- **3-State Buffer-Type Outputs Drive Bus-Lines Directly**
- **Bus-Structured Pinout**
- **Choice of True or Inverting Logic**

| | |
|---|---|
| 'ALS874, 'AS874 | True Outputs |
| 'ALS876, 'AS876 | Inverting Outputs |

- **Asynchronous Clear**
- **Package Options Include Both Plastic and Ceramic Chip Carriers in Addition to Plastic and Ceramic DIPs**
- **Dependable Texas Instruments Quality and Reliability**

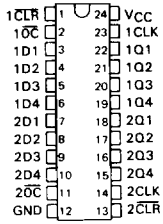
## description

These dual four-bit registers feature three-state outputs designed specifically for bus driving. This makes these devices particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

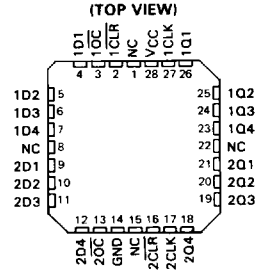
The edge-triggered flip-flops enter data on the low-to-high transition of the clock. The 'ALS874 and 'AS874 have $\overline{CLR}$ inputs and noninverting Q outputs; the 'ALS876 and 'AS876 have $\overline{PRE}$ inputs and inverting $\overline{Q}$ outputs. In each case, taking this input low causes the four Q or $\overline{Q}$ outputs to go low independently of the clock.

The SN54ALS874, SN54AS874, SN54ALS876 and SN54AS876 are characterized for operation over the full military temperature range of −55°C to 125°C. The SN74ALS874, SN74AS874, SN74ALS876, and SN74AS876 are characterized for operation from 0°C to 70°C.

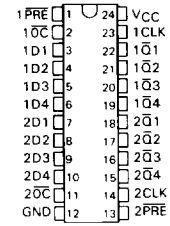
**SN54ALS874, SN54AS874 . . . JT PACKAGE**
**SN74ALS874, SN74AS874 . . . NT PACKAGE**
**(TOP VIEW)**



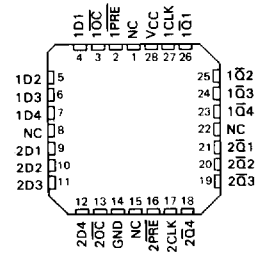

**SN54ALS874, SN54AS874 . . . FH PACKAGE**
**SN74ALS874, SN74AS874 . . . FN PACKAGE**
**(TOP VIEW)**




**SN54ALS876, SN54AS876 . . . JT PACKAGE**
**SN74ALS876, SN74AS876 . . . NT PACKAGE**
**(TOP VIEW)**




**SN54ALS876, SN54AS876 . . . FH PACKAGE**
**SN74ALS876, SN74AS876 . . . FN PACKAGE**
**(TOP VIEW)**




NC — No internal connection

## FUNCTION TABLES

'ALS874, 'AS874 (EACH FLIP-FLOP)

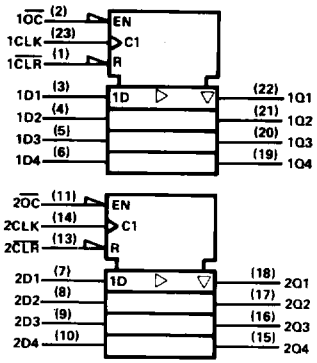
| INPUTS | | | | OUTPUT |
|---|---|---|---|---|
| $\overline{OC}$ | $\overline{CLR}$ | CLK | D | Q |
| L | L | X | X | L |
| L | H | ↑ | H | H |
| L | H | ↑ | L | L |
| L | H | L | X | $Q_0$ |
| H | X | X | X | Z |

'ALS876, 'AS876 (EACH FLIP-FLOP)

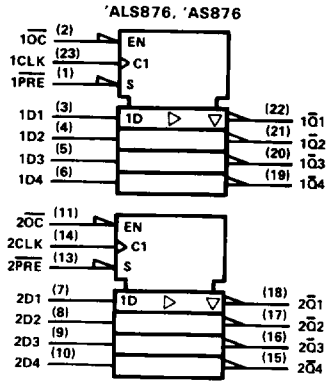
| INPUTS | | | | OUTPUT |
|---|---|---|---|---|
| $\overline{OC}$ | $\overline{PRE}$ | CLK | D | $\overline{Q}$ |
| L | L | X | X | L |
| L | H | ↑ | H | L |
| L | H | ↑ | L | H |
| L | H | L | X | $\overline{Q}_0$ |
| H | X | X | X | Z |

### logic symbols

'ALS874, 'AS874

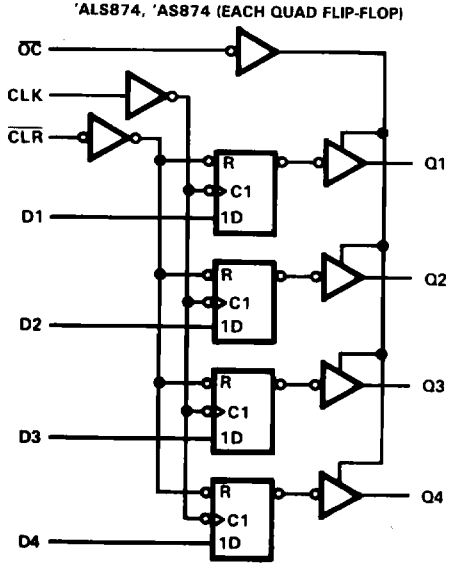



'ALS876, 'AS876

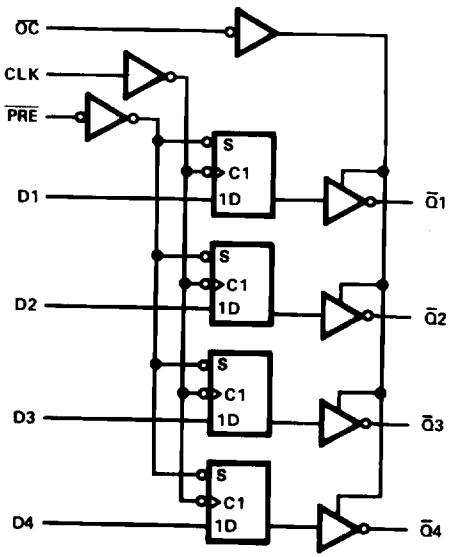



### logic diagrams (positive logic)

'ALS874, 'AS874 (EACH QUAD FLIP-FLOP)




'ALS876, 'AS876 (EACH QUAD FLIP-FLOP)




Pin numbers shown are for JT and NT packages.

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

Supply voltage, $V_{CC}$ . . . . . 7 V
Input voltage . . . . . 7 V
Voltage applied to a disabled 3-state output . . . . . 5.5 V
Operating free-air temperature range: SN54ALS874, SN54ALS876 . . . . . −55°C to 125°C
SN74ALS874, SN74ALS876 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

**recommended operating conditions**

| | | | SN54ALS874 SN54ALS876 | | | SN74ALS874 SN74ALS876 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | NOM | MAX | MIN | NOM | MAX | |
| $V_{CC}$ | Supply voltage | | 4.5 | 5 | 5.5 | 4.5 | 5 | 5.5 | V |
| $V_{IH}$ | High-level input voltage | | 2 | | | 2 | | | V |
| $V_{IL}$ | Low-level input voltage | | | | 0.8 | | | 0.8 | V |
| $I_{OH}$ | High-level output current | | | | −1 | | | −2.6 | mA |
| $I_{OL}$ | Low-level output current | | | | 12 | | | 24 | mA |
| $f_{clock}$ | Clock frequency | | 0 | | 25 | 0 | | 30 | MHz |
| $t_w$ | Pulse duration | $\overline{PRE}$ or $\overline{CLR}$ low | 10 | | | 10 | | | ns |
| | | CLK high | 20 | | | 16.5 | | | |
| | | CLK low | 20 | | | 16.5 | | | |
| $t_{su}$ | Setup time before CLK↑ | Data | 15 | | | 15 | | | ns |
| | | $\overline{PRE}$ or $\overline{CLR}$ inactive | 10 | | | 10 | | | |
| $t_h$ | Hold time, data after CLK↑ | | 4 | | | 0 | | | ns |
| $T_A$ | Operating free-air temperature | | −55 | | 125 | 0 | | 70 | °C |

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

| PARAMETER | TEST CONDITIONS | | SN54ALS874 SN54ALS876 | | | SN74ALS874 SN74ALS876 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP† | MAX | MIN | TYP† | MAX | |
| $V_{IK}$ | $V_{CC}$ = 4.5 V, | $I_I$ = −18 mA | | | −1.5 | | | −1.5 | V |
| $V_{OH}$ | $V_{CC}$ = 4.5 V to 5.5 V, | $I_{OH}$ = −0.4 mA | $V_{CC}$−2 | | | $V_{CC}$−2 | | | V |
| | $V_{CC}$ = 4.5 V, | $I_{OH}$ = −1 mA | 2.4 | 3.3 | | | | | |
| | $V_{CC}$ = 4.5 V, | $I_{OH}$ = −2.6 mA | | | | 2.4 | 3.2 | | |
| $V_{OL}$ | $V_{CC}$ = 4.5 V, | $I_{OL}$ = 12 mA | | 0.25 | 0.4 | | 0.25 | 0.4 | V |
| | $V_{CC}$ = 4.5 V, | $I_{OL}$ = 24 mA | | | | | 0.35 | 0.5 | |
| $I_{OZH}$ | $V_{CC}$ = 5.5 V, | $V_O$ = 2.7 V | | | 20 | | | 20 | μA |
| $I_{OZL}$ | $V_{CC}$ = 5.5 V, | $V_O$ = 0.4 V | | | −20 | | | −20 | μA |
| $I_I$ | $V_{CC}$ = 5.5 V, | $V_I$ = 7 V | | | 0.1 | | | 0.1 | mA |
| $I_{IH}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 2.7 V | | | 20 | | | 20 | μA |
| $I_{IL}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 0.4 V | | | −0.2 | | | −0.2 | mA |
| $I_O$‡ | $V_{CC}$ = 5.5 V, | $V_O$ = 2.25 V | −15 | | −70 | −15 | | −70 | mA |
| $I_{CC}$ | $V_{CC}$ = 5.5 V | Outputs high | | 14 | 21 | | 14 | 21 | mA |
| | | Outputs low | | 18 | 29 | | 18 | 29 | |
| | | Outputs disabled | | 20 | 31 | | 20 | 31 | |

†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 output current, $I_{OS}$.

'ALS874 switching characteristics (see Note 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ = 4.5 V to 5.5 V, $C_L$ = 50 pF, R1 = 500 Ω, R2 = 500 Ω, $T_A$ = MIN to MAX | | | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | SN54ALS874 | | SN74ALS874 | | |
| | | | MIN | MAX | MIN | MAX | |
| $f_{max}$ | | | 25 | | 30 | | MHz |
| $t_{PLH}$ | CLK | Any Q | 4 | 15 | 4 | 14 | ns |
| $t_{PHL}$ | | | 4 | 15 | 4 | 14 | |
| $t_{PHL}$ | $\overline{CLR}$ | Any Q | 6 | 22 | 6 | 19 | ns |
| $t_{PZH}$ | $\overline{OC}$ | Any Q | 4 | 21 | 4 | 18 | ns |
| $t_{PZL}$ | | | 4 | 21 | 4 | 18 | |
| $t_{PHZ}$ | $\overline{OC}$ | Any Q | 2 | 10 | 2 | 8 | ns |
| $t_{PLZ}$ | | | 3 | 15 | 3 | 13 | |

'ALS876 switching characteristics (see Note 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ = 4.5 V to 5.5 V, $C_L$ = 50 pF, R1 = 500 Ω, R2 = 500 Ω, $T_A$ = MIN to MAX | | | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | SN54ALS876 | | SN74ALS876 | | |
| | | | MIN | MAX | MIN | MAX | |
| $f_{max}$ | | | 25 | | 30 | | MHz |
| $t_{PLH}$ | CLK | Any $\overline{Q}$ | 4 | 15 | 4 | 14 | ns |
| $t_{PHL}$ | | | 4 | 15 | 4 | 14 | |
| $t_{PHL}$ | $\overline{PRE}$ | Any $\overline{Q}$ | 6 | 22 | 6 | 19 | ns |
| $t_{PZH}$ | $\overline{OC}$ | Any $\overline{Q}$ | 4 | 21 | 4 | 18 | ns |
| $t_{PZL}$ | | | 4 | 21 | 4 | 18 | |
| $t_{PHZ}$ | $\overline{OC}$ | Any $\overline{Q}$ | 2 | 10 | 2 | 8 | ns |
| $t_{PLZ}$ | | | 3 | 15 | 3 | 13 | |

NOTE 1: For load circuit and voltage waveforms, see page 1-12.





TEXAS INSTRUMENTS
POST OFFICE BOX 225012 • DALLAS, TEXAS 75265

**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: SN54AS874, SN54AS876 . . . . . −55 °C to 125 °C
SN74AS874, SN74AS876 . . . . . 0 °C to 70 °C
Storage temperature range . . . . . −65 °C to 150 °C

**recommended operating conditions**

| | | | SN54AS874 SN54AS876 | | | SN74AS874 SN74AS876 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | NOM | MAX | MIN | NOM | MAX | |
| $V_{CC}$ | Supply voltage | | 4.5 | 5 | 5.5 | 4.5 | 5 | 5.5 | V |
| $V_{IH}$ | High-level input voltage | | 2 | | | 2 | | | V |
| $V_{IL}$ | Low-level input voltage | | | | 0.8 | | | 0.8 | V |
| $I_{OH}$ | High-level output current | | | | −12 | | | −15 | mA |
| $I_{OL}$ | Low-level output current | | | | 32 | | | 48 | mA |
| $f_{clock}$ | Clock frequency | | 0 | | 100 | 0 | | 125 | MHz |
| $t_w$ | Pulse duration | $\overline{PRE}$ or $\overline{CLR}$ low | 3 | | | 2 | | | ns |
| | | CLK high | 4 | | | 3 | | | |
| | | CLK low | 5 | | | 4 | | | |
| $t_{su}$ | Setup time before CLK↑ | Data | 2.5 | | | 2 | | | ns |
| | | $\overline{PRE}$ or $\overline{CLR}$ inactive | 5 | | | 4 | | | |
| $t_h$ | Hold time, data after CLK↑ | | 1 | | | 1 | | | ns |
| $T_A$ | Operating free-air temperature | | −55 | | 125 | 0 | | 70 | °C |

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

| PARAMETER | | TEST CONDITIONS | | SN54AS874 SN54AS876 | | | SN74AS874 SN74AS876 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP† | MAX | MIN | TYP† | MAX | |
| $V_{IK}$ | | $V_{CC}$ = 4.5 V, | $I_I$ = −18 mA | | | −1.2 | | | −1.2 | V |
| $V_{OH}$ | | $V_{CC}$ = 4.5 V to 5.5 V, | $I_{OH}$ = −2 mA | $V_{CC}$ − 2 | | | $V_{CC}$ − 2 | | | V |
| | | $V_{CC}$ = 4.5 V, | $I_{OH}$ = −12 mA | 2.4 | 3.2 | | | | | |
| | | $V_{CC}$ = 4.5 V, | $I_{OH}$ = −15 mA | | | | 2.4 | 3.3 | | |
| $V_{OL}$ | | $V_{CC}$ = 4.5 V, | $I_{OL}$ = 32 mA | | 0.25 | 0.5 | | | | V |
| | | $V_{CC}$ = 4.5 V, | $I_{OL}$ = 48 mA | | | | | 0.35 | 0.5 | |
| $I_{OZH}$ | | $V_{CC}$ = 5.5 V, | $V_O$ = 2.7 V | | | 50 | | | 50 | μA |
| $I_{OZL}$ | | $V_{CC}$ = 5.5 V, | $V_O$ = 0.4 V | | | −50 | | | −50 | μA |
| $I_I$ | | $V_{CC}$ = 5.5 V, | $V_I$ = 7 V | | | 0.1 | | | 0.1 | mA |
| $I_{IH}$ | | $V_{CC}$ = 5.5 V, | $V_I$ = 2.7 V | | | 20 | | | 20 | μA |
| $I_{IL}$ | D | $V_{CC}$ = 5.5 V, | $V_I$ = 0.4 V | | | −3 | | | −2 | mA |
| | All other | | | | | −0.5 | | | −0.5 | |
| $I_O$‡ | | $V_{CC}$ = 5.5 V, | $V_O$ = 2.25 V | −30 | | −112 | −30 | | −112 | mA |
| $I_{CC}$ | 'AS874 | $V_{CC}$ = 5.5 V | Outputs high | | 82 | 133 | | 82 | 133 | mA |
| | | | Outputs low | | 92 | 149 | | 92 | 149 | |
| | | | Outputs disabled | | 100 | 160 | | 100 | 160 | |
| | 'AS876 | | Outputs high | | 88 | 142 | | 88 | 142 | |
| | | | Outputs low | | 94 | 150 | | 94 | 150 | |
| | | | Outputs disabled | | 100 | 160 | | 100 | 160 | |

†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 output current, $I_{OS}$.

'AS874 switching characteristics (see Note 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ = 4.5 V to 5.5 V, $C_L$ = 50 pF, R1 = 500 Ω, R2 = 500 Ω, $T_A$ = MIN to MAX | | | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | SN54AS874 | | SN74AS874 | | |
| | | | MIN | MAX | MIN | MAX | |
| $f_{max}$ | | | 100 | | 125 | | MHz |
| $t_{PLH}$ | CLK | Any Q | 3 | 11.5 | 3 | 8.5 | ns |
| $t_{PHL}$ | | | 4 | 12.5 | 4 | 10.5 | |
| $t_{PHL}$ | $\overline{CLR}$ | Any Q | 4 | 11 | 4 | 9.5 | ns |
| $t_{PZH}$ | $\overline{OC}$ | Any Q | 2 | 8 | 2 | 7 | ns |
| $t_{PZL}$ | | | 3 | 11.5 | 3 | 10.5 | |
| $t_{PHZ}$ | $\overline{OC}$ | Any Q | 2 | 7 | 2 | 6 | ns |
| $t_{PLZ}$ | | | 2 | 8.5 | 2 | 7.5 | |

'AS876 switching characteristics (see Note 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ = 4.5 V to 5.5 V, $C_L$ = 50 pF, R1 = 500 Ω, R2 = 500 Ω, $T_A$ = MIN to MAX | | | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | SN54AS876 | | SN74AS876 | | |
| | | | MIN | MAX | MIN | MAX | |
| $f_{max}$ | | | 100 | | 125 | | MHz |
| $t_{PLH}$ | CLK | Any $\overline{Q}$ | 3 | 11.5 | 3 | 8.5 | ns |
| $t_{PHL}$ | | | 4 | 12.5 | 4 | 10.5 | |
| $t_{PHL}$ | $\overline{PRE}$ | Any $\overline{Q}$ | 4 | 11 | 4 | 9.5 | ns |
| $t_{PZH}$ | $\overline{OC}$ | Any $\overline{Q}$ | 2 | 8 | 2 | 7 | ns |
| $t_{PZL}$ | | | 3 | 11.5 | 3 | 10.5 | |
| $t_{PHZ}$ | $\overline{OC}$ | Any $\overline{Q}$ | 2 | 7 | 2 | 6 | ns |
| $t_{PLZ}$ | | | 2 | 7 | 2 | 6 | |

NOTE 1: For load circuit and voltage waveforms, see page 1-12.