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## NTE8556 Integrated Circuit 3-State Programmable Binary Counter

**Description:**

The NTE8556 is a tri-state four-bit binary counter which has both conventional and tri-state outputs. When the tri-state outputs are in the high-impedance mode they can be used to load information into the subsequent stage. This is particularly useful in applications involving program counters. Fully synchronous operation results when these devices are cascaded.

**Features:**

- Typical power dissipation ..... 375mW
- Target propagation delay ..... 27nS
- Target logic clock frequency ..... 50MHz
- Tri-State Outputs
- Synchronous Loading
- Cascading Circuitry Provided Internally

**Absolute Maximum Ratings:** ( $T_A = +25^{\circ}\text{C}$  unless otherwise specified)

Supply Voltage,  $V_{CC}$  ..... 7V  
 Input Voltage,  $V_I$  ..... 5.5V  
 Operating Temperature Range,  $T_{opr}$  .....  $0^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$   
 Storage Temperature Range,  $T_{str}$  .....  $-65^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$

**Recommended Operating Conditions:** ( $V_{CC} = 5V$ ,  $T_A = +25^{\circ}\text{C}$ , unless otherwise specified)

| Parameter                 |       | Symbol    | Min  | Typ | Max  | Unit |
|---------------------------|-------|-----------|------|-----|------|------|
| Supply Voltage            |       | $V_{CC}$  | 4.75 | 5   | 5.25 | V    |
| High Level Input Voltage  |       | $V_{IH}$  | 2    | -   | -    | V    |
| Low Level Input Voltage   |       | $V_{IL}$  | -    | -   | 0.8  | V    |
| High Level Output Current |       | $I_{OH}$  | -    | -   | -5.2 | mA   |
| Low Level Output Current  |       | $I_{OL}$  | -    | -   | 16   | mA   |
| Clock Frequency           |       | $f_{CLK}$ | 0    | -   | 25   | MHz  |
| Pulse Width               | Clock | $t_w$     | 25   | -   | -    | ns   |
|                           | Clear |           | 20   | -   | -    |      |
|                           | Load  |           | 30   | -   | -    |      |
| Count Enable Time         | Setup | $t_{CE}$  | 30   | -   | -    | ns   |
|                           | Hold  |           | -10  | -   | -    |      |

**Recommended Operating Conditions (Cont'd):** ( $V_{CC} = 5V$ ,  $T_A = +25^{\circ}C$ , unless otherwise specified)

| Parameter                      |      | Symbol         | Min | Typ | Max | Unit        |
|--------------------------------|------|----------------|-----|-----|-----|-------------|
| Setup Time High Logic Level    | Data | $t_{SETUP(1)}$ | 25  | -   | -   | ns          |
|                                | Load |                | 30  | -   | -   |             |
| Hold Time High Logic Level     | Data | $t_{HOLD(1)}$  | 5   | -   | -   | ns          |
|                                | Load |                | -10 | -   | -   |             |
| Setup Time Low Logic Level     | Data | $t_{SETUP(0)}$ | 30  | -   | -   | ns          |
|                                | Load |                | 25  | -   | -   |             |
| Hold Time Low Logic Level      | Data | $t_{HOLD(0)}$  | 5   | -   | -   | ns          |
|                                | Load |                | -10 | -   | -   |             |
| Free Air Operating Temperature |      | $T_A$          | 0   | -   | 70  | $^{\circ}C$ |

**Electrical Characteristics:** ( $V_{CC} = 5V$ ,  $T_A = +25^{\circ}C$ , unless otherwise specified)

| Parameter   | Symbol    | Test Conditions  | Min | Typ | Max  | Unit    |
|---|-----------|--|-----|-----|------|---------|
| Input Clamp Voltage   | $V_I$     | $V_{CC} = \text{Min}$ , $I_I = -12\text{mA}$   | -   | -   | -1.5 | V       |
| High Level Output Voltage                                       | $V_{CH}$  | $V_{CC} = \text{Min}$ , $I_{OH} = \text{Max}$ ,<br>$V_{IL} = \text{Max}$ , $V_{IH} = \text{Max}$ | 2.4 | -   | -    | V       |
| Low Level Output Voltage  | $V_{OL}$  | $V_{CC} = \text{Min}$ , $I_{OL} = \text{Max}$ ,<br>$V_{IL} = \text{Max}$ , $V_{IL} = \text{Max}$ | -   | -   | 0.4  | V       |
| Input Current @ Max Input Voltage                               | $I_I$     | $V_{CC} = \text{Max}$ , $V_I = 5.5V$   | -   | -   | 1    | mA      |
| High Level Input Current  | $I_{IH}$  | $V_{CC} = \text{Max}$ , $V_I = 2.4V$   | -   | -   | 40   | $\mu A$ |
| Low Level Input Current   | $I_{IL}$  | $V_{CC} = \text{Max}$ , $V_I = 0.4V$   | -   | -   | -1.6 | mA      |
| Off-State Output Current with High Level Output Voltage Applied | $I_{OZH}$ | $V_{CC} = \text{Max}$ , $V_O = 2.4V$ ,<br>$V_{IH} = \text{Min}$ , $V_{IL} = \text{Max}$          | -   | -   | 40   | $\mu A$ |
| Off-State Output Current with Low Level Output Voltage Applied  | $I_{OZL}$ | $V_{CC} = \text{Max}$ , $V_O = 0.4V$ ,<br>$V_{IH} = \text{Min}$ , $V_{IL} = \text{Max}$          | -   | -   | -40  | $\mu A$ |
| Short Circuit Output Current                                    | $I_{OS}$  | $V_{CC} = \text{Max}$ (Note 1)   | -25 | -   | -70  | mA      |
| Supply Current  | $I_{CC}$  | $V_{CC} = \text{Max}$  | -   | 75  | 100  | mA      |

Note 1. Note more than one output should be shorted at a time.

**Switching Characteristics:** ( $V_{CC} = 5V$ ,  $T_A = +25^{\circ}C$ , unless otherwise specified)

| Parameter                                       | Symbol    | From (Input)<br>To (Output) | $R_L = 400\Omega$   |     |                      |     | Unit |
|---|-----------|-----------------------------|---------------------|-----|----------------------|-----|------|
|   |           |                             | $C_L = 5\text{ pF}$ |     | $C_L = 50\text{ pF}$ |     |      |
|   |           |                             | Min                 | Max | Min                  | Max |      |
| Maximum Clock Frequency                         | $f_{MAX}$ |                             | -                   | -   | 25                   | -   | MHz  |
| Propagation Delay Time Low to High Level Output | $t_{PLH}$ | Clock to Output             | -                   | -   | -                    | 22  | ns   |
| Propagation Delay Time High to Low Level Output | $t_{PHL}$ | Clock to Output             | -                   | -   | -                    | 44  | ns   |
| Propagation Delay Time Low to High Level Output | $t_{PLH}$ | Clock to MAX-CNT            | -                   | -   | -                    | 33  | ns   |
| Propagation Delay Time High to Low Level Output | $t_{PHL}$ | Clock to MAX-CNT            | -                   | -   | -                    | 33  | ns   |
| Propagation Delay Time High to Low Level Output | $t_{PHL}$ | Reset to Output             | -                   | -   | -                    | 44  | ns   |
| Output Enable Time to High Level Output         | $t_{PZH}$ | Output Disable to Q         | -                   | -   | -                    | 20  | ns   |
| Output Enable Time to Low Level Output          | $t_{PZL}$ | Output Disable to Q         | -                   | -   | -                    | 20  | ns   |
| Output Disable Time from High Level Output      | $t_{PHZ}$ | Output Disable to Q         | -                   | 12  | -                    | -   | ns   |
| Output Disable Time from Low Level Output       | $t_{PLZ}$ | Output Disable to Q         | -                   | 20  | -                    | -   | ns   |

### Pin Connection Diagram

