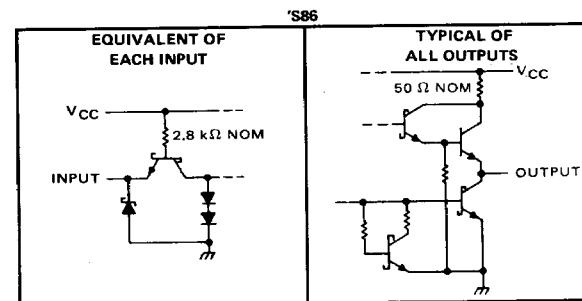
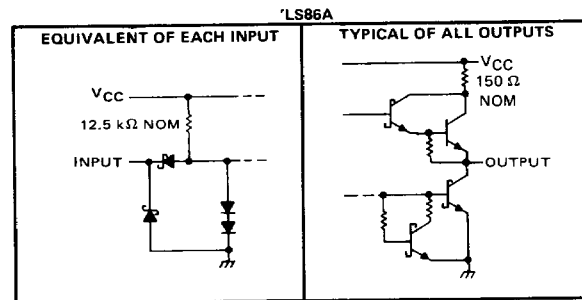
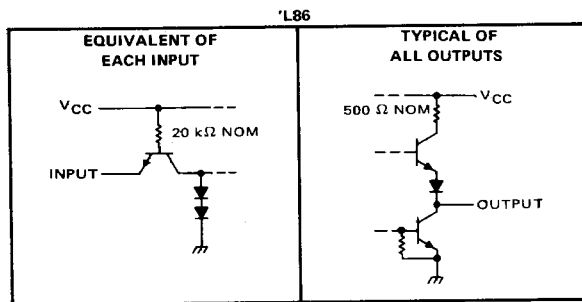
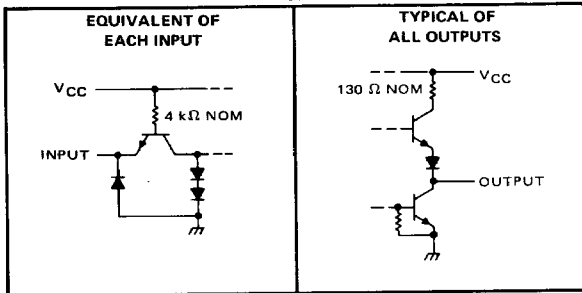


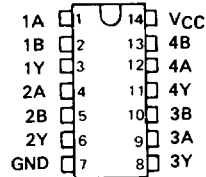
TYPES SN5486, SN54L86, SN54LS86A, SN54S86, SN7486, SN74LS86A, SN74S86 QUADRUPLE 2-INPUT EXCLUSIVE-OR GATES

DECEMBER 1972—REVISED DECEMBER 1983

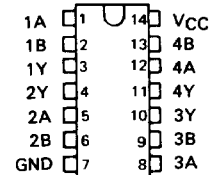
schematics of inputs and outputs



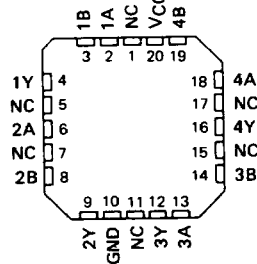
SN5486, SN54LS86A, SN54S86 ... J OR W PACKAGE
SN7486 ... J OR N PACKAGE
SN74LS86A, SN74S86 ... D, J OR N PACKAGE
(TOP VIEW)



SN54L86 ... J PACKAGE
(TOP VIEW)



SN54LS86A, SN54S86 ... FK PACKAGE
SN74LS86A, SN74S86 ... FN PACKAGE
(TOP VIEW)



NC - No internal connection

FUNCTION TABLES

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

H = high level, L = low level

TYPE	TYPICAL AVERAGE PROPAGATION DELAY TIME	TYPICAL TOTAL POWER DISSIPATION
'86	14 ns	150 mW
'L86	55 ns	15 mW
'LS86A	10 ns	30.5 mW
'S86	7 ns	250 mW

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TTL DEVICES

PRODUCTION DATA
This document contains 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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3-349

TYPES SN5486, SN7486

QUADRUPLE 2-INPUT EXCLUSIVE-OR GATES

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: SN5486	-55°C to 125°C
SN7486	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

	SN5486			SN7486			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 current, I_{OH}			-800			-800	μ A
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†	SN5486			SN7486			UNIT	
		MIN	TYP‡	MAX	MIN	TYP‡	MAX		
V_{IH} High-level input voltage		2			2			V	
V_{IL} Low-level input voltage				0.8			0.8	V	
V_{IK} Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -8 \text{ mA}$			-1.5			-1.5	V	
V_{OH} High-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OH} = -800 \mu\text{A}$	2.4	3.4		2.4	3.4		V	
V_{OL} Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OL} = 16 \text{ mA}$		0.2	0.4		0.2	0.4	V	
I_I Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$			1			1	mA	
I_{IH} High-level input current	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$			40			40	μ A	
I_{IL} Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$			-1.6			-1.6	mA	
I_{OS} Short-circuit output current§	$V_{CC} = \text{MAX}$			-20		-55	-18	-55	mA
I_{CC} Supply current	$V_{CC} = \text{MAX}, \text{ See Note 2}$			30		43	30	50	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 $V_{CC} = 5 \text{ V}, T_A = 25^\circ \text{C}$.

§ Not more than one output should be shorted at a time.

NOTE 2: I_{CC} is measured with the 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	$C_L = 15 \text{ pF}, R_L = 400 \Omega, \text{ See Note 3}$		15	23	ns
t_{PHL}					11	17	
t_{PLH}	A or B	Other input high			18	30	ns
t_{PHL}					13	22	

¶ t_{PLH} = propagation delay time, low-to-high level output

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

NOTE 3: See General Information Section for load circuits and voltage waveforms.

TYPES SN54L86

QUADRUPLE 2-INPUT EXCLUSIVE-OR GATES

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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage (see Note 4)	5.5 V
Operating free-air temperature SN54L86	-55°C to 125°C
Storage temperature range	-65°C to 150°C

- NOTES: 1. Voltage values are with respect to network ground terminal.
 4. Input voltages must be zero or positive with respect to network ground terminal.

recommended operating conditions

	MIN	NOM	MAX	UNIT
V_{CC} Supply voltage	4.5	5	5.5	V
V_{IH} High-level input voltage	2			V
V_{IL} Low-level input voltage			0.7	V
I_{OH} High-level output current			-0.1	mA
I_{OL} Low-level output current			2	mA
T_A Operating free-air temperature	-55		125	°C

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

PARAMETER	TEST CONDITIONS†		MIN	TYP	MAX	UNIT
V_{OH}	$V_{CC} = \text{MIN}$,	$V_{IH} = 2 \text{ V}$, $V_{IL} = 0.7 \text{ V}$,	2.4	3.3		V
V_{OL}	$V_{CC} = \text{MIN}$,	$V_{IH} = 2 \text{ V}$, $V_{IL} = 0.7 \text{ V}$,			0.15	V
I_I	$V_{CC} = \text{MAX}$,	$V_I = 5.5 \text{ V}$			0.2	mA
I_{IH}	$V_{CC} = \text{MAX}$,	$V_I = 2.4 \text{ V}$			20	μA
I_{IL}	$V_{CC} = \text{MAX}$,	$V_I = 0.3 \text{ V}$			-0.36	mA
I_{OS}	$V_{CC} = \text{MAX}$,		-3		-15	mA
I_{CCH}	$V_{CC} = \text{MAX}$,	See Note 5		2.2	4.4	mA
I_{CCL}	$V_{CC} = \text{MAX}$,	See Note 6		3.8	6.68	mA

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

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

NOTES: 5. I_{CCH} is measured with all outputs open, one input of each gate at 4.5 V, and the other inputs grounded.

6. I_{CCL} is measured with all outputs open and all inputs at 4.5 V.

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	50	60	75	ns
t_{PHL}					150	
t_{PLH}	A or B	Other input high	50	35	90	ns
t_{PHL}					60	

‡ t_{PLH} = propagation delay time, low-to-high-level output

‡ t_{PHL} = propagation delay time, high-to-low-level output

NOTE 3: See General Information Section for load circuits and voltage waveforms.



TTL DEVICES

TYPES SN54LS86A, SN74LS86A QUADRUPLE 2-INPUT EXCLUSIVE-OR GATES

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: SN54LS86A	-55°C to 125°C
SN74LS86A	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

	SN54LS86A			SN74LS86A			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 current, I_{OH}			-400			-400	μ A
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†	SN54LS86A		SN74LS86A		UNIT		
		MIN	TYP‡	MAX	MIN		TYP‡	MAX
V_{IH} High-level input voltage		2		0.7		0.8	V	
V_{IL} Low-level input voltage							V	
V_{IK} Input clamp voltage	$V_{CC} = \text{MIN}$, $I_I = -18 \text{ mA}$			-1.5		-1.5	V	
V_{OH} High-level output voltage	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = V_{IL \text{ max}}$, $I_{OH} = -400 \mu\text{A}$	2.5	3.4	2.7	3.4		V	
V_{OL} Low-level output voltage	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = V_{IL \text{ max}}$						V	
	$I_{OL} = 4 \text{ mA}$	0.25	0.4	0.25	0.4			
	$I_{OL} = 8 \text{ mA}$			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		μ A	
I_{IL} Low-level input current	$V_{CC} = \text{MAX}$, $V_I = 0.4 \text{ V}$		-0.8		-0.8		mA	
I_{OS} Short-circuit output current§	$V_{CC} = \text{MAX}$	-20	-100	-20	-100		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 $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$.

§Not more than one output should be shorted at a time.

NOTE 2: I_{CC} is measured with the 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		12	23	ns
t_{PHL}					10	17	
t_{PLH}	A or B	Other input high			20	30	ns
t_{PHL}					13	22	

¶ t_{PLH} = propagation delay time, low-to-high-level output

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

NOTE 3: See General Information Section for load circuits and voltage waveforms.

TYPES SN54S86, SN74S86

QUADRUPLE 2-INPUT EXCLUSIVE-OR GATES

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: SN54S86	-55°C to 125°C
SN74S86	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

	SN54S86			SN74S86			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 current, I_{OH}			-1			-1	mA
Low-level output current, I_{OL}			20			20	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†	SN54S86			SN74S86			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IH} High-level input voltage		2			2			V
V_{IL} Low-level input voltage				0.8			0.8	V
V_{IK} Input clamp voltage				-1.2			-1.2	V
V_{OH} High-level output voltage	$V_{CC} = \text{MIN}$, $I_I = -18 \text{ mA}$	2.5	3.4		2.7	3.4		V
V_{OL} Low-level output voltage	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = 0.8 \text{ V}$, $I_{OH} = -1 \text{ mA}$			0.5			0.5	V
I_I Input current at maximum input voltage	$V_{CC} = \text{MAX}$, $V_I = 5.5 \text{ V}$			1			1	mA
I_{IH} High-level input current	$V_{CC} = \text{MAX}$, $V_I = 2.7 \text{ V}$			50			50	μA
I_{IL} Low-level input current	$V_{CC} = \text{MAX}$, $V_I = 0.5 \text{ V}$			-2			-2	mA
I_{OS} Short-circuit output current§	$V_{CC} = \text{MAX}$	-40		-100	-40		-100	mA
I_{CC} Supply current	$V_{CC} = \text{MAX}$, See Note 2		50	75		50	75	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 $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ \text{C}$.

§ Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

NOTE 2: I_{CC} is measured with the 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	7	10.5	ns	$C_L = 15 \text{ pF}$, $R_L = 280 \Omega$, See Note 3
t_{PHL}						
t_{PLH}	A or B	Other input high	7	10.5	ns	
t_{PHL}						

¶ t_{PLH} = propagation delay time, low-to-high-level output

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

NOTE 3: See General Information Section for load circuits and voltage waveforms.

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TTL DEVICES