

**MNMM70C98-X REV 1A0**

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**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 MM70C98 provide the logical opposite of the input signal. The MM70C98 has 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 Vcc and Gnd.

**Industry Part Number**

MM70C98

**NS Part Numbers**

 MM70C98J/883  
 MM70C98W/883

**Prime Die**

MM70C98

**Processing**

MIL-STD-883, Method 5004

**Quality Conformance Inspection**

MIL-STD-883, Method 5005

Subgrp	Description	Temp ( °C)
1	Static tests at	+25
2	Static tests at	+125
3	Static tests at	-55
4	Dynamic tests at	+25
5	Dynamic tests at	+125
6	Dynamic tests at	-55
7	Functional tests at	+25
8A	Functional tests at	+125
8B	Functional tests at	-55
9	Switching tests at	+25
10	Switching tests at	+125
11	Switching tests at	-55

**Features**

- Wide supply voltage range                    3.0V to 15V
- Guaranteed noise margin                    1.0V
- High noise immunity                    0.45 Vcc (typ.)
- TTL compatible                    Drives 1 TTL load

**Applications**

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

**(Absolute Maximum Ratings)**

(Note 1)

Voltage at Any Pin	-0.3V to Vcc +0.3V
Operating Temperature Range	-55 C to +125 C
Storage Temperature Range	-65 C to +150 C
Power Dissipation (Pd)	
Dual-In-Line	700mW
Small Outline	500mW
Power Supply Voltage (Vcc)	18V
Lead Temperature (Soldering, 10 seconds)	260 C

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 devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

## Electrical Characteristics

### DC PARAMETERS: CMOS TO CMOS:

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Voh	Logical "1" Output Voltage	Vcc = 5V, Ioh = -10uA, Vil = 1.5V			4.5		V	1, 2, 3
		Vcc = 10V, Ioh = -10uA, Vil = 2V			9		V	1, 2, 3
Vol	Logical "0" Output Voltage	Vcc = 5V, Iol = 10uA, Vih = 3.5V, Vil = 1.5V				0.5	V	1, 2, 3
		Vcc = 10V, Iol = 10uA, Vih = 8V, Vil = 2V				1	V	1, 2, 3
Iih	Logical "1" Input Current	Vcc = 15V, Vin = 15V				0.15	uA	1, 3
						1	uA	2
Iil	Logical "0" Input Current	Vcc = 15V, Vin = 0V				-0.15	uA	1, 3
						-1	uA	2
Icc	Supply Current	Vcc = 15V				0.5	uA	1, 3
						15	uA	2
Iozh	Output Current In High Impedance State	Vcc = 15V, Vout = 15V				0.15	uA	1, 3
						1	uA	2
Iozl	Output Current In High Impedance State	Vcc = 15V, Vout = 0V				-0.15	uA	1, 3
						-1	uA	2
Vih	Logical "1" Input Voltage	Vcc = 5V	1		3.5		V	1, 2, 3
		Vcc = 10V	1		8		V	1, 2, 3
Vil	Logical "0" Input Voltage	Vcc = 5V	1			1.5	V	1, 2, 3
		Vcc = 10V	1			2	V	1, 2, 3

### DC PARAMETERS: TTL INTERFACE:

Voh	Logical "1" Output Voltage	Vcc = 4.5V, Ioh = -1.6mA, Vil = 0.8V			2.4		V	1, 2, 3
Vol	Logical "0" Output Voltage	Vcc = 4.5V, Iol = 1.6mA, Vih = 3V, Vil = 0.8V				0.4	V	1, 2, 3
Vih	Logical "1" Input Voltage	Vcc = 4.5V	1		3		V	1, 2, 3
Vil	Logical "0" Input Voltage	Vcc = 4.5V	1			0.8	V	1, 2, 3

## Electrical Characteristics

### DC PARAMETERS: OUTPUT DRIVE:

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
I <sub>source</sub>	Output Source Current	V <sub>cc</sub> = 5V, V <sub>out</sub> = 0V, V <sub>in</sub> = 0V			-4.35		mA	1
		V <sub>cc</sub> = 10V, V <sub>out</sub> = 0V, V <sub>in</sub> = 0V			-20		mA	1
I <sub>sink</sub>	Output Sink Current	V <sub>cc</sub> = 5V, V <sub>out</sub> = 5V, V <sub>in</sub> = 5V			4.35		mA	1
		V <sub>cc</sub> = 10V, V <sub>out</sub> = 10V, V <sub>in</sub> = 10V			20		mA	1, 2, 3

### AC PARAMETERS: PROPAGATION DELAY TIME:

(The following conditions apply to all the following parameters, unless otherwise specified.)

AC: C<sub>l</sub> = 50pF or equivalent impedance provided by diode load.

t <sub>PHL</sub> /t <sub>PLH</sub>	Data to Q	V <sub>cc</sub> = 5V	3			150	nS	9	
			3			210	nS	10	
			3			120	nS	11	
		V <sub>cc</sub> = 10V	2			75	nS	9	
			2			105	nS	10	
			2			60	nS	11	
		V <sub>cc</sub> = 5V, C <sub>l</sub> = 150pF	2			210	nS	9	
			2			295	nS	10	
			2			170	nS	11	
		V <sub>cc</sub> = 10V, C <sub>l</sub> = 150pF	2			110	nS	9	
t <sub>lH</sub> /t <sub>lO</sub>	Disable Time	V <sub>cc</sub> = 5V	3			170	nS	9, 11	
			3			255	nS	10	
		V <sub>cc</sub> = 10V	2			125	nS	9, 11	
			2			188	nS	10	
t <sub>H1</sub> /t <sub>H0</sub>	Enable Time	V <sub>cc</sub> = 5V	3			200	nS	9, 11	
			3			300	nS	10	
		V <sub>cc</sub> = 10V	2			90	nS	9, 11	
			2			135	nS	10	

Note 1: Parameter tested go-no-go only.

Note 2: Guaranteed parameter not tested.

Note 3: Tested at 25 C; guaranteed but not tested at +125 C and -55 C.