

TC74VHC27F, TC74VHC27FN, TC74VHC27FT, TC74VHC27FK

Triple 3-Input NOR Gate

The TC74VHC27 is an advanced high speed CMOS 3-INPUT NOR 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.

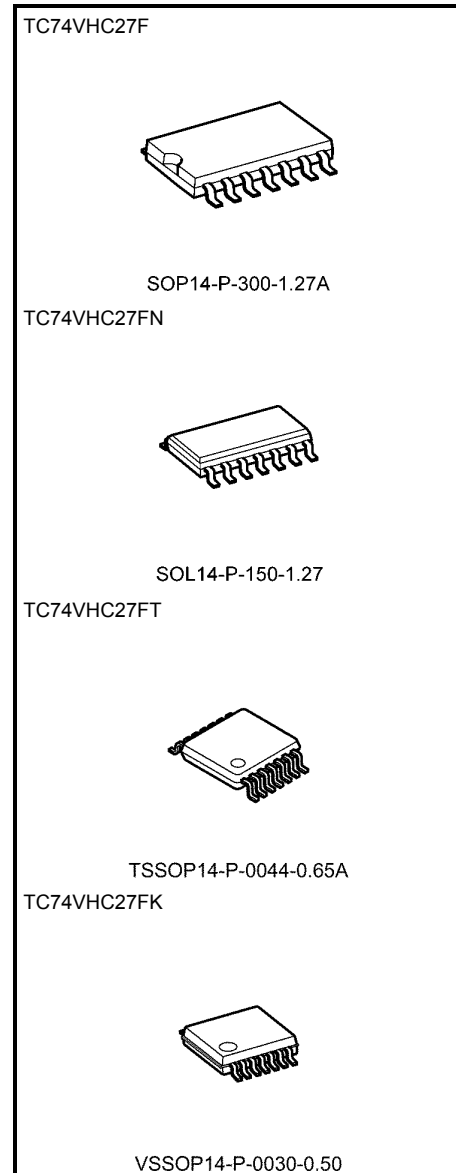
The internal circuit is composed of 3 stages including a buffer output, which provide high noise immunity and stable output.

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

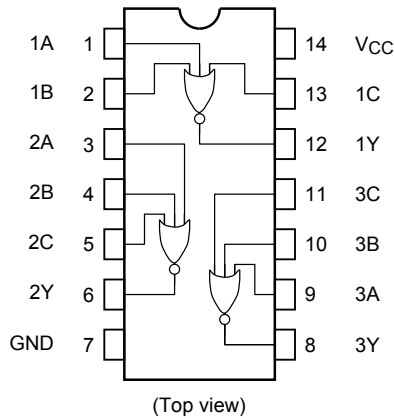
- High speed: $t_{pd} = 4.1 \text{ ns (typ.)}$ at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 2 \mu\text{A (max)}$ at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (min)}$
- Power down protection is provided on all inputs.
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range: $V_{CC} \text{ (opr)} = 2 \text{ to } 5.5 \text{ V}$
- Pin and function compatible with 74ALS27

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

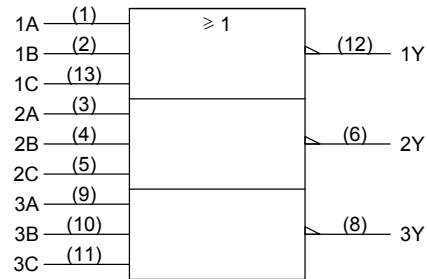


| | |
|-----------------------|---------------|
| Weight | |
| SOP14-P-300-1.27A: | 0.18 g (typ.) |
| SOL14-P-150-1.27: | 0.12 g (typ.) |
| TSSOP14-P-0044-0.65A: | 0.06 g (typ.) |
| VSSOP14-P-0030-0.50: | 0.02 g (typ.) |

Pin Assignment



IEC Logic Symbol



Truth Table

| A | B | C | Y |
|---|---|---|---|
| H | X | X | L |
| X | H | X | L |
| X | X | H | L |
| L | L | L | H |

X: Don't care

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 ($V_{CC} = 3.3 \pm 0.3$ 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 | $T_a = 25^\circ\text{C}$ | | | | $T_a = -40$ to 85°C | | Unit | | |
|---------------------------|----------|---------------------------------|----------------------------|--|-------------------|-----------------------------|-----------------------------------|-----------------------------|-------------------|---|---|
| | | | V_{CC} (V) | Min | Typ. | Max | Min | Max | | | |
| High-level input voltage | V_{IH} | — | 2.0 3.0 to 5.5 | 1.50 $V_{CC} \times 0.7$ | — — | — — | 1.50 $V_{CC} \times 0.7$ | — — | V | | |
| Low-level input voltage | V_{IL} | — | 2.0 3.0 to 5.5 | — — | — — | 0.50 $V_{CC} \times 0.3$ | — — | 0.50 $V_{CC} \times 0.3$ | V | | |
| High-level output voltage | V_{OH} | $V_{IN} = V_{IL}$ | $I_{OH} = -50 \mu\text{A}$ | 2.0 3.0 4.5 | 1.9 2.9 4.4 | 2.0 3.0 4.5 | — — — | 1.9 2.9 4.4 | — — — | V | |
| | | | $I_{OH} = -4 \text{ mA}$ | 3.0 4.5 | 2.58 3.94 | — — | — — | 2.48 3.80 | — — | | |
| | | | $I_{OL} = 50 \mu\text{A}$ | 2.0 3.0 4.5 | — — — | 0.0 0.0 0.0 | 0.1 0.1 0.1 | — — — | 0.1 0.1 0.1 | | V |
| | | | | $I_{OL} = 4 \text{ mA}$ $I_{OL} = 8 \text{ mA}$ | 3.0 4.5 | — — | — — | 0.36 0.36 | — — | | |
| Input leakage current | I_{IN} | $V_{IN} = 5.5 \text{ V}$ or GND | 0 to 5.5 | — | — | ± 0.1 | — | ± 1.0 | μA | | |
| Quiescent supply current | I_{CC} | $V_{IN} = V_{CC}$ or GND | 5.5 | — | — | 2.0 | — | 20.0 | μA | | |

AC Characteristics (input: $t_r = t_f = 3$ ns)

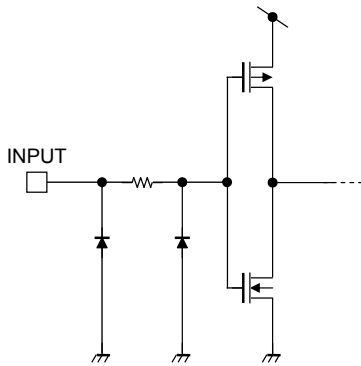
| Characteristics | Symbol | Test Condition | | Ta = 25°C | | | Ta = -40 to 85°C | | Unit | |
|-------------------------------|------------------|---------------------|---------------------|-----------|------|-----|------------------|-----|------|----|
| | | V _{CC} (V) | C _L (pF) | Min | Typ. | Max | Min | Max | | |
| Propagation delay time | t _{pLH} | — | 3.3 ± 0.3 | 15 | — | 6.2 | 8.8 | 1.0 | 10.5 | ns |
| | | | | 50 | — | 8.7 | 12.3 | 1.0 | 14.0 | |
| | t _{pHL} | | 5.0 ± 0.5 | 15 | — | 4.1 | 5.9 | 1.0 | 7.0 | |
| | | | | 50 | — | 5.6 | 7.9 | 1.0 | 9.0 | |
| Input capacitance | C _{IN} | — | | — | 4 | 10 | — | 10 | pF | |
| Power dissipation capacitance | C _{PD} | — | | (Note) | — | 20 | — | — | 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:

$$I_{CC (opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 3 \text{ (per gate)}$$

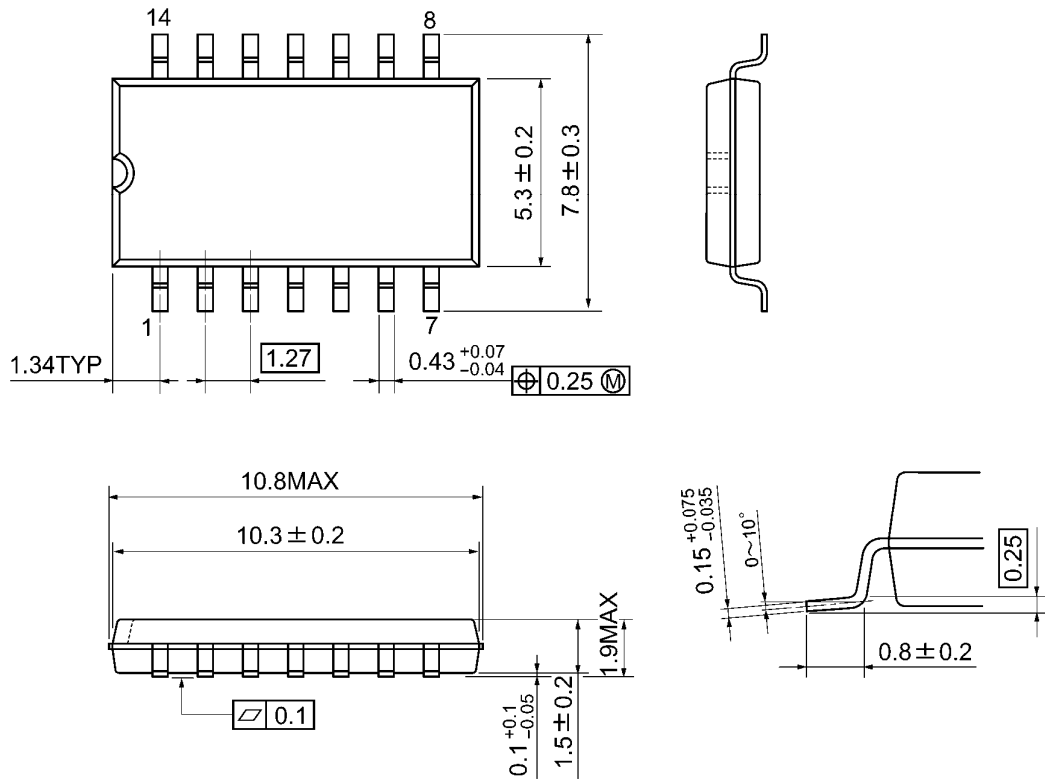
Input Equivalent Circuit



Package Dimensions

SOP14-P-300-1.27A

Unit: mm

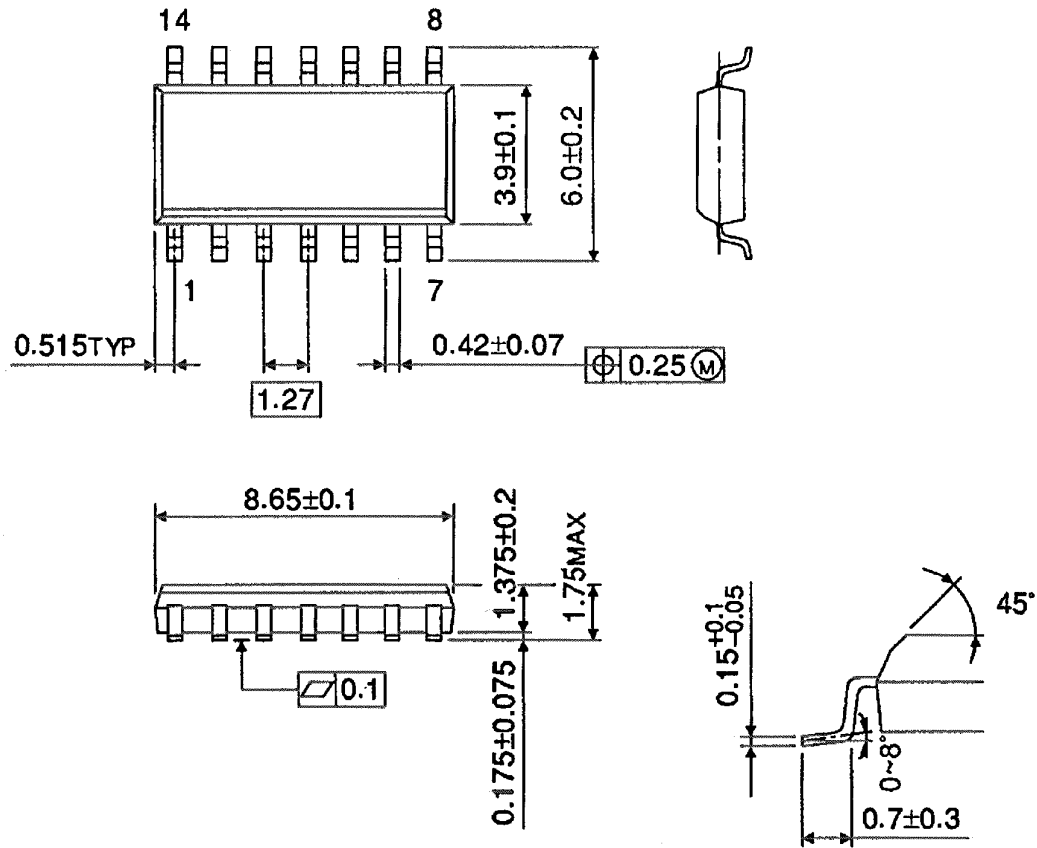


Weight: 0.18 g (typ.)

Package Dimensions (Note)

SOL14-P-150-1.27

Unit : mm



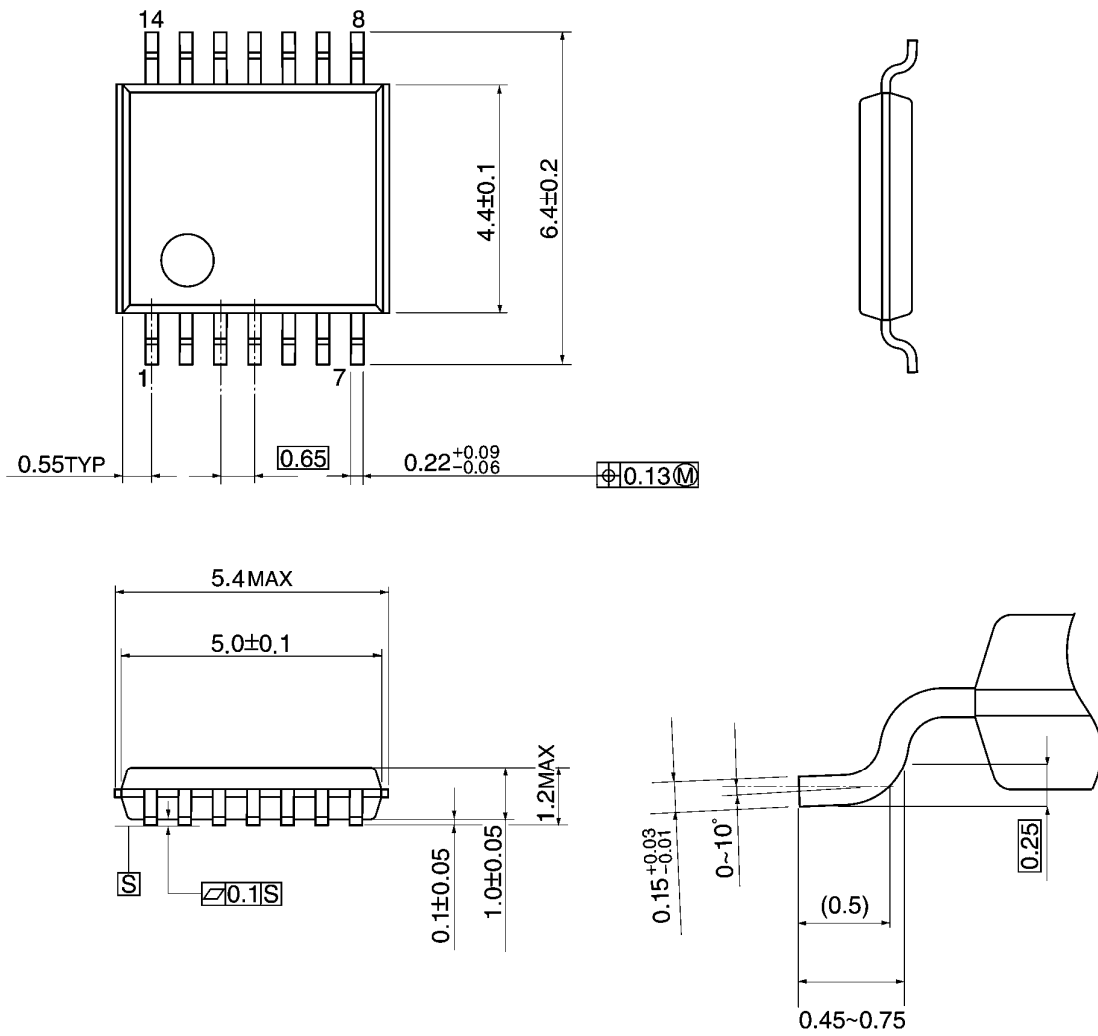
Note: This package is not available in Japan.

Weight: 0.12 g (typ.)

Package Dimensions

TSSOP14-P-0044-0.65A

Unit: mm

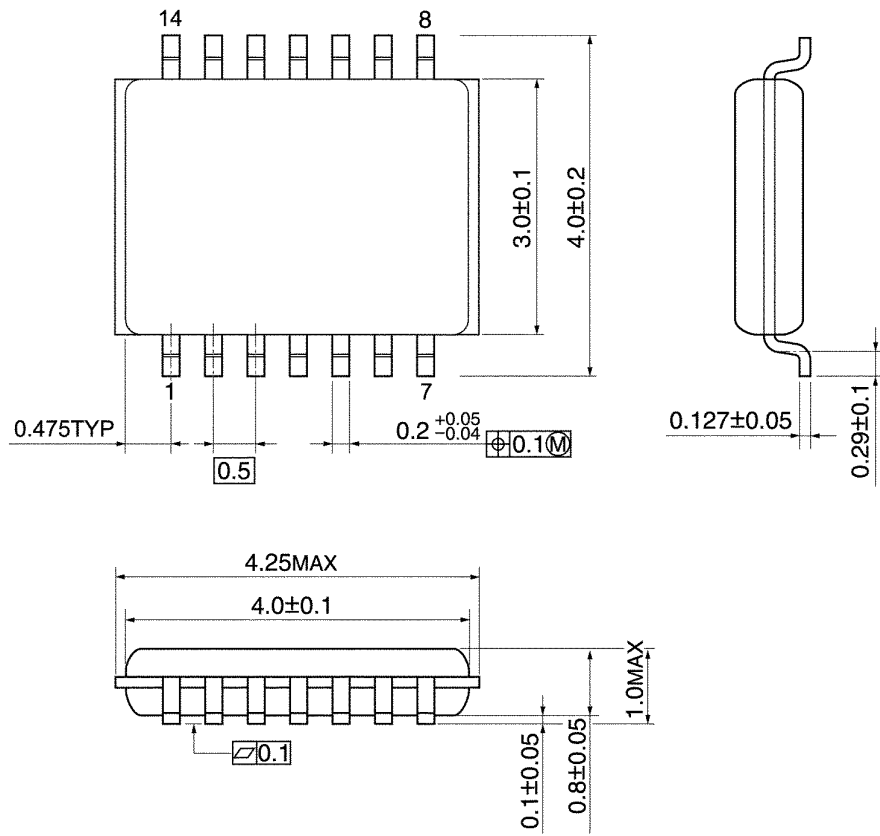


Weight: 0.06 g (typ.)

Package Dimensions

VSSOP14-P-0030-0.50

Unit: mm



Weight: 0.02 g (typ.)

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20070701-EN GENERAL

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