

POSITIVE-NAND GATES AND INVERTERS WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

PARAMETER	TEST CONDITIONS†	TEST FIGURE	54 FAMILY 74 FAMILY		SERIES 54 SERIES 74		SERIES 54H SERIES 74H		SERIES 54L SERIES 74L		SERIES 54LS SERIES 74LS		SERIES 54S SERIES 74S		UNIT
			MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}			4.5	5	5.5	4.5	5	5.5	4.5	5	5.5	4.5	5	5.5	V
High-level output voltage, V_{OH}			4.75	5	5.25	4.75	5	5.25	4.75	5	5.25	4.75	5	5.25	V
Low-level output voltage, V_{OL}					5.5			5.5			5.5			5.5	V
Low-level output current, I_{OL}					16			20			2			4	mA
Operating free-air temperature, T_A			-55	125	175	-55	125	175	-55	125	175	-55	125	175	°C

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

PARAMETER	TEST FIGURE	TEST CONDITIONS†	SERIES 54 SERIES 74		SERIES 54H SERIES 74H		SERIES 54L SERIES 74L		SERIES 54LS SERIES 74LS		SERIES 54S SERIES 74S		UNIT
			MIN	TYP‡	MAX	MIN	TYP‡	MAX	MIN	TYP‡	MAX	MIN	
V _{IH} High-level input voltage	1, 2		2			2			2			2	V
V _{IL} Low-level input voltage	1, 2	54 Family 74 Family		0.8 0.8		0.8 0.8		0.6 0.6		0.7 0.8		0.8 0.8	V
V _{IK} Input clamp voltage	3	V _{CC} = MIN, I _I = 8		-1.5		-1.5				-1.5		-1.2	V
I _{OH} High-level output current	1	V _{CC} = MIN, V _{IL} = V _{IL} max, V _{OH} = 5.5 V		250		250		50		100		250	µA
V _{OL} Low-level output voltage	2	V _{CC} = MIN, V _{IH} = 2 V		0.2 0.2		0.2 0.2		0.15 0.2		0.3 0.4		0.25 0.5	0.5 V
		I _{OL} = MAX I _{OL} = 4 mA		0.4 0.4		0.4 0.4		0.4 0.4		0.5 0.5		0.5 0.5	
I _I Input current at maximum input voltage	4	V _I = 5.5 V V _I = 7 V		1		1		0.1		0.1		1	mA
I _{IH} High-level input current	4	V _{IH} = 2.4 V V _{IH} = 2.7 V		40		50		10		20		50	µA
		V _{CC} = MAX											
I _{IL} Low-level input current	5	V _{IL} = 0.3 V V _{IL} = 0.4 V		-1.6		-2		-0.18		-0.4		-2	mA
		V _{CC} = MAX											
I _{CC} Supply current	7	V _{CC} = MAX										-2	mA
See table on next page													

†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, $T_A = 25^\circ\text{C}$.

§ $I_I = -12$ 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

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	
'01	4	8	12	22	2	
'03	4	8	12	22	2	
'05	6	12	18	33	2	
'12	3	6	9	16.5	2	
'22	2	4	6	11	2	
'H01	10	16.8	26	40	4.1	
'H05	16	26	40	58	4.67	
'H22	5	8.4	13	20	4.1	
'L01	0.44	0.8	1.16	2.04	0.20	
'L03	0.44	0.8	1.16	2.04	0.20	
'LS01	0.8	1.6	2.4	4.4	0.4	
'LS03	0.8	1.6	2.4	4.4	0.4	
'LS05	1.2	2.4	3.6	6.6	0.4	
'LS12	0.7	1.4	1.8	3.3	0.42	
'LS22	0.4	0.8	1.2	2.2	0.4	
'S03	6	13.2	20	36	3.25	
'S05	9	19.8	30	54	3.25	
'S22	3	6.6	10	18	3.25	

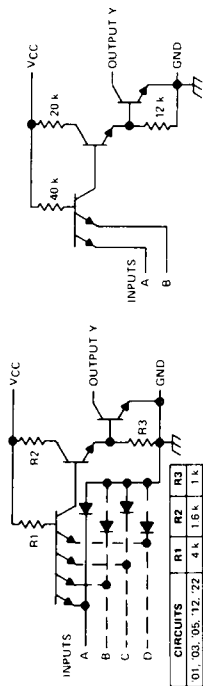
[†] Maximum values of I_{CC} are over the recommended operating ranges of V_{CC} and T_A; typical values are at V_{CC} = 5 V, T_A = 25°C.

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

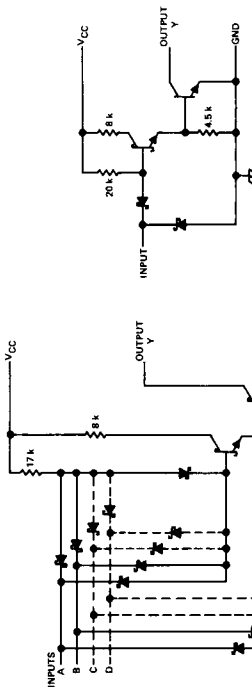
TYPE	TEST CONDITIONS#	t _{PLH} (ns) Propagation delay time, low-to-high-level output		t _{PHL} (ns) Propagation delay time, high-to-low-level output	
		MIN	MAX	MIN	MAX
'01, '03	C _L = 15 pF, R _L = 4 kΩ for t _{PLH} , 400 Ω for t _{PHL}	35	45	8	15
'05		40	55	8	15
'12, '22	C _L = 25 pF, R _L = 280 Ω	35	45	8	15
'H01, 'H05, 'H22		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	2	4.5
	C _L = 50 pF, R _L = 280 Ω		7.5		7

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

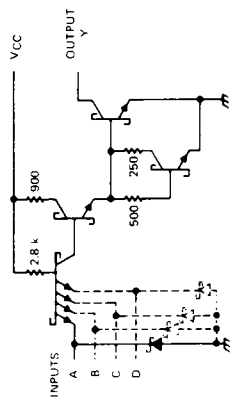
schematics (each gate)



'L01, 'L03 CIRCUITS



'LS05 CIRCUITS



'S03, 'S05, 'S22 CIRCUITS

Resistor values shown are nominal and in ohms.