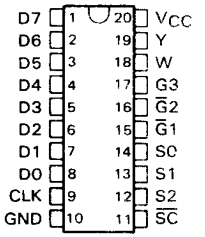
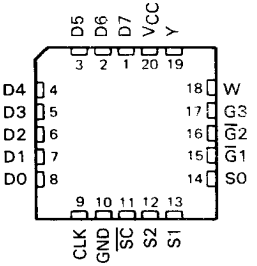
- **Transparent Latches on Data Select Inputs**
- **Edge-Triggered Data Registers**
- **High-Current 3-State Outputs Can Drive Up to 15 LSTTL Loads**
- **Complementary Outputs**
- **Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs**
- **Dependable Texas Instruments Quality and Reliability**

SN54HC356 . . . J PACKAGE
SN74HC356 . . . DW OR N PACKAGE
(TOP VIEW)




SN54HC356 . . . FK PACKAGE
(TOP VIEW)

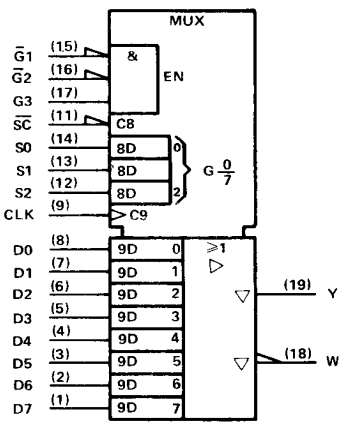



## description

These monolithic data selectors/multiplexers contain full on-chip binary decoding to select one of eight data sources. The data-select address is stored in transparent latches that are enabled by a low level in pin 11, $\overline{SC}$. The edge-triggered data registers are clocked by a low-to-high transition on pin 9, CLK. Both true and complementary outputs are available.

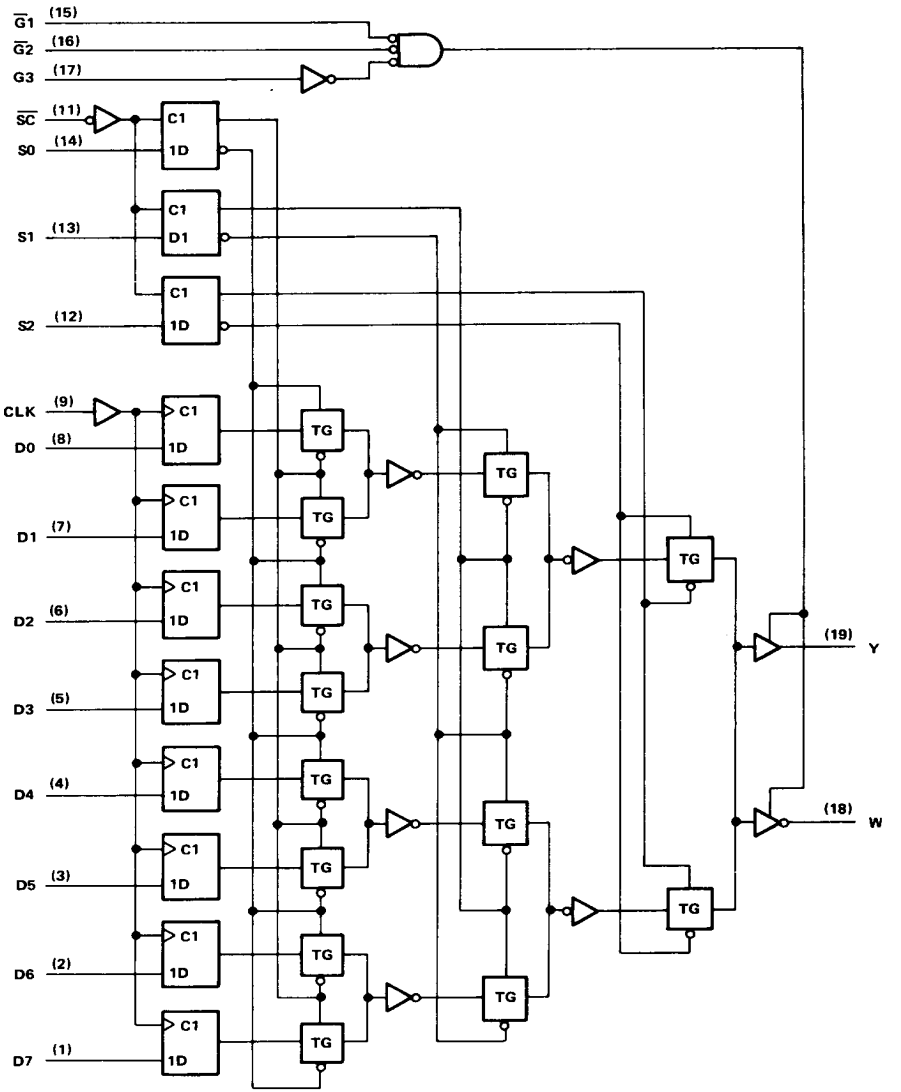
The SN54HC356 is characterized for operation over the full military temperature range of −55°C to 125°C. The SN74HC356 is characterized for operation from −40°C to 85°C.

## logic symbol†




†This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)



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**FUNCTION TABLE**

| INPUTS | | | | | | | OUTPUTS | |
|---|---|---|---|---|---|---|---|---|
| SELECT† | | | CLOCK | OUTPUT ENABLES | | | | |
| S2 | S1 | S0 | | $\overline{G1}$ | $\overline{G2}$ | G3 | W | Y |
| X | X | X | X | H | X | X | Z | Z |
| X | X | X | X | X | H | X | Z | Z |
| X | X | X | X | X | X | L | Z | Z |
| L | L | L | ↑ | L | L | H | $\overline{D0}$ | D0 |
| L | L | L | H or L | L | L | H | $\overline{D0}_n$ | $D0_n$ |
| L | L | H | ↑ | L | L | H | $\overline{D1}$ | D1 |
| L | L | H | H or L | L | L | H | $\overline{D1}_n$ | $D1_n$ |
| L | H | L | ↑ | L | L | H | $\overline{D2}$ | D2 |
| L | H | L | H or L | L | L | H | $\overline{D2}_n$ | $D2_n$ |
| L | H | H | ↑ | L | L | H | $\overline{D3}$ | D3 |
| L | H | H | H or L | L | L | H | $\overline{D3}_n$ | $D3_n$ |
| H | L | L | ↑ | L | L | H | $\overline{D4}$ | D4 |
| H | L | L | H or L | L | L | H | $\overline{D4}_n$ | $D4_n$ |
| H | L | H | ↑ | L | L | H | $\overline{D5}$ | D5 |
| H | L | H | H or L | L | L | H | $\overline{D5}_n$ | $D5_n$ |
| H | H | L | ↑ | L | L | H | $\overline{D6}$ | D6 |
| H | H | L | H or L | L | L | H | $\overline{D6}_n$ | $D6_n$ |
| H | H | H | ↑ | L | L | H | $\overline{D7}$ | D7 |
| H | H | H | H or L | L | L | H | $\overline{D7}_n$ | $D7_n$ |

†This column shows the input address setup with $\overline{SC}$ low.

**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 $V_{CC}$) . . . . . ±35 mA
Continuous current through $V_{CC}$ or GND pins . . . . . ±70 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: DW 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**

| | | | SN54HC356 | | | SN74HC356 | | | 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°C | | SN54HC356 | | SN74HC356 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | MAX | MIN | MAX | MIN | MAX | |
| $V_{OH}$ | $V_I$ = $V_{IH}$ or $V_{IL}$, $I_{OH}$ = −20 μA | 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 $V_{IL}$, $I_{OH}$ = −6 mA | 4.5 V | 3.98 | 4.30 | 3.7 | | 3.84 | | |
| | $V_I$ = $V_{IH}$ or $V_{IL}$, $I_{OH}$ = −7.8 mA | 6 V | 5.48 | 5.80 | 5.2 | | 5.34 | | |
| $V_{OL}$ | $V_I$ = $V_{IH}$ or $V_{IL}$, $I_{OL}$ = 20 μA | 2 V | | 0.002 | | 0.1 | | 0.1 | V |
| | | 4.5 V | | 0.001 | | 0.1 | | 0.1 | |
| | | 6 V | | 0.001 | | 0.1 | | 0.1 | |
| | $V_I$ = $V_{IH}$ or $V_{IL}$, $V_{OL}$ = 6 mA | 4.5 V | | 0.17 | | 0.26 | | 0.4 | | 0.33 | |
| | $V_I$ = $V_{IH}$ or $V_{IL}$, $I_{OL}$ = 7.8 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 |
| $I_{OZ}$ | $V_O$ = $V_{CC}$ or 0 | 6 | | ±0.01 | | ±0.5 | | ±10 | | ±5 | μA |
| $I_{CC}$ | $V_I$ = $V_{CC}$ or 0, $I_O$ = 0 | 6 V | | | | 8 | | 160 | | 80 | μA |
| $C_i$ | | 2 to 6 V | | 3 | | 10 | | 10 | | 10 | pF |



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

| | | | $V_{CC}$ | $T_A$ = 25°C | | SN54HC356 | | SN74HC356 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | MAX | MIN | MAX | MIN | MAX | |
| $f_{clock}$ | Clock frequency | | 2 V | 0 | 6 | 0 | 4.2 | 0 | 5 | MHz |
| | | | 4.5 V | 0 | 31 | 0 | 21 | 0 | 25 | |
| | | | 6 V | 0 | 33 | 0 | 25 | 0 | 28 | |
| $t_w$ | Pulse duration | CLK high or low | 2 V | 80 | | 120 | | 100 | | ns |
| | | | 4.5 V | 16 | | 24 | | 20 | | |
| | | | 6 V | 15 | | 20 | | 18 | | |
| | | $\overline{SC}$ low | 2 V | 80 | | 120 | | 100 | | |
| | | | 4.5 V | 16 | | 24 | | 20 | | |
| | | | 6 V | 15 | | 20 | | 18 | | |
| $t_{su}$ | Setup time | Data before CLK↑ | 2 V | 75 | | 115 | | 95 | | ns |
| | | | 4.5 V | 15 | | 23 | | 19 | | |
| | | | 6 V | 13 | | 20 | | 16 | | |
| | | Select before $\overline{SC}$↑ | 2 V | 75 | | 115 | | 95 | | |
| | | | 4.5 V | 15 | | 23 | | 19 | | |
| | | | 6 V | 13 | | 20 | | 16 | | |
| $t_h$ | Hold time | Data after CLK↑ | 2 V | 5 | | 5 | | 5 | | ns |
| | | | 4.5 V | 5 | | 5 | | 5 | | |
| | | | 6 V | 5 | | 5 | | 5 | | |
| | | Select after $\overline{SC}$↑ | 2 V | 5 | | 5 | | 5 | | |
| | | | 4.5 V | 5 | | 5 | | 5 | | |
| | | | 6 V | 5 | | 5 | | 5 | | |

**switching characteristics over recommended operating free-air temperature range (unless otherwise noted), $C_L$ = 50 pF**

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ | $T_A$ = 25°C | | | SN54HC356 | | SN74HC356 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $f_{max}$ | CLK | | 2 V | 6 | | | 4.2 | | 5 | | MHz |
| | | | 4.5 V | 31 | | | 21 | | 25 | | |
| | | | 6 V | 33 | | | 25 | | 28 | | |
| $t_{pd}$ | CLK | W or Y | 2 V | | 100 | 225 | | 338 | | 318 | ns |
| | | | 4.5 V | | 36 | 51 | | 77 | | 64 | |
| | | | 6 V | | 28 | 43 | | 64 | | 53 | |
| $t_{pd}$ | S0, S1 or S2 | W or Y | 2 V | | 120 | 285 | | 427 | | 355 | ns |
| | | | 4.5 V | | 42 | 57 | | 86 | | 71 | |
| | | | 6 V | | 34 | 48 | | 72 | | 60 | |
| $t_{pd}$ | $\overline{SC}$ | W or Y | 2 V | | 120 | 300 | | 450 | | 375 | ns |
| | | | 4.5 V | | 45 | 60 | | 90 | | 75 | |
| | | | 6 V | | 36 | 51 | | 77 | | 64 | |
| $t_{en}$ | $\overline{G}1$, $\overline{G}2$, or G3 | W or Y | 2 V | | 50 | 125 | | 188 | | 155 | ns |
| | | | 4.5 V | | 18 | 25 | | 38 | | 31 | |
| | | | 6 V | | 15 | 21 | | 32 | | 26 | |
| $t_{dis}$ | $\overline{G}1$, $\overline{G}2$, or G3 | W or Y | 2 V | | 68 | 165 | | 248 | | 205 | ns |
| | | | 4.5 V | | 24 | 33 | | 50 | | 41 | |
| | | | 6 V | | 20 | 28 | | 42 | | 35 | |
| $t_t$ | | W or Y | 2 V | | 28 | 60 | | 90 | | 75 | ns |
| | | | 4.5 V | | 8 | 12 | | 18 | | 15 | |
| | | | 6 V | | 6 | 10 | | 15 | | 13 | |

| | | | |
|---|---|---|---|
| $C_{pd}$ | Power dissipation capacitance | No load, $T_A$ = 25°C | 100 pF typ |

**switching characteristics over recommended operating free-air temperature range (unless otherwise noted), $C_L$ = 150 pF (see Note 1)**

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ | $T_A$ = 25°C | | | SN54HC356 | | SN74HC356 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $t_{pd}$ | CLK | W or Y | 2 V | | 110 | 295 | | 442 | | 365 | ns |
| | | | 4.5 V | | 42 | 59 | | 89 | | 73 | |
| | | | 6 V | | 34 | 50 | | 75 | | 62 | |
| $t_{pd}$ | S0, S1, S2 | W or Y | 2 V | | 130 | 325 | | 485 | | 405 | ns |
| | | | 4.5 V | | 50 | 65 | | 97 | | 81 | |
| | | | 6 V | | 40 | 55 | | 82 | | 69 | |
| $t_{pd}$ | $\overline{SC}$ | W or Y | 2 V | | 110 | 340 | | 510 | | 425 | ns |
| | | | 4.5 V | | 52 | 68 | | 102 | | 85 | |
| | | | 6 V | | 42 | 58 | | 87 | | 72 | |
| $t_{en}$ | $\overline{G}1$, $\overline{G}2$, or G3 | W or Y | 2 V | | 60 | 165 | | 248 | | 205 | ns |
| | | | 4.5 V | | 25 | 33 | | 50 | | 41 | |
| | | | 6 V | | 21 | 28 | | 42 | | 35 | |
| $t_t$ | | Any | 2 V | | 37 | 210 | | 315 | | 265 | ns |
| | | | 4.5 V | | 12 | 42 | | 63 | | 53 | |
| | | | 6 V | | 10 | 36 | | 53 | | 45 | |

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



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