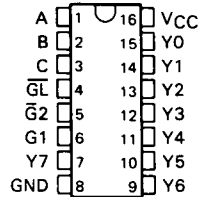


# SN54HC137, SN74HC137 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS WITH ADDRESS LATCHES

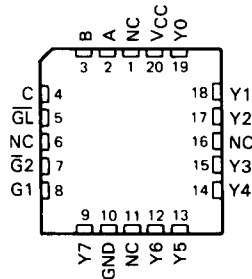
D2684, DECEMBER 1982 - REVISED JUNE 1989

- Combines Decoder and 3-Bit Address Latch
- Incorporates 2 Output Enables to Simplify Cascading
- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs
- Dependable Texas Instruments Quality and Reliability

SN54HC137 . . . J PACKAGE  
SN74HC137 . . . D<sup>†</sup> OR N PACKAGE  
(TOP VIEW)



SN54HC137 . . . FK PACKAGE  
(TOP VIEW)



NC--No internal connection

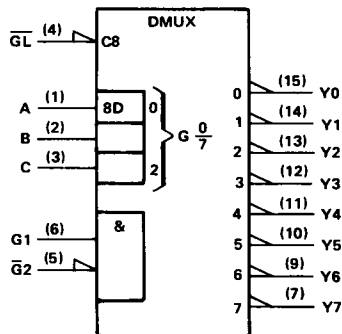
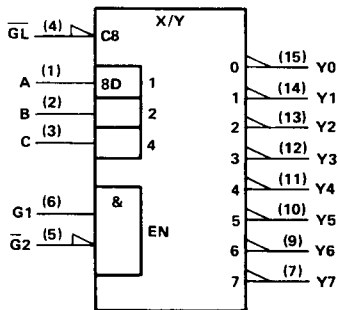
<sup>†</sup>Contact the factory for D availability

## description

The 'HC137 is a three-line to eight-line decoder/demultiplexer with latches on the three address inputs. When the latch-enable input ( $\overline{GL}$ ) is low, the 'HC137 acts as a decoder/demultiplexer. When  $\overline{GL}$  goes from low to high, the address present at the select inputs (A, B, and C) is stored in the latches. Further address changes are ignored as long as  $\overline{GL}$  remains high. The output enable controls, G1 and  $\overline{G2}$ , control the outputs independently of the select or latch-enable inputs. All of the outputs are forced high if G1 is low or  $\overline{G2}$  is high. The 'HC137 is ideally suited for implementing glitch-free decoders in strobed (stored-address) applications in bus-oriented systems.

The SN54HC137 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74HC137 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

## logic symbols<sup>‡</sup> (alternatives)



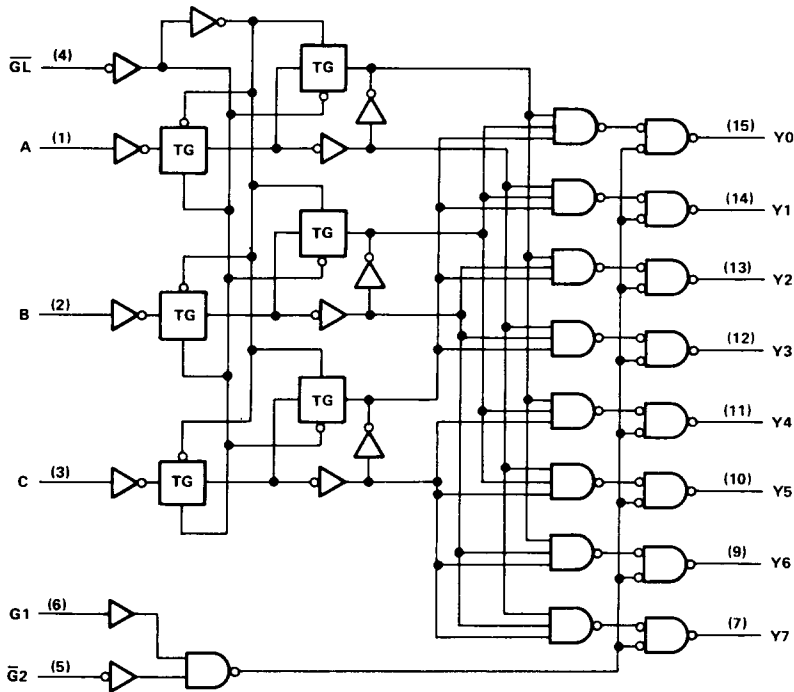
<sup>‡</sup>These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for D, J, and N packages.

**SN54HC137, SN74HC137**  
**3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS**  
**WITH ADDRESS LATCHES**

FUNCTION TABLE

| INPUTS |    |    |        |   |   | OUTPUTS  |    |    |    |    |    |    |    |
|--------|----|----|--------|---|---|--|----|----|----|----|----|----|----|
| ENABLE |    |    | SELECT |   |   |  |    |    |    |    |    |    |    |
| GL     | G1 | G2 | C      | B | A | Y0   | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 | Y7 |
| X      | X  | H  | X      | X | X | H  | H  | H  | H  | H  | H  | H  | H  |
| X      | L  | X  | X      | X | X | H  | H  | H  | H  | H  | H  | H  | H  |
| L      | H  | L  | L      | L | L | L  | H  | H  | H  | H  | H  | H  | H  |
| L      | H  | L  | L      | L | H | H  | L  | H  | H  | H  | H  | H  | H  |
| L      | H  | L  | L      | H | L | H  | H  | L  | H  | H  | H  | H  | H  |
| L      | H  | L  | L      | H | H | H  | H  | H  | L  | H  | H  | H  | H  |
| L      | H  | L  | H      | L | L | H  | H  | H  | H  | L  | H  | H  | H  |
| L      | H  | L  | H      | L | H | H  | H  | H  | H  | H  | L  | H  | H  |
| L      | H  | L  | H      | H | L | H  | H  | H  | H  | H  | H  | L  | H  |
| L      | H  | L  | H      | H | H | H  | H  | H  | H  | H  | H  | H  | L  |
| H      | H  | L  | X      | X | X | Output corresponding to stored address, L; all others, H |    |    |    |    |    |    |    |

logic diagram (positive logic)



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

# SN54HC137, SN74HC137

## 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS WITH ADDRESS LATCHES

2

HCMOS Devices

### absolute maximum ratings over operating free-air temperature range†

|   |                |
|---|----------------|
| Supply voltage, $V_{CC}$ .....  | -0.5 V to 7 V  |
| Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ ) .....         | ±20 mA         |
| Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) .....        | ±20 mA         |
| Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ ) .....            | ±25 mA         |
| Continuous current through $V_{CC}$ or GND pins .....                       | ±50 mA         |
| Lead temperature 1,6 mm (1/16 in) from case for 60 s: FK or J package ..... | 300°C          |
| Lead temperature 1,6 mm (1/16 in) from case for 10 s: D or N package .....  | 260°C          |
| Storage temperature range .....   | -65°C to 150°C |

† Stresses beyond those listed under "absolute maximum ratings" 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.

### recommended operating conditions

|  |                  | SN54HC137 |          |     | SN74HC137 |          |     | UNIT |
|--|------------------|-----------|----------|-----|-----------|----------|-----|------|
|  |                  | MIN       | NOM      | MAX | MIN       | NOM      | MAX |      |
| $V_{CC}$ Supply voltage                      |                  | 2         | 5        | 6   | 2         | 5        | 6   | V    |
| $V_{IH}$ High-level input voltage            | $V_{CC} = 2$ V   | 1.5       |          |     | 1.5       |          |     | V    |
|  | $V_{CC} = 4.5$ V | 3.15      |          |     | 3.15      |          |     |      |
|  | $V_{CC} = 6$ V   | 4.2       |          |     | 4.2       |          |     |      |
| $V_{IL}$ Low-level input voltage             | $V_{CC} = 2$ V   | 0         | 0.3      |     | 0         | 0.3      |     | V    |
|  | $V_{CC} = 4.5$ V | 0         | 0.9      |     | 0         | 0.9      |     |      |
|  | $V_{CC} = 6$ V   | 0         | 1.2      |     | 0         | 1.2      |     |      |
| $V_I$ Input voltage                          |                  | 0         | $V_{CC}$ |     | 0         | $V_{CC}$ |     | V    |
| $V_O$ Output voltage                         |                  | 0         | $V_{CC}$ |     | 0         | $V_{CC}$ |     | V    |
| $t_t$ Input transition (rise and fall) times | $V_{CC} = 2$ V   | 0         | 1000     |     | 0         | 1000     |     | ns   |
|  | $V_{CC} = 4.5$ V | 0         | 500      |     | 0         | 500      |     |      |
|  | $V_{CC} = 6$ V   | 0         | 400      |     | 0         | 400      |     |      |
| $T_A$ Operating free-air temperature         |                  | -55       | 125      |     | -40       | 85       |     | °C   |

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

| PARAMETER | TEST CONDITIONS   | $V_{CC}$ | $T_A = 25^\circ\text{C}$ |       |     | SN54HC137 |       | SN74HC137 |     | UNIT |
|-----------|---|----------|--------------------------|-------|-----|-----------|-------|-----------|-----|------|
|           |   |          | MIN                      | TYP   | MAX | MIN       | MAX   | MIN       | MAX |      |
| $V_{OH}$  | $V_I = V_{IH}$ or $V_{IL}$ , $I_{OH} = -20 \mu\text{A}$ | 2 V      | 1.9                      | 1.998 |     | 1.9       | 1.9   | V         |     |      |
|           |   | 4.5 V    | 4.4                      | 4.499 |     | 4.4       | 4.4   |           |     |      |
|           |   | 6 V      | 5.9                      | 5.999 |     | 5.9       | 5.9   |           |     |      |
|           | $V_I = V_{IH}$ or $V_{IL}$ , $I_{OH} = -4 \text{ mA}$   | 4.5 V    | 3.98                     | 4.30  |     | 3.7       | 3.84  |           |     |      |
| $V_{OL}$  | $V_I = V_{IH}$ or $V_{IL}$ , $I_{OL} = 20 \mu\text{A}$  | 2 V      | 0.002                    | 0.1   |     | 0.1       | 0.1   | V         |     |      |
|           |   | 4.5 V    | 0.001                    | 0.1   |     | 0.1       | 0.1   |           |     |      |
|           |   | 6 V      | 0.001                    | 0.1   |     | 0.1       | 0.1   |           |     |      |
|           | $V_I = V_{IH}$ or $V_{IL}$ , $I_{OL} = 4 \text{ mA}$    | 4.5 V    | 0.17                     | 0.26  |     | 0.4       | 0.33  |           |     |      |
|           | $V_I = V_{IH}$ or $V_{IL}$ , $I_{OL} = 5.2 \text{ mA}$  | 6 V      | 0.15                     | 0.26  |     | 0.4       | 0.33  |           |     |      |
| $I_I$     | $V_I = V_{CC}$ or 0                                     | 6 V      | ±0.1                     | ±100  |     | ±1000     | ±1000 | nA        |     |      |
| $I_{CC}$  | $V_I = V_{CC}$ or 0, $I_O = 0$                          | 6 V      |                          | 8     |     | 160       | 80    | μA        |     |      |
| $C_i$     |   | 2 to 6 V |                          | 3     | 10  |           | 10    | 10        | pF  |      |

**SN54HC137, SN74HC137**  
**3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS**  
**WITH ADDRESS LATCHES**

timing requirements over recommended operating free-air temperature range (unless otherwise noted)

|  | V <sub>CC</sub> | T <sub>A</sub> = 25°C |     |     | SN54HC137 |     | SN74HC137 |    | UNIT |
|--|-----------------|-----------------------|-----|-----|-----------|-----|-----------|----|------|
|  |                 | MIN                   | MAX | MIN | MAX       | MIN | MAX       |    |      |
| t <sub>w</sub> Pulse duration, $\overline{GL}$ low               | 2 V             | 80                    |     | 120 |           | 100 |           | ns |      |
|  | 4.5 V           | 16                    |     | 24  |           | 20  |           |    |      |
|  | 6 V             | 14                    |     | 20  |           | 17  |           |    |      |
| t <sub>su</sub> Setup time, A, B, and C before $\overline{GL}$ I | 2 V             | 75                    |     | 115 |           | 95  |           | ns |      |
|  | 4.5 V           | 15                    |     | 23  |           | 19  |           |    |      |
|  | 6 V             | 13                    |     | 20  |           | 16  |           |    |      |
| t <sub>h</sub> Hold time, A, B, and C after $\overline{GL}$ I    | 2 V             | 5                     |     | 5   |           | 5   |           | ns |      |
|  | 4.5 V           | 5                     |     | 5   |           | 5   |           |    |      |
|  | 6 V             | 5                     |     | 5   |           | 5   |           |    |      |

switching characteristics over recommended operating free-air temperature range (unless otherwise noted), C<sub>L</sub> = 50 pF (see Note 1)

| PARAMETER       | FROM (INPUT)    | TO (OUTPUT) | V <sub>CC</sub> | T <sub>A</sub> = 25°C |     |     | SN54HC137 |     | SN74HC137 |     | UNIT |
|-----------------|-----------------|-------------|-----------------|-----------------------|-----|-----|-----------|-----|-----------|-----|------|
|                 |                 |             |                 | MIN                   | TYP | MAX | MIN       | MAX | MIN       | MAX |      |
| t <sub>pd</sub> | A, B, C         | Y           | 2 V             | 82                    | 190 |     | 285       |     | 240       | ns  |      |
|                 |                 |             | 4.5 V           | 23                    | 38  |     | 57        |     | 48        |     |      |
|                 |                 |             | 6 V             | 19                    | 32  |     | 48        |     | 41        |     |      |
| t <sub>pd</sub> | $\overline{G2}$ | Y           | 2 V             | 59                    | 145 |     | 220       |     | 180       | ns  |      |
|                 |                 |             | 4.5 V           | 17                    | 29  |     | 44        |     | 36        |     |      |
|                 |                 |             | 6 V             | 14                    | 25  |     | 37        |     | 31        |     |      |
| t <sub>pd</sub> | G1              | Y           | 2 V             | 61                    | 145 |     | 220       |     | 180       | ns  |      |
|                 |                 |             | 4.5 V           | 17                    | 29  |     | 44        |     | 36        |     |      |
|                 |                 |             | 6 V             | 14                    | 25  |     | 37        |     | 31        |     |      |
| t <sub>pd</sub> | $\overline{GL}$ | Y           | 2 V             | 77                    | 190 |     | 285       |     | 240       | ns  |      |
|                 |                 |             | 4.5 V           | 22                    | 38  |     | 57        |     | 48        |     |      |
|                 |                 |             | 6 V             | 19                    | 32  |     | 48        |     | 41        |     |      |
| t <sub>t</sub>  |                 | Y           | 2 V             | 38                    | 75  |     | 110       |     | 95        | ns  |      |
|                 |                 |             | 4.5 V           | 8                     | 15  |     | 22        |     | 19        |     |      |
|                 |                 |             | 6 V             | 6                     | 13  |     | 19        |     | 16        |     |      |

|                 |                               |                                |           |
|-----------------|-------------------------------|--------------------------------|-----------|
| C <sub>pd</sub> | Power dissipation capacitance | No load, T <sub>A</sub> = 25°C | 85 pF typ |
|-----------------|-------------------------------|--------------------------------|-----------|

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