

Hex Inverter (Open Drain)

MM74HCT05

General Description

The MM74HCT05 is a logic function fabricated by using advanced silicon-gate CMOS technology, which provides the inherent benefits of CMOS—low quiescent power and wide power supply range. The device is also input and output characteristic and pinout compatible with standard DM74LS logic families. The MM74HCT05 open drain Hex Inverter requires the addition of an external resistor to perform a wire-NOR function.

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

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.

Features

- Open Drain for Wire-NOR Function
- LS-TTL Pinout and Threshold Compatible
- Fanout of 10 LS-TTL Loads
- Typical Propagation Delays:
 - ♦ t_{PZL} (with 1 k Ω Resistor) 10 ns
 - ♦ t_{PLZ} (with 1 k Ω Resistor) 12 ns
- These are Pb-Free Devices

Connection Diagram

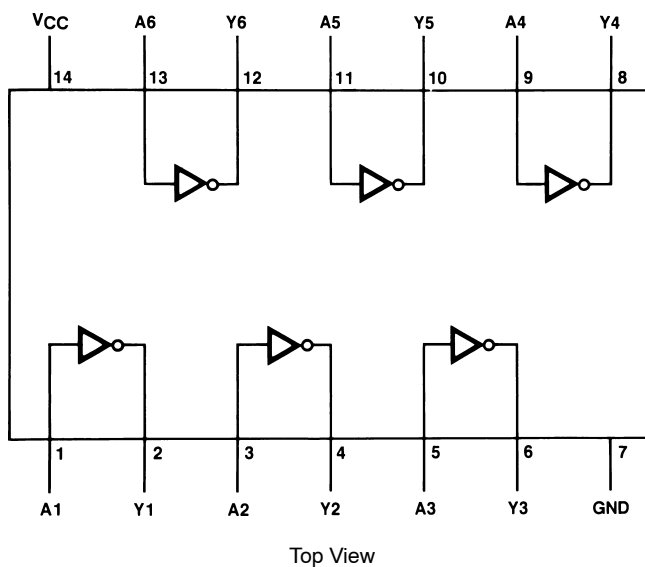
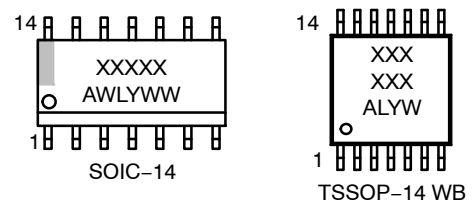


Figure 1. Connection Diagram

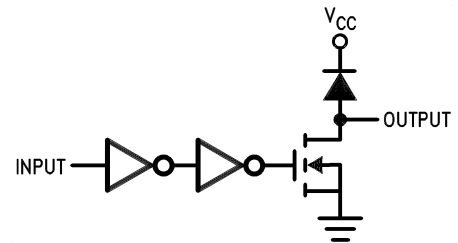


MARKING DIAGRAMS

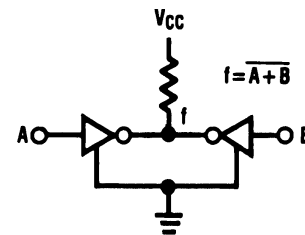


XXXXX = Specific Device Code
A = Assembly Location
WL, L = Wafer Lot
Y = Year
WW, W = Work Week

LOGIC DIAGRAM



TYPICAL APPLICATION



ORDERING INFORMATION

See detailed ordering and shipping information on page 4 of this data sheet.

MM74HCT05

ABSOLUTE MAXIMUM RATINGS (Note 1)

| Symbol | Parameter | | Rating |
|------------------|---|-------------------|--------------------------|
| V_{CC} | Supply Voltage | | -0.5 to +7.0 V |
| V_{IN} | DC Input Voltage | | -0.5 to $V_{CC} + 0.5$ V |
| V_{OUT} | DC Output Voltage | | -0.5 to $V_{CC} + 0.5$ V |
| I_{IK}, I_{OK} | Clamp Diode Current | | ± 20 mA |
| I_{OUT} | DC Output Current, per Pin | | ± 25 mA |
| I_{CC} | DC V_{CC} or GND Current, per Pin | | ± 50 mA |
| T_{STG} | Storage Temperature Range | | -65°C to +150°C |
| P_D | Power Dissipation | Note 2 | 600 mW |
| | | S.O. Package Only | 500 mW |
| T_L | Lead Temperature (Soldering 10 Seconds) | | 260°C |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Unless otherwise specified all voltages are referenced to ground.
2. Power Dissipation temperature derating – plastic “N” package: -12 mW/°C from 65°C to 85°C.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Max | Unit |
|------------|-----------------------------|-----|----------|------|
| V_{CC} | Supply Voltage | 4.5 | 5.5 | V |
| V_{IN} | DC Input Voltage | 0 | V_{CC} | V |
| V_{OUT} | DC Output Voltage | 0 | 5.5 | V |
| T_A | Operating Temperature Range | -40 | +85 | °C |
| t_r, t_f | Input Rise or Fall Times | - | 500 | ns |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

MM74HCT05

DC ELECTRICAL CHARACTERISTICS

($V_{CC} = 5\text{ V} \pm 10\%$ unless otherwise specified)

| Symbol | Parameter | Conditions | $T_A = 25^\circ\text{C}$ | | $T_A = -40^\circ\text{C}$ to 85°C | Unit |
|-----------|---|--|--------------------------|-------------------|--|---------------|
| | | | Typ | Guaranteed Limits | | |
| V_{IH} | Minimum HIGH Level Input Voltage | | – | 2.0 | 2.0 | V |
| V_{IL} | Maximum LOW Level Input Voltage | | – | 0.8 | 0.8 | V |
| V_{OL} | Maximum LOW Level Output Voltage | $V_{IN} = V_{IH}$ or V_{IL} , $ I_{OUT} \leq 20\ \mu\text{A}$ | 0 | 0.1 | 0.1 | V |
| | | $V_{IN} = V_{IH}$ or V_{IL} , $ I_{OUT} = 4.0\ \text{mA}$, $V_{CC} = 4.5\ \text{V}$ | 0.2 | 0.26 | 0.33 | |
| | | $V_{IN} = V_{IH}$ or V_{IL} , $ I_{OUT} = 4.8\ \text{mA}$, $V_{CC} = 5.5\ \text{V}$ | 0.2 | 0.26 | 0.33 | |
| I_{IN} | Maximum Input Current | $V_{IN} = V_{CC}$ or GND, V_{IH} or V_{IL} | – | ± 0.1 | ± 1.0 | μA |
| I_{LKG} | Maximum HIGH Level Output Leakage Current | $V_{IN} = V_{IH}$ or V_{IL} , $V_{OUT} = V_{CC}$ | – | 0.5 | 5.0 | μA |
| I_{CC} | Maximum Quiescent Supply Current | $V_{IN} = V_{CC}$ or GND, $I_{OUT} = 0\ \mu\text{A}$ | – | 2.0 | 20 | μA |
| | | $V_{IN} = 2.4\ \text{V}$ or $0.5\ \text{V}$ (Note 3) | – | 0.3 | 0.4 | mA |
| I_{OHZ} | Off State Current | $V_{CC} = 4.5\ \text{V} - 5.5\ \text{V}$, $V_O = 5.5\ \text{V}$ | – | – | 10 | μA |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

3. This is measured per input with all other inputs held at V_{CC} or ground.

AC ELECTRICAL CHARACTERISTICS

($V_{CC} = 5\ \text{V}$, $T_A = 25^\circ\text{C}$, $C_L = 15\ \text{pF}$, $t_r = t_f = 6\ \text{ns}$ unless otherwise specified)

| Symbol | Parameter | Conditions | Typ | Guaranteed Limit | Unit |
|-----------|---------------------------|---------------------------|-----|------------------|------|
| t_{PZL} | Maximum Propagation Delay | $R_L = 1\ \text{k}\Omega$ | 8 | 15 | ns |
| t_{PLZ} | Maximum Propagation Delay | $R_L = 1\ \text{k}\Omega$ | 9 | 16 | ns |

AC ELECTRICAL CHARACTERISTICS

($V_{CC} = 5\ \text{V} \pm 10\%$, $C_L = 50\ \text{pF}$, $t_r = t_f = 6\ \text{ns}$ unless otherwise specified)

| Symbol | Parameter | Conditions | $T_A = 25^\circ\text{C}$ | | $T_A = -40^\circ\text{C}$ to 85°C | Unit |
|-----------|-------------------------------|------------------------------------|--------------------------|-------------------|--|-------------|
| | | | Typ | Guaranteed Limits | | |
| t_{PZL} | Maximum Propagation Delay | $R_L = 1\ \text{k}\Omega$ | 10 | 22 | 28 | ns |
| t_{PLZ} | Maximum Propagation Delay | $R_L = 1\ \text{k}\Omega$ | 12 | 20 | 25 | ns |
| t_{THL} | Maximum Output Fall Time | | 10 | 15 | 19 | ns |
| C_{PD} | Power Dissipation Capacitance | (per gate) $R_L = \infty$ (Note 4) | – | 20 | – | pF |
| C_{IN} | Maximum Input Capacitance | | – | 5 | 10 | pF |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. 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, $I_S = C_{PD} V_{CC} f + I_{CC}$.

MM74HCT05

ORDERING INFORMATION

| Part Number | Package | Shipping [†] |
|---------------|--|--------------------------|
| MM74HCT05M | SOIC-14, Case 751EF (Pb-Free, Halide-Free) | 1100 Units / Tube |
| MM74HCT05MX | SOIC-14, Case 751EF (Pb-Free, Halide-Free) | 2500 Units / Tape & Reel |
| MM74HCT05MTCX | TSSOP-14 WB, Case 948G (Pb-Free, Halide Free) | 2500 Units / Tape & Reel |

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

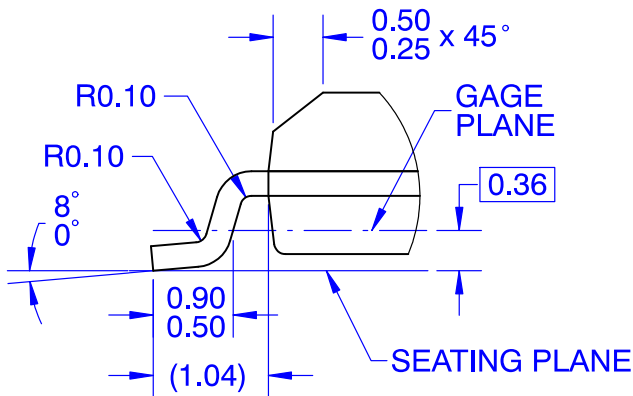
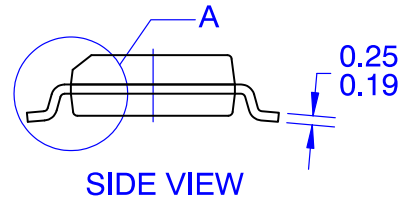
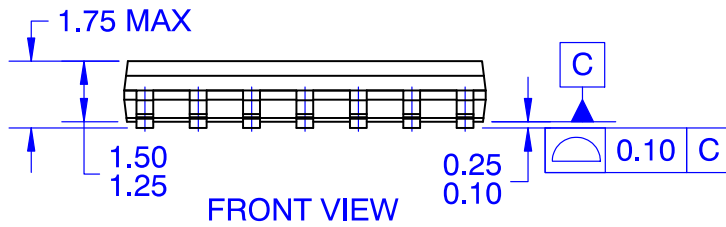
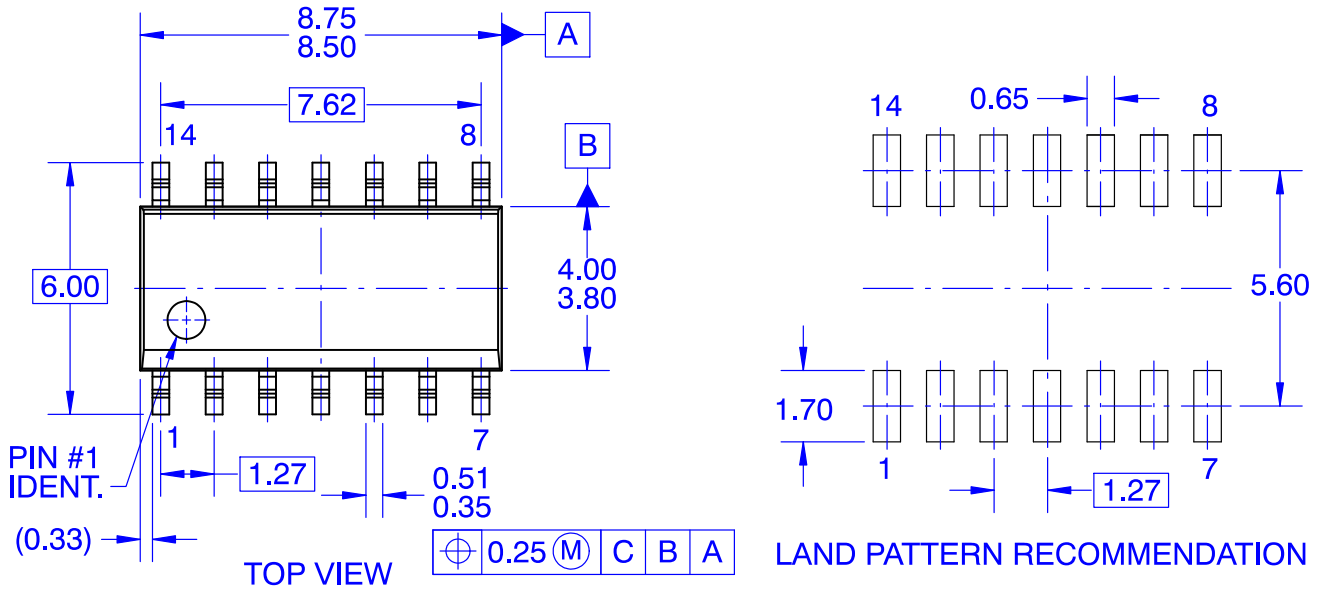
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®



SOIC14
CASE 751EF
ISSUE O

DATE 30 SEP 2016



DETAIL A
SCALE 16 : 1

NOTES:

- A. CONFORMS TO JEDEC MS-012, VARIATION AB, ISSUE C
- B. ALL DIMENSIONS ARE IN MILLIMETERS
- C. DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS
- D. LAND PATTERN STANDARD: SOIC127P600X145-14M
- E. CONFORMS TO ASME Y14.5M, 2009

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MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



TSSOP-14 WB
CASE 948G
ISSUE C

DATE 17 FEB 2016

SCALE 2:1



NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: MILLIMETER.
- DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
- DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
- DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
- TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
- DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | 4.90 | 5.10 | 0.193 | 0.200 |
| B | 4.30 | 4.50 | 0.169 | 0.177 |
| C | --- | 1.20 | --- | 0.047 |
| D | 0.05 | 0.15 | 0.002 | 0.006 |
| F | 0.50 | 0.75 | 0.020 | 0.030 |
| G | 0.65 BSC | | 0.026 BSC | |
| H | 0.50 | 0.60 | 0.020 | 0.024 |
| J | 0.09 | 0.20 | 0.004 | 0.008 |
| J1 | 0.09 | 0.16 | 0.004 | 0.006 |
| K | 0.19 | 0.30 | 0.007 | 0.012 |
| K1 | 0.19 | 0.25 | 0.007 | 0.010 |
| L | 6.40 BSC | | 0.252 BSC | |
| M | 0° | 8° | 0° | 8° |

GENERIC MARKING DIAGRAM*



- A = Assembly Location
- L = Wafer Lot
- Y = Year
- W = Work Week
- = Pb-Free Package

(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

SOLDERING FOOTPRINT



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