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# MM74HC125, MM74HC126

## 3-STATE Quad Buffers

### Features

- Typical propagation delay: 13ns
- Wide operating voltage range: 2V–6V
- Low input current: 1μA maximum
- Low quiescent current: 80μA maximum (74HC)
- Fanout of 15 LS-TTL loads

### General Description

The MM74HC125 and MM74HC126 are general purpose 3-STATE high speed non-inverting buffers utilizing advanced silicon-gate CMOS technology. They have high drive current outputs which enable high speed operation even when driving large bus capacitances. These circuits possess the low power dissipation of CMOS circuitry, yet have speeds comparable to low power Schottky TTL circuits. Both circuits are capable of driving up to 15 low power Schottky inputs.


The MM74HC125 require the 3-STATE control input C to be taken high to put the output into the high impedance condition, whereas the MM74HC126 require the control input to be low to put the output into high impedance.

All inputs are protected from damage due to static discharge by diodes to  $V_{CC}$  and ground.

### Ordering Information

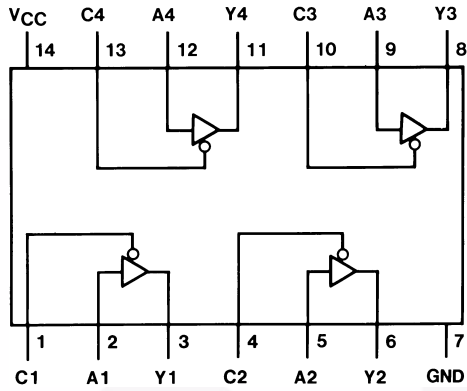
| Order Number | Package Number | Package Description  |
|--------------|----------------|--|
| MM74HC125M   | M14A           | 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow |
| MM74HC125SJ  | M14D           | 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide                |
| MM74HC125MTC | MTC14          | 14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide  |
| MM74HC125N   | N14A           | 14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide       |
| MM74HC126M   | M14A           | 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow |
| MM74HC126SJ  | M14D           | 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide                |
| MM74HC126MTC | MTC14          | 14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide  |
| MM74HC126N   | N14A           | 14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide       |

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

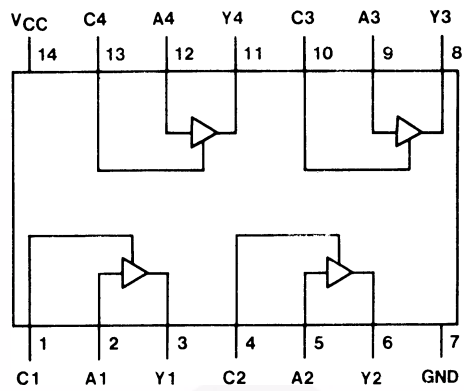
 All packages are lead free per JEDEC: J-STD-020B standard.

## Connection Diagrams

Pin Assignments for DIP, SOIC, SOP and TSSOP



Top View (MM74HC125)



Top View (MM74HC126)

## Truth Tables

| Inputs |   | Output |
|--------|---|--------|
| A      | C | Y      |
| H      | L | H      |
| L      | L | L      |
| X      | H | Z      |

MM74HC125

| Inputs |   | Output |
|--------|---|--------|
| A      | C | Y      |
| H      | H | H      |
| L      | H | L      |
| X      | L | Z      |

MM74HC126

## Absolute Maximum Ratings<sup>(1)</sup>

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

| Symbol           | Parameter                               | Rating                |
|------------------|---|-----------------------|
| $V_{CC}$         | Supply Voltage                          | -0.5 to +7.0V         |
| $V_{IN}$         | DC Input Voltage                        | -1.5 to $V_{CC}+1.5V$ |
| $V_{OUT}$        | DC Output Voltage                       | -0.5 to $V_{CC}+0.5V$ |
| $I_{IK}, I_{OK}$ | Clamp Diode Current                     | $\pm 20mA$            |
| $I_{OUT}$        | DC Output Current, per pin              | 35mA                  |
| $I_{CC}$         | DC $V_{CC}$ or GND Current, per pin     | $\pm 70mA$            |
| $T_{STG}$        | Storage Temperature Range               | -65°C to +150°C       |
| $P_D$            | Power Dissipation<br>Note 2             | 600mW                 |
|                  | S.O. Package only                       | 500mW                 |
| $T_L$            | Lead Temperature (Soldering 10 seconds) | 260°C                 |

### Notes:

1. Unless otherwise specified all voltages are referenced to ground.
2. Power Dissipation temperature derating — plastic “N” package: -12mW/°C from 65°C to 85°C.

## Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to absolute maximum ratings.

| Symbol            | Parameter                                   | Min. | Max.     | Units |
|-------------------|---|------|----------|-------|
| $V_{CC}$          | Supply Voltage                              | 2    | 6        | V     |
| $V_{IN}, V_{OUT}$ | DC Input or Output Voltage                  | 0    | $V_{CC}$ | V     |
| $T_A$             | Operating Temperature Range                 | -40  | +85      | °C    |
| $t_r, t_f$        | Input Rise or Fall Times<br>$V_{CC} = 2.0V$ |      | 1000     | ns    |
|                   | $V_{CC} = 4.5V$                             |      | 500      | ns    |
|                   | $V_{CC} = 6.0V$                             |      | 400      | ns    |

DC Electrical Characteristics<sup>(3)</sup>

| Symbol          | Parameter                              | Conditions  | V <sub>CC</sub> (V) | T <sub>A</sub> = 25°C |                   |      | T <sub>A</sub> = -40°C to 85°C | T <sub>A</sub> = -40°C to 125°C | Units |
|-----------------|--|---|---------------------|-----------------------|-------------------|------|--------------------------------|---------------------------------|-------|
|                 |  |   |                     | Typ.                  | Guaranteed Limits |      |                                |                                 |       |
| V <sub>IH</sub> | Minimum HIGH Level Input Voltage       |   | 2.0                 |                       | 1.5               | 1.5  | 1.5                            | V                               |       |
|                 |  |   | 4.5                 |                       | 3.15              | 3.15 | 3.15                           |                                 |       |
|                 |  |   | 6.0                 |                       | 4.2               | 4.2  | 4.2                            |                                 |       |
| V <sub>IL</sub> | Maximum LOW Level Input Voltage        |   | 2.0                 |                       | 0.5               | 0.5  | 0.5                            | V                               |       |
|                 |  |   | 4.5                 |                       | 1.35              | 1.35 | 1.35                           |                                 |       |
|                 |  |   | 6.0                 |                       | 1.8               | 1.8  | 1.8                            |                                 |       |
| V <sub>OH</sub> | Minimum HIGH Level Output Voltage      | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> ,<br> I <sub>OUT</sub>   ≤ 20μA  | 2.0                 | 2.0                   | 1.9               | 1.9  | 1.9                            | V                               |       |
|                 |  |   | 4.5                 | 4.5                   | 4.4               | 4.4  | 4.4                            |                                 |       |
|                 |  |   | 6.0                 | 6.0                   | 5.9               | 5.9  | 5.9                            |                                 |       |
|                 |  | 4.5   | 4.2                 | 3.98                  | 3.84              | 3.7  |                                |                                 |       |
|                 |  | 6.0   | 5.7                 | 5.48                  | 5.34              | 5.2  |                                |                                 |       |
| V <sub>OL</sub> | Maximum LOW Level Output Voltage       | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> ,<br> I <sub>OUT</sub>   ≤ 20μA  | 2.0                 | 0                     | 0.1               | 0.1  | 0.1                            | V                               |       |
|                 |  |   | 4.5                 | 0                     | 0.1               | 0.1  | 0.1                            |                                 |       |
|                 |  |   | 6.0                 | 0                     | 0.1               | 0.1  | 0.1                            |                                 |       |
|                 |  | 4.5   | 0.2                 | 0.26                  | 0.33              | 0.4  |                                |                                 |       |
|                 |  | 6.0   | 0.2                 | 0.26                  | 0.33              | 0.4  |                                |                                 |       |
| I <sub>OZ</sub> | Maximum 3-STATE Output Leakage Current | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> ,<br>V <sub>OUT</sub> = V <sub>CC</sub> or GND,<br>C <sub>n</sub> = Disabled | 6.0                 |                       | ±0.5              | ±5   | ±10                            | μA                              |       |
| I <sub>IN</sub> | Maximum Input Current                  | V <sub>IN</sub> = V <sub>CC</sub> or GND  | 6.0                 |                       | ±0.1              | ±1.0 | ±1.0                           | μA                              |       |
| I <sub>CC</sub> | Maximum Quiescent Supply Current       | V <sub>IN</sub> = V <sub>CC</sub> or GND,<br>I <sub>OUT</sub> = 0μA   | 6.0                 |                       | 8.0               | 80   | 160                            | μA                              |       |

**Note:**

3. For a power supply of 5V ±10% the worst case output voltages (V<sub>OH</sub>, and V<sub>OL</sub>) occur for HC at 4.5V. Thus the 4.5V values should be used when designing with this supply. Worst case V<sub>IH</sub> and V<sub>IL</sub> occur at V<sub>CC</sub>=5.5V and 4.5V respectively. (The V<sub>IH</sub> value at 5.5V is 3.85V.) The worst case leakage current (I<sub>IN</sub>, I<sub>CC</sub>, and I<sub>OZ</sub>) occur for CMOS at the higher voltage and so the 6.0V values should be used.

**AC Electrical Characteristics** $V_{CC} = 5V$ ,  $T_A = 25^\circ C$ ,  $C_L = 45pF$ ,  $t_r = t_f = 6ns$ 

| Symbol                | Parameter                                   | Conditions                     | Typ. | Guaranteed Limit | Units |
|-----------------------|---|--------------------------------|------|------------------|-------|
| $t_{PHL}$ , $t_{PLH}$ | Maximum Propagation Delay Time              |                                | 13   | 18               | ns    |
| $t_{PZH}$             | Maximum Output Enable Time to HIGH Level    | $R_L = 1k\Omega$               | 13   | 25               | ns    |
| $t_{PHZ}$             | Maximum Output Disable Time from HIGH Level | $R_L = 1k\Omega$ , $C_L = 5pF$ | 17   | 25               | ns    |
| $t_{PZL}$             | Maximum Output Enable Time to LOW Level     | $R_L = 1k\Omega$               | 18   | 25               | ns    |
| $t_{PLZ}$             | Maximum Output Disable Time from LOW Level  | $R_L = 1k\Omega$ , $C_L = 5pF$ | 13   | 25               | ns    |

**AC Electrical Characteristics** $V_{CC} = 2.0V$  to  $6.0V$ ,  $C_L = 50pF$ ,  $t_r = t_f = 6ns$  (unless otherwise specified)

| Symbol                | Parameter   | $V_{CC}$ (V) | Conditions                          | $T_A = 25^\circ C$ |                   | $T_A = -40^\circ C$ to $85^\circ C$ |                   | $T_A = -40^\circ C$ to $125^\circ C$ |  | Units |
|-----------------------|---|--------------|-------------------------------------|--------------------|-------------------|-------------------------------------|-------------------|--------------------------------------|--|-------|
|                       |   |              |                                     | Typ.               | Guaranteed Limits | Guaranteed Limits                   | Guaranteed Limits |                                      |  |       |
| $t_{PHL}$ , $t_{PLH}$ | Maximum Propagation Delay Time                          | 2.0          |                                     | 40                 | 100               | 125                                 | 150               | ns                                   |  |       |
|                       |   | 4.5          |                                     | 14                 | 20                | 25                                  | 30                |                                      |  |       |
|                       |   | 6.0          |                                     | 12                 | 17                | 21                                  | 25                |                                      |  |       |
| $t_{PLH}$ , $t_{PHL}$ | Maximum Propagation Delay Time                          | 2.0          | $C_L = 150pF$                       | 35                 | 130               | 163                                 | 195               | ns                                   |  |       |
|                       |   | 4.5          |                                     | 14                 | 26                | 33                                  | 39                |                                      |  |       |
|                       |   | 6.0          |                                     | 12                 | 22                | 28                                  | 39                |                                      |  |       |
| $t_{PZH}$ , $t_{PZL}$ | Maximum Output Enable Time                              | 2.0          | $R_L = 1k\Omega$                    | 25                 | 125               | 156                                 | 188               | ns                                   |  |       |
|                       |   | 4.5          |                                     | 14                 | 25                | 31                                  | 38                |                                      |  |       |
|                       |   | 6.0          |                                     | 12                 | 21                | 26                                  | 31                |                                      |  |       |
| $t_{PHZ}$ , $t_{PLZ}$ | Maximum Output Disable Time                             | 2.0          | $R_L = 1k\Omega$                    | 25                 | 125               | 156                                 | 188               | ns                                   |  |       |
|                       |   | 4.5          |                                     | 14                 | 25                | 31                                  | 38                |                                      |  |       |
|                       |   | 6.0          |                                     | 12                 | 21                | 26                                  | 31                |                                      |  |       |
| $t_{PZL}$ , $t_{PZH}$ | Maximum Output Enable Time                              | 2.0          | $C_L = 150pF$ ,<br>$R_L = 1k\Omega$ | 35                 | 140               | 175                                 | 210               | ns                                   |  |       |
|                       |   | 4.5          |                                     | 15                 | 28                | 35                                  | 42                |                                      |  |       |
|                       |   | 6.0          |                                     | 13                 | 24                | 30                                  | 36                |                                      |  |       |
| $t_{TLH}$ , $t_{THL}$ | Maximum Output Rise and Fall Time                       | 2.0V         | $C_L = 50pF$                        | 30                 | 60                | 75                                  | 90                | ns                                   |  |       |
|                       |   | 4.5V         |                                     | 7                  | 12                | 15                                  | 18                |                                      |  |       |
|                       |   | 6.0V         |                                     | 6                  | 10                | 13                                  | 15                |                                      |  |       |
| $C_{IN}$              | Input Capacitance                                       |              |                                     | 5                  | 10                | 10                                  | 10                | pF                                   |  |       |
| $C_{OUT}$             | Output Capacitance Outputs                              |              |                                     | 15                 | 20                | 20                                  | 20                | pF                                   |  |       |
| $C_{PD}$              | Power Dissipation Capacitance (per gate) <sup>(4)</sup> |              | Enabled                             | 45                 |                   |                                     |                   | pF                                   |  |       |
|                       |   |              | Disabled                            | 6                  |                   |                                     |                   |                                      |  |       |

**Note:**

4.  $C_{PD}$  determines the no load dynamic power consumption,  $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$ , and the no load dynamic current consumption,  $I_S = C_{PD} V_{CC} f + I_{CC}$ .



**NOTES:**

- A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AB, REF NOTE 6
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS
- D. DIMENSIONING AND TOLERANCES PER ANSI Y14.5M, 2009.
- E. LANDPATTERN STANDARD: SOP65P640X110-14M.
- F. DRAWING FILE NAME: MKT-MTC14rev7.





NOTES:

- A. CONFORMS TO JEDEC MS-012, VARIATION AB, ISSUE C
- B. ALL DIMENSIONS ARE IN MILLIMETERS
- C. DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS
- D. LAND PATTERN STANDARD: SOIC127P600X145-14M
- E. CONFORMS TO ASME Y14.5M, 2009
- D. DRAWING FILENAME: MKT-M14Arev14





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