



**THE DATASHEET OF
N74F827D,602**



DATA SHEET

74F827

10-bit buffer/line driver, non-inverting
(3-State)

Product data

2004 Jan 21

Replaces Product specification 74F827/74F828 of 1994 Dec 5

10-bit buffer/line driver, non-inverting (3-State)

74F827

FEATURES

- High impedance NPN base inputs for reduced loading (20 μ A in HIGH and LOW states)
- I_{IL} is 20 μ A vs FAST family spec of 600 μ A
- Ideal where high speed, light bus loading and increased fan-in are required
- Controlled rise and fall times to minimize ground bounce
- Glitch free power-up in 3-State
- Flow through pinout architecture for microprocessor oriented applications
- Outputs sink 64 mA
- 74F827 is available in SSOP type II package

DESCRIPTION

The 74F827 10-Bit buffer provides high performance bus interface buffering for wide data/address paths or buses carrying parity. The device has NOR Output Enables ($\overline{OE}0$, $\overline{OE}1$) for maximum control flexibility.

| TYPE | TYPICAL PROPAGATION DELAY | TYPICAL SUPPLY CURRENT (TOTAL) |
|--------|---------------------------|--------------------------------|
| 74F827 | 6.0ns | 60 mA |

ORDERING INFORMATION

COMMERCIAL RANGE: $V_{CC} = 5 V \pm 10\%$; $T_{amb} = 0^\circ C$ to $+70^\circ C$

| Type number | Package | | Version |
|-------------|---------|---|----------|
| | Name | Description | |
| N74F827N | DIP24 | plastic dual in-line package; 24 leads (300 mil) | SOT222-1 |
| N74F827D | SO24 | plastic small outline package; 24 leads; body width 7.5 mm | SOT137-1 |
| N74F827DB | SSOP24 | plastic shrink small outline package; 24 leads; body width 5.3 mm | SOT340-1 |

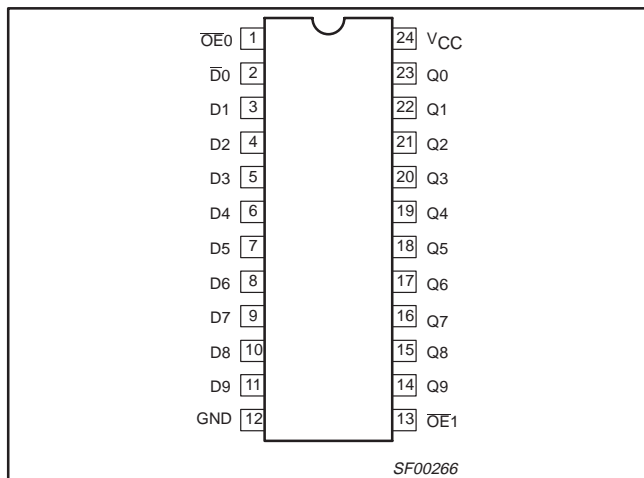
INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

| PINS | DESCRIPTION | 74F(U.L.) HIGH/LOW | LOAD VALUE HIGH / LOW |
|-------------------------------------|-----------------------------------|--------------------|-------------------------|
| D0-D9 | Data inputs | 1.0/0.033 | 20 μ A / 20 μ A |
| $\overline{OE}0$ - $\overline{OE}1$ | Output enable inputs (active-LOW) | 1.0/0.033 | 20 μ A / 20 μ A |
| Q0-Q9 | Data outputs | 1200/106.7 | 24 mA / 64 mA |

NOTES:

One (1.0) FAST Unit Load is defined as: 20 μ A in the HIGH state and 0.6 mA in the LOW state.

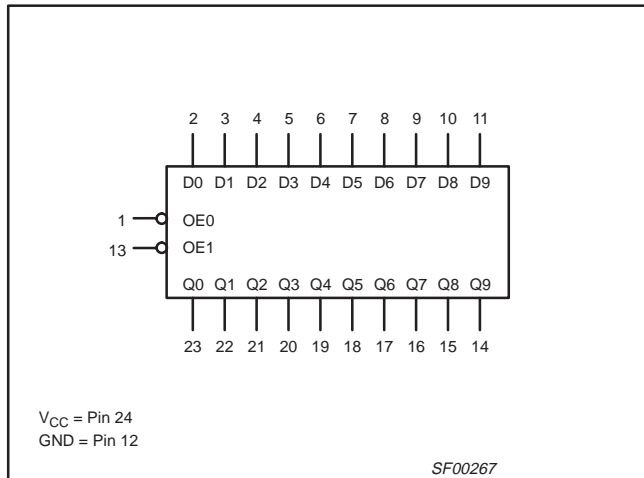
PIN CONFIGURATION



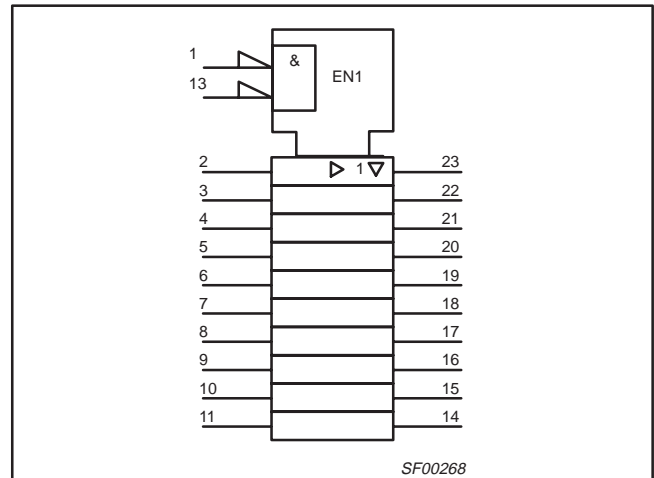
10-bit buffer/line driver, non-inverting (3-State)

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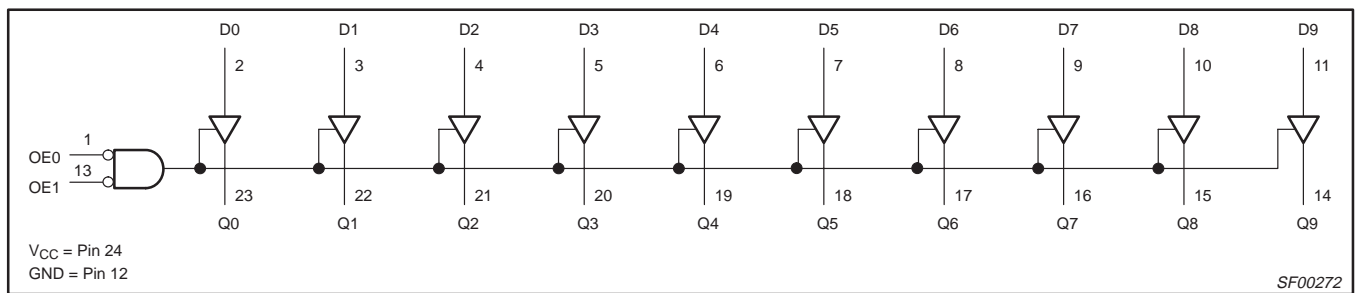
LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



LOGIC DIAGRAM



FUNCTION TABLE

| INPUTS | | OUTPUTS | OPERATING MODE |
|-----------------|----------------|----------------|----------------|
| OE _n | D _n | Q _n | |
| L | L | L | Transparent |
| L | H | H | Transparent |
| H | X | Z | High impedance |

- H = HIGH voltage level
- L = LOW voltage level
- X = Don't care
- Z = High impedance "off" state

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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 | 128 | 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 | - | - | -24 | mA |
| I _{OL} | LOW-level output current | - | - | 64 | mA |
| T _{amb} | Operating free-air temperature range | 0 | - | +70 | °C |

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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 voltage | V _{CC} = MIN, V _{IL} = MAX, V _{IH} = MIN | I _{OH} = -15 mA | ± 10% V _{CC} | 2.4 | - | - | V |
| | | | | ± 5% V _{CC} | 2.4 | 3.3 | - | V |
| | | V _{CC} = MIN, V _{IL} = MAX, V _{IH} = MIN | I _{OH} = -24 mA | ± 10% V _{CC} | 2.0 | - | - | V |
| | | | | ± 5% V _{CC} | 2.0 | - | - | V |
| V _{OL} | LOW-level output voltage | V _{CC} = MIN, V _{IL} = MAX, V _{IH} = MIN | I _{OL} = 64 mA | ± 10% V _{CC} | - | - | 0.55 | V |
| | | | | ± 5% V _{CC} | - | 0.42 | 0.55 | 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} = 0 V; V _I = 7.0 V | | | - | - | 100 | μA |
| I _{IH} | HIGH-level input current | V _{CC} = MAX; V _I = 2.7 V | | | - | - | 20 | μA |
| I _{IL} | LOW-level input current | V _{CC} = MAX; V _I = 0.5 V | | | - | - | -20 | μA |
| I _{OZH} | Off-state output current, HIGH voltage applied | V _{CC} = MAX; V _O = 2.7 V | | | - | - | 50 | μA |
| I _{OZL} | Off-state output current, LOW voltage applied | V _{CC} = MAX; V _O = 0.5 V | | | - | - | -50 | μA |
| I _{OS} | Short circuit output current ³ | V _{CC} = MAX | | | -100 | - | -225 | mA |
| I _{CC} | Supply current (total) | I _{CCH} | V _{CC} = MAX | | - | 50 | 70 | mA |
| | | I _{CCL} | | | - | 70 | 100 | mA |
| | | I _{CCZ} | | | - | 60 | 90 | mA |

NOTES:

- For conditions shown as MIN or MAX, use the appropriate value specified under operating conditions for the applicable type.
- All typical values are at V_{CC} = 5 V, T_{amb} = 25 °C.
- Not more than one output should be shorted at one time. For testing I_{OS}, the use of high-speed test apparatus and/or sample-and-hold techniques are preferable in order to minimize internal heating and more accurately reflect operational values. Otherwise, prolonged shorting of a HIGH output may raise the chip temperature well above normal and thereby cause invalid readings in other parameter tests. In any sequence of parameter tests, I_{OS} tests should be performed last.

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AC CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | LIMITS | | | | | UNIT |
|------------------------|---|--------------------------|---|------------|--------------|--|--------------|------|
| | | | $T_{amb} = +25\text{ }^{\circ}\text{C}$ $V_{CC} = 5\text{ V}$ $C_L = 50\text{ pF}; R_L = 500\text{ }\Omega$ | | | $T_{amb} = 0\text{ }^{\circ}\text{C to } +70\text{ }^{\circ}\text{C}$ $V_{CC} = 5\text{ V} \pm 10\%$ $C_L = 50\text{ pF}; R_L = 500\text{ }\Omega$ | | |
| | | | Min | Typ | Max | Min | Max | |
| t_{PLH} t_{PHL} | Propagation delay D_n to Q_n | Waveform 1 | 2.0 2.0 | 5.5 4.5 | 8.5 8.5 | 2.0 2.0 | 9.0 9.0 | ns |
| t_{PZH} t_{PZL} | Output enable time \overline{OE}_n to Q_n | Waveform 2 Waveform 3 | 5.0 4.0 | 8.0 6.0 | 12.0 10.5 | 4.5 4.0 | 14.0 11.5 | ns |
| t_{PHZ} t_{PLZ} | Output disable time \overline{OE}_n to Q_n | Waveform 2 Waveform 3 | 2.5 2.5 | 5.0 5.0 | 8.0 8.0 | 2.0 2.0 | 8.5 8.5 | ns |

AC CHARACTERISTICS

For 1 Output switching with $C_L = 300\text{ pF}$ and $R_L = 500\text{ }\Omega$ load

| SYMBOL | PARAMETER | CONDITIONS | LIMITS | | | | | UNIT |
|------------------------|---|--------------------------|--|-------------|--------------|---|--------------|------|
| | | | $T_{amb} = +25\text{ }^{\circ}\text{C}$ $V_{CC} = 5\text{ V}$ $C_L = 300\text{ pF}; R_L = 500\text{ }\Omega$ | | | $T_{amb} = 0\text{ }^{\circ}\text{C to } +70\text{ }^{\circ}\text{C}$ $V_{CC} = 5\text{ V} \pm 10\%$ $C_L = 300\text{ pF}; R_L = 500\text{ }\Omega$ | | |
| | | | MIN | Typ | Max | MIN | Max | |
| t_{PLH} t_{PHL} | Propagation delay D_n to Q_n | Waveform 1 | – – | 9.5 7.5 | 13.0 10.0 | – – | 14.0 11.0 | ns |
| t_{PZH} t_{PZL} | Output enable time \overline{OE}_n to Q_n | Waveform 2 Waveform 3 | – – | 15.0 9.5 | 20.0 13.0 | – – | 21.0 14.0 | ns |
| t_{PHZ} t_{PLZ} | Output disable time \overline{OE}_n to Q_n | Waveform 2 Waveform 3 | – – | 15.0 9.5 | 19.0 13.5 | – – | 20.0 14.0 | ns |

AC CHARACTERISTICS

For 10 Outputs switching with $C_L = 300\text{ pF}$ and $R_L = 500\text{ }\Omega$ load

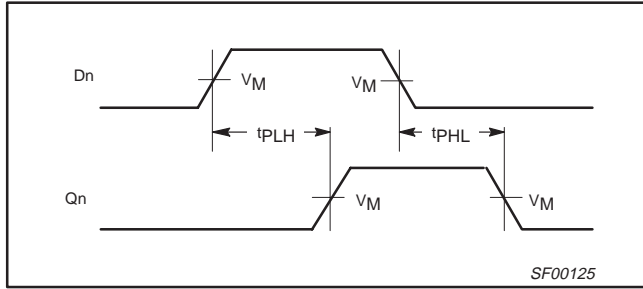
| SYMBOL | PARAMETER | CONDITIONS | LIMITS | | | | | UNIT |
|------------------------|---|--------------------------|--|--------------|--------------|---|--------------|------|
| | | | $T_{amb} = +25\text{ }^{\circ}\text{C}$ $V_{CC} = 5\text{ V}$ $C_L = 300\text{ pF}; R_L = 500\text{ }\Omega$ | | | $T_{amb} = 0\text{ }^{\circ}\text{C to } +70\text{ }^{\circ}\text{C}$ $V_{CC} = 5\text{ V} \pm 10\%$ $C_L = 300\text{ pF}; R_L = 500\text{ }\Omega$ | | |
| | | | MIN | Typ | Max | MIN | Max | |
| t_{PLH} t_{PHL} | Propagation delay D_n to Q_n | Waveform 1 | – – | 12.0 14.0 | 16.0 17.0 | – – | 17.0 18.0 | ns |
| t_{PZH} t_{PZL} | Output enable time \overline{OE}_n to Q_n | Waveform 2 Waveform 3 | – – | 15.0 17.0 | 20.0 21.0 | – – | 21.0 21.5 | ns |
| t_{PHZ} t_{PLZ} | Output disable time \overline{OE}_n to Q_n | Waveform 2 Waveform 3 | – – | 15.0 12.5 | 19.0 15.5 | – – | 20.0 16.0 | ns |

10-bit buffer/line driver, non-inverting (3-State)

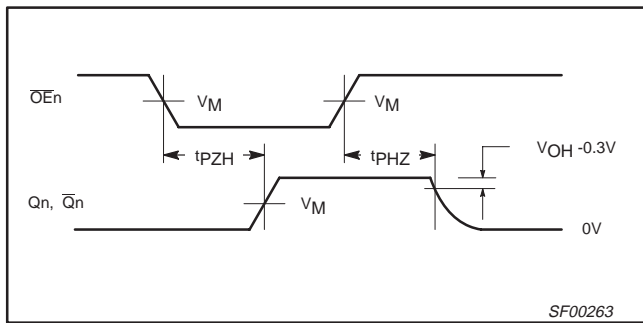
74F827

AC WAVEFORMS

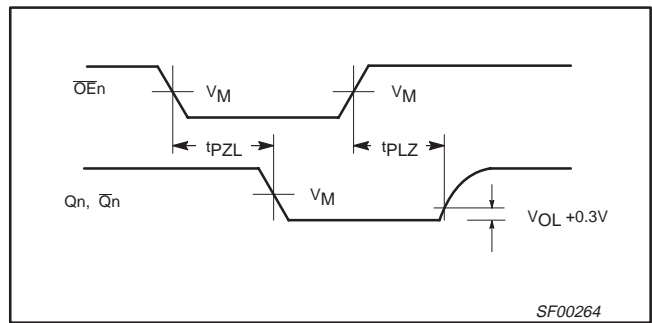
For all waveforms, $V_M = 1.5\text{ V}$



Waveform 1. Propagation delay for non-inverting output



Waveform 2. 3-State Output Enable time to HIGH level and Output Disable time from HIGH level



Waveform 3. 3-State Output Enable time to LOW level and Output Disable time from LOW level

Test Circuit for Open Collector Outputs

Input Pulse Definition

| SWITCH POSITION | |
|-----------------|--------|
| TEST | SWITCH |
| t_{PLZ} | closed |
| t_{PZL} | closed |
| All other | open |

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_{THL} |
| 74F | 3.0 V | 1.5 V | 1 MHz | 500 ns | 2.5 ns | 2.5 ns |

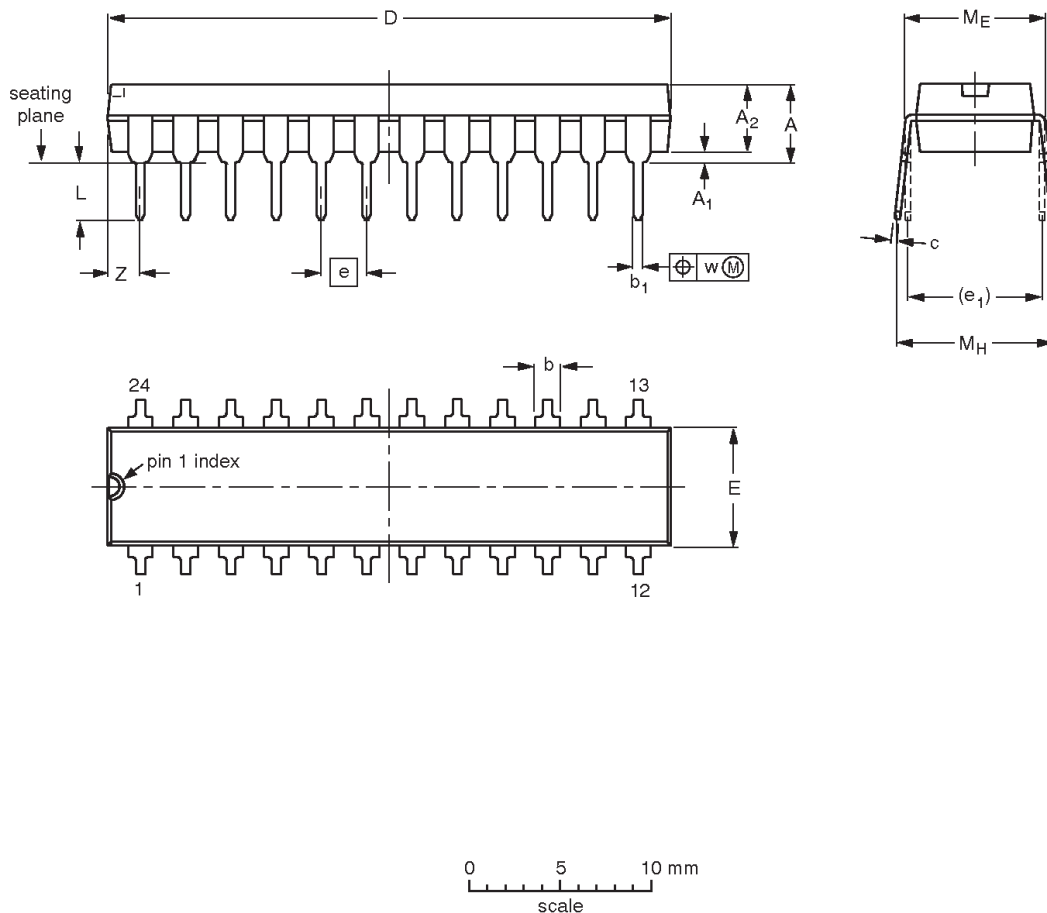
SF00128

10-bit buffer/line driver, non-inverting (3-State)

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DIP24: plastic dual in-line package; 24 leads (300 mil)

SOT222-1



DIMENSIONS (mm dimensions are derived from the original inch 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 | 4.7 | 0.38 | 3.94 | 1.63 1.14 | 0.56 0.43 | 0.36 0.25 | 31.9 31.5 | 6.73 6.25 | 2.54 | 7.62 | 3.51 3.05 | 8.13 7.62 | 10.03 7.62 | 0.25 | 2.05 |
| inches | 0.185 | 0.015 | 0.155 | 0.064 0.045 | 0.022 0.017 | 0.014 0.010 | 1.256 1.240 | 0.265 0.246 | 0.1 | 0.3 | 0.138 0.120 | 0.32 0.30 | 0.395 0.300 | 0.01 | 0.081 |

Note

1. Plastic or metal protrusions of 0.25 mm (0.01 inch) maximum per side are not included.

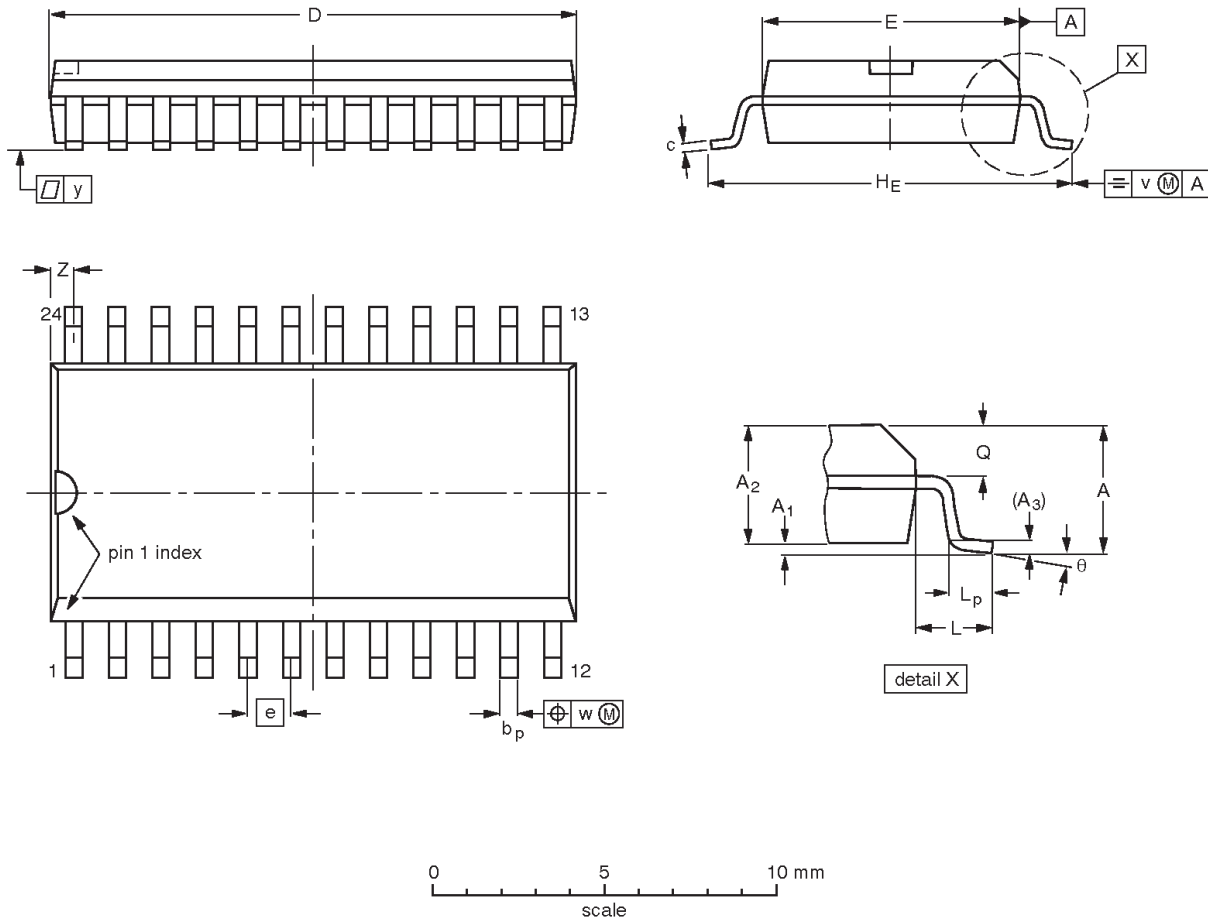
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|-------|--|---------------------|---------------------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT222-1 | | MS-001 | | | | 99-12-27 03-03-12 |

10-bit buffer/line driver, non-inverting (3-State)

74F827

SO24: plastic small outline package; 24 leads; body width 7.5 mm

SOT137-1



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 | 0.3 0.1 | 2.45 2.25 | 0.25 | 0.49 0.36 | 0.32 0.23 | 15.6 15.2 | 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 | 0.1 | 0.012 0.004 | 0.096 0.089 | 0.01 | 0.019 0.014 | 0.013 0.009 | 0.61 0.60 | 0.30 0.29 | 0.05 | 0.419 0.394 | 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 (0.006 inch) maximum per side are not included.

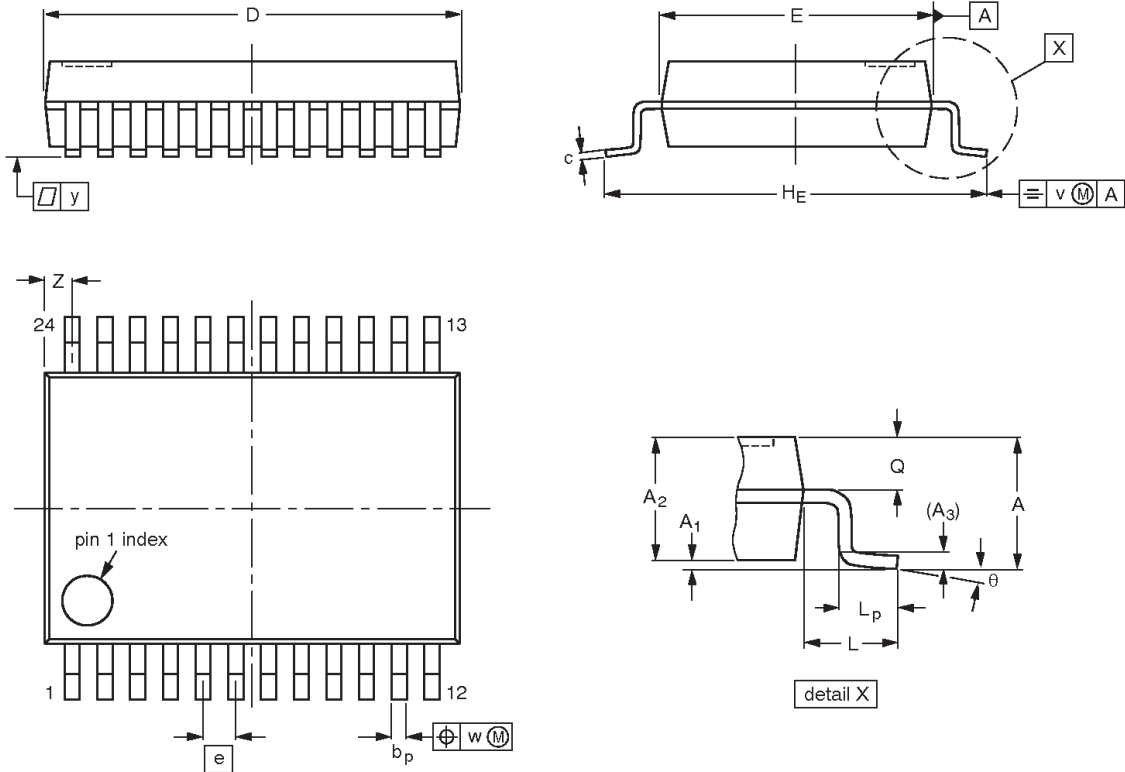
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|-------|--|---------------------|-----------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT137-1 | 075E05 | MS-013 | | | | -99-12-27 03-02-19 |

10-bit buffer/line driver, non-inverting (3-State)

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SSOP24: plastic shrink small outline package; 24 leads; body width 5.3 mm

SOT340-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽¹⁾ | e | HE | L | L _p | Q | v | w | y | Z ⁽¹⁾ | θ |
|------|--------|----------------|----------------|----------------|----------------|--------------|------------------|------------------|------|------------|------|----------------|------------|-----|------|-----|------------------|----------|
| mm | 2 | 0.21 0.05 | 1.80 1.65 | 0.25 | 0.38 0.25 | 0.20 0.09 | 8.4 8.0 | 5.4 5.2 | 0.65 | 7.9 7.6 | 1.25 | 1.03 0.63 | 0.9 0.7 | 0.2 | 0.13 | 0.1 | 0.8 0.4 | 8° 0° |

Note

1. Plastic or metal protrusions of 0.2 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|-------|--|---------------------|----------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT340-1 | | MO-150 | | | | 99-12-27 03-02-19 |

10-bit buffer/line driver, non-inverting (3-State)

74F827

REVISION HISTORY

| Rev | Date | Description |
|-----|----------|---|
| _3 | 20040121 | Product data (9397 750 12741). ECN 853-0880 A15336 of 21 January 2004. Replaces 74F827_74F828_2 dated 1994 Dec 5. Modifications: <ul style="list-style-type: none"> • Delete all references to 74F828 (product discontinued). • AC Characteristics table (for 10 outputs switching): change Limits columns' headings from $C_L = 50$ pF to $C_L = 300$ pF. |
| _2 | 19941205 | Product specification. ECN 853-0880 14382 of 05 December 1994. |

Data sheet status

| Level | Data sheet status ^[1] | Product status ^{[2] [3]} | Definitions |
|-------|----------------------------------|-----------------------------------|--|
| I | Objective data | Development | This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice. |
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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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