

POSITIVE-NAND GATES AND INVERTERS WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

PARAMETER	TEST FIGURE	TEST CONDITIONS†	SERIES 54		SERIES 54H		SERIES 54L		SERIES 54LS		SERIES 54S		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
Supply voltage, V _{CC}	1, 2	54 FAMILY 74 FAMILY	'01, '03, '05, '12, '22		'H01, 'H05, 'H22		'L01, 'L03		'LS01, 'LS03, 'LS05, 'LS12, 'LS22		'S03, 'S05, 'S22		V
High-level output voltage, V _{OH}	1, 2		4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5	
Low-level output voltage, V _{OL}	3	54 FAMILY 74 FAMILY	4.75		5.25		4.75		5.25		4.75		V
High-level output current, I _{OH}	1, 2		16	20	16	20	16	20	16	20	16	20	
Low-level output current, I _{OL}	3	54 FAMILY 74 FAMILY	-55		125		-55		125		-55		mA
Operating free-air temperature, T _A	7		0	70	0	70	0	70	0	70	0	70	

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

PARAMETER	TEST FIGURE	TEST CONDITIONS†	SERIES 54		SERIES 54H		SERIES 54L		SERIES 54LS		SERIES 54S		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
V _{IH}	1, 2	54 FAMILY 74 FAMILY	2		2		2		2		2		V
V _{IL}	1, 2		0.8	0.8	0.8	0.8	0.6	0.6	0.7	0.7	0.8	0.8	
V _{IK}	3	54 FAMILY 74 FAMILY	-1.5		-1.5		-1.5		-1.5		-1.5		V
I _{OH}	1		V _{CC} = MIN, V _{IL} = V _{IL} max, V _{OH} = 5.5 V	250		250		50		100		250	
V _{OL}	2	54 FAMILY 74 FAMILY	0.2		0.4		0.2		0.4		0.25		V
I _I	4		V _{CC} = MIN, V _{IH} = 2 V	0.2		0.4		0.2		0.4		0.35	
I _I	4	Series 74LS	1		1		0.1		0.1		1		mA
I _{IH}	4		V _I = 5.5 V	40		50		10		20		50	
I _{IL}	5	Series 74LS	-1.6		-2		-0.18		-0.18		-0.4		mA
I _{CC}	7		V _I = 7 V	-1.6		-2		-0.18		-0.18		-0.4	

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

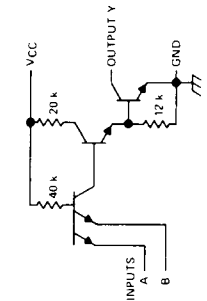
‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.

§ I_I = -12 mA for SN54/SN74, -8 mA for SN54H/SN74H, and -18 mA for SN54LS/SN74LS and SN54S/SN74S.

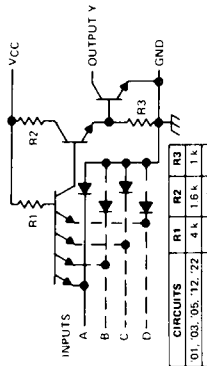
See table on next page

POSITIVE-NAND GATES AND INVERTERS WITH OPEN-COLLECTOR OUTPUTS

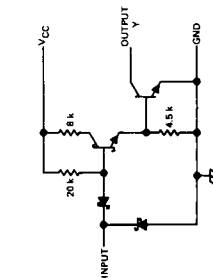
schematics (each gate)



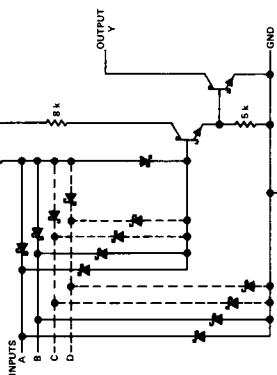
'L01, 'L03 CIRCUITS



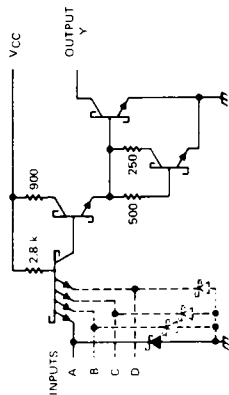
'01, '03, '05, '12, '22, 'H01, 'H05, 'H22 CIRCUITS



'LS05 CIRCUITS



'L01, 'LS03, 'LS12, 'LS22 CIRCUITS



'S03, 'S05, 'S22 CIRCUITS

Resistor values shown are nominal and in ohms.

supply current[†]

TYPE	I _{CCH} (mA) Total with outputs high		I _{CCL} (mA) Total with outputs low		I _{CC} (mA) Average per Gate (50% duty cycle)	
	TYP	MAX	TYP	MAX	TYP	MAX
'01	4	8	12	22	2	2
'03	4	8	12	22	2	2
'05	6	12	18	33	2	2
'12	3	6	9	16.5	2	2
'22	2	4	6	11	2	2
'H01	10	16.8	26	40	4.1	4.1
'H05	16	26	40	58	4.67	4.67
'H22	5	8.4	13	20	4.1	4.1
'L01	0.44	0.8	1.16	2.04	0.20	0.20
'L03	0.44	0.8	1.16	2.04	0.20	0.20
'LS01	0.8	1.6	2.4	4.4	0.4	0.4
'LS03	0.8	1.6	2.4	4.4	0.4	0.4
'LS05	1.2	2.4	3.6	6.6	0.4	0.4
'LS12	0.7	1.4	1.8	3.3	0.42	0.42
'LS22	0.4	0.8	1.2	2.2	0.4	0.4
'S03	6	13.2	20	36	3.25	3.25
'S05	9	19.8	30	54	3.25	3.25
'S22	3	6.6	10	18	3.25	3.25

[†] Maximum values of I_{CC} are over the recommended operating ranges of V_{CC} and T_A; typical values are at V_{CC} = 5 V, T_A = 25°C.

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

TYPE	TEST CONDITIONS#	t _{PLH} (ns)		Propagation delay time, high-to-low-level output	
		MIN	MAX	MIN	MAX
'01, '03, '05	C _L = 15 pF, R _L = 4 kΩ for t _{PLH} , 400 Ω for t _{PHL}	35	45	8	15
		40	55	8	15
'12, '22	C _L = 25 pF, R _L = 280 Ω	35	45	8	15
		10	15	7.5	12
'L01, 'L03	C _L = 50 pF, R _L = 4 kΩ	60	90	33	60
'LS01, 'LS03, 'LS05, 'LS12, 'LS22	C _L = 15 pF, R _L = 2 kΩ	17	32	15	28
'S03, 'S05, 'S22	C _L = 15 pF, R _L = 280 Ω	2	5	7.5	2
		7.5	7.5	4.5	7

Load circuits and voltage waveforms are shown on pages 3-10 and 3-11.