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DATA SHEET

74F545

Octal bidirectional transceiver (with
3-State inputs/outputs)

Product specification

1990 Mar 01

IC15 Data Handbook

Octal bidirectional transceiver (with 3-State inputs/outputs)

74F545

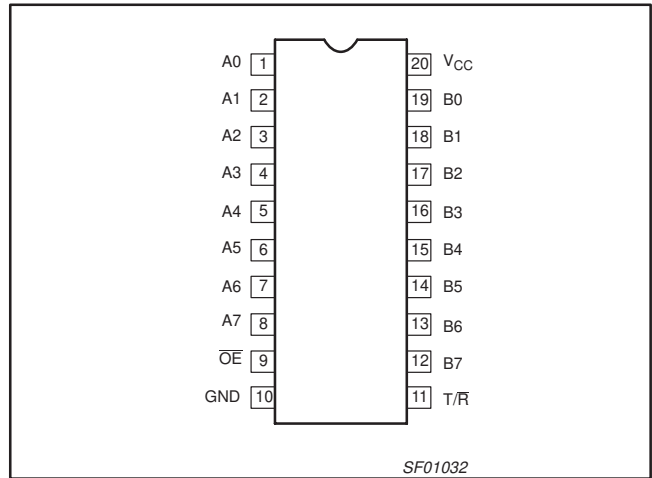
FEATURES

- High impedance NPN base inputs for reduced loading (70µA in High and Low states) output
- 8-bit bidirectional data flow reduces system package count
- 3-State inputs/outputs for interfacing with bus oriented systems
- 24mA and 64mA bus drive capability on A and B ports, respectively
- Transmit/Receive and Output Enable simplify control logic

DESCRIPTION

The 74F545 is an 8-bit, 3-State, high speed transceiver. It provides bidirectional drive for the bus-oriented microprocessor and digital communications systems. Straight through bidirectional transceivers are featured, with 24mA bus drive capability on the A ports and 64mA bus drive capability on the B ports. One input, Transmit/Receive (T/R) determines the direction of logic signals through the bidirectional transceiver. Transmit enables data from A ports to B ports; Receive enables data from B ports to A ports. The Output Enable input disables both A and B ports by placing them in a 3-State condition. The 74F545 performs the same function as the 74F245, the only difference being package pin assignment.

PIN CONFIGURATION



| TYPE | TYPICAL PROPAGATION DELAY | TYPICAL SUPPLY CURRENT (TOTAL) |
|--------|---------------------------|--------------------------------|
| 74F545 | 4.0ns | 87mA |

ORDERING INFORMATION

| DESCRIPTION | COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$, $T_{amb} = 0^{\circ}C \text{ to } +70^{\circ}C$ | PKG DWG # |
|--------------------|---|-----------|
| 20-Pin Plastic DIP | N74F545N | SOT146-1 |
| 20-Pin Plastic SOL | N74F545D | SOT163-1 |

INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

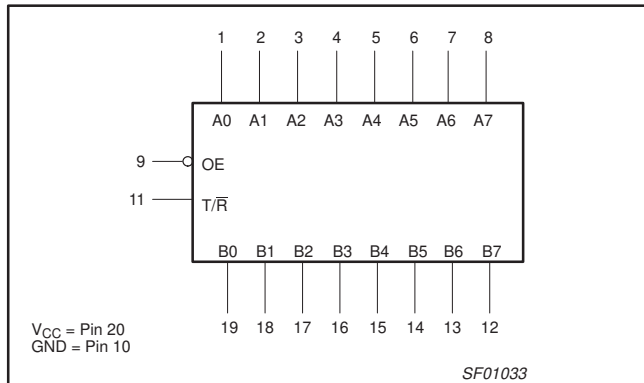
| PINS | DESCRIPTION | 74F(U.L.) HIGH/LOW | LOAD VALUE HIGH/LOW |
|-----------------|----------------------------------|--------------------|---------------------|
| A0–A7, B0–B7 | Data inputs | 3.5/0.117 | 70µA/70µA |
| \overline{OE} | Output Enable input (active Low) | 2.0/0.067 | 40µA/40µA |
| T/R | Transmit/Receive input | 2.0/0.067 | 40µA/40µA |
| A0 - A7 | Port A 3-State outputs | 150/40 | 3.0mA/24mA |
| B0 - B7 | Port B 3-State outputs | 750/107 | 15mA/64mA |

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

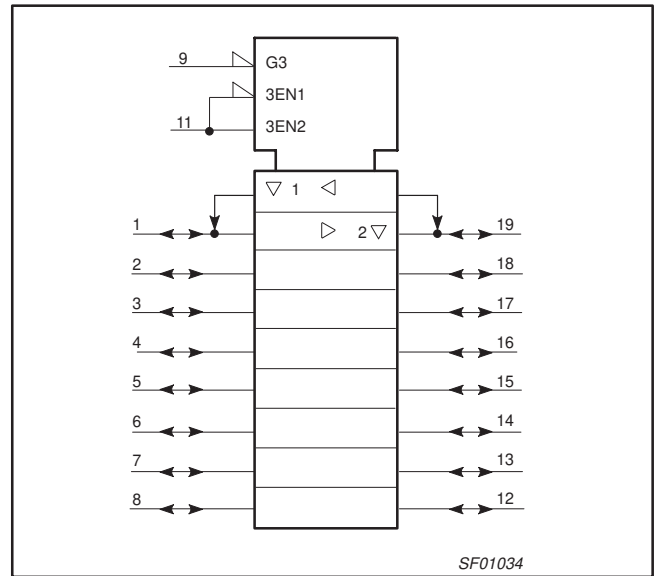
Octal bidirectional transceiver (with 3-State inputs/outputs)

74F545

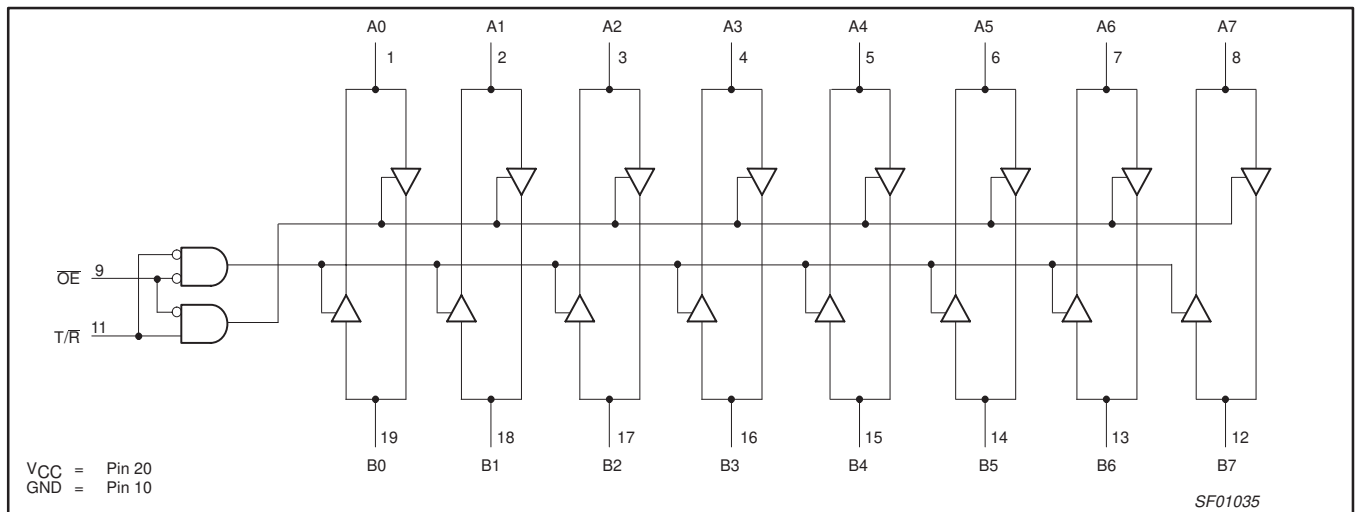
LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



LOGIC DIAGRAM



FUNCTION TABLE

| INPUTS | | OUTPUTS |
|--------|-----|---------------------|
| OE | T/R | |
| L | L | Bus B data to Bus A |
| L | H | Bus A data to Bus B |
| H | X | Z |

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

Octal bidirectional transceiver (with 3-State inputs/outputs)

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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 +5.0 | mA | |
| V_{OUT} | Voltage applied to output in High output state | -0.5 to +5.5 | V | |
| I_{OUT} | Current applied to output in Low output state | A0-A7 | 48 | mA |
| | | B0-B7 | 128 | mA |
| T_{amb} | Operating free-air temperature range | 0 to +70 | °C | |
| T_{stg} | Storage temperature | -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 | A0-A7 | | -3 | mA |
| | | B0-B7 | | -15 | mA |
| I_{OL} | Low-level output current | A0-A7 | | 24 | mA |
| | | B0-B7 | | 64 | mA |
| T_{amb} | Operating free-air temperature range | 0 | | 70 | °C |

Octal bidirectional transceiver (with 3-State inputs/outputs)

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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 | A0–A7 | V _{CC} = MIN, V _{IL} = MAX, V _{IH} = MIN | I _{OH} = –3mA | ±10%V _{CC} | 2.4 | | | V |
| | | B0–B7 | | | ±5%V _{CC} | 2.7 | 3.3 | | V |
| | | B0–B7 | | I _{OH} = –15mA | ±10%V _{CC} | 2.0 | | | V |
| | | | | | ±5%V _{CC} | 2.0 | | | V |
| V _{OL} | Low-level output voltage | A0–A7 | V _{CC} = MIN, V _{IL} = MAX, V _{IH} = MIN | I _{OL} = 24mA | ±10%V _{CC} | | 0.35 | 0.50 | V |
| | | B0–B7 | | | ±5%V _{CC} | | 0.35 | 0.50 | V |
| | | B0–B7 | | I _{OL} = MAX | ±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 | OE, T/R | V _{CC} = 0.0V, V _I = 7.0V | | | | | 100 | μA |
| | | A0–A7, B0–B7 | V _{CC} = 5.5V, V _I = 5.5V | | | | | 1.0 | mA |
| I _{IH} | High-level input current | OE, T/R | V _{CC} = MAX, V _I = 2.7V | | | | | 40 | μA |
| I _{IL} | Low-level input current | only | V _{CC} = MAX, V _I = 0.5V | | | | | –40 | μA |
| I _{OZH} +I _{IH} | Off-state output current High-level voltage applied | | V _{CC} = MAX, V _I = 2.7V | | | | | 70 | μA |
| I _{OZL} +I _{IL} | Off-state output current Low-level voltage applied | | V _{CC} = MAX, V _I = 0.5V | | | | | –70 | μA |
| I _{OS} | Short-circuit output current ³ | A0–A7 | V _{CC} = MAX | | | –60 | | –150 | mA |
| | | B0–B7 | | | | –100 | | –225 | μA |
| I _{CC} | Supply current (total) ⁴ | I _{CCH} | V _{CC} = MAX | T/R=An=4.5V, OE=GND | | | 84 | 100 | mA |
| | | I _{CCL} | | OE=T/R=Bn=GND | | | 96 | 120 | mA |
| | | I _{CCZ} | | T/R=Bn=GND, OE=4.5V | | | 96 | 120 | mA |

NOTES:

- For conditions shown as MIN or MAX, use the appropriate value under the recommended operating conditions for the applicable type.
- All typical values are at V_{CC} = 5V, T_{amb} = 25°C.
- Not more than one output should be shorted at a 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} should be performed last.
- Measure I_{CC} with outputs open.

AC ELECTRICAL CHARACTERISTICS

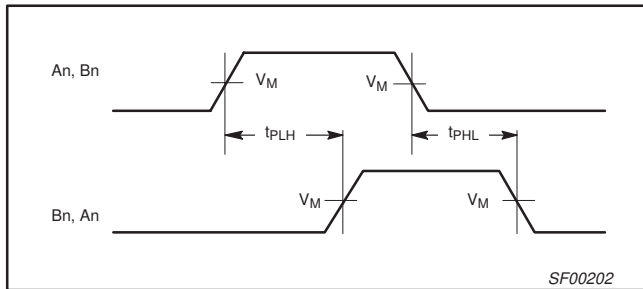
| SYMBOL | PARAMETER | | TEST CONDITIONS | | LIMITS | | | | UNIT | |
|------------------|------------------------|--|-----------------|------------|---|------|-----|--|------|-----|
| | | | | | T _{amb} = +25°C V _{CC} = +5.0V C _L = 50pF, R _L = 500Ω | | | T _{amb} = 0°C to +70°C V _{CC} = +5.0V ± 10% C _L = 50pF, R _L = 500Ω | | |
| | | | | | MIN | TYP | MAX | MIN | | MAX |
| t _{PLH} | Propagation delay | | Waveform 1 | 1.5 | 3.5 | 5.5 | 1.5 | 6.5 | ns | |
| t _{PHL} | An to Bn, Bn to An | | | 2.5 | 4.5 | 6.5 | 2.5 | 7.0 | ns | |
| t _{PZH} | Output Enable time | | Waveform 2 | 6.0 | 8.5 | 10.5 | 6.0 | 11.0 | ns | |
| t _{PZL} | to High or Low level | | | Waveform 3 | 5.5 | 8.0 | 9.5 | 5.5 | 10.0 | ns |
| t _{PHZ} | Output Disable time | | Waveform 2 | 2.5 | 5.0 | 7.0 | 2.5 | 8.0 | ns | |
| t _{PLZ} | from High or Low level | | | Waveform 3 | 2.0 | 4.5 | 6.5 | 2.0 | 7.5 | ns |

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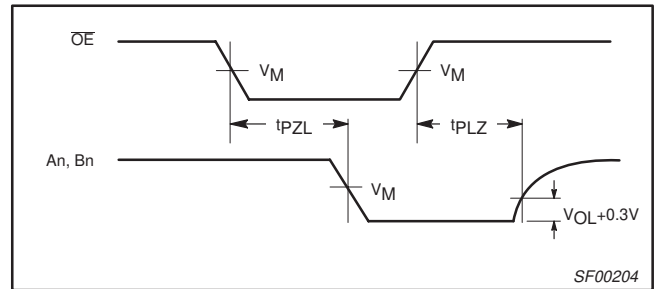
74F545

AC WAVEFORMS

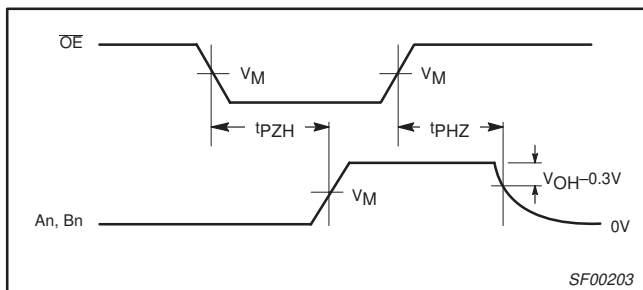
For all waveforms, $V_M = 1.5V$.



Waveform 1. Propagation Delay Data for Non-Inverting Output



Waveform 3. 3-State Output Enable Time to Low Level and Output Disable Time from Low Level



Waveform 2. 3-State Output Enable Time to High Level and Output Disable Time from High Level

TEST CIRCUIT AND WAVEFORM

Test Circuit for 3-State Outputs

| 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.

Input Pulse Definition

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

SF00777

Octal bidirectional transceiver (with 3-State inputs/outputs)

74F545

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 |

Octal bidirectional transceiver (with 3-State inputs/outputs)

74F545

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 | 0.419 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 maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|----------|------|--|---------------------|----------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT163-1 | 075E04 | MS-013AC | | | | 95-01-24 97-05-22 |

Octal bidirectional transceiver (with 3-State inputs/outputs)

74F545

NOTES

Octal bidirectional transceiver (with 3-State inputs/outputs)

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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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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). 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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