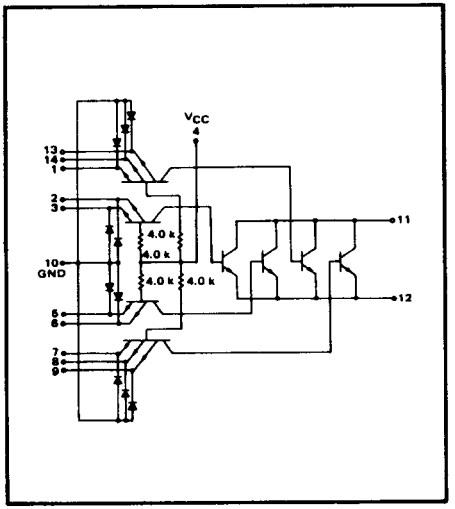
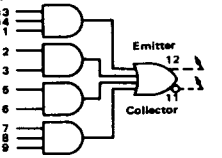
MC509 · MC559
MC409 · MC459



This device consists of two 2-input and two 3-input AND gates ORed together with the common ORing nodes made available as the output. The basic expandable gate can be expanded up to 10 AND gates by using the MC509 series or the MC510 series expander package.



Total Power Dissipation = 20 mW/pkg.

Propagation Delay Time:

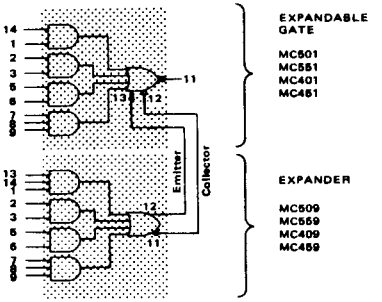
Δt_{pd} = +4.0 ns typ (1.0 ns per ORed function) When added to the expandable "AND-OR-INVERT" gate.

$\Delta t_{pd}/pF$ = 1.0 ns/pF typ Caused by additional capacitance at expansion points.

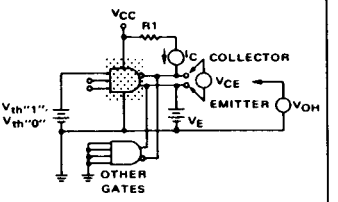
TYPE NO.	INPUT LOADING FACTOR	(I_F)	TEMPERATURE RANGE
MC509 MC559	1	(−1.33 mA)	−55°C to +125°C
MC409 MC459	1	(−1.66 mA)	0°C to +75°C

Full output loading factor of the expandable gate is maintained.

APPLICATION: EXPANDABLE 4-WIDE "AND-OR-INVERT" GATE WITH A 4-WIDE 3-2-2-3 INPUT EXPANDER CONNECTED.



V_{CE}, V_{OH} TEST CIRCUIT



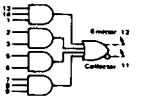
R1 = 1.3 k ohms for V_{OH} test. Adjustable to obtain I_C on V_{CE} test.

POSITIVE LOGIC:

$$12 = \underbrace{(14 \cdot 1) + (2 \cdot 3) + (5 \cdot 6) + (7 \cdot 8 \cdot 9)}_{\text{EXPANDABLE GATE}} + \underbrace{(13 \cdot 14 \cdot 1) + (2 \cdot 3) + (5 \cdot 6) + (7 \cdot 8 \cdot 9)}_{\text{EXPANDER}}$$

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		TEST CONDITIONS mA I_C	I_{in}	Volts V_R	V_{E1}	V_{E2}	V_{E3}	$V_{th\,1}$	$V_{th\,0}$	V_{out}	V_{CR}	V_{CRH}	V_{CC}	V_{CCH}
MC509, MC559	−55°C	4.0	1.0	4.5	1.00	0.90	0.8	2.0	1.0	5.5	*	-	5.0	-
	+25°C	4.0	1.0	4.5	0.85	0.75	0.8	1.7	1.2	5.5	*	**	5.0	8.0
	+125°C	4.0	1.0	4.5	0.65	0.55	0.8	1.4	0.9	5.5	*	-	5.0	-
MC409, MC459	0°C	4.0	1.0	4.5	0.90	0.80	0.8	1.9	1.1	5.5	*	-	5.0	-
	+25°C	4.0	1.0	4.5	0.85	0.75	0.8	1.8	1.2	5.5	*	**	5.0	7.0
	+75°C	4.0	1.0	4.5	0.75	0.65	0.8	1.7	1.1	5.5	*	-	5.0	-

Characteristic	Symbol	Pin Under Test	MC509, MC559 Test Limits −55°C Min	−55°C Max	+25°C Min	+25°C Max	+125°C Min	+125°C Max	MC409, MC459 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_C	I_{in}	V_R	V_{E1}	V_{E2}	V_{E3}	$V_{th\,1}$	$V_{th\,0}$	V_{out}	V_{CR}	V_{CRH}	V_{CC}	V_{CCH}	Gnd
Input																												
Forward Current	I_F	1	-	-1.33	-	-1.33	-	-1.33	-	-1.66	-	-1.66	-	-1.66	mAdc	-	-	2,3,5,6,7,8,9,13,14	-	-	-	-	-	-	-	-	4	-	1,10
Leakage Current	I_R	1	-	100	-	100	-	100	-	100	-	100	-	100	μAdc	-	-	1	-	-	-	-	-	-	-	-	4	-	2,3,5,6,7,8,9,10,13,14
Inverse Beta Current	I_L	1	-	100	-	100	-	100	-	100	-	100	-	100	μAdc	-	-	1	12	-	-	-	-	-	11	-	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	-	12	-	-	-	-	-	11	-	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	-	2,3,5,6,7,8,9,10,13,14
Output																												
Output Voltage	V_{OH}	11	4.8	-	4.8	-	4.8	-	4.8	-	4.8	-	4.8	-	Vdc	-	-	-	-	12	-	-	1	-	11	-	4	-	2,3,5,6,7,8,9,10
	V_{CE} ①	11	-	0.65	-	0.65	-	0.65	-	0.65	-	0.65	-	0.65	Vdc	11	-	-	12	-	-	1	-	-	-	-	4	-	2,3,5,6,7,8,9,10
Leakage Current	I_{OLK}	11	-	250	-	250	-	250	-	250	-	250	-	250	μAdc	-	-	-	-	-	12	-	-	11	-	-	4	-	1,2,3,5,6,7,8,9,10,13,14
Power Requirements (Total Device)																												
Maximum Power Supply Current	I_{max}	4	-	-	-	20	-	-	-	-	-	20	-	-	mAdc	-	-	-	-	-	12	-	-	-	-	11	-	4	1,2,3,5,6,7,8,9,10,13,14
Power Supply Drain	I_{PDH}	4	-	5.0	-	5.0	-	5.0	-	6.0	-	6.0	-	6.0	mAdc	-	-	-	-	-	12	-	-	-	-	-	4	-	10
	I_{PDL}	4	-	6.0	-	6.0	-	6.0	-	7.0	-	7.0	-	7.0	mAdc	-	-	-	-	-	-	-	-	-	-	-	4	-	1,2,3,5,6,7,8,9,10,13,14

* Indicated pins tied to V_{CC} thru 1.3 kohms ± 1.0% resistor
** Indicated pins tied to V_{CCH} thru 1.3 kohms ± 1.0% resistor
① V_{CE} is referenced to the emitter Voltage (Pin 12)