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## CMOS Logic

## ■ GENERAL DESCRIPTION

XC74WL74AASR is d-type flip flop manufactured using silicon gate CMOS processes. The small supply current, which is one of the features of the CMOS logic, gives way to high speed operations which enables LS-TTL.

With wave forming buffers connected internally, stabilized output can be achieved as the series offers high noise immunity.

As the series is integrated into a mini molded, MSOP-8B package, high density mounting is possible.

## ■ APPLICATIONS

- Palmtops
- Digital equipment

## ■ FEATURES

**High Speed Operations** :  $f_{max} = 170\text{MHz}$  (TYP.) ( $V_{CC}=5\text{V}$ )

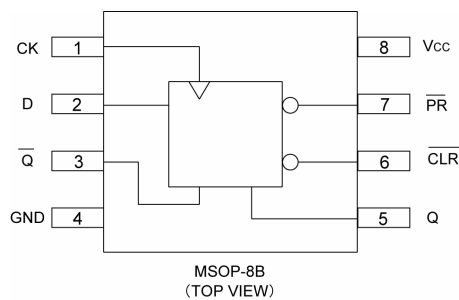
**Operating Voltage Range** :  $2\text{V} \sim 5.5\text{V}$

**Low Power Consumption**:  $1\ \mu\text{A}$  (MAX.)@ $T_a=25^\circ\text{C}$

**CMOS Logic D-Type Flip Flop**

**Small Package** : MSOP-8B

## ■ PIN CONFIGURATION



## ■ FUNCTIONS

| INPUT                  |                         |              |   | OUTPUT |                       |
|------------------------|-------------------------|--------------|---|--------|-----------------------|
| $\overline{\text{PR}}$ | $\overline{\text{CLR}}$ | CK           | D | Q      | $\overline{\text{Q}}$ |
| L                      | H                       | X            | X | H      | L                     |
| H                      | L                       | X            | X | L      | H                     |
| L                      | L                       | X            | X | H      | H                     |
| H                      | H                       | $\uparrow$   | H | H      | L                     |
| H                      | H                       | $\downarrow$ | L | L      | H                     |
| H                      | H                       | $\downarrow$ | X | $Q_0$  | $\overline{Q_0}$      |

H=High level

L=Low level

X=Don't care

## ■ ABSOLUTE MAXIMUM RATINGS

Ta=-40°C~85°C

| PARAMETER                     | SYMBOL                            | CONDITIONS                | UNITS |
|-------------------------------|-----------------------------------|---------------------------|-------|
| Supply Voltage                | V <sub>CC</sub>                   | -0.5~+6.0                 | V     |
| Input Voltage                 | V <sub>IN</sub>                   | -0.5~+6.0                 | V     |
| Output Voltage                | V <sub>OUT</sub>                  | -0.5~V <sub>CC</sub> +0.5 | V     |
| Input Diode Current           | I <sub>IK</sub>                   | -20                       | mA    |
| Output Diode Current          | I <sub>OK</sub>                   | ±20                       | mA    |
| Switch Output Current         | I <sub>OUT</sub>                  | ±25                       | mA    |
| V <sub>CC</sub> ,GND Current  | I <sub>CC</sub> ,I <sub>GND</sub> | ±50                       | mA    |
| Power Dissipation (Ta = 25°C) | P <sub>d</sub>                    | 300                       | mW    |
| Storage Temperature Range     | T <sub>stg</sub>                  | -65~+150                  | °C    |

Note; Voltage is all ground standardized.

## ■ RECOMMENDED OPERATING CONDITIONS

| PARAMETER                   | SYMBOL           | CONDITIONS                    | UNITS |
|-----------------------------|------------------|-------------------------------|-------|
| Supply Voltage              | V <sub>CC</sub>  | 2~5.5                         | V     |
| Input Voltage               | V <sub>IN</sub>  | 0~5.5                         | V     |
| Output Voltage              | V <sub>OUT</sub> | 0~V <sub>CC</sub>             | V     |
| Operating Temperature Range | T <sub>opr</sub> | -40~+85                       | °C    |
| Input Rise and Fall Time    | tr, tf           | 0~200 (V <sub>CC</sub> =3.3V) | ns    |
|                             |                  | 0~100 (V <sub>CC</sub> =5V)   |       |

## ■ DC ELECTRICAL CHARACTERISTICS

| PARAMETER             | SYMBOL          | V <sub>CC</sub> (V)                                 | CONDITIONS  | Ta=25°C                 |      |      | Ta=-40°C~85°C |      | UNITS |   |
|-----------------------|-----------------|---|---|-------------------------|------|------|---------------|------|-------|---|
|                       |                 |   |   | MIN.                    | TYP. | MAX. | MIN.          | MAX. |       |   |
| Input Voltage         | V <sub>IH</sub> | 2.0   |   | 1.5                     | —    | —    | 1.5           | —    | V     |   |
|                       |                 | 3.0   |   | 2.1                     | —    | —    | 2.1           | —    |       |   |
|                       |                 | 5.5   |   | 3.85                    | —    | —    | 3.85          | —    |       |   |
|                       | V <sub>IL</sub> | 2.0   |   | —                       | —    | 0.5  | —             | 0.5  | V     |   |
|                       |                 | 3.0   |   | —                       | —    | 0.9  | —             | 0.9  |       |   |
|                       |                 | 5.5   |   | —                       | —    | 1.65 | —             | 1.65 |       |   |
| Output Voltage        | V <sub>OH</sub> | 2.0   | V <sub>IN</sub> =V <sub>IL</sub>                                | I <sub>OH</sub> =-50 μA | 1.9  | 2.0  | —             | 1.9  | —     | V |
|                       |                 | 3.0   |   |                         | 2.9  | 3.0  | —             | 2.9  | —     |   |
|                       |                 | 4.5   |   |                         | 4.4  | 4.5  | —             | 4.4  | —     |   |
|                       |                 | 3.0   |   | I <sub>OH</sub> =-4mA   | 2.58 | —    | —             | 2.48 | —     |   |
|                       |                 | 4.5   |   | I <sub>OH</sub> =-8mA   | 3.94 | —    | —             | 3.80 | —     |   |
|                       | V <sub>OL</sub> | V <sub>IN</sub> =V <sub>IL</sub> or V <sub>IH</sub> | I <sub>OL</sub> =50 μA  | 2.0                     | —    | —    | 0.1           | —    | 0.1   | V |
|                       |                 |   |   | 3.0                     | —    | —    | 0.1           | —    | 0.1   |   |
|                       |                 |   |   | 4.5                     | —    | —    | 0.1           | —    | 0.1   |   |
|                       |                 |   | 3.0   | I <sub>OL</sub> =4mA    | —    | —    | 0.36          | —    | 0.44  |   |
|                       |                 |   | 4.5   | I <sub>OL</sub> =8mA    | —    | —    | 0.36          | —    | 0.44  |   |
| Input Current         | I <sub>IN</sub> | 0~5.5   | V <sub>IN</sub> =V <sub>CC</sub> or GND                         | -0.1                    | —    | 0.1  | -1.0          | 1.0  | μA    |   |
| Static Supply Current | I <sub>CC</sub> | 5.5   | V <sub>IN</sub> =V <sub>CC</sub> or GND, I <sub>OUT</sub> =0 μA | —                       | —    | 1.0  | —             | 10.0 | μA    |   |

## SWITCHING ELECTRICAL CHARACTERISTICS

(tr=tf=3ns)

| PARAMETER  | SYMBOL           | CONDITIONS      |        | Ta=25°C                                 |      |      | Ta=-40°C~85°C |      | UNITS |    |
|--|------------------|-----------------|--------|---|------|------|---------------|------|-------|----|
|  |                  | CL              | Vcc(V) | MIN.                                    | TYP. | MAX. | MIN.          | MAX. |       |    |
| Delay Time<br>(CK-Q, $\bar{Q}$ )                     | t <sub>PLH</sub> | 15pF            | 3.3    | —                                       | 6.7  | 11.9 | 1.0           | 14.0 | ns    |    |
|  |                  |                 | 5.0    | —                                       | 4.6  | 7.3  | 1.0           | 8.5  |       |    |
|  |                  | 50pF            | 3.3    | —                                       | 9.2  | 15.4 | 1.0           | 17.5 | ns    |    |
|  |                  |                 | 5.0    | —                                       | 6.1  | 9.3  | 1.0           | 10.5 |       |    |
|  | t <sub>PHL</sub> | 15pF            | 3.3    | —                                       | 6.7  | 11.9 | 1.0           | 14.0 | ns    |    |
|  |                  |                 | 5.0    | —                                       | 4.6  | 7.3  | 1.0           | 8.5  |       |    |
|  |                  | 50pF            | 3.3    | —                                       | 9.2  | 15.4 | 1.0           | 17.5 | ns    |    |
|  |                  |                 | 5.0    | —                                       | 6.1  | 9.3  | 1.0           | 10.5 |       |    |
| Delay Time<br>(PR, CLR-Q, $\bar{Q}$ )                | t <sub>PLH</sub> | 15pF            | 3.3    | —                                       | 7.6  | 12.3 | 1.0           | 14.5 | ns    |    |
|  |                  |                 | 5.0    | —                                       | 4.8  | 7.7  | 1.0           | 9.0  |       |    |
|  |                  | 50pF            | 3.3    | —                                       | 10.1 | 15.8 | 1.0           | 18.0 | ns    |    |
|  |                  |                 | 5.0    | —                                       | 6.3  | 9.7  | 1.0           | 11.0 |       |    |
|  | t <sub>PHL</sub> | 15pF            | 3.3    | —                                       | 7.6  | 12.3 | 1.0           | 14.5 | ns    |    |
|  |                  |                 | 5.0    | —                                       | 4.8  | 7.7  | 1.0           | 9.0  |       |    |
|  |                  | 50pF            | 3.3    | —                                       | 10.1 | 15.8 | 1.0           | 18.0 | ns    |    |
|  |                  |                 | 5.0    | —                                       | 6.3  | 9.7  | 1.0           | 11.0 |       |    |
| Minimum Set Up Time                                  | ts(L)            | —               | 3.3    | 6.0                                     | —    | —    | 7.0           | —    | ns    |    |
|  | ts(H)            | —               | 5.0    | 5.0                                     | —    | —    | 5.0           | —    |       |    |
| Minimum Hold Time                                    | th(L)            | —               | 3.3    | 2.0                                     | —    | —    | 2.0           | —    | ns    |    |
|  | th(H)            | —               | 5.0    | 2.0                                     | —    | —    | 2.0           | —    |       |    |
| Minimum Pulse Width<br>(CK)                          | tw(L)            | —               | 3.3    | 7.0                                     | —    | —    | 7.0           | —    | ns    |    |
|  | tw(H)            | —               | 5.0    | 5.0                                     | —    | —    | 5.0           | —    |       |    |
| Minimum Pulse Width<br>( $\bar{PR}$ , $\bar{CLR}$ )  | Tw               | —               | 3.3    | 7.0                                     | —    | —    | 7.0           | —    | ns    |    |
|  |                  | —               | 5.0    | 5.0                                     | —    | —    | 5.0           | —    |       |    |
| Minimum Removal Time<br>( $\bar{PR}$ , $\bar{CLR}$ ) | trem             | —               | 3.3    | 5.0                                     | —    | —    | 5.0           | —    | ns    |    |
|  |                  | —               | 5.0    | 3.0                                     | —    | —    | 3.0           | —    |       |    |
| Maximum Clock<br>Frequency                           | fmax             | 15pF            | 3.3    | 80                                      | 125  | —    | 70            | —    | MHz   |    |
|  |                  |                 | 5.0    | 130                                     | 170  | —    | 110           | —    |       |    |
|  | 50pF             | 3.3             | 50     | 75                                      | —    | 45   | —             | MHz  |       |    |
|  |                  | 5.0             | 90     | 115                                     | —    | 75   | —             |      |       |    |
| Input Capacitance                                    | C <sub>IN</sub>  | —               | 5.0    | V <sub>IN</sub> =V <sub>CC</sub> or GND | —    | 4    | 10            | —    | 10    | pF |
| Power Dissipation<br>Capacitance                     | C <sub>pd</sub>  | No Load, f=1MHz |        |   | —    | 9.3  | —             | —    | —     | pF |

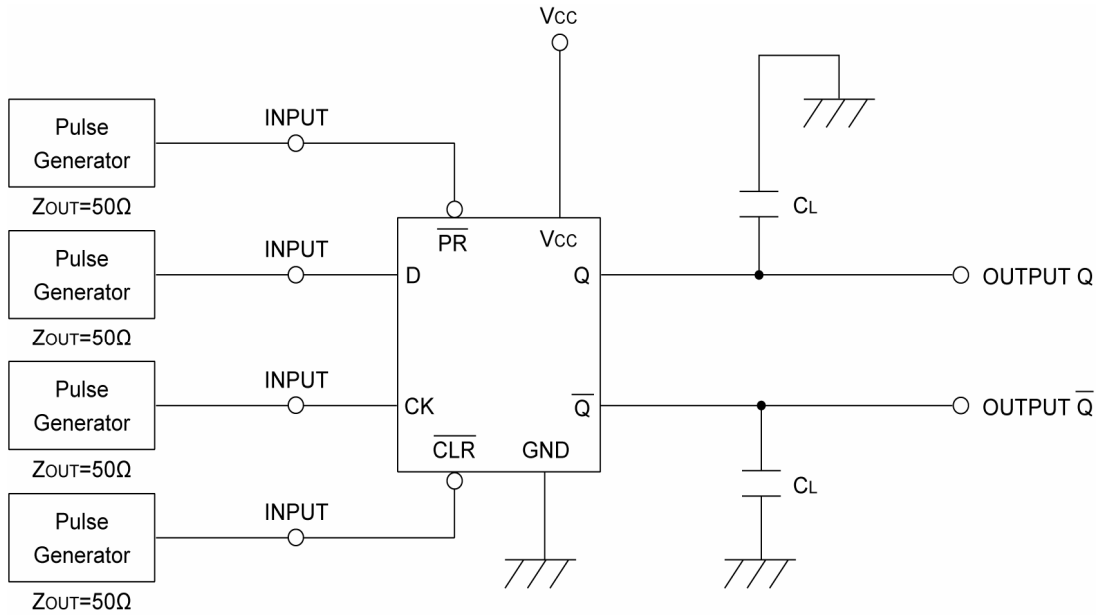
## NOISE CHARACTERISTICS

(tr=tf=3ns)

| PARAMETER   | SYMBOL           | CONDITIONS |        | Ta=25°C |      |      | UNITS |
|---|------------------|------------|--------|---------|------|------|-------|
|   |                  | CL         | Vcc(V) | MIN.    | TYP. | MAX. |       |
| Non Functional Output Maximum Dynamic V <sub>OL</sub> | V <sub>OLP</sub> | 50pF       | 5.0    | —       | 0.3  | 0.8  | V     |
| Non Functional Output Minimum Dynamic V <sub>OL</sub> | V <sub>OLV</sub> | 50pF       | 5.0    | -0.8    | -0.3 | —    | V     |
| Minimum Dynamic V <sub>IH</sub>                       | V <sub>IHD</sub> | 50pF       | 5.0    | —       | —    | 3.5  | V     |
| Maximum Dynamic V <sub>IL</sub>                       | V <sub>ILD</sub> | 50pF       | 5.0    | —       | —    | 1.5  | V     |

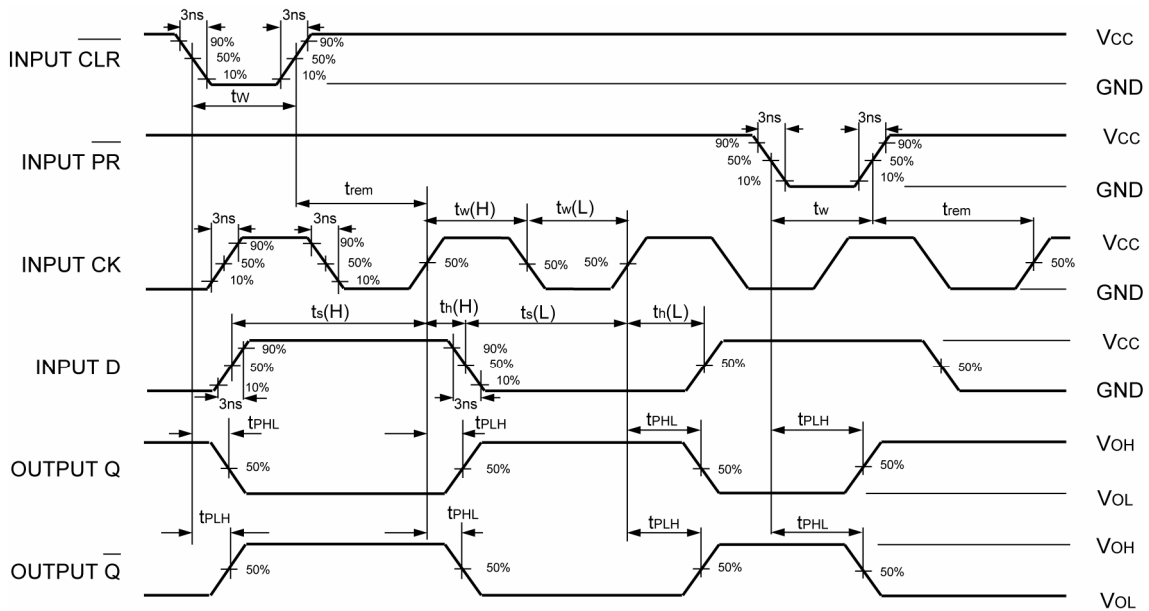
# XC74WL74AASR

## TEST CIRCUIT



Notes:  $V_{OUT}$ =open when measuring supply current

## WAVEFORM



Notes: 1. Input Clock Frequency: 10MHz  
2. D Input Frequency: 5MHz

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