

**SN55451B THRU SN55454B
SN75451B THRU SN75454B
DUAL PERIPHERAL DRIVERS**

D2217, DECEMBER 1976—REVISED MAY 1990

**PERIPHERAL DRIVERS FOR
HIGH-CURRENT SWITCHING
AT VERY HIGH SPEEDS**

- Characterized for Use to 300 mA
- High-Voltage Outputs
- No Output Latch-Up at 20 V (After Conducting 300 mA)
- High-Speed Switching
- Circuit Flexibility for Varied Applications
- TTL-Compatible Diode-Clamped Inputs
- Standard Supply Voltages
- Plastic DIP (P) with Copper Lead Frame Provides Cooler Operation and Improved Reliability
- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs

SUMMARY OF SERIES 55451B/75451B

| DEVICE | LOGIC OF COMPLETE CIRCUIT | PACKAGES |
|----------|---------------------------|----------|
| SN55451B | AND [†] | FK,JG |
| SN55452B | NAND | FK,JG |
| SN55453B | OR | FK,JG |
| SN55454B | NOR | FK,JG |
| SN75451B | AND | D,P |
| SN75452B | NAND | D,P |
| SN75453B | OR | D,P |
| SN75454B | NOR | D,P |

[†]With output transistor base connected externally to output of gate.

description

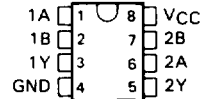
Series SN55451B/75451B dual peripheral drivers are a family of versatile devices designed for use in systems that employ TTL logic. This family is functionally interchangeable with and replaces the SN75450 family and the SN75450A family devices manufactured previously. The speed of the SN55451B/SN75451B family is equal to that of the SN75450 family, and the parts are designed to ensure freedom from latch-up. Diode-clamped inputs simplify circuit design. Typical applications include high-speed logic buffers, power drivers, relay drivers, lamp drivers, MOS drivers, line drivers, and memory drivers.

The SN55451B/SN75451B, SN55452B/SN75452B, SN55453B/SN75453B, and SN55454B/SN75454B are dual peripheral AND, NAND, OR, and NOR drivers, respectively, (assuming positive logic), with the output of the logic gates internally connected to the bases of the n-p-n output transistors.

Series SN55451B drivers are characterized for operation over the full military range of -55°C to 125°C. Series SN75451B drivers are characterized for operation from 0°C to 70°C.

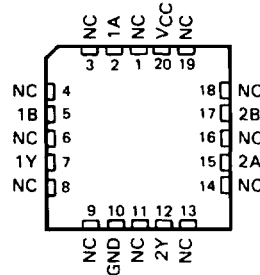
SN55451B, SN55452B,
SN55453B, SN55454B . . . JG PACKAGE
SN75451B, SN75452B,
SN75453B, SN75454B . . . D OR P PACKAGE

(TOP VIEW)



SN55451B, SN55452B,
SN55453B, SN55454B . . . FK PACKAGE

(TOP VIEW)



NC—No internal connection

PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



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**SN55451B THRU SN55454B,
SN75451B THRU SN75454B
DUAL PERIPHERAL DRIVERS**

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

| | SN55451B SN55452B SN55453B SN55454B | SN75451B SN75452B SN75453B SN75454B | UNIT |
|--|--|--|------|
| Supply voltage, V_{CC} (see Note 1) | 7 | 7 | V |
| Input voltage | 5.5 | 5.5 | V |
| Interemitter voltage (see Note 2) | 5.5 | 5.5 | V |
| Off-state output voltage | 30 | 30 | V |
| Continuous collector or output current (see Note 4) | 400 | 400 | mA |
| Peak collector or output current ($t_w \leq 10$ ms, duty cycle $\leq 50\%$, see Note 4) | 500 | 500 | mA |
| Continuous total power dissipation | See Dissipation Rating Table | | |
| Operating free-air temperature range, T_A | -55 to 125 | 0 to 70 | °C |
| Storage temperature range | -65 to 150 | -65 to 150 | °C |
| Case temperature for 60 seconds | FK package | 280 | °C |
| Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds | JG package | 300 | °C |
| Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds | D or P package | 260 | °C |

- NOTES: 1. Voltage values are with respect to the network ground terminal unless otherwise specified.
 2. This is the voltage between two emitters of a multiple-emitter transistor.
 3. This value applies when the base-emitter resistance (R_{BE}) is equal to or less than 500 Ω .
 4. Both halves of these dual circuits may conduct rated current simultaneously; however, power dissipation averaged over a short time interval must fall within the continuous dissipation rating.

DISSIPATION RATING TABLE

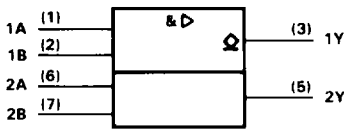
| PACKAGE | $T_A \leq 25^\circ\text{C}$ | DERATING FACTOR | $T_A = 70^\circ\text{C}$ | $T_A = 125^\circ\text{C}$ |
|---------|-----------------------------|--------------------------------|--------------------------|---------------------------|
| | POWER RATING | ABOVE $T_A = 25^\circ\text{C}$ | POWER RATING | POWER RATING |
| D | 725 mW | 5.8 mW/°C | 484 mW | — |
| FK | 1375 mW | 11.0 mW/°C | 880 mW | 275 mW |
| JG | 1050 mW | 8.4 mW/°C | 672 mW | 210 mW |
| P | 1000 mW | 8.0 mW/°C | 640 mW | — |

recommended operating conditions

| | SERIES 55451B | | | SERIES 75451B | | | UNIT | | |
|---------------------------------------|---------------|-----|-----|---------------|-----|------|------|----|----|
| | MIN | NOM | MAX | MIN | NOM | MAX | | | |
| Supply voltage, V_{CC} | 4.5 | 5 | 5.5 | 4.75 | 5 | 5.25 | V | | |
| High-level input voltage, V_{IH} | 2 | | | 2 | | | V | | |
| Low-level input voltage, V_{IL} | 0.8 | | | 0.8 | | | V | | |
| Operating free-air temperature, T_A | -55 | | | 125 | | | 0 | 70 | °C |

SN55451B, SN75451B DUAL PERIPHERAL POSITIVE-AND DRIVERS

logic symbol†



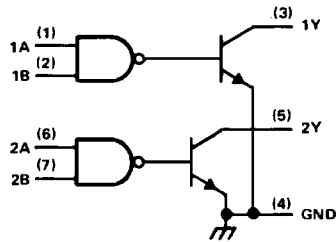
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

**FUNCTION TABLE
(EACH DRIVER)**

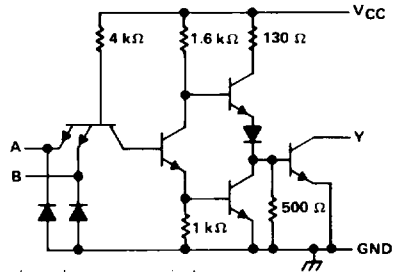
| A | B | Y |
|---|---|---------------|
| L | L | L (on state) |
| L | H | L (on state) |
| H | L | L (on state) |
| H | H | H (off state) |

positive logic:
Y = AB or $\bar{A} + \bar{B}$

logic diagram (positive logic)



schematic (each driver)



Pin numbers shown are for D, JG, and P packages.

Resistor values shown are nominal.

electrical characteristics over recommended operating free-air temperature range

| PARAMETER | TEST CONDITIONS‡ | SN55451B | | SN75451B | | UNIT | |
|---|--|----------|------|----------|------|------|------|
| | | MIN | TYP‡ | MAX | MIN | | TYP‡ |
| V _{IK} Input clamp voltage | V _{CC} = MIN, I _I = -12 mA | -1.2 | -1.5 | -1.2 | -1.5 | V | |
| I _{OH} High-level output current | V _{CC} = MIN, V _{IH} = MIN, V _{OH} = 30 V | | 300 | | 100 | μA | |
| V _{OL} Low-level output voltage | V _{CC} = MIN, V _{IL} = 0.8 V, I _{OL} = 100 mA | 0.25 | 0.5 | 0.25 | 0.4 | V | |
| | V _{CC} = MIN, V _{IL} = 0.8 V, I _{OL} = 300 mA | 0.5 | 0.8 | 0.5 | 0.7 | | |
| I _I Input current at maximum input voltage | V _{CC} = MAX, V _I = 5.5 V | | | 1 | 1 | mA | |
| I _{IH} High-level input current | V _{CC} = MAX, V _I = 2.4 V | | | 40 | 40 | μA | |
| I _{IL} Low-level input current | V _{CC} = MAX, V _I = 0.4 V | | | -1 | -1.6 | mA | |
| I _{CCCH} Supply current, outputs high | V _{CC} = MAX, V _I = 5 V | | 7 | 11 | 7 | 11 | mA |
| I _{CCCL} Supply current, outputs low | V _{CC} = MAX, V _I = 0 | | 52 | 65 | 52 | 65 | 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.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

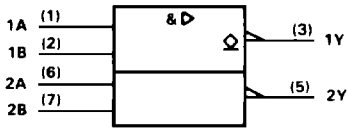
| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|--|---|-----|----------------------|------|
| t _{PLH} Propagation delay time, low-to-high-level output | I _O ≈ 200 mA, C _L = 15 pF, R _L = 50 Ω. See Figure 1 | | 18 | 25 | ns |
| t _{PHL} Propagation delay time, high-to-low-level output | | | 18 | 25 | |
| t _{TLH} Transition time, low-to-high-level output | | | 5 | 8 | |
| t _{THL} Transition time, high-to-low-level output | | | 7 | 12 | |
| V _{OH} High-level output voltage after switching | SN55451B | V _S = 20 V, I _O ≈ 300 mA, | | V _S - 6.5 | mV |
| | SN75451B | See Figure 2 | | V _S - 6.5 | |

**TEXAS
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SN55452B, SN75452B DUAL PERIPHERAL POSITIVE-NAND DRIVERS

logic symbol†



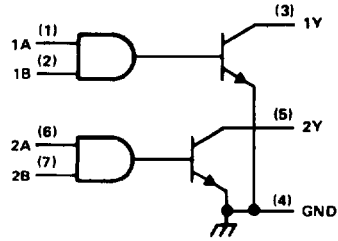
†This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

FUNCTION TABLE
(EACH DRIVER)

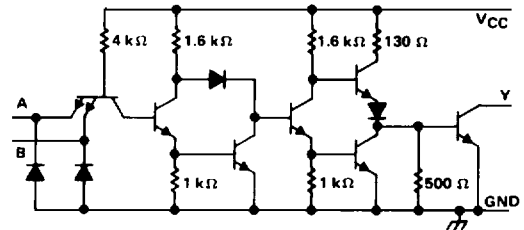
| A | B | Y |
|---|---|---------------|
| L | L | H (off state) |
| L | H | H (off state) |
| H | L | H (off state) |
| H | H | L (on state) |

positive logic:
 $Y = \overline{AB}$ or $\overline{A + B}$

logic diagram (positive logic)



schematic (each driver)



Pin numbers shown are for D, JG, and P packages.

Resistor values shown are nominal.

electrical characteristics over recommended operating free-air temperature range

| PARAMETER | TEST CONDITIONS‡ | SN55452B | | SN75452B | | UNIT | | |
|--|---|----------|------|----------|------|------|---------------|-----|
| | | MIN | TYP‡ | MAX | MIN | | TYP‡ | MAX |
| V_{IK} Input clamp voltage | $V_{CC} = \text{MIN}$, $I_I = -12 \text{ mA}$ | -1.2 | | -1.5 | -1.2 | | V | |
| I_{OH} High-level output current | $V_{CC} = \text{MIN}$, $V_{OH} = 30 \text{ V}$ | | | 300 | | 100 | μA | |
| V_{OL} Low-level output voltage | $V_{CC} = \text{MIN}$, $I_{OL} = 100 \text{ mA}$, $V_{IH} = \text{MIN}$ | | 0.25 | 0.5 | 0.25 | 0.4 | V | |
| | $V_{CC} = \text{MIN}$, $I_{OL} = 300 \text{ mA}$, $V_{IH} = \text{MIN}$ | | 0.5 | 0.8 | 0.5 | 0.7 | | |
| I_I Input current at maximum input voltage | $V_{CC} = \text{MAX}$, $V_I = 5.5 \text{ V}$ | | | 1 | | 1 | mA | |
| I_{IH} High-level input current | $V_{CC} = \text{MAX}$, $V_I = 2.4 \text{ V}$ | | | 40 | | 40 | μA | |
| I_{IL} Low-level input current | $V_{CC} = \text{MAX}$, $V_I = 0.4 \text{ V}$ | | | -1.1 | -1.6 | -1.1 | -1.6 | mA |
| I_{CCH} Supply current, outputs high | $V_{CC} = \text{MAX}$, $V_I = 0$ | | 11 | 14 | 11 | 14 | mA | |
| I_{CCL} Supply current, outputs low | $V_{CC} = \text{MAX}$, $V_I = 5 \text{ V}$ | | 56 | 71 | 56 | 71 | mA | |

‡For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

§All typical values are at $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$.

switching characteristics, $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$

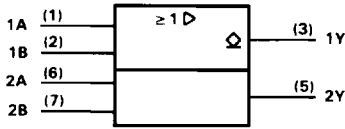
| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNIT | |
|--|--|---|-----|-------------|------|----|
| t_{PLH} Propagation delay time, low-to-high-level output | $I_O = 200 \text{ mA}$, $C_L = 15 \text{ pF}$, $R_L = 50 \Omega$. See Figure 1 | | 26 | 35 | ns | |
| t_{PHL} Propagation delay time, high-to-low-level output | | | 24 | 35 | ns | |
| t_{TLH} Transition time, low-to-high-level output | | | | 5 | 8 | ns |
| t_{THL} Transition time, high-to-low-level output | | | | 7 | 12 | ns |
| V_{OH} High-level output voltage after switching | SN55452B | $V_S = 20 \text{ V}$, $I_O \approx 300 \text{ mA}$, See Figure 2 | | $V_S - 6.5$ | mV | |
| | SN75452B | | | $V_S - 6.5$ | | |

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SN55453B, SN75453B DUAL PERIPHERAL POSITIVE-OR DRIVERS

logic symbol†



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

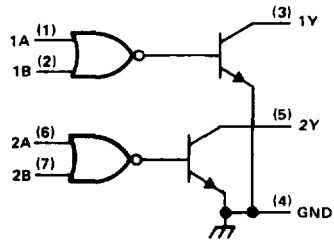
**FUNCTION TABLE
(EACH DRIVER)**

| A | B | Y |
|---|---|---------------|
| L | L | L (on state) |
| L | H | H (off state) |
| H | L | H (off state) |
| H | H | H (off state) |

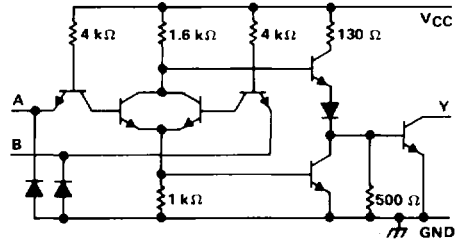
positive logic:

$$Y = A + B \text{ or } \overline{AB}$$

logic diagram (positive logic)



schematic (each driver)



Pin numbers shown are for D, JG, and P packages.

Resistor values shown are nominal.

electrical characteristics over recommended operating free-air temperature range

| PARAMETER | TEST CONDITIONS‡ | SN55453B | | | SN75453B | | | UNIT |
|--|--|----------|------|------|----------|------|------|---------------|
| | | MIN | TYP‡ | MAX | MIN | TYP‡ | MAX | |
| V_{IK} Input clamp voltage | $V_{CC} = \text{MIN}$, $I_I = -12 \text{ mA}$ | -1.2 | -1.5 | | -1.2 | -1.5 | | V |
| I_{OH} High-level output current | $V_{CC} = \text{MIN}$, $V_{OH} = 30 \text{ V}$ | | | 300 | | | 100 | μA |
| V_{OL} Low-level output voltage | $V_{CC} = \text{MIN}$, $V_{IL} = 0.8 \text{ V}$, $I_{OL} = 100 \text{ mA}$ | | 0.25 | 0.5 | | 0.25 | 0.4 | V |
| | $V_{CC} = \text{MIN}$, $V_{IL} = 0.8 \text{ V}$, $I_{OL} = 300 \text{ mA}$ | | 0.5 | 0.8 | | 0.5 | 0.7 | |
| I_I Input current at maximum input voltage | $V_{CC} = \text{MAX}$, $V_I = 5.5 \text{ V}$ | | | 1 | | | 1 | mA |
| I_{IH} High-level input current | $V_{CC} = \text{MAX}$, $V_I = 2.4 \text{ V}$ | | | 40 | | | 40 | μA |
| I_{IL} Low-level input current | $V_{CC} = \text{MAX}$, $V_I = 0.4 \text{ V}$ | | -1 | -1.6 | | -1 | -1.6 | mA |
| I_{CCH} Supply current, outputs high | $V_{CC} = \text{MAX}$, $V_I = 5 \text{ V}$ | | 8 | 11 | | 8 | 11 | mA |
| I_{CCL} Supply current, outputs low | $V_{CC} = \text{MAX}$, $V_I = 0$ | | 54 | 68 | | 54 | 68 | mA |

‡ For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

§ All typical values are at $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$.

switching characteristics, $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$

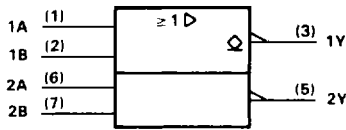
| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNIT | |
|--|--|---|-----|-----|------|----|
| t_{PLH} Propagation delay time, low-to-high-level output | $I_O = 200 \text{ mA}$, $C_L = 15 \text{ pF}$, $R_L = 50 \Omega$, See Figure 1 | | 18 | 25 | ns | |
| t_{PHL} Propagation delay time, high-to-low-level output | | | 16 | 25 | | |
| t_{TLH} Transition time, low-to-high-level output | | | | 5 | | 8 |
| t_{THL} Transition time, high-to-low-level output | | | | 7 | | 12 |
| V_{OH} High-level output voltage after switching | SN55453B | $V_S = 20 \text{ V}$, $I_O = 300 \text{ mA}$, See Figure 2 | | | mV | |
| | SN75453B | $V_S - 6.5$ | | | | |

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SN55454B, SN75454B DUAL PERIPHERAL POSITIVE-NOR DRIVERS

logic symbol†



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

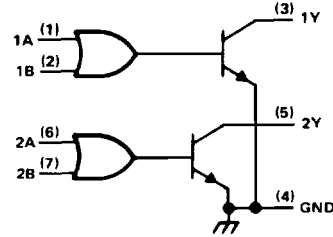
FUNCTION TABLE
(EACH DRIVER)

| A | B | Y |
|---|---|---------------|
| L | L | H (off state) |
| L | H | L (on state) |
| H | L | L (on state) |
| H | H | L (on state) |

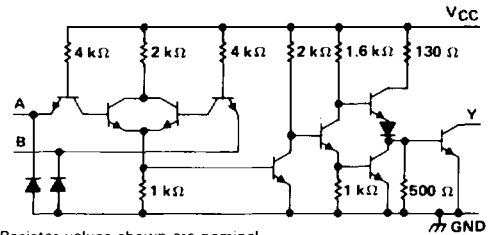
positive logic:

$$Y = \overline{A + B} \text{ or } \overline{AB}$$

logic diagram (positive logic)



schematic (each driver)



Pin numbers shown are for D, JG, and P packages.

Resistor values shown are nominal.

electrical characteristics over recommended operating free-air temperature range

| PARAMETER | TEST CONDITIONS‡ | SN55454B | | SN75454B | | UNIT | |
|--|--|----------|------|----------|------|------|---------------|
| | | MIN | TYP‡ | MAX | MIN | | TYP‡ |
| V_{IK} Input clamp voltage | $V_{CC} = \text{MIN}$, $I_I = -12 \text{ mA}$ | -1.2 | | -1.5 | -1.2 | -1.5 | V |
| I_{OH} High-level output current | $V_{CC} = \text{MIN}$, $V_{IL} = 0.8 \text{ V}$ $V_{OH} = 30 \text{ V}$ | | 300 | | | 100 | μA |
| V_{OL} Low-level output voltage | $V_{CC} = \text{MIN}$, $V_{IH} = \text{MIN}$ $I_{OL} = 100 \text{ mA}$ | 0.25 | 0.5 | | 0.25 | 0.4 | V |
| | $V_{CC} = \text{MIN}$, $V_{IH} = \text{MIN}$, $I_{OL} = 300 \text{ mA}$ | 0.5 | 0.8 | | 0.5 | 0.7 | |
| I_I Input current at maximum input voltage | $V_{CC} = \text{MAX}$, $V_I = 5.5 \text{ V}$ | | | 1 | | 1 | mA |
| I_{IH} High-level input current | $V_{CC} = \text{MAX}$, $V_I = 2.4 \text{ V}$ | | 40 | | | 40 | μA |
| I_{IL} Low-level input current | $V_{CC} = \text{MAX}$, $V_I = 0.4 \text{ V}$ | -1 | -1.6 | | -1 | -1.6 | mA |
| I_{CCH} Supply current, outputs high | $V_{CC} = \text{MAX}$, $V_I = 0$ | 13 | 17 | | 13 | 17 | mA |
| I_{CCL} Supply current, outputs low | $V_{CC} = \text{MAX}$, $V_I = 5 \text{ V}$ | 61 | 79 | | 61 | 79 | mA |

‡ For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

§ All typical values are at $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$.

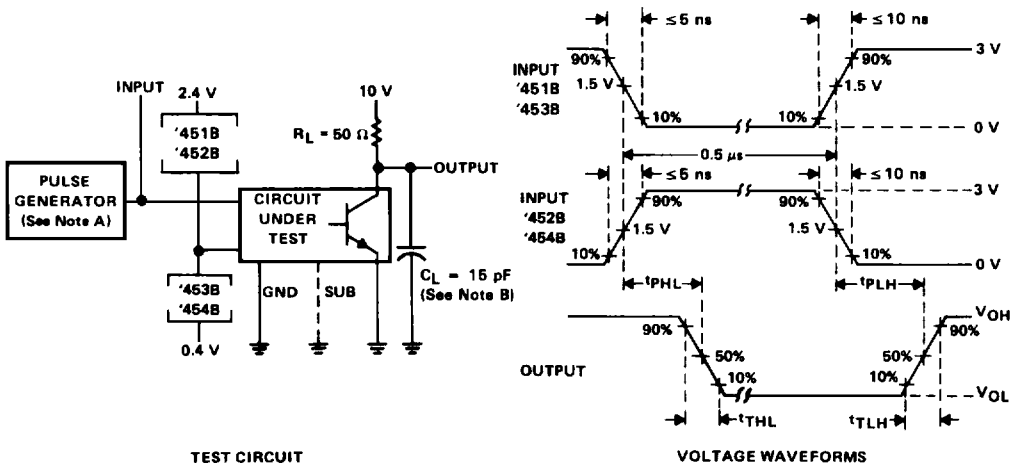
switching characteristics, $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$

| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|--|--|---|-----|-----|------|
| | | | | | |
| t_{PLH} Propagation delay time, low-to-high-level output | $I_O \approx 200 \text{ mA}$, $C_L = 15 \text{ pF}$, $R_L = 50 \Omega$. See Figure 1 | | 27 | 35 | ns |
| t_{PHL} Propagation delay time, high-to-low-level output | | | 24 | 35 | |
| t_{TLH} Transition time, low-to-high-level output | | | 5 | 8 | ns |
| t_{THL} Transition time, high-to-low-level output | | | 7 | 12 | |
| V_{OH} High-level output voltage after switching | SN55454B | $V_S = 20 \text{ V}$, $I_O \approx 300 \text{ mA}$, See Figure 2 | | | mV |
| | SN75454B | $V_S = 6.5$ | | | |

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INSTRUMENTS

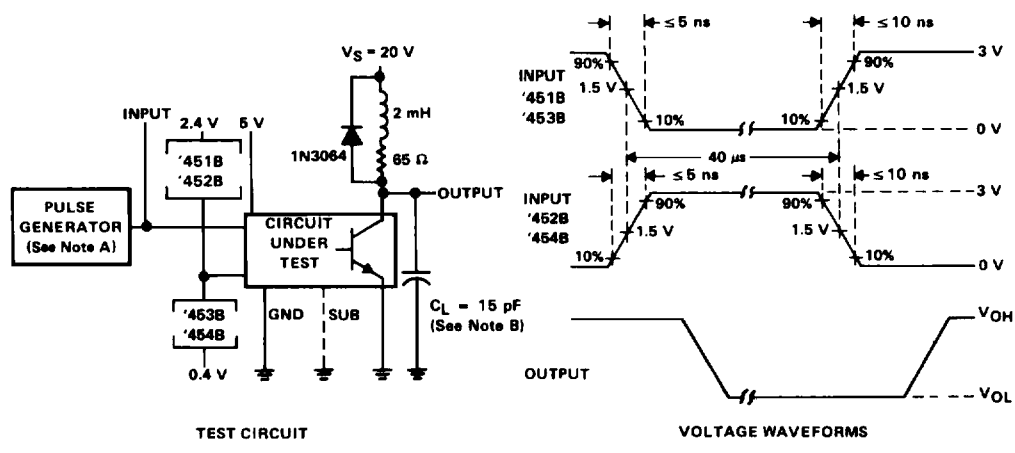
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PARAMETER MEASUREMENT INFORMATION



NOTES: A. The pulse generator has the following characteristics: PRR \leq 1 MHz, $Z_0 \approx 50 \Omega$.
B. C_L includes probe and jig capacitance.

FIGURE 1. SWITCHING TIMES OF COMPLETE DRIVERS



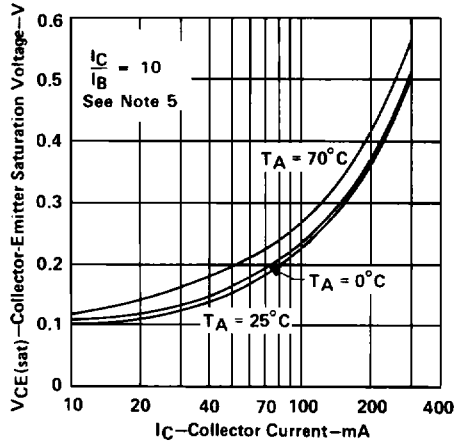
NOTES: A. The pulse generator has the following characteristics: PRR \leq 12.5 kHz, $Z_0 = 50 \Omega$.
B. C_L includes probe and jig capacitance.

FIGURE 2. LATCH-UP TEST OF COMPLETE DRIVERS

**SN55451B THRU SN55454B,
SN75451B THRU SN75454B
DUAL PERIPHERAL DRIVERS**

TYPICAL CHARACTERISTICS

TRANSISTOR
COLLECTOR-EMITTER SATURATION VOLTAGE
vs
COLLECTOR CURRENT



NOTE 5: These parameters must be measured using pulse techniques, $t_w = 300 \mu\text{s}$, duty cycle $\leq 2\%$.

FIGURE 3