

## CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

# TC40H242P/F TC40H243P/F

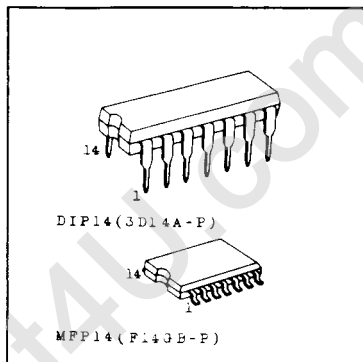
### QUAD BIDIRECTIONAL BUS BUFFER

TC40H242 INVERTED 3-STATE OUTPUTS

TC40H243 NONINVERTED 3-STATE OUTPUTS

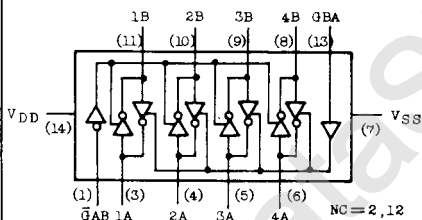
#### MAXIMUM RATINGS

| CHARACTERISTIC      | SYMBOL    | RATING                                     | UNIT               |
|---------------------|-----------|--|--------------------|
| Supply Voltage      | $V_{DD}$  | $V_{SS}-0.5 \sim V_{SS}+10$                | V                  |
| Input Voltage       | $V_{IN}$  | $V_{SS}-0.5 \sim V_{DD}+0.5$               | V                  |
| Output Voltage      | $V_{OUT}$ | $V_{SS}-0.5 \sim V_{SS}+0.5$               | V                  |
| Input Current       | $I_{IN}$  | $\pm 10$                                   | mA                 |
| Power Dissipation   | $P_D$     | 300 (DIP) / 180 (MFP)                      | mW                 |
| Storage Temperature | $T_{stg}$ | $-65 \sim 150$                             | $^{\circ}\text{C}$ |
| Lead Temp./Time     | $T_{sol}$ | $260^{\circ}\text{C} \cdot 10 \text{ sec}$ |                    |



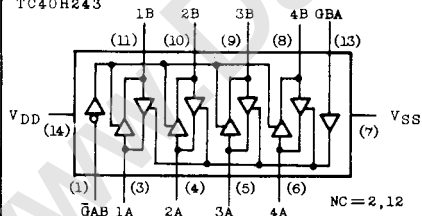
#### PIN CONNECTION AND TRUTH TABLE

TC40H242



| CONTROL INPUTS |          | DATA PORT STATUS |   |        |   |
|----------------|----------|------------------|---|--------|---|
| $\bar{G}_{AB}$ | $G_{BA}$ | A                |   | B      |   |
| L              | L        | INPUT            | L | OUTPUT | H |
|                |          |                  | H |        | L |
| H              | H        | OUTPUT           | L | INPUT  | H |
|                |          |                  | H |        | L |
| L              | H        | Don't use        |   |        |   |
| H              | L        | High Impedance   |   |        |   |

TC40H243



| CONTROL INPUTS |          | DATA PORT STATUS |   |        |   |
|----------------|----------|------------------|---|--------|---|
| $\bar{G}_{AB}$ | $G_{BA}$ | A                |   | B      |   |
| L              | L        | INPUT            | L | OUTPUT | L |
|                |          |                  | H |        | H |
| H              | H        | OUTPUT           | L | INPUT  | L |
|                |          |                  | H |        | H |
| L              | H        | Don't use        |   |        |   |
| H              | L        | High Impedance   |   |        |   |

#### RECOMMENDED OPERATING CONDITIONS

| CHARACTERISTIC        | SYMBOL    | TEST CONDITION | MIN. | TYP. | MAX.     | UNIT               |
|-----------------------|-----------|----------------|------|------|----------|--------------------|
| Supply Voltage        | $V_{DD}$  |                | 2.0  | -    | 8.0      | V                  |
| Input Voltage         | $V_{IN}$  |                | 0    | -    | $V_{DD}$ | V                  |
| Operating Temperature | $T_{opr}$ |                | -40  | -    | 85       | $^{\circ}\text{C}$ |

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ELECTRICAL CHARACTERISTICS ( $V_{SS}=0V$ )

| CHARACTERISTIC            |           | SYMBOL   | TEST CONDITION                                  | $V_{DD}$<br>(V) | -40°C |      | 25°C  |            |      | 85°C |      | UNIT    |
|---------------------------|-----------|----------|---|-----------------|-------|------|-------|------------|------|------|------|---------|
|                           |           |          |   |                 | MIN.  | MAX. | MIN.  | TYP.       | MAX. | MIN. | MAX. |         |
| High Level Output Voltage |           | $V_{OH}$ | $ I_{OUT}  < 1\mu A$<br>$V_{IN}=V_{SS}, V_{DD}$ | 5               | 4.95  | -    | 4.95  | 5.0        | -    | 4.95 | -    | V       |
| Low Level Output Voltage  |           | $V_{OL}$ | $ I_{OUT}  < 1\mu A$<br>$V_{IN}=V_{SS}, V_{DD}$ | 5               | -     | 0.05 | -     | 0.0        | 0.05 | -    | 0.05 |         |
| High Level Output Current |           | $I_{OH}$ | $V_{OUT}=4.6V$<br>$V_{IN}=V_{SS}, V_{DD}$       | 5               | -0.95 | -    | -0.88 | -          | -    | -0.8 | -    | mA      |
| High Level Output Current |           | $I_{OL}$ | $V_{OUT}=0.4V$<br>$V_{IN}=V_{SS}, V_{DD}$       | 5               | 4.7   | -    | 4.4   | -          | -    | 4.0  | -    |         |
| Input Voltage             | "H" Level | $V_{IH}$ | $ I_{OUT}  < 1\mu A$<br>$V_{OUT}=0.5V$          | 5               | 4.0   | -    | 4.0   | -          | -    | 4.0  | -    | V       |
|                           | "L" Level | $V_{IL}$ | $V_{OUT}=4.5V$                                  | 5               | -     | 1.0  | -     | -          | 1.0  | -    | 1.0  |         |
| Input Current             | "H" Level | $I_{IH}$ | $V_{IN}=8.0V$                                   | 8               | -     | 0.5  | -     | $10^{-4}$  | 0.5  | -    | 5    | $\mu A$ |
|                           | "L" Level | $I_{IL}$ | $V_{IN}=0.0V$                                   | 8               | -     | -0.5 | -     | $-10^{-4}$ | -0.5 | -    | -5   |         |
| Output Disable Current    | "H" Level | $I_{DH}$ | $V_{DH}=8.0V$                                   | 8               | -     | 0.5  | -     | $10^{-4}$  | 0.5  | -    | 5    | $\mu A$ |
|                           | "L" Level | $I_{DL}$ | $V_{DL}=0.0V$                                   | 8               | -     | -0.5 | -     | $-10^{-4}$ | -0.5 | -    | -5   |         |
| Quiescent Supply Current  |           | $I_{DD}$ | $*V_{IN}=V_{SS}, V_{DD}$                        | 5               | -     | 5.0  | -     | 0.005      | 5.0  | -    | 25   | $\mu A$ |

\*All valid input combinations.

SWITCHING CHARACTERISTICS ( $T_a=25^\circ C$ ,  $V_{SS}=0V$ ,  $V_{DD}=5V$ ,  $C_L=50pF$ ,  $R_L=1k\Omega$ )

| CHARACTERISTIC         | SYMBOL     | TEST CONDITION | TC40H242 |        |      | TC40H243 |      |      | UNIT |    |
|------------------------|------------|----------------|----------|--------|------|----------|------|------|------|----|
|                        |            |                | MIN.     | TYP.   | MAX. | MIN.     | TYP. | MAX. |      |    |
| Output Rise Time       | $t_{or}$   | Fig. 1         | -        | 15     | 30   | -        | 15   | 30   | ns   |    |
| Output Fall Time       | $t_{of}$   |                | -        | 14     | 30   | -        | 14   | 30   |      |    |
| Propagation Delay Time | (Low-High) | $t_{pLH}$      | Fig. 1   | -      | 23   | 35       | -    | 22   | 35   | ns |
|                        | (High-Low) | $t_{pHL}$      |          | -      | 26   | 39       | -    | 25   | 39   |    |
| Output Disable Time    | "H" Level  | $t_{pHZ}$      | Fig. 3   | -      | 32   | 48       | -    | 32   | 48   | ns |
|                        | "L" Level  | $t_{pLZ}$      |          | Fig. 2 | -    | 29       | 44   | -    | 29   |    |
| Output Enable Time     | "H" Level  | $t_{pZH}$      | Fig. 3   |        | -    | 29       | 44   | -    | 29   |    |
|                        | "L" Level  | $t_{pZL}$      |          | Fig. 2 | -    | 32       | 48   | -    | 32   |    |
| Input Capacitance      | $C_{IN}$   |                | -        |        | 5    |          | -    | 5    |      | pF |
| Output Capacitance     | $C_{OUT}$  |                | -        | 19     |      | -        | 19   |      | pF   |    |

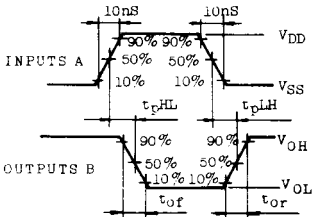
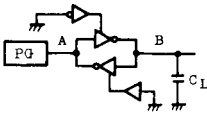
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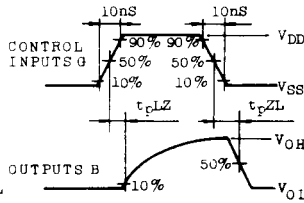
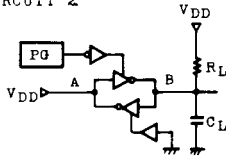
## SWITCHING TIME TEST CIRCUIT AND WAVEFORM

TC40H242

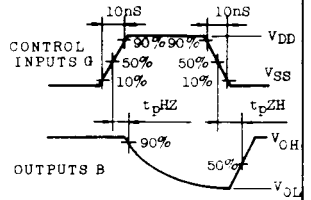
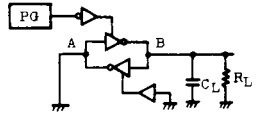
CIRCUIT 1



CIRCUIT 2

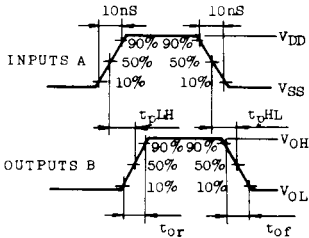
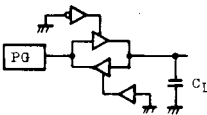


CIRCUIT 3

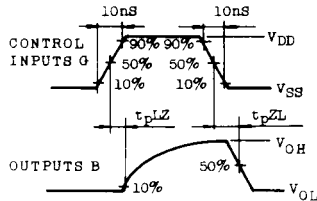
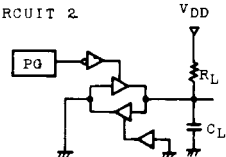


TC40H243

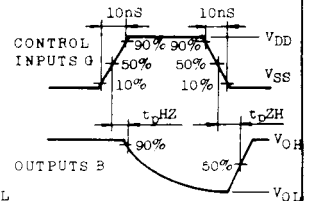
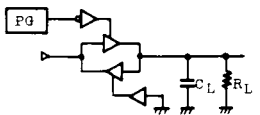
CIRCUIT 1



CIRCUIT 2



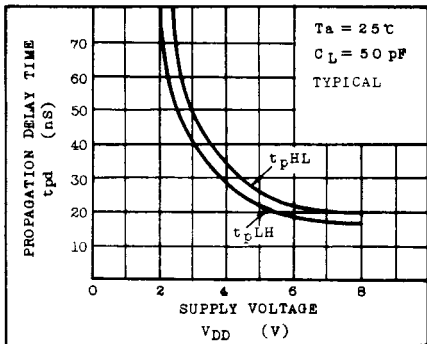
CIRCUIT 3



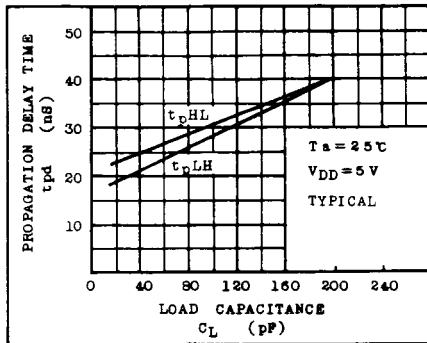
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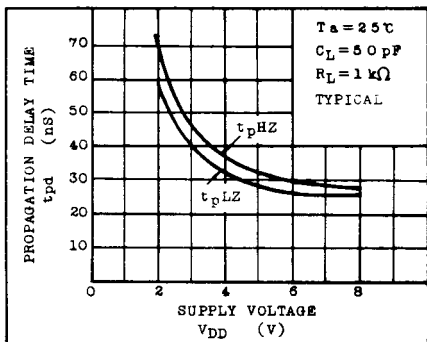
$t_{pd} - V_{DD}$



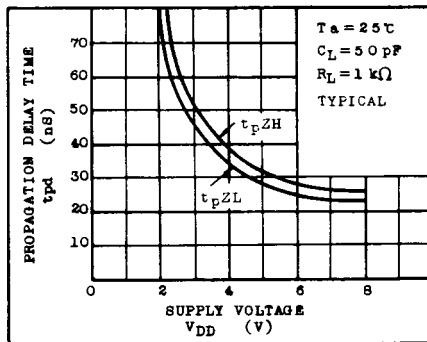
$t_{pd} - C_L$



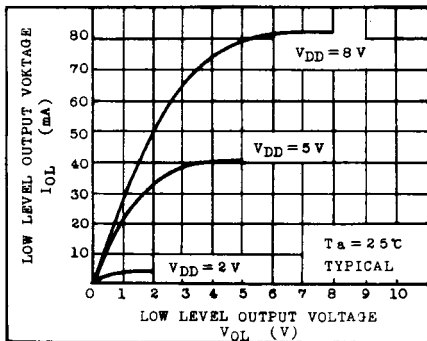
$t_{pd} - V_{DD}$



$t_{pd} - V_{DD}$



$I_{OL} - V_{OL}$



$I_{OH} - (V_{DD} - V_{OH})$

