

DESCRIPTION

The M54610P is a semiconductor integrated circuit consisting of an 8-bit parallel data interface function.

FEATURES

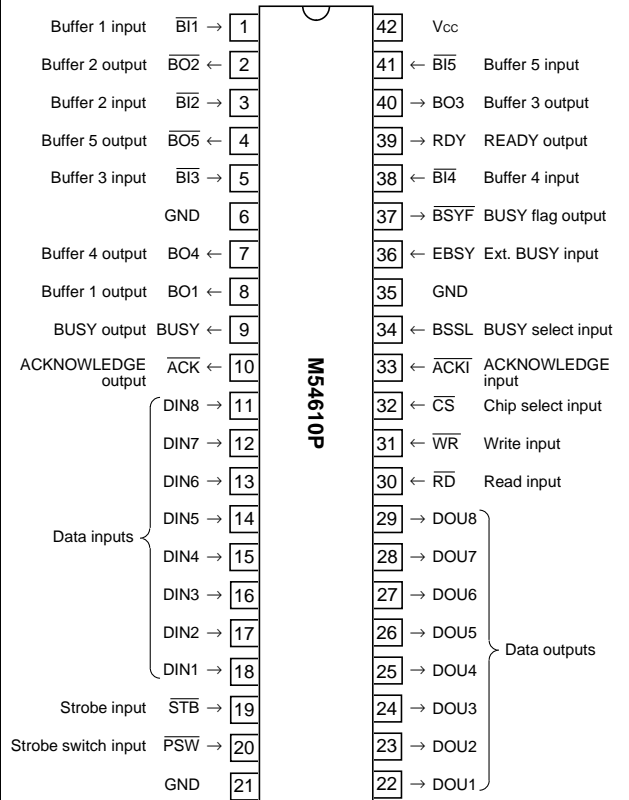
- I/O electrical characteristics equivalent to LSTTL
- 3-state 8-bit data output
- Strobe signal with polarity switching input
- Wide operating temperature range $T_a = -20 - +75^{\circ}\text{C}$

APPLICATION

Printer

FUNCTION

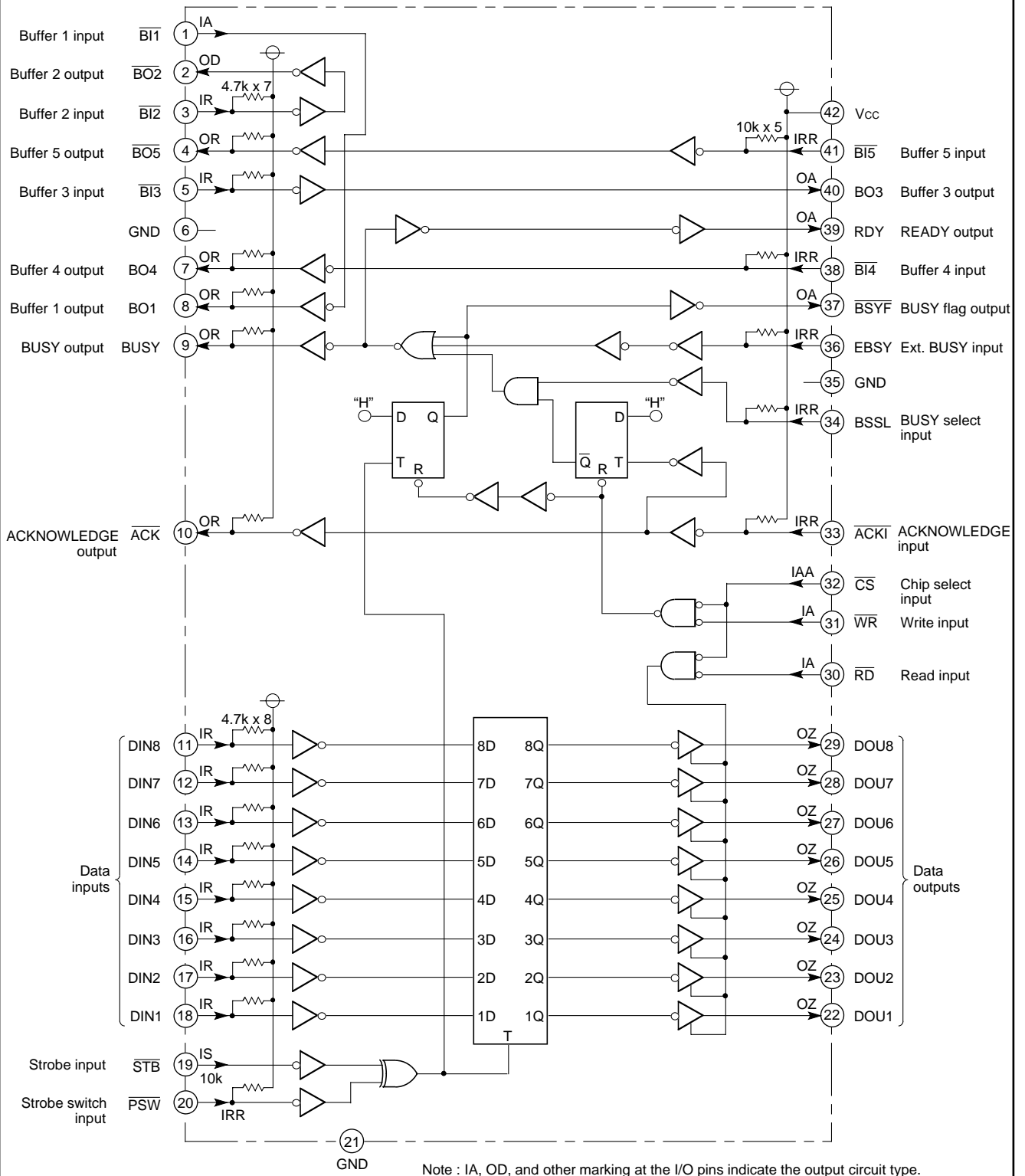
The M54610P, when used in a printer, is capable of implementing a standard 8-bit parallel data interface. As shown in the timing diagram, printing data DIN 1 through 8 and strobe pulses $\overline{\text{STB}}$ are input from a host computer. Data are exchanged by outputting the BUSY and $\overline{\text{ACK}}$ (ACKNOWLEDGE) signals to the host computer. Control signals EBSY, $\overline{\text{CS}}$, $\overline{\text{WR}}$, $\overline{\text{RD}}$ and $\overline{\text{ACKI}}$ are input from a printer controller, and this IC outputs DOU 1 through 8, and $\overline{\text{BSYF}}$.

PIN CONFIGURATION (TOP VIEW)

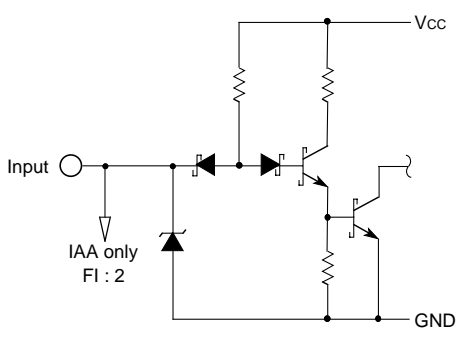
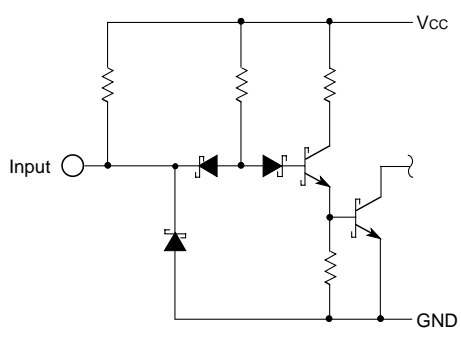
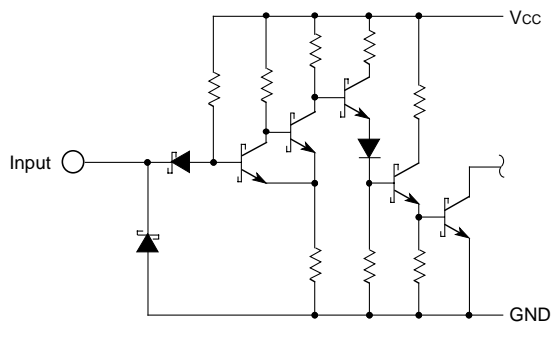
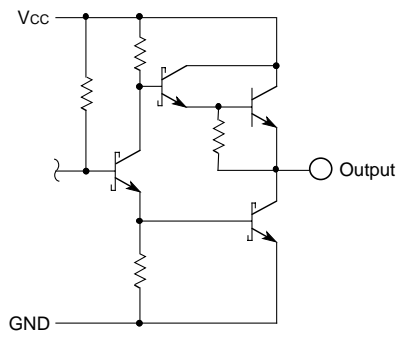
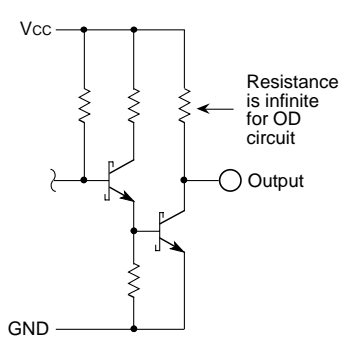
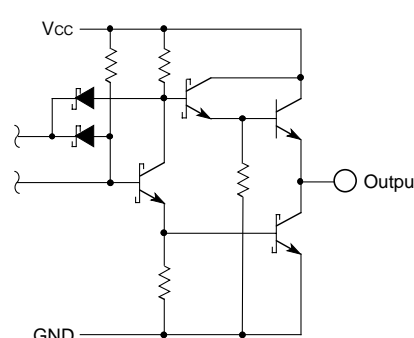
Outline 42P4B

8-BIT PARALLEL DATA INTERFACE FOR PRINTER

BLOCK DIAGRAM



I/O CIRCUIT DIAGRAM

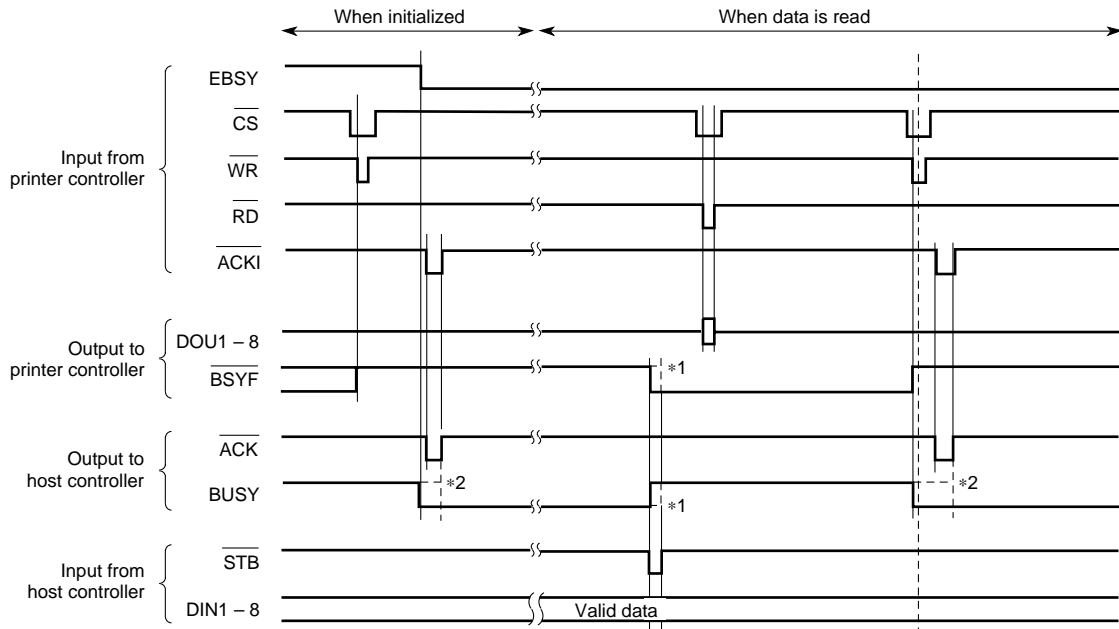
| | |
|---|--|
| <p>1 Input circuit form: IA, IAA</p>  | <p>2 Input circuit form: IR, IRR</p>  |
| <p>3 Input circuit form: IS</p>  | <p>4 Output circuit form: OA</p>  |
| <p>5 Output circuit form: OR, OD</p>  | <p>6 Output circuit form: OZ</p>  |

8-BIT PARALLEL DATA INTERFACE FOR PRINTER

PIN FUNCTION DESCRIPTION

| Pin No. | Pin name | Function |
|------------------|-------------------|--|
| ⑨ | BUSY | BUSY output to host |
| ⑩ | ACK | ACKNOWLEDGE output to host |
| ⑪ ⑮ | DIN8 DIN1 | 8-bit parallel data input from host |
| ⑲ | STB | Data strobe pulse input from host |
| ⑳ | PSW | Polarity switching input for STB |
| ⑥ ⑳ ㉑ ㉓ | GND | GND |
| ㉒ ㉔ | DOU1 DOU8 | 8-bit parallel data output to printer controller (3-state) |
| ⑳ | RD | Read input from printer controller |
| ㉑ | WR | Write input from printer controller |
| ㉒ | CS | Chip select input from printer controller |
| ㉓ | ACKI | ACKNOWLEDGE input from printer controller |
| ㉔ | BSSL | BUSY select input. Switches busy timing. |
| ㉕ | EBSY | External BUSY input from printer controller |
| ㉖ | BSYF | BUSY flag output to printer controller |
| ㉗ | RDY | Inverted BUSY output to printer controller |
| ㉘ | Vcc | Power supply |

OPERATION TIMING DIAGRAM



*1 : The broken lines of \overline{BSYF} and \overline{BUSY} show the timing when \overline{PSW} is low.

*2 : The broken lines of \overline{BUSY} signal show the timing when \overline{BSSL} is low.

8-BIT PARALLEL DATA INTERFACE FOR PRINTER

ABSOLUTE MAXIMUM RATINGS (Ta = -20 – 75°C unless otherwise noted)

| Symbol | Parameter | Conditions | Ratings | Unit |
|------------------|-----------------------|--------------|--|------|
| V _{cc} | Supply voltage | | -0.5 – +7 | V |
| V _i | Input voltage | IR, IS | -0.5 – +15 | V |
| | | IA, IAA, IRR | -0.5 – V _{cc} | |
| V _o | Output voltage | OR | When output is "H" -0.5 – +15 | V |
| | | OA, OD | When output is "H" -0.5 – V _{cc} | |
| | | OZ | When output is "H" -0.5 – +5.5 | |
| T _{opr} | Operating temperature | | -20 – 75 | °C |
| T _{stg} | Storage temperature | | -55 – 125 | °C |

RECOMMENDED OPERATING CONDITIONS (Ta = -20 – 75°C unless otherwise noted)

| Symbol | Parameter | Limits | | | Unit |
|-----------------|--------------------|--------------------------|------|------|------|
| | | Min. | Typ. | Max. | |
| V _{cc} | Supply voltage | 4.75 | 5 | 5.25 | V |
| I _{oH} | "H" output current | OR, OA | 0 | -400 | μA |
| | | OZ | 0 | -2.8 | mA |
| | | OD V _o = 5.5V | 0 | 100 | μA |
| I _{oL} | "L" output current | OR, OA | 0 | 8 | mA |
| | | OZ | 0 | 8 | |
| | | OD | 0 | 100 | |

8-BIT PARALLEL DATA INTERFACE FOR PRINTER

ELECTRICAL CHARACTERISTICS (Ta = -20 – 75°C unless otherwise noted)

| Symbol | Parameter | | Test conditions | | Limits | | | Unit | | |
|-----------------------------------|------------------------------|--|------------------|---|--|------|------|------|----|------|
| | | | | | Min. | Typ* | Max. | | | |
| V _{IH} | "H" input voltage | | IA, IAA, IRR, IR | | 2 | | | V | | |
| V _{IL} | "L" input voltage | | IA, IAA, IRR, IR | | | | 0.8 | V | | |
| V _{T+} | Positive threshold voltage | | IS | | V _{CC} = 5V | 1.4 | 1.6 | 1.9 | V | |
| V _{T-} | Negative threshold voltage | | IS | | V _{CC} = 5V | 0.5 | 0.8 | 1.0 | V | |
| V _{T+} – V _{T-} | Hysteresis width | | IS | | V _{CC} = 5V | 0.4 | 0.8 | | V | |
| V _{IC} | Input clamp voltage | | All inputs | | V _{CC} = 4.75V, I _I = -1mA | | | -1.5 | V | |
| V _{OH} | "H" output voltage | | OA | V _{CC} = 4.75V | I _{OH} = -400μA | 2.7 | 3.1 | | V | |
| | | | OZ | | I _{OH} = -2.6mA | 2.4 | 2.9 | | | |
| | | | OR | | I _{OH} = -400μA | 2.4 | 3.1 | | | |
| I _{OH} | "H" output current | | OD | V _{CC} = 4.75V, V _O = 5.5V | | | | 100 | μA | |
| V _{OL} | "L" output voltage | | OD | V _{CC} = 4.75V | I _{OL} = 24mA | | 0.3 | 0.4 | V | |
| | | | OA, OZ | | I _{OL} = 8mA | | 0.3 | 0.4 | | |
| | | | OR | | I _{OL} = 8mA | | 0.3 | 0.4 | | |
| I _{OZH} | OFF-state "H" output current | | OZ | V _{CC} = 5.25V | | | | 20 | μA | |
| I _{OZL} | OFF-state "L" output current | | OZ | V _{CC} = 5.25V | | | | -20 | μA | |
| I _{IH} | "H" input current | | IA, IS | V _{CC} = 5.25V, V _I = 2.7V | | | | 20 | μA | |
| | | | IAA | | | | | 40 | | |
| I _{IH} | "H" input current | | IRR | V _{CC} = 5.25V, V _I = 2.7V | | -0.2 | | -0.4 | mA | |
| | | | IR | | | | | -0.4 | | -0.8 |
| I _{IL} | "L" input current | | IA, IS | V _{CC} = 5.25V, V _I = 0.4V | | | | -0.4 | mA | |
| | | | IAA | | | | | | | -0.8 |
| I _{IL} | "L" input current | | IRR | V _{CC} = 5.25V, V _I = 0.4V | | | | -1.1 | mA | |
| | | | IR | | | | | | | -1.8 |
| I _{OS} | Output short-circuit current | | OA | (Note 1) V _{CC} = 5.25V, V _O = 0V | | -20 | | -100 | mA | |
| | | | OZ | | | | | -30 | | -130 |
| | | | OR | | | | | -0.8 | | -1.5 |
| I _{CC} | Supply current | | | V _{CC} = 5.25V Point "A" in the operational timing diagram. When: 4.5V: $\overline{BI1}$ Open: $\overline{BI2}$, BSSL and $\overline{BI5}$ 0V: $\overline{BI3}$, DIN1 – 8, EBSY and $\overline{BI4}$. | | | 35 | 45 | mA | |

*: Typical values are at V_{CC} = 5V and Ta = 25°C.

Note 1: Measurements are conducted in the shortest possible time, and no two outputs are shorted simultaneously.

8-BIT PARALLEL DATA INTERFACE FOR PRINTER

SWITCHING CHARACTERISTICS ($V_{CC} = 5V$ and $T_a = 25^\circ C$ unless otherwise noted)

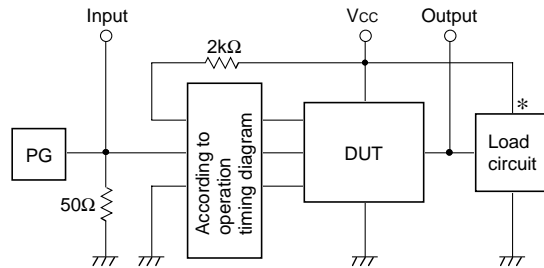
| Symbol | Parameter | Test conditions (Note 2) | Limits | | | Unit |
|--------|--|------------------------------|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| tPLH | Output "L-H" and "H-L" propagation time 1 Buffer | | | | 200 | ns |
| tPHL | | | | | 200 | |
| tPLH | Output "L-H" and "H-L" propagation time 2 Buffer | | | | 300 | ns |
| tPHL | | | | | 300 | |
| tPLH | Output "L-H" and "H-L" propagation time EBSY to BUSY | | | | 500 | ns |
| tPHL | | | | | 500 | |
| tPLH | Output "L-H" and "H-L" propagation time STB to DOU1 – 8 | | | | 500 | ns |
| tPHL | | | | | 500 | |
| tPLH | Output "L-H" propagation time STB to BUSY | | | | 500 | ns |
| tPHL | Output "H-L" propagation time ACKI to BUSY | | | | 500 | ns |
| tPHL | Output "H-L" propagation time WR to BUSY | | | | 500 | ns |
| tPLH | Output "L-H" propagation time WR to BSYF | | | | 500 | ns |
| tPHL | Output "H-L" propagation time STB to BSYF | | | | 500 | ns |
| tPZH | "H" output enabled time | $R_L = 1k\Omega, C_L = 30pF$ | | | 80 | ns |
| tPZL | "L" output enabled time | $R_L = 1k\Omega, C_L = 30pF$ | | | 80 | ns |
| tPH2 | "H" output disabled time | $R_L = 1k\Omega, C_L = 5pF$ | | | 100 | ns |
| tPL2 | "L" output disabled time | $R_L = 1k\Omega, C_L = 5pF$ | | | 100 | ns |

Note 2: Refer to switching test circuits for measurement conditions.

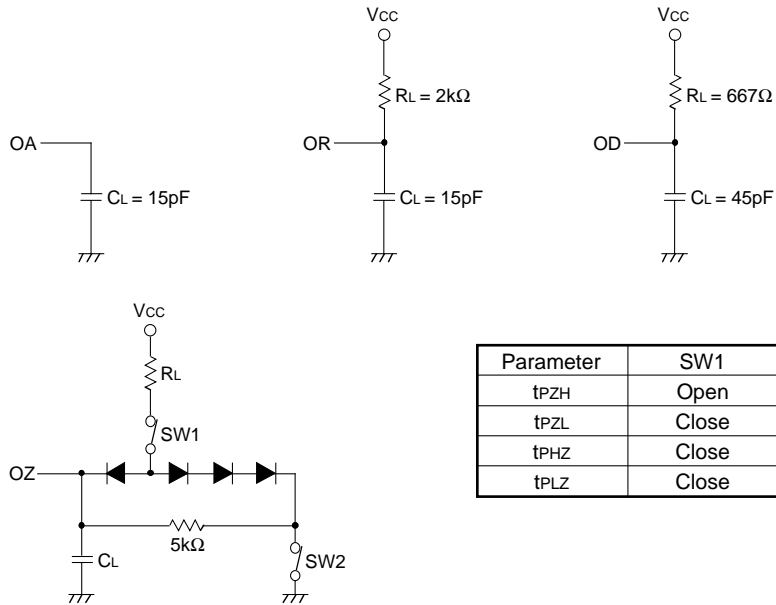
TIMING REQUIREMENTS ($V_{CC} = 5V$ and $T_a = 25^\circ C$ unless otherwise noted)

| Symbol | Parameter | Test conditions | Limits | | | Unit |
|----------|---------------------------------|-----------------|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| tW(STB) | STB "L" and "H" pulse width | | 500 | | | ns |
| tW(ACK) | ACKI pulse width | | 500 | | | ns |
| tW(WR) | WR pulse width | | 200 | | | ns |
| tSU(DIN) | DIN1 – DIN8 setup time to STB | | 500 | | | ns |
| tH(DIN) | DIN1 – DIN8 holding time to STB | | 500 | | | ns |
| trec(WR) | WR recovery time to ACKI | | 500 | | | ns |

SWITCHING TEST CIRCUIT



* The load circuit to the output circuit type is as follows

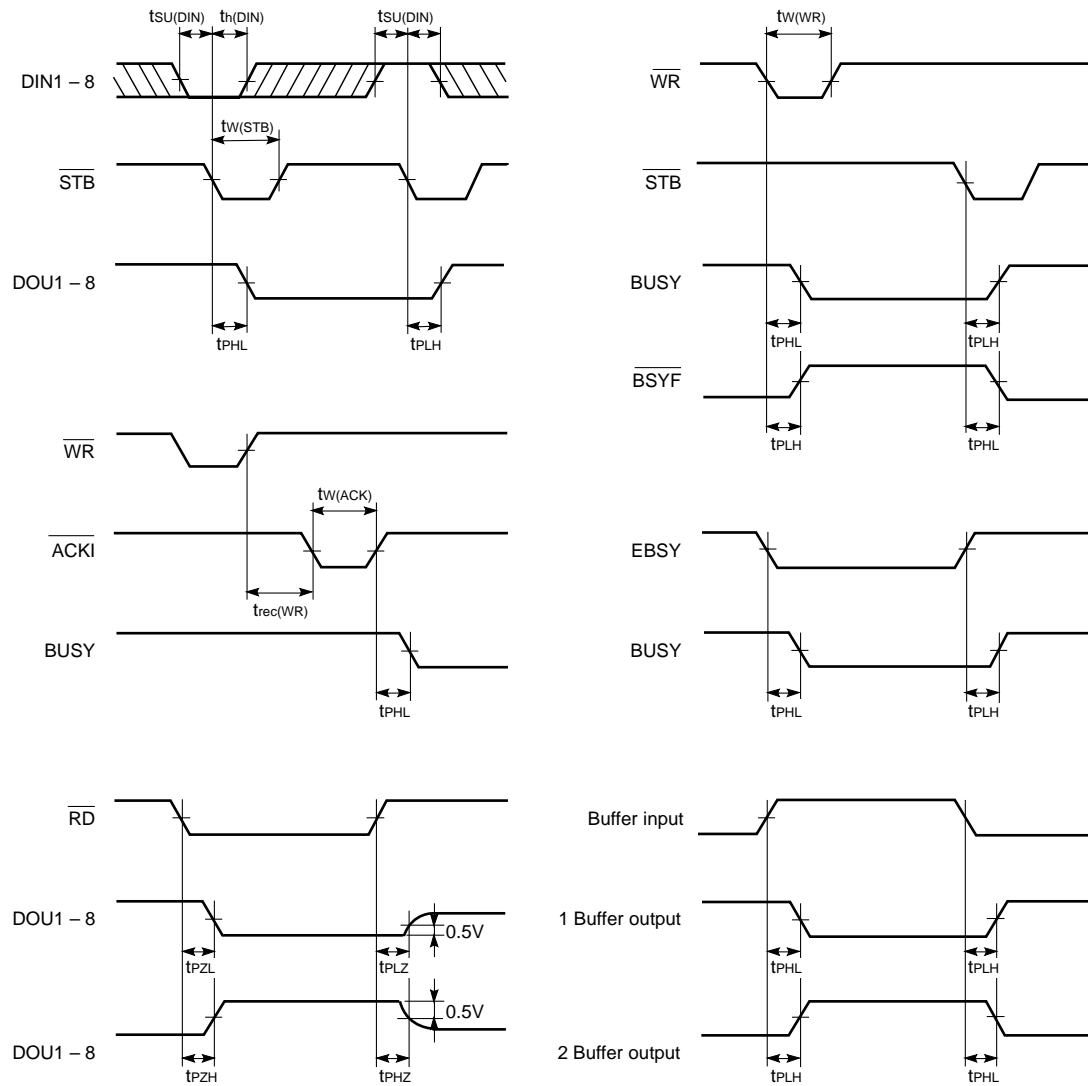


| Parameter | SW1 | SW2 |
|-----------|-------|-------|
| tPZH | Open | Close |
| tPZL | Close | Open |
| tPHZ | Close | Close |
| tPLZ | Close | Close |

- (1) The pulse generator (PG) characteristics: PRR = 100kHz, $t_r = 6\text{ns}$, $t_f = 6\text{ns}$, $t_w = 5\mu\text{s}$, $V_P = 3\text{VP-P}$, $Z_O = 50\Omega$
- (2) The diodes used are all high-speed switching diodes ($t_{rr} \leq 4\text{ns}$).
- (3) The capacitance C_L includes stray wiring capacitance and the probe input capacitance.

8-BIT PARALLEL DATA INTERFACE FOR PRINTER

TIMING DIAGRAM (Reference voltage = 1.3V)



Note: The shaded are indicated the period when switching is possible.