

DATA SHEET

74F3040

Dual 4-input NAND 30 Ω line driver

Product specification
IC15 Data Handbook

1990 Jan 29

Dual 4-input NAND 30Ω line driver

74F3040

FEATURES

- 30Ω line driver
- 160mA output drive capability in the Low state
- 67mA output drive capability in the High state
- High speed
- Facilitates incident wave switching
- 3nh lead inductance each on V_{CC} and GND when both side pins are used

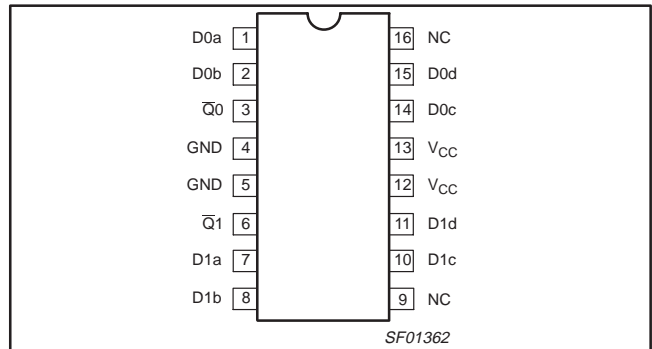
DESCRIPTION

The 74F3040 is a high current Line Driver composed of two 4-input NAND gates. It has been designed to deal with the transmission line effects of PC boards which appear when fast edge rates are used.

The drive capability of the 74F3040 is 67mA source and 160mA sink with a V_{CC} as low as 4.5V. This guarantees incident wave switching with V_{OH} not less than 2.0V and V_{OL} not more than 0.8V while driving impedances as low as 30Ω. This is applicable with any combination of outputs using continuous duty.

The propagation delay of the part is minimally affected by reflections when terminated only by the TTL inputs of other devices. Performance may be improved by full or partial line termination.

PIN CONFIGURATION



| TYPE | TYPICAL PROPAGATION DELAY | TYPICAL SUPPLY CURRENT (TOTAL) |
|---------|---------------------------|--------------------------------|
| 74F3040 | 2.0ns | 10mA |

ORDERING INFORMATION

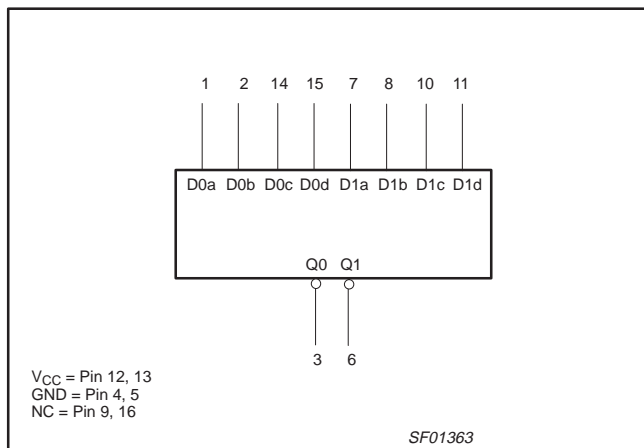
| DESCRIPTION | COMMERCIAL RANGE V _{CC} = 5V ±10%, T _{amb} = 0°C to +70°C | PACKAGE DRAWING NUMBER |
|--------------------|---|------------------------|
| 16-pin Plastic DIP | N74F3040N | SOT38-4 |
| 16-pin Plastic SOL | N74F3040D | SOT162-1 |

INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

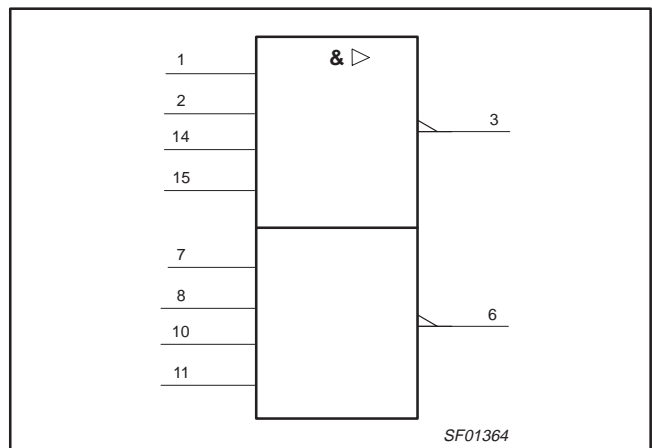
| PINS | DESCRIPTION | 74F(U.L.) HIGH/LOW | LOAD VALUE HIGH/LOW |
|--------------------|--------------|--------------------|---------------------|
| Dna, Dnb, Dnc, Dnd | Data inputs | 1.0/1.0 | 20μA/0.6mA |
| Qn | Data outputs | 3350/266 | 67mA/160mA |

NOTE: One (1.0) FAST unit load is defined as: 20μA in the High state and 0.6mA in the Low state.

LOGIC SYMBOL



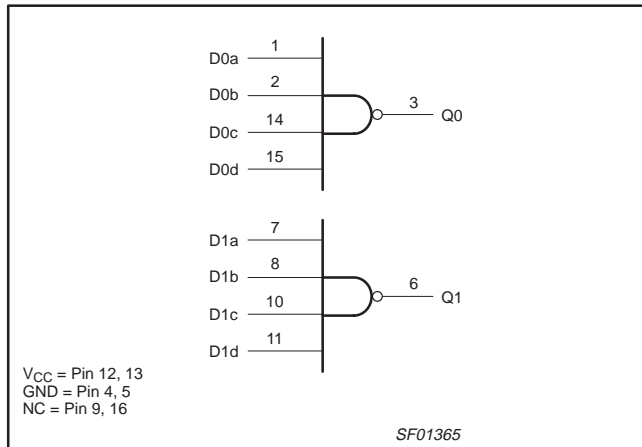
IEC/IEEE SYMBOL



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74F3040

LOGIC DIAGRAM



FUNCTION TABLE

| INPUTS | | | | OUTPUT |
|--------|-----|-----|-----|-------------|
| Dna | Dnb | Dnc | Dnd | \bar{Q}_n |
| L | X | X | X | H |
| X | L | X | X | H |
| X | X | L | X | H |
| X | X | X | L | H |
| H | H | H | H | L |

H = High voltage level
L = Low voltage level
X = Don't care

ABSOLUTE MAXIMUM RATINGS

(Operation beyond the limits set forth in this table may impair the useful life of the device. Unless otherwise noted these limits are over the operating free-air temperature range.)

| SYMBOL | PARAMETER | RATING | UNIT |
|------------------|--|-------------------------|------|
| V _{CC} | Supply voltage | -0.5 to +7.0 | V |
| V _{IN} | Input voltage | -0.5 to +7.0 | V |
| I _{IN} | Input current | -30 to +5 | mA |
| V _{OUT} | Voltage applied to output in High output state | -0.5 to V _{CC} | V |
| I _{OUT} | Current applied to output in Low output state | 320 | mA |
| T _{amb} | Operating free-air temperature range | 0 to +70 | °C |
| T _{stg} | Storage temperature range | -65 to +150 | °C |

RECOMMENDED OPERATING CONDITIONS

| SYMBOL | PARAMETER | LIMITS | | | UNIT |
|------------------|--------------------------------------|--------|-----|-----|------|
| | | MIN | NOM | MAX | |
| V _{CC} | Supply voltage | 4.5 | 5.0 | 5.5 | V |
| V _{IH} | High-level input voltage | 2.0 | | | V |
| V _{IL} | Low-level input voltage | | | 0.8 | V |
| I _{IK} | Input clamp current | | | -18 | mA |
| I _{OH} | High-level output current | | | -67 | mA |
| I _{OL} | Low-level output current | | | 160 | mA |
| T _{amb} | Operating free-air temperature range | 0 | | +70 | °C |

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74F3040

DC ELECTRICAL CHARACTERISTICS

(Over recommended operating free-air temperature range unless otherwise noted.)

| SYMBOL | PARAMETER | TEST CONDITIONS ¹ | | LIMITS | | | UNIT | | |
|-----------------|--|---|---------------------------------------|----------------------|------------------|------|------|-----|----|
| | | | | MIN | TYP ² | MAX | | | |
| V _{OH} | High-level output current | V _{CC} = MIN V _{IL} = MAX V _{IH} = MIN | I _{OH} = -45mA | ±10% V _{CC} | 2.5 | | | V | |
| | | | | ±5% V _{CC} | 2.7 | 3.4 | | V | |
| | | | I _{OH1} = -67mA ³ | ±10% V _{CC} | 2.0 | | | V | |
| V _{OL} | Low-level output current | V _{CC} = MIN V _{IL} = MAX V _{IH} = MIN | I _{OL} = 100mA | ±10% V _{CC} | | 0.30 | 0.50 | V | |
| | | | I _{OL1} = 160mA ⁴ | ±5% V _{CC} | | 0.30 | 0.50 | V | |
| V _{IK} | Input clamp voltage | V _{CC} = MIN, I _I = I _{IK} | | | -0.73 | -1.2 | | V | |
| I _I | Input current at maximum input voltage | V _{CC} = MAX, V _I = 7.0V | | | | | 100 | μA | |
| I _{IH} | High-level input current | V _{CC} = MAX, V _I = 2.7V | | | | | 20 | μA | |
| I _{IL} | Low-level input current | V _{CC} = MAX, V _I = 0.5V | | | | | -0.6 | mA | |
| I _O | Output current ⁵ | V _{CC} = MAX, V _O = 2.25V | | | -100 | | -200 | mA | |
| I _{CC} | Supply current (total) | I _{CCH} | V _{CC} = MAX | | | | 3.0 | 5.0 | mA |
| | | I _{CCL} | | | | | 16 | 22 | mA |

NOTES:

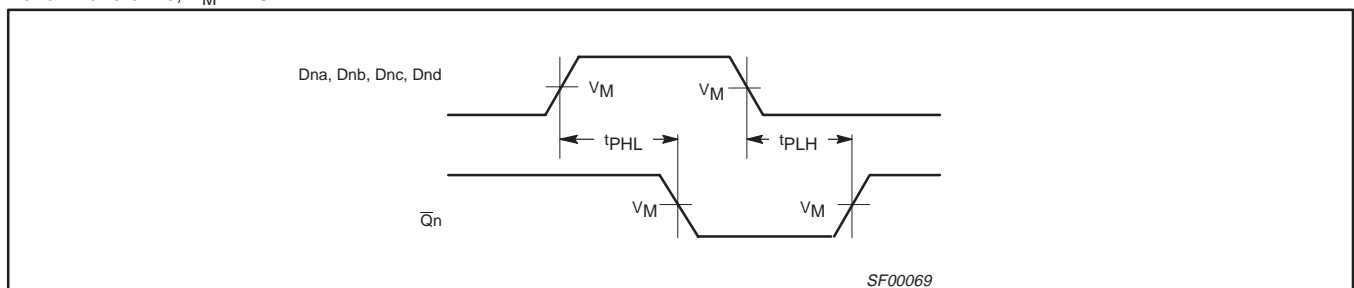
- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at V_{CC} = 5V, T_{amb} = 25°C.
- I_{OH1} is the current necessary to guarantee the Low-to-High transition in a 30Ω transmission line on the incident wave.
- I_{OL1} is the current necessary to guarantee the High-to-Low transition in a 30Ω transmission line on the incident wave.
- I_O is tested under conditions that produce current approximately one half of the true short-circuit output current (I_{OS}).

AC ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | TEST CONDITION | LIMITS | | | | | UNIT |
|--------------------------------------|---|----------------|---|------------|------------|--|------------|------|
| | | | T _{amb} = +25°C V _{CC} = +5.0V C _L = 50pF, R _L = 500Ω | | | T _{amb} = 0°C to +70°C V _{CC} = +5.0V ± 10% C _L = 50pF, R _L = 500Ω | | |
| | | | MIN | TYP | MAX | MIN | MAX | |
| t _{PLH} t _{PHL} | Propagation delay D _{na} , D _{nb} , D _{nc} , D _{nd} to \bar{Q}_n | Waveform 1 | 1.0 1.0 | 2.0 2.0 | 5.0 4.5 | 1.0 1.0 | 5.5 5.0 | ns |

AC WAVEFORMS

For all waveforms, V_M = 1.5V.

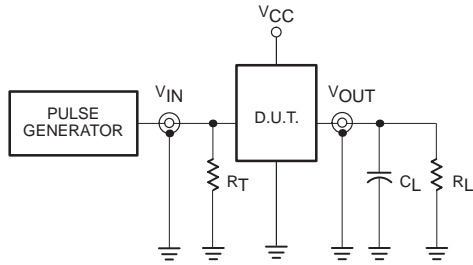


Waveform 1. Propagation Delay for Inputs to Output

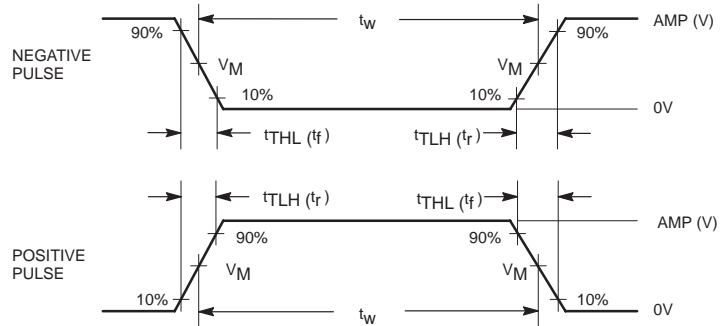
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74F3040

TEST CIRCUIT AND WAVEFORMS



Test Circuit for Totem-Pole Outputs



Input Pulse Definition

DEFINITIONS:

- R_L = Load resistor; see AC ELECTRICAL CHARACTERISTICS for value.
- C_L = Load capacitance includes jig and probe capacitance; see AC ELECTRICAL CHARACTERISTICS for value.
- R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

| family | INPUT PULSE REQUIREMENTS | | | | | |
|--------|--------------------------|-------|-----------|-------|-----------------|-----------------|
| | amplitude | V_M | rep. rate | t_w | $t_{TLH} (t_r)$ | $t_{THL} (t_f)$ |
| 74F | 3.0V | 1.5V | 1MHz | 500ns | 2.5ns | 2.5ns |

SF00006

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DIP20: plastic dual in-line package; 20 leads (300 mil)

SOT146-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

| UNIT | A max. | A ₁ min. | A ₂ max. | b | b ₁ | c | D ⁽¹⁾ | E ⁽¹⁾ | e | e ₁ | L | M _E | M _H | w | Z ⁽¹⁾ max. |
|--------|--------|---------------------|---------------------|----------------|----------------|----------------|------------------|------------------|------|----------------|--------------|----------------|----------------|-------|-----------------------|
| mm | 4.2 | 0.51 | 3.2 | 1.73 1.30 | 0.53 0.38 | 0.36 0.23 | 26.92 26.54 | 6.40 6.22 | 2.54 | 7.62 | 3.60 3.05 | 8.25 7.80 | 10.0 8.3 | 0.254 | 2.0 |
| inches | 0.17 | 0.020 | 0.13 | 0.068 0.051 | 0.021 0.015 | 0.014 0.009 | 1.060 1.045 | 0.25 0.24 | 0.10 | 0.30 | 0.14 0.12 | 0.32 0.31 | 0.39 0.33 | 0.01 | 0.078 |

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|-------|--|---------------------|----------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT146-1 | | | SC603 | | | 92-11-17 95-05-24 |

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74F3040

SO20: plastic small outline package; 20 leads; body width 7.5 mm

SOT163-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽¹⁾ | e | H _E | L | L _p | Q | v | w | y | Z ⁽¹⁾ | θ |
|--------|--------|----------------|----------------|----------------|----------------|----------------|------------------|------------------|-------|----------------|-------|----------------|----------------|------|------|-------|------------------|----------|
| mm | 2.65 | 0.30 0.10 | 2.45 2.25 | 0.25 | 0.49 0.36 | 0.32 0.23 | 13.0 12.6 | 7.6 7.4 | 1.27 | 10.65 10.00 | 1.4 | 1.1 0.4 | 1.1 1.0 | 0.25 | 0.25 | 0.1 | 0.9 0.4 | 8° 0° |
| inches | 0.10 | 0.012 0.004 | 0.096 0.089 | 0.01 | 0.019 0.014 | 0.013 0.009 | 0.51 0.49 | 0.30 0.29 | 0.050 | 0.42 0.39 | 0.055 | 0.043 0.016 | 0.043 0.039 | 0.01 | 0.01 | 0.004 | 0.035 0.016 | |

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|----------|------|--|---------------------|----------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT163-1 | 075E04 | MS-013AC | | | | 92-11-17 95-01-24 |

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Data sheet status

| Data sheet status | Product status | Definition [1] |
|---------------------------|----------------|--|
| Objective specification | Development | This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice. |
| Preliminary specification | Qualification | This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product. |
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[1] Please consult the most recently issued datasheet before initiating or completing a design.

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