

## DM74ALS874B

### Dual 4-Bit D-Type Edge-Triggered Flip-Flop with 3-STATE Outputs

#### General Description

This dual 4-bit register features totem-pole 3-STATE outputs designed specifically for driving highly-capacitive or relatively low-impedance loads. The high-impedance state and increased high-logic-level drive provide this register with the capability of being connected directly to and driving the bus lines in a bus-organized system without need for interface or pull-up components. It is particularly attractive for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

The eight flip-flops of the DM74ALS874B are edge-triggered D-type flip-flops. On the positive transition of the clock, the Q outputs will be set to the logic states that were set up at the D inputs.

A buffered output control input can be used to place the eight outputs in either a normal logic state (HIGH or LOW logic levels) or a high-impedance state. In the high-impedance state the outputs neither load nor drive the bus lines significantly.

The output control does not affect the internal operation of the flip-flops. That is, the old data can be retained or new data can be entered even while the outputs are OFF.

#### Features

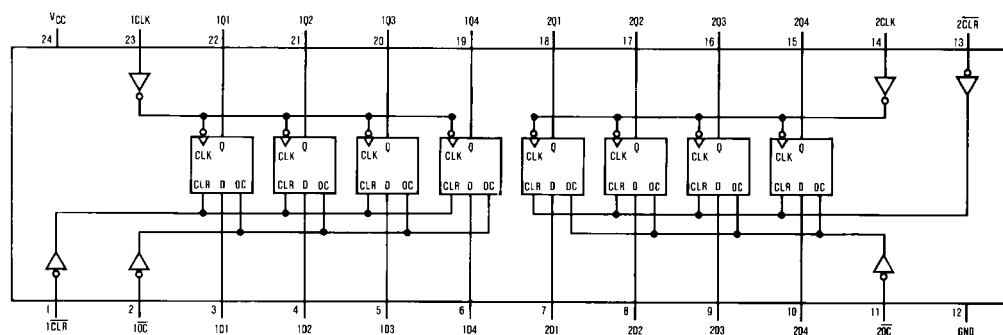
- Switching specifications at 50 pF
- Switching specifications guaranteed over full temperature and  $V_{CC}$  range
- Advanced oxide-isolated, ion-implanted Schottky TTL process
- 3-STATE buffer-type outputs drive bus lines directly
- Space saving 300 mil wide package
- Asynchronous clear

#### Ordering Code:

| Order Number  | Package Number | Package Description                                                       |
|---------------|----------------|---------------------------------------------------------------------------|
| DM74ALS874BWM | M24B           | 24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide |
| DM74ALS874BNT | N24C           | 24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-100, 0.300 Wide     |

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

#### Connection Diagram



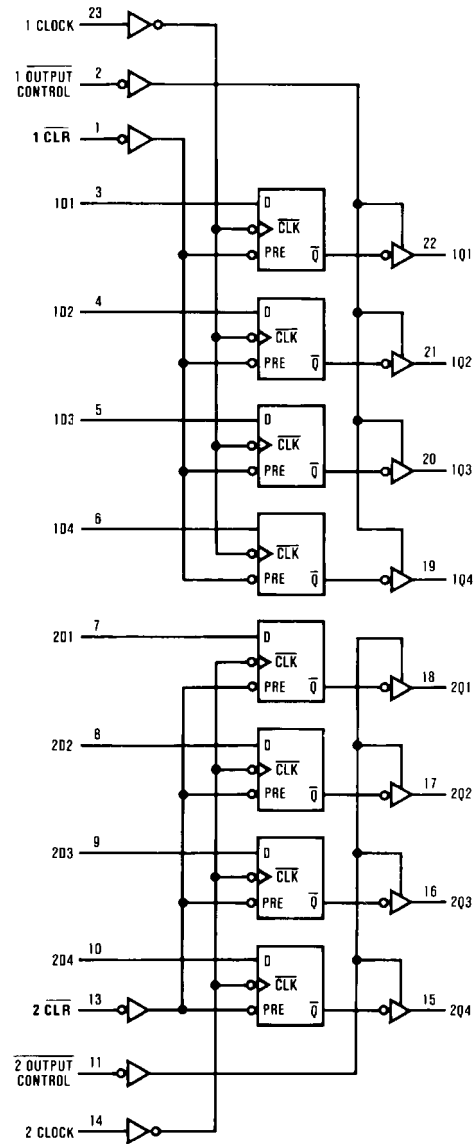
DM74ALS874B Dual 4-Bit D-Type Edge-Triggered Flip-Flop with 3-STATE Outputs

Function Table

| Inputs                  |   |            |                        | Output |
|-------------------------|---|------------|------------------------|--------|
| $\overline{\text{CLR}}$ | D | CLK        | $\overline{\text{OC}}$ | Q      |
| X                       | X | X          | H                      | Z      |
| L                       | X | X          | L                      | L      |
| H                       | H | $\uparrow$ | L                      | H      |
| H                       | L | $\uparrow$ | L                      | L      |
| H                       | X | L          | L                      | $Q_0$  |

L = LOW State  
 H = HIGH State  
 X = Don't Care  
 $\uparrow$  = Positive Edge Transition  
 Z = High Impedance State  
 $Q_0$  = Previous Condition of Q

Logic Diagram



**Absolute Maximum Ratings**(Note 1)

|                                      |                 |
|--------------------------------------|-----------------|
| Supply Voltage                       | 7V              |
| Input Voltage                        | 7V              |
| Voltage Applied to Disabled Output   | 5.5V            |
| Operating Free Air Temperature Range | 0°C to +70°C    |
| Storage Temperature Range            | –65°C to +150°C |
| Typical $\theta_{JA}$                |                 |
| N Package                            | 51.0°C/W        |
| M Package                            | 86.5°C/W        |

**Note 1:** The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

**Recommended Operating Conditions**

| Symbol     | Parameter                      | Min             | Nom  | Max  | Units |
|------------|--------------------------------|-----------------|------|------|-------|
| $V_{CC}$   | 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      |                 |      | –2.6 | mA    |
| $I_{OL}$   | LOW Level Output Current       |                 |      | 24   | mA    |
| $f_{CLK}$  | Clock Frequency                | 0               |      | 30   | MHz   |
| $t_{WCLK}$ | Width of Clock Pulse           | HIGH            | 16.5 |      | ns    |
|            |                                | LOW             | 16.5 |      | ns    |
| $t_{WCLR}$ | Width of Clear Pulse           | LOW             | 10   |      | ns    |
| $t_{SU}$   | Data Setup Time (Note 2)       | 15 <sup>†</sup> |      |      | ns    |
| $t_H$      | Data Hold Time (Note 2)        | 0 <sup>†</sup>  |      |      | ns    |
| $t_{SU}$   | Clear Inactive                 | 12              |      |      | ns    |
| $T_A$      | Free Air Operating Temperature | 0               |      | 70   | °C    |

**Note 2:** The (†) arrow indicates the positive edge of the Clock is used for reference.

## Electrical Characteristics

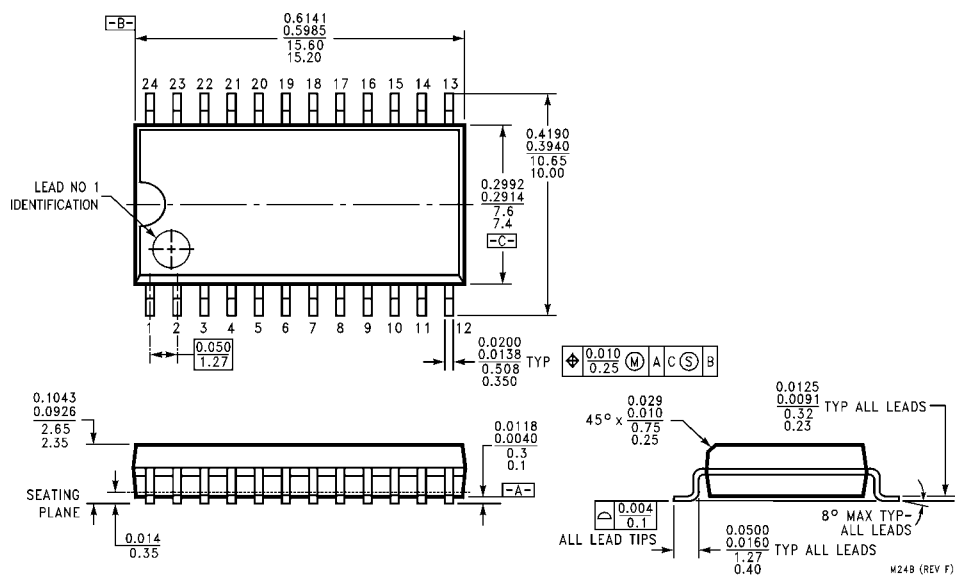
over recommended operating free air temperature range. All typical values are measured at  $V_{CC} = 5V$ ,  $T_A = 25^\circ C$ .

| Symbol    | Parameter                                              | Conditions                                      | Min                          | Typ          | Max  | Units   |
|-----------|--------------------------------------------------------|-------------------------------------------------|------------------------------|--------------|------|---------|
| $V_{IK}$  | Input Clamp Voltage                                    | $V_{CC} = 4.5V$ , $I_I = -18\text{ mA}$         |                              |              | -1.2 | V       |
| $V_{OH}$  | HIGH Level Output Voltage                              | $V_{CC} = 4.5V$<br>$V_{IL} = V_{IL\text{ Max}}$ | $I_{OH} = \text{Max}$        | 2.4          | 3.2  | V       |
|           |                                                        | $V_{CC} = 4.5V$ to $5.5V$                       | $I_{OH} = -400\text{ }\mu A$ | $V_{CC} - 2$ |      | V       |
| $V_{OL}$  | LOW Level Output Voltage                               | $V_{CC} = 4.5V$<br>$V_{IH} = 2V$                | $I_{OL} = 12\text{ mA}$      | 0.25         | 0.4  | V       |
|           |                                                        |                                                 | $I_{OL} = 24\text{ mA}$      | 0.35         | 0.5  | V       |
| $I_I$     | Input Current @Maximum Input Voltage                   | $V_{CC} = 5.5V$ , $V_{IH} = 7V$                 |                              |              | 0.1  | mA      |
| $I_{IH}$  | HIGH Level Input Current                               | $V_{CC} = 5.5V$ , $V_{IH} = 2.7V$               |                              |              | 20   | $\mu A$ |
| $I_{IL}$  | LOW Level Input Current                                | $V_{CC} = 5.5V$ , $V_{IL} = 0.4V$               |                              |              | -0.2 | mA      |
| $I_O$     | Output Drive Current                                   | $V_{CC} = 5.5V$ , $V_O = 2.25V$                 | -30                          |              | -112 | mA      |
| $I_{OZH}$ | OFF-State Output Current<br>HIGH Level Voltage Applied | $V_{CC} = 5.5V$ , $V_{IH} = 2V$<br>$V_O = 2.7V$ |                              |              | 20   | $\mu A$ |
| $I_{OZL}$ | OFF-State Output Current<br>LOW Level Voltage Applied  | $V_{CC} = 5.5V$ , $V_{IH} = 2V$<br>$V_O = 0.4V$ |                              |              | -20  | $\mu A$ |
| $I_{CC}$  | Supply Current                                         | $V_{CC} = 5.5V$                                 | Outputs HIGH                 | 14           | 21   | mA      |
|           |                                                        | Outputs OPEN                                    | Outputs LOW                  | 19           | 30   | mA      |
|           |                                                        |                                                 | Outputs Disabled             | 20           | 32   | mA      |

## Switching Characteristics

over recommended operating free air temperature range.

| Symbol    | Parameter                                          | Conditions                                  | From           | To    | Min | Max | Units |
|-----------|----------------------------------------------------|---------------------------------------------|----------------|-------|-----|-----|-------|
| $f_{MAX}$ | Maximum Clock Frequency                            | $V_{CC} = 4.5V$ to $5.5V$                   |                |       | 30  |     | MHz   |
| $t_{PLH}$ | Propagation Delay Time<br>LOW-to-HIGH Level Output | $R_L = 500\Omega$ ,<br>$C_L = 50\text{ pF}$ | Clock          | Any Q | 4   | 14  | ns    |
| $t_{PHL}$ | Propagation Delay Time<br>HIGH-to-LOW Level Output |                                             | Clock          | Any Q | 4   | 14  | ns    |
| $t_{PZH}$ | Output Enable Time<br>to HIGH Level Output         |                                             | Output Control | Any Q | 4   | 18  | ns    |
| $t_{PZL}$ | Output Enable Time<br>to LOW Level Output          |                                             | Output Control | Any Q | 4   | 18  | ns    |
| $t_{PHZ}$ | Output Disable Time<br>from HIGH Level Output      |                                             | Output Control | Any Q | 2   | 10  | ns    |
| $t_{PLZ}$ | Output Disable Time<br>from LOW Level Output       |                                             | Output Control | Any Q | 3   | 12  | ns    |
| $t_{PHL}$ | Propagation Delay Time<br>HIGH-to-LOW Level Output |                                             | Clear          | Any Q | 5   | 17  | ns    |



**24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide  
Package Number M24B**



**24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-100, 0.300 Wide  
Package Number N24C**

## LIFE SUPPORT POLICY

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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