

SDLS048

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

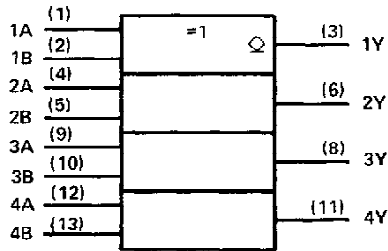
DECEMBER 1972 - REVISED MARCH 1988

FUNCTION TABLE

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

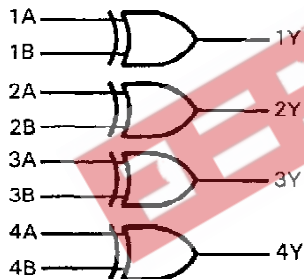
H = high level, L = low level

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.

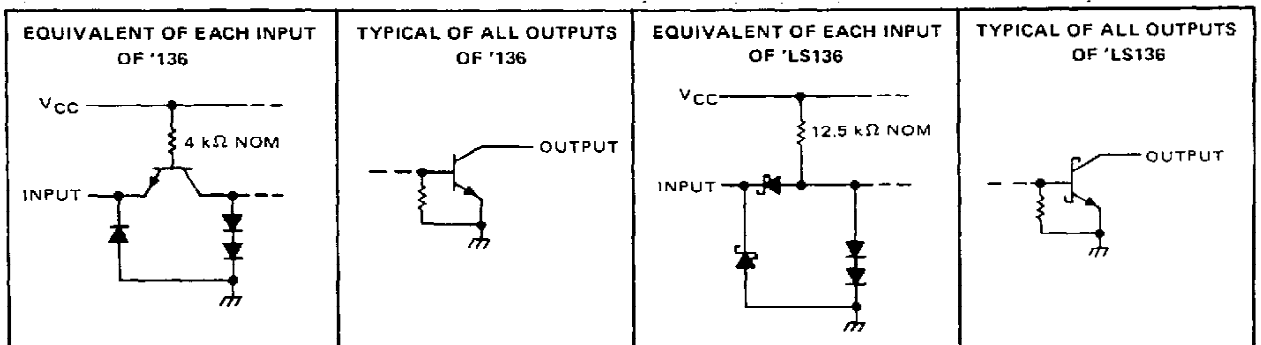
logic diagram (each gate)



positive logic

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

schematics of inputs and outputs



Resistor values shown are nominal.

PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS  
INSTRUMENTS**

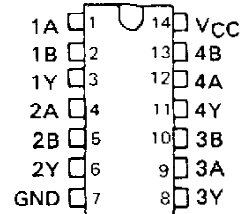
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SN54136, SN54LS136 . . . J OR W PACKAGE

SN74136 . . . N PACKAGE

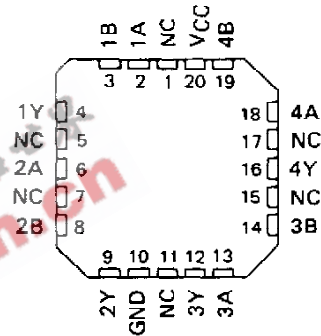
SN74LS136 . . . D OR N PACKAGE

(TOP VIEW)



SN54LS136 . . . FK PACKAGE

(TOP VIEW)



NC - No internal connection

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

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 <sup>†</sup>	SN54136			SN74136			UNIT	
		MIN	TYP <sup>‡</sup>	MAX	MIN	TYP <sup>‡</sup>	MAX		
$V_{IK}$	$V_{CC} = \text{MIN}$ , $I_I = -8 \text{ mA}$			-1.5			-1.5	V	
$I_{OH}$	$V_{CC} = \text{MIN}$ , $V_{IH} = 2 \text{ V}$ , $V_{IL} = 0.8 \text{ V}$ , $V_{OH} = 5.5 \text{ V}$						0.25	mA	
	$V_{CC} = \text{MIN}$ , $V_{IH} = 2 \text{ V}$ , $V_{IL} = 0.7 \text{ V}$ , $V_{OH} = 5.5 \text{ V}$			0.25					
$V_{OL}$	$V_{CC} = \text{MIN}$ , $V_{IH} = 2 \text{ V}$ , $V_{IL} = 0.8 \text{ V}$ , $I_{OL} = 16 \text{ mA}$			0.2		0.4	0.2	0.4	V
$I_I$	$V_{CC} = \text{MAX}$ , $V_I = 5.5 \text{ V}$			1			1	mA	
$I_{IH}$	$V_{CC} = \text{MAX}$ , $V_I = 2.4 \text{ V}$			40			40	$\mu\text{A}$	
$I_{IL}$	$V_{CC} = \text{MAX}$ , $V_I = 0.4 \text{ V}$			-1.6			-1.6	mA	
$I_{CC}$	$V_{CC} = \text{MAX}$ , See Note 2			30		43	30	50	mA

<sup>†</sup> For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

<sup>‡</sup> All typical values are at  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

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,  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^\circ\text{C}$

PARAMETER <sup>¶</sup>	FROM (INPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
$t_{PLH}$	A or B	Other input low	$C_L = 15 \text{ pF}$ , $R_L = 400 \Omega$ ,				ns
$t_{PHL}$							
$t_{PLH}$	A or B	Other input high	See Note 3				ns
$t_{PHL}$							

<sup>¶</sup> $t_{PLH}$  propagation delay time, low-to-high-level output

<sup>¶</sup> $t_{PHL}$  propagation delay time, high-to-low-level output

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

  
**TEXAS  
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# SN54LS136, SN74LS136 QUADRUPLE 2-INPUT EXCLUSIVE-OR GATES WITH OPEN-COLLECTOR OUTPUTS

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	$V_{CC} = \text{MIN.}$ , $I_I = -18 \text{ mA}$			-1.5			-1.5	V
$I_{OH}$ High-level output current	$V_{CC} = \text{MIN.}$ , $V_{IH} = 2 \text{ V.}$ $V_{IL} = V_{IL \text{ max.}}$ , $V_{OH} = 5.5 \text{ V}$			100			100	μA
$V_{OL}$ Low-level output voltage	$V_{CC} = \text{MIN.}$ , $I_{OL} = 4 \text{ mA}$		0.25	0.4		0.25	0.4	V
	$V_{IH} = 2 \text{ V.}$ $V_{IL} = V_{IL \text{ max.}}$ , $I_{OL} = 8 \text{ mA}$					0.35	0.5	
$I_I$ Input current at maximum input voltage	$V_{CC} = \text{MAX.}$ , $V_I = 7 \text{ V}$			0.2			0.2	mA
$I_{IH}$ High-level input current	$V_{CC} = \text{MAX.}$ , $V_I = 2.7 \text{ V}$			40			40	μA
$I_{IL}$ Low-level input current	$V_{CC} = \text{MAX.}$ , $V_I = 0.4 \text{ V}$			-0.8			-0.8	mA
$I_{CC}$ Supply current	$V_{CC} = \text{MAX.}$ , 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  $V_{CC} = 5 \text{ V.}$   $T_A = 25^\circ\text{C.}$

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, $V_{CC} = 5 \text{ V, } T_A = 25^\circ\text{C}$

PARAMETER¶	FROM (INPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
$t_{PLH}$	A or B	Other input low	$C_L = 15 \text{ pF,}$ $R_L = 2 \text{ k}\Omega,$ (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

¶  $t_{PHL}$  propagation delay time, high-to-low-level output

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



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