



## DM7875A/DM8875A, DM7875B/DM8875B TRI-STATE® 4-Bit Parallel Binary Multipliers

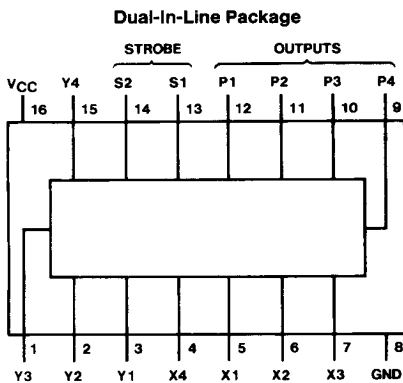
### General Description

These circuits are capable of multiplying together two 4-bit binary numbers when used together in pairs. The DM7875A/8875A provides the most significant four bits, and the DM7875B/8875B provides the least significant four bits. Since the largest number that can be obtained by multiplying two 4-bit numbers is 225 ( $15 \times 15$ ), the eight output pins (four from each package) are sufficient to produce this number. Both the multiplier and the multiplicand must be connected to the eight input pins of each device. These devices are pin compatible with the SN54284/74284, and SN54285/74285; but have the advantage that these circuits provide either standard totem-pole TTL or TRI-STATE outputs. A gated two-input strobe control is provided. When either one, or both, of the strobe inputs is raised to a high logic level the outputs are forced into the high-impedance state. Thus, multiple devices may be connected to a common bus line.

### Features

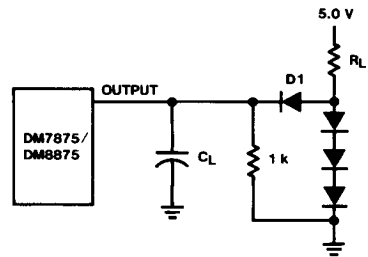
- Pin compatible replacements for  
SN54284/74284 (DM7875A/8875A)  
SN54285/74285 (DM7875B/8875B)
- TRI-STATE outputs
- Typical propagation delay 35 ns

### Connection Diagram



Order Number DM7875AJ, DM7875BJ,  
DM8875AN or DM8875BN  
See NS Package Number J16A or N16A

### AC Test Circuit



TL/F/6592-2

## Absolute Maximum Ratings (Note)

Specifications for Military/Aerospace products are not contained in this datasheet. Refer to the associated reliability electrical test specifications document.

|                                      |                 |
|--------------------------------------|-----------------|
| Supply Voltage                       | 7V              |
| Input Voltage                        | 5.5V            |
| Operating Free Air Temperature Range |                 |
| DM78                                 | -55°C to +125°C |
| DM88                                 | 0°C to +70°C    |
| Storage Temperature Range            | -65°C to +150°C |

Note: 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" table 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                      | DM7875A |     |     | DM8875A |     |      | Units |
|-----------------|--------------------------------|---------|-----|-----|---------|-----|------|-------|
|                 |                                | Min     | Nom | Max | Min     | Nom | Max  |       |
| V <sub>CC</sub> | Supply Voltage                 | 4.5     | 5   | 5.5 | 4.75    | 5   | 5.25 | V     |
| V <sub>IH</sub> | High Level Input Voltage       | 2       |     |     | 2       |     |      | V     |
| V <sub>IL</sub> | Low Level Input Voltage        |         |     | 0.8 |         |     | 0.8  | V     |
| I <sub>OH</sub> | High Level Output Current      |         |     | -2  |         |     | -5.2 | mA    |
| I <sub>OL</sub> | Low Level Output Current       |         |     | 16  |         |     | 16   | mA    |
| T <sub>A</sub>  | Free Air Operating Temperature | -55     |     | 125 | 0       |     | 70   | °C    |

## DM78/8875A Electrical Characteristics

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

| Symbol           | Parameter   | Conditions   | Min | Typ<br>(Note 1) | Max  | Units |
|------------------|---|--|-----|-----------------|------|-------|
| V <sub>I</sub>   | Input Clamp Voltage   | V <sub>CC</sub> = Min, I <sub>I</sub> = -12 mA   |     |                 | -1.5 | V     |
| V <sub>OH</sub>  | High Level Output Voltage                                       | V <sub>CC</sub> = Min, I <sub>OH</sub> = Max<br>V <sub>IL</sub> = Max, V <sub>IH</sub> = Min | 2.4 |                 |      | V     |
| V <sub>OL</sub>  | Low Level Output Voltage  | V <sub>CC</sub> = Min, I <sub>OL</sub> = Max<br>V <sub>IH</sub> = Min, V <sub>IL</sub> = Max |     |                 | 0.4  | V     |
| I <sub>I</sub>   | Input Current @ Max Input Voltage                               | V <sub>CC</sub> = Max, V <sub>I</sub> = 5.5V   |     |                 | 1    | mA    |
| I <sub>IH</sub>  | High Level Input Current  | V <sub>CC</sub> = Max, V <sub>I</sub> = 2.4V   |     |                 | 40   | μA    |
| I <sub>IL</sub>  | Low Level Input Current   | V <sub>CC</sub> = Max, V <sub>I</sub> = 0.4V   |     |                 | -1   | mA    |
| I <sub>OZH</sub> | Off-State Output Current with High Level Output Voltage Applied | V <sub>CC</sub> = Max, V <sub>O</sub> = 2.4V<br>V <sub>IH</sub> = Min, V <sub>IL</sub> = Max |     |                 | 40   | μA    |
| I <sub>OZL</sub> | Off-State Output Current with Low Level Output Voltage Applied  | V <sub>CC</sub> = Max, V <sub>O</sub> = 0.4V<br>V <sub>IH</sub> = Min, V <sub>IL</sub> = Max |     |                 | -40  | μA    |
| I <sub>OS</sub>  | Short Circuit Output Current                                    | V <sub>CC</sub> = Max<br>(Note 2)  |     |                 |      |       |
|                  |   | DM78   | -20 |                 | -70  | mA    |
|                  |   | DM88   | -20 |                 | -70  | mA    |
| I <sub>CC</sub>  | Supply Current  | V <sub>CC</sub> = Max  |     | 75              | 110  | mA    |

Note 1: All typicals are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

Note 2: Not more than one output should be shorted at a time.

Note 3: I<sub>CC</sub> is measured with all inputs grounded.

**DM78/8875A Switching Characteristics**at  $V_{CC} = 5V$  and  $T_A = 25^\circ C$  (See Section 1 for Test Waveforms and Output Load)

| Symbol    | Parameter  | $R_L = 400\Omega$   |     |                      |     | Units |
|-----------|--|---------------------|-----|----------------------|-----|-------|
|           |  | $C_L = 5\text{ pF}$ |     | $C_L = 50\text{ pF}$ |     |       |
|           |  | Min                 | Max | Min                  | Max |       |
| $t_{PLH}$ | Propagation Delay Time<br>Low to High Level Output |                     |     |                      | 60  | ns    |
| $t_{PHL}$ | Propagation Delay Time<br>High to Low Level Output |                     |     |                      | 60  | ns    |
| $t_{PZH}$ | Output Enable Time<br>to High Level Output         |                     |     |                      | 30  | ns    |
| $t_{PZL}$ | Output Enable Time<br>to Low Level Output          |                     |     |                      | 30  | ns    |
| $t_{PHZ}$ | Output Disable Time<br>from High Level Output      |                     | 30  |                      |     | ns    |
| $t_{PLZ}$ | Output Disable Time<br>from Low Level Output       |                     | 30  |                      |     | ns    |

**Recommended Operating Conditions**

| Symbol   | Parameter                      | DM7875B |     |     | DM8875B |     |      | Units      |
|----------|--------------------------------|---------|-----|-----|---------|-----|------|------------|
|          |                                | Min     | Nom | Max | Min     | Nom | Max  |            |
| $V_{CC}$ | Supply Voltage                 | 4.5     | 5   | 5.5 | 4.75    | 5   | 5.25 | 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      |         |     | -2  |         |     | -5.2 | mA         |
| $I_{OL}$ | Low Level Output Current       |         |     | 16  |         |     | 16   | mA         |
| $T_A$    | Free Air Operating Temperature | -55     |     | 125 | 0       |     | 70   | $^\circ C$ |

**DM78/8875B Electrical Characteristics**

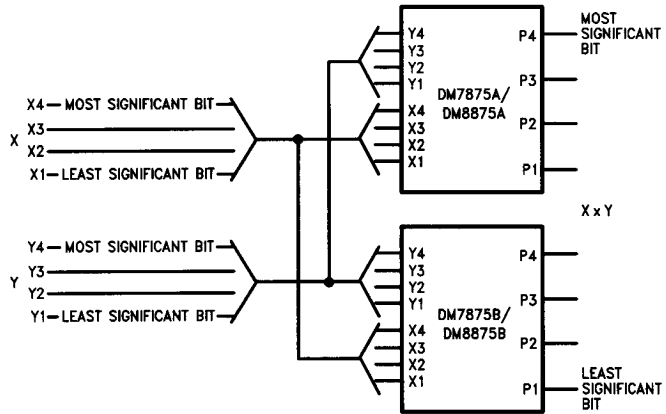
over recommended operating free air temperature range (unless otherwise noted)

| Symbol    | Parameter   | Conditions   | Min  | Typ<br>(Note 1) | Max  | Units         |
|-----------|---|--|------|-----------------|------|---------------|
| $V_I$     | Input Clamp Voltage   | $V_{CC} = \text{Min}, I_I = -12 \text{ mA}$  |      |                 | -1.5 | V             |
| $V_{OH}$  | High Level Output Voltage                                       | $V_{CC} = \text{Min}, I_{OH} = \text{Max}$<br>$V_{IL} = \text{Max}, V_{IH} = \text{Min}$ | 2.4  |                 |      | V             |
| $V_{OL}$  | Low Level Output Voltage  | $V_{CC} = \text{Min}, I_{OL} = \text{Max}$<br>$V_{IH} = \text{Min}, V_{IL} = \text{Max}$ |      |                 | 0.4  | V             |
| $I_I$     | Input Current @ Max Input Voltage                               | $V_{CC} = \text{Max}, V_I = 5.5 \text{ V}$   |      |                 | 1    | mA            |
| $I_{IH}$  | High Level Input Current  | $V_{CC} = \text{Max}, V_I = 2.4 \text{ V}$   |      |                 | 40   | $\mu\text{A}$ |
| $I_{IL}$  | Low Level Input Current   | $V_{CC} = \text{Max}, V_I = 0.4 \text{ V}$   |      |                 | -1   | mA            |
| $I_{OZH}$ | Off-State Output Current with High Level Output Voltage Applied | $V_{CC} = \text{Max}, V_O = 2.4 \text{ V}$<br>$V_{IH} = \text{Min}, V_{IL} = \text{Max}$ |      |                 | 40   | $\mu\text{A}$ |
| $I_{OZL}$ | Off-State Output Current with Low Level Output Voltage Applied  | $V_{CC} = \text{Max}, V_O = 0.4 \text{ V}$<br>$V_{IH} = \text{Min}, V_{IL} = \text{Max}$ |      |                 | -40  | $\mu\text{A}$ |
| $I_{OS}$  | Short Circuit Output Current                                    | $V_{CC} = \text{Max}$<br>(Note 2)  | DM78 | -20             | -70  | mA            |
|           |   |  | DM88 | -20             | -70  |               |
| $I_{CC}$  | Supply Current  | $V_{CC} = \text{Max}$ (Note 3)   |      | 75              | 110  | mA            |

**Note 1:** All typicals are at  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^\circ\text{C}$ .**Note 2:** Not more than one output should be shorted at a time.**Note 3:**  $I_{CC}$  is measured with all inputs grounded.**DM78/8875B Switching Characteristics**at  $V_{CC} = 5 \text{ V}$  and  $T_A = 25^\circ\text{C}$  (See Section 1 for Test Waveforms and Output Load)

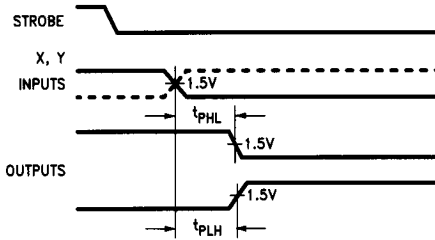
| Symbol    | Parameter  | $R_L = 400\Omega$    |     |                       |     | Units |
|-----------|--|----------------------|-----|-----------------------|-----|-------|
|           |  | $C_L = 5 \text{ pF}$ |     | $C_L = 50 \text{ pF}$ |     |       |
|           |  | Min                  | Max | Min                   | Max |       |
| $t_{PLH}$ | Propagation Delay Time<br>Low to High Level Output |                      |     |                       | 60  | ns    |
| $t_{PHL}$ | Propagation Delay Time<br>High to Low Level Output |                      |     |                       | 60  | ns    |
| $t_{PZH}$ | Output Enable Time<br>to High Level Output         |                      |     |                       | 30  | ns    |
| $t_{PZL}$ | Output Enable Time<br>to Low Level Output          |                      |     |                       | 30  | ns    |
| $t_{PHZ}$ | Output Disable Time<br>from High Level Output      |                      | 30  |                       |     | ns    |
| $t_{PLZ}$ | Output Disable Time<br>from Low Level Output       |                      | 30  |                       |     | ns    |

### Typical Application

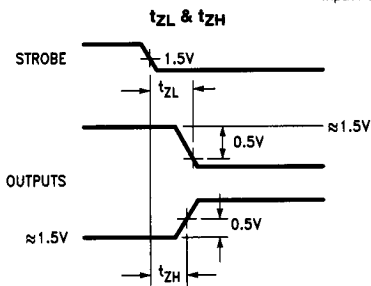


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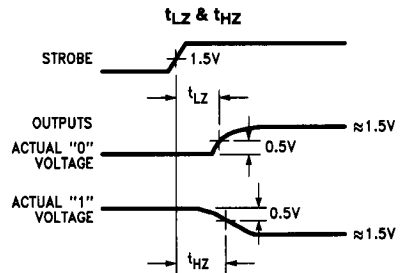
### Switching Time Waveforms



TL/F/6592-4



TL/F/6592-5



TL/F/6592-6