SN54136, SN54LS136, SN74136, SN74LS136
QUADRUPLE 2-INPUT EXCLUSIVE-OR GATES WITH OPEN-COLLECTOR OUTPUTS

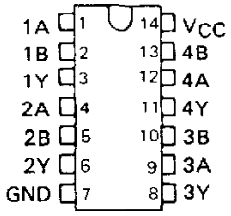
DECEMBER 1972 – REVISED MARCH 1988

FUNCTION TABLE

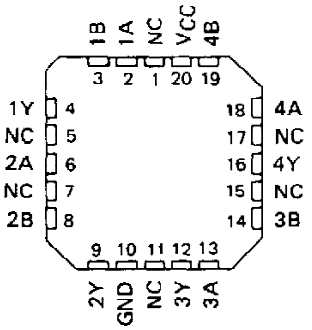
INPUTS		OUTPUT
A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L

H = high level, L = low level

SN54136, SN54LS136 . . . J OR W PACKAGE
SN74136 . . . N PACKAGE
SN74LS136 . . . D OR N PACKAGE
(TOP VIEW)

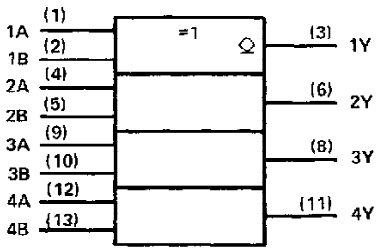


SN54LS136 . . . FK PACKAGE
(TOP VIEW)



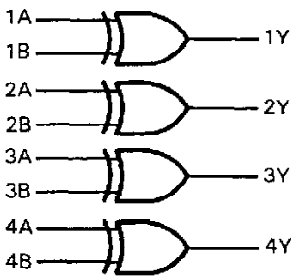
NC – No internal connection

logic symbol†



†This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for D, J, N, and W packages.

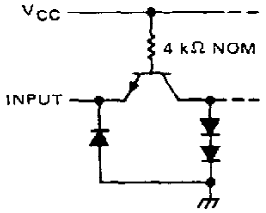
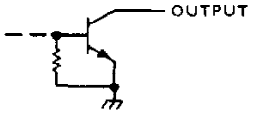
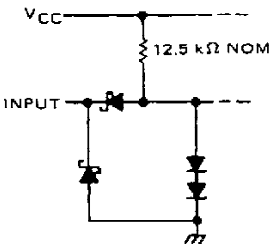
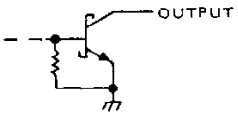
logic diagram (each gate)



positive logic

$$Y = A \oplus B = \overline{A} \cdot B + A \cdot \overline{B}$$

schematics of inputs and outputs

EQUIVALENT OF EACH INPUT OF '136	TYPICAL OF ALL OUTPUTS OF '136	EQUIVALENT OF EACH INPUT OF 'LS136	TYPICAL OF ALL OUTPUTS OF 'LS136
			

Resistor values shown are nominal.

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absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1) . . . . . 7 V
Input voltage . . . . . 5.5 V
Operating free-air temperature range: SN54136 . . . . . −55°C to 125°C
SN74136 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

recommended operating conditions

	SN54136			SN74136			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level input voltage, V_{IH}	2			2			V
Low-level input voltage, V_{IL}			0.8			0.8	V
High-level output voltage, V_{OH}			5.5			5.5	V
Low-level output current, I_{OL}			16			16	mA
Operating free-air temperature, T_A	−55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	SN54136			SN74136			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}	V_{CC} = MIN, I_I = −8 mA			−1.5			−1.5	V
I_{OH}	V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = 0.8 V, V_{OH} = 5.5 V						0.25	mA
	V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = 0.7 V, V_{OH} = 5.5 V			0.25				
V_{OL}	V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = 0.8 V, I_{OL} = 16 mA		0.2	0.4		0.2	0.4	V
I_I	V_{CC} = MAX, V_I = 5.5 V			1			1	mA
I_{IH}	V_{CC} = MAX, V_I = 2.4 V			40			40	μA
I_{IL}	V_{CC} = MAX, V_I = 0.4 V			−1.6			−1.6	mA
I_{CC}	V_{CC} = MAX, See Note 2		30	43		30	50	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.
NOTE 2: I_{CC} is measured with one input of each gate at 4.5 V, the other inputs grounded, and the outputs open.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER¶	FROM (INPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	A or B	Other input low	C_L = 15 pF, R_L = 400 Ω, See Note 3		12	18	ns
t_{PHL}					39	50	
t_{PLH}	A or B	Other input high			14	22	ns
t_{PHL}					42	55	

¶ t_{PLH} propagation delay time, low-to-high-level output
t_{PLH} propagation delay time, high-to-low-level output
NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1) . . . . . 7 V
Input voltage . . . . . 7 V
Operating free-air temperature range: SN54LS136 . . . . . −55°C to 125°C
SN74LS136 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

recommended operating conditions

	SN54LS136			SN74LS136			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output voltage, V_{OH}			5.5			5.5	V
Low-level output current, I_{OL}			4			8	mA
Operating free-air temperature, T_A	−55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS†		SN54LS136			SN74LS136			UNIT
				MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IH}	High-level input voltage			2			2			V
V_{IL}	Low-level input voltage					0.7			0.8	V
V_{IK}	Input clamp voltage	V_{CC} = MIN,	I_I = −18 mA			−1.5			−1.5	V
I_{OH}	High-level output current	V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = V_{IL} max,	V_{OH} = 5.5 V			100			100	μA
V_{OL}	Low-level output voltage	V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = V_{IL} max	I_{OL} = 4 mA		0.25	0.4		0.25	0.4	V
			I_{OL} = 8 mA					0.35	0.5	
I_I	Input current at maximum input voltage	V_{CC} = MAX,	V_I = 7 V			0.2			0.2	mA
I_{IH}	High-level input current	V_{CC} = MAX,	V_I = 2.7 V			40			40	μA
I_{IL}	Low-level input current	V_{CC} = MAX,	V_I = 0.4 V			−0.8			−0.8	mA
I_{CC}	Supply current	V_{CC} = MAX,	See Note 2		6.1	10		6.1	10	mA

†For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
‡All typical values are at V_{CC} = 5 V, T_A = 25°C.
NOTE 2: I_{CC} is measured with one input of each gate at 4.5 V, the other inputs grounded, and the outputs open.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER¶	FROM (INPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	A or B	Other input low	C_L = 15 pF, R_L = 2 kΩ, (See Note 3)		18	30	ns
t_{PHL}					18	30	
t_{PLH}	A or B	Other input high			18	30	ns
t_{PHL}					18	30	

¶t_{PLH} propagation delay time, low-to-high-level output
t_{PLH} propagation delay time, high-to-low-level output
NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

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