



MM54C86/MM74C86 Quad 2-Input EXCLUSIVE-OR Gate

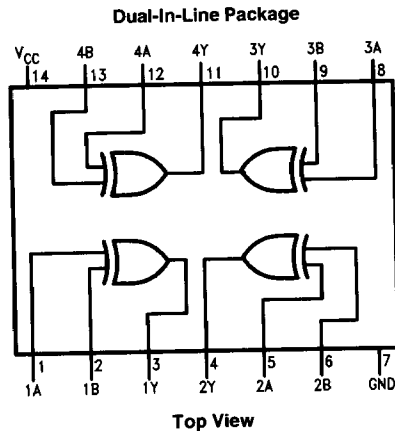
General Description

Employing complementary MOS (CMOS) transistors to achieve wide power supply operating range, low power consumption and high noise margin these gates provide basic functions used in the implementation of digital integrated circuit systems. The N- and P-channel enhancement mode transistors provide a symmetrical circuit with output swing essentially equal to the supply voltage. No DC power other than that caused by leakage current is consumed during static condition. All inputs are protected from damage due to static discharge by diode clamps to V_{CC} and GND.

Features

- Wide supply voltage range 3.0V to 15V
- Guaranteed noise margin 1.0V
- High noise immunity 0.45 V_{CC} (typ.)
- Low power Fan out of 2 driving 74L
- TTL compatibility 10 nW/package (typ.)
- Low power consumption
- The MM54C86/MM74C86 follows the MM54LS86/MM74LS86 Pinout

Connection Diagram



TL/F/5887-1

Order Number MM54C86* or MM74C86*

*Please look into Section 8, Appendix D for availability of various package types.

Truth Table

Inputs		Output
A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L

H = High Level L = Low Level

Absolute Maximum Ratings

If Military/Aerospace specified devices are required, contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Voltage at any Pin (Note 1)	-0.3V to $V_{CC} + 0.3V$
Operating Temperature Range	
MM54C86	-55°C to +125°C
MM74C86	-40°C to +85°C
Storage Temperature Range	-65°C to +150°C

Power Dissipation (P_D)	
Dual-In-Line Package	700 mW
Small Outline	500 mW
Operating Range (V_{CC})	3.0V to 15V
Absolute Maximum (V_{CC})	18V
Lead Temperature (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
CMOS TO CMOS						
$V_{IN(1)}$	Logical "1" Input Voltage	$V_{CC} = 5.0V$ $V_{CC} = 10V$	3.5 8.0			V V
$V_{IN(0)}$	Logical "0" Input Voltage	$V_{CC} = 5.0V$ $V_{CC} = 10V$			1.5 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	μA
$I_{IN(0)}$	Logical "0" Input Current	$V_{CC} = 15V, V_{IN} = 0V$	-1.0	-0.005		μA
I_{CC}	Supply Current	$V_{CC} = 15V$		0.01	15	μA

CMOS/LPTTL INTERFACE

$V_{IN(1)}$	Logical "1" Input Voltage	54C, $V_{CC} = 4.5V$ 74C, $V_{CC} = 4.75V$	$V_{CC} - 1.5$ $V_{CC} - 1.5$			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, $V_{CC} = 4.5V, I_O = -360 \mu A$ 74C, $V_{CC} = 4.75V, I_O = -360 \mu A$	2.4 2.4			V V
$V_{OUT(0)}$	Logical "0" Output Voltage	54C, $V_{CC} = 4.5V, I_O = 360 \mu A$ 74C, $V_{CC} = 4.75V, I_O = 360 \mu A$			0.4 0.4	V V

OUTPUT DRIVE (See 54/74C Family Characteristics Data Sheet) (Short Circuit Current)

I_{SOURCE}	Output Source Current (P-Channel)	$V_{CC} = 5.0V, V_{OUT} = 0V$ $T_A = 25^\circ C$	-1.75	-3.3		mA
I_{SOURCE}	Output Source Current (P-Channel)	$V_{CC} = 10V, V_{OUT} = 0V$ $T_A = 25^\circ C$	-8.0	-15		mA
I_{SINK}	Output Sink Current (N-Channel)	$V_{CC} = 5.0V, V_{OUT} = V_{CC}$ $T_A = 25^\circ C$	1.75	3.6		mA
I_{SINK}	Output Sink Current (N-Channel)	$V_{CC} = 10V, V_{OUT} = V_{CC}$ $T_A = 25^\circ C$	8.0	16		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* (MM54C86/MM74C86) $T_A = 25^\circ\text{C}$, $C_L = 50\text{ pF}$, unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t_{pd}	Propagation Time to Logical "1" or "0"	$V_{CC} = 5.0\text{V}$		110	185	ns
		$V_{CC} = 10\text{V}$		50	90	ns
C_{IN}	Input Capacitance	Note 2		5.0		pF
C_{PD}	Power Dissipation Capacitance	(Note 3) Per Gate		20		pF

*AC Parameters are guaranteed by DC correlated testing.

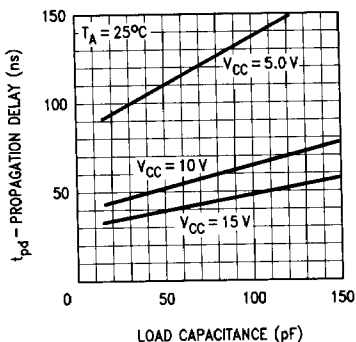
Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual 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.

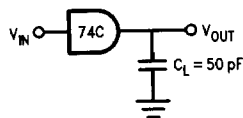
Typical Performance Characteristics

Propagation Delay Time vs
Load Capacitance
MM54C86/MM74C86



TL/F/5887-2

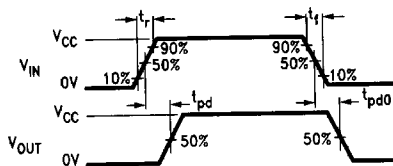
AC Test Circuit



TL/F/5887-3

Note: Delays Measured with Input t_r , $t_f = 20\text{ ns}$

Switching Time Waveforms



TL/F/5887-4