Signetics

Military Logic Products

54LS86, 54S86
Gates

Quad Two-Input Exclusive-OR Gates

Product Specification

FUNCTION TABLE

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

H = High voltage level
L = Low voltage level

ORDERING INFORMATION

DESCRIPTION	ORDER CODE
14-Pin Ceramic DIP	54LS86/BCA, 54S86/BCA
14-Pin Ceramic Flat Pack	54LS86/BDA, 54S86/BDA
Ceramic LLCC	54LS86/B2A, 54S86/B2A

INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

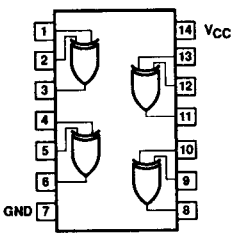
PINS	DESCRIPTION	54S	54LS
A, B	Inputs	1SUL	1LSUL
Y	Output	10SUL	10LSUL

NOTE: Where a 54S Unit Load (SUL) is 50μA I_{IH} and -2.0mA I_{IL}, and a 54LS Unit Load (LSUL) is 20μA I_{IH} and -0.4mA I_{IL}.

ABSOLUTE MAXIMUM RATINGS (Over operating free-air temperature range unless otherwise noted.)

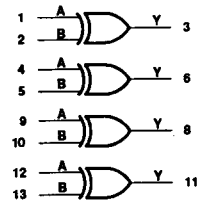
SYMBOL	PARAMETER	54LS	54S	UNIT
V_{CC}	Supply voltage	7.0	7.0	V
V_I	Input voltage range	-0.5 to +7.0	-0.5 to +5.5	V
I_I	Input current range	-30 to +1	-30 to +5	mA
V_O	Voltage applied to output in High output state range	-0.5 to +V_{CC}	-0.5 to +V_{CC}	V
T_{STG}	Storage temperature range	-65 to +150	-65 to +150	°C

PIN CONFIGURATION



For LLCC pin assignments, see JEDEC Standard No. 2

LOGIC SYMBOL



For LLCC pin assignments, see JEDEC Standard No. 2

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER		54LS			54S			UNIT
			Min	Nom	Max	Min	Nom	Max	
V_{CC}	Supply voltage		4.5	5.0	5.5	4.5	5.0	5.5	V
V_{IH}	High-level input voltage		2.0			2.0			V
V_{IL}	Low-level input voltage				+0.7			+0.8	V
		+125°C			+0.7			+0.7	V
I_{IK}	Input clamp current				-18			-18	mA
I_{OH}	High-level output current				-400			-1000	µA
I_{OL}	Low-level output current				4			20	mA
T_A	Operating free-air temperature range		-55		+125	-55		+125	°C

DC ELECTRICAL CHARACTERISTICS (Over recommended operating free–air temperature range unless otherwise noted.)

SYMBOL	PARAMETER	TEST CONDITIONS[1]		54LS86			54S86			UNIT
				Min	Typ[2]	Max	Min	Typ[2]	Max	
V_{OH}	High-level output voltage	V_{CC} = Min, V_{IH} = Min, V_{IL} = Max, I_{OH} = Max		2.5	3.4		2.5	3.4		V
V_{OL}	Low-level output voltage	V_{CC} = Min, V_{IH} = Min, V_{IL} = Max,			0.25	0.4			0.5	V
		I_{OL} = Max	+125°C			0.4			0.45	V
V_{IK}	Input clamp voltage	V_{CC} = Min, I_I = I_{IK}				-1.5			-1.2	V
I_{IH2}	Input current at maximum	V_{CC} = Max	V_I = 5.5V						1.0	mA
	input voltage		V_I = 7.0V			0.2				mA
I_{IH1}	High-level input current	V_{CC} = Max, V_I = 2.7V				40			50	µA
I_{IL}	Low-level input current	V_{CC} = Max	V_I = 0.4V			-0.8				mA
			V_I = 0.5V						-2.0	mA
I_{OS}	Short-circuit output current[3]	V_{CC} = Max		-20		-110	-40		-100	mA
I_{CC}	Supply current[4] (total)	V_{CC} = Max			0.1	10		50	75	mA

AC ELECTRICAL CHARACTERISTICS T_A = 25°C, V_{CC} = 5.0V

SYMBOL	PARAMETER	TEST CONDITIONS	54LS		54S[5]		UNIT
			C_L = 15pF		C_L = 15pF		
			Min	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation delay A or B to output	Other input Low Waveform 2		23 17		10.5 10	ns ns
t_{PLH} t_{PHL}	Propagation delay A or B to output	Other input High Waveform 1		30 22		10.5 10	ns ns

AC ELECTRICAL CHARACTERISTICS T_A = 25°C, V_{CC} = 5.0V

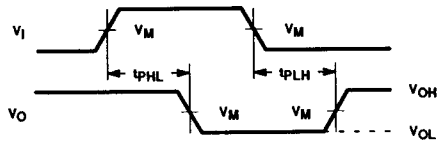
SYMBOL	PARAMETER	TEST CONDITIONS	54LS[5]		54S		UNIT
			C_L = 50pF		C_L = 50pF		
			Min	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation delay A or B to output	Other input Low Waveform 2		25 22		12.5 12	ns ns
t_{PLH} t_{PHL}	Propagation delay A or B to output	Other input High Waveform 1		35 27		12.5 12	ns ns

AC ELECTRICAL CHARACTERISTICS T_A = –55°C and + 125°C, V_{CC} = 5.0V[5]

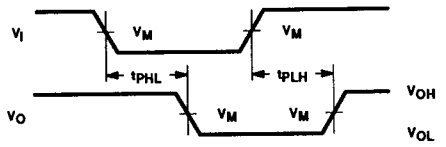
SYMBOL	PARAMETER	TEST CONDITIONS	54LS		54S		UNIT
			C_L = 50pF		C_L = 50pF		
			Min	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation delay A or B to output	Other input Low Waveform 2		33 29		16.5 15.5	ns ns
t_{PLH} t_{PHL}	Propagation delay A or B to output	Other input High Waveform 1		46 35		16.5 15.5	ns ns

NOTES:
1. For conditions shown as Min or Max, use the appropriate value specified under recommended operating conditions for the applicable type and function table operating mode.
2. All typical values are at V_{CC} = 5V, T_A = 25°C.
3. Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.
4. I_{CC} is measured with inputs grounded and outputs open.
5. These parameters are guaranteed, but not tested.

AC WAVEFORMS



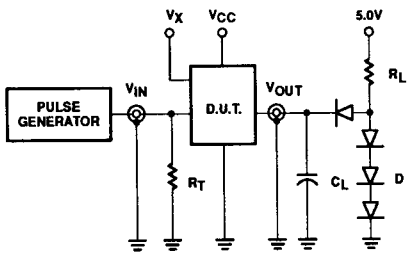
Waveform 1. Waveform for Inverting Outputs



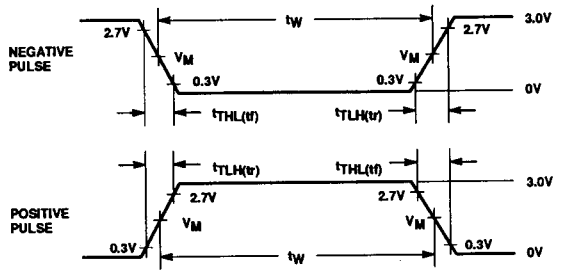
Waveform 2. Waveform for Non-Inverting Outputs

NOTE: V_M = 1.3V for 54LS, V_M = 1.5V for all other TTL families.

TEST CIRCUIT AND WAVEFORM



Test Circuit for 54 Totem-Pole Outputs



Input Pulse Definition

FAMILY	INPUT PULSE CHARACTERISTICS					
	R_L	V_M	Rep. Rate	T_W	T_{TLH}	T_{THL}
54LSXXX	2.0kΩ	1.3V	1MHz	500ns	≤15ns	≤6ns
54SXXX	280Ω	1.5V	1MHz	500ns	≤2.5ns	≤2.5ns

DEFINITIONS:
C_L = Load capacitance includes jig and probe capacitance; see AC Characteristics for value.
R_T = Termination resistance should be equal to Z_{OUT} of Pulse Generators.
D = Diodes are 1N916, 1N3064, or equivalent.
V_X = Unclocked pins must be held at ≤0.8V, ≥2.7V or open per FunctionTable.