

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74AC32P, TC74AC32F, TC74AC32FN, TC74AC32FT

Quad 2-Input OR Gate

The TC74AC32 is an advanced high speed CMOS 2-INPUT OR GATE fabricated with silicon gate and double-layer metal wiring C²MOS technology.

It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

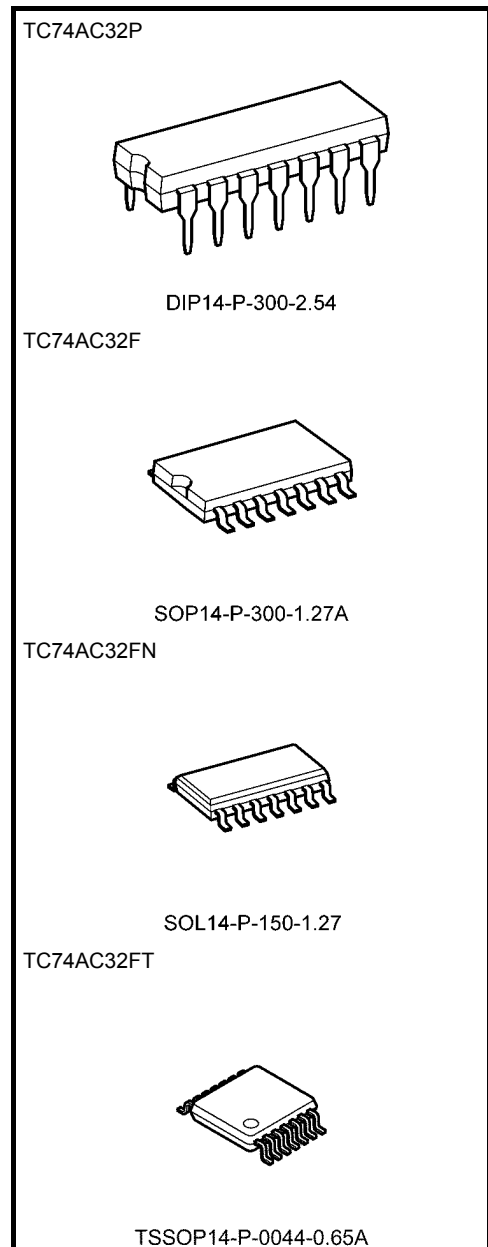
The internal circuit is composed of 2 stages including buffer output, which provide high noise immunity and stable output.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.

Features

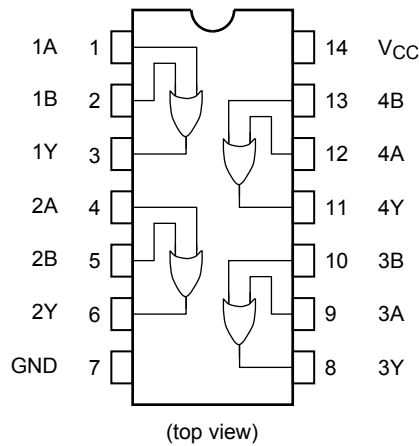
- High speed: $t_{pd} = 4.1 \text{ ns (typ.)}$ at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 4 \mu\text{A (max)}$ at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (min)
- Symmetrical output impedance: $|I_{OH}| = I_{OL} = 24 \text{ mA (min)}$
Capability of driving 50Ω transmission lines.
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range: $V_{CC (opr)} = 2 \text{ to } 5.5 \text{ V}$
- Pin and function compatible with 74F32

Note: xxxFN (JEDEC SOP) is not available in Japan.

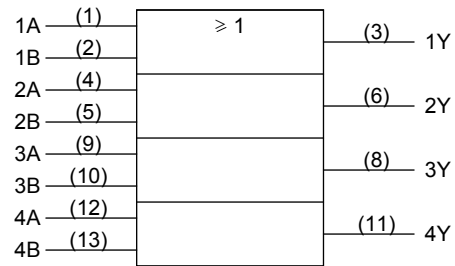


| | |
|----------------------|-----------------|
| Weight | |
| DIP14-P-300-2.54 | : 0.96 g (typ.) |
| SOP14-P-300-1.27A | : 0.18 g (typ.) |
| SOL14-P-150-1.27 | : 0.12 g (typ.) |
| TSSOP14-P-0044-0.65A | : 0.06 g (typ.) |

Pin Assignment



IEC Logic Symbol



Truth Table

| A | B | Y |
|---|---|---|
| H | H | H |
| L | H | H |
| H | L | H |
| L | L | L |

Absolute Maximum Ratings (Note 1)

| Characteristics | Symbol | Rating | Unit |
|-----------------------------|-----------|------------------------------------|-------------|
| Supply voltage range | V_{CC} | -0.5 to 7.0 | V |
| DC input voltage | V_{IN} | -0.5 to $V_{CC} + 0.5$ | V |
| DC output voltage | V_{OUT} | -0.5 to $V_{CC} + 0.5$ | V |
| Input diode current | I_{IK} | ± 20 | mA |
| Output diode current | I_{OK} | ± 50 | mA |
| DC output current | I_{OUT} | ± 50 | mA |
| DC V_{CC} /ground current | I_{CC} | ± 100 | mA |
| Power dissipation | P_D | 500 (DIP) (Note 2)/180 (SOP/TSSOP) | mW |
| Storage temperature | T_{stg} | -65 to 150 | $^{\circ}C$ |

Note 1: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 2: 500 mW in the range of $T_a = -40$ to $65^{\circ}C$. From $T_a = 65$ to $85^{\circ}C$ a derating factor of -10 mW/ $^{\circ}C$ should be applied up to 300 mW.

Operating Ranges (Note)

| Characteristics | Symbol | Rating | Unit |
|--------------------------|-----------|---|------|
| Supply voltage | V_{CC} | 2.0 to 5.5 | V |
| Input voltage | V_{IN} | 0 to V_{CC} | V |
| Output voltage | V_{OUT} | 0 to V_{CC} | V |
| Operating temperature | T_{opr} | -40 to 85 | °C |
| Input rise and fall time | dt/dV | 0 to 100 ($V_{CC} = 3.3 \pm 0.3$ V) 0 to 20 ($V_{CC} = 5 \pm 0.5$ V) | ns/V |

Note: The operating ranges must be maintained to ensure the normal operation of the device.
Unused inputs must be tied to either V_{CC} or GND.

Electrical Characteristics

DC Characteristics

| Characteristics | Symbol | Test Condition | V_{CC} (V) | $T_a = 25^\circ\text{C}$ | | | $T_a = -40$ to 85°C | | Unit | |
|---------------------------|----------|-------------------------------|---|--------------------------|------|-----------|-----------------------------------|-----------|---------------|---|
| | | | | Min | Typ. | Max | Min | Max | | |
| High-level input voltage | V_{IH} | — | 2.0 | 1.50 | — | — | 1.50 | — | V | |
| | | | 3.0 | 2.10 | — | — | 2.10 | — | | |
| | | | 5.5 | 3.85 | — | — | 3.85 | — | | |
| Low-level input voltage | V_{IL} | — | 2.0 | — | — | 0.50 | — | 0.50 | V | |
| | | | 3.0 | — | — | 0.90 | — | 0.90 | | |
| | | | 5.5 | — | — | 1.65 | — | 1.65 | | |
| High-level output voltage | V_{OH} | $V_{IN} = V_{IH}$ or V_{IL} | $I_{OH} = -50 \mu\text{A}$ | 2.0 | 1.9 | 2.0 | — | 1.9 | — | V |
| | | | | 3.0 | 2.9 | 3.0 | — | 2.9 | — | |
| | | | $I_{OH} = -4 \text{ mA}$ $I_{OH} = -24 \text{ mA}$ $I_{OH} = -75 \text{ mA}$ (Note) | 3.0 | 2.58 | — | — | 2.48 | — | |
| | | | | 4.5 | 3.94 | — | — | 3.80 | — | |
| | | | | 5.5 | — | — | — | 3.85 | — | |
| Low-level output voltage | V_{OL} | $V_{IN} = V_{IL}$ | $I_{OL} = 50 \mu\text{A}$ | 2.0 | — | 0.0 | 0.1 | — | 0.1 | V |
| | | | | 3.0 | — | 0.0 | 0.1 | — | 0.1 | |
| | | | | 4.5 | — | 0.0 | 0.1 | — | 0.1 | |
| | | | $I_{OL} = 12 \text{ mA}$ $I_{OL} = 24 \text{ mA}$ $I_{OL} = 75 \text{ mA}$ (Note) | 3.0 | — | — | 0.36 | — | 0.44 | |
| | | | | 4.5 | — | — | 0.36 | — | 0.44 | |
| 5.5 | — | — | — | — | 1.65 | — | | | | |
| Input leakage current | I_{IN} | $V_{IN} = V_{CC}$ or GND | 5.5 | — | — | ± 0.1 | — | ± 1.0 | μA | |
| Quiescent supply current | I_{CC} | $V_{IN} = V_{CC}$ or GND | 5.5 | — | — | 4.0 | — | 40.0 | μA | |

Note: This spec indicates the capability of driving 50Ω transmission lines.
One output should be tested at a time for a 10 ms maximum duration.

AC Characteristics ($C_L = 50 \text{ pF}$, $R_L = 500 \Omega$, input: $t_r = t_f = 3 \text{ ns}$)

| Characteristics | Symbol | Test Condition | Ta = 25°C | | | Ta = -40 to 85°C | | Unit | |
|-------------------------------|-----------|----------------|---------------|-----|------|------------------|-----|------|-----|
| | | | VCC (V) | Min | Typ. | Max | Min | | Max |
| Propagation delay time | t_{pLH} | — | 3.3 ± 0.3 | — | 6.1 | 10.3 | 1.0 | 11.9 | ns |
| | t_{pHL} | | 5.0 ± 0.5 | — | 5.2 | 7.4 | 1.0 | 8.5 | |
| Input capacitance | C_{IN} | — | — | 5 | 10 | — | 10 | pF | |
| Power dissipation capacitance | C_{PD} | (Note) | — | 64 | — | — | — | pF | |

Note: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation:

$$I_{CC (opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/4 \text{ (per gate)}$$

Package Dimensions

DIP14-P-300-2.54

Unit : mm



Weight: 0.96 g (typ.)

Package Dimensions

SOP14-P-300-1.27A

Unit: mm

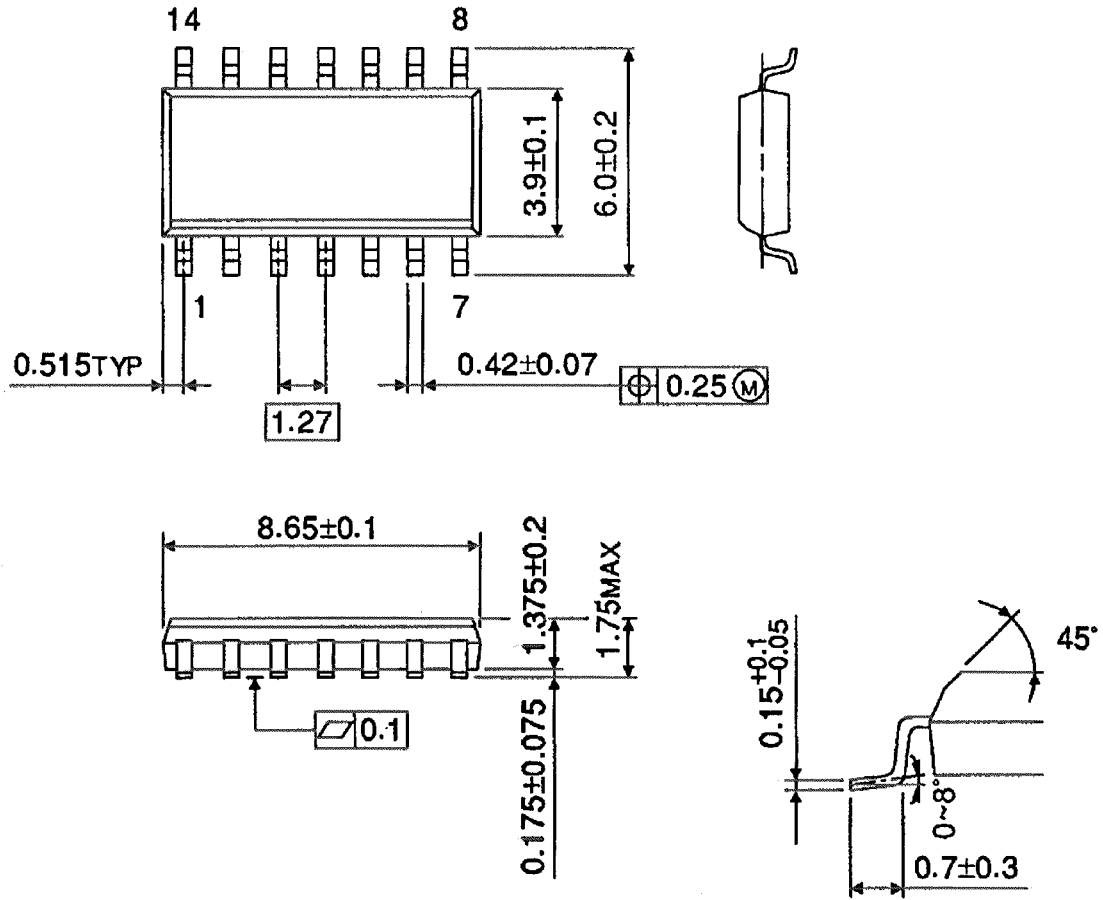


Weight: 0.18 g (typ.)

Package Dimensions (Note)

SOL14-P-150-1.27

Unit : mm



Note: This package is not available in Japan.

Weight: 0.12 g (typ.)

Package Dimensions

TSSOP14-P-0044-0.65A

Unit: mm



Weight: 0.06 g (typ.)

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