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## 32-Channel, Serial-to-Parallel Converter with High-Voltage Push-Pull Outputs

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### Features

- Processed with High-Voltage CMOS technology
- Low power-level shifting
- Source/sink current minimum 20mA
- Shift register speed 8.0 MHz
- Latched data outputs
- CMOS compatible inputs
- Forward and reverse shifting options
- Diode to  $V_{PP}$  allows efficient power recovery

### Description

HV5308 and HV5408 are low-voltage serial to high-voltage parallel converters with push-pull outputs. These devices have been designed for use as a driver for AC-electroluminescent displays. HV5308 / HV5408 can also be used in any application requiring multiple output high-voltage, current sourcing, and sinking capabilities such as driving plasma panels, vacuum fluorescent, or large matrix LCD displays.

These devices consist of a 32-bit shift register, 32 latches, and control logic to enable outputs. Data is shifted through the shift register on the low-to-high transition of the clock. HV5308 shifts in the clockwise direction, when viewed from the top of the package, and HV5408 shifts in the counter-clockwise direction.

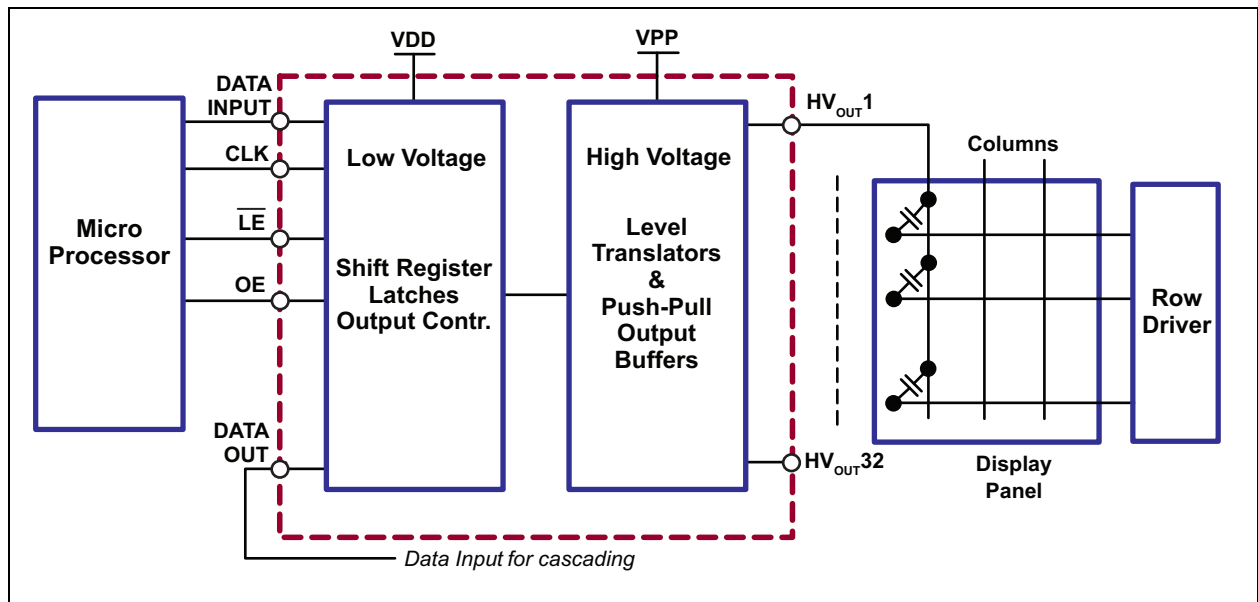
A data output buffer is provided for cascading devices. This output reflects the current status of the last bit of the shift register (32). Operation of the shift register is not affected by the  $\overline{LE}$  (latch enable) or the  $\overline{OE}$  (output enable) inputs. Transfer of data from the shift register to the latch occurs when the  $\overline{LE}$  input is high. The data in the latch is retained when  $\overline{LE}$  is low.

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The diagram illustrates the pin configurations for two 44-lead packages. On the left is a 44-Lead PQFP (Quad Flat Pack), which has a square body with octagonal corners and pins extending from all four sides. The pins are numbered 1 to 44 in a counter-clockwise direction starting from the bottom-left corner. On the right is a 44-Lead PLCC (Plastic Leaded Ceramic Carrier), which has a square body with a notch on the top edge and pins extending from all four sides. The pins are numbered 1 to 44 in a counter-clockwise direction starting from the bottom-left corner.

The schematic diagram illustrates the HVOUT module. It features a 32-bit Shift Register and a 32-bit Latches block. The module is controlled by VPP, OE, and LE signals. The DATA INPUT and CLK signals are connected to the Shift Register. The DATA OUT signal is connected to the Latches. The module has 32 HV\_OUT outputs, labeled HV\_OUT1 through HV\_OUT32, with 28 additional outputs indicated by an ellipsis. The outputs are connected to a common ground.

## Typical Application Circuit



# HV5308 / HV5408

## 1.0 ELECTRICAL CHARACTERISTICS

### ABSOLUTE MAXIMUM RATINGS†

|                                                 |                        |
|-------------------------------------------------|------------------------|
| Supply voltage, $V_{DD}$                        | -0.5V to +16V          |
| Supply voltage, $V_{PP}$                        | -0.5V to +90V          |
| Logic input levels                              | -0.5V to $V_{DD}+0.5V$ |
| Ground current <sup>1</sup>                     | 1.5A                   |
| Continuous total power dissipation <sup>2</sup> | 1200mW                 |
| Operating temperature range                     | -40°C to +85°C         |
| Storage temperature range                       | -65°C to +150°C        |

† **Notice:** Stresses above those listed under “Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

- 1: Duty cycle is limited by the total power dissipated in the package.
- 2: For operation above 25°C ambient derate linearly to maximum operating temperature at 20mW/°C.

### ELECTRICAL CHARACTERISTICS

| Electrical Specifications: V <sub>PP</sub> = 60V, V <sub>DD</sub> = 12V, T <sub>A</sub> = 25°C |                   |                                    |      |      |       |                                                                               |
|------------------------------------------------------------------------------------------------|-------------------|------------------------------------|------|------|-------|-------------------------------------------------------------------------------|
| Parameter                                                                                      |                   | Symbol                             | Min  | Max  | Units | Conditions                                                                    |
| DC Characteristics                                                                             |                   |                                    |      |      |       |                                                                               |
| V <sub>PP</sub> supply current                                                                 |                   | I <sub>PP</sub>                    | -    | 0.5  | mA    | HV <sub>OUTPUTS</sub> high to low                                             |
| I <sub>DD</sub> supply current (quiescent)                                                     |                   | I <sub>DDQ</sub>                   | -    | 100  | μA    | All inputs = V <sub>DD</sub> or GND                                           |
| I <sub>DD</sub> supply current (operating)                                                     |                   | I <sub>DD</sub>                    | -    | 15   | mA    | V <sub>DD</sub> = V <sub>DD</sub> max, f <sub>CLK</sub> = 8.0MHz              |
| High level logic input current                                                                 |                   | I <sub>IH</sub>                    | -    | 1.0  | μA    | V <sub>IN</sub> = V <sub>DD</sub>                                             |
| Low level logic input current                                                                  |                   | I <sub>IL</sub>                    | -    | -1.0 | μA    | V <sub>IN</sub> = 0                                                           |
| High level output voltage                                                                      | HV <sub>OUT</sub> | V <sub>OH</sub>                    | 52   | -    | V     | I <sub>OH</sub> = -20mA, -40 to 85°C<br>I <sub>OH</sub> = -15mA, -55 to 125°C |
|                                                                                                | Data out          |                                    | 10.5 | -    | V     | I <sub>O</sub> = -100μA                                                       |
| Low level output voltage                                                                       | HV <sub>OUT</sub> | V <sub>OL</sub>                    | -    | 8.0  | V     | I <sub>OL</sub> = 20mA, -40 to 85°C<br>I <sub>OL</sub> = 15mA, -55 to 125°C   |
|                                                                                                | Data out          |                                    | -    | 1.0  | V     | I <sub>O</sub> = 100μA                                                        |
| HV output clamp diode voltage                                                                  |                   | V <sub>OC</sub>                    | -    | -1.5 | V     | I <sub>OL</sub> = -100mA                                                      |
| AC Characteristics                                                                             |                   |                                    |      |      |       |                                                                               |
| Clock frequency                                                                                |                   | f <sub>CLK</sub>                   | -    | 8.0  | MHz   | ---                                                                           |
| Clock width, High or Low                                                                       |                   | t <sub>WL</sub> or t <sub>WH</sub> | 62   | -    | ns    | ---                                                                           |
| Setup time before CLK rises                                                                    |                   | t <sub>SU</sub>                    | 25   | -    | ns    | ---                                                                           |
| Hold time after CLK rises                                                                      |                   | t <sub>H</sub>                     | 10   | -    | ns    | ---                                                                           |
| Data output delay after L to H CLK                                                             |                   | t <sub>DLH</sub> (Data)            | -    | 110  | ns    | C <sub>L</sub> = 15pF, (Note 1)                                               |
| Data output delay after H to L CLK                                                             |                   | t <sub>DHL</sub> (Data)            | -    | 110  | ns    | C <sub>L</sub> = 15pF, (Note 1)                                               |
| LE delay after L to H CLK                                                                      |                   | t <sub>DLE</sub>                   | 50   | -    | ns    | (Note 1)                                                                      |
| Width of LE pulse                                                                              |                   | t <sub>WLE</sub>                   | 50   | -    | ns    | ---                                                                           |
| LE setup time before L to H CLK                                                                |                   | t <sub>SLE</sub>                   | 50   | -    | ns    | (Note 1)                                                                      |
| Delay from LE to HV <sub>OUT</sub> , L to H                                                    |                   | t <sub>ON</sub>                    | -    | 500  | ns    | (Note 1)                                                                      |
| Delay from LE to HV <sub>OUT</sub> , H to L                                                    |                   | t <sub>OFF</sub>                   | -    | 500  | ns    | (Note 1)                                                                      |

**Note 1:** L to H = Low to High; H to L = High to Low.

## TEMPERATURE SPECIFICATIONS

| Electrical Specifications: Unless otherwise specified, for all specifications $T_A = T_J = +25^{\circ}\text{C}$ |               |     |     |     |                      |            |
|-----------------------------------------------------------------------------------------------------------------|---------------|-----|-----|-----|----------------------|------------|
| Parameter                                                                                                       | Symbol        | Min | Typ | Max | Units                | Conditions |
| <b>Temperature Ranges</b>                                                                                       |               |     |     |     |                      |            |
| Operating Temperature                                                                                           |               | -40 | –   | 85  | $^{\circ}\text{C}$   |            |
| Storage Temperature                                                                                             |               | -65 | –   | 150 | $^{\circ}\text{C}$   |            |
| <b>Package Thermal Resistances</b>                                                                              |               |     |     |     |                      |            |
| Thermal Resistance, 44-Lead PQFP                                                                                | $\theta_{ja}$ | –   | 51  | –   | $^{\circ}\text{C/W}$ |            |
| Thermal Resistance, 44-Lead PLCC                                                                                | $\theta_{ja}$ | –   | 37  | –   | $^{\circ}\text{C/W}$ |            |

# HV5308 / HV5408

## 2.0 PIN DESCRIPTION

The locations of the pins are listed in [Package Type](#).

**TABLE 2-1: PIN DESCRIPTION PQFP**

| Pin # | HV5308                 | HV5408                 | Description                                                                                                                                                                                                                 |
|-------|------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1     | HV <sub>OUT</sub> 22   | HV <sub>OUT</sub> 11   | High voltage outputs.<br>High voltage push-pull outputs, which, depending on controlling low voltage data, can drive loads either to GND, or to V <sub>PP</sub> rail levels.                                                |
| 2     | HV <sub>OUT</sub> 21   | HV <sub>OUT</sub> 12   |                                                                                                                                                                                                                             |
| 3     | HV <sub>OUT</sub> 20   | HV <sub>OUT</sub> 13   |                                                                                                                                                                                                                             |
| 4     | HV <sub>OUT</sub> 19   | HV <sub>OUT</sub> 14   |                                                                                                                                                                                                                             |
| 5     | HV <sub>OUT</sub> 18   | HV <sub>OUT</sub> 15   |                                                                                                                                                                                                                             |
| 6     | HV <sub>OUT</sub> 17   | HV <sub>OUT</sub> 16   |                                                                                                                                                                                                                             |
| 7     | HV <sub>OUT</sub> 16   | HV <sub>OUT</sub> 17   |                                                                                                                                                                                                                             |
| 8     | HV <sub>OUT</sub> 15   | HV <sub>OUT</sub> 18   |                                                                                                                                                                                                                             |
| 9     | HV <sub>OUT</sub> 14   | HV <sub>OUT</sub> 19   |                                                                                                                                                                                                                             |
| 10    | HV <sub>OUT</sub> 13   | HV <sub>OUT</sub> 20   |                                                                                                                                                                                                                             |
| 11    | HV <sub>OUT</sub> 12   | HV <sub>OUT</sub> 21   |                                                                                                                                                                                                                             |
| 12    | HV <sub>OUT</sub> 11   | HV <sub>OUT</sub> 22   |                                                                                                                                                                                                                             |
| 13    | HV <sub>OUT</sub> 10   | HV <sub>OUT</sub> 23   |                                                                                                                                                                                                                             |
| 14    | HV <sub>OUT</sub> 9    | HV <sub>OUT</sub> 24   |                                                                                                                                                                                                                             |
| 15    | HV <sub>OUT</sub> 8    | HV <sub>OUT</sub> 25   |                                                                                                                                                                                                                             |
| 16    | HV <sub>OUT</sub> 7    | HV <sub>OUT</sub> 26   |                                                                                                                                                                                                                             |
| 17    | HV <sub>OUT</sub> 6    | HV <sub>OUT</sub> 27   |                                                                                                                                                                                                                             |
| 18    | HV <sub>OUT</sub> 5    | HV <sub>OUT</sub> 28   |                                                                                                                                                                                                                             |
| 19    | HV <sub>OUT</sub> 4    | HV <sub>OUT</sub> 29   |                                                                                                                                                                                                                             |
| 20    | HV <sub>OUT</sub> 3    | HV <sub>OUT</sub> 30   |                                                                                                                                                                                                                             |
| 21    | HV <sub>OUT</sub> 2    | HV <sub>OUT</sub> 31   |                                                                                                                                                                                                                             |
| 22    | HV <sub>OUT</sub> 1    | HV <sub>OUT</sub> 32   |                                                                                                                                                                                                                             |
| 23    | DATA OUT               | DATA OUT               | Serial data output.<br>Data output for cascading to the data input of the next device.                                                                                                                                      |
| 24    | N/C                    | N/C                    | No connect.                                                                                                                                                                                                                 |
| 25    |                        |                        |                                                                                                                                                                                                                             |
| 26    |                        |                        |                                                                                                                                                                                                                             |
| 27    | CLK                    | CLK                    | Data shift register clock<br>Input are shifted into the shift register on the positive edge of the clock.                                                                                                                   |
| 28    | GND                    | GND                    | Logic and high voltage ground                                                                                                                                                                                               |
| 29    | VPP                    | VPP                    | High voltage power rail.                                                                                                                                                                                                    |
| 30    | VDD                    | VDD                    | Low voltage logic power rail.                                                                                                                                                                                               |
| 31    | $\overline{\text{LE}}$ | $\overline{\text{LE}}$ | Latch enable input.<br>When $\overline{\text{LE}}$ is High, shift register data is transferred into a data latch. When $\overline{\text{LE}}$ is Low, data is latched, and new data can be clocked into the shift register. |
| 32    | DATA IN                | DATA IN                | Serial data input.<br>Data needs to be present before each rising edge of the clock.                                                                                                                                        |
| 33    | OE                     | OE                     | Output enable input.<br>When OE is Low, all HV outputs are forced into a Low state, regardless of data in each channel. When OE is High, all HV outputs reflect data latched.                                               |
| 34    | N/C                    | N/C                    | No connect.                                                                                                                                                                                                                 |

**TABLE 2-1: PIN DESCRIPTION PQFP (CONTINUED)**

| Pin # | HV5308               | HV5408               | Description                                                                                                                                                                  |
|-------|----------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 35    | HV <sub>OUT</sub> 32 | HV <sub>OUT</sub> 1  | High voltage outputs.<br>High voltage push-pull outputs, which, depending on controlling low voltage data, can drive loads either to GND, or to V <sub>PP</sub> rail levels. |
| 36    | HV <sub>OUT</sub> 31 | HV <sub>OUT</sub> 2  |                                                                                                                                                                              |
| 37    | HV <sub>OUT</sub> 30 | HV <sub>OUT</sub> 3  |                                                                                                                                                                              |
| 38    | HV <sub>OUT</sub> 29 | HV <sub>OUT</sub> 4  |                                                                                                                                                                              |
| 39    | HV <sub>OUT</sub> 28 | HV <sub>OUT</sub> 5  |                                                                                                                                                                              |
| 40    | HV <sub>OUT</sub> 27 | HV <sub>OUT</sub> 6  |                                                                                                                                                                              |
| 41    | HV <sub>OUT</sub> 26 | HV <sub>OUT</sub> 7  |                                                                                                                                                                              |
| 42    | HV <sub>OUT</sub> 25 | HV <sub>OUT</sub> 8  |                                                                                                                                                                              |
| 43    | HV <sub>OUT</sub> 24 | HV <sub>OUT</sub> 9  |                                                                                                                                                                              |
| 44    | HV <sub>OUT</sub> 23 | HV <sub>OUT</sub> 10 |                                                                                                                                                                              |

**TABLE 2-2: PIN DESCRIPTION PLCC**

| Pin # | HV5308               | HV5408               | Description                                                                                                                                                                                                   |
|-------|----------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1     | HV <sub>OUT</sub> 17 | HV <sub>OUT</sub> 16 | High voltage outputs.<br>High voltage push-pull outputs, which, depending on controlling low voltage data, can drive loads either to GND, or to V <sub>PP</sub> rail levels.                                  |
| 2     | HV <sub>OUT</sub> 16 | HV <sub>OUT</sub> 17 |                                                                                                                                                                                                               |
| 3     | HV <sub>OUT</sub> 15 | HV <sub>OUT</sub> 18 |                                                                                                                                                                                                               |
| 4     | HV <sub>OUT</sub> 14 | HV <sub>OUT</sub> 19 |                                                                                                                                                                                                               |
| 5     | HV <sub>OUT</sub> 13 | HV <sub>OUT</sub> 20 |                                                                                                                                                                                                               |
| 6     | HV <sub>OUT</sub> 12 | HV <sub>OUT</sub> 21 |                                                                                                                                                                                                               |
| 7     | HV <sub>OUT</sub> 11 | HV <sub>OUT</sub> 22 |                                                                                                                                                                                                               |
| 8     | HV <sub>OUT</sub> 10 | HV <sub>OUT</sub> 23 |                                                                                                                                                                                                               |
| 9     | HV <sub>OUT</sub> 9  | HV <sub>OUT</sub> 24 |                                                                                                                                                                                                               |
| 10    | HV <sub>OUT</sub> 8  | HV <sub>OUT</sub> 25 |                                                                                                                                                                                                               |
| 11    | HV <sub>OUT</sub> 7  | HV <sub>OUT</sub> 26 |                                                                                                                                                                                                               |
| 12    | HV <sub>OUT</sub> 6  | HV <sub>OUT</sub> 27 |                                                                                                                                                                                                               |
| 13    | HV <sub>OUT</sub> 5  | HV <sub>OUT</sub> 28 |                                                                                                                                                                                                               |
| 14    | HV <sub>OUT</sub> 4  | HV <sub>OUT</sub> 29 |                                                                                                                                                                                                               |
| 15    | HV <sub>OUT</sub> 3  | HV <sub>OUT</sub> 30 |                                                                                                                                                                                                               |
| 16    | HV <sub>OUT</sub> 2  | HV <sub>OUT</sub> 31 |                                                                                                                                                                                                               |
| 17    | HV <sub>OUT</sub> 1  | HV <sub>OUT</sub> 32 |                                                                                                                                                                                                               |
| 18    | DATA OUT             | DATA OUT             | Serial data output.<br>Data output for cascading to the data input of the next device.                                                                                                                        |
| 19    | N/C                  | N/C                  | No connect.                                                                                                                                                                                                   |
| 20    |                      |                      |                                                                                                                                                                                                               |
| 21    |                      |                      |                                                                                                                                                                                                               |
| 22    | CLK                  | CLK                  | Data shift register clock<br>Input are shifted into the shift register on the positive edge of the clock.                                                                                                     |
| 23    | GND                  | GND                  | Logic and high voltage ground                                                                                                                                                                                 |
| 24    | VPP                  | VPP                  | High voltage power rail.                                                                                                                                                                                      |
| 25    | VDD                  | VDD                  | Low voltage logic power rail.                                                                                                                                                                                 |
| 26    | LE                   | LE                   | Latch enable input.<br>When $\overline{LE}$ is High, shift register data is transferred into a data latch. When $\overline{LE}$ is Low, data is latched, and new data can be clocked into the shift register. |

# HV5308 / HV5408

**TABLE 2-2: PIN DESCRIPTION PLCC (CONTINUED)**

| Pin # | HV5308  | HV5408              | Description                                                                                                                                                                   |
|-------|---------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 27    | DATA IN | DATA IN             | Serial data input.<br>Data needs to be present before each rising edge of the clock.                                                                                          |
| 28    | OE      | OE                  | Output enable input.<br>When OE is Low, all HV outputs are forced into a LOW state, regardless of data in each channel. When OE is High, all HV outputs reflect data latched. |
| 29    | N/C     | N/C                 | No connect.                                                                                                                                                                   |
| 30    | HVOUT32 | HV <sub>OUT1</sub>  | High voltage outputs.<br>High voltage push-pull outputs, which, depending on controlling low voltage data, can drive loads either to GND, or to V <sub>PP</sub> rail levels.  |
| 31    | HVOUT31 | HV <sub>OUT2</sub>  |                                                                                                                                                                               |
| 32    | HVOUT30 | HV <sub>OUT3</sub>  |                                                                                                                                                                               |
| 33    | HVOUT29 | HV <sub>OUT4</sub>  |                                                                                                                                                                               |
| 34    | HVOUT28 | HV <sub>OUT5</sub>  |                                                                                                                                                                               |
| 35    | HVOUT27 | HV <sub>OUT6</sub>  |                                                                                                                                                                               |
| 36    | HVOUT26 | HV <sub>OUT7</sub>  |                                                                                                                                                                               |
| 37    | HVOUT25 | HV <sub>OUT8</sub>  |                                                                                                                                                                               |
| 38    | HVOUT24 | HV <sub>OUT9</sub>  |                                                                                                                                                                               |
| 39    | HVOUT23 | HV <sub>OUT10</sub> |                                                                                                                                                                               |
| 40    | HVOUT22 | HV <sub>OUT11</sub> |                                                                                                                                                                               |
| 41    | HVOUT21 | HV <sub>OUT12</sub> |                                                                                                                                                                               |
| 42    | HVOUT20 | HV <sub>OUT13</sub> |                                                                                                                                                                               |
| 43    | HVOUT19 | HV <sub>OUT14</sub> |                                                                                                                                                                               |
| 44    | HVOUT18 | HV <sub>OUT15</sub> |                                                                                                                                                                               |

## 3.0 FUNCTIONAL DESCRIPTION

Table 3-1 provides functional information about HV5308 / HV5408.

**TABLE 3-1: FUNCTIONAL TABLE CLK**

| DATA IN | CLK  | DATA OUT  |
|---------|------|-----------|
| H       | ↑    | H         |
| L       | ↑    | L         |
| X       | No ↑ | No change |

**Note:** H = High level, L = Low level, ↑ = Low-to-High transition

**TABLE 3-2: FUNCTIONAL TABLE  $\overline{LE}$ , OE**

| DATA IN | $\overline{LE}$ | OE | HV <sub>OUT</sub>           |
|---------|-----------------|----|-----------------------------|
| X       | X               | L  | All HV <sub>OUT</sub> = Low |
| X       | L               | H  | Previous latched data       |
| H       | H               | H  | H                           |
| L       | H               | H  | L                           |

**Note:** H = High level, L = Low level, X= Don't Care

**TABLE 3-3: RECOMMENDED OPERATING CONDITIONS (-40°C to 85°C)**

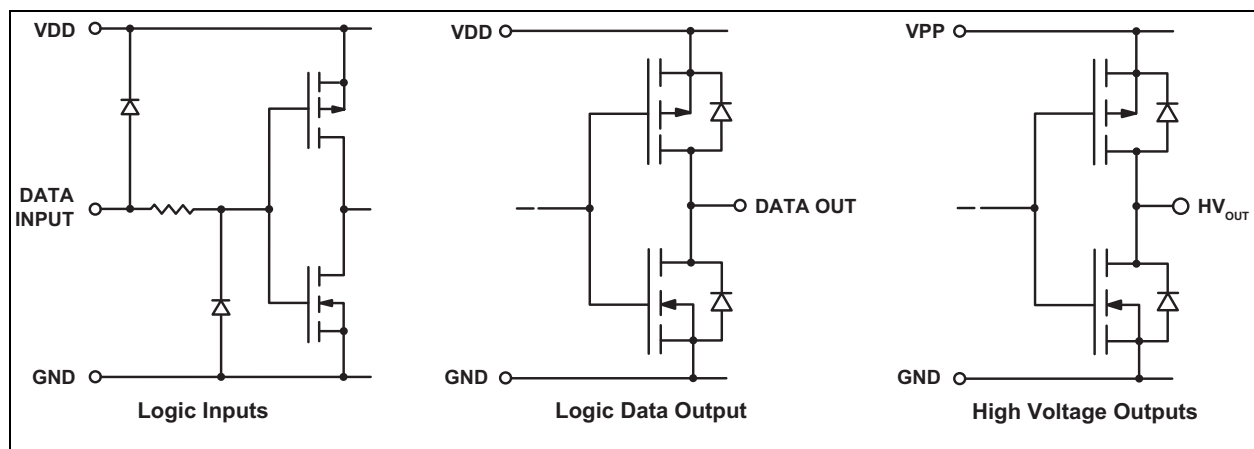
| Symbol           | Parameter            | Min                   | Max             | Units |
|------------------|----------------------|-----------------------|-----------------|-------|
| V <sub>DD</sub>  | Logic voltage supply | 10.8                  | 13.2            | V     |
| V <sub>PP</sub>  | High voltage supply  | 8.0                   | 80              | V     |
| V <sub>IH</sub>  | Input high voltage   | V <sub>DD</sub> - 2.0 | V <sub>DD</sub> | V     |
| V <sub>IL</sub>  | Input low voltage    | 0                     | 2.0             | V     |
| f <sub>CLK</sub> | Clock frequency      | 0                     | 8.0             | MHz   |

## 3.1 Power-Up and Recommended Operating Conditions

To power-up HV5308 / HV5408, perform the following power-up sequence:

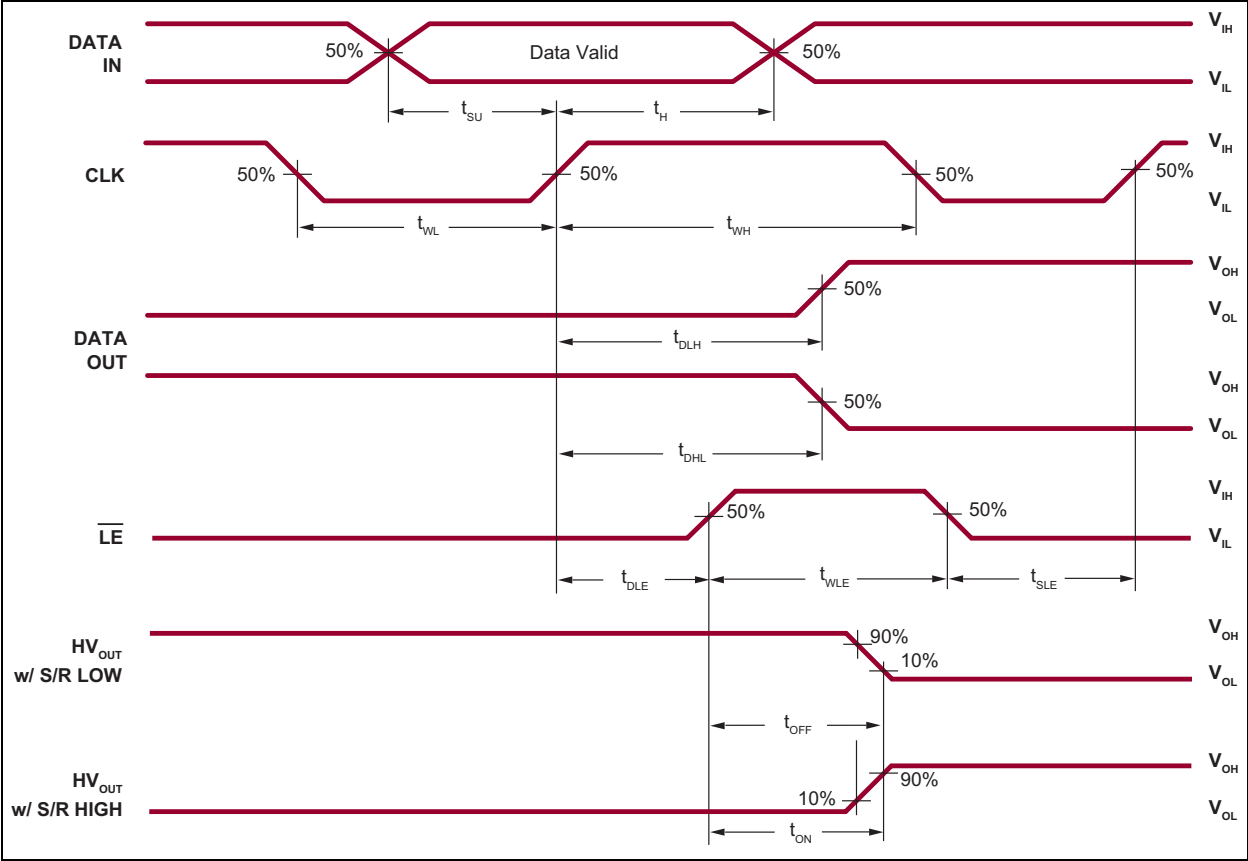
1. Connect ground
2. Apply V<sub>DD</sub>
3. Set all inputs (Data, CLK,  $\overline{LE}$ , etc.) to a known state
4. Apply V<sub>PP</sub>
5. The V<sub>PP</sub> should not fall below V<sub>DD</sub> or float during operation.

To power-down the device, reverse the steps above.



**FIGURE 3-1:** Input and Output Equivalent Circuits

# HV5308 / HV5408

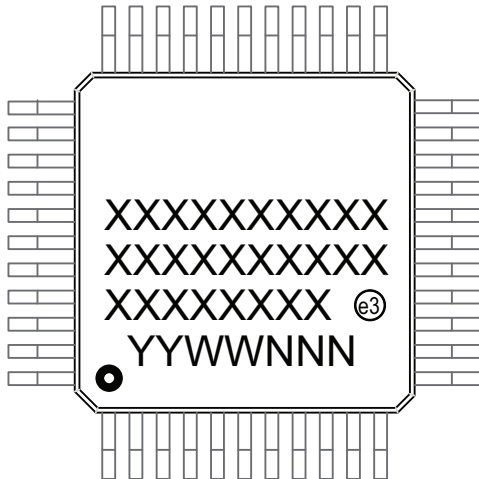


**FIGURE 3-2:** Switching Waveforms

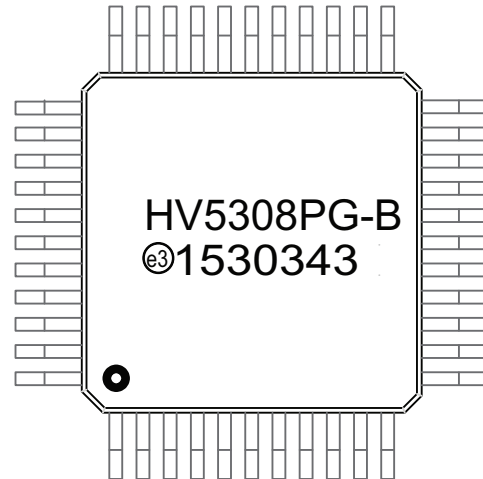
## 4.0 PACKAGING INFORMATION

### 4.1 Package Marking Information

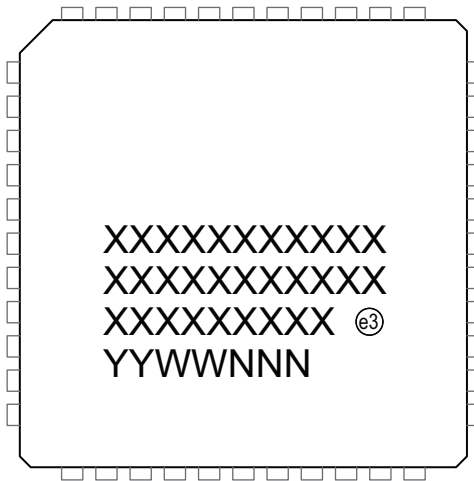
44-lead PQFP



Example



44-lead PLCC



Example

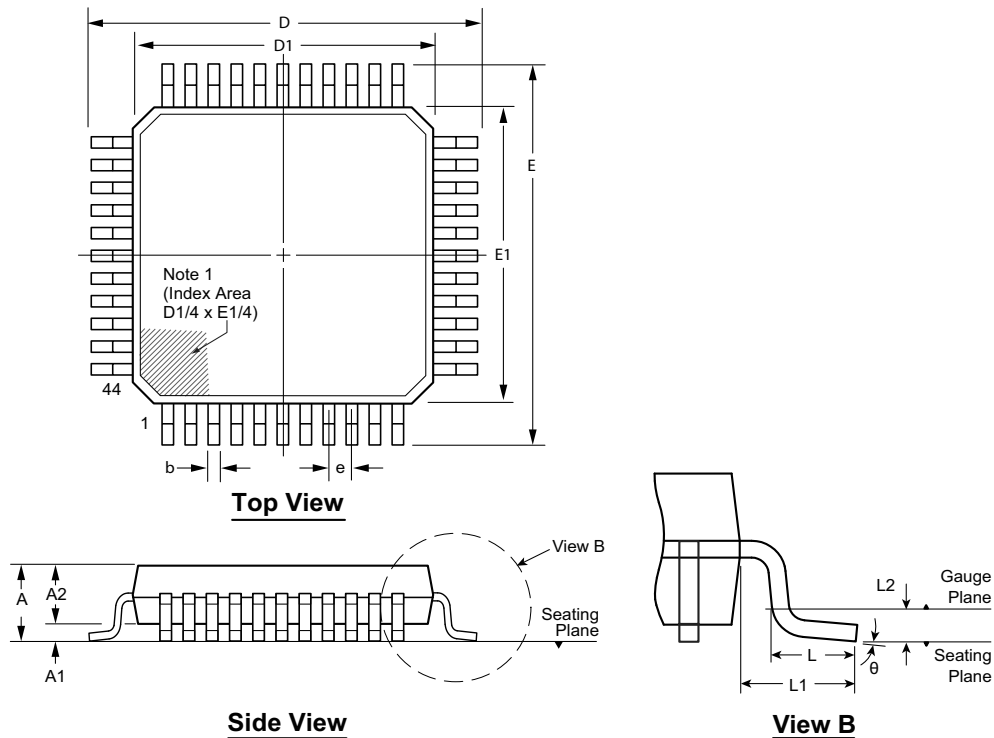


|                |        |                                                                                                                  |
|----------------|--------|------------------------------------------------------------------------------------------------------------------|
| <b>Legend:</b> | XX...X | Product Code or Customer-specific information                                                                    |
|                | Y      | Year code (last digit of calendar year)                                                                          |
|                | YY     | Year code (last 2 digits of calendar year)                                                                       |
|                | WW     | Week code (week of January 1 is week '01')                                                                       |
|                | NNN    | Alphanumeric traceability code                                                                                   |
|                | (e3)   | Pb-free JEDEC® designator for Matte Tin (Sn)                                                                     |
|                | *      | This package is Pb-free. The Pb-free JEDEC designator (e3) can be found on the outer packaging for this package. |

**Note:** In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for product code or customer-specific information. Package may or not include the corporate logo.

## 44-Lead PQFP Package Outline (PG)

10.00x10.00mm body, 2.35mm height (max), 0.80mm pitch



Note: For the most current package drawings, see the Microchip Packaging Specification at [www.microchip.com/packaging](http://www.microchip.com/packaging).

**Note:**

1. A Pin 1 identifier must be located in the index area indicated. The Pin 1 identifier can be: a molded mark/identifier; an embedded metal marker; or a printed indicator.

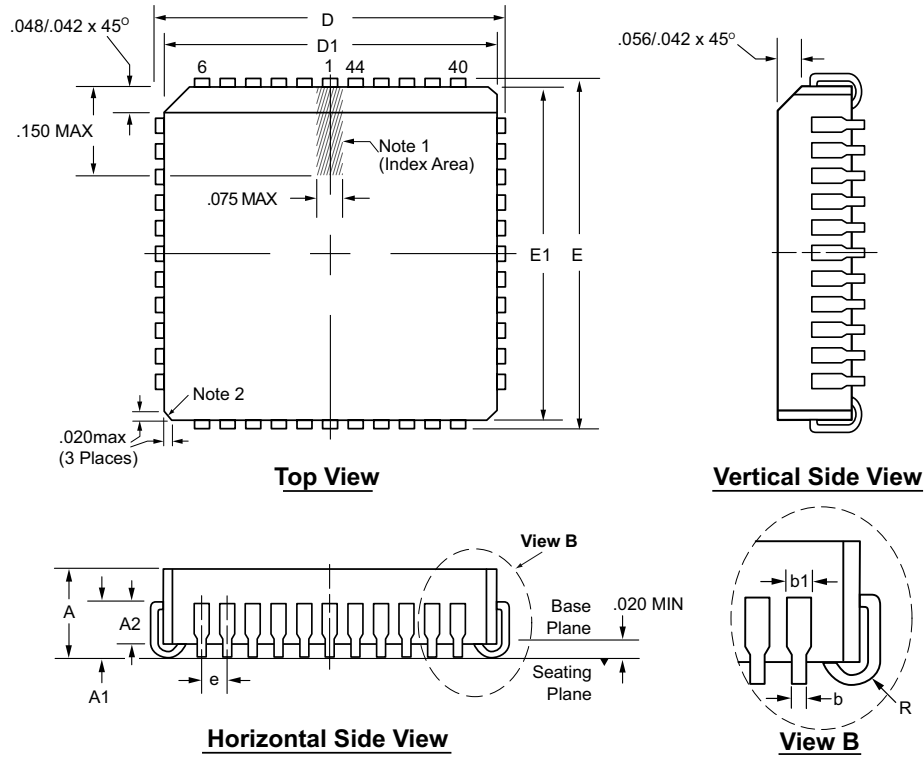
| Symbol            |     | A     | A1   | A2   | b    | D      | D1     | E      | E1     | e           | L    | L1          | L2          | θ    |
|-------------------|-----|-------|------|------|------|--------|--------|--------|--------|-------------|------|-------------|-------------|------|
| Dimension<br>(mm) | MIN | 1.95* | 0.00 | 1.95 | 0.30 | 13.65* | 9.80*  | 13.65* | 9.80*  | 0.80<br>BSC | 0.73 | 1.95<br>REF | 0.25<br>BSC | 0°   |
|                   | NOM | -     | -    | 2.00 | -    | 13.90  | 10.00  | 13.90  | 10.00  |             | 0.88 |             |             | 3.5° |
|                   | MAX | 2.35  | 0.25 | 2.10 | 0.45 | 14.15* | 10.20* | 14.15* | 10.20* |             | 1.03 |             |             | 7°   |

JEDEC Registration MO-112, Variation AA-2, Issue B, Sep.1995.

\* This dimension is not specified in the JEDEC drawing.

Drawings not to scale.

## 44-Lead PLCC Package Outline (PJ) .653x.653in body, .180in height (max), .050in pitch



Note: For the most current package drawings, see the Microchip Packaging Specification at [www.microchip.com/packaging](http://www.microchip.com/packaging).

**Notes:**

1. A Pin 1 identifier must be located in the index area indicated. The Pin 1 identifier can be: a molded mark/identifier; an embedded metal marker; or a printed indicator.
2. Actual shape of this feature may vary.

| Symbol                |     | A    | A1   | A2   | b    | b1    | D    | D1   | E    | E1   | e           | R    |
|-----------------------|-----|------|------|------|------|-------|------|------|------|------|-------------|------|
| Dimension<br>(inches) | MIN | .165 | .090 | .062 | .013 | .026  | .685 | .650 | .685 | .650 | .050<br>BSC | .025 |
|                       | NOM | .172 | .105 | -    | -    | -     | .690 | .653 | .690 | .653 |             | .035 |
|                       | MAX | .180 | .120 | .083 | .021 | .036† | .695 | .656 | .695 | .656 |             | .045 |

JEDEC Registration MS-018, Variation AC, Issue A, June, 1993.

† This dimension differs from the JEDEC drawing.

Drawings not to scale.

## APPENDIX A: REVISION HISTORY

### Revision A (December 2015)

- Updated file to Microchip format

## PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

| <u>PART NO.</u> | <u>XX</u>                                                                                                                                                                                                                                                    | - | <u>X</u> | - | <u>X</u>      | - | <u>X</u>   |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----------|---|---------------|---|------------|
| Device          | Package Options                                                                                                                                                                                                                                              |   | Version  |   | Environmental |   | Media Type |
| Device:         | HV5308 = 32-Channel Serial to Parallel Converter, with High-voltage Push-pull Outputs data shifts in clockwise direction<br>HV5408 = 32-Channel Serial to Parallel Converter, with High-voltage Push-pull Outputs data shifts in counter-clockwise direction |   |          |   |               |   |            |
| Package:        | PG = 44-Lead PQFP<br>PJ = 44-Lead PLCC                                                                                                                                                                                                                       |   |          |   |               |   |            |
| Version         | B = Revision B                                                                                                                                                                                                                                               |   |          |   |               |   |            |
| Environmental   | G = Lead (Pb)-free/ROHS-compliant package                                                                                                                                                                                                                    |   |          |   |               |   |            |
| Media Type:     | (blank) = 96/Tray for PG package<br>= 27/Tube for PJ package<br>M903 = 500/Reel for PG package<br>M919 = 500/Reel for PJ package                                                                                                                             |   |          |   |               |   |            |

| Examples:            |                                                             |
|----------------------|-------------------------------------------------------------|
| a) HV5308PG-B-G      | Clockwise data shift, 44-Lead PQFP package, 96/Tray         |
| b) HV5308PG-B-G-M919 | Clockwise data shift, 44-Lead PQFP package, 500/Reel        |
| c) HV5308PJ-B-G      | Clockwise data shift, 44-Lead PLCC package, 27/Tube         |
| d) HV5308PJ-B-G-M903 | Clockwise data shift, 44-Lead PLCC package, 500/Reel        |
| e) HV5408PG-B-G      | Counter-clockwise data shift, 44-Lead PQFP package, 96/Tray |
| f) HV5408PJ-B-G      | Counter-clockwise data shift, 44-Lead PLCC package, 27/Tube |

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ISBN: 978-1-5224-0073-8

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