

# Hex 3-State Noninverting Buffer with Common Enables

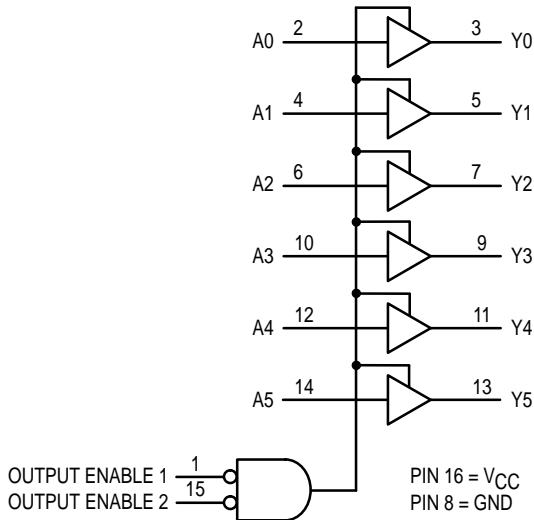
## High-Performance Silicon-Gate CMOS

The MC54/74HC365 is identical in pinout to the LS365. The device inputs are compatible with standard CMOS outputs; with pullup resistors, they are compatible with LSTTL outputs.

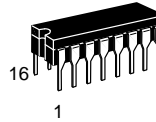
This device is a high-speed hex buffer with 3-state outputs and two common active-low Output Enables. When either of the enables is high, the buffer outputs are placed into high-impedance states. The HC365 has noninverting outputs.

- Output Drive Capability: 15 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS, and TTL
- Operating Voltage Range: 2 to 6 V
- Low Input Current: 1  $\mu$ A
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance with the Requirements Defined by JEDEC Standard No. 7A
- Chip Complexity: 90 FETs or 22.5 Equivalent Gates

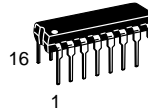
### LOGIC DIAGRAM



## MC54/74HC365



**J SUFFIX**  
CERAMIC PACKAGE  
CASE 620-10



**N SUFFIX**  
PLASTIC PACKAGE  
CASE 648-08

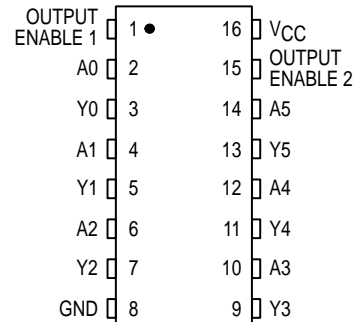


**DT SUFFIX**  
TSSOP PACKAGE  
CASE 948F-01

### ORDERING INFORMATION

MC54HCXXXJ	Ceramic
MC74HCXXXN	Plastic
MC74HCXXXDT	TSSOP

### PIN ASSIGNMENT



### FUNCTION TABLE

Inputs			Output
Enable 1	Enable 2	A	Y
L	L	L	L
L	L	H	H
H	X	X	Z
X	H	X	Z

X = don't care  
Z = high impedance



## MAXIMUM RATINGS\*

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	DC Supply Voltage (Referenced to GND)	- 0.5 to + 7.0	V
V <sub>in</sub>	DC Input Voltage (Referenced to GND)	- 1.5 to V <sub>CC</sub> + 1.5	V
V <sub>out</sub>	DC Output Voltage (Referenced to GND)	- 0.5 to V <sub>CC</sub> + 0.5	V
I <sub>in</sub>	DC Input Current, per Pin	± 20	mA
I <sub>out</sub>	DC Output Current, per Pin	± 35	mA
I <sub>CC</sub>	DC Supply Current, V <sub>CC</sub> and GND Pins	± 75	mA
P <sub>D</sub>	Power Dissipation in Still Air, Plastic or Ceramic DIP† TSSOP Package†	750 450	mW
T <sub>stg</sub>	Storage Temperature	- 65 to + 150	°C
T <sub>L</sub>	Lead Temperature, 1 mm from Case for 10 Seconds (Plastic DIP or TSSOP Package) (Ceramic DIP)	260 300	°C

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V<sub>in</sub> and V<sub>out</sub> should be constrained to the range GND ≤ (V<sub>in</sub> or V<sub>out</sub>) ≤ V<sub>CC</sub>. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V<sub>CC</sub>). Unused outputs must be left open.

\* Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditions.

† Derating — Plastic DIP: - 10 mW/°C from 65° to 125°C  
Ceramic DIP: - 10 mW/°C from 100° to 125°C  
TSSOP Package: - 6.1 mW/°C from 65° to 125°C

For high frequency or heavy load considerations, see Chapter 2 of the Motorola High-Speed CMOS Data Book (DL129/D).

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit	
V <sub>CC</sub>	DC Supply Voltage (Referenced to GND)	2.0	6.0	V	
V <sub>in</sub> , V <sub>out</sub>	DC Input Voltage, Output Voltage (Referenced to GND)	0	V <sub>CC</sub>	V	
T <sub>A</sub>	Operating Temperature, All Package Types	- 55	+ 125	°C	
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time (Figure 1)	V <sub>CC</sub> = 2.0 V V <sub>CC</sub> = 4.5 V V <sub>CC</sub> = 6.0 V	0 0 0	1000 500 400	ns

## DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

Symbol	Parameter	Test Conditions	V <sub>CC</sub> V	Guaranteed Limit			Unit
				- 55 to 25°C	≤ 85°C	≤ 125°C	
V <sub>IH</sub>	Minimum High-Level Input Voltage	V <sub>out</sub> = V <sub>CC</sub> - 0.1 V  I <sub>out</sub>   ≤ 20 μA	2.0	1.5	1.5	1.5	V
			4.5	3.15	3.15	3.15	
			6.0	4.2	4.2	4.2	
V <sub>IL</sub>	Maximum Low-Level Input Voltage	V <sub>out</sub> = 0.1 V  I <sub>out</sub>   ≤ 20 μA	2.0	0.3	0.3	0.3	V
			4.5	0.9	0.9	0.9	
			6.0	1.2	1.2	1.2	
V <sub>OH</sub>	Minimum High-Level Output Voltage	V <sub>in</sub> = V <sub>IH</sub>  I <sub>out</sub>   ≤ 20 μA	2.0	1.9	1.9	1.9	V
			4.5	4.4	4.4	4.4	
			6.0	5.9	5.9	5.9	
			V <sub>in</sub> = V <sub>IH</sub>  I <sub>out</sub>   ≤ 6.0 mA  I <sub>out</sub>   ≤ 7.8 mA	4.5	3.98	3.84	
6.0	5.48	5.34	5.20				
V <sub>OL</sub>	Maximum Low-Level Output Voltage	V <sub>in</sub> = V <sub>IL</sub>  I <sub>out</sub>   ≤ 20 μA	2.0	0.1	0.1	0.1	V
			4.5	0.1	0.1	0.1	
			6.0	0.1	0.1	0.1	
			V <sub>in</sub> = V <sub>IL</sub>  I <sub>out</sub>   ≤ 6.0 mA  I <sub>out</sub>   ≤ 7.8 mA	4.5	0.26	0.33	
6.0	0.26	0.33	0.40				
I <sub>in</sub>	Maximum Input Leakage Current	V <sub>in</sub> = V <sub>CC</sub> or GND	6.0	± 0.1	± 1.0	± 1.0	μA

**DC ELECTRICAL CHARACTERISTICS** (Voltages Referenced to GND)

Symbol	Parameter	Test Conditions	V <sub>CC</sub> V	Guaranteed Limit			Unit
				- 55 to 25°C	≤ 85°C	≤ 125°C	
I <sub>OZ</sub>	Maximum Three-State Leakage Current	Output in High-Impedance State V <sub>in</sub> = V <sub>IL</sub> or V <sub>IH</sub> V <sub>out</sub> = V <sub>CC</sub> or GND	6.0	± 0.5	± 5.0	± 10	μA
I <sub>CC</sub>	Maximum Quiescent Supply Current (per Package)	V <sub>in</sub> = V <sub>CC</sub> or GND I <sub>out</sub> = 0 μA	6.0	8	80	160	μA

NOTE: Information on typical parametric values can be found in Chapter 2 of the Motorola High-Speed CMOS Data Book (DL129/D).

**AC ELECTRICAL CHARACTERISTICS** (C<sub>L</sub> = 50 pF, Input t<sub>r</sub> = t<sub>f</sub> = 6 ns)

Symbol	Parameter	V <sub>CC</sub> V	Guaranteed Limit			Unit
			- 55 to 25°C	≤ 85°C	≤ 125°C	
t <sub>PLH</sub> , t <sub>PHL</sub>	Maximum Propagation Delay, Input A to Output Y (Figures 1 and 3)	2.0 4.5 6.0	120 24 20	150 30 26	180 36 31	ns
t <sub>PLZ</sub> , t <sub>PHZ</sub>	Maximum Propagation Delay, Output Enable to Output Y (Figures 2 and 4)	2.0 4.5 6.0	220 44 37	275 55 47	330 66 56	ns
t <sub>PZL</sub> , t <sub>PZH</sub>	Maximum Propagation Delay, Output Enable to Output Y (Figures 2 and 4)	2.0 4.5 6.0	220 44 37	275 55 47	330 66 56	ns
t <sub>TLH</sub> , t <sub>THL</sub>	Maximum Output Transition Time, Any Output (Figures 1 and 3)	2.0 4.5 6.0	60 12 10	75 15 13	90 18 15	ns
C <sub>in</sub>	Maximum Input Capacitance	—	10	10	10	pF
C <sub>out</sub>	Maximum Three-State Output Capacitance (Output in High-Impedance State)	—	15	15	15	pF

NOTES:

1. For propagation delays with loads other than 50 pF, see Chapter 2 of the Motorola High-Speed CMOS Data Book (DL129/D).
2. Information on typical parametric values can be found in Chapter 2 of the Motorola High-Speed CMOS Data Book (DL129/D).

C <sub>PD</sub>	Power Dissipation Capacitance (Per Buffer)*	Typical @ 25°C, V <sub>CC</sub> = 5.0 V		pF
		40		

\* Used to determine the no-load dynamic power consumption: P<sub>D</sub> = C<sub>PD</sub> V<sub>CC</sub><sup>2</sup>f + I<sub>CC</sub> V<sub>CC</sub>. For load considerations, see Chapter 2 of the Motorola High-Speed CMOS Data Book (DL129/D).

**SWITCHING WAVEFORMS**

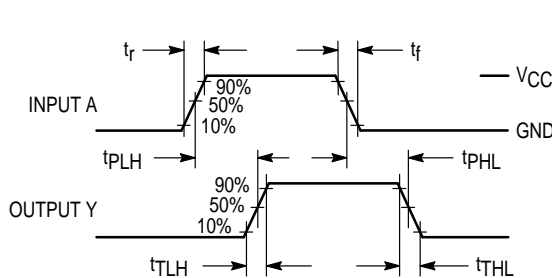


Figure 1.

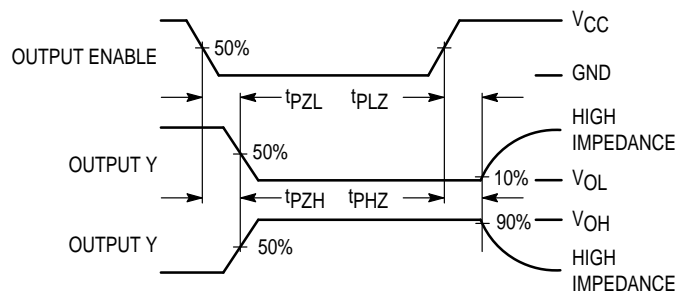
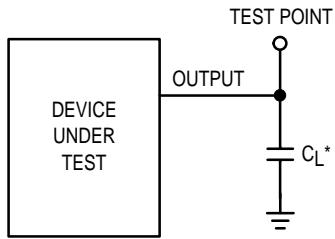


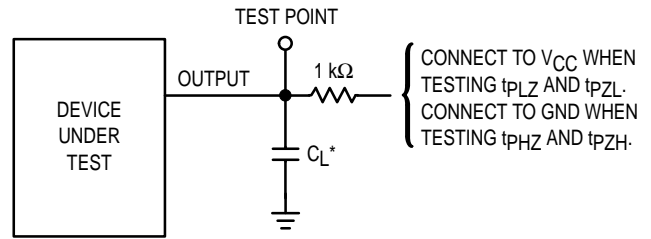
Figure 2.

TEST CIRCUITS



\* Includes all probe and jig capacitance

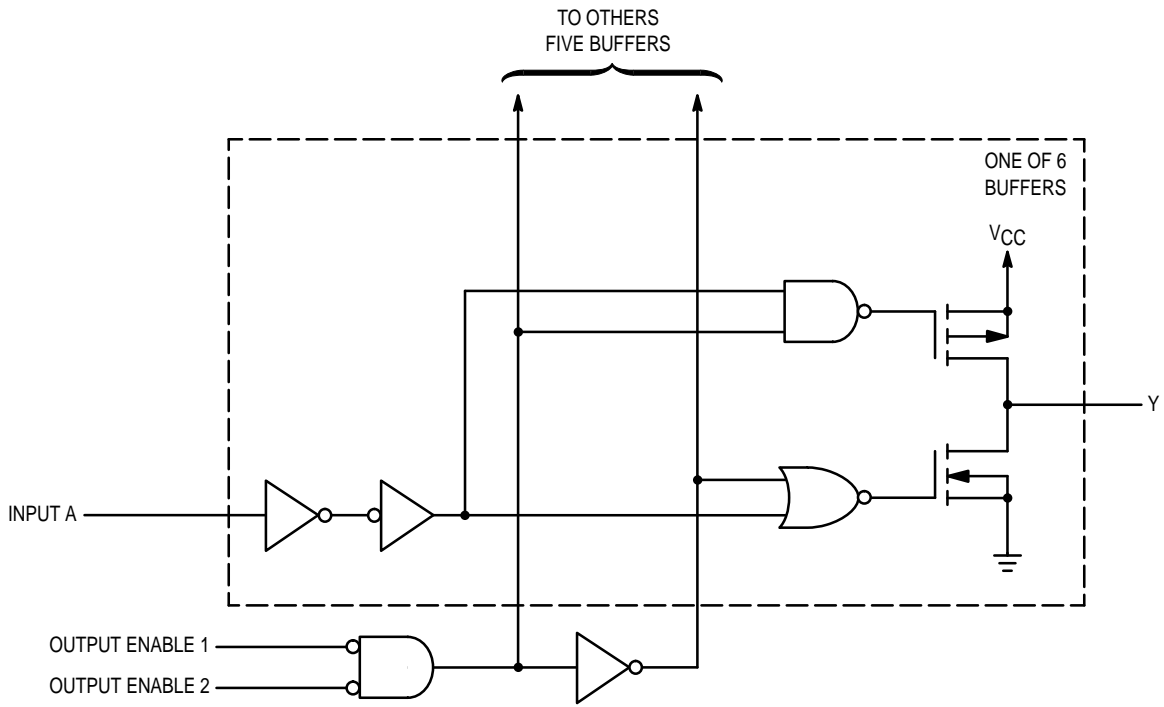
Figure 3.



\* Includes all probe and jig capacitance

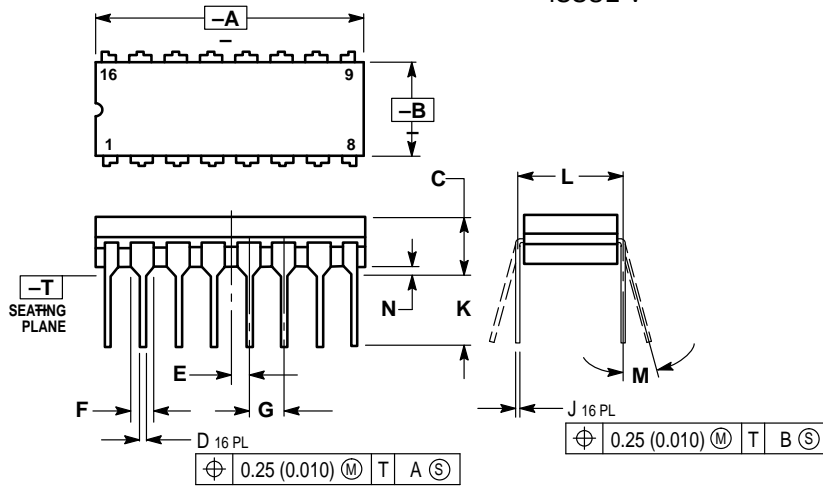
Figure 4.

LOGIC DETAIL



OUTLINE DIMENSIONS

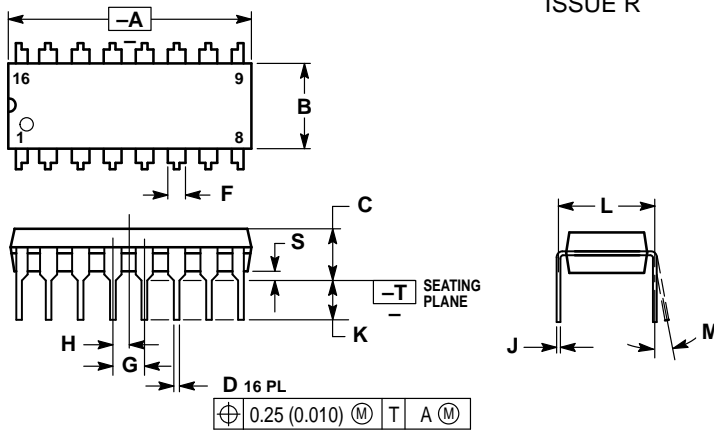
**J SUFFIX**  
**CERAMIC PACKAGE**  
 CASE 620-10  
 ISSUE V



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
  4. DIM F MAY NARROW TO 0.76 (0.030) WHERE THE LEAD ENTERS THE CERAMIC BODY.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.750	0.785	19.05	19.93
B	0.240	0.295	6.10	7.49
C	—	0.200	—	5.08
D	0.015	0.020	0.39	0.50
E	0.050 BSC		1.27 BSC	
F	0.055	0.065	1.40	1.65
G	0.100 BSC		2.54 BSC	
J	0.008	0.015	0.21	0.38
K	0.125	0.170	3.18	4.31
L	0.300 BSC		7.62 BSC	
M	0°	15°	0°	15°
N	0.020	0.040	0.51	1.01

**N SUFFIX**  
**PLASTIC PACKAGE**  
 CASE 648-08  
 ISSUE R

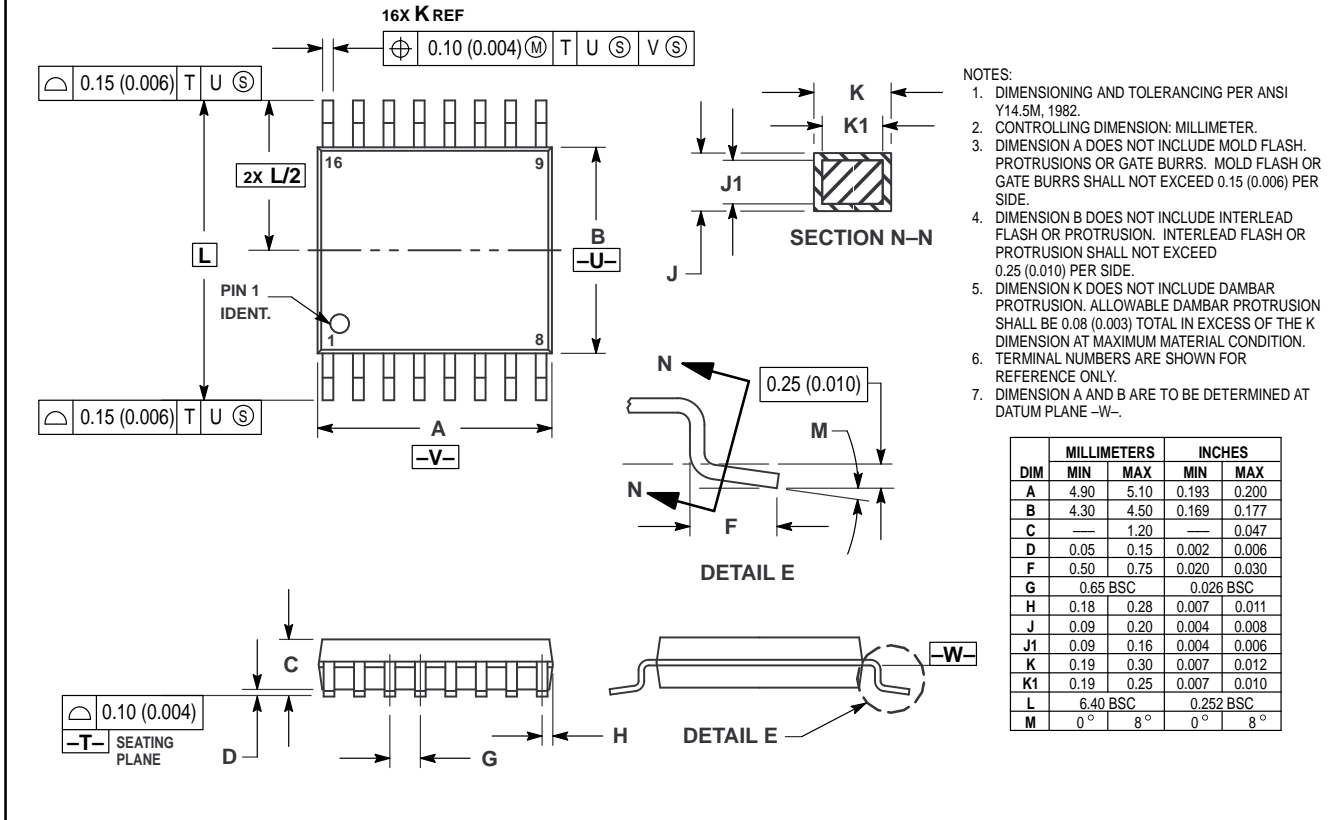


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
  4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
  5. ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.740	0.770	18.80	19.55
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.021	0.39	0.53
F	0.040	0.070	1.02	1.77
G	0.100 BSC		2.54 BSC	
H	0.050 BSC		1.27 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.130	2.80	3.30
L	0.295	0.305	7.50	7.74
M	0°	10°	0°	10°
S	0.020	0.040	0.51	1.01

OUTLINE DIMENSIONS

DT SUFFIX  
PLASTIC TSSOP PACKAGE  
CASE 948F-01  
ISSUE O



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