

SN74AS850, SN74AS851

1 OF 16 DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

D2822, DECEMBER 1983 REVISED JANUARY 1986

- 4-Line to 1-Line Data Selectors/Multiplexers That Can Select 1 of 16 Data Inputs.

Typical Applications:

Boolean Function Generators
Parallel-to-Serial Converters
Data Source Selectors

- Cascadable to n-Bits
- 3-State Bus Driver Outputs
- 'AS850 Offers Clocked Selects; 'AS851 Offers Enable-Controlled Selects
- Has a Master Output Control (\bar{G}) for Cascading and Individual Output Controls ($\bar{G}Y$, GW) for Each Output
- Package Options Include Plastic "Small Outline" Packages, Both Plastic and Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs
- Dependable Texas Instruments Quality and Reliability

description

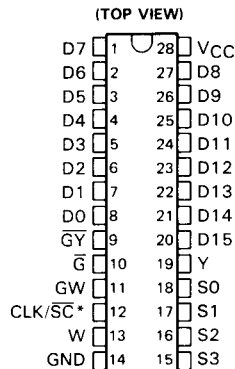
These four-line to one-line data selectors/multiplexers provide full binary decoding to select one-of-sixteen data sources with complementary Y and W outputs. The 'AS850 has a clock-controlled select register allowing for a symmetrical presentation of the select inputs to the decoder while the 'AS851 has an enable-controlled select register allowing the user to select and hold one particular data line.

A buffered group of output controls (\bar{G} , $\bar{G}Y$, GW) can be used to place the two-outputs in either a normal logic (high or low logic level) or a high-impedance state. In the high-impedance state the outputs neither load nor drive the bus lines significantly. The high-impedance third state and increased drive provide the capability to drive the bus lines in a bus-organized system without the need for interface or pull-up components.

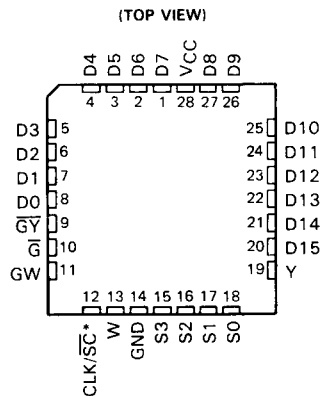
The output controls do not affect the internal operations of the data selector/multiplexer. New data can be setup while the outputs are in the high-impedance state.

The SN74AS850 and SN74AS851 are characterized for operation from 0°C to 70°C.

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*CLK for 'AS850 or $\bar{S}C$ for 'AS851

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INPUT SELECTION TABLE

| SELECT INPUTS | | | | 'AS850 | 'AS851 | INPUT SELECTED |
|---------------|----|----|----|--------|--------|-------------------|
| S3 | S2 | S1 | S0 | CLK | SC | |
| L | L | L | L | ↑ | L | D0 |
| L | L | L | H | ↑ | L | D1 |
| L | L | H | L | ↑ | L | D2 |
| L | L | H | H | ↑ | L | D3 |
| L | H | L | L | ↑ | L | D4 |
| L | H | L | H | ↑ | L | D5 |
| L | H | H | L | ↑ | L | D6 |
| L | H | H | H | ↑ | L | D7 |
| H | L | L | L | ↑ | L | D8 |
| H | L | L | H | ↑ | L | D9 |
| H | L | H | L | ↑ | L | D10 |
| H | L | H | H | ↑ | L | D11 |
| H | H | L | L | ↑ | L | D12 |
| H | H | L | H | ↑ | L | D13 |
| H | H | H | L | ↑ | L | D14 |
| H | H | H | H | ↑ | L | D15 |
| X | X | X | X | H or L | H | Dn |

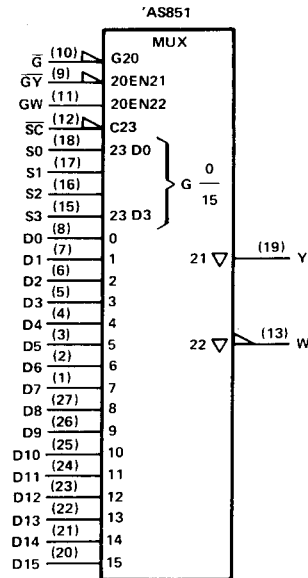
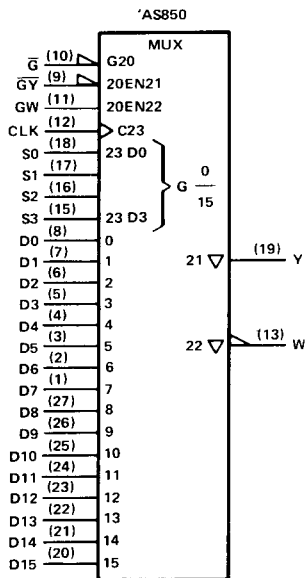
OUTPUT FUNCTION TABLE

| \bar{G} | $\bar{G}Y$ | GW | OUTPUTS | |
|-----------|------------|----|---------|-----------|
| | | | Y | W |
| H | X | X | Z | Z |
| L | H | L | Z | Z |
| L | L | L | D | Z |
| L | H | H | Z | \bar{D} |
| L | L | H | D | \bar{D} |

D = level of selected input D0–D15

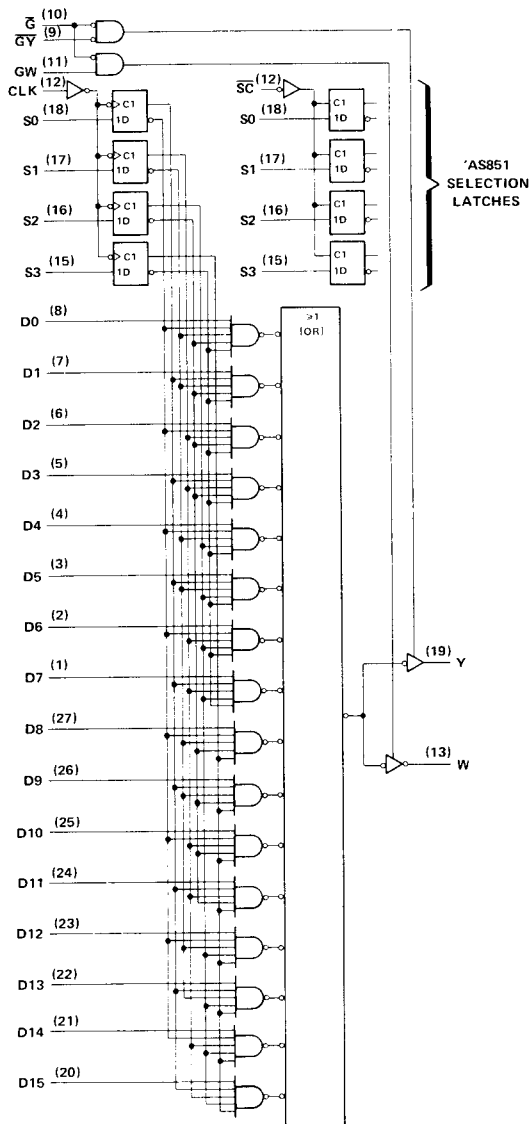
Dn = the input selected before the most-recent low-to-high transition of CLK or $\bar{S}C$.

logic symbols†



† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

'AS850 logic diagrams (positive logic) (see inset for 'AS851)



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

| | |
|--|----------------|
| Supply voltage, V_{CC} | 7 V |
| Input voltage | 7 V |
| Operating free-air temperature range | 0°C to 70°C |
| Storage temperature range | -65°C to 150°C |

SN74AS850 recommended operating conditions

| | | MIN | NOM | MAX | UNIT |
|-------------|---------------------------------------|----------|-----|-----|------|
| V_{CC} | Supply voltage | 4.5 | 5 | 5.5 | V |
| V_{IH} | High-level input voltage | 2 | | | V |
| V_{IL} | Low-level input voltage | | | 0.8 | V |
| I_{OH} | High-level output current | | | -15 | mA |
| I_{OL} | Low-level output current | | | 48 | mA |
| f_{clock} | Clock frequency | 0 | | 60 | MHz |
| t_w | Pulse duration | CLK high | | 8 | ns |
| | | CLK low | | 8 | |
| t_{su} | Setup time, select inputs before CLK† | 10 | | | ns |
| t_h | Hold time, select inputs after CLK† | 0 | | | ns |
| T_A | Operating free-air temperature | 0 | | 70 | °C |

SN74AS850 electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | | MIN | TYP† | MAX | UNIT | |
|----------------|--|-------------------------------|------------------|------|------|---------|----|
| V_{IK} | $V_{CC} = 4.5 V, I_I = -18 mA$ | | | | -1.2 | V | |
| V_{OH} | $V_{CC} = 4.5 V \text{ to } 5.5 V, I_{OH} = -2 mA$ | | $V_{CC} - 2$ | | | V | |
| | $V_{CC} = 4.5 V, I_{OH} = -15 mA$ | | 2 | 3.3 | | | |
| V_{OL} | $V_{CC} = 4.5 V, I_{OL} = 48 mA$ | | 0.35 | 0.5 | | V | |
| I_{OZH} | $V_{CC} = 5.5 V, V_O = 2.7 V$ | | | | 50 | μA | |
| I_{OZL} | $V_{CC} = 5.5 V, V_O = 0.4 V$ | | | | -50 | μA | |
| I_I | $V_{CC} = 5.5 V, V_I = 7 V$ | | | | 0.1 | mA | |
| I_{IH} | $V_{CC} = 5.5 V, V_I = 2.7 V$ | | | | 20 | μA | |
| I_{IL} | D, \bar{G} | $V_{CC} = 5.5 V, V_I = 0.4 V$ | | | -1 | mA | |
| | All others | | | | -0.5 | | |
| I_O^\ddagger | $V_{CC} = 5.5 V, V_O = 2.25 V$ | | -30 | | -112 | mA | |
| I_{CC} | $V_{CC} = 5.5 V$ | | Outputs active | | 50 | 81 | mA |
| | | | Outputs disabled | | 52 | 85 | |

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

‡ The output conditions have been chosen to produce a current that closely approximates one-half of the true short-circuit current, I_{OS} .

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WITH 3-STATE OUTPUTS

SN74AS850 switching characteristics (see Note 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V,}$ $C_L = 50 \text{ pF,}$ $R_1 = 500 \Omega,$ $R_2 = 500 \Omega,$ $T_A = 0^\circ\text{C to } 70^\circ\text{C}$ | | UNIT |
|-----------|-----------------|----------------|---|------|------|
| | | | MIN | MAX | |
| f_{max} | | | 60 | | MHz |
| t_{PLH} | Any D | Y | 3 | 10.5 | ns |
| t_{PHL} | | | 3 | 11 | |
| t_{PLH} | Any D | W | 3 | 8 | ns |
| t_{PHL} | | | 1 | 6 | |
| t_{PLH} | CLK | Y | 3 | 14.5 | ns |
| t_{PHL} | | | 3 | 17.5 | |
| t_{PLH} | CLK | W | 3 | 15 | ns |
| t_{PHL} | | | 3.5 | 13 | |
| t_{PZH} | $\bar{0}$ | Y | 2 | 8 | ns |
| t_{PZL} | | | 3 | 11 | |
| t_{PHZ} | $\bar{0}$ | Y | 1 | 6 | ns |
| t_{PLZ} | | | 2 | 8 | |
| t_{PZH} | $\bar{0}$ | W | 2 | 8 | ns |
| t_{PZL} | | | 3 | 21 | |
| t_{PHZ} | $\bar{0}$ | W | 1 | 6 | ns |
| t_{PLZ} | | | 2 | 8 | |
| t_{PZH} | $\bar{0Y}$ | Y | 2 | 8 | ns |
| t_{PZL} | | | 3 | 11 | |
| t_{PHZ} | $\bar{0Y}$ | Y | 1 | 6 | ns |
| t_{PLZ} | | | 2 | 8 | |
| t_{PZH} | GW | W | 2 | 10 | ns |
| t_{PZL} | | | 3 | 25 | |
| t_{PHZ} | GW | W | 1 | 6 | ns |
| t_{PLZ} | | | 2 | 11 | |

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

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1 OF 16 DATA SELECTORS/MULTIPLEXERS
WITH 3-STATE OUTPUTS

SN74AS851 recommended operating conditions

| | MIN | NOM | MAX | UNIT |
|--|-----|-----|-----|------|
| V _{CC} Supply voltage | 4.5 | 5 | 5.5 | V |
| V _{IH} High-level input voltage | 2 | | | V |
| V _{IL} Low-level input voltage | | | 0.8 | V |
| I _{OH} High-level output current | | | -15 | mA |
| I _{OL} Low-level output current | | | 48 | mA |
| t _w Pulse duration, \overline{SC} low | 10 | | | ns |
| t _{su} Setup time, select inputs before \overline{SC} † | 4.5 | | | ns |
| t _h Hold time, select inputs after \overline{SC} † | 0 | | | ns |
| T _A Operating free-air temperature | 0 | | 70 | °C |

SN74AS851 electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | MIN | TYP† | MAX | UNIT | |
|------------------|---|---------------------|------|------|------|----|
| V _{IK} | V _{CC} = 4.5 V, I _I = -18 mA | | | -1.2 | C | |
| V _{OH} | V _{CC} = 4.5 V to 5.5 V, I _{OH} = -2 mA | V _{CC} - 2 | | | V | |
| | V _{CC} = 4.5 V, I _{OH} = -15 mA | 2 | 3.3 | | | |
| V _{OL} | V _{CC} = 4.5 V, I _{OL} = 48 mA | | 0.35 | 0.5 | V | |
| I _{OZH} | V _{CC} = 5.5 V, V _O = 2.7 V | | | 50 | μA | |
| I _{OZL} | V _{CC} = 5.5 V, V _O = 0.4 V | | | -50 | μA | |
| I _I | V _{CC} = 5.5 V, V _I = 7 V | | | 0.1 | mA | |
| I _{IH} | V _{CC} = 5.5 V, V _I = 2.7 V | | | 20 | μA | |
| I _{IL} | V _{CC} = 5.5 V, V _I = 0.4 V | D, \overline{G} | | -1 | mA | |
| | | All others | | -0.5 | | |
| I _O ‡ | V _{CC} = 5.5 V, V _O = 2.25 V | -30 | | -112 | mA | |
| I _{CC} | V _{CC} = 5.5 V | Outputs active | | 50 | 81 | mA |
| | | Outputs disabled | | 52 | 85 | |

† All typical values are at V_{CC} = 5 V, T_A = 25°C.

‡ The output conditions have been chosen to produce a current that closely approximates one-half of the true short-circuit current, I_{OS}.

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1 OF 16 DATA SELECTORS/MULTIPLEXERS
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SN74AS851 switching characteristics (see Note 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R ₁ = 500 Ω, R ₂ = 500 Ω, T _A = 0°C to 70°C | | UNIT |
|------------------|---|----------------|--|------|------|
| | | | MIN | MAX | |
| t _{PLH} | Any D | Y | 3 | 10.5 | ns |
| t _{PHL} | | | 3 | 11 | |
| t _{PLH} | Any D | W | 3 | 8 | ns |
| t _{PHL} | | | 1 | 6 | |
| t _{PLH} | S ₀ , S ₁ , S ₂ , S ₃ | Y | 3 | 18 | ns |
| t _{PHL} | | | 3 | 19 | |
| t _{PLH} | S ₀ , S ₁ , S ₂ , S ₃ | W | 3 | 16 | ns |
| t _{PHL} | | | 3 | 15 | |
| t _{PLH} | $\overline{S_C}$ | Y | 3 | 18 | ns |
| t _{PHL} | | | 3 | 20 | |
| t _{PLH} | $\overline{S_C}$ | W | 3 | 16 | ns |
| t _{PHL} | | | 3 | 15 | |
| t _{PZH} | \overline{G} | Y | 2 | 8 | ns |
| t _{PZL} | | | 3 | 11 | |
| t _{PHZ} | \overline{G} | Y | 1 | 6 | ns |
| t _{PLZ} | | | 2 | 8 | |
| t _{PZH} | \overline{G} | W | 2 | 8 | ns |
| t _{PZL} | | | 3 | 21 | |
| t _{PHZ} | \overline{G} | W | 1 | 6 | ns |
| t _{PLZ} | | | 2 | 8 | |
| t _{PZH} | $\overline{G_Y}$ | Y | 2 | 8 | ns |
| t _{PZL} | | | 3 | 11 | |
| t _{PHZ} | $\overline{G_Y}$ | Y | 1 | 6 | ns |
| t _{PLL} | | | 2 | 8 | |
| t _{PZH} | GW | W | 2 | 10 | ns |
| t _{PZL} | | | 3 | 25 | |
| t _{PHZ} | GW | W | 1 | 6 | ns |
| t _{PLZ} | | | 2 | 11 | |

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

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TYPICAL APPLICATION DATA

The 'AS850 or 'AS851 can be used as a 1-of-16 Boolean function generator. Figure 1 shows the 'AS850 in one example.

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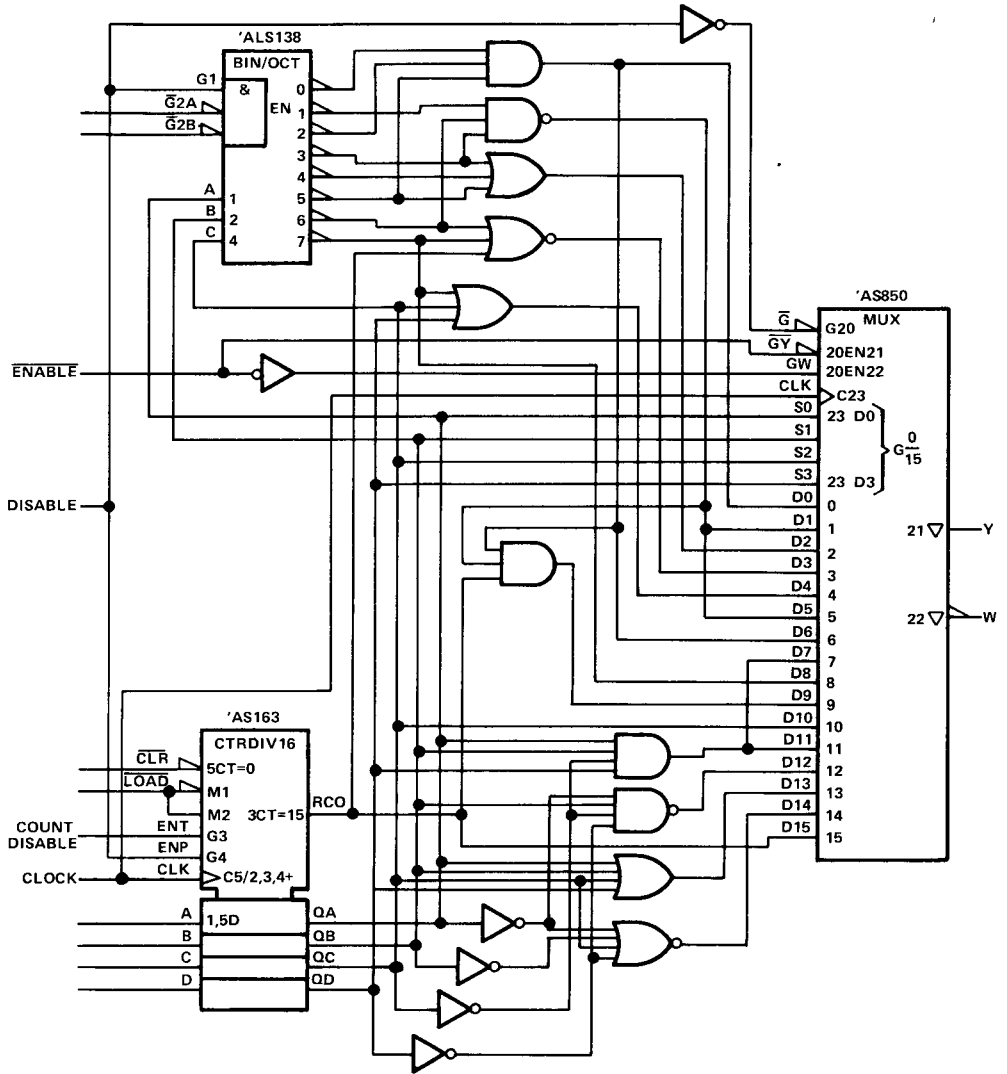


FIGURE 1. 1-of-16 BOOLEAN FUNCTION GENERATOR

TYPICAL APPLICATION DATA

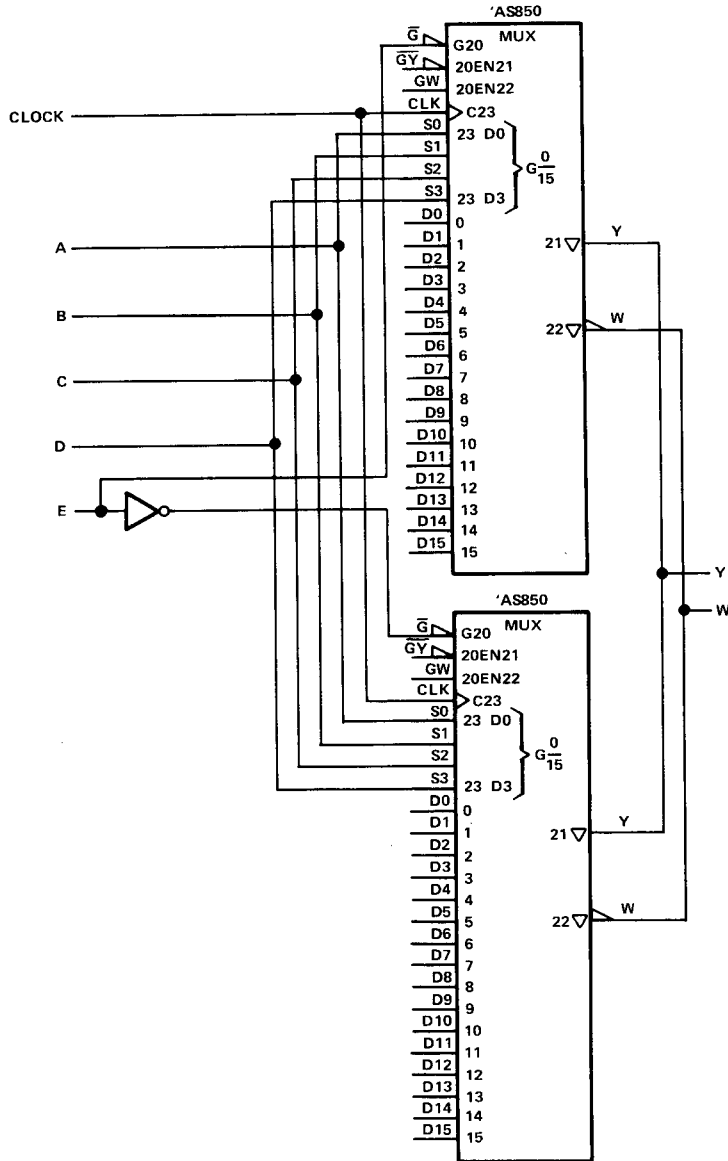


FIGURE 2. 1-of-32 DATA SELECTOR/MULTIPLEXER

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1 OF 16 DATA SELECTORS/MULTIPLEXERS
WITH 3-STATE OUTPUTS

TYPICAL APPLICATION DATA

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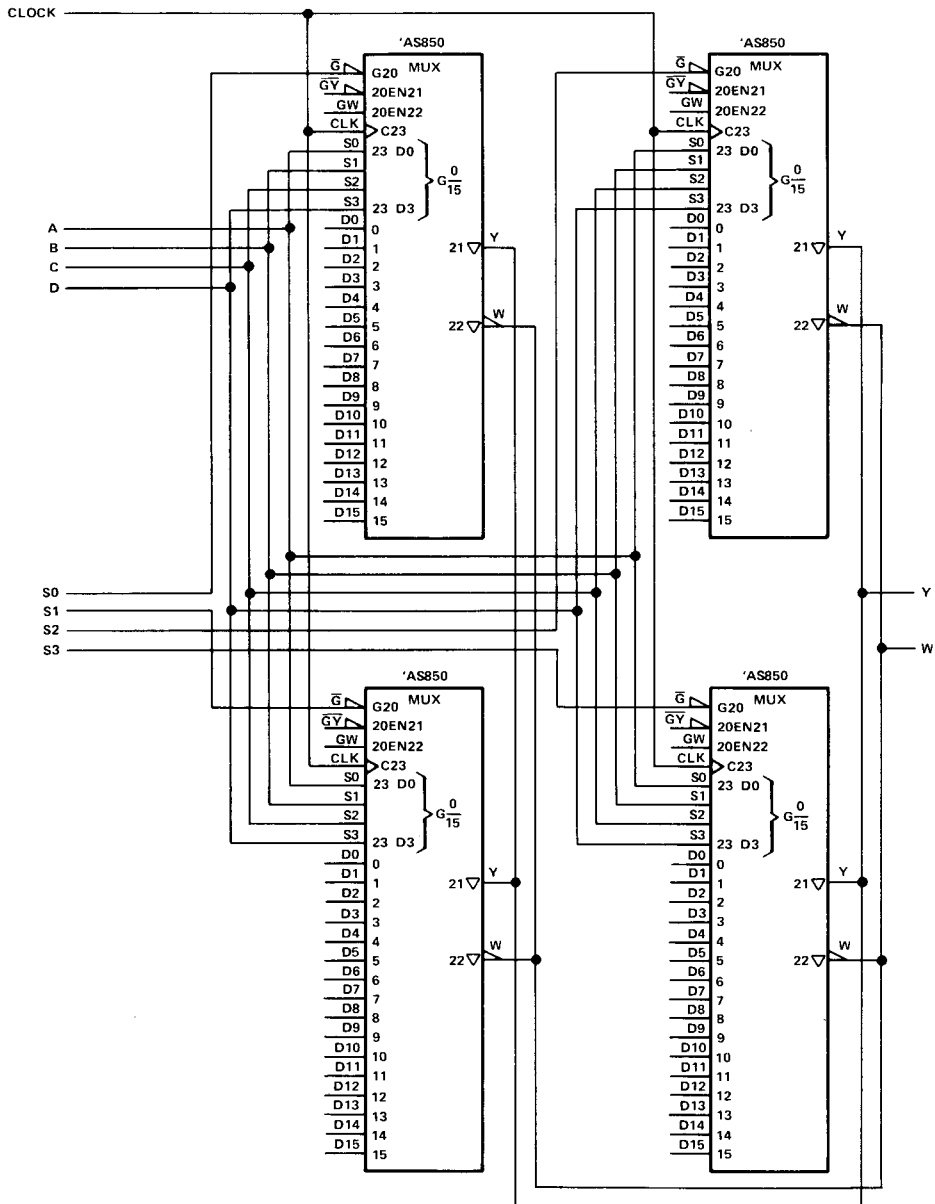


FIGURE 3. 1-of-64 DATA SELECTOR/MULTIPLEXER