

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74AC240P, TC74AC240F, TC74AC240FT TC74AC244P, TC74AC244F, TC74AC244FT

Octal Bus Buffer

| | |
|-----------------|-------------------------------|
| TC74AC240P/F/FT | Inverted, 3-State Outputs |
| TC74AC244P/F/FT | Non-Inverted, 3-State Outputs |

The TC74AC240 and 244 are advanced high speed CMOS OCTAL BUS BUFFERS fabricated with silicon gate and double-layer metal wiring C²MOS technology.

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

The 74AC240 is an inverting 3-state buffer while the 74AC244 is non-inverting. Both devices have two active-low output enables.

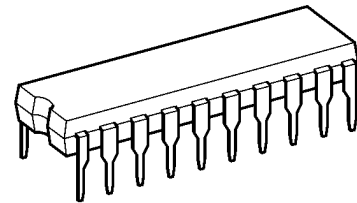
These devices are designed to be used in such applications as 3-state memory address drivers.

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

Features

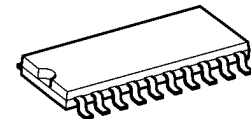
- High speed: $t_{pd} = 4.0 \text{ ns (typ.)}$ at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 8 \mu\text{A (max)}$ at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (min)}$
- Symmetrical output impedance: $|I_{OH}| = I_{OL} = 24 \text{ mA (min)}$
Capability of driving 50Ω transmission lines.
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range: $V_{CC} \text{ (opr)} = 2 \text{ to } 5.5 \text{ V}$
- Pin and function compatible with 74F240/244

TC74AC240P, TC74AC244P



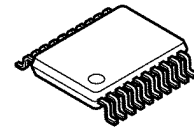
DIP20-P-300-2.54A

TC74AC240F, TC74AC244F



SOP20-P-300-1.27A

TC74AC240FT, TC74AC244FT



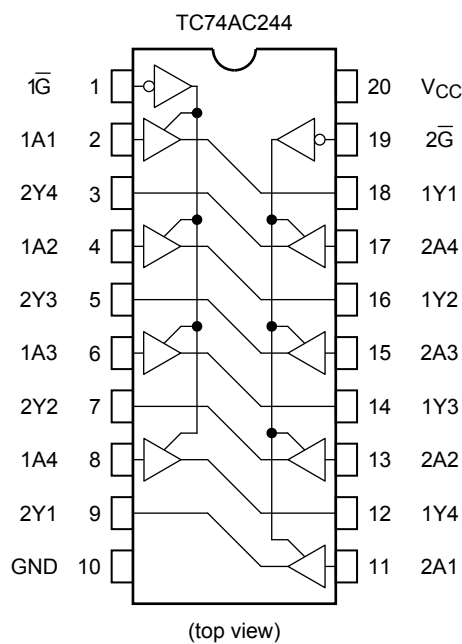
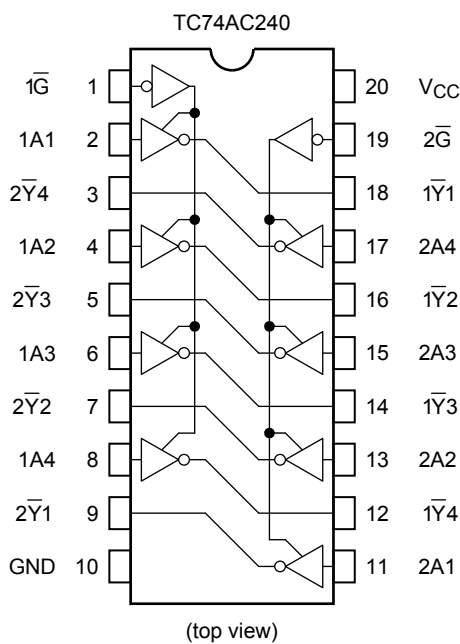
TSSOP20-P-0044-0.65A

Weight

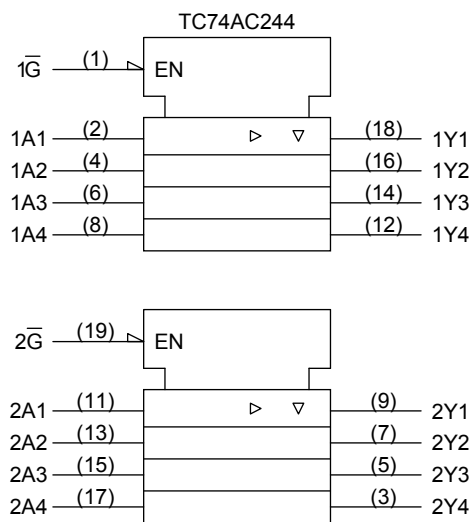
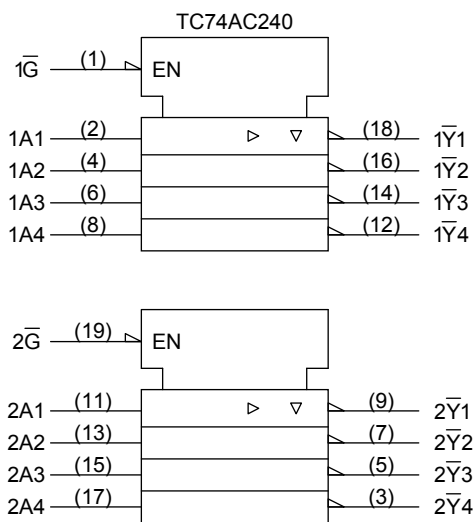
| | |
|----------------------|-----------------|
| DIP20-P-300-2.54A | : 1.30 g (typ.) |
| SOP20-P-300-1.27A | : 0.22 g (typ.) |
| TSSOP20-P-0044-0.65A | : 0.08 g (typ.) |

Start of commercial production
1986-05

Pin Assignment



IEC Logic Symbol



Truth Table

| Inputs | | Outputs | |
|----------------|-------|-------------|------------------------|
| \overline{G} | A_n | Y_n (244) | \overline{Y}_n (240) |
| L | L | L | H |
| L | H | H | L |
| H | X | Z | Z |

X: Don't care

Z: High impedance

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} | ± 200 | mA |
| Power dissipation | P_D | 500 (DIP) (Note 2)/180 (SOP/TSSOP) | mW |
| Storage temperature | T_{stg} | -65 to 150 | °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°C . From $T_a = 65$ to 85°C , a derating factor of -10 mW/°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 | | Ta = 25°C | | | Ta = -40 to 85°C | | Unit |
|----------------------------------|-----------------|---|---------------------------------|------------------------|----------------------|-------------------|----------------------|----------------------|------|
| | | | | V _{CC} (V) | Min | Typ. | Max | Min | Max |
| High-level input voltage | V _{IH} | — | | 2.0 3.0 5.5 | 1.50 2.10 3.85 | — — — | — — — | 1.50 2.10 3.85 | V |
| Low-level input voltage | V _{IL} | — | | 2.0 3.0 5.5 | — — — | — — — | 0.50 0.90 1.65 | — 0.90 1.65 | V |
| High-level output voltage | V _{OH} | V _{IN} = V _{IH} or V _{IL} | I _{OH} = -50 µA | 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 mA | 3.0 | 2.58 | — | — | 2.48 | |
| | | | I _{OH} = -24 mA | 4.5 | 3.94 | — | — | 3.80 | |
| | | | I _{OH} = -75 mA (Note) | 5.5 | — | — | — | 3.85 | |
| Low-level output voltage | V _{OL} | V _{IN} = V _{IH} or V _{IL} | I _{OL} = 50 µA | 2.0 3.0 4.5 | — — — | 0.0 0.0 0.0 | 0.1 0.1 0.1 | — — — | V |
| | | | I _{OL} = 12 mA | 3.0 | — | — | 0.36 | — | |
| | | | I _{OL} = 24 mA | 4.5 | — | — | 0.36 | — | |
| | | | I _{OL} = 75 mA (Note) | 5.5 | — | — | — | — | |
| 3-state output off-state current | I _{OZ} | V _{IN} = V _{IH} or V _{IL} V _{OUT} = V _{CC} or GND | | 5.5 | — | — | ±0.5 | — | µA |
| Input leakage current | I _{IN} | V _{IN} = V _{CC} or GND | | 5.5 | — | — | ±0.1 | — | µA |
| Quiescent supply current | I _{CC} | V _{IN} = V _{CC} or GND | | 5.5 | — | — | 8.0 | — | µA |

Note: This spec indicates the capability of driving 50 Ω 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 | $V_{CC} \text{ (V)}$ | $T_a = 25^\circ\text{C}$ | | | $T_a = -40 \text{ to } 85^\circ\text{C}$ | | Unit |
|------------------------------------|-----------|----------------|----------------------|--------------------------|------|------|--|------|------|
| | | | | Min | Typ. | Max | Min | Max | |
| Propagation delay time (Note 2) | t_{pLH} | — | 3.3 ± 0.3 | — | 6.3 | 10.5 | 1.0 | 12.0 | ns |
| | t_{pHL} | | 5.0 ± 0.5 | — | 4.8 | 7.0 | 1.0 | 8.0 | |
| Propagation delay time (Note 3) | t_{pLH} | — | 3.3 ± 0.3 | — | 7.0 | 11.4 | 1.0 | 13.0 | ns |
| | t_{pHL} | | 5.0 ± 0.5 | — | 5.2 | 7.5 | 1.0 | 8.5 | |
| Output enable time | t_{pZL} | — | 3.3 ± 0.3 | — | 8.4 | 14.0 | 1.0 | 16.0 | ns |
| | t_{pZH} | | 5.0 ± 0.5 | — | 5.9 | 8.7 | 1.0 | 10.0 | |
| Output disable time | t_{pLZ} | — | 3.3 ± 0.3 | — | 6.4 | 10.5 | 1.0 | 12.0 | ns |
| | t_{pHZ} | | 5.0 ± 0.5 | — | 5.5 | 7.9 | 1.0 | 9.0 | |
| Input capacitance | C_{IN} | — | — | — | 5 | 10 | — | 10 | pF |
| Output capacitance | C_{OUT} | — | — | — | 10 | — | — | — | pF |
| Power dissipation capacitance | C_{PD} | (Note 1) | — | — | 30 | — | — | — | pF |

Note 1: 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:

$$I_{CC \text{ (opr)}} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/8 \text{ (per bit)}$$

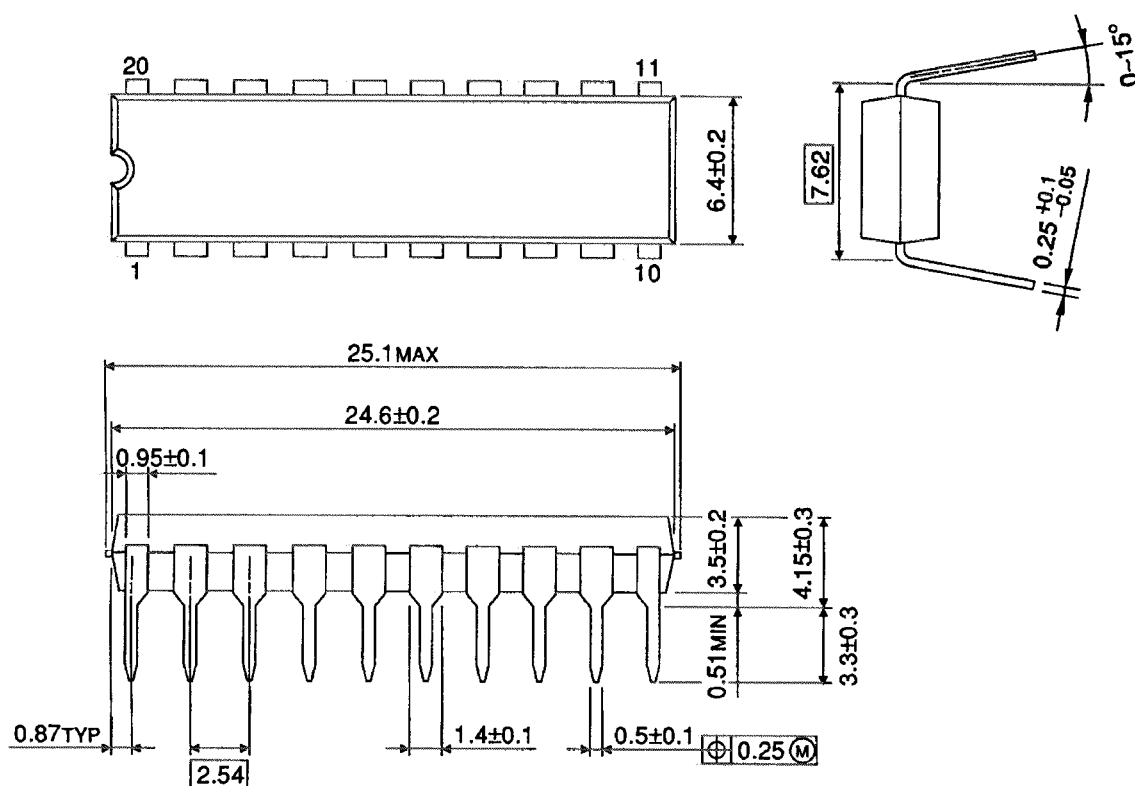
Note 2: For TC74AC240 only

Note 3: For TC74AC244 only

Package Dimensions

DIP20-P-300-2.54A

Unit : mm

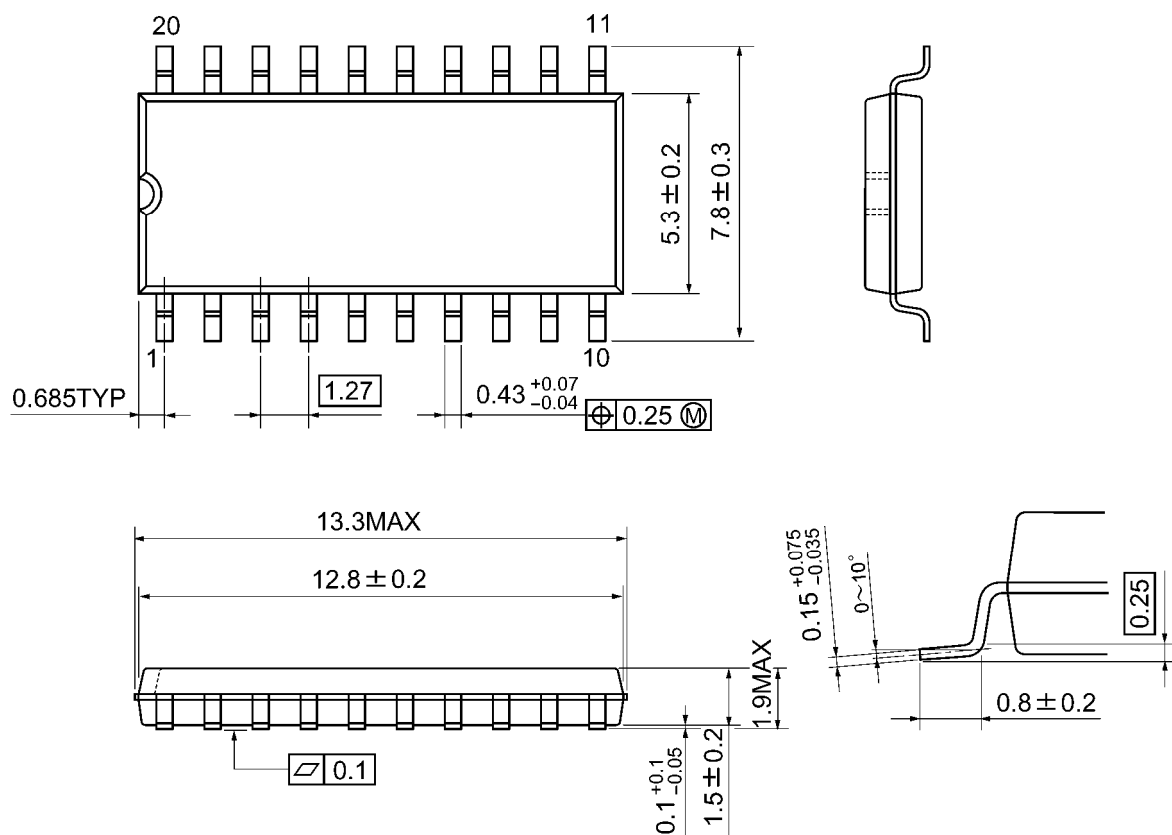


Weight: 1.30 g (typ.)

Package Dimensions

SOP20-P-300-1.27A

Unit: mm

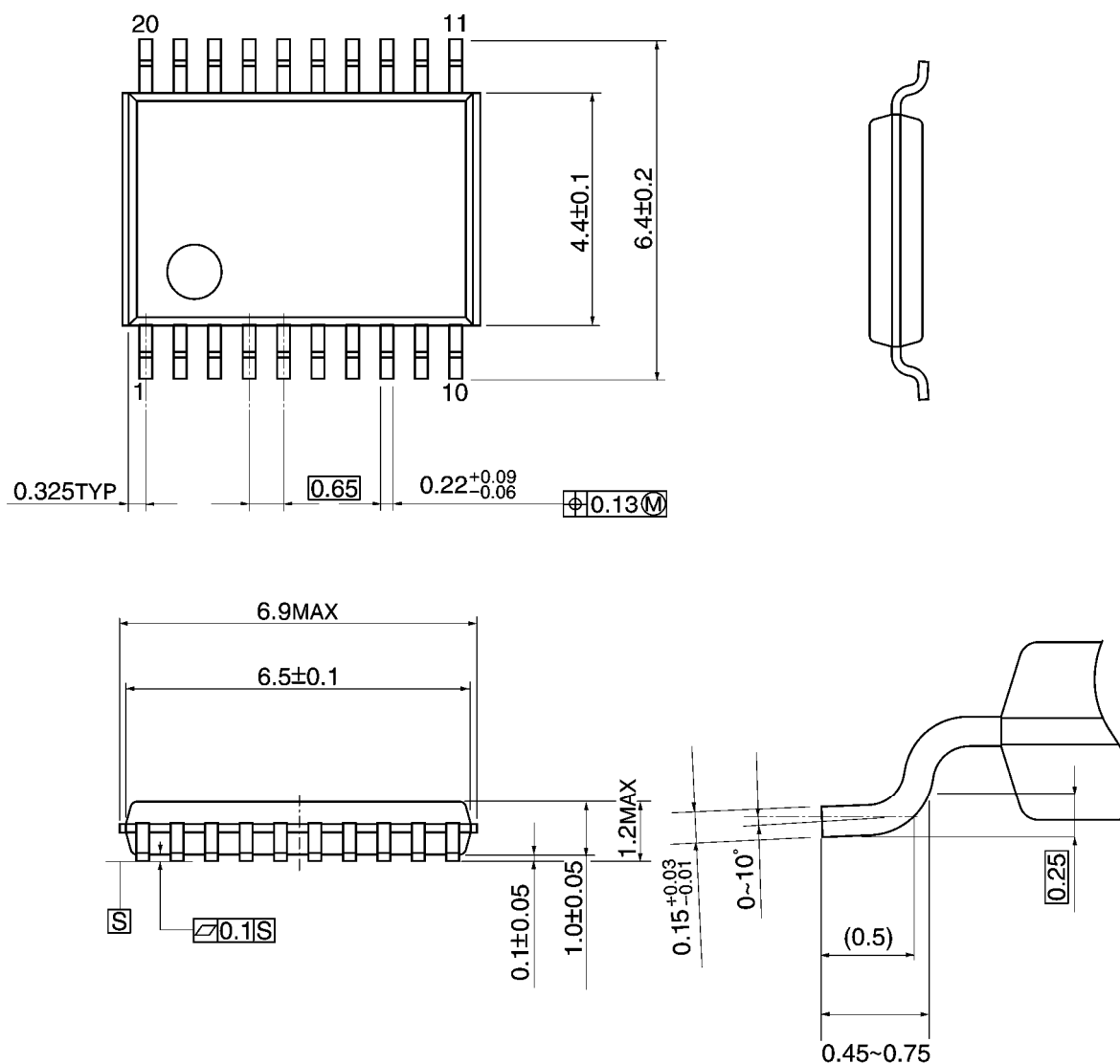


Weight: 0.22 g (typ.)

Package Dimensions

TSSOP20-P-0044-0.65A

Unit: mm



Weight: 0.08 g (typ.)

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