

August 1986 Revised April 2000

# **DM74S05**

# **Hex Inverter with Open-Collector Outputs**

#### **General Description**

This device contains six independent gates each of which performs the logic INVERT function. The open-collector outputs require external pull-up resistors for proper logical operation.

#### **Pull-Up Resistor Equations**

$$R_{MAX} = \frac{V_{CC} (Min) - V_{OH}}{N_1 (I_{OH}) + N_2 (I_{IH})}$$

$$\mathsf{R}_{MIN} = \frac{\mathsf{V}_{CC} \left(\mathsf{Max}\right) - \mathsf{V}_{OL}}{\mathsf{I}_{OL} - \mathsf{N}_{3} \left(\mathsf{I}_{IL}\right)}$$

Where:

 $N_1 \ (I_{\mbox{\scriptsize OH}}) = total \ maximum \ output \ high \ current$ 

for all outputs tied to pull-up resistor

 $\rm N_2~(I_{IH}) = total~maximum~input~high~current~for$ 

all inputs tied to pull-up resistor

 $N_3$  (I<sub>IL</sub>) = total maximum input low current for

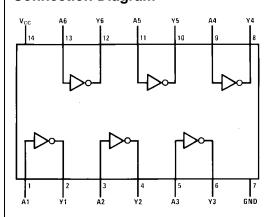
all inputs tied to pull-up resistor

### **Ordering Code:**

Order Number	Package Number	Package Description				
DM74S05M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150 Narrow				
DM74S05N	N14A	14-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 Diagram**



#### **Function Table**

$Y = \overline{A}$					
Input	Output				
Α	Y				
L	Н				
Н	L				

H = HIGH Logic Level L = LOW Logic Level

# **Absolute Maximum Ratings**(Note 1)

7V Supply Voltage 5.5V Input Voltage 7V Output Voltage Operating Free Air Temperature Range  $0^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ 

Storage Temperature Range  $-65^{\circ}C$  to  $+150^{\circ}C$  Note 1: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

# **Recommended Operating Conditions**

Symbol	Parameter	Min	Nom	Max	Units
V <sub>CC</sub>	Supply Voltage	4.75	5	5.25	V
V <sub>IH</sub>	HIGH Level Input Voltage	2			V
V <sub>IL</sub>	LOW Level Input Voltage			0.8	V
V <sub>OH</sub>	HIGH Level Output Voltage			5.5	V
I <sub>OL</sub>	LOW Level Output Current			20	mA
T <sub>A</sub>	Free Air Operating Temperature	0		70	°C

#### **Electrical Characteristics**

over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 2)	Max	Units
VI	Input Clamp Voltage	$V_{CC} = Min, I_I = -18 \text{ mA}$			-1.2	V
I <sub>CEX</sub>	HIGH Level	$V_{CC} = Min, V_O = 5.5V$			250	μА
	Output Current	V <sub>IL</sub> = Max			230	
V <sub>OL</sub>	LOW Level	V <sub>CC</sub> = Min, I <sub>OL</sub> = Max			0.5	V
	Output Voltage	V <sub>IH</sub> = Min			0.5	
I	Input Current @ Max Input Voltage	$V_{CC} = Max, V_I = 5.5V$			1	mA
I <sub>IH</sub>	HIGH Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 2.7V			50	μΑ
I <sub>IL</sub>	LOW Level Input Current	$V_{CC} = Max, V_I = 0.5V$			-2	mA
I <sub>CCH</sub>	Supply Current with Outputs HIGH	V <sub>CC</sub> = Max		9	19.8	mA
I <sub>CCL</sub>	Supply Current with Outputs LOW	V <sub>CC</sub> = Max		30	54	mA

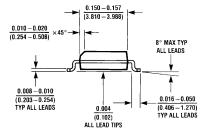
Note 2: All typicals are at  $V_{CC} = 5V$ ,  $T_A = 25$ °C.

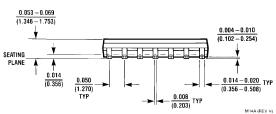
### **Switching Characteristics**

at  $V_{CC} = 5V$  and  $T_A = 25^{\circ}C$ 

	Parameter	$R_L = 280\Omega$				
Symbol		C <sub>L</sub> = 15 pF		C <sub>L</sub> = 50 pF		Units
		Min	Max	Min	Max	
t <sub>PLH</sub>	Propagation Delay Time	2	7.5	3	11	ns
	LOW-to-HIGH Level Output	2	7.5	3	'''	115
t <sub>PHL</sub>	Propagation Delay Time	2	7	3	11	
	HIGH-to-LOW Level Output	2	,	3	''	ns

# 





14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150 Narrow Package Number M14A

#### Physical Dimensions inches (millimeters) unless otherwise noted (Continued) 0.740 - 0.770 (18.80 - 19.56)0.090 (2.286) 14 13 12 11 10 9 8 14 13 12 INDEX AREA 0.250 ± 0.010 (6.350 ± 0.254) PIN NO. 1 PIN NO. 1 IDENT 1 2 3 4 5 6 7 1 2 3 $\frac{0.092}{(2.337)}$ DIA 0.030 MAX (0.762) DEPTH OPTION 1 OPTION 02 $\frac{0.135 \pm 0.005}{(3.429 \pm 0.127)}$ 0.300 - 0.320 $\frac{0.630 - 8.128}{(7.620 - 8.128)}$ 0.060 0.145 - 0.2004° TYP Optional (1.651) (3.683 - 5.080) $\frac{0.008 - 0.016}{(0.203 - 0.406)}$ TYP 0.020 (0.508)0.125 - 0.150 $0.075 \pm 0.015$ $\overline{(3.175 - 3.810)}$ $(1.905 \pm 0.381)$ (7.112) MIN 0.014 - 0.0230.100 ± 0.010 (2.540 ± 0.254) (0.356 - 0.584) $\frac{0.050 \pm 0.010}{(1.270 - 0.254)}$ TYP 0.325 <sup>+0.040</sup> -0.015 8.255 + 1.016

14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide Package Number N14A

Fairchild does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and Fairchild reserves the right at any time without notice to change said circuitry and specifications.

#### LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

- 1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
- 2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

www.fairchildsemi.com

N144 (REV.F)