REVISED DECEMBER 1983

- **Package Options Include Plastic and Ceramic DIPs**
- **Dependable Texas Instruments Quality and Reliability**

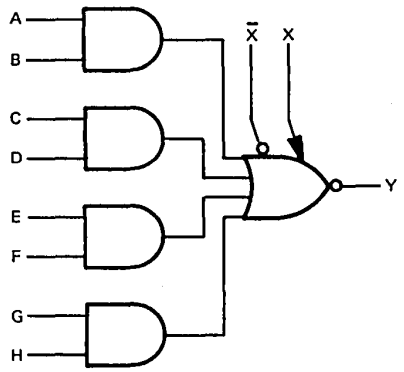
description

These devices contain expandable 4-wide AND-OR-INVERT gates. The '53 perform the Boolean function $Y = \overline{AB + CD + EF + GH + X}$ and the 'H53 perform $Y = \overline{AB + CD + EFG + HI + X}$ with X = output of SN5460/SN7460, SN54H60/SN74H60 or SN54H62/SN74H62 respectively.

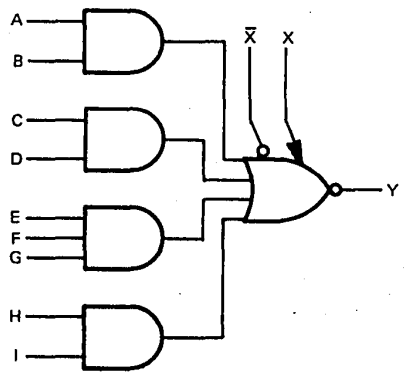
The SN5453 and SN54H53 are characterized for operation over the full military temperature range of −55°C to 125°C. The SN7453 and SN74H53 are characterized for operation from 0°C to 70°C.

logic diagrams

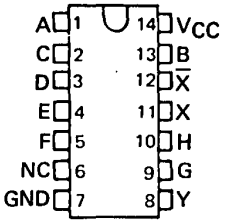
'53



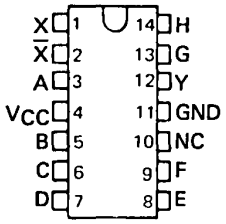
'H53



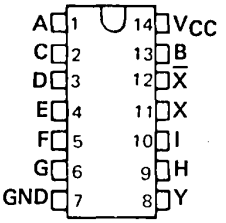
SN5453 . . . J PACKAGE
SN7453 . . . J OR N PACKAGE
(TOP VIEW)



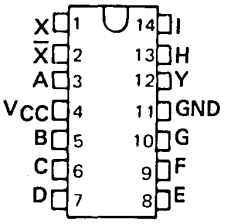
SN5453 . . . W PACKAGE
(TOP VIEW)



SN54H53 . . . J PACKAGE
SN74H53 . . . J OR N PACKAGE
(TOP VIEW)



SN54H53 . . . W PACKAGE
(TOP VIEW)



NC - No internal connection

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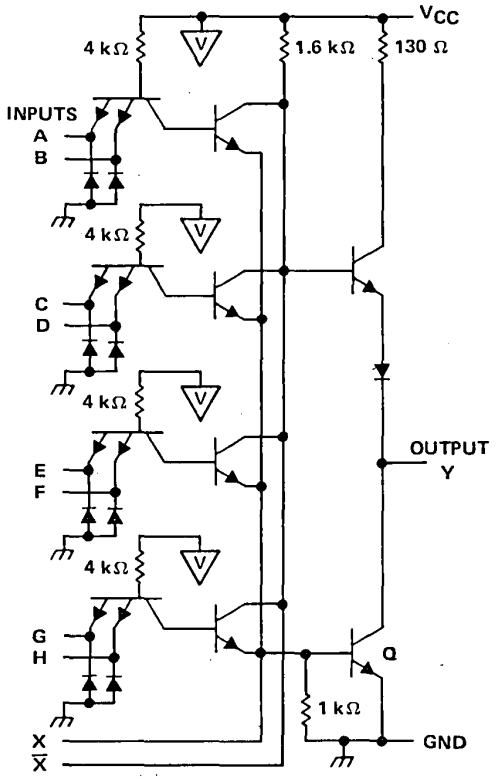
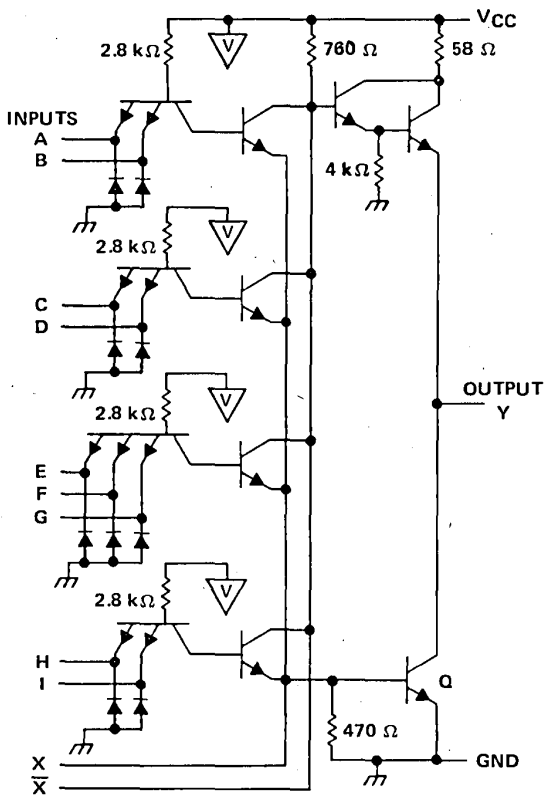
schematics

'53



'H53



Resistor values shown are nominal.
If expander is not used, leave X and $\overline{X}$ open.

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: SN54' . . . . . −55°C to 125°C
SN74' . . . . . 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

		SN5453			SN7453			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
I_{OH}	High-level output current			−0.4			−0.4	mA
I_{OL}	Low-level output current			16			16	mA
T_A	Operating free-air temperature	−55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS†			SN5453			SN7453			UNIT
				MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}	V_{CC} = MIN,	I_I = −12 mA				−1.5			−1.5	V
V_{OH}	V_{CC} = MIN,	V_{IL} = 0.8 V,	I_{OH} = −0.4 mA	2.4	3.4		2.4	3.4		V
V_{OL}	V_{CC} = MIN,	V_{IH} = 2 V,	I_{OL} = 16 mA		0.2	0.4		0.2	0.4	V
I_I	V_{CC} = MAX,	V_I = 5.5 V				1			1	mA
I_{IH}	V_{CC} = MAX,	V_{IH} = 2.4 V				40			40	μA
I_{IL}	V_{CC} = MAX,	V_{IL} = 0.4 V				−1.6			−1.6	mA
I_{OS}§	V_{CC} = MAX			−20		−55	−18		−55	mA
I_{CCH}	V_{CC} = MAX,	V_I = 0 V			4	8		4	8	mA
I_{CCL}	V_{CC} = MAX,	See Note 2			5.1	9.5		5.1	9.5	mA
$I_{\overline{X}}$▲	$V_{\overline{X}X}$ = 0.4 V,	I_{OL} = 16 mA				−2.9			−3.1	mA
$V_{BE(Q)}$▲	$I_X+I_{\overline{X}}$ = 0.41 mA	$R_{\overline{X}X}$ = 0,	I_{OL} = 16 mA			1.1				V
	$I_X+I_{\overline{X}}$ = 0.62 mA,	$R_{\overline{X}X}$ = 0,	I_{OL} = 16 mA						1	
V_{OH}▲	I_X = 0.15 mA,	$I_{\overline{X}}$ = −0.15 mA,	I_{OH} = −0.4 mA	2.4	3.4					V
	I_X = 0.27 mA,	$I_{\overline{X}}$ = −0.27 mA,	I_{OH} = −0.4 mA				2.4	3.4		
V_{OL}▲	$I_X+I_{\overline{X}}$ = 0.3 mA,	$R_{\overline{X}X}$ = 138 Ω,	I_{OL} = 16 mA		0.2	0.4				V
	$I_X+I_{\overline{X}}$ = 0.43 mA,	$R_{\overline{X}X}$ = 130 Ω,	I_{OL} = 16 mA					0.2	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.
§ Not more than one output should be shorted at a time.
▲ Using expander inputs, V_{CC} = MIN, T_A = MIN, except typical values
NOTE 2: All inputs of one AND gate at 4.5 V, all others at GND.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Any	Y	R_L = 400 Ω, C_L = 15 pF ¶		13	22	ns
t_{PHL}					8	15	ns

¶ Expander pins open.
NOTE 3: See General Information Section for load circuits and voltage waveforms.

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recommended operating conditions

		SN54H53			SN74H53			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
I_{OH}	High-level output current			−0.5			−0.5	mA
I_{OL}	Low-level output current			20			20	mA
T_A	Operating free-air temperature	−55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS†			SN54H53			SN74H53			UNIT
				MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}	V_{CC} = MIN,	I_I = −8 mA				−1.5			−1.5	V
V_{OH}	V_{CC} = MIN,	V_{IL} = 0.8 V	I_{OH} = −0.5 mA	2.4	3.4		2.4	3.4		V
V_{OL}	V_{CC} = MIN,	V_{IH} = 2 V,	I_{OL} = 20 mA		0.2	0.4		0.2	0.4	V
I_I	V_{CC} = MAX,	V_I = 5.5 V				1			1	mA
I_{IH}	V_{CC} = MAX,	V_{IH} = 2.4 V				50			50	μA
I_{IL}	V_{CC} = MAX,	V_{IL} = 0.4 V				−2			−2	mA
I_{OS}§	V_{CC} = MAX			−40		−100	−40		−100	mA
I_{CCH}	V_{CC} = MAX,	V_I = 0 V			7.1	11		7.1	11	mA
I_{CCL}	V_{CC} = MAX,	See Note 2			9.4	14		9.4	14	mA
$I_{\overline{X}}$▲	$V_{\overline{X}}$ = 1.4 V,	I_X = 0,	I_{OL} = 0			−5.85			−6.3	mA
$V_{BE(Q)}$▲	$I_X+I_{\overline{X}}$ = 0.7 mA,	$R_{\overline{X}X}$ = 0,	I_{OL} = 20 mA			1.1				V
	$I_X+I_{\overline{X}}$ = 1.1 mA	$R_{\overline{X}X}$ = 0,	I_{OL} = 20 mA						1	
V_{OH}▲	I_X = 0.32 mA,	$I_{\overline{X}}$ = −0.32 mA,	I_{OH} = −0.5 mA	2.4	3.4					V
	I_X = 0.57 mA,	$I_{\overline{X}}$ = −0.57 mA,	I_{OH} = −0.5 mA				2.4	3.4		
V_{OL}▲	$I_X+I_{\overline{X}}$ = 0.47 mA,	$R_{\overline{X}X}$ = 68 Ω,	I_{OL} = 20 mA		0.2	0.4				V
	$I_X+I_{\overline{X}}$ = 0.6 mA,	$R_{\overline{X}X}$ = 63 Ω,	I_{OL} = 20 mA					0.2	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.
§ Not more than one output should be shorted at a time.
▲ Using expander inputs, V_{CC} = MIN, T_A = MIN, except typical values.
NOTE 2: All inputs of one AND gate at 4.5 V, all others at GND.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Any	Y	R_L = 280 Ω, C_L = 25 pF ¶		7	11	ns
t_{PHL}					6.2	11	ns
t_{PLH}			R_L = 280 Ω, C_L = 25 pF ¶ C = 15 pF #		11.4		ns
t_{PHL}					7.4		ns

¶ Expander pins open.
# GND to $\overline{X}$.
NOTE 3: See General Information Section for load circuits and voltage waveforms.