

32-Channel Vacuum-Fluorescent Display Driver

Ordering Information

| Device | Package Options | | |
|--------|-----------------|-------------------------|--------|
| | 40 Pin Dip | 44 Plastic Chip Carrier | Die |
| HV518 | HV518P | HV518PJ | HV518X |

Features

- ☐ 32 output lines
- ☐ 90V output swing
- ☐ Active pull-down
- ☐ Latches on all outputs
- ☐ Up to 6MHz @ $V_{DD} = 5V$
- ☐ -40°C to +85°C operation

General Description

The HV518 is designed for vacuum fluorescent or DC plasma applications, where it can serve as a segment, digit or matrix display driver. Each device has 32 outputs, 32 latches and a 32 bit cascable shift register.

Serial data enters the shift register on the LOW-to-HIGH transition of the clock input. With latch enable (\overline{LE}) HIGH, parallel data is transferred to the output buffers through a 32-bit latch. When \overline{LE} is low the data is stored in the latch. When STROBE is LOW, all outputs are enabled; if STROBE is HIGH, all outputs are LOW.

Absolute Maximum Ratings

| | |
|---|--------------------------|
| Supply voltage, V_{DD} ¹ | -0.5V to +6.0V |
| Supply voltage, V_{PP} ¹ | -0.5V to +90V |
| Logic input levels ¹ | -0.5V to $V_{DD} + 0.5V$ |
| Continuous total power dissipation ^{2,3} | 1200mW |
| Operating temperature range | -40°C to +85°C |
| Storage temperature range | -65°C to +150°C |
| Lead temperature 1.6mm(1/16 inch) from case for 10 seconds | 260°C |

Notes:

1. All voltages referenced to GND.
2. Duty cycle is limited by the total power dissipated in the package.
3. For operation above 25°C ambient, derate linearly to 85°C at 20mW/°C.

Electrical Characteristics

(over recommended ranges of operating free-air temperature and V_{DD} . Unless otherwise noted, $V_{PP} = 80V$)

| Symbol | Parameter | | Min | Typ | Max | Units | Conditions |
|-----------|--------------------------------|---------------|------|------|-----|---------|---|
| I_{DD} | Supply current | | | | 10 | mA | $V_{DD} = 5V$, $f_{CH} = 6.0$ MHz |
| I_{DDQ} | Quiescent supply current | | | | 0.5 | mA | $V_{DD} = 5.5V$, $V_{IN} = 0V$ |
| I_{PP} | Supply current | | | | 12 | mA | Output high, $T_A = -40^\circ C$ |
| | | | | 7 | 10 | mA | Output high, $T_A = 0$ to $+85^\circ C$ |
| | | | | | 500 | μA | Outputs low |
| V_{OH} | High-level output voltage | HVoutput | 70.0 | | | V | $I_{OH} = -25mA$ |
| | | Serial output | 4.5 | 4.9 | 5 | V | $V_{DD} = 5V$, $I_{OH} = -20\mu A$ |
| V_{OL} | Low-level output | HVoutput | | | 5 | V | $I_{OL} = 1mA$ |
| | | Serial output | | 0.06 | 0.8 | V | $I_{OL} = 20\mu A$ |
| I_{IH} | High-level logic input current | | | 0.1 | 1 | μA | $V_{IH} = V_{DD}$ |
| I_{IL} | Low-level logic input current | | | -0.1 | -1 | μA | $V_{IL} = 0V$ |

Note: The total number of ON outputs times the duty cycle must not exceed the allowable package power dissipation.

Switching Characteristics ($V_{PP} = 80V$, $C_L = 50$ pF, $T_A = 25^\circ C$, unless otherwise noted)

| Symbol | Parameter | | Min | Max | Unit | Conditions |
|-----------|--|-------------------|-----------------|-----|---------|-------------------------------|
| t_d | Delay time, Clock to data output | | $V_{DD} = 4.5V$ | 600 | ns | $C_L = 15$ pF See Figure 4 |
| t_{DHL} | Delay time, high-to-low-level, HVoutput | from latch enable | $V_{DD} = 4.5V$ | 1.5 | μs | See Figure 5 |
| | | from strobe | | 1 | | See Figure 6 |
| t_{DLH} | Delay time, low-to-high-level, HVoutput | from latch enable | $V_{DD} = 4.5V$ | 1.5 | μs | See Figure 5 |
| | | from strobe | | 1 | | See Figure 6 |
| t_{THL} | Transition time, high-to-low-level, HVoutput | | $V_{DD} = 4.5V$ | 3 | μs | See Figure 6 |
| t_{TLH} | Transition time, low-to-high-level, HVoutput | | $V_{DD} = 4.5V$ | 2.5 | μs | See Figure 6 |

Recommended Operating Conditions ($T_A = 25^\circ C$, unless otherwise noted)

| Symbol | Parameter | | Min | Max | Units |
|--------------|---------------------------------------|-----------------|-----|-----|------------|
| V_{DD} | Logic voltage supply | | 4.5 | 5.5 | V |
| V_{PP} | High voltage supply | | 8 | 80 | V |
| V_{IH} | High-level input voltage (See Fig.3.) | $V_{DD} = 4.5V$ | 3.5 | | V |
| V_{IL} | Low-level input voltage (See Fig. 3.) | $V_{DD} = 4.5V$ | | 1 | V |
| I_{OH} | High-level output current | | -25 | | mA |
| I_{OL} | Low-level output current | | | 2 | mA |
| f_{CLK} | Clock frequency (see Figure 3) | $V_{DD} = 4.5V$ | | 6.0 | MHz |
| $t_{w(CKH)}$ | Pulse duration, clock high | $V_{DD} = 4.5V$ | 83 | | ns |
| $t_{w(CKL)}$ | Pulse duration, clock low | $V_{DD} = 4.5V$ | 83 | | ns |
| t_{su} | Setup time, data before clock | $V_{DD} = 4.5V$ | 75 | | ns |
| t_h | Hold time, data after clock | $V_{DD} = 4.5V$ | 75 | | ns |
| T_A | Operating free-air temperature | | -40 | 85 | $^\circ C$ |

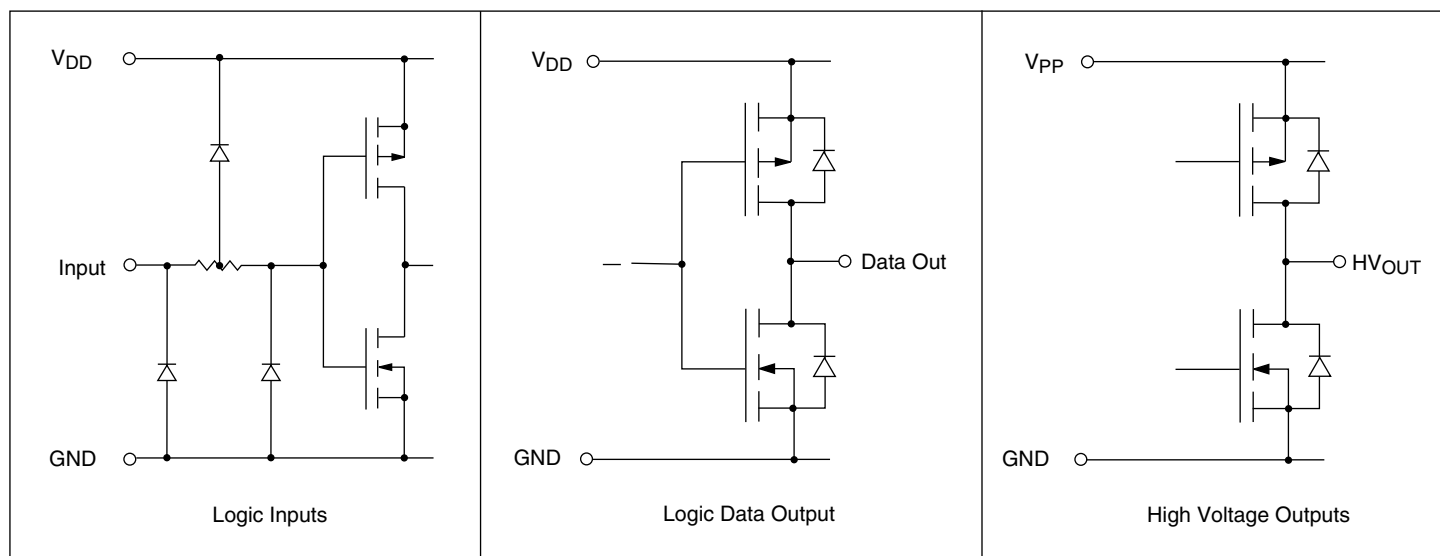
Note:

Power-up sequence should be the following:

1. Connect ground.
2. Apply V_{DD} .
3. Set all inputs (Data, CLK, Enable, etc.) to a known state.
4. Apply V_{PP} .
5. The V_{PP} should not drop below V_{DD} or float during operation.

Power-down sequence should be the reverse of the above.

Input and Output Equivalent Circuits



Parameter Measurement Information

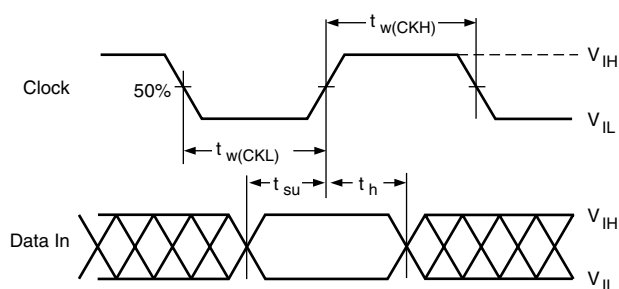


Figure 3: Input Timing Voltage Waveforms

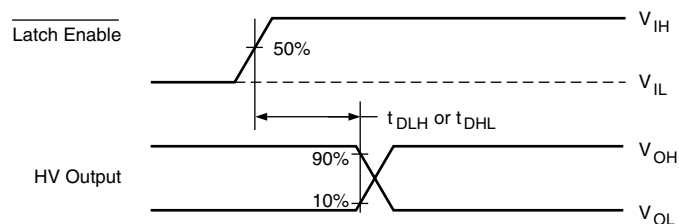


Figure 5

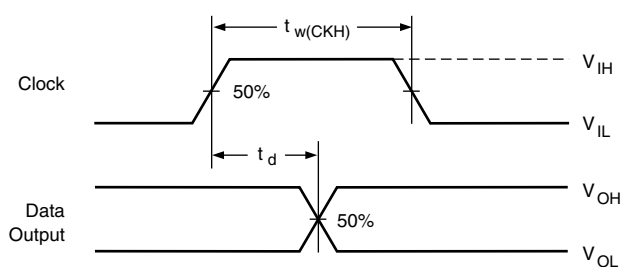


Figure 4

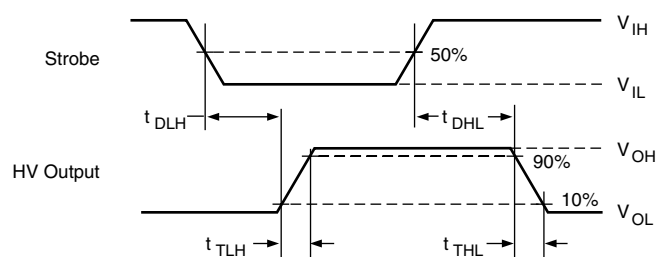
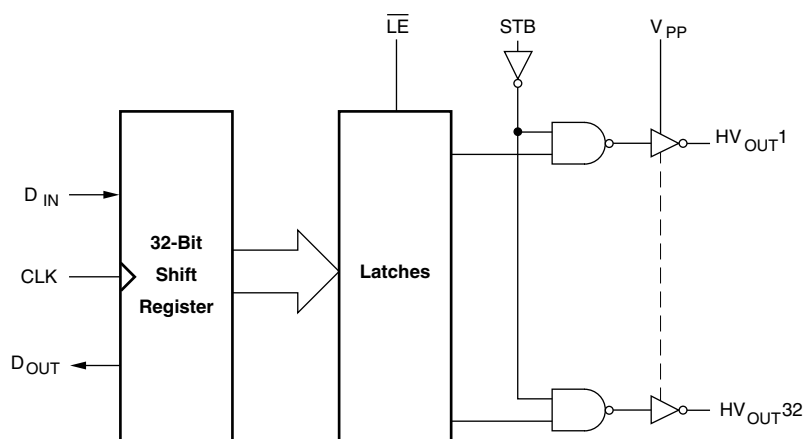


Figure 6: Switching-Time Voltage Waveforms

Note: For testing purposes, all input pulses have maximum rise and fall times of 30 nsec.

Block Diagram



Truth Tables

Input

| Data In | CLK | Data Out |
|---------|-----------|----------|
| H | | H |
| L | | L |
| X | No Change | * |

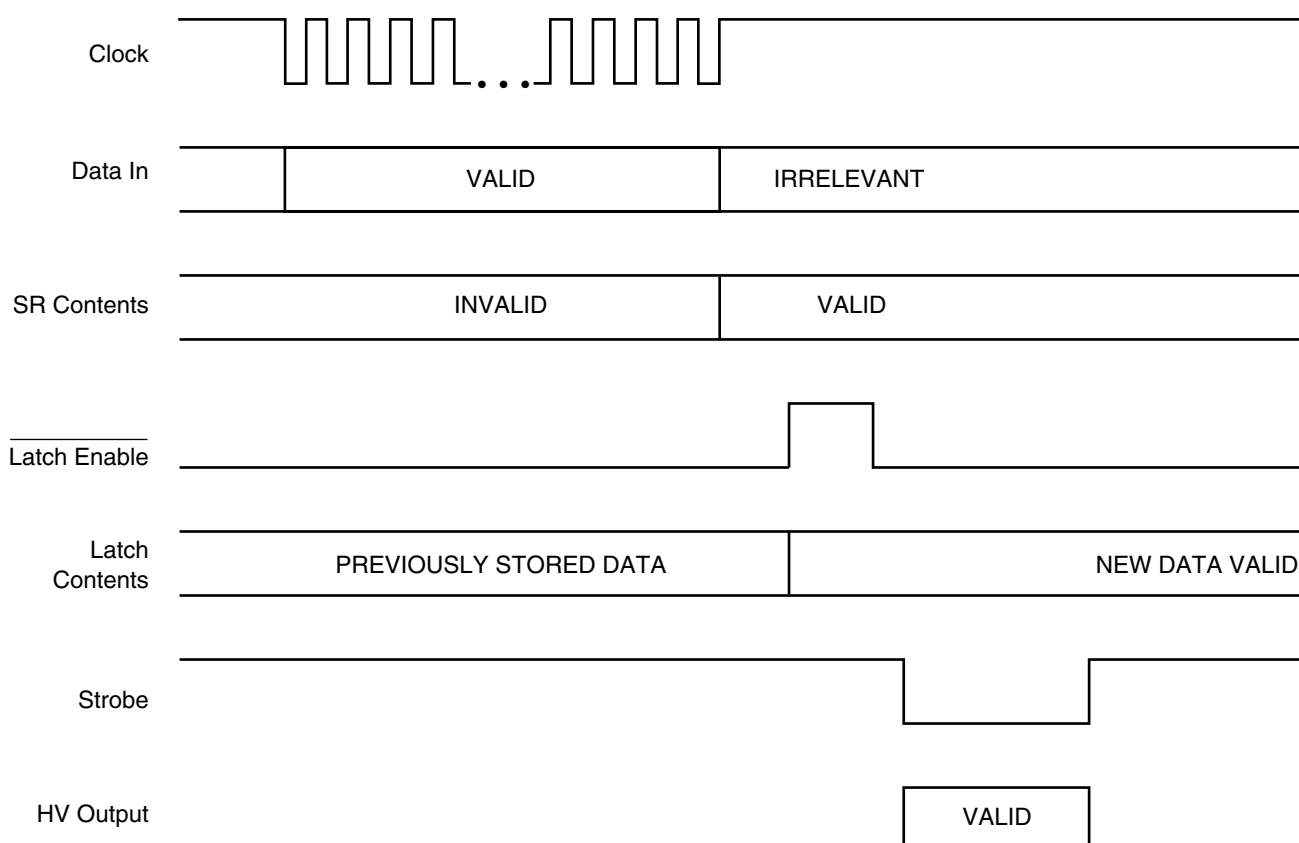
* Previous state

Output

| Data In | \overline{LE} | STB | HV Outputs |
|---------|-----------------|-----|------------|
| X | X | H | All Low |
| H | H | L | High |
| L | H | L | Low |
| X | L | L | * |

* Previous state

Typical Operating Sequence



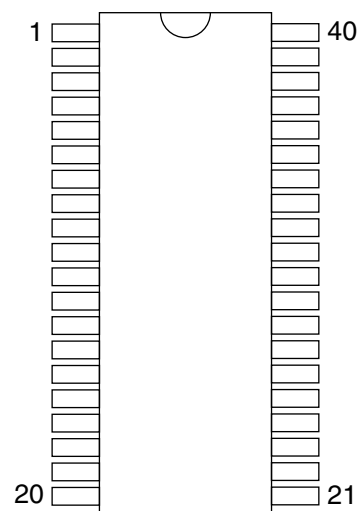
Pin Configurations

Package Outline

HV518

40 Pin Dual-In-Line Package

| Pin | Function | Pin | Function |
|-----|----------------------|-----|------------------------|
| 1 | V _{PP} | 21 | Clock |
| 2 | Serial Out | 22 | $\overline{\text{LE}}$ |
| 3 | HV _{OUT} 32 | 23 | HV _{OUT} 16 |
| 4 | HV _{OUT} 31 | 24 | HV _{OUT} 15 |
| 5 | HV _{OUT} 30 | 25 | HV _{OUT} 14 |
| 6 | HV _{OUT} 29 | 26 | HV _{OUT} 13 |
| 7 | HV _{OUT} 28 | 27 | HV _{OUT} 12 |
| 8 | HV _{OUT} 27 | 28 | HV _{OUT} 11 |
| 9 | HV _{OUT} 26 | 29 | HV _{OUT} 10 |
| 10 | HV _{OUT} 25 | 30 | HV _{OUT} 9 |
| 11 | HV _{OUT} 24 | 31 | HV _{OUT} 8 |
| 12 | HV _{OUT} 23 | 32 | HV _{OUT} 7 |
| 13 | HV _{OUT} 22 | 33 | HV _{OUT} 6 |
| 14 | HV _{OUT} 21 | 34 | HV _{OUT} 5 |
| 15 | HV _{OUT} 20 | 35 | HV _{OUT} 4 |
| 16 | HV _{OUT} 19 | 36 | HV _{OUT} 3 |
| 17 | HV _{OUT} 18 | 37 | HV _{OUT} 2 |
| 18 | HV _{OUT} 17 | 38 | HV _{OUT} 1 |
| 19 | Strobe | 39 | Data In |
| 20 | GND | 40 | V _{DD} |

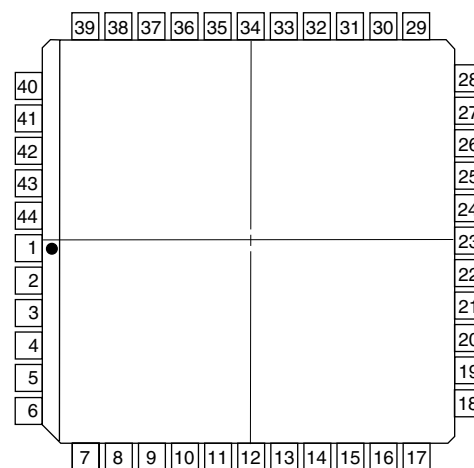


top view
40-pin DIP

HV518

44 Pin J-Lead Package

| Pin | Function | Pin | Function |
|-----|----------------------|-----|------------------------|
| 1 | V _{PP} | 23 | Clock |
| 2 | Serial Out | 24 | $\overline{\text{LE}}$ |
| 3 | HV _{OUT} 32 | 25 | HV _{OUT} 16 |
| 4 | HV _{OUT} 31 | 26 | HV _{OUT} 15 |
| 5 | HV _{OUT} 30 | 27 | HV _{OUT} 14 |
| 6 | N/C | 28 | N/C |
| 7 | HV _{OUT} 29 | 29 | N/C |
| 8 | HV _{OUT} 28 | 30 | HV _{OUT} 13 |
| 9 | HV _{OUT} 27 | 31 | HV _{OUT} 12 |
| 10 | HV _{OUT} 26 | 32 | HV _{OUT} 11 |
| 11 | HV _{OUT} 25 | 33 | HV _{OUT} 10 |
| 12 | HV _{OUT} 24 | 34 | HV _{OUT} 9 |
| 13 | HV _{OUT} 23 | 35 | HV _{OUT} 8 |
| 14 | HV _{OUT} 22 | 36 | HV _{OUT} 7 |
| 15 | HV _{OUT} 21 | 37 | HV _{OUT} 6 |
| 16 | HV _{OUT} 20 | 38 | HV _{OUT} 5 |
| 17 | HV _{OUT} 19 | 39 | HV _{OUT} 4 |
| 18 | N/C | 40 | HV _{OUT} 3 |
| 19 | HV _{OUT} 18 | 41 | HV _{OUT} 2 |
| 20 | HV _{OUT} 17 | 42 | HV _{OUT} 1 |
| 21 | Strobe | 43 | Data In |
| 22 | GND | 44 | V _{DD} |



top view



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