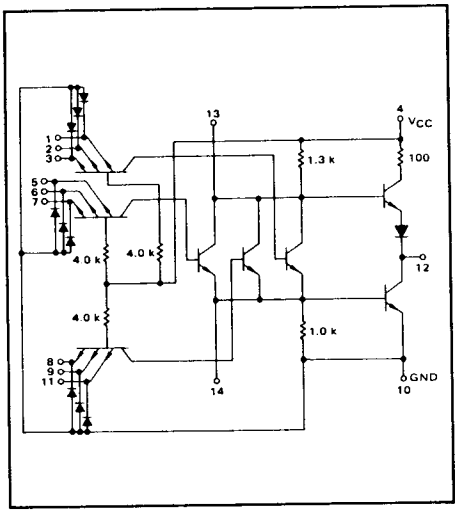
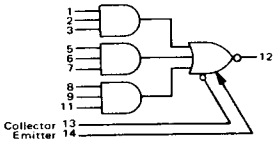
EXPANDABLE 3-WIDE 3-INPUT "AND-OR-INVERT" GATE

MC504 · MC554
MC404 · MC454



This device consists of three 3-input AND gates ORed together driving an output inverter. The common ORing nodes are available for expansion, and up to 10 AND gates can be ORed together using the MC509 or 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:

$$12 = \overline{(1 \cdot 2 \cdot 3) + (5 \cdot 6 \cdot 7) + (8 \cdot 9 \cdot 11) + (\text{Expanders})}$$

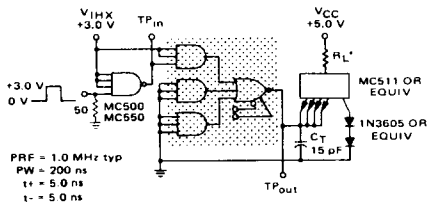
Negative Logic:

$$12 = \overline{(1 + 2 + 3) \cdot (5 + 6 + 7) \cdot (8 + 9 + 11) \cdot (\text{Expanders})}$$

Total Power Dissipation = 25 mW typ/pkg
Propagation Delay Time = 12 ns typ

TYPE NO.	INPUT LOADING FACTOR	(I_{IF})	OUTPUT DRIVE		(I_{OL})	TEMPERATURE RANGE
MC504 MC554	1	(−1.33 mA)	15 7	MC500 series Gates MC500 series Gates	(20 mA) (10 mA)	−55°C to +125°C
MC404 MC454	1	(−1.66 mA)	12 6	MC400 series Gates MC400 series Gates	(20 mA) (10 mA)	0° to +75°C

SWITCHING TIME TEST CIRCUIT

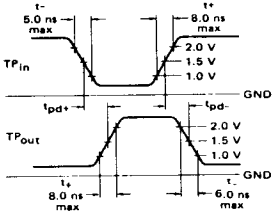


PRF = 1.0 MHz typ
PW = 200 ns
t_+ = 5.0 ns
t_- = 5.0 ns

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.

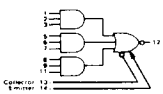
*MC504 = 260 Ω
MC554 = 570 Ω
MC404 = 330 Ω
MC454 = 660 Ω

VOLTAGE WAVEFORMS AND DEFINITIONS



ELECTRICAL CHARACTERISTICS

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



	@ Test Temperature	I_{OL} mA Pr*	I_{OL} mA Std	I_{OH} mA Pr*	I_{OH} mA Std	I_{in} mA	V_{IL} Volts	V_{IH} Volts	V_R Volts	$V_{th\,1}$ Volts	$V_{th\,0}$ Volts	V_{out} Volts	V_{CC} Volts	V_{CCH} Volts	V_{HX} Volts
MC504*, MC554	−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	-	-
MC404*, MC454	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	MC504, MC554 Test Limits −55°C Min	−55°C Max	+25°C Min	+25°C Max	+125°C Min	+125°C Max	MC404, MC454 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_{HX}	Gnd
Input Forward Current	I_F	1	-	-1.33	-	-1.33	-	-1.33	-	-1.66	-	-1.66	-	-1.66	mAdc	-	-	-	-	-	2.3	-	-	-	4	-	-	1,5,6,7,8,9,10,11
Leakage Current	I_R	1	-	100	-	100	-	100	-	100	-	100	-	100	μAdc	-	-	-	-	-	1	-	-	-	4	-	-	2,3,5,6,7,8,9,10,11
Inverse Beta Current	I_L	1	-	100	-	100	-	100	-	100	-	100	-	100	μAdc	-	-	-	-	-	1	-	-	-	4	-	-	5,6,7,8,9,10,11
Breakdown Voltage	BV_{in} "0"	1	5.5	-	5.5	-	5.5	-	5.5	-	5.5	-	5.5	-	Vdc	-	-	1	-	-	-	-	-	-	4	-	-	5,6,7,8,9,10,11
	BV_{in} "1"	1	5.5	-	5.5	-	5.5	-	5.5	-	5.5	-	5.5	-	Vdc	-	-	1	-	-	-	-	-	-	4	-	-	2,3,5,6,7,8,9,10,11
Output Output Voltage	V_{out} "0"	12	-	0.45	-	0.45	-	0.45	-	0.45	-	0.45	-	0.45	Vdc	12	-	-	-	-	-	1	-	-	4	-	-	5,6,7,8,9,10,11
	V_{out} "1"	12	2.5	-	2.4	-	2.7	-	2.5	-	2.4	-	2.5	-	Vdc	-	12	-	-	-	-	-	1	-	4	-	-	5,6,7,8,9,10,11
Leakage Current	I_{OLK}	12	-	250	-	250	-	250	-	250	-	250	-	250	μAdc	-	-	-	-	-	-	-	-	12	4	-	-	1,2,3,5,6,7,8,9,10,11
Short-Circuit Current	I_{SC}	12	-10	-45	-10	-45	-10	-45	-10	-45	-10	-45	-10	-45	mAdc	-	-	-	-	-	-	-	-	-	4	-	-	1,2,3,5,6,7,8,9,10,11,12
Output Voltage	V_{OL}	12	-	0.40	-	0.40	-	0.45	-	0.40	-	0.40	-	0.45	Vdc	12	-	-	-	1	-	-	-	-	4	-	-	5,6,7,8,9,10,11
	V_{OH}	12	2.4	-	3.2	-	3.35	-	3.0	-	3.1	-	3.15	-	Vdc	-	12	-	1	-	-	-	-	-	4	-	-	5,6,7,8,9,10,11
Power Requirements (Total Device) Maximum Power Supply Current	I_{max}	4	-	-	-	10	-	-	-	-	-	10	-	-	mAdc	-	-	-	-	-	-	-	-	-	-	4	-	1,2,3,5,6,7,8,9,10,11
Power Supply Drain	I_{PDH}	4	-	8.0	-	8.0	-	8.0	-	10	-	10	-	10	mAdc	-	-	-	-	-	-	-	-	-	4	-	-	10
	I_{PDL}	4	-	6.0	-	6.0	-	6.0	-	6.0	-	6.0	-	6.0	mAdc	-	-	-	-	-	-	-	-	-	4	-	-	1,2,3,5,6,7,8,9,10,11
Switching Parameters																Pulse In	Pulse Out											
Turn-On Delay	t_{pd-}	1,12	-	-	-	22	-	-	-	-	-	22	-	-	ns	1	12	-	-	-	-	-	-	-	4	-	2,3	5,6,7,8,9,10,11
Turn-Off Delay	t_{pd+}	1,12	-	-	-	22	-	-	-	-	-	22	-	-	ns	1	12	-	-	-	-	-	-	-	4	-	2,3	5,6,7,8,9,10,11
Rise Time	t_+	1,12	-	-	-	8.0	-	-	-	-	-	8.0	-	-	ns	1	12	-	-	-	-	-	-	-	4	-	2,3	5,6,7,8,9,10,11
Fall Time	t_-	1,12	-	-	-	6.0	-	-	-	-	-	6.0	-	-	ns	1	12	-	-	-	-	-	-	-	4	-	2,3	5,6,7,8,9,10,11

* Prime Fan-Out