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MM74HCT240 • MM74HCT244

Inverting Octal 3-STATE Buffer • Octal 3-STATE Buffer

General Description

The MM74HCT240 and MM74HCT244 3-STATE buffers utilize advanced silicon-gate CMOS technology and are general purpose high speed inverting and non-inverting buffers. They possess high drive current outputs which enable high speed operation even when driving large bus capacitances. These circuits achieve speeds comparable to low power Schottky devices, while retaining the low power consumption of CMOS. All three devices are TTL input compatible and have a fanout of 15 LS-TTL equivalent inputs.

MM74HCT devices are intended to interface between TTL and NMOS components and standard CMOS devices. These parts are also plug-in replacements for LS-TTL devices and can be used to reduce power consumption in existing designs.

The MM74HCT240 is an inverting buffer and the MM74HCT244 is a non-inverting buffer. Each device has two active low enables (1G and 2G), and each enable independently controls 4 buffers.

All inputs are protected from damage due to static discharge by diodes to V_{CC} and Ground.

Features

- TTL input compatible
- Typical propagation delay: 14 ns
- 3-STATE outputs for connection to system buses
- Low quiescent current: 80 μ A
- High output drive current: 6 mA (min)

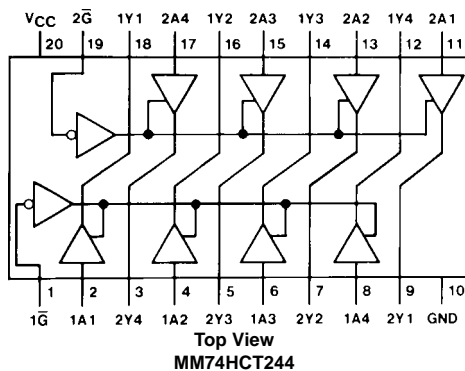
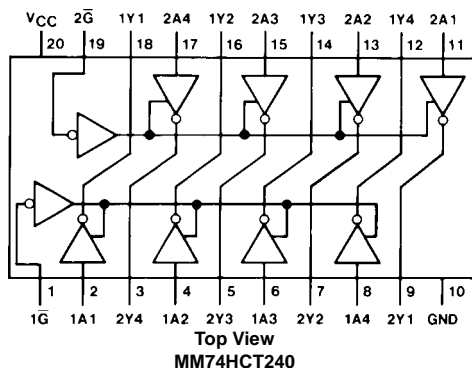
Ordering Code:

| Order Number | Package Number | Package Description |
|---------------|----------------|---|
| MM74HCT240WM | M20B | 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide |
| MM74HCT240SJ | M20D | 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide |
| MM74HCT240MTC | MTC20 | 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide |
| MM74HCT240N | N20A | 20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide |
| MM74HCT244WM | M20B | 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide |
| MM74HCT244SJ | M20D | 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide |
| MM74HCT244MTC | MTC20 | 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide |
| MM74HCT244N | N20A | 20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide |

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Connection Diagrams

Pin Assignments for DIP, SOIC, SOP and TSSOP



Truth Tables

MM74HCT240

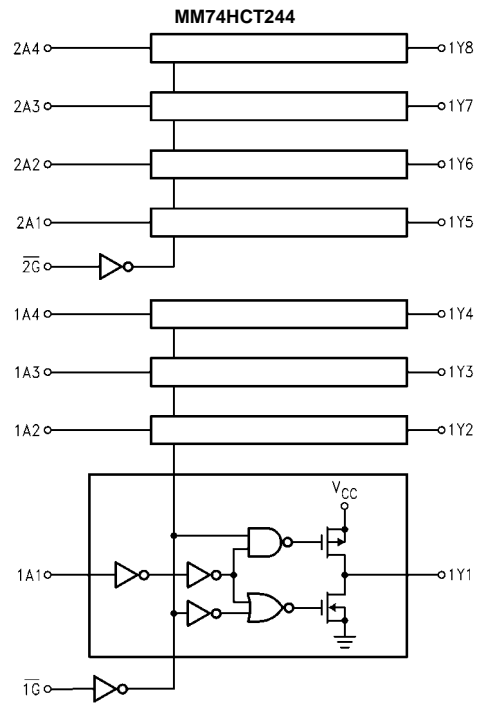
| 1 \bar{G} | 1A | 1Y | 2 \bar{G} | 2A | 2Y |
|-------------|----|----|-------------|----|----|
| L | L | H | L | L | H |
| L | H | L | L | H | L |
| H | L | Z | H | L | Z |
| H | H | Z | H | H | Z |

H = HIGH Level L = LOW Level Z = High Impedance

MM74HCT244

| 1 \bar{G} | 1A | 1Y | 2 \bar{G} | 2A | 2Y |
|-------------|----|----|-------------|----|----|
| L | L | L | L | L | L |
| L | H | H | L | H | H |
| H | L | Z | H | L | Z |
| H | H | Z | H | H | Z |

Logic Diagrams



| Absolute Maximum Ratings ^(Note 1) | | Recommended Operating Conditions | | | | | |
|---|--|---|--------------------|-------------------|-----------------------------|------------------------------------|---------|
| ^(Note 2) | | | | | | | |
| Supply Voltage (V_{CC}) | -0.5 to +7.0V | Min | Max Units | | | | |
| DC Input Voltage (V_{IN}) | -1.5 to $V_{CC} + 1.5V$ | 4.5 | 5.5 V | | | | |
| DC Output Voltage (V_{OUT}) | -0.5 to $V_{CC} + 0.5V$ | 0 | V_{CC} V | | | | |
| Clamp Diode Current (I_{IK}, I_{OK}) | ± 20 mA | | | | | | |
| DC Output Current, per pin (I_{OUT}) | ± 35 mA | | | | | | |
| DC V_{CC} or GND Current, per pin (I_{CC}) | ± 70 mA | | | | | | |
| Storage Temperature Range (T_{STG}) | -65°C to +150°C | Operating Temperature Range (T_A) | -40 +85 °C | | | | |
| Power Dissipation (P_D) | | Input Rise or Fall Times | | | | | |
| ^(Note 3) | 600 mW | (t_r, t_f) | 500 ns | | | | |
| S.O. Package only | 500 mW | Note 1: Absolute Maximum Ratings are those values beyond which damage to the device may occur. | | | | | |
| Lead Temperature (T_L) | | Note 2: Unless otherwise specified all voltages are referenced to ground. | | | | | |
| (Soldering 10 seconds) | 260°C | Note 3: Power Dissipation temperature derating — plastic "N" package: -12 mW/°C from 65°C to 85°C. | | | | | |
| DC Electrical Characteristics | | | | | | | |
| $V_{CC} = 5V \pm 10\%$ (unless otherwise specified) | | | | | | | |
| Symbol | Parameter | Conditions | $T_A = 25^\circ C$ | | $T_A = -40$ to $85^\circ C$ | $T_A = -55^\circ$ to $125^\circ C$ | Units |
| | | | Typ | Guaranteed Limits | | | |
| V_{IH} | Minimum HIGH Level Input Voltage | | | 2.0 | 2.0 | 2.0 | V |
| V_{IL} | Maximum LOW Level Input Voltage | | | 0.8 | 0.8 | 0.8 | V |
| V_{OH} | Minimum HIGH Level Output Voltage | $V_{IN-EE} = V_{IH}$ or V_{IL} | V_{CC} | $V_{CC}-0.1$ | $V_{CC}-0.1$ | $V_{CC}-0.1$ | V |
| | | $ I_{OUT} = 20 \mu A$ | 4.2 | 3.98 | 3.84 | 3.7 | V |
| | | $ I_{OUT} = 6.0$ mA, $V_{CC} = 4.5V$ | 5.2 | 4.98 | 4.84 | 4.7 | V |
| V_{OL} | Maximum LOW Level Voltage | $V_{IN} = V_{IH}$ or V_{IL} | 0 | 0.1 | 0.1 | 0.1 | V |
| | | $ I_{OUT} = 20 \mu A$ | 0.2 | 0.26 | 0.33 | 0.4 | V |
| | | $ I_{OUT} = 6.0$ mA, $V_{CC} = 4.5V$ | 0.2 | 0.26 | 0.33 | 0.4 | V |
| I_{IN} | Maximum Input Current | $V_{IN} = V_{CC}$ or GND, V_{IH} or V_{IL} | | ± 0.05 | ± 0.5 | ± 1.0 | μA |
| | | | | | | | |
| I_{OZ} | Maximum 3-STATE Output Leakage Current | $V_{OUT} = V_{CC}$ or GND $\bar{G} = V_{IH}$ $G = V_{IL}$ | | ± 0.25 | ± 2.5 | ± 10 | μA |
| I_{CC} | Maximum Quiescent Supply Current | $V_{IN} = V_{CC}$ or GND $I_{OUT} = 0 \mu A$ | | 4.0 | 40 | 160 | μA |
| | | $V_{IN} = 2.4V$ or $0.5V$ (Note 4) | 0.6 | 1.0 | 1.3 | 1.5 | mA |
| Note 4: Measured per input. All other inputs at V_{CC} or GND. | | | | | | | |

AC Electrical Characteristics

MM74HCT240, MM74HCT244 $V_{CC} = 5.0V$, $t_r = t_f = 6$ ns, $T_A = 25^\circ C$ (unless otherwise specified)

| Symbol | Parameter | Conditions | Typ | Guaranteed Limits | Units |
|--------------------|----------------------------------|---------------------------------------|-----|-------------------|-------|
| t_{PHL}, t_{PLH} | Maximum Output Propagation Delay | $C_L = 45$ pF | 14 | 18 | ns |
| t_{PZL}, t_{PZH} | Maximum Output Enable Time | $C_L = 45$ pF $R_L = 1$ k Ω | 20 | 30 | ns |
| t_{PLZ}, t_{PHZ} | Maximum Output Disable Time | $C_L = 5$ pF $R_L = 1$ k Ω | 16 | 25 | ns |

AC Electrical Characteristics

MM74HCT240, MM74HCT244 $V_{CC} = 5.0V \pm 10\%$, $t_r = t_f = 6$ ns (unless otherwise specified)

| Symbol | Parameter | Conditions | $T_A = 25^\circ C$ | | | Units | | |
|--------------------|--|---|--------------------|-------------------|----|-------|----|----|
| | | | Typ | Guaranteed Limits | | | | |
| t_{PHL}, t_{PLH} | Maximum Output Propagation Delay | $C_L = 50$ pF | 14 | 20 | 25 | 30 | ns | |
| | | $C_L = 150$ pF | 20 | 28 | 35 | 42 | ns | |
| t_{PZH}, t_{PZL} | Maximum Output Enable Time | $R_L = 1$ k Ω | $C_L = 50$ pF | 21 | 30 | 38 | 45 | ns |
| | | | $C_L = 150$ pF | 26 | 42 | 53 | 63 | ns |
| t_{PHZ}, t_{PLZ} | Maximum Output Disable Time | $R_L = 1$ k Ω $C_L = 50$ pF | 16 | 25 | 32 | 38 | ns | |
| t_{THL}, t_{TLH} | Maximum Output Rise and Fall Time | $C_L = 50$ pF | 6 | 12 | 15 | 18 | ns | |
| C_{IN} | Maximum Input Capacitance | | 10 | 15 | 15 | 15 | pF | |
| C_{OUT} | Maximum Output Capacitance | | 15 | 20 | 20 | 20 | pF | |
| C_{PD} | Power Dissipation Capacitance (Note 5) | (per buffer) $\bar{G} = V_{CC}, G = GND$ | 5 | | | | pF | |
| | | $\bar{G} = GND, G = V_{CC}$ | 90 | | | | pF | |

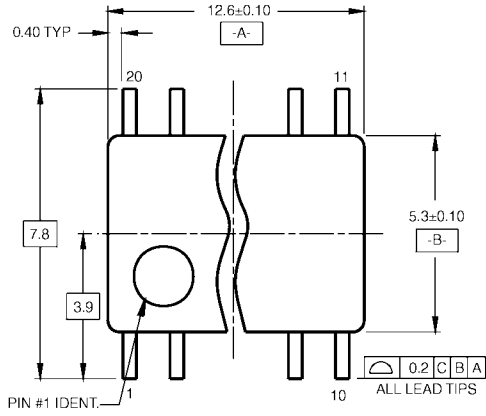
Note 5: C_{PD} determines the no load dynamic power consumption, $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$, and the no load dynamic current consumption, $I_S = C_{PD} V_{CC} f + I_{CC}$.

Physical Dimensions inches (millimeters) unless otherwise noted



20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
Package Number M20B

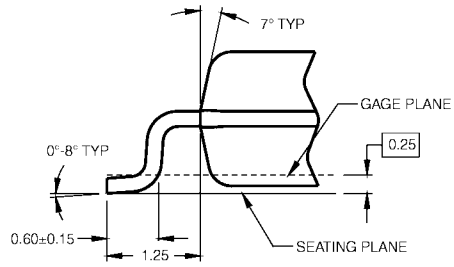
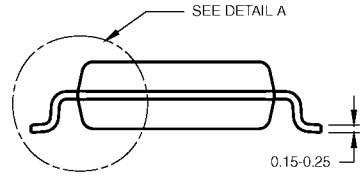
Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



LAND PATTERN RECOMMENDATION



DIMENSIONS ARE IN MILLIMETERS



DETAIL A

- NOTES:
 A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.
 B. DIMENSIONS ARE IN MILLIMETERS.
 C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M20DRevB1

20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide Package Number M20D

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



PIN #1 IDENT.

LAND PATTERN RECOMMENDATION



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DETAIL A

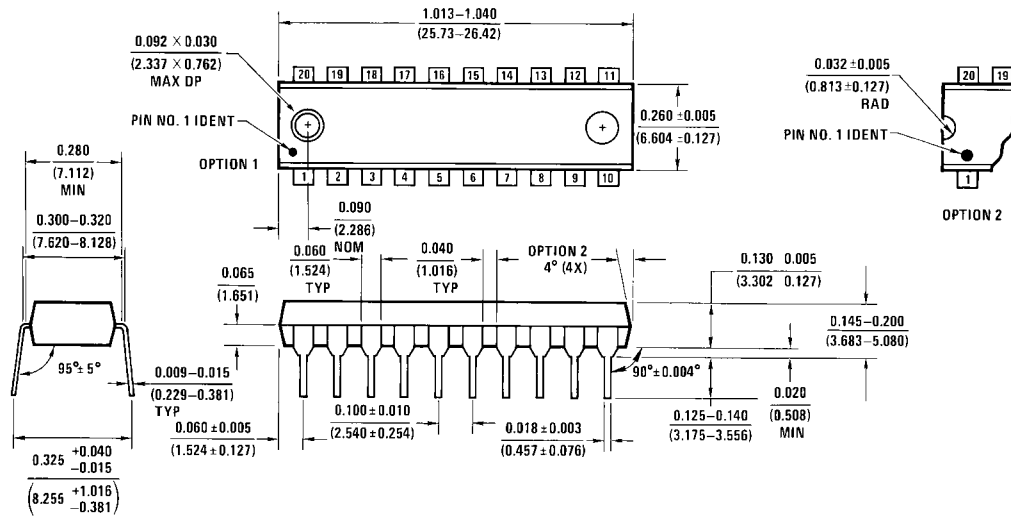
NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AC, REF NOTE 6, DATE 7/93.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLDS FLASH, AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTC20REVD1

20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide Package Number MTC20

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
Package Number N20A

N20A (REV G)

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