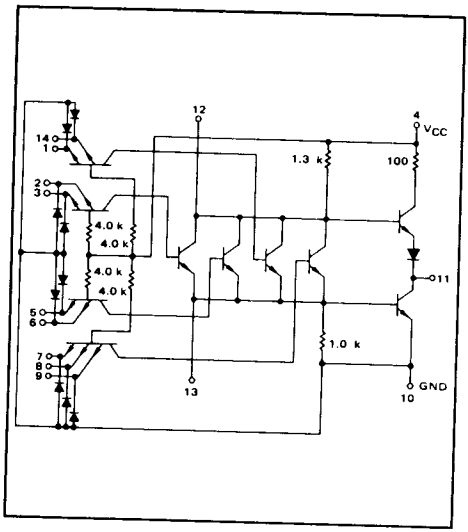
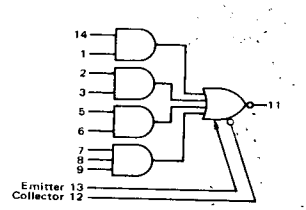
EXPANDABLE 4-WIDE
2-2-2-3 INPUT
"AND-OR-INVERT" GATE

MC501 · MC551
MC401 · MC451



This device consists of three 2-input and one 3-input AND gates internally ORed together and then inverted to provide the output. The common ORing nodes are available for expansion and up to 10 AND gates can be ORed together using the MC509 and the MC510 series expanders. Care should be taken to minimize the amount of capacitance on the expander terminals in order to maintain switching speeds.



Positive Logic:

$$11 = \overline{(14 \cdot 1) + (2 \cdot 3) + (5 \cdot 6) + (7 \cdot 8 \cdot 9) + (\text{Expanders})}$$

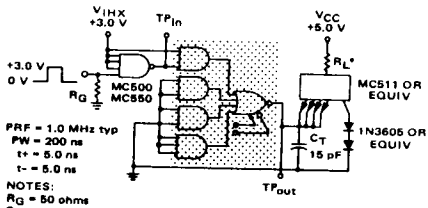
Negative Logic:

$$11 = \overline{(14 + 1) \cdot (2 + 3) \cdot (5 + 6) \cdot (7 + 8 + 9) \cdot (\text{Expanders})}$$

Total Power Dissipation = 30 mW typ/pkg
Propagation Delay Time = 12 ns typ

TYPE NO.	INPUT LOADING FACTOR	(I_F)	OUTPUT DRIVE		(I_{OL})	TEMPERATURE RANGE
MC501 MC551	1	(−1.33 mA)	15 7	MC500 series Gates MC500 series Gates	(20 mA) (10 mA)	−55°C to +125°C
MC401 MC451	1	(−1.66 mA)	12 6	MC400 series Gates MC400 series Gates	(20 mA) (10 mA)	0° to +75°C

SWITCHING TIME TEST CIRCUIT

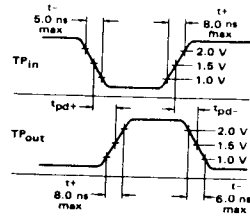


PRF = 1.0 MHz typ
PW = 200 ns
t+ = 5.0 ns
t− = 5.0 ns

NOTES:
R_G = 50 ohms
C_T = the total parasitic capacitance which includes probe, wiring and load capacitances.
Scope rise time < 1.0 ns
Probe capacitance < 5.0 pF
Expander pins should be left open when measuring switching times.

*MC501 – 260 Ω
MC551 – 570 Ω
MC401 – 330 Ω
MC451 – 660 Ω

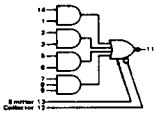
VOLTAGE WAVEFORMS AND DEFINITIONS



488

ELECTRICAL CHARACTERISTICS

Test procedures are shown for one input of the device. To complete testing, sequence through remaining inputs in a similar manner.



	@ Test Temperature	TEST CONDITIONS: mA I_{OL} Pr*	I_{OL} Std	I_{OH} Pr*	I_{OH} Std	I_{in}	Volts V_{IL}	V_{IH}	V_R	$V_{th\,1}$	$V_{th\,0}$	V_{out}	V_{CC}	V_{CCH}	V_{IHX}
MC501*, MC551	−55°C	20	10	-1.5	-0.7	1.0	0.45	2.8	4.5	2.0	1.0	5.5	5.0	-	-
	+25°C	20	10	-1.5	-0.7	1.0	0.45	2.8	4.5	1.7	1.2	5.5	5.0	8.0	3.0
	+125°C	20	10	-1.5	-0.7	1.0	0.45	2.8	4.5	1.4	0.9	5.5	5.0	-	-
MC401*, MC451	0°C	20	10	-1.2	-0.6	1.0	0.45	3.0	4.5	1.9	1.1	5.5	5.0	-	-
	+25°C	20	10	-1.2	-0.6	1.0	0.45	3.0	4.5	1.8	1.2	5.5	5.0	7.0	3.0
	+75°C	20	10	-1.2	-0.6	1.0	0.45	3.0	4.5	1.7	1.1	5.5	5.0	-	-

Characteristic	Symbol	Pin Under Test	MC501, MC551 Test Limits −55°C Min	−55°C Max	+25°C Min	+25°C Max	+125°C Min	+125°C Max	MC401, MC451 Test Limits 0°C Min	0°C Max	+25°C Min	+25°C Max	+75°C Min	+75°C Max	Unit	TEST CURRENT / VOLTAGE APPLIED TO PINS LISTED BELOW: I_{OL}	I_{OH}	I_{in}	V_{IL}	V_{IH}	V_R	$V_{th\,1}$	$V_{th\,0}$	V_{out}	V_{CC}	V_{CCH}	V_{IHX}	Gnd
Input																												
Forward Current	I_F	1	-	-1.33	-	-1.33	-	-1.33	-	-1.66	-	-1.66	-	-1.66	mAdc	-	-	-	-	-	14	-	-	-	4	-	-	1,2,3,5,6,7,8,9,10
Leakage Current	I_R	1	-	100	-	100	-	100	-	100	-	100	-	100	μAdc	-	-	-	-	-	1	-	-	-	4	-	-	2,3,5,6,7,8,9,10,14
Inverse Beta Current	I_L	1	-	100	-	100	-	100	-	100	-	100	-	100	μAdc	-	-	-	-	-	1	-	-	-	4	-	-	2,3,5,6,7,8,9,10
Breakdown Voltage	BV_{in} "0"	1	5.5	-	5.5	-	5.5	-	5.5	-	5.5	-	5.5	-	Vdc	-	-	1	-	-	-	-	-	-	4	-	-	2,3,5,6,7,8,9,10
	BV_{in} "1"	1	5.5	-	5.5	-	5.5	-	5.5	-	5.5	-	5.5	-	Vdc	-	-	1	-	-	-	-	-	-	4	-	-	2,3,5,6,7,8,9,10,14
Output																												
Output Voltage	V_{out} "0"	11	-	0.45	-	0.45	-	0.45	-	0.45	-	0.45	-	0.45	Vdc	11	-	-	-	-	-	1	-	-	4	-	-	2,3,5,6,7,8,9,10
	V_{out} "1"	11	2.5	-	2.4	-	2.7	-	2.5	-	2.4	-	2.5	-	Vdc	-	11	-	-	-	-	-	1	-	4	-	-	2,3,5,6,7,8,9,10
Leakage Current	I_{OLK}	11	-	250	-	250	-	250	-	250	-	250	-	250	μAdc	-	-	-	-	-	-	-	-	11	4	-	-	1,2,3,5,6,7,8,9,10,14
Short-Circuit Current	I_{SC}	11	-10	-45	-10	-45	-10	-45	-10	-45	-10	-45	-10	-45	mAdc	-	-	-	-	-	-	-	-	-	4	-	-	1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 14
Output Voltage	V_{OL}	11	-	0.40	-	0.40	-	0.45	-	0.40	-	0.40	-	0.45	Vdc	11	-	-	-	1	-	-	-	-	4	-	-	2,3,5,6,7,8,9,10
	V_{OH}	11	2.8	-	3.2	-	3.35	-	3.0	-	3.1	-	3.15	-	Vdc	-	11	-	1	-	-	-	-	-	4	-	-	2,3,5,6,7,8,9,10
Power Requirements (Total Device) Maximum Power Supply Current	I_{max}	4	-	-	-	12	-	-	-	-	-	12	-	-	mAdc	-	-	-	-	-	-	-	-	-	-	4	-	1,2,3,5,6,7,8,9,10,14
Power Supply Drain	I_{PDH}	4	-	9.0	-	9.0	-	9.0	-	11	-	11	-	11	mAdc	-	-	-	-	-	-	-	-	-	4	-	-	10
	I_{PDL}	4	-	7.5	-	7.5	-	7.5	-	7.5	-	7.5	-	7.5	mAdc	-	-	-	-	-	-	-	-	-	4	-	-	1,2,3,5,6,7,8,9,10,14
Switching Parameters																Pulse In	Pulse Out											
Turn-On Delay	t_{pd-}	1,11	-	-	-	23	-	-	-	-	-	23	-	-	ns	1	11	-	-	-	-	-	-	-	4	-	14	2,3,5,6,7,8,9,10
Turn-Off Delay	t_{pd+}	1,11	-	-	-	23	-	-	-	-	-	23	-	-	ns	1	11	-	-	-	-	-	-	-	4	-	14	2,3,5,6,7,8,9,10
Rise Time	t+	1,11	-	-	-	8.0	-	-	-	-	-	8.0	-	-	ns	1	11	-	-	-	-	-	-	-	4	-	14	2,3,5,6,7,8,9,10
Fall Time	t-	1,11	-	-	-	8.0	-	-	-	-	-	6.0	-	-	ns	1	11	-	-	-	-	-	-	-	4	-	14	2,3,5,6,7,8,9,10

* Prime Fan-Out.