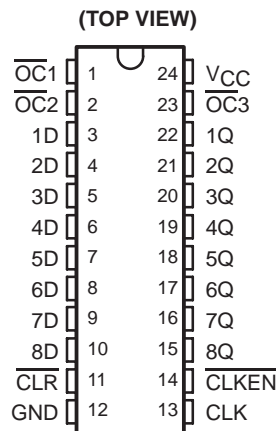


SN54ALS29825, SN74ALS29825, SN74ALS29826 8-BIT BUS INTERFACE FLIP-FLOPS WITH 3-STATE OUTPUTS

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- Functionally Equivalent to AMD AM29825 and AM29826
- Improved I_{OH} Specifications
- Multiple Output Enables Allow Multiuser Control of the Interface
- Outputs Have Undershoot Protection Circuitry
- Power-Up High-Impedance State
- Package Options Include Plastic "Small-Outline" Packages and Standard Plastic and Ceramic 300-mil DIPs
- Buffered Control Inputs to Reduce DC Loading Effect

SN54ALS29825 . . . JT PACKAGE
SN74ALS29825 . . . DW OR NT PACKAGE



description

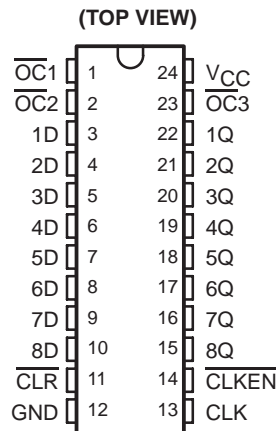
These 8-bit flip-flops feature three-state outputs designed specifically for driving highly capacitive or relatively low-impedance loads. They are particularly suitable for implementing multiuser registers, I/O ports, bidirectional bus drivers, and working registers.

With the clock enable (\overline{CLKEN}) low, the eight D-type edge-triggered flip-flops enter data on the low-to-high transitions of the clock. Taking \overline{CLKEN} high will disable the clock buffer, thus latching the outputs. The 'ALS29825 has noninverting D inputs and the 'ALS29826 has inverting \overline{D} inputs. Taking the \overline{CLR} input low causes the eight Q outputs to go low independently of the clock.

Multiuser buffered output-control inputs ($\overline{OC1}$, $\overline{OC2}$, and $\overline{OC3}$) can be used to place the eight outputs in either a normal logic state (high or low level) or a high-impedance state. The outputs are also in the high-impedance state during power-up and power-down conditions. The outputs remain in the high-impedance state while the device is powered-down. In the high-impedance state the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased drive provide the capability to drive the bus lines in a bus-organized system without need for interface or pullup components. The output controls do not affect the internal operation of the flip-flops. Old data can be retained or new data can be entered while the outputs are in the high-impedance state.

The SN54ALS29825 is characterized over the full military range of -55°C to 125°C . The SN74ALS29825 and SN74ALS29826 are characterized for operation from 0°C to 70°C .

SN74ALS29826 . . . DW OR NT PACKAGE



SN54ALS29825, SN74ALS29825

8-BIT BUS INTERFACE FLIP-FLOPS WITH 3-STATE OUTPUTS

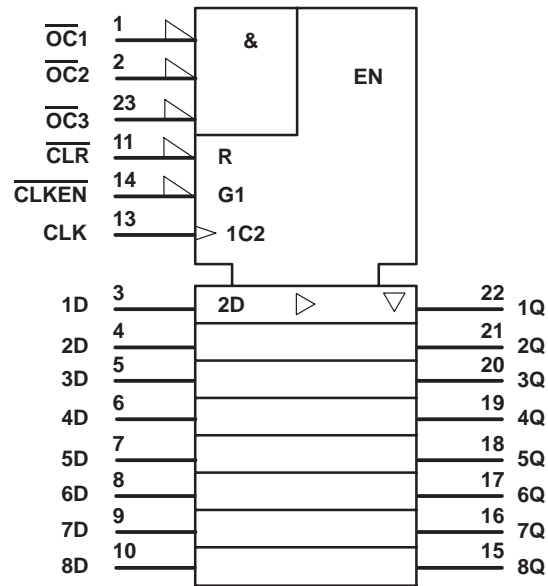
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FUNCTION TABLE

| INPUTS | | | | | OUTPUT |
|-------------------|------------------|--------------------|-----|---|--------|
| \overline{OC}^* | \overline{CLR} | \overline{CLKEN} | CLK | D | Q |
| L | L | X | X | X | L |
| L | H | L | ↑ | H | H |
| L | H | L | ↑ | L | L |
| L | H | H | X | X | Q_0 |
| H | X | X | X | X | Z |

$\overline{OC}^* = H$ if any of $\overline{OC}1$, $\overline{OC}2$, or $\overline{OC}3$ is high.
 $\overline{OC}^* = L$ if any of $OC1$, $OC2$, or $OC3$ is low.

logic symbol †



logic diagram (positive logic)

MISSING ILLUSTRATION

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

SN74ALS29826

8-BIT BUS INTERFACE FLIP-FLOPS WITH 3-STATE OUTPUTS

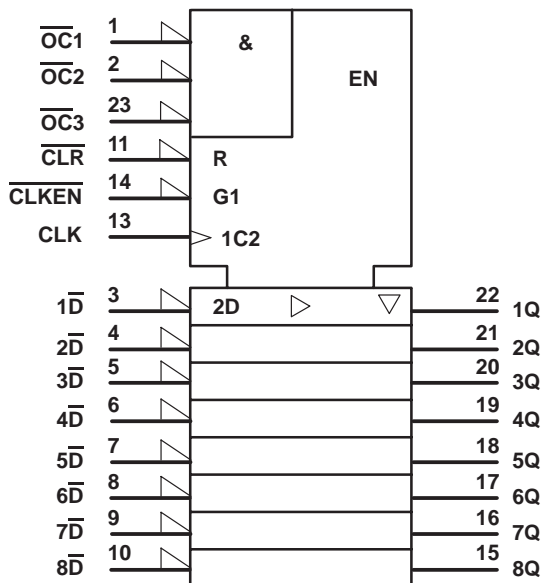
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FUNCTION TABLE

| INPUTS | | | | | OUTPUT |
|-------------------|------------------|--------------------|-----|---|--------|
| \overline{OC}^* | \overline{CLR} | \overline{CLKEN} | CLK | D | Q |
| L | L | X | X | X | L |
| L | H | L | ↑ | H | H |
| L | H | L | ↑ | L | L |
| L | H | H | X | X | Q_0 |
| H | X | X | X | X | Z |

\overline{OC}^* = H if any of $\overline{OC}1$, $\overline{OC}2$, or $\overline{OC}3$ is high.
 \overline{OC}^* = L if any of $\overline{OC}1$, $\overline{OC}2$, or $\overline{OC}3$ is low.

logic symbol †



logic diagram (positive logic)

MISSING ILLUSTRATION

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

SN54ALS29825

8-BIT BUS INTERFACE FLIP-FLOPS WITH 3-STATE OUTPUTS

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

| | |
|---|----------------|
| Supply voltage, V_{CC} (see Note 1) | 7 V |
| Input voltage | 7 V |
| Voltage applied to a disabled high-impedance output | 5.5 V |
| Operating free-air temperature range | -55°C to 125°C |
| Storage temperature range | -65°C to 150°C |

† Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only, and functional operation of the device at these or any other conditions beyond those indicated in the "Recommended Operating Conditions" section of this specification is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: All voltage values are with respect to GND.

recommended operating conditions

| | | MIN | NOM | MAX | MIN | NOM | MAX | UNIT |
|----------|--------------------------------|-------------------|-----|-----|------|-----|-----|------|
| V_{CC} | Supply voltage | | 5 | | 4.75 | 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 | | | | | | -18 | mA |
| I_{OL} | Low-level output current | | | | | | 32 | mA |
| t_w | Pulse duration | CLR low | 7 | | 7 | | | ns |
| | | CLK high | 8 | | 8 | | | |
| | | CLK low | 8 | | 8 | | | |
| t_{su} | Setup time before CLK ↑ | CLR inactive | 7 | | 7 | | ns | |
| | | Data | 4 | | 4 | | | |
| | | CLKEN high or low | 8 | | 8 | | | |
| t_h | Hold time, data after CLK ↑ | Data | 4 | | 4 | | ns | |
| | | CLKEN | 2 | | 2 | | | |
| T_A | Operating free-air temperature | | 25 | | -55 | | 125 | °C |

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

| PARAMETER | TEST CONDITIONS ‡ | | MIN | TYP § | MAX | UNIT |
|------------|-------------------------|---------------------------|-----|-------|------|------|
| V_{IK} | $V_{CC} = \text{MIN}$, | $I_I = -18 \text{ mA}$ | | | -1.2 | V |
| V_{OH} | $V_{CC} = \text{MIN}$, | $I_{OH} = -12 \text{ mA}$ | 2.4 | | | V |
| | $V_{CC} = \text{MIN}$, | $I_{OH} = -18 \text{ mA}$ | 2 | | | |
| V_{OL} | $V_{CC} = \text{MIN}$, | $I_{OL} = 32 \text{ mA}$ | | 0.35 | 0.5 | V |
| I_{OZH} | $V_{CC} = \text{MAX}$, | $V_O = 2.4 \text{ V}$ | | | 50 | μA |
| I_{OZL} | $V_{CC} = \text{MAX}$, | $V_O = 0.4 \text{ V}$ | | | -50 | μA |
| I_I | $V_{CC} = \text{MAX}$, | $V_I = 5.5 \text{ V}$ | | | 0.1 | mA |
| I_{IH} | $V_{CC} = \text{MAX}$, | $V_I = 2.7 \text{ V}$ | | | 20 | μA |
| I_{IL} | $V_{CC} = \text{MAX}$, | $V_I = 0.4 \text{ V}$ | | | -0.5 | mA |
| $I_{OS} ¶$ | $V_{CC} = \text{MAX}$, | $V_O = 0 \text{ V}$ | -75 | | -250 | mA |
| I_{CC} | $V_{CC} = \text{MAX}$, | Outputs open | | 70 | 115 | 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 and duration of the short circuit should not exceed one second.



SN74ALS29825, SN74ALS29826

8-BIT BUS INTERFACE FLIP-FLOPS WITH 3-STATE OUTPUTS

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

| | |
|---|-----------------|
| Supply voltage, V_{CC} (see Note 1) | 7 V |
| Input voltage | 7 V |
| Voltage applied to a disabled high-impedance output | 5.5 V |
| Operating free-air temperature range | 0°C to 70°C |
| Storage temperature range | – 65°C to 150°C |

† Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only, and functional operation of the device at these or any other conditions beyond those indicated in the "Recommended Operating Conditions" section of this specification is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: All voltage values are with respect to GND.

recommended operating conditions

| | | MIN | NOM | MAX | MIN | NOM | MAX | UNIT |
|----------|--------------------------------|-------------------|-----|-----|------|-----|-----|------|
| V_{CC} | Supply voltage | | 5 | | 4.75 | 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 | | | | | | –24 | mA |
| I_{OL} | Low-level output current | | | | | | 48 | mA |
| t_w | Pulse duration | CLR low | 5 | | 7 | | | ns |
| | | CLK high | 5 | | 7 | | | |
| | | CLK low | 5 | | 7 | | | |
| t_{su} | Setup time before CLK ↑ | CLR inactive | 5 | | 7 | | | ns |
| | | Data | 2 | | 4 | | | |
| | | CLKEN high or low | 6 | | 6 | | | |
| t_h | Hold time, data after CLK ↑ | Data | 2 | | 2 | | | ns |
| | | CLKEN | 0 | | 2 | | | |
| T_A | Operating free-air temperature | | 25 | | 0 | | 70 | °C |

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

| PARAMETER | TEST CONDITIONS ‡ | MIN | TYP ‡ | MAX | UNIT |
|--------------------|--|-----|-------|------|------|
| V_{IK} | $V_{CC} = \text{MIN}$, $I_I = -18 \text{ mA}$ | | | –1.2 | V |
| V_{OH} | $V_{CC} = \text{MIN}$, $I_{OH} = -15 \text{ mA}$ | 2.4 | 3.3 | | V |
| | $V_{CC} = \text{MIN}$, $I_{OH} = -24 \text{ mA}$ | 2 | 3.1 | | |
| V_{OL} | $V_{CC} = \text{MIN}$, $I_{OL} = 48 \text{ mA}$ | | 0.35 | 0.5 | V |
| I_{OZH} | $V_{CC} = \text{MAX}$, $V_O = 2.4 \text{ V}$ | | | 20 | μA |
| I_{OZL} | $V_{CC} = \text{MAX}$, $V_O = 0.4 \text{ V}$ | | | –20 | μA |
| I_I | $V_{CC} = \text{MAX}$, $V_I = 5.5 \text{ V}$ | | | 0.1 | mA |
| I_{IH} | $V_{CC} = \text{MAX}$, $V_I = 2.7 \text{ V}$ | | | 20 | μA |
| I_{IL} | $V_{CC} = \text{MAX}$, $V_I = 0.4 \text{ V}$ | | | –0.2 | mA |
| $I_{OS} \text{ ¶}$ | $V_{CC} = \text{MAX}$, $V_O = 0 \text{ V}$ | –75 | | –250 | mA |
| I_{CC} | $V_{CC} = \text{MAX}$, Outputs open | | 70 | 100 | 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 and duration of the short circuit should not exceed one second.



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8-BIT BUS INTERFACE FLIP-FLOPS WITH 3-STATE OUTPUTS

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switching characteristics over recommended ranges of supply voltage and free-air temperature

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS (see Figure 1) | V _{CC} = 5 V, T _A = 25°C | | | V _{CC} = MIN to MAX, † T _A = MIN to MAX † | | UNIT |
|------------------|-------------------------|-------------|--------------------------------|--|------|------|--|------|------|
| | | | | MIN | TYP | MAX | MIN | MAX | |
| t _{PLH} | CLK | Any Q | C _L = 50 pF | 2 | | 8.5 | 2 | 14 | ns |
| t _{PHL} | | | | 2 | | 8.5 | 2 | 17.5 | |
| t _{PLH} | | | C _L = 300 pF | 2 | | 14 | 2 | 16 | |
| t _{PHL} | | | | 2 | | 17.5 | 2 | 21 | |
| t _{PHL} | $\overline{\text{CLR}}$ | Any Q | C _L = 50 pF | 1 | 6 | 14.5 | 1 | 17.5 | ns |
| t _{PZH} | $\overline{\text{OC}}$ | Any Q | C _L = 50 pF | 1 | 11.5 | 14.5 | 1 | 17.5 | ns |
| t _{PZL} | | | | 1 | 11 | 13 | 1 | 18 | |
| t _{PZH} | | | C _L = 300 pF | 1 | | 18 | 1 | 22 | |
| t _{PZL} | | | | 1 | | 25 | 1 | 29.5 | |
| t _{PHZ} | $\overline{\text{OC}}$ | Any Q | C _L = 50 pF | 1 | | 15 | 1 | 19 | ns |
| t _{PLZ} | | | | 1 | | 10 | 1 | 12 | |
| t _{PHZ} | | | C _L = 5 pF | 1 | 5.2 | 10 | 1 | 14 | |
| t _{PLZ} | | | | 1 | 5.2 | 9 | 1 | 11 | |

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



SN74ALS29825, SN74ALS29826

8-BIT BUS INTERFACE FLIP-FLOPS WITH 3 STATE OUTPUTS

SDAS147B — JANUARY 1986 — REVISED MARCH 1990

switching characteristics over recommended ranges of supply voltage and free-air temperature

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS (see Figure 1) | $V_{CC} = 5\text{ V},$ $T_A = 25^\circ\text{C}$ | | | $V_{CC} = \text{MIN to MAX}, \dagger$ $T_A = \text{MIN to MAX} \dagger$ | | UNIT |
|-----------|-------------------------|----------------|--------------------------------------|--|------|-----|--|-----|------|
| | | | | MIN | TYP | MAX | MIN | MAX | |
| t_{PLH} | CLK | Any Q | $C_L = 50\text{ pF}$ | 2 | | 8.5 | 2 | 10 | ns |
| t_{PHL} | | | | 2 | | 8.5 | 2 | 10 | |
| t_{PLH} | | | $C_L = 300\text{ pF}$ | | | 14 | | 16 | |
| t_{PHL} | | | | | | 14 | | 16 | |
| t_{PHL} | $\overline{\text{CLR}}$ | Any Q | $C_L = 50\text{ pF}$ | | 6 | 10 | | 12 | ns |
| t_{PZH} | $\overline{\text{OC}}$ | Any Q | $C_L = 50\text{ pF}$ | | 11.5 | 12 | | 14 | ns |
| t_{PZL} | | | | | 11 | 12 | | 14 | |
| t_{PZH} | | | $C_L = 300\text{ pF}$ | | | 17 | | 20 | |
| t_{PZL} | | | | | | 21 | | 23 | |
| t_{PHZ} | $\overline{\text{OC}}$ | Any Q | $C_L = 50\text{ pF}$ | | | 11 | | 14 | ns |
| t_{PLZ} | | | | | | 9 | | 12 | |
| t_{PHZ} | | | $C_L = 5\text{ pF}$ | | 5.2 | 8 | | 9 | |
| t_{PLZ} | | | | | 5.2 | 8 | | 9 | |

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



SN54ALS29825, SN74ALS29825, SN74ALS29826

8-BIT BUS INTERFACE FLIP-FLOPS WITH 3-STATE OUTPUTS

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PARAMETER MEASUREMENT INFORMATION

MISSING ILLUSTRATION

NOTES: A. C_L includes probe and jig capacitance.

B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control.
Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.

C. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10$ MHz, $Z_0 = 50 \Omega$, $t_r \leq 2.5$ ns, $t_f \leq 2.5$ ns.

Figure 1. Load Circuit and Voltage Waveforms



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