



DP7310/DP8310/DP7311/DP8311 Octal Latched Peripheral Drivers

General Description

The DP7310/8310, DP7311/8311 Octal Latched Peripheral Drivers provide the function of latching eight bits of data with open collector outputs, each driving up to 100 mA DC with an operating voltage range of 30V. Both devices are designed for low input currents, high input/output voltages, and feature a power up clear (outputs off) function.

The DP7310/8310 are positive edge latching. Two active low write/enable inputs are available for convenient data bussing without external gating.

The DP7311/8311 are positive edge latches. The active low strobe input latches data or allows fall through operation when held at logic "0". The latches are cleared (outputs off) with a logic "0" on the clear pin.

Features

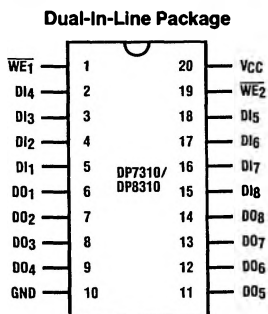
- High current, high voltage open collector outputs
- Low current, high voltage inputs

- All outputs simultaneously sink rated current "DC" with no thermal derating at maximum rated temperature
- Parallel latching or buffering
- Separate active low enables for easy data bussing
- Internal "glitch free" power up clear
- 10% V_{CC} tolerance

Applications

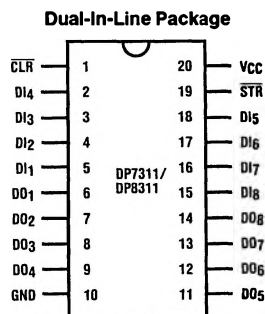
- High current high voltage drivers
- Relay drivers
- Lamp drivers
- LED drivers
- TRIAC drivers
- Solenoid drivers
- Stepper motor drivers
- Level translators
- Fiber-optic LED drivers

Connection Diagrams



Top View

TL/F/5246-1



Top View

TL/F/5246-2

**Order Number DP7310J, DP7311J,
DP8310N or DP8311N
See NS Package Number J20A or N20A**

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

| | |
|--------------------------------------|-----------------|
| Supply Voltage | 7.0V |
| Input Voltage | 35V |
| Output Voltage | 35V |
| Maximum Power Dissipation* at 25°C | |
| Cavity Package | 1821 mW |
| DP8310/DP8311 | 2005 mW |
| Storage Temperature Range | -65°C to +150°C |
| Lead Temperature (Soldering, 4 sec.) | 260°C |

*Derate cavity package 12.1 mW/°C above 25°C; derate molded package 16.0 mW/°C above 25°C.

Operating Conditions

| | Min | Max | Units |
|-----------------------------|-----|------|-------|
| Supply Voltage (V_{CC}) | 4.5 | 5.5 | V |
| Temperature | | | |
| DP7310/DP7311 | -55 | +125 | °C |
| DP8310/DP8311 | 0 | +70 | °C |
| Input Voltage | | 30 | V |
| Output Voltage | | 30 | V |

DC Electrical Characteristics DP7310/DP8310, DP7311/DP8311 (Notes 2 and 3)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|-------------|--|---|-----|------|------------|--------------------------------|
| V_{IH} | Logical "1" Input Voltage | | 2.0 | | | V |
| V_{IL} | Logical "0" Input Voltage | | | | 0.8 | V |
| V_{OL} | Logical "0" Output Voltage | Data outputs latched to logical "0", $V_{CC} = \text{Min}$. $I_{OL} = 75 \text{ mA}$ $I_{OL} = 100 \text{ mA}$ | | 0.35 | 0.4 0.5 | V V |
| I_{OH} | Logical "1" Output Current | Data outputs latched to logical "1", $V_{CC} = \text{Min}$. $V_{OH} = 25\text{V}$ $V_{OH} = 30\text{V}$ | | 2.5 | 500 250 | μA μA |
| I_{IH} | Logical "1" Input Current | $V_{IH} = 2.7\text{V}$, $V_{CC} = \text{Max}$ | | 0.1 | 25 | μA |
| I_I | Input Current at Maximum Input Voltage | $V_{IN} = 30\text{V}$, $V_{CC} = \text{Max}$ | | 1 | 250 | μA |
| I_{IL} | Logical "0" Input Current | $V_{IN} = 0.4\text{V}$, $V_{CC} = \text{Max}$ | | -215 | -300 | μA |
| V_{clamp} | Input Clamp Voltage | $I_{IN} = 12 \text{ mA}$ | | -0.8 | -1.5 | V |
| I_{CC0} | Supply Current, Outputs On | Data outputs latched to a logical "0". All inputs are at logical "1", $V_{CC} = \text{Max}$. | | | | |
| | DP7310 | | | 100 | 125 | mA |
| | DP8310 | | | 100 | 152 | mA |
| | DP7311 | | | 88 | 117 | mA |
| | DP8311 | | | 88 | 125 | mA |
| I_{CC1} | Supply Current, Outputs Off | Data outputs latched to a logic "1". Other conditions same as I_{CC0} . | | | | |
| | DP7310 | | | 40 | 47 | mA |
| | DP8310 | | | 40 | 57 | mA |
| | DP7311 | | | 25 | 34 | mA |
| | DP8311 | | | 25 | 36 | mA |

AC Electrical Characteristics DP7310/DP8310: $V_{CC} = 4.5V$, $T_A = -55^{\circ}C$ to $+125^{\circ}C$

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|--------------------------|---|---------------------------------|-----|-----|-----|-------|
| t_{pd0} | High to Low Propagation Delay Write Enable Input to Output | (Figure 1) | | 40 | 120 | ns |
| t_{pd1} | Low to High Propagation Delay Write Enable Input to Output | (Figure 1) | | 70 | 150 | ns |
| t_{SETUP} | Minimum Set-Up Time Data in to Write Enable Input | $t_{HOLD} = 0$ ns (Figure 1) | 45 | 20 | | ns |
| t_{pWH} , t_{pWL} | Minimum Write Enable Pulse Width | (Figure 1) | 60 | 25 | | ns |
| t_{THL} | High to Low Output Transition Time | (Figure 1) | | 16 | 35 | ns |
| t_{TLH} | Low to High Output Transition Time | (Figure 1) | | 38 | 70 | ns |
| C_{IN} | "N" Package (Note 4) | | | 5 | 15 | pF |

AC Electrical Characteristics DP7311/DP8311: $V_{CC} = 5V$, $T_A = 25^{\circ}C$

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|-------------|--|---------------------------------|-----|-----|-----|-------|
| t_{pd0} | High to Low Propagation Delay Data In to Output | (Figure 2) | | 30 | 60 | ns |
| t_{pd1} | Low to High Propagation Delay Data to Output | (Figure 2) | | 70 | 100 | ns |
| t_{SETUP} | Minimum Set-Up Time Data in to Strobe Input | $t_{HOLD} = 0$ ns (Figure 2) | 0 | -25 | | ns |
| t_{pWL} | Minimum Strobe Enable Pulse Width | (Figure 2) | 60 | 35 | | ns |
| t_{pdC} | Propagation Delay Clear to Data Output | (Figure 2) | | 70 | 135 | ns |
| t_{pWC} | Minimum Clear Input Pulse Width | (Figure 2) | 60 | 25 | | ns |
| t_{THL} | High to Low Output Transition Time | (Figure 2) | | 20 | 35 | ns |
| t_{TLH} | Low to High Output Transition Time | (Figure 2) | | 38 | 60 | ns |
| C_{IN} | Input Capacitance—Any Input | (Note 4) | | 5 | 15 | pF |

Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

Note 2: Unless otherwise specified min/max limits apply across the $-55^{\circ}C$ to $+125^{\circ}C$ temperature range for the DP7310/DP7311 and across the $0^{\circ}C$ to $+70^{\circ}C$ for the DP8310/DP8311. All typical values are for $T_A = 25^{\circ}C$, $V_{CC} = 5V$.

Note 3: All currents into device pins shown as positive, out of device pins as negative, all voltages referenced to ground unless otherwise noted.

Note 4: Input capacitance is guaranteed by periodic testing. $f_{TEST} = 10$ kHz at 300 mV, $T_A = 25^{\circ}C$.

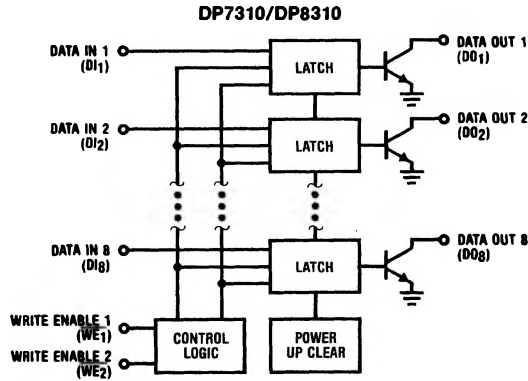
Logic Table

| DP7310/DP8310 | | | |
|-------------------------------------|-------------------------------------|---------------------------------|----------------------------------|
| Write Enable 1 \overline{WE}_1 | Write Enable 2 \overline{WE}_2 | Data Input DI ₁₋₈ | Data Output DO ₁₋₈ |
| 0 | 0 | X | Q |
| 0 | ↗ | 0 | 1 |
| 0 | ↘ | 1 | 0 |
| ↗ | 0 | 0 | 1 |
| ↘ | 0 | 1 | 0 |
| 0 | 1 | X | Q |
| 1 | 0 | X | Q |
| 1 | 1 | X | Q |

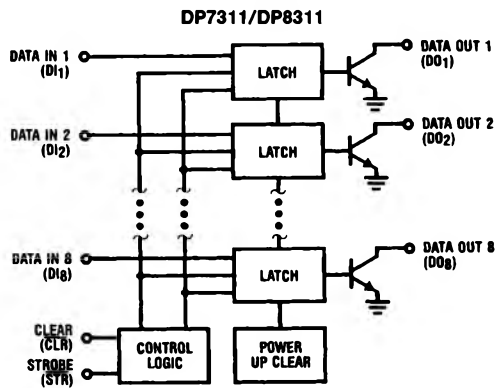
| DP7311/DP8311 | | | |
|---------------|---------------|---------------------------------|----------------------------------|
| Clear CLR | Strobe STR | Data Input DI ₁₋₈ | Data Output DO ₁₋₈ |
| 1 | 1 | X | Q |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 |
| 0 | X | X | 1 |

X = Don't Care
 1 = Outputs Off
 0 = Outputs On
 Q = Pre-existing Output
 ↗ = Positive Edge Transition

Block Diagrams

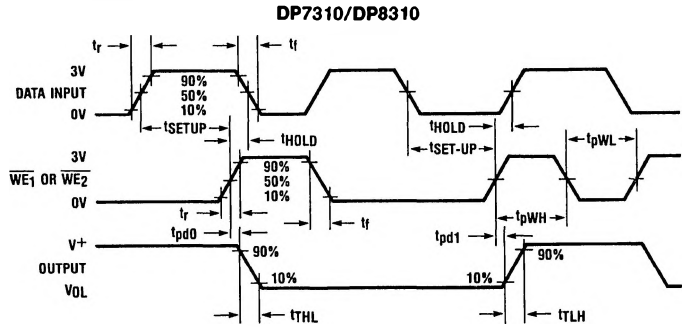


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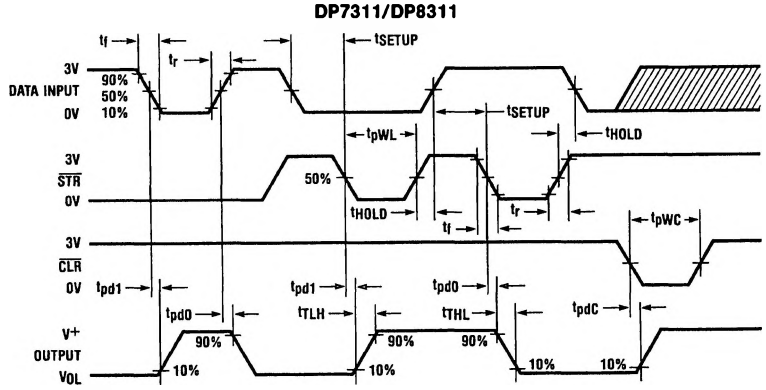


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Switching Time Waveforms

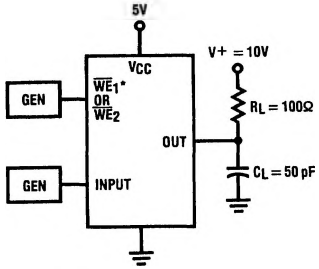


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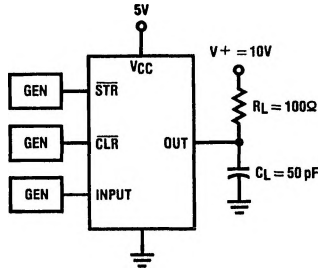
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Switching Time Test Circuits



TL/F/5246-7

*WE₁ = 0V When the Input = \overline{WE}_2
FIGURE 1. DP7310/DP8310

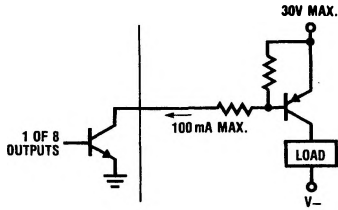


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Pulse Generator Characteristics:
 $Z_0 = 50\Omega$, $t_r = t_f = 5\text{ ns}$
FIGURE 2. DP7311/DP8311

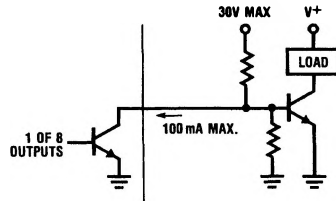
Typical Applications DP8310/11 Buffering High Current Device (Notes 1 and 2)

PNP High Current Driver



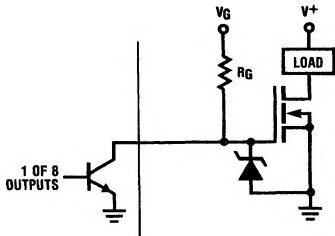
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NPN High Current Driver



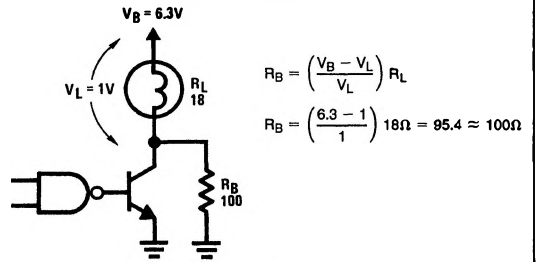
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VMOS High Current Driver



TL/F/5246-11

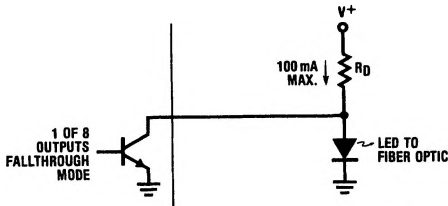
Circuit Used to Reduce Peak Transient Lamp Current



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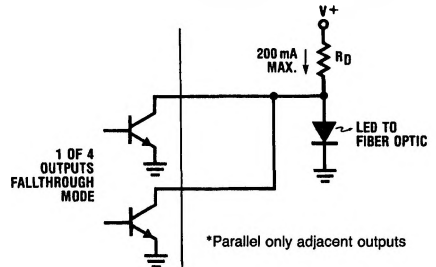
Eight Output/Four Output Fiber Optic LED Driver

DP8311 100 mA Drivers



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DP8311 Parallel Outputs (200 mA) Drivers*

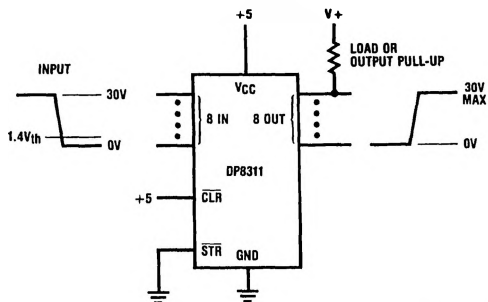


*Parallel only adjacent outputs

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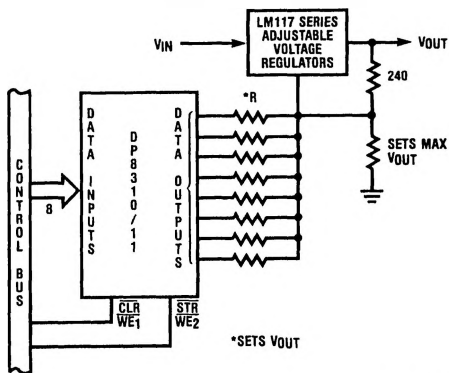
Typical Applications (Continued)

8-Bit Level Translator-Driver



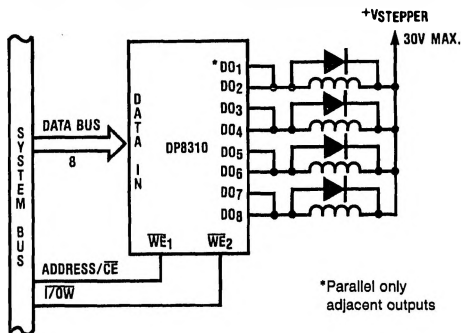
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Digital Controlled 256 Level Power Supply from 1.2V to 30V



TL/F/5246-16

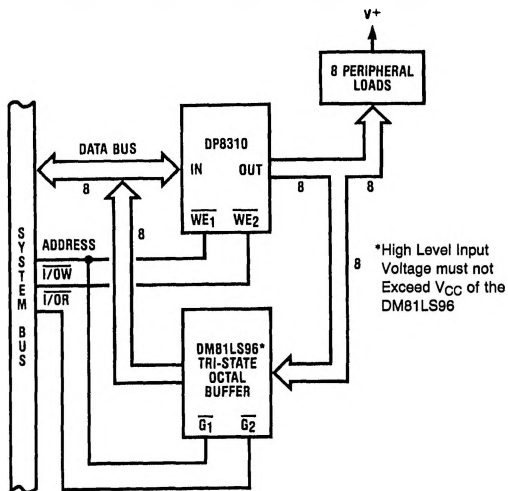
200 mA Drive for a 4 Phase Bifilar Stepper Motor



*Parallel only adjacent outputs

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Reading the State of the Latched Peripherals



*High Level Input Voltage must not Exceed V_{CC} of the DM81LS96

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Note 1: Always use good V_{CC} bypass and ground techniques to suppress transients caused by peripheral loads.

Note 2: Printed circuit board mounting is required if these devices are operated at maximum rated temperature and current (all outputs on DC).