

MM70C95/MM80C95, MM70C97/MM80C97 TRI-STATE® Hex Buffers MM70C96/MM80C96, MM70C98/MM80C98 TRI-STATE Hex Inverters

General Description

These gates are monolithic complementary MOS (CMOS) integrated circuits constructed with N- and P-channel enhancement mode transistors. The MM70C95/MM80C95 and the MM70C97/MM80C97 convert CMOS or TTL outputs to TRI-STATE outputs with no logic inversion, the MM70C96/MM80C96 and the MM70C98/MM80C98 provide the logical opposite of the input signal. The MM70C95/MM80C95 and the MM70C96/MM80C96 have common TRI-STATE controls for all six devices. The MM70C97/MM80C97 and the MM70C98/MM80C98 have two TRI-STATE controls; one for two devices and one for the other four devices. Inputs are protected from damage due to static discharge by diode clamps to V_{CC} and GND.

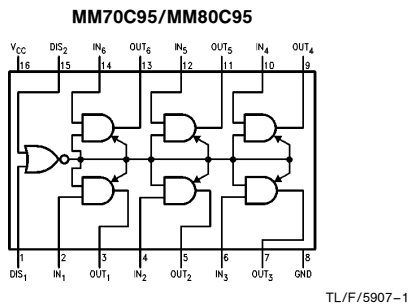
Features

- Wide supply voltage range 3.0V to 15V
- Guaranteed noise margin 1.0V
- High noise immunity 0.45 V_{CC} (typ.)
- TTL compatible Drive 1 TTL Load

Applications

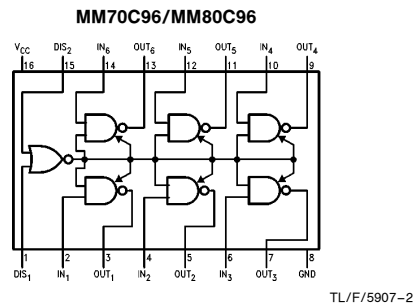
- Bus drivers Typical propagation delay into 150 pF load is 40 ns

Connection Diagrams (Dual-In-Line Packages)



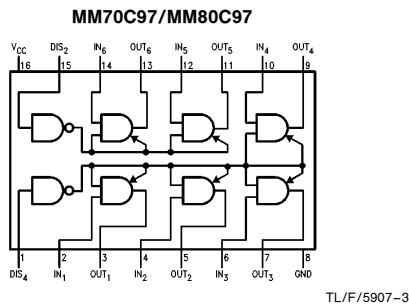
Top View

Order Number MM70C95 or MM80C95



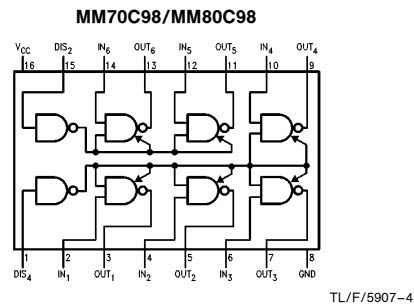
Top View

Order Number MM70C96 or MM80C96



Top View

Order Number MM70C97 or MM80C97



Top View

Order Number MM70C98 or MM80C98

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Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Voltage at Any Pin	-0.3V to $V_{CC} + 0.3V$
Operating Temperature Range	-55°C to +125°C
MM70CXX	-40°C to +85°C
MM80CXX	

Storage Temperature Range	-65°C to +150°C
Power Dissipation (P_D)	
Dual-In-Line	700 mW
Small Outline	500 mW
Power Supply Voltage (V_{CC})	18V
Lead Temperature (Soldering, 10 seconds)	260°C

DC Electrical Characteristics Min/Max limits apply across temperature range unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Units
CMOS TO CMOS						
$V_{IN(1)}$	Logical "1" Input Voltage	$V_{CC} = 5V$	3.5			V
		$V_{CC} = 10V$	8.0			V
$V_{IN(0)}$	Logical "0" Input Voltage	$V_{CC} = 5V$			1.5	V
		$V_{CC} = 10V$			2.0	V
$V_{OUT(1)}$	Logical "1" Output Voltage	$V_{CC} = 5V$	4.5			V
		$V_{CC} = 10V$	9.0			V
$V_{OUT(0)}$	Logical "0" Output Voltage	$V_{CC} = 5V$			0.5	V
		$V_{CC} = 10V$			1.0	V
$I_{IN(1)}$	Logical "1" Input Current	$V_{CC} = 15V$		0.005	1.0	μA
$I_{IN(0)}$	Logical "0" Input Current		-1.0	-0.005		μA
I_{OZ}	Output Current in High Impedance State	$V_{CC} = 15V, V_O = 15V$		0.005	1.0	μA
		$V_{CC} = 15V, V_O = 0V$	-1.0	-0.005		μA
I_{CC}	Supply Current	$V_{CC} = 15V$		0.01	15	μA

TTL INTERFACE

$V_{IN(1)}$	Logical "1" Input Voltage	70C $V_{CC} = 4.5V$	$V_{CC} - 1.5$			V
		80C $V_{CC} = 4.75V$	$V_{CC} - 1.5$			V
$V_{IN(0)}$	Logical "0" Input Voltage	70C $V_{CC} = 4.5V$			0.8	V
		80C $V_{CC} = 4.75V$			0.8	V
$V_{OUT(1)}$	Logical "1" Output Voltage	70C $V_{CC} = 4.5V, I_O = -1.6 mA$	2.4			V
		80C $V_{CC} = 4.75V, I_O = -1.6 mA$	2.4			V
$V_{OUT(0)}$	Logical "0" Output Voltage	70C $V_{CC} = 4.5V, I_O = 1.6 mA$			0.4	V
		80C $V_{CC} = 4.75V, I_O = 1.6 mA$			0.4	V

OUTPUT DRIVE (Short Circuit Current)

I_{SOURCE}	Output Source Current	$V_{CC} = 5V, V_{IN(1)} = 5V$ $T_A = 25^\circ C, V_{OUT} = 0V$	-4.35			mA
I_{SOURCE}	Output Source Current	$V_{CC} = 10V, V_{IN(1)} = 10V$ $T_A = 25^\circ C, V_{OUT} = 0V$	-20			mA
I_{SINK}	Output Sink Current	$V_{CC} = 5V, V_{IN(0)} = 0V$ $T_A = 25^\circ C, V_{OUT} = V_{CC}$	4.35			mA
I_{SINK}	Output Sink Current	$V_{CC} = 10V, V_{IN(0)} = 0V$ $T_A = 25^\circ C, V_{OUT} = V_{CC}$	20			mA

Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the device should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

Note 2: Capacitance is guaranteed by periodic testing.

Note 3: C_{PD} determines the no load AC power consumption of any CMOS device. For complete explanation see 54C/74C Family Characteristics application note AN-90.

AC Electrical Characteristics* $T_A = 25^\circ\text{C}$, $C_L = 50\text{ pF}$, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Units					
t_{pd0} , t_{pd1}	Propagation Delay Time to a Logical "0" or Logical "1" from Data Input to Output MM70C95/MM80C95, MM70C97/MM80C97	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$		60 25	100 40	ns ns					
							MM70C96/MM80C96, MM70C98/MM80C98	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$	70 35	150 75	ns ns
t_{pd0} , t_{pd1}	Propagation Delay Time to a Logical "0" or Logical "1" from Data Input to Output MM70C95/MM80C95, MM70C97/MM80C97	$V_{CC} = 5\text{V}$, $C_L = 150\text{ pF}$ $V_{CC} = 10\text{V}$, $C_L = 150\text{ pF}$		85 40	160 80	ns ns					
							MM70C96/MM80C96, MM70C98/MM80C98	$V_{CC} = 5\text{V}$, $C_L = 150\text{ pF}$ $V_{CC} = 10\text{V}$, $C_L = 150\text{ pF}$	95 45	210 110	ns ns
t_{1H} , t_{0H}	Delay from Disable Input to High Impedance State, (from Logical "1" or Logical "0") MM70C95/MM80C95	$R_L = 10\text{k}$, $C_L = 5\text{ pF}$ $V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$		80 50	135 90	ns ns					
							MM70C96/MM80C96	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$	100 70	180 125	ns ns
							MM70C98/MM80C98	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$	90 70	170 125	ns ns
t_{H1} , t_{H0}	Delay from Disable Input to Logical "1" Level (from High Impedance State) MM70C95/MM80C95	$R_L = 10\text{k}$, $C_L = 50\text{ pF}$ $V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$		120 50	200 90	ns ns					
							MM70C96/MM80C96	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$	130 60	225 110	ns ns
							MM70C98/MM80C98	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$	120 50	200 90	ns ns
C_{IN}	Input Capacitance	Any Input (Note 2)		5.0		pF					
C_{OUT}	Output Capacitance TRI-STATE	Any Output (Note 2)		11		pF					
C_{PD}	Power Dissipation Capacitance	(Note 3)		60		pF					

*AC Parameters are guaranteed by DC correlated testing.

Truth Tables

MM70C95/MM80C95

Disable DIS ₁	Input DIS ₂	Input	Output
0	0	0	0
0	0	1	1
0	1	X	H-z
1	0	X	H-z
1	1	X	H-z

MM70C96/MM80C96

Disable DIS ₁	Input DIS ₂	Input	Output
0	0	0	1
0	0	1	0
0	1	X	H-z
1	0	X	H-z
1	1	X	H-z

MM70C97/MM80C97

Disable DIS ₄	Input DIS ₂	Input	Output
0	0	0	0
0	0	1	1
X	1	X	H-z*
1	X	X	H-z**

MM70C98/MM80C98

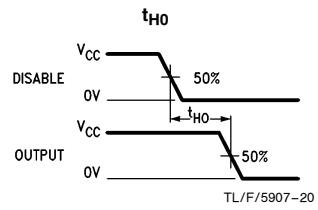
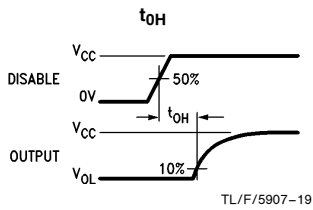
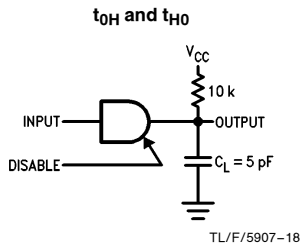
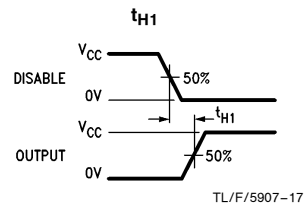
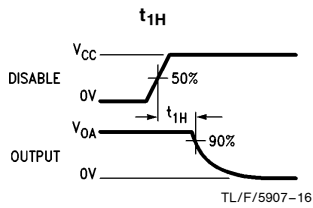
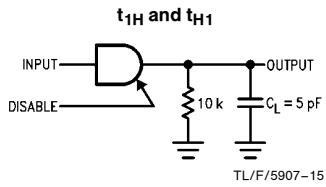
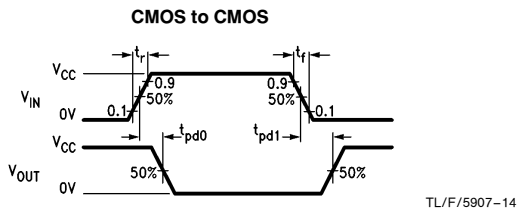
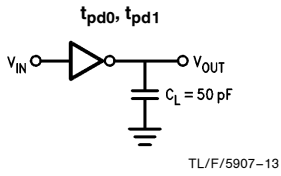
Disable DIS ₄	Input DIS ₂	Input	Output
0	0	0	1
0	0	1	0
X	1	X	H-z*
1	X	X	H-z**

*Output 5-6 only

**Output 1-4 only

X = Irrelevant

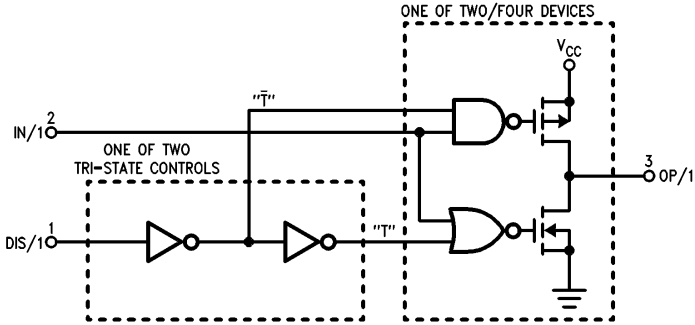
AC Test Circuits and Switching Time Waveforms



Note: Delays measured with input t_r , $t_f \leq 20$ ns.

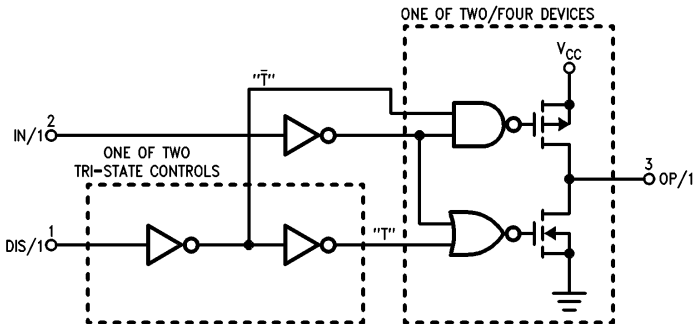
Schematic Diagrams (Continued)

MM70C97/MM80C97 TRI-STATE



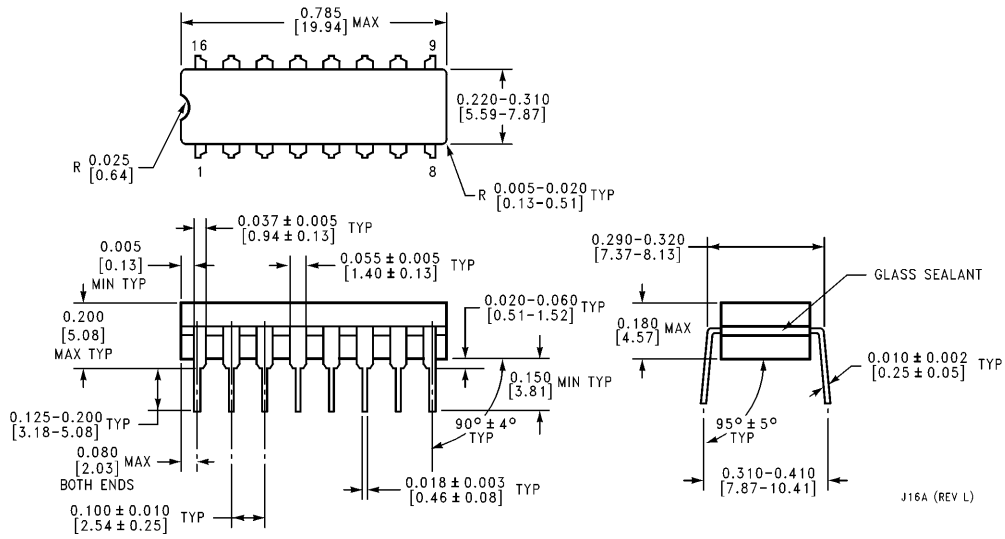
TL/F/5907-11

MM70C98/MM80C98 TRI-STATE



TL/F/5907-12

Physical Dimensions inches (millimeters)

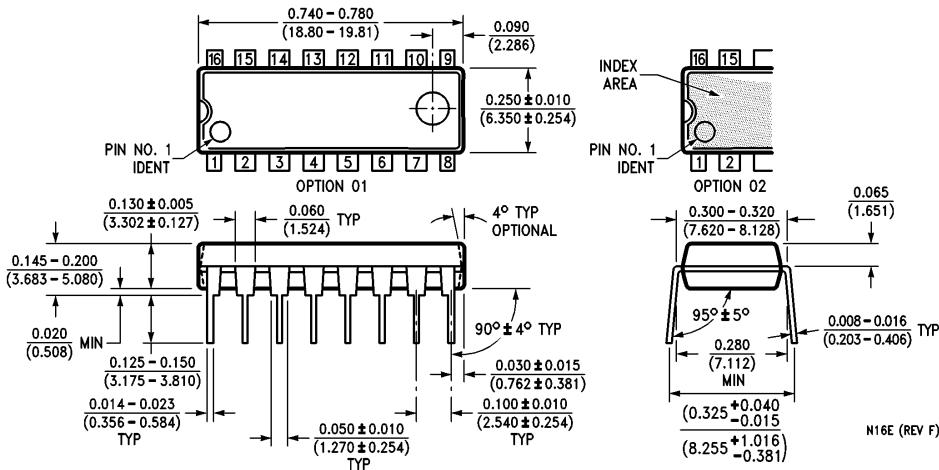


Ceramic Dual-In-Line Package (J)
Order Number MM70C95J, MM70C96J, MM70C97J, MM70C98J,
MM80C95J, MM80C96J, MM80C97J or MM80C98J
NS Package Number J16A

J16A (REV L)

**MM70C95/MM80C95, MM70C97/MM80C97 TRI-STATE Hex Buffers
MM70C96/MM80C96, MM70C98/MM80C98 TRI-STATE Hex Inverters**

Physical Dimensions inches (millimeters) (Continued)



Molded Dual-In-Line Package (N)
Order Number MM70C95N, MM70C96N, MM70C97N, MM70C98N,
MM80C95N, MM80C96N, MM80C97N or MM80C98N
NS Package Number N16E

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