

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74VHC32F, TC74VHC32FK

Quad 2-Input OR Gate

The TC74VHC32 is an advanced high speed CMOS 2-INPUT OR GATE fabricated with silicon gate C²MOS technology.

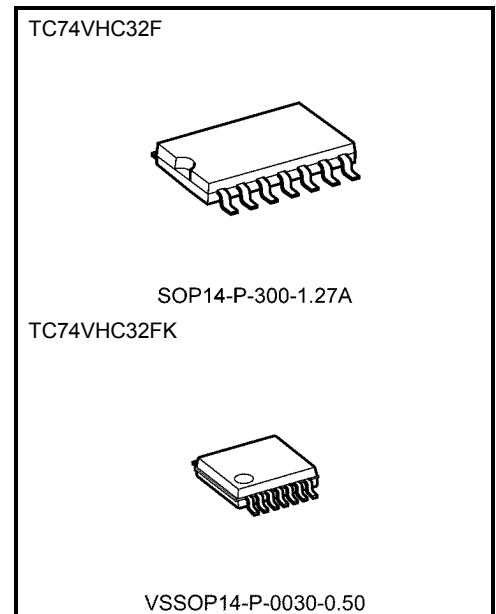
It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

The internal circuit is composed of 4 stages including buffer output, which provide high noise immunity and stable output.

An input protection circuit ensures that 0 to 5.5 V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5 V to 3 V systems and two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

Features

- High speed: $t_{pd} = 3.8 \text{ ns (typ.)}$ at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 2 \mu\text{A (max)}$ at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (min)}$
- Power down protection is provided on all inputs.
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range: $V_{CC} \text{ (opr)} = 2 \text{ V to } 5.5 \text{ V}$
- Low noise: $V_{OLP} = 0.8 \text{ V (max)}$
- Pin and function compatible with 74ALS32

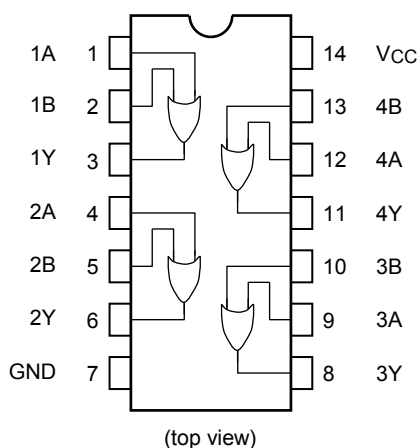


Weight

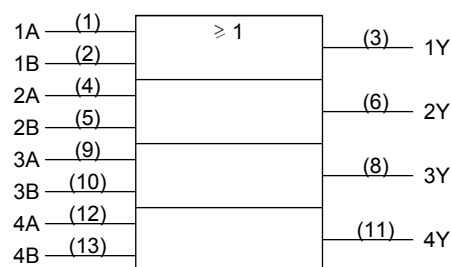
| | |
|---------------------|-----------------|
| SOP14-P-300-1.27A | : 0.18 g (typ.) |
| VSSOP14-P-0030-0.50 | : 0.02 g (typ.) |

Start of commercial production
1991-05

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)

| Characteristics | Symbol | Rating | Unit |
|------------------------------------|------------------|-------------------------------|------|
| Supply voltage range | V _{CC} | -0.5 to 7.0 | V |
| DC input voltage | V _{IN} | -0.5 to 7.0 | 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} | ±20 | mA |
| DC output current | I _{OUT} | ±25 | mA |
| DC V _{CC} /ground current | I _{CC} | ±50 | mA |
| Power dissipation | P _D | 180 | mW |
| Storage temperature | T _{stg} | -65 to 150 | °C |

Note: 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).

Operating Ranges (Note)

| Characteristics | Symbol | Rating | Unit |
|--------------------------|------------------|---|------|
| Supply voltage | V _{CC} | 2.0 to 5.5 | V |
| Input voltage | V _{IN} | 0 to 5.5 | 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 ± 0.3 V) 0 to 20 (V _{CC} = 5 ± 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 | | Ta = 25°C | | | Ta = -40 to 85°C | | Unit | |
|---------------------------|--------|--------------------|----------------------------|-------------------|-------------------|--------|---------------------|-------------------|-------------------|-----|
| | | | | VCC (V) | Min | Typ. | Max | Min | | Max |
| High-level input voltage | VIH | — | | 2.0 3.0 to 5.5 | 1.50 VCC × 0.7 | — — | — — | 1.50 VCC × 0.7 | — — | V |
| Low-level input voltage | VIL | — | | 2.0 3.0 to 5.5 | — — | — — | 0.50 VCC × 0.3 | — — | 0.50 VCC × 0.3 | V |
| High-level output voltage | VOH | VIN = VIH or VIL | IOH = -50 μA | 2.0 | 1.9 | 2.0 | — | 1.9 | — | V |
| | | | | 3.0 | 2.9 | 3.0 | — | 2.9 | — | |
| | | | IOH = -4 mA IOH = -8 mA | 4.5 | 4.4 | 4.5 | — | 4.4 | — | |
| | | | | 3.0 4.5 | 2.58 3.94 | — — | — — | 2.48 3.80 | — — | |
| Low-level output voltage | VOL | VIN = VIL | IOL = 50 μA | 2.0 | — | 0.0 | 0.1 | — | 0.1 | V |
| | | | | 3.0 | — | 0.0 | 0.1 | — | 0.1 | |
| | | | IOL = 4 mA IOL = 8 mA | 4.5 | — | 0.0 | 0.1 | — | 0.1 | |
| | | | | 3.0 4.5 | — — | — — | 0.36 0.36 | — — | 0.44 0.44 | |
| Input leakage current | IIN | VIN = 5.5 V or GND | | 0 to 5.5 | — | — | ±0.1 | — | ±1.0 | μA |
| Quiescent supply current | ICC | VIN = VCC or GND | | 5.5 | — | — | 2.0 | — | 20.0 | μA |

AC Characteristics (input: $t_r = t_f = 3 \text{ ns}$)

| Characteristics | Symbol | Test Condition | | Ta = 25°C | | | Ta = -40 to 85°C | | Unit |
|-------------------------------|------------------------|----------------|---------|-----------|------|------|------------------|------|------|
| | | VCC (V) | CL (pF) | Min | Typ. | Max | Min | Max | |
| Propagation delay time | t_{pLH} t_{pHL} | 3.3 ± 0.3 | 15 | — | 5.5 | 7.9 | 1.0 | 9.5 | ns |
| | | | 50 | — | 8.0 | 11.4 | 1.0 | 13.0 | |
| | | 5.0 ± 0.5 | 15 | — | 3.8 | 5.5 | 1.0 | 6.5 | |
| | | | 50 | — | 5.3 | 7.5 | 1.0 | 8.5 | |
| Input capacitance | CIN | — | | — | 4 | 10 | — | 10 | pF |
| Power dissipation capacitance | CPD | (Note) | | — | 14 | — | — | — | pF |

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

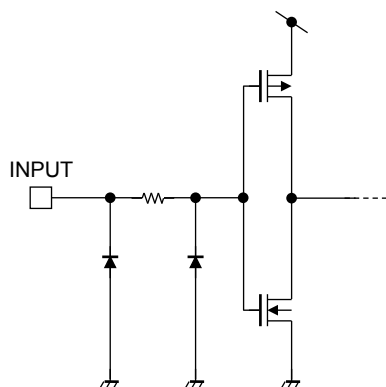
Average operating current can be obtained by the equation:

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

Noise Characteristics (input: $t_r = t_f = 3 \text{ ns}$)

| Characteristics | Symbol | Test Condition | Ta = 25°C | | Unit |
|--|--------|----------------|-----------|------------|------|
| | | | VCC (V) | Typ. Limit | |
| Quiet output maximum dynamic VOL | VOLP | CL = 50 pF | 5.0 | 0.3 0.8 | V |
| Quiet output minimum dynamic VOL | VOLV | CL = 50 pF | 5.0 | -0.3 -0.8 | V |
| Minimum high level dynamic input voltage | VIHD | CL = 50 pF | 5.0 | — 3.5 | V |
| Maximum low level dynamic input voltage | VILD | CL = 50 pF | 5.0 | — 1.5 | V |

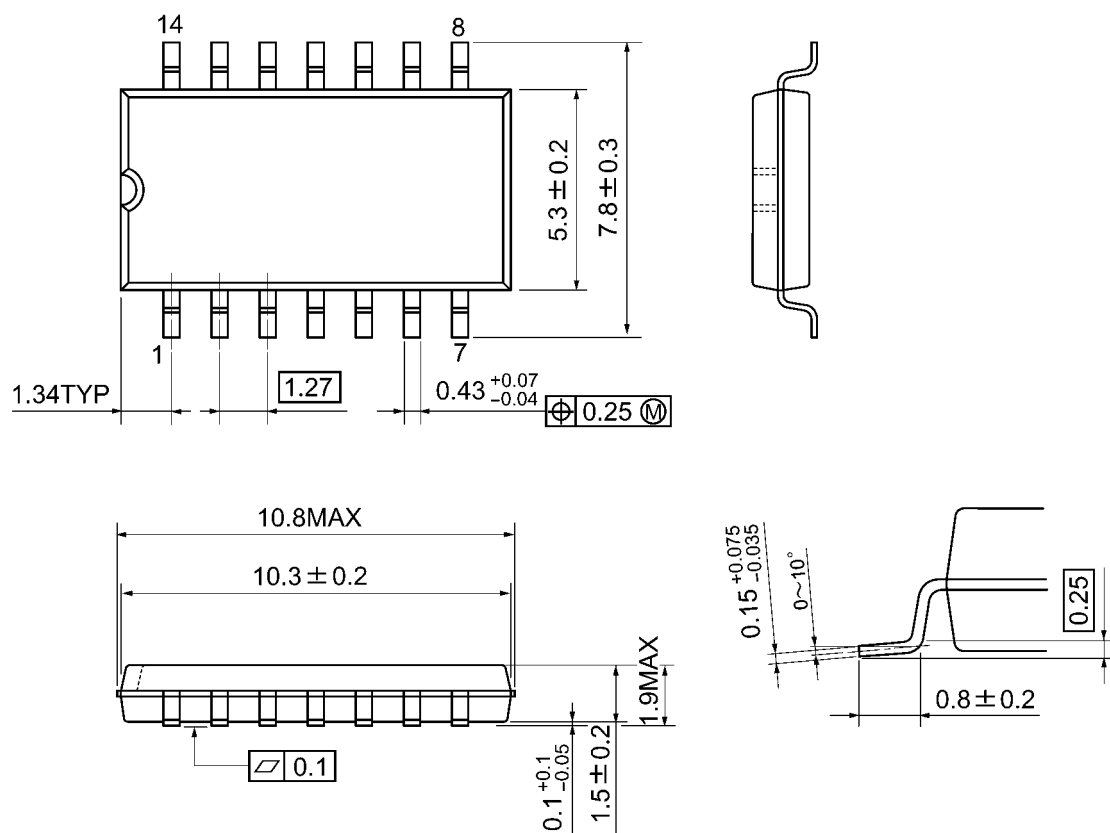
Input Equivalent Circuit



Package Dimensions

SOP14-P-300-1.27A

Unit: mm

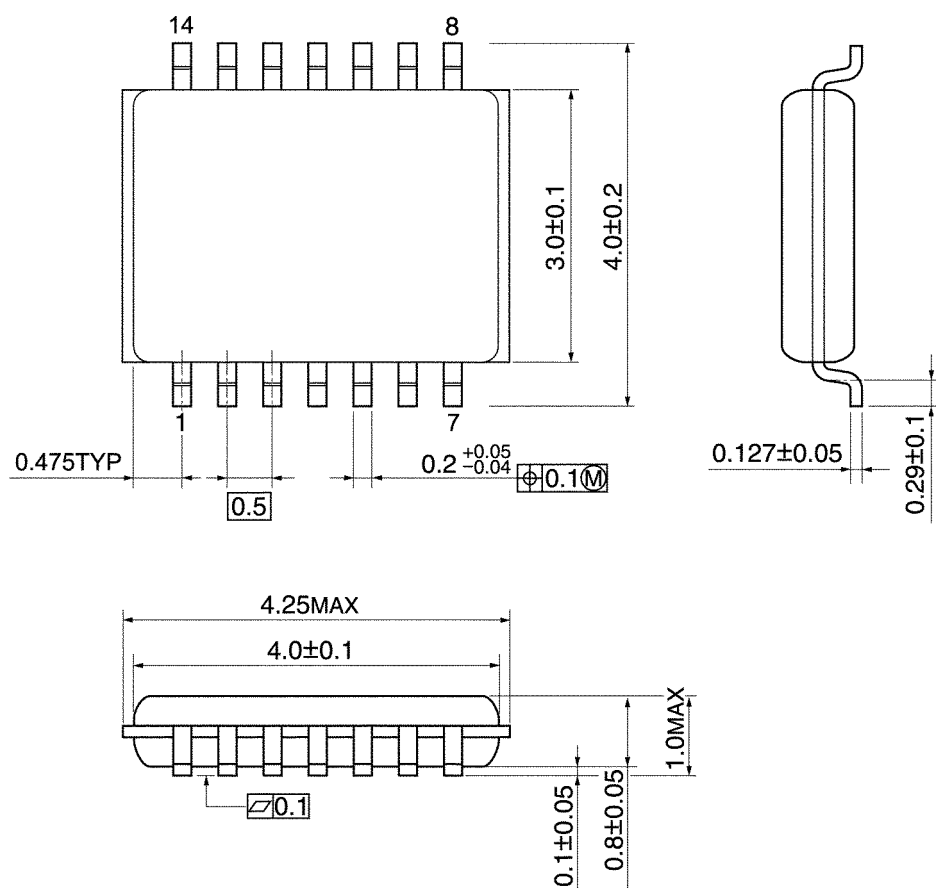


Weight: 0.18 g (typ.)

Package Dimensions

VSSOP14-P-0030-0.50

Unit: mm



Weight: 0.02 g (typ.)

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