# SN54S140, SN74S140
# DUAL 4-INPUT POSITIVE-NAND 50-OHM LINE DRIVERS

DECEMBER 1983—REVISED MARCH 1988

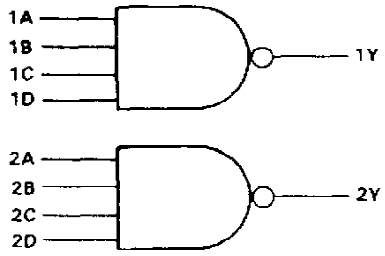
- **Package Options Include Ceramic Chip Carriers and Flat Packages in Addition to Plastic and Ceramic DIPs**
- **Dependable Texas Instruments Quality and Reliability**

## description

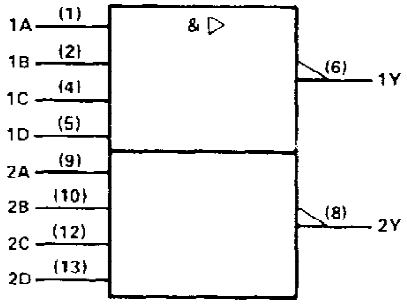
These devices contain two independent 4-input positive-NAND 50-ohm line drivers. They perform the Boolean function $Y = \overline{ABCD}$.

The SN54S140 is characterized for operation over the full military temperature range of −55°C to 125°C. The SN74S140 is characterized for operation from 0°C to 70°C.

## logic diagram (each driver)



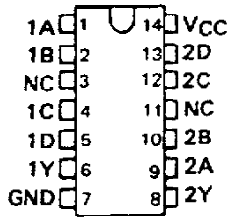

## logic symbol†



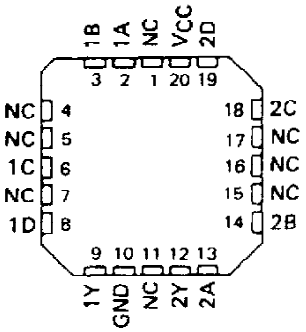

†This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.

Pin numbers shown are for D, J, N, and W packages.

**SN54S140 . . . J OR W PACKAGE**
**SN74S140 . . . D OR N PACKAGE**
**(TOP VIEW)**

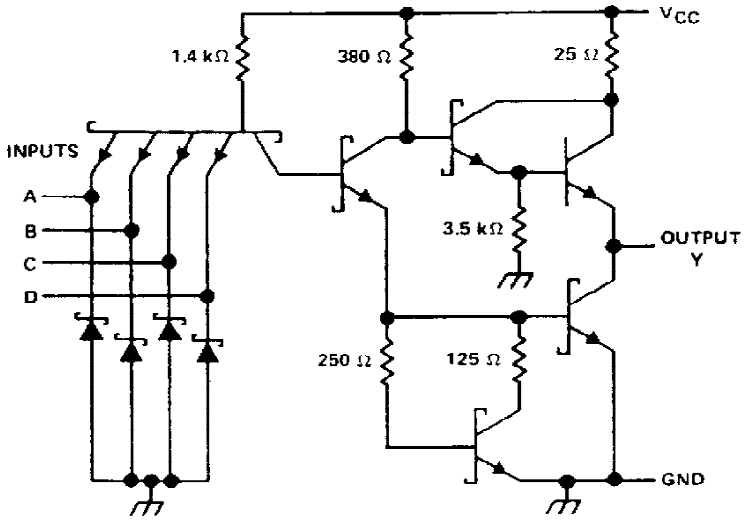



**SN54S140 . . . FK PACKAGE**
**(TOP VIEW)**




NC—No internal connection

## schematic (each driver)




Resistor values shown are nominal.

## 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

| | | SN54S140 | | | SN74S140 | | | 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 | | | −40 | | | −40 | mA |
| $I_{OL}$ | Low-level output current | | | 60 | | | 60 | 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† | | | SN54S140 | | | SN74S140 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP‡ | MAX | MIN | TYP‡ | MAX | |
| $V_{IK}$ | $V_{CC}$ = MIN, | $I_I$ = −18 mA | | | | −1.2 | | | −1.2 | V |
| $V_{OH}$ | $V_{CC}$ = MIN, | $V_{IL}$ = 0.8 V, | $I_{OH}$ = −3 mA | 2.5 | 3.4 | | 2.7 | 3.4 | | V |
| | $V_{CC}$ = MIN, | $V_{IL}$ = 0.5 V, | $R_O$ = 50 Ω to GND | 2 | | | 2 | | | |
| $V_{OL}$ | $V_{CC}$ = MIN, | $V_{IH}$ = 2 V, | $I_{OL}$ = 60 mA | | | 0.5 | | | 0.5 | V |
| $I_I$ | $V_{CC}$ = MAX, | $V_I$ = 5.5 V | | | | 1 | | | 1 | mA |
| $I_{IH}$ | $V_{CC}$ = MAX, | $V_{IH}$ = 2.7 V | | | | 0.1 | | | 0.1 | mA |
| $I_{IL}$ | $V_{CC}$ = MAX, | $V_{IL}$ = 0.5 V | | | | −4 | | | −4 | mA |
| $I_{OS}$§ | $V_{CC}$ = MAX | | | −50 | | −225 | −50 | | −225 | mA |
| $I_{CCH}$ | $V_{CC}$ = MAX, | $V_I$ = 0 V | | | 10 | 18 | | 10 | 18 | mA |
| $I_{CCL}$ | $V_{CC}$ = MAX, | $V_I$ = 4.5 V | | | 25 | 44 | | 25 | 44 | mA |

† 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, and the duration of the short circuit should not exceed 100 milliseconds.

## switching characteristics, $V_{CC}$ = 5 V, $T_A$ = 25°C (see note 2)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| $t_{PLH}$ | Any | Y | $R_L$ = 93 Ω, | $C_L$ = 50 pF | | 4 | 6.5 | ns |
| $t_{PHL}$ | | | | | | 4 | 6.5 | ns |
| $t_{PLH}$ | | | $R_L$ = 93 Ω, | $C_L$ = 150 pF | | 6 | | ns |
| $t_{PHL}$ | | | | | | 6 | | ns |

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

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