

## MM54C941/MM74C941 Octal Buffers/Line Receivers/ Line Drivers with TRI-STATE® Outputs

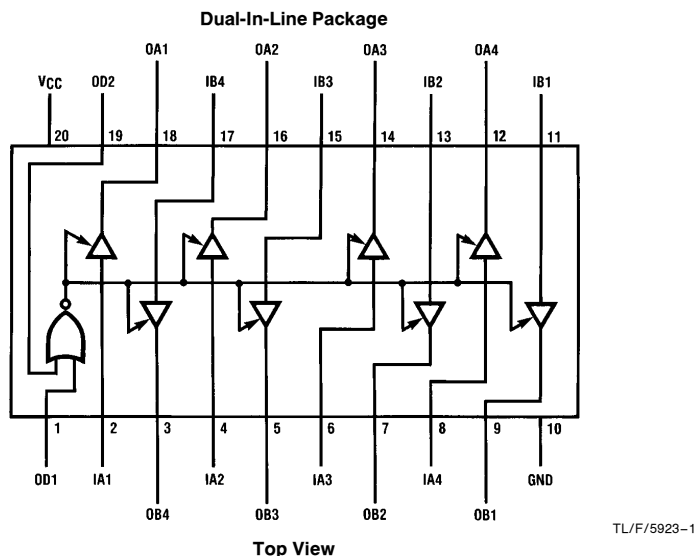
### General Description

These octal buffers and line drivers are monolithic complementary MOS (CMOS) integrated circuits with TRI-STATE outputs. These outputs have been specially designed to drive highly capacitive loads such as bus-oriented systems. These devices have a fan-out of 6 low power Schottky loads. When  $V_{CC} = 5V$ , inputs can accept true TTL high and low logic levels.

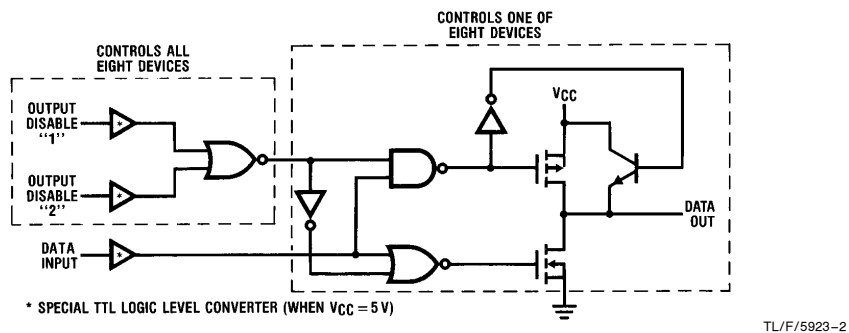
### Features

- Wide supply voltage range (3V to 15V)
- Low power consumption
- TTL compatibility (Improved on the inputs)
- High capacitive load
- TRI-STATE outputs
- Input protection
- 20-pin dual-in-line package
- High output drive

### Connection and Logic Diagrams



Order Number MM54C941 or MM74C941



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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 ( $T_A$ )	–55°C to +125°C MM54C941 –40°C to +85°C MM74C941

Storage Temperature Range ( $T_S$ )	–65°C to +150°C
Power Dissipation ( $P_D$ )	
Dual-In-Line	700 mW
Small Outline	500 mW
Operating $V_{CC}$ Range	3V to 15V
$V_{CC}$	18V
Lead Temperature ( $T_L$ )	
(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
<b>CMOS TO CMOS</b>						
$V_{IN(1)}$	Logical “1” Input Voltage	$V_{CC} = 5.0V$ $V_{CC} = 10V$	2.5 8.0			V V
$V_{IN(0)}$	Logical “0” Input Voltage	$V_{CC} = 5.0V$ $V_{CC} = 10V$			0.8 2.0	V V
$V_{OUT(1)}$	Logical “1” Output Voltage	$V_{CC} = 5.0V, I_O = -10\mu A$ $V_{CC} = 10V, I_O = -10\mu A$	4.5 9.0			V V
$V_{OUT(0)}$	Logical “0” Output Voltage	$V_{CC} = 5.0V, I_O = 10\mu A$ $V_{CC} = 10V, I_O = 10\mu A$			0.5 1.0	V V
$I_{IN(1)}$	Logical “1” Input Current	$V_{CC} = 15V, V_{IN} = 15V$		0.005	1.0	$\mu A$
$I_{IN(0)}$	Logical “0” Input Current	$V_{CC} = 15V, V_{IN} = 0V$	–1.0	–0.005		$\mu A$
$I_{CC}$	Supply Current	$V_{CC} = 15V$		0.05	300	$\mu A$
$I_{OZ}$	TRI-STATE Leakage	$V_{CC} = 15V, V_{OUT} = 0V$ or 15V			$\pm 10$	$\mu A$

## CMOS/TTL INTERFACE

$V_{IN(1)}$	Logical “1” Input Voltage	54C, $V_{CC} = 4.5V$ 74C, $V_{CC} = 4.75V$	$V_{CC} - 2.5$ $V_{CC} - 2.5$			V V
$V_{IN(0)}$	Logical “0” Input Voltage	54C, $V_{CC} = 4.5V$ 74C, $V_{CC} = 4.75V$			0.8 0.8	V V
$V_{OUT(1)}$	Logical “1” Output Voltage	54C, $V_{CC} = 4.5V, I_O = -450\mu A$ 74C, $V_{CC} = 4.75V, I_O = -450\mu A$ 54C, $V_{CC} = 4.5V, I_O = -2.2mA$ 74C, $V_{CC} = 4.75V, I_O = -2.2mA$	$V_{CC} - 0.4$ $V_{CC} - 0.4$ 2.4 2.4			V V V V
$V_{OUT(0)}$	Logical “0” Output Voltage	54C, $V_{CC} = 4.5V, I_O = 2.2mA$ 74C, $V_{CC} = 4.75V, I_O = 2.2mA$			0.4 0.4	V V

## OUTPUT DRIVE (See 54C/74C Family Characteristics Data Sheet)

$I_{SOURCE}$	Output Source Current (P-Channel)	$V_{CC} = 5.0V, V_{OUT} = 0V$ $T_A = 25^\circ C$	–14.0	–30.0		mA
$I_{SOURCE}$	Output Source Current (P-Channel)	$V_{CC} = 10V, V_{OUT} = 0V$ $T_A = 25^\circ C$	–36.0	–70.0		mA
$I_{SINK}$	Output Sink Current (N-Channel)	$V_{CC} = 5.0V, V_{OUT} = V_{CC}$ $T_A = 25^\circ C$	12.0	20.0		mA
$I_{SINK}$	Output Sink Current (N-Channel)	$V_{CC} = 10V, V_{OUT} = V_{CC}$ $T_A = 25^\circ C$	48.0	70		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 devices should be operated at these limits. The table of “Electrical Characteristics” provides conditions for actual device operation.

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$t_{pd1}$ , $t_{pd0}$	Propagation Delay (Data IN to OUT)	$V_{CC} = 5.0\text{V}$ , $C_L = 50\text{ pF}$ $V_{CC} = 10\text{V}$ , $C_L = 50\text{ pF}$ $V_{CC} = 5.0\text{V}$ , $C_L = 150\text{ pF}$ $V_{CC} = 10\text{V}$ , $C_L = 150\text{ pF}$		70 35 90 45	140 70 160 90	ns ns ns ns
$t_{IH}$ , $t_{OH}$	Propagation Delay Output Disable to Logic Level (from High Impedance State) (from a Logic Level)	$R_L = 1\text{ k}\Omega$ , $C_L = 50\text{ pF}$ $V_{CC} = 5.0\text{V}$ $V_{CC} = 210\text{V}$		100 55	200 110	ns ns
$t_{H1}$ , $t_{H0}$	Propagation Delay Output Disable to Logic Level (from High Impedance State)	$R_L = 1\text{ k}\Omega$ , $C_L = 50\text{ pF}$ $V_{CC} = 5.0\text{V}$ $V_{CC} = 10\text{V}$		100 55	200 110	ns ns
$t_{THL}$ , $t_{TLH}$	Transition Time	$V_{CC} = 5.0\text{V}$ , $C_L = 50\text{ pF}$ $V_{CC} = 10\text{V}$ , $C_L = 50\text{ pF}$ $V_{CC} = 5.0\text{V}$ , $C_L = 150\text{ pF}$ $V_{CC} = 10\text{V}$ , $C_L = 150\text{ pF}$		50 30 80 50	100 60 160 100	ns ns ns ns
$C_{PD}$	Power Dissipation Capacitance (Output Enabled per Buffer) (Output Disabled per Buffer)	(Note 3)		100 10		pF pF
$C_{IN}$	Input Capacitance (Any Input)	(Note 2) $V_{IN} = 0\text{V}$ , $f = 1\text{ MHz}$ , $T_A = 25^\circ\text{C}$		10		pF
$C_O$	(Output Capacitance) (Output Disabled)	$V_{IN} = 0\text{V}$ , $f = 1\text{ MHz}$ , $T_A = 25^\circ\text{C}$		10		pF

\*AC Parameters are guaranteed by DC correlated testing.

**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.

**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.

## Truth Table

OD1	OD2	Input	Output
0	0	0	0
0	0	1	1
0	1	X	Z
1	0	X	Z
1	1	X	Z

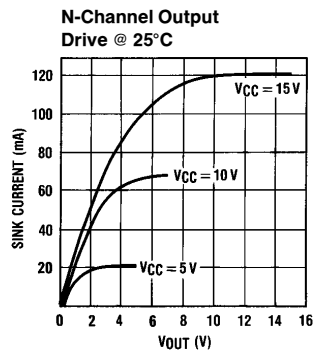
1 = High

0 = Low

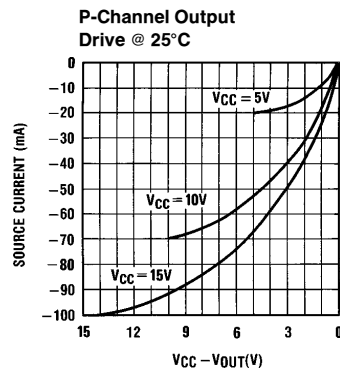
X = Don't Care

Z = TRI-STATE

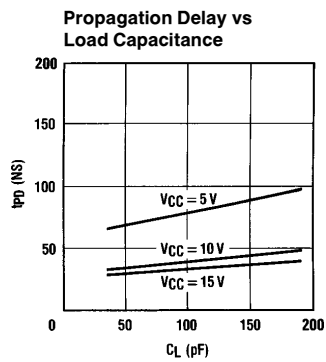
## Typical Performance Characteristics



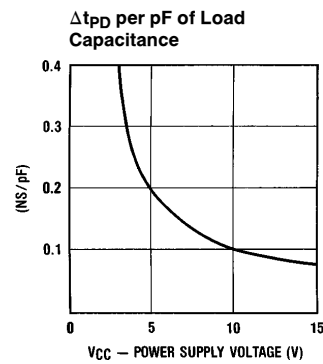
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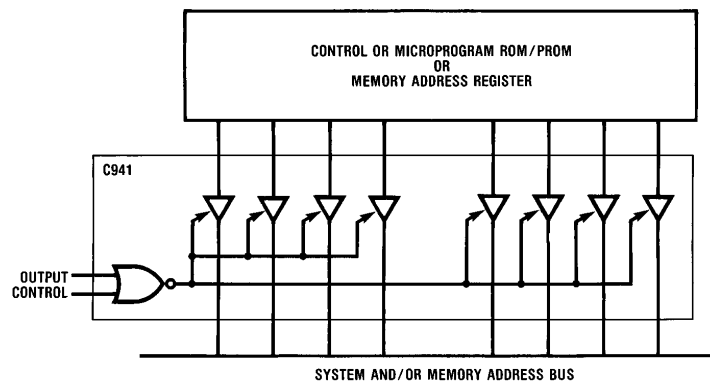


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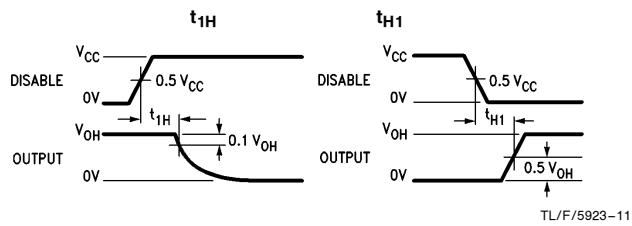
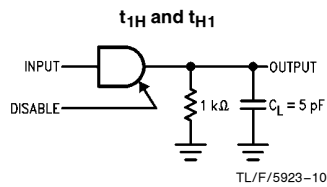
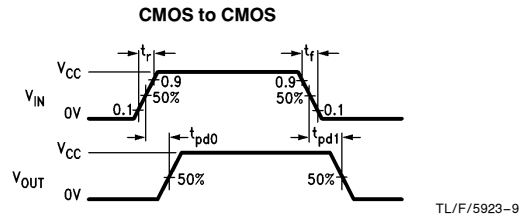
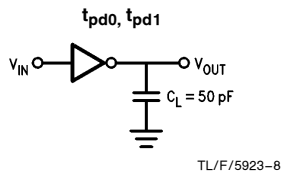
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## Typical Application

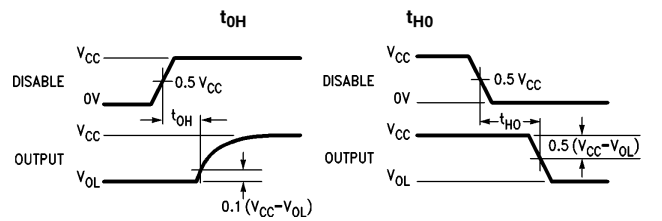
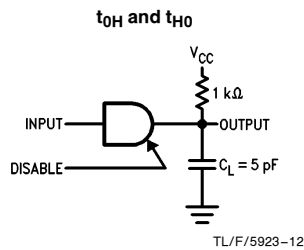


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## AC Test Circuits and Switching Time Waveforms

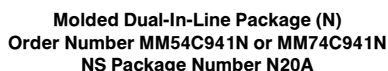
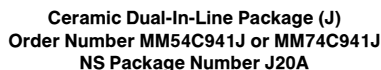


**Note:**  $V_{OH}$  is defined as the DC output high voltage when the device is loaded with a 1 kΩ resistor to ground.



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

**Note:**  $V_{OL}$  is defined as the DC output low voltage when the device is loaded with a 1 kΩ resistor to  $V_{CC}$ .



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 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 is 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.

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