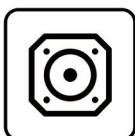


自主封測 品質把控 售後保障

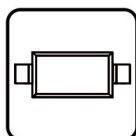
WEB | [WWW.TDSEMIC.COM](http://WWW.TDSEMIC.COM)



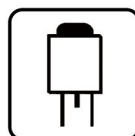
電源管理



顯示驅動



二三極管



LDO穩壓器



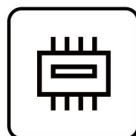
觸摸芯片



MOS管



運算放大器



存儲芯片



MCU



串口通信

## 74HC164D-TD

產品規格說明書

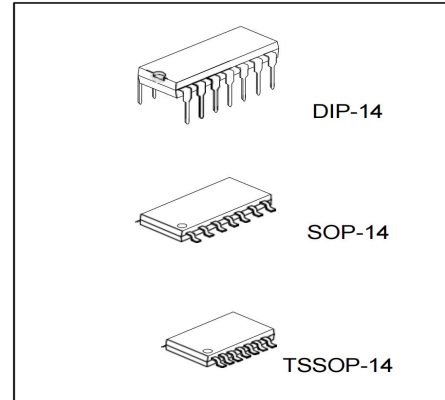
## 1. DESCRIPTION

The **74HC164** is an 8-bit edge-triggered shift registers with serial input and parallel output. A LOW-to-HIGH transition on the CP will shifts the data one place to the right which is the logical AND of DSA and DSB.

A Low level on the  $\overline{\text{MR}}$  will clear the registers asynchronously and force the outputs LOW.

## 2. FEATURES

- Wide Operation Voltage Range: 2~6V
- Asynchronous Reset Input
- Low Input Current: 0.1 $\mu$ A
- Latch-up performance  $\leq 250$  mA
- ESD protection:
  - HBM: ANSI/ESDA/JEDEC JS-001 2023 exceeds 1500 V
  - CDM: ANSI/ESDA/JEDEC JS-002 2022 exceeds 1000 V
- Package Options DIP-14, SOP-14 and TSSOP-14



## 3. ORDERING INFORMATION

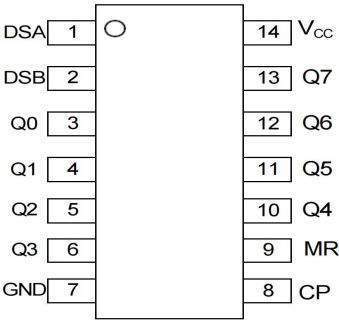
### • Tube

| Part Number | Marking code | Package | Packing | Pcs/Tube | Pcs/Box |
|-------------|--------------|---------|---------|----------|---------|
| 74HC164N    | 74HC164      | DIP-14  | Tube    | 25       | 1250    |

### • Tape Reel

| Part Number | Marking code | Package  | Packing   | Pcs/Reel | Pcs/ Box |
|-------------|--------------|----------|-----------|----------|----------|
| 74HC164D-TD | 74HC164      | SOP-14   | Tape Reel | 4K       | 64k      |
| 74HC164S-R  | 74HC164      | TSSOP-14 | Tape Reel | 5K       | 80k      |

4. PIN CONFIGURATION

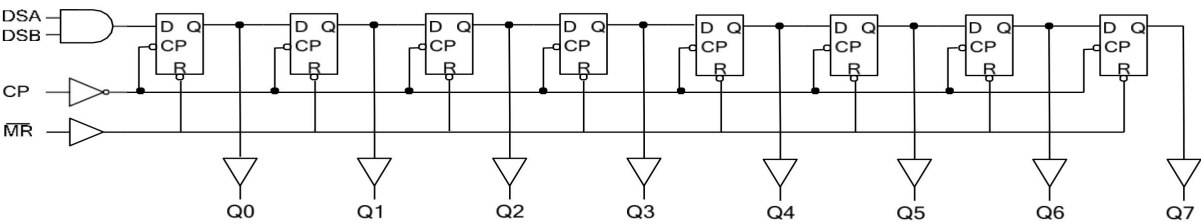


5. FUNCTION TABLE

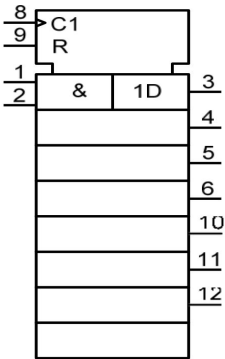
| INPUT |    |     |     | OUTPUT |          |
|-------|----|-----|-----|--------|----------|
| MR    | CP | DSA | DSB | Q0     | Q1 to Q7 |
| L     | X  | X   | X   | L      | L to L   |
| H     | L  | X   | X   | Q0     | Q1 to Q7 |
| H     | ↑  | H   | L   | L      | Q0 to Q6 |
| H     | ↑  | H   | H   | H      | Q0 to Q6 |
| H     | ↑  | L   | H   | L      | Q0 to Q6 |
| H     | ↑  | L   | L   | L      | Q0 to Q6 |

6. FUNCTIONAL DIAGRAM

Logic Diagram



IEC Logic Symbol



## 7. ABSOLUTE MAXIMUM RATING (T<sub>A</sub>=25°C, unless otherwise specified)

| PARAMETER            | SYMBOL           | RATINGS    | UNIT |
|----------------------|------------------|------------|------|
| Supply Voltage       | V <sub>CC</sub>  | -0.5 ~ 7.0 | V    |
| VCC or GND Current   | I <sub>CC</sub>  | ±50        | mA   |
| Output Current       | I <sub>OUT</sub> | ±25        | mA   |
| Input Diode Current  | I <sub>IK</sub>  | ±20        | mA   |
| Switch Diode Current | I <sub>OK</sub>  | ±20        | mA   |
| Storage Temperature  | T <sub>STG</sub> | -65 ~ +150 | °C   |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

## 8. RECOMMENDED OPERATING COMDITIONS

| PARAMETER                          | SYMBOL                | CONDITIONS            | MIN | TYP | MAX             | UNIT |
|------------------------------------|-----------------------|-----------------------|-----|-----|-----------------|------|
| Supply Voltage                     | V <sub>CC</sub>       | -                     | 2.0 | 5.0 | 6.0             | V    |
| Input Voltage                      | V <sub>IN</sub>       | -                     | 0   | -   | V <sub>CC</sub> | V    |
| Output Voltage                     | V <sub>OUT</sub>      | -                     | 0   | -   | V <sub>CC</sub> | V    |
| Input Transition Rise or Fall Rate | $\Delta t / \Delta v$ | V <sub>CC</sub> =2V   | -   | -   | 1000            | ns   |
|                                    |                       | V <sub>CC</sub> =4.5V | -   | 6.0 | 500             | ns   |
|                                    |                       | V <sub>CC</sub> =6V   | -   | -   | 400             | ns   |
| Operating Temperature              | T <sub>A</sub>        | -                     | -40 | -   | +125            | °C   |

## 9. THERMAL DATA

| PARAMETER           | SYMBOL    | RATINGS | UNIT |
|---------------------|-----------|---------|------|
| Ambient to Junction | DIP-14    | 100     | °C/W |
|                     | SOP-14U   | 125     | °C/W |
|                     | TSSOP-14U | 150     | °C/W |

## 10. ELECTRICAL CHARACTERISTICS(T<sub>A</sub>=25°C, Unless otherwise specified)

| PARAMETER                 | SYMBOL               | TEST CONDITIONS                                                                       | MIN  | TYP  | MAX  | UNIT |
|---------------------------|----------------------|---------------------------------------------------------------------------------------|------|------|------|------|
| Input Voltage High-Level  | V <sub>IH</sub>      | V <sub>CC</sub> =2.0V                                                                 | 1.5  | 1.2  | -    | V    |
|                           |                      | V <sub>CC</sub> =4.5V                                                                 | 3.15 | 2.4  | -    | V    |
|                           |                      | V <sub>CC</sub> =6.0V                                                                 | 4.2  | 3.2  | -    | V    |
| Input Voltage Low-Level   | V <sub>IL</sub>      | V <sub>CC</sub> =2.0V                                                                 | -    | 0.8  | 0.5  | V    |
|                           |                      | V <sub>CC</sub> =4.5V                                                                 | -    | 2.1  | 1.35 | V    |
|                           |                      | V <sub>CC</sub> =6.0V                                                                 | -    | 2.8  | 1.8  | V    |
| Output Voltage High-Level | V <sub>OH</sub>      | V <sub>CC</sub> =2.0V, I <sub>OH</sub> =20μA                                          | 1.9  | 2.0  | -    | V    |
|                           |                      | V <sub>CC</sub> =4.5V, I <sub>OH</sub> =20μA                                          | 4.4  | 4.5  | -    | V    |
|                           |                      | V <sub>CC</sub> =6.0V, I <sub>OH</sub> =20μA                                          | 5.9  | 6.0  | -    | V    |
|                           |                      | V <sub>CC</sub> =4.5V, I <sub>OH</sub> =4mA                                           | 3.98 | 4.32 | -    | V    |
|                           |                      | V <sub>CC</sub> =6.0V, I <sub>OH</sub> = 5.2mA                                        | 5.48 | 5.81 | -    | V    |
| Output Voltage Low-Level  | V <sub>OL</sub>      | V <sub>CC</sub> =2.0V, I <sub>OL</sub> =20μA                                          | -    | 0    | 0.1  | V    |
|                           |                      | V <sub>CC</sub> =4.5V, I <sub>OL</sub> =20μA                                          | -    | 0    | 0.1  | V    |
|                           |                      | V <sub>CC</sub> =6.0V, I <sub>OL</sub> =20μA                                          | -    | 0    | 0.1  | V    |
|                           |                      | V <sub>CC</sub> =4.5V, I <sub>OL</sub> =4mA                                           | -    | 0.15 | 0.26 | V    |
|                           |                      | V <sub>CC</sub> =6.0V, I <sub>OL</sub> =5.2mA                                         | -    | 0.16 | 0.26 | V    |
| Input Leakage Current     | I <sub>I(LEAK)</sub> | V <sub>IN</sub> =V <sub>CC</sub> or GND<br>V <sub>CC</sub> =6.0V                      | -    | -    | ±1.0 | μA   |
| Quiescent Supply Current  | I <sub>Q</sub>       | V <sub>IN</sub> =V <sub>CC</sub> or GND<br>V <sub>CC</sub> =6.0V, I <sub>OUT</sub> =0 | -    | -    | 8    | μA   |
| Input Capacitance         | C <sub>IN</sub>      |                                                                                       | -    | 3.5  | -    | pF   |

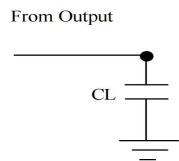
## 11. DYNAMIC CHARACTERISTICS (GND=0V; $t_R=t_F=6\text{ns}$ ; $C_L=50\text{pF}$ , unless otherwise specified)

| PARAMETER                                           | SYMBOL             | TEST CONDITIONS      | MIN | TYP | MAX | UNIT |
|-----------------------------------------------------|--------------------|----------------------|-----|-----|-----|------|
| Propagation Delay From CP to Qn                     | $t_{PHL}, t_{PLH}$ | $V_{CC}=2.0\text{V}$ | -   | 41  | 255 | ns   |
|                                                     |                    | $V_{CC}=4.5\text{V}$ | -   | 15  | 51  | ns   |
|                                                     |                    | $V_{CC}=6.0\text{V}$ | -   | 12  | 43  | ns   |
| Propagation Delay From $\overline{\text{MR}}$ to Qn | $t_{PHL}$          | $V_{CC}=2.0\text{V}$ | -   | 39  | 210 | ns   |
|                                                     |                    | $V_{CC}=4.5\text{V}$ | -   | 14  | 42  | ns   |
|                                                     |                    | $V_{CC}=6.0\text{V}$ | -   | 11  | 36  | ns   |
| Output Transition Time                              | $t_{THL}, t_{TLH}$ | $V_{CC}=2.0\text{V}$ | -   | 19  | 110 | ns   |
|                                                     |                    | $V_{CC}=4.5\text{V}$ | -   | 7   | 22  | ns   |
|                                                     |                    | $V_{CC}=6.0\text{V}$ | -   | 6   | 19  | ns   |
| Clock Pulse Width High or Low                       | $t_W$              | $V_{CC}=2.0\text{V}$ | 80  | 14  | -   | ns   |
|                                                     |                    | $V_{CC}=4.5\text{V}$ | 16  | 5   | -   | ns   |
|                                                     |                    | $V_{CC}=6.0\text{V}$ | 14  | 4   | -   | ns   |
| Master Reset Pulse Width Low                        | $t_W$              | $V_{CC}=2.0\text{V}$ | 60  | 17  | -   | ns   |
|                                                     |                    | $V_{CC}=4.5\text{V}$ | 12  | 6   | -   | ns   |
|                                                     |                    | $V_{CC}=6.0\text{V}$ | 10  | 5   | -   | ns   |
| Removal Time $\overline{\text{MR}}$ to CP           | $t_{rem}$          | $V_{CC}=2.0\text{V}$ | 60  | 17  | -   | ns   |
|                                                     |                    | $V_{CC}=4.5\text{V}$ | 12  | 6   | -   | ns   |
|                                                     |                    | $V_{CC}=6.0\text{V}$ | 10  | 5   | -   | ns   |
| Setup Time DSA and DSB to CP                        | $t_{SU}$           | $V_{CC}=2.0\text{V}$ | 60  | 8   | -   | ns   |
|                                                     |                    | $V_{CC}=4.5\text{V}$ | 12  | 3   | -   | ns   |
|                                                     |                    | $V_{CC}=6.0\text{V}$ | 10  | 2   | -   | ns   |
| Hold Time DSA and DSB to CP                         | $t_H$              | $V_{CC}=2.0\text{V}$ | +4  | -6  | -   | ns   |
|                                                     |                    | $V_{CC}=4.5\text{V}$ | +4  | -2  | -   | ns   |
|                                                     |                    | $V_{CC}=6.0\text{V}$ | +4  | -2  | -   | ns   |
| Maximum Clock Pulse Frequency                       | $f_{MAX}$          | $V_{CC}=2.0\text{V}$ | 6   | 23  | -   | MHZ  |
|                                                     |                    | $V_{CC}=4.5\text{V}$ | 30  | 71  | -   | MHZ  |
|                                                     |                    | $V_{CC}=6.0\text{V}$ | 35  | 85  | -   | MHZ  |
| Clock Frequency                                     | $f_{CLOCK}$        | $V_{CC}=2.0\text{V}$ | -   | -   | 6   | MHz  |
|                                                     |                    | $V_{CC}=4.5\text{V}$ | -   | -   | 31  | MHz  |
|                                                     |                    | $V_{CC}=6.0\text{V}$ | -   | -   | 36  | MHz  |

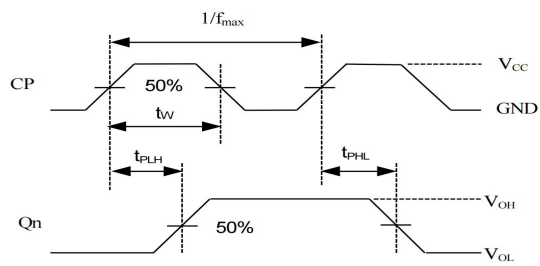
## 12. OPERATING CHARACTERISTICS

| PARAMETER                     | SYMBOL   | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|-------------------------------|----------|-----------------|-----|-----|-----|------|
| Power Dissipation Capacitance | $C_{PD}$ | No load         | -   | 40  | -   | pF   |

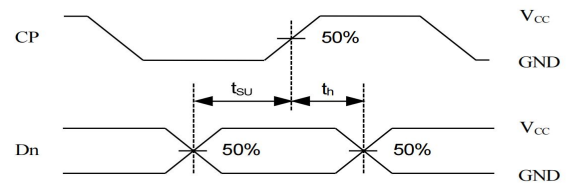
## 13. TEST CIRCUIT AND WAVEFORMS



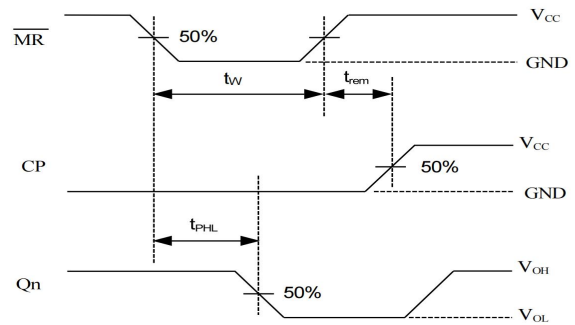
TEST CIRCUIT



PROPAGATION DELAY TIMES FROM CP TO Qn



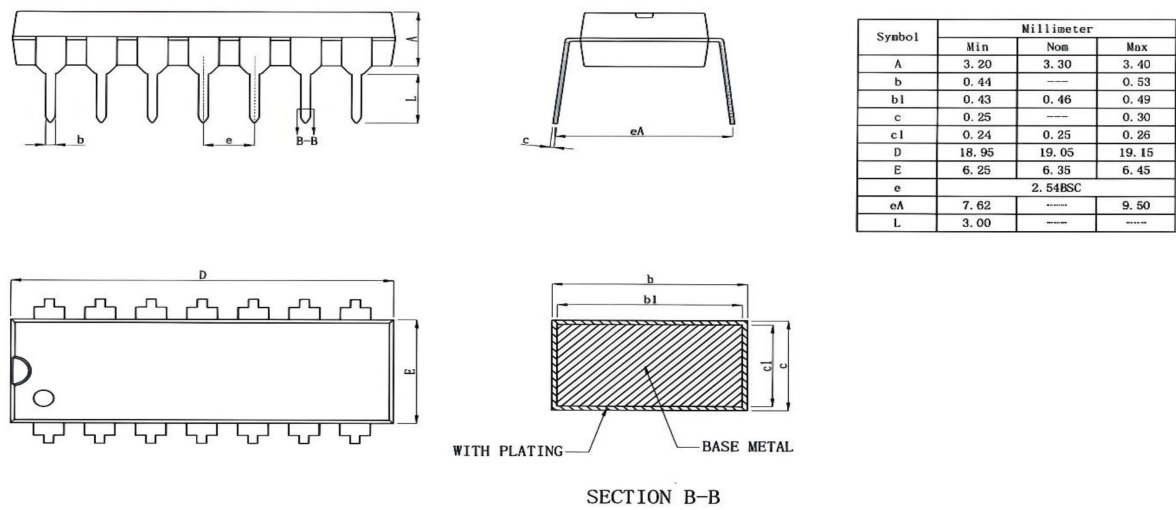
SETUP TIME AND HOLD TIME



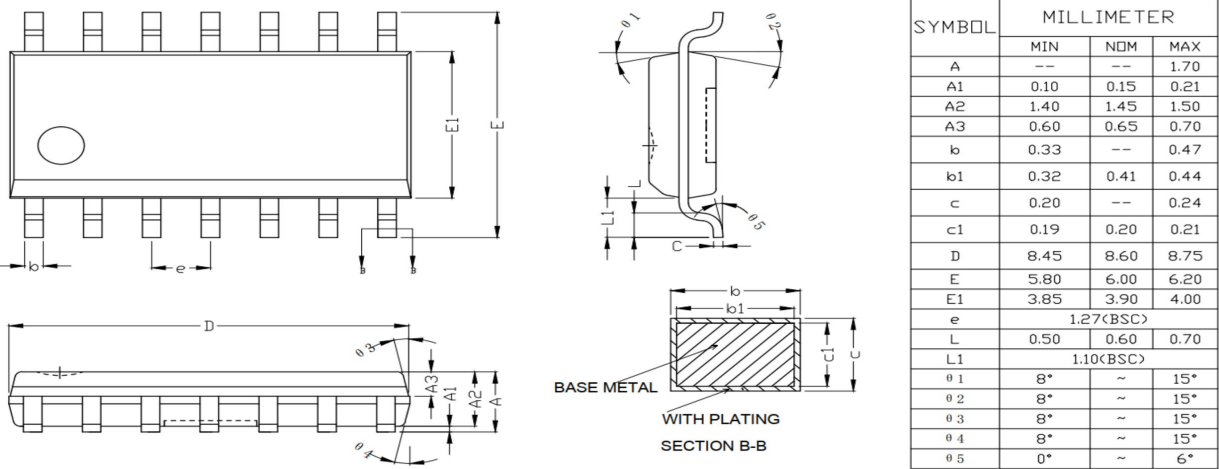
PROPAGATION DELAY TIMES FROM  $\overline{MR}$  TO Qn

14. PACKAGE INFORMATION

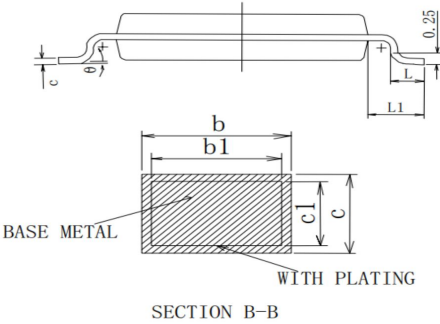
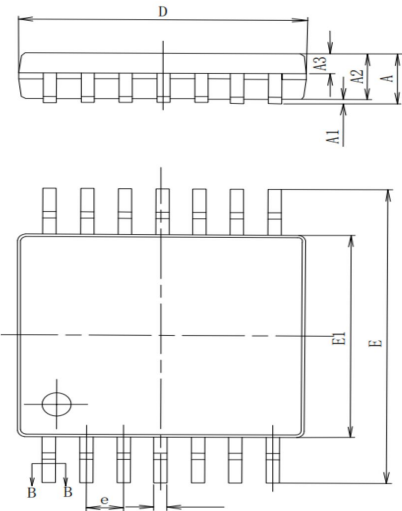
DIP 14 package information



SOP 14 package information



TSSOP 14 package information



| SYMBOL | MILLIMETER |      |      |
|--------|------------|------|------|
|        | MIN        | NOM  | MAX  |
| A      | —          | —    | 1.20 |
| A1     | 0.05       | —    | 0.15 |
| A2     | 0.90       | 1.00 | 1.05 |
| A3     | 0.39       | 0.44 | 0.49 |
| b      | 0.20       | —    | 0.28 |
| b1     | 0.19       | 0.22 | 0.25 |
| c      | 0.13       | —    | 0.17 |
| c1     | 0.12       | 0.13 | 0.14 |
| D      | 4.90       | 5.00 | 5.10 |
| E1     | 4.30       | 4.40 | 4.50 |
| E      | 6.20       | 6.40 | 6.60 |
| e      | 0.65BSC    |      |      |
| L      | 0.45       | 0.60 | 0.75 |
| L1     | 1.00BSC    |      |      |
| θ      | 0          | —    | 8°   |













