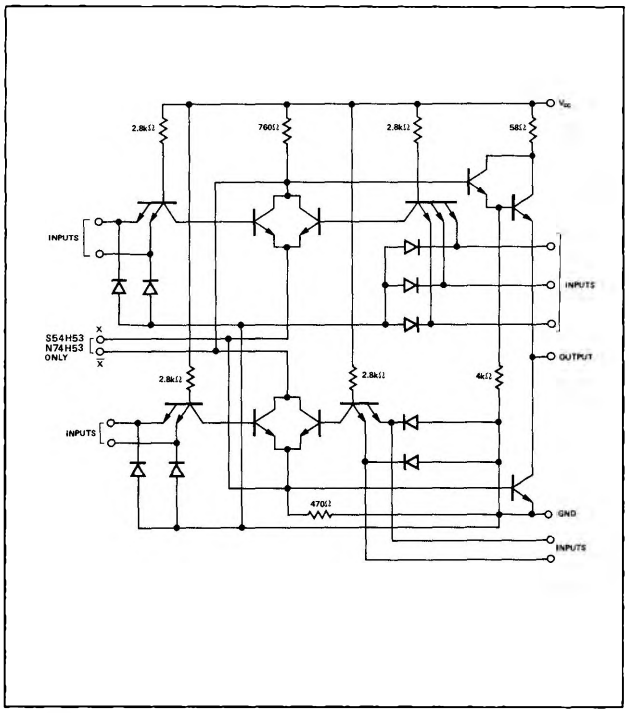
EXPANDABLE 2-2-2-3-INPUT AND-OR-INVERT GATE

S54H53–A,F,W • S54H54–A,F,W • N74H53–A,F • N74H54–A,F

DIGITAL 54/74 TTL SERIES

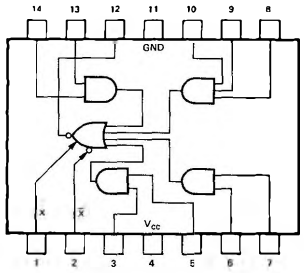
S54H53 S54H54 N74H53 N74H54

SCHEMATIC DIAGRAM

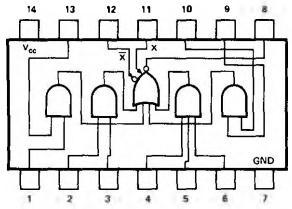


PIN CONFIGURATIONS

W PACKAGE



A,F PACKAGE



NOTES:

1. Component values shown are nominal.
2. Both expander inputs are used simultaneously for expanding.
3. If expander is not used leave X and $\overline{X}$ pins open.
4. Expander inputs X and $\overline{X}$ are functional on the S54H53 and N74H53 circuits only. Make no external connection to X and $\overline{X}$ pins of the S54H54 and N74H54.
5. A total of four S54H60/N74H60 expander gates or one S54H62/N74H62 expander gate may be connected to the expander inputs.

RECOMMENDED OPERATING CONDITIONS

		MIN	NOM	MAX	UNIT
Supply Voltage V_{CC}:	S54H53, S54H54 Circuits	4.5	5	5.5	V
	N74H53, N74H54 Circuits	4.75	5	5.25	V
Normalized Fan-Out from each Output, N				10	
Operating Free-Air Temperature Range, T_A:	S54H53, S54H54 Circuits	-55	25	125	°C
	N74H53, N74H54 Circuits	0	25	70	°C

ELECTRICAL CHARACTERISTICS (over recommended operating free-air temperature range unless otherwise noted)

PARAMETER		TEST CONDITIONS*		MIN	TYP†	MAX	UNIT
$V_{in(1)}$	Logical 1 input voltage required at all input terminals of one AND section to ensure logical 0 at output	V_{CC} = MIN,		2			V
$V_{in(0)}$	Logical 0 input voltage required at one input terminal of each AND section to ensure logical 1 at output	V_{CC} = MIN,				0.8	V
$V_{out(1)}$	Logical 1 output voltage	V_{CC} = MIN, I_{load} = -500μA	V_{in} = 0.8V,	2.4			V
$V_{out(0)}$	Logical 0 output voltage	V_{CC} = MIN, I_{sink} = 20mA	V_{in} = 2V,			0.4	V
$I_{in(0)}$	Logical 0 level input current (each input)	V_{CC} = MAX,	V_{in} = 0.4V			-2	mA

ELECTRICAL CHARACTERISTICS (Cont'd)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
$I_{in(1)}$	Logical 1 level input current (each input)	V_{CC} = MAX,	V_{in} = 2.4V			50	μA
		V_{CC} = MAX,	V_{in} = 5.5V			1	mA
I_{OS}	Short circuit output current **	V_{CC} = MAX		-40		-100	mA
$I_{CC(0)}$	Logical 0 level supply current	V_{CC} = MAX,	V_{in} = 4.5V		9.4	14	mA
$I_{CC(1)}$	Logical 1 level supply current	V_{CC} = MAX,	V_{in} = 0		7.1	11	mA

ELECTRICAL CHARACTERISTICS (S54H53 circuits only) using expander inputs, V_{CC}= 4.5V, T_A = -55°C

PARAMETER		TEST CONDITIONS			MIN	TYP	MAX	UNIT
$I_{in\overline{X}}$	Expander-node input current	$V_{\overline{X}}$ = 1.4V					-5.85	mA
$V_{BE(Q)}$	Base-emitter voltage of output transistor Q	I_{sink} = 20mA,	I_1 = 700μA,	R_1 = 0			1	V
$V_{out(1)}$	Logical 1 output voltage	I_{load} = -500μA, I_2 = -320μA	I_1 = 320μA,		2.4			V
$V_{out(0)}$	Logical 0 output voltage	I_{sink} = 20mA	I_1 = 470μA,	R_1 = 68Ω			0.4	V

ELECTRICAL CHARACTERISTICS (N74H53 circuits only) using expander inputs, V_{CC}= 4.75V, T_A = 0°C

PARAMETER		TEST CONDITIONS			MIN	TYP	MAX	UNIT
$I_{in\overline{X}}$	Expander-node input current	$V_{\overline{X}}$ = 1.4V					-6.3	mA
$V_{BE(Q)}$	Base-emitter voltage of output transistor Q	I_{sink} = 20mA,	I_1 = 1.1mA,	R_1 = 0			1	V
$V_{out(1)}$	Logical 1 output voltage	I_{load} = -500μA, I_2 = -570μA	I_1 = 570μA,		2.4			V
$V_{out(0)}$	Logical 0 output voltage	I_{sink} = 20mA,	I_1 = 600μA,	R_1 = 63Ω			0.4	V

SWITCHING CHARACTERISTICS, V_{CC}= 5V, T_A = 25°C, N = 10, expander pins are open

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{pd0}	Propagation delay time to logical 0 level	C_L = 25pF,	R_L = 280Ω		6.2	11	ns
t_{pd1}	Propagation delay time to logical 1 level	C_L = 25pF,	R_L = 280Ω		7	11	ns

SWITCHING CHARACTERISTICS, (S54H53/N74H53 circuits only) V_{CC}= 5V, T_A = 25°C, N = 10, C_X = 15 pF

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{pd0}	Propagation delay time to logical 0 level	C_L = 25pF,	R_L = 280Ω		7.4		ns
t_{pd1}	Propagation delay time to logical 1 level	C_L = 25pF,	R_L = 280Ω		11.4		ns

* For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable device type. Expander pins are open.

** Duration of short circuit test should not exceed 1 second.

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