                                        | 0.1                    |          | 0.1        |          | mA   |
| I <sub>IH</sub> High-level input current              | V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V                                                                      | 20                     |          | 20         |          | μA   |
| I <sub>IL</sub> Low-level input current               | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V                                                                      | −0.4                   |          | −0.4       |          | mA   |
| I <sub>OS</sub> Short-circuit output current §        | V <sub>CC</sub> = MAX                                                                                              | − 20                   | − 100    | − 20       | − 100    | mA   |
| I <sub>CC</sub> Supply current                        | V <sub>CC</sub> = MAX, See Note 2                                                                                  | 6.1                    | 10       | 6.1        | 10       | mA   |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^{\circ}\text{C}$ .

§ Not more than one output should be shorted at a time.

NOTE 2:  $I_{CC}$  is measured with outputs open, A, B, and 1C inputs at 4.5 V, and 2C, 1G, and 2G inputs grounded.

## switching characteristics, $V_{CC} = 5 \text{ V}$ , $T_A = 25^{\circ}\text{C}$

| PARAMETER¶ | FROM (INPUT)                                  | TO (OUTPUT) | LEVELS OF LOGIC | TEST CONDITIONS                                                      | SN54LS155A<br>SN74LS155A |     |     | UNIT |
|------------|-----------------------------------------------|-------------|-----------------|----------------------------------------------------------------------|--------------------------|-----|-----|------|
|            |                                               |             |                 |                                                                      | MIN                      | TYP | MAX |      |
| $t_{PLH}$  | A, B, $2\bar{C}$ , $1\bar{G}$ , or $2\bar{G}$ | Y           | 2               | $C_L = 15 \text{ pF}$ ,<br>$R_L = 2 \text{ k}\Omega$ ,<br>See Note 3 | 10                       | 15  |     | ns   |
| $t_{PHL}$  | A, B, $2\bar{C}$ , $1\bar{G}$ , or $2\bar{G}$ | Y           | 2               |                                                                      | 19                       | 30  |     | ns   |
| $t_{PLH}$  | A or B                                        | Y           | 3               |                                                                      | 17                       | 26  |     | ns   |
| $t_{PHL}$  | A or B                                        | Y           | 3               |                                                                      | 19                       | 30  |     | ns   |
| $t_{PLH}$  | 1C                                            | Y           | 3               |                                                                      | 18                       | 27  |     | ns   |
| $t_{PHL}$  | 1C                                            | Y           | 3               |                                                                      | 18                       | 27  |     | ns   |

¶  $t_{PLH}$  = propagation delay time, low-to-high-level output

$t_{PHL}$  = propagation delay time, high-to-low-level output

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

# SN54LS156A, SN74LS156A

## DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

SDLS057 – MARCH 1974 – REVISED MARCH 1988

### recommended operating conditions

|                                       | SN54LS156 |     |     | SN74LS156 |     |      | UNIT |
|---------------------------------------|-----------|-----|-----|-----------|-----|------|------|
|                                       | MIN       | NOM | MAX | MIN       | NOM | MAX  |      |
| Supply voltage, $V_{CC}$              | 4.5       | 5   | 5.5 | 4.75      | 5   | 5.25 | V    |
| High-level output voltage, $V_{OH}$   |           |     | 5.5 |           |     | 5.5  | V    |
| Low-level output current, $I_{OL}$    |           |     | 4   |           |     | 8    | mA   |
| Operating free-air temperature, $T_A$ | –55       |     | 125 | 0         |     | 70   | °C   |

### electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER       |                                        | TEST CONDITIONS†                                                |                                                                                          | SN54LS156              |      | SN74LS156 |      | UNIT |      |
|-----------------|----------------------------------------|-----------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------|------|-----------|------|------|------|
|                 |                                        |                                                                 |                                                                                          | MIN                    | TYP‡ | MAX       | MIN  |      | TYP‡ |
| V <sub>IH</sub> | High-level input voltage               |                                                                 |                                                                                          | 2                      |      | 2         |      | V    |      |
| V <sub>IL</sub> | Low-level input voltage                |                                                                 |                                                                                          | 0.7                    |      | 0.8       |      | V    |      |
| V <sub>IK</sub> | Input clamp voltage                    | V <sub>CC</sub> = MIN,                                          | I <sub>I</sub> = −18 mA                                                                  | −1.5                   |      | −1.5      |      | V    |      |
| I <sub>OH</sub> | High-level output current              | V <sub>CC</sub> = MIN,                                          | V <sub>IH</sub> = 2 V,<br>V <sub>IL</sub> = V <sub>IL</sub> max, V <sub>OH</sub> = 5.5 V | 100                    |      | 100       |      | μA   |      |
| V <sub>OL</sub> | Low-level output voltage               | V <sub>CC</sub> = MIN,<br>V <sub>IL</sub> = V <sub>IL</sub> max | V <sub>IH</sub> = 2 V,                                                                   | I <sub>OL</sub> = 4 mA | 0.25 | 0.4       | 0.25 | 0.4  | V    |
|                 |                                        |                                                                 |                                                                                          | I <sub>OL</sub> = 8 mA |      |           | 0.35 | 0.5  |      |
| I <sub>I</sub>  | Input current at maximum input voltage | V <sub>CC</sub> = MAX,                                          | V <sub>I</sub> = 7 V                                                                     | 0.1                    |      | 0.1       |      | mA   |      |
| I <sub>IH</sub> | High-level input current               | V <sub>CC</sub> = MAX,                                          | V <sub>I</sub> = 2.7 V                                                                   | 20                     |      | 20        |      | μA   |      |
| I <sub>IL</sub> | Low-level input current                | V <sub>CC</sub> = MAX,                                          | V <sub>I</sub> = 0.4 V                                                                   | −0.4                   |      | −0.4      |      | mA   |      |
| I <sub>CC</sub> | Supply current                         | V <sub>CC</sub> = MAX,                                          | See Note 2                                                                               | 6.1 10                 |      | 6.1 10    |      | mA   |      |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at  $V_{CC} = 5 \text{ V}, T_A = 25^\circ \text{C}$ .

NOTE 2:  $I_{CC}$  is measured with outputs open, A, B, and 1C inputs at 4.5 V, and 2C, 1G, and 2G inputs grounded.

### switching characteristics, $V_{CC} = 5 \text{ V}, T_A = 25^\circ \text{C}$

| PARAMETER§ | FROM (INPUT)           | TO (OUTPUT) | LEVELS OF LOGIC | TEST CONDITIONS                                                    | SN54LS156<br>SN74LS156 |     |     | UNIT |
|------------|------------------------|-------------|-----------------|--------------------------------------------------------------------|------------------------|-----|-----|------|
|            |                        |             |                 |                                                                    | MIN                    | TYP | MAX |      |
| $t_{PLH}$  | A, B, 2C<br>1G, or 2G  | Y           | 2               | $C_L = 15 \text{ pF},$<br>$R_L = 2 \text{ k}\Omega,$<br>See Note 3 |                        | 25  | 40  | ns   |
| $t_{PHL}$  | A, B, 2C,<br>1G, or 2G | Y           | 2               |                                                                    |                        | 34  | 51  | ns   |
| $t_{PLH}$  | A or B                 | Y           | 3               |                                                                    |                        | 31  | 46  | ns   |
| $t_{PHL}$  | A or B                 | Y           | 3               |                                                                    |                        | 34  | 51  | ns   |
| $t_{PLH}$  | 1C                     | Y           | 3               |                                                                    |                        | 32  | 48  | ns   |
| $t_{PHL}$  | 1C                     | Y           | 3               |                                                                    |                        | 32  | 48  | ns   |

§  $t_{PLH}$  = propagation delay time, low-to-high-level output

$t_{PHL}$  = propagation delay time, high-to-low-level output

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

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