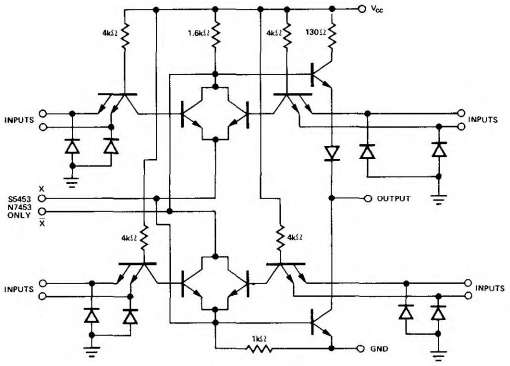
# 4-WIDE 2-INPUT AND-OR-INVERT GATE

**S5453**
**S5454**
**N7453**
**N7454**

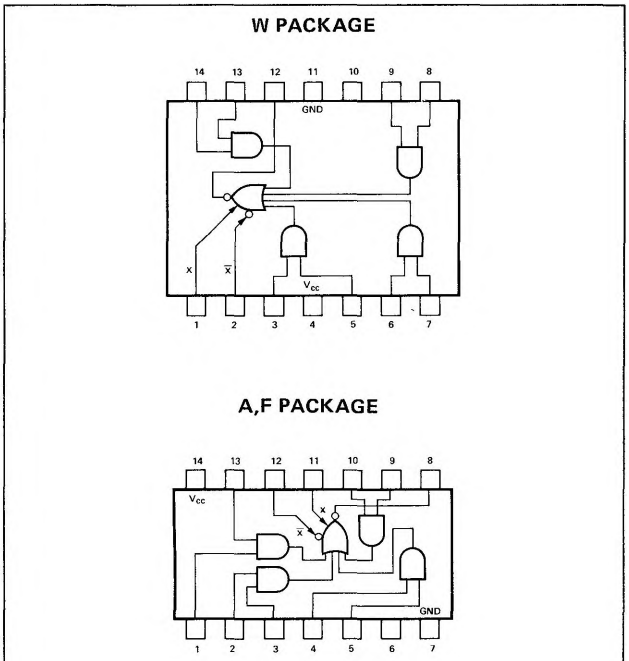
S5453–A,F,W • S5454–A,F,W •N7453–A,F • N7454–A,F

DIGITAL 54/74 TTL SERIES

## SCHEMATIC DIAGRAM




## PIN CONFIGURATIONS




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. Make no external connection to X and X pins of the S5454 and N7454.
5. A total of four expander gates can be connected to the expander inputs.

## RECOMMENDED OPERATING CONDITIONS

| | MIN | NOM | MAX | UNIT |
|---|---|---|---|---|
| Supply Voltage $V_{CC}$: S5453, S5454 Circuits | 4.5 | 5 | 5.5 | V |
| N7453, N7454 Circuits | 4.75 | 5 | 5.25 | V |
| Normalized Fan-Out from Output, N | | | 10 | |
| Operating Free-Air Temperature Range, $T_A$: S5453, S5454 Circuits | -55 | 25 | 125 | °C |
| N7453, N7454 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 both input terminals of one AND section to ensure logical 0 level 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 level at output | $V_{CC}$ = MIN | | | | 0.8 | V |
| $V_{out(1)}$ | Logical 1 output voltage | $V_{CC}$ = MIN, $I_{load}$ = -400μA | $V_{in}$ = 0.8V, | 2.4 | 3.3 | | V |
| $V_{out(0)}$ | Logical 0 output voltage | $V_{CC}$ = MIN, $I_{sink}$ = 16mA | $V_{in}$ = 2V, | | 0.22 | 0.4 | V |

**ELECTRICAL CHARACTERISTICS** (Cont'd)

| PARAMETER | | TEST CONDITIONS | | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| $I_{in(0)}$ | Logical 0 level input current (each input) | $V_{CC}$ = MAX, | $V_{in}$ = 0.4V | | | | -1.6 | mA |
| $I_{in(1)}$ | Logical 1 level input current (each input) | $V_{CC}$ = MAX, | $V_{in}$ = 2.4V | | | | 40 | μA |
| | | $V_{CC}$ = MAX, | $V_{in}$ = 5.5V | | | | 1 | mA |
| $I_{OS}$ | Short circuit output current† | $V_{CC}$ = 5.5V | | S5453, S5454 | -20 | | -55 | mA |
| | | | | N7453, N7454 | -18 | | -55 | |
| $I_{CC(0)}$ | Logical 0 level supply current | $V_{CC}$ = MAX, | $V_{in}$ = 5V | | | 5.1 | 9.5 | mA |
| $I_{CC(1)}$ | Logical 1 level supply current | $V_{CC}$ = MAX, | $V_{in}$ = 0 | | | 4 | 8 | mA |

**ELECTRICAL CHARACTERISTICS (S5453 circuits) using expander inputs, $V_{CC}$ = 4.5V, $T_A$ = -55°C**

| PARAMETER | | TEST CONDITIONS* | | | MIN | TYP** | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| $I_X$ | Expander current | $V_1$ = 0.4V, | $I_{sink}$ = 16mA | | | | 2.9 | mA |
| $V_{BE(Q)}$ | Base-emitter voltage of output transistor (Q) | $I_{sink}$ = 16mA, | $I_1$ = 0.41mA, | $R_1$ = 0 | | | 1 | V |
| $V_{out(1)}$ | Logical 1 output voltage | $I_{load}$ = -400μA, $I_2$ = -0.15mA | $I_1$ = 0.15mA, | | 2.4 | 3.3 | | V |
| $V_{out(0)}$ | Logical 0 output voltage | $I_{sink}$ = 16mA, | $I_1$ = 0.3mA, | $R_1$ = 138Ω | | 0.22 | 0.4 | V |

**ELECTRICAL CHARACTERISTICS (N7453 circuits) using expander inputs, $V_{CC}$ = 4.75V, $T_A$ = 0°C**

| PARAMETER | | TEST CONDITIONS* | | | MIN | TYP** | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| $I_X$ | Expander current | $V_1$ = 0.4V, | $I_{sink}$ = 16mA | | | | 3.1 | mA |
| $V_{BE(Q)}$ | Base-emitter voltage of output transistor (Q) | $I_{sink}$ = 16mA, | $I_1$ = 0.62mA, | $R_1$ = 0 | | | 1 | V |
| $V_{out(1)}$ | Logical 1 output voltage | $I_{load}$ = -400μA, $I_2$ = -270μA | $I_1$ = 270μA, | | 2.4 | 3.3 | | V |
| $V_{out(0)}$ | Logical 0 output voltage | $I_{sink}$ = 16mA, | $I_1$ = 0.43mA, | $R_1$ = 130Ω | | 0.22 | 0.4 | V |

**SWITCHING CHARACTERISTICS, $V_{CC}$ = 5V, $T_A$ = 25°C, N = 10**

| PARAMETER | | TEST CONDITIONS* | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| $t_{pd0}$ | Propagation delay time to logical 0 level | $C_L$ = 15pF, | $R_L$ = 400Ω | | 8 | 15 | ns |
| $t_{pd1}$ | Propagation delay time to logical 1 level | $C_L$ = 15pF, | $R_L$ = 400Ω | | 13 | 22 | ns |

* For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable device type. Expander inputs X and $\overline{X}$ are open.

** All typical values are at $V_{cc}$ = 5V, $T_A$ = 25°C.

† Not more than one output should be shorted at a time.