



## MM54HCT155/MM74HCT155

### Dual 2-to-4 Line Decoder/Demultiplexers

#### General Description

The MM54HCT155/MM74HCT155 is a high speed silicon gate CMOS decoder/demultiplexer. It features dual 1-to-4 line demultiplexers with independent strobes and common binary address inputs. When both sections are enabled by the strobes, the common address inputs 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 C1 is inverted at its outputs and data applied to C2 is "non-inverted" at its outputs. If the strobes (G1 and G2) are connected together and the Data Inputs are connected together, the device can be used as a 3-to-8 line decoder or a 1-to-8 line demultiplexer.

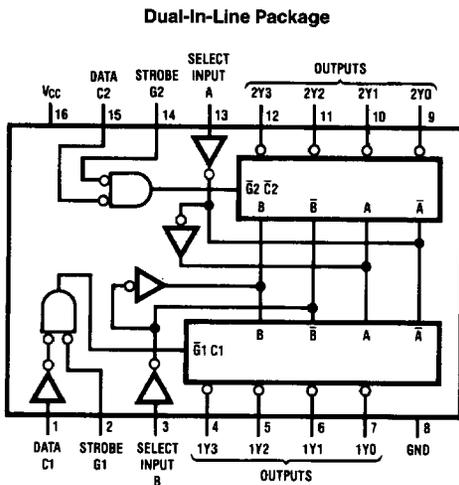
All inputs to the decoder are protected from damage due to electrostatic discharge by diodes to  $V_{CC}$  and ground. The device is capable of driving 10 low power Schottky TTL equivalent loads.

The MM54HCT155/MM74HCT155 is functionally and pin equivalent to the 54LS155/74LS155 and can be used as a plug-in replacement to reduce system power consumption in existing systems.

#### Features

- Applications:
  - Dual 2-to-4 line decoder
  - Dual 1-to-4 line demultiplexer
  - 3-to-8 line decoder
  - 1-to-8 line demultiplexer
- Typical propagation delay: 22 ns
- Low quiescent current: 80  $\mu$ A maximum (74HCT Series)

#### Connection Diagram



TL/F/5759-1

Order Number MM54HCT155\* or MM74HCT155\*

\*Please look into Section 8, Appendix D for availability of various package types.

IC = inputs C1 and C2 connected together  
 IG = inputs G1 and G2 connected together  
 H = high level  
 L = low level  
 X = don't care

#### Truth Tables

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

| Inputs |        |      |    | Outputs |     |     |     |
|--------|--------|------|----|---------|-----|-----|-----|
| Select | Strobe | Data |    |         |     |     |     |
| B      | A      | G1   | C1 | 1Y0     | 1Y1 | 1Y2 | 1Y3 |
| X      | X      | H    | X  | H       | H   | H   | H   |
| L      | L      | L    | L  | 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 |    |         |     |     |     |
| B      | A      | G2   | C2 | 2Y0     | 2Y1 | 2Y2 | 2Y3 |
| 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   |

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

| Inputs |                |   |    | Outputs |     |     |     |     |     |     |     |
|--------|----------------|---|----|---------|-----|-----|-----|-----|-----|-----|-----|
| Select | Strobe or Data |   |    | (0)     | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| IC     | B              | A | IG | 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   |

### Absolute Maximum Ratings (Notes 1 and 2)

If Military/Aerospace specified devices are required, contact the National Semiconductor Sales Office/Distributors for availability and specifications.

|  |                          |
|--|--------------------------|
| Supply Voltage ( $V_{CC}$ )                      | -0.5V to +7.0V           |
| DC Input Voltage ( $V_{IN}$ )                    | -1.5V to $V_{CC}$ + 1.5V |
| DC Output Voltage ( $V_{OUT}$ )                  | -0.5V to $V_{CC}$ + 0.5V |
| Clamp Diode Current ( $I_{IK}, I_{OK}$ )         | ± 20 mA                  |
| DC Output Current, per Pin ( $I_{OUT}$ )         | ± 25 mA                  |
| DC $V_{CC}$ or GND Current, per Pin ( $I_{CC}$ ) | 50 mA                    |
| Storage Temperature Range ( $T_{STG}$ )          | -65°C to +150°C          |
| Power Dissipation ( $P_D$ ) (Note 3)             | 600 mW                   |
| S.O. Package only                                | 500 mW                   |
| Lead Temp. ( $T_L$ ) (Soldering, 10 seconds)     | 300°C                    |

### Operating Conditions

|  | Min | Max      | Units |
|--|-----|----------|-------|
| Supply Voltage ( $V_{CC}$ )                      | 4.5 | 5.5      | V     |
| DC Input or Output Voltage ( $V_{IN}, V_{OUT}$ ) | 0   | $V_{CC}$ | V     |
| Operating Temp. Range ( $T_A$ )                  |     |          |       |
| MM74HCT  | -40 | +85      | °C    |
| MM54HCT  | -55 | +125     | °C    |
| Input Rise/Fall Time ( $t_r, t_f$ )              |     | 500      | ns    |

### DC Electrical Characteristics $V_{CC} = 5V \pm 10\%$ unless otherwise specified

| Symbol   | Parameter                         | Conditions  | $V_{CC}$ | Typ                | Guaranteed Limits  |  | Units          |   |
|----------|-----------------------------------|---|----------|--------------------|--------------------|--|----------------|---|
|          |                                   |   |          | $T_A = 25^\circ C$ | $T_A = 25^\circ C$ | 74HCT<br>$T_A = -40^\circ C$ to $85^\circ C$ |                | 54HCT<br>$T_A = -55^\circ C$ to $125^\circ C$ |
| $V_{IH}$ | Minimum High Level Input Voltage  |   |          |                    | 2.0                | 2.0  | 2.0            | V   |
| $V_{IL}$ | Maximum High Level Input Voltage  |   |          |                    | 0.8                | 0.8  | 0.8            | V   |
| $V_{OH}$ | Minimum High Level Output Voltage | $V_{IN} = V_{IH}$ or $V_{IL}$<br>$ I_{OUT}  = 20 \mu A$<br>$ I_{OUT}  = 4.0 \text{ mA}, V_{CC} = 4.5V$<br>$ I_{OUT}  = 4.8 \text{ mA}, V_{CC} = 5.5V$ | $V_{CC}$ | $V_{CC} - 0.1$     | $V_{CC} - 0.1$     | $V_{CC} - 0.1$                               | $V_{CC} - 0.1$ | V   |
| $V_{OL}$ | Maximum Low Level Output Voltage  | $V_{IN} = V_{IH}$ or $V_{IL}$<br>$ I_{OUT}  = 20 \mu A$<br>$ I_{OUT}  = 4.0 \text{ mA}, V_{CC} = 4.5V$<br>$ I_{OUT}  = 4.8 \text{ mA}, V_{CC} = 5.5V$ |          | 0.10               | 0.10               | 0.1  | V              |   |
|          |                                   |   |          | 0.26               | 0.33               | 0.4  | V              |   |
|          |                                   |   |          | 0.26               | 0.33               | 0.4  | V              |   |
| $I_{IN}$ | Maximum Input Current             | $V_{IN} = V_{CC}$ or GND<br>$V_{IN} = V_{IH}$ or $V_{IL}$   |          | ± 0.1              | ± 1.0              | ± 1.0  | μA             |   |
| $I_{CC}$ | Maximum Quiescent Supply Current  | $V_{IN} = V_{CC}$ or GND<br>$I_{OUT} = 0.0 \mu A$ (Note 4)  |          | 8                  | 80                 | 160  | μA             |   |
|          |                                   | $V_{IN} = 2.4V$ or $0.5V$<br>$I_{OUT} = 0.0 \mu A$ (Note 4)   |          | 0.3                | 0.4                | 0.5  | mA             |   |

**Note 1:** Absolute Maximum Ratings are those values beyond which damage to the device may occur.

**Note 2:** Unless otherwise specified, all voltages are referenced to ground.

**Note 3:** Power dissipation temperature deratings: plastic N package: -12 mW/°C from 65°C to 85°C; ceramic J package: -12 mW/°C from 100°C to 125°C.

**Note 4:** Measured per input, other inputs at  $V_{CC}$  or GND.

## AC Electrical Characteristics

$V_{CC}$ , temperature and loading of LS-TTL;  $V_{CC}=5V$ ,  $T_A=25^\circ C$ ,  $C_L=15\text{ pF}$ ,  $t_r=t_f=6\text{ ns}$

| Symbol                | Parameter   | Conditions | Typ | Guaranteed Limits | Units |
|-----------------------|---|------------|-----|-------------------|-------|
| $t_{PLH}$ , $t_{PHL}$ | Maximum Propagation Delay from Inputs A, B, or C2 to any Output |            | 19  | 30                | ns    |
| $t_{PLH}$ , $t_{PHL}$ | Maximum Propagation Delay from Inputs G1 or G2 to any Output    |            | 24  | 35                | ns    |
| $t_{PLH}$ , $t_{PHL}$ | Maximum Propagation Delay from Input C1 to any Output           |            | 25  | 35                | ns    |

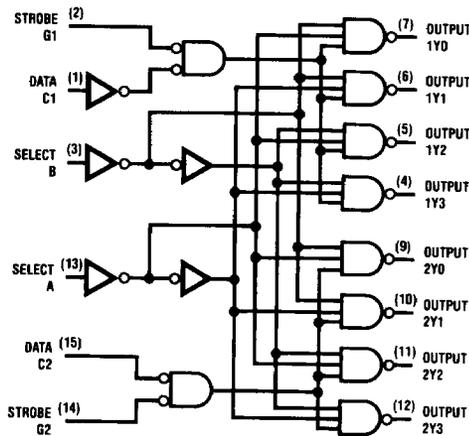
## AC Electrical Characteristics

Full range of  $V_{CC}$  and temperature;  $V_{CC}=5V \pm 10\%$ ,  $C_L=50\text{ pF}$  unless otherwise specified

| Symbol                | Parameter   | Conditions | Typ      |          |                   |                    | Units |
|-----------------------|---|------------|----------|----------|-------------------|--------------------|-------|
|                       |   |            | T = 25°C |          | 74HCT             | 54HCT              |       |
|                       |   |            | T = 25°C | T = 25°C | T = -40°C to 85°C | T = -55°C to 125°C |       |
| $t_{PLH}$ , $t_{PHL}$ | Maximum Propagation Delay from Inputs A, B, or C2 to any Output |            | 21       | 35       | 44                | 51                 | ns    |
| $t_{PLH}$ , $t_{PHL}$ | Maximum Propagation Delay from Inputs G1 or G2 to any Output    |            | 26       | 40       | 50                | 60                 | ns    |
| $t_{PLH}$ , $t_{PHL}$ | Maximum Propagation Delay from Input C1 to any Output           |            | 27       | 40       | 50                | 60                 | ns    |
| $t_{TLH}$ , $t_{THL}$ | Maximum Output Rise and Fall Time                               |            |          | 15       | 19                | 22                 | ns    |
| $C_{PD}$              | Power Dissipation Capacitance                                   | Note 5     | 45       |          |                   |                    | pF    |
| $C_{IN}$              | Minimum Input Capacitance                                       |            | 5        | 10       | 10                | 10                 | pF    |

**Note 5:**  $C_{PD}$  determines the no load dynamic power consumption,  $P_D = C_{PD} V_{CC}^2 f + I_{CC}$ , and the no load dynamic current consumption,  $I_S = C_{PD} V_{CC} f + I_{CC}$ .

## Logic Diagram



TL/F/5759-2