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# Die Datasheet, Logic Gate Device

74HC4051

## 8 – CHANNEL ANALOG MULTIPLEXER / DEMULTIPLEXER

### Die Source:



70 mils x 79 mils x 14 mils

Backside : Silicon  
Topside Metal: Aluminum

### General Description:

The 74HC4051 is a member of the Industries 74xxx series of Logic devices. The 74HC4051 is a device description which contains an 8-Channel Analog multiplexer/demultiplexer.

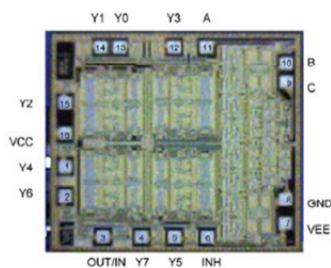
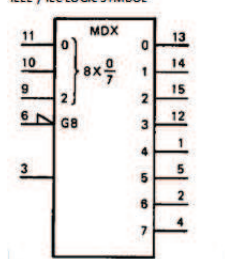
#### ABSOLUTE MAXIMUM RATINGS

| PARAMETER                        | SYMBOL    | CONDITIONS                             | LIMIT                  | UNITS |
|----------------------------------|-----------|----------------------------------------|------------------------|-------|
| Supply Voltage                   | $V_{CC}$  |                                        | -0.5 to +7.0           | V     |
| DC Input Diode Current           | $I_{IK}$  | $V_I = -0.5V$<br>$V_I = V_{CC} + 0.5V$ | -20.0<br>20.0          | mA    |
| DC Input Voltage                 | $V_I$     |                                        | -0.5 to $V_{CC} + 0.5$ | V     |
| DC Output Diode Current          | $I_{OK}$  | $V_O = -0.5V$<br>$V_O = V_{CC} + 0.5V$ | -20.0<br>20.0          | mA    |
| DC Output Voltage                | $V_O$     |                                        | -0.5 to $V_{CC} + 0.5$ | V     |
| DC Output Source or Sink Current | $I_O$     |                                        | $\pm 25.0$             | mA    |
| DC VCC Current                   | $I_{CC}$  |                                        | +50                    | mA    |
| DC GND Current                   | $I_{DD}$  |                                        | -50.0                  | mA    |
| Storage Temp                     | $T_{STG}$ |                                        | -65.0 to +150          | °C    |
| Max Junction Temp                | $T_J$     |                                        | 150.0                  | °C    |

#### RECOMMENDED OPERATING CONDITIONS

| PARAMETER                                             | TECH | SYMBOL              | LIMIT         | UNITS |
|-------------------------------------------------------|------|---------------------|---------------|-------|
| Supply Voltage                                        | HC   | $V_{CC}$            | 2.0 to 6.0    | V     |
| Input Voltage                                         |      | $V_I$               | 0 to $V_{CC}$ | V     |
| Output Voltage                                        |      | $V_O$               | 0 to $V_{CC}$ | V     |
| Operating Temperature                                 |      | $T_A$               | -40 to +85    | °C    |
| Minimum Input Rise & Fall times<br>(@5.0V $\pm$ 0.5V) | HC   | $\Delta T/\Delta V$ | 500           | ns/V  |

IEEE / IEC LOGIC SYMBOL



### DC ELECTRICAL CHARACTERISTICS

| PARAMETER                         | TECH | SYMBOL   | VCC (V) | CONDITIONS                                            | Guarenteed Limits |         | UNITS | NOTE |
|-----------------------------------|------|----------|---------|-------------------------------------------------------|-------------------|---------|-------|------|
|                                   |      |          |         |                                                       | Min@25C           | Min@85C |       |      |
| Minimum HIGH level Input Voltage  | HC   | $V_{IH}$ | 2.0     |                                                       | 1.50              | 1.50    | V     |      |
|                                   |      |          | 4.5     |                                                       | 3.15              | 3.15    |       |      |
|                                   |      |          | 6.0     |                                                       | 4.20              | 4.20    |       |      |
| Maximum LOW level Input Voltage   | HC   | $V_{IL}$ | 2.0     |                                                       | 0.50              | 0.50    | V     |      |
|                                   |      |          | 4.0     |                                                       | 1.35              | 1.35    |       |      |
|                                   |      |          | 4.5     |                                                       | 1.80              | 1.80    |       |      |
| Minimum HIGH level Output Voltage | HC   | $V_{OH}$ | 2.0     | $I_{OUT} = -20\mu A$                                  | 1.90              | 1.90    | V     |      |
|                                   |      |          | 4.5     |                                                       | 4.40              | 4.40    |       |      |
|                                   |      |          | 6.0     |                                                       | 5.90              | 5.90    |       |      |
|                                   | HC   | $V_{OH}$ | 4.5     | $V_{IN} = V_{IL} \text{ or } V_{IH}, I_{OL} = -4mA$   | 3.98              | 3.84    | V     |      |
|                                   |      |          | 6.0     | $V_{IN} = V_{IL} \text{ or } V_{IH}, I_{OL} = -5.2mA$ | 5.48              | 5.34    |       |      |
|                                   |      |          |         |                                                       |                   |         |       |      |



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## 8 – CHANNEL ANALOG MULTIPLEXER / DEMULTIPLEXER

### DC ELECTRICAL CHARACTERISTICS - CONT'D

| PARAMETER                        | TECH | SYMBOL          | VCC (V) | CONDITIONS                                                                                    | Guarenteed Limits |         | UNITS | NOTE |
|----------------------------------|------|-----------------|---------|-----------------------------------------------------------------------------------------------|-------------------|---------|-------|------|
|                                  |      |                 |         |                                                                                               | Min@25C           | Min@85C |       |      |
| Maximum LOW level Output Voltage | HC   | V <sub>OL</sub> | 2.0     | I <sub>OUT</sub> = 20uA                                                                       | 0.1               | 0.1     | V     |      |
|                                  |      |                 | 4.5     |                                                                                               | 0.1               | 0.1     |       |      |
|                                  |      |                 | 6.0     |                                                                                               | 0.1               | 0.1     |       |      |
|                                  | HC   | V <sub>OL</sub> | 4.5     | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>O</sub> = 4mA                   | 0.36              | 0.44    | V     |      |
|                                  |      |                 | 6.0     | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>O</sub> = 5.2mA                 | 0.36              | 0.44    |       |      |
|                                  |      |                 |         |                                                                                               |                   |         |       |      |
| Maximum Input Leakage Current    | HC   | I <sub>IN</sub> | 6.0     | V <sub>I</sub> = V <sub>CC</sub> or GND                                                       | ±0.1              | ±1.0    | uA    |      |
| 3-State Output OFF Current       | HC   | I <sub>OZ</sub> | 6.0     | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> , V <sub>O</sub> = V <sub>CC</sub> or GND | --                | ±5.0    | uA    |      |
| Maximum Quiescent Supply Current | HC   | I <sub>CC</sub> | 6.0     | V <sub>IN</sub> = V <sub>CC</sub> or GND                                                      | --                | 20      | uA    |      |

### AC ELECTRICAL CHARACTERISTICS

| PARAMETER                     | TECH | SYMBOL           | VCC (V) | CONDITIONS                         | Guarenteed Limits |         | Guarenteed Limits |         | UNITS |
|-------------------------------|------|------------------|---------|------------------------------------|-------------------|---------|-------------------|---------|-------|
|                               |      |                  |         |                                    | Min@25C           | Max@25C | Min@85C           | Max@85C |       |
| Propagation Delay, Vis to Vos | HC   | t <sub>PLH</sub> | 2.0     | GND = 0V, tr = tf = 6ns, CL = 50pF | --                | 60.0    | --                | 75.0    | ns    |
|                               |      |                  | 4.5     |                                    | --                | 12.0    | --                | 15.0    |       |
|                               |      |                  | 6.0     |                                    | --                | 10.0    | --                | 13.0    |       |
|                               | HC   | t <sub>PHL</sub> | 4.5     | Above Plus VEE = -4.5V             | --                | 8.0     | --                | 10.0    | ns    |
|                               |      |                  | 2.0     | GND = 0V, tr = tf = 6ns, CL = 50pF | --                | 60.0    | --                | 75.0    |       |
|                               |      |                  | 4.5     |                                    | --                | 12.0    | --                | 15.0    |       |
| Turn ON Time, E\ to Vos       | HC   | t <sub>PLH</sub> | 6.0     |                                    | --                | 10.0    | --                | 13.0    | ns    |
|                               |      |                  | 4.5     | Above Plus VEE = -4.5V             | --                | 8.0     | --                | 10.0    |       |
|                               |      |                  | 2.0     | GND = 0V, tr = tf = 6ns, CL = 50pF | --                | 345.0   | --                | 430.0   | ns    |
|                               | HC   | t <sub>PHL</sub> | 4.5     |                                    | --                | 69.0    | --                | 86.0    |       |
|                               |      |                  | 6.0     |                                    | --                | 59.0    | --                | 73.0    |       |
|                               |      |                  | 4.5     | Above Plus VEE = -4.5V             | --                | 51.0    | --                | 64.0    |       |
| Turn ON Time, Sn to Vos       | HC   | t <sub>PZH</sub> | 2.0     | GND = 0V, tr = tf = 6ns, CL = 50pF | --                | 345.0   | --                | 430.0   | ns    |
|                               |      |                  | 4.5     |                                    | --                | 69.0    | --                | 86.0    |       |
|                               |      |                  | 6.0     |                                    | --                | 59.0    | --                | 73.0    |       |
|                               | HC   | t <sub>PZL</sub> | 4.5     | Above Plus VEE = -4.5V             | --                | 51.0    | --                | 64.0    | ns    |
|                               |      |                  | 2.0     | GND = 0V, tr = tf = 6ns, CL = 50pF | --                | 345.0   | --                | 430.0   |       |
|                               |      |                  | 4.5     |                                    | --                | 69.0    | --                | 86.0    |       |
|                               | HC   |                  | 6.0     |                                    | --                | 59.0    | --                | 73.0    | ns    |
|                               |      |                  | 4.5     | Above Plus VEE = -4.5V             | --                | 51.0    | --                | 64.0    |       |
|                               |      |                  | 2.0     |                                    | --                |         | --                |         |       |



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### AC ELECTRICAL CHARACTERISTICS - CONT'D

| PARAMETER                | TECH | SYMBOL | VCC (V) | CONDITIONS                         | Guarenteed Limits |         | Guarenteed Limits |         | UNITS |
|--------------------------|------|--------|---------|------------------------------------|-------------------|---------|-------------------|---------|-------|
|                          |      |        |         |                                    | Min@25C           | Max@25C | Min@85C           | Max@85C |       |
| Turn OFF Time, E\ to Vos | HC   | tPHZ   | 2.0     | GND = 0V, tr = tf = 6ns, CL = 50pF | --                | 290.0   | --                | 365.0   | ns    |
|                          |      |        | 4.5     |                                    | --                | 58.0    | --                | 73.0    |       |
|                          |      |        | 6.0     |                                    | --                | 49.0    | --                | 62.0    |       |
|                          |      |        | 4.5     |                                    | --                | 42.0    | --                | 53.0    |       |
|                          | HC   | tPLZ   | 2.0     | GND = 0V, tr = tf = 6ns, CL = 50pF | --                | 290.0   | --                | 365.0   | ns    |
|                          |      |        | 4.5     |                                    | --                | 58.0    | --                | 73.0    |       |
|                          |      |        | 6.0     |                                    | --                | 49.0    | --                | 62.0    |       |
|                          |      |        | 4.5     |                                    | --                | 42.0    | --                | 53.0    |       |
| Turn OFF Time, Sn to Vos | HC   | tTLH   | 2.0     | GND = 0V, tr = tf = 6ns, CL = 50pF | --                | 290.0   | --                | 365.0   | ns    |
|                          |      |        | 4.5     |                                    | --                | 58.0    | --                | 73.0    |       |
|                          |      |        | 6.0     |                                    | --                | 49.0    | --                | 62.0    |       |
|                          |      |        | 4.5     |                                    | --                | 42.0    | --                | 53.0    |       |
|                          | HC   | tTHL   | 2.0     | GND = 0V, tr = tf = 6ns, CL = 50pF | --                | 290.0   | --                | 365.0   | ns    |
|                          |      |        | 4.5     |                                    | --                | 58.0    | --                | 73.0    |       |
|                          |      |        | 6.0     |                                    | --                | 49.0    | --                | 62.0    |       |
|                          |      |        | 4.5     |                                    | --                | 42.0    | --                | 53.0    |       |