

## 32-Channel Serial To Parallel Converter With Open Drain Outputs

### Ordering Information

Device	Package Options			
	44 J-Lead Quad Ceramic Chip Carrier	44 J-Lead Quad Plastic Chip Carrier	44 Lead Quad Plastic Gullwing	Die
HV5122	HV5122DJ	HV5122PJ	HV5122PG	HV5122X
HV5222	HV5222DJ	HV5222PJ	HV5222PG	HV5222X

### Features

- Processed with HVCMOS® technology
- Output voltages to 225V using a ramped supply voltage
- Sink current minimum 100mA
- Shift register speed 8MHz
- Strobe and enable inputs
- CMOS compatible inputs
- Forward and reverse shifting options
- 44-lead ceramic surface mount package
- Hi-Rel processing available

### Absolute Maximum Ratings<sup>1</sup>

Supply voltage, $V_{DD}$	-0.5V to +15V	
Output voltage, $V_{PP}$	-0.5V to +250V	
Logic input levels	-0.5V to $V_{DD} + 0.5V$	
Ground current <sup>2</sup>	1.5A	
Continuous total power dissipation <sup>3</sup>	Plastic	1200mW
	Ceramic	1500mW
Operating temperature range	Plastic	-40°C to +85°C
	Ceramic	-55 to +125°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 are 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 maximum operating temperature at 20mW/°C for plastic and at 15mW/°C for ceramic.

12/13/01

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### General Description

The HV51 and HV52 are low voltage serial to high voltage parallel converters with open drain outputs. These devices have been designed for use as drivers for AC electroluminescent displays. They can also be used in any application requiring multiple output high voltage current sinking capabilities such as driving inkjet and electrostatic print heads, plasma panels, vacuum fluorescent, or large matrix LCD displays.

These devices consist of a 32-bit shift register and control logic to perform the Output Enable and All-ON functions. Data is shifted through the shift register on the high to low transition of the clock. The HV51 shifts in the counterclockwise direction when viewed from the top of the package and the HV52 shifts in the 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. Operation of the shift register is not affected by the OE (Output Enable) or the STR (Strobe) inputs.

The HV51 and HV52 have been designed to be used in systems which either switch off the high voltage supply before changing the state of the high voltage outputs or which limit the current through each output.

# Electrical Characteristics (over recommended operating conditions unless noted)

## DC Characteristics

Symbol	Parameter	Min	Typ	Max	Units	Conditions
$I_{DD}$	$V_{DD}$ supply current			15	mA	$f_{CLK} = 8\text{MHz}$ $F_{DATA} = 4\text{MHz}$
$I_{DDQ}$	Quiescent $V_{DD}$ supply current			100	$\mu\text{A}$	All $V_{IN} = 0\text{V}$
$I_{O(OFF)}$	Off state output current			10	$\mu\text{A}$	All outputs high All SWS parallel
$I_{IH}$	High-level logic input current			1	$\mu\text{A}$	$V_{IH} = 12\text{V}$
$I_{IL}$	Low-level logic input current			-1	$\mu\text{A}$	$V_{IL} = 0\text{V}$
$V_{OH}$	High-level output data out	$V_{DD} - 1.0\text{V}$			V	$I_{Dout} = -100\mu\text{A}$
$V_{OL}$	Low-level output voltage	$HV_{OUT}$		15.0	V	$I_{HVout} = +100\text{mA}$
		Data out		1.0	V	$I_{Dout} = +100\mu\text{A}$
$V_{OC}$	$HV_{OUT}$ Clamp Voltage			-1.5	V	$I_{OL} = -100\text{mA}$

## AC Characteristics ( $V_{DD} = 12\text{V}$ , $T_C = 25^\circ\text{C}$ )

Symbol	Parameter	Min	Typ	Max	Units	Conditions
$f_{CLK}$	Clock frequency			8	MHz	
$t_W$	Clock width high or low	62			ns	
$t_{SU}$	Data set-up time before clock falls	25			ns	
$t_H$	Data hold time after clock falls	10			ns	
$t_{ON}$	Turn ON time, $HV_{OUT}$ from strobe			500	ns	$R_L = 2\text{K}\Omega$ to 200V
$t_{DHL}$	Delay time clock to data high to low			100	ns	$C_L = 15\text{pF}$
$t_{DLH}$	Delay time clock to data low to high			100	ns	$C_L = 15\text{pF}$

## Recommended Operating Conditions

Symbol	Parameter	Min	Typ	Max	Units	
$V_{DD}$	Logic supply voltage	10.8	12	13.2	V	
$HV_{OUT}$	High voltage output	-0.3		225	V	
$V_{IH}$	High-level input voltage	$V_{DD} - 2\text{V}$		$V_{DD}$	V	
$V_{IL}$	Low-level input voltage	0		2.0	V	
$f_{CLK}$	Clock frequency			8	MHz	
$T_A$	Operating free-air temperature	Plastic		-40	+85	$^\circ\text{C}$
		Ceramic		-55	+125	$^\circ\text{C}$

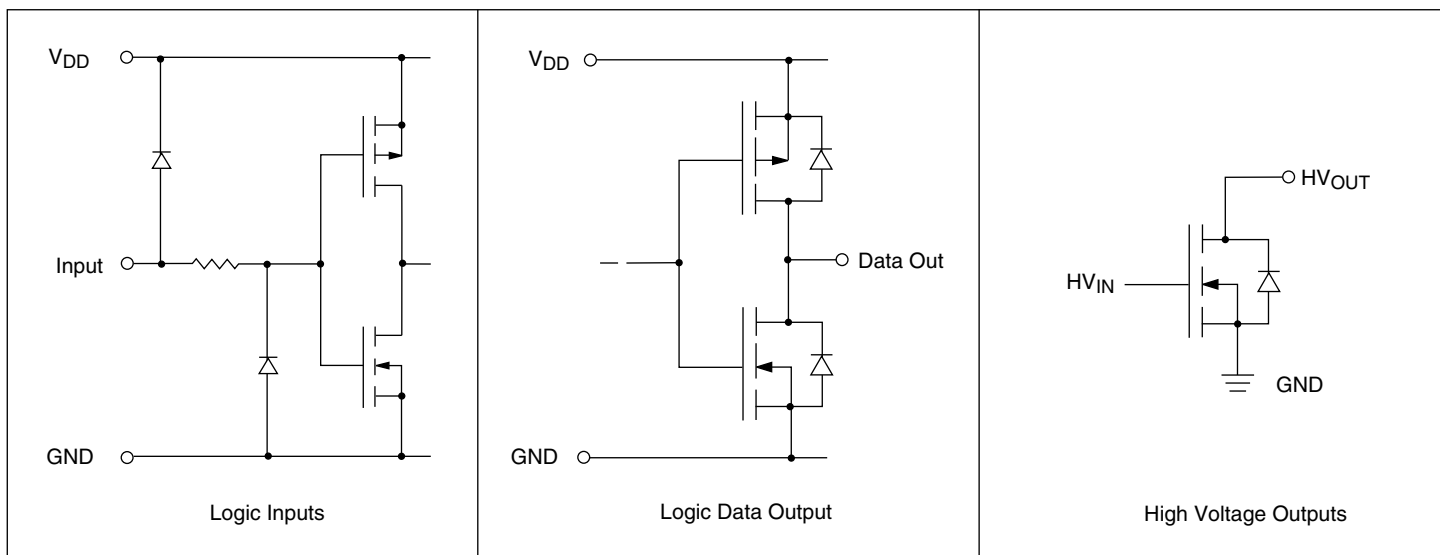
### Notes:

Power-up sequence should be the following:

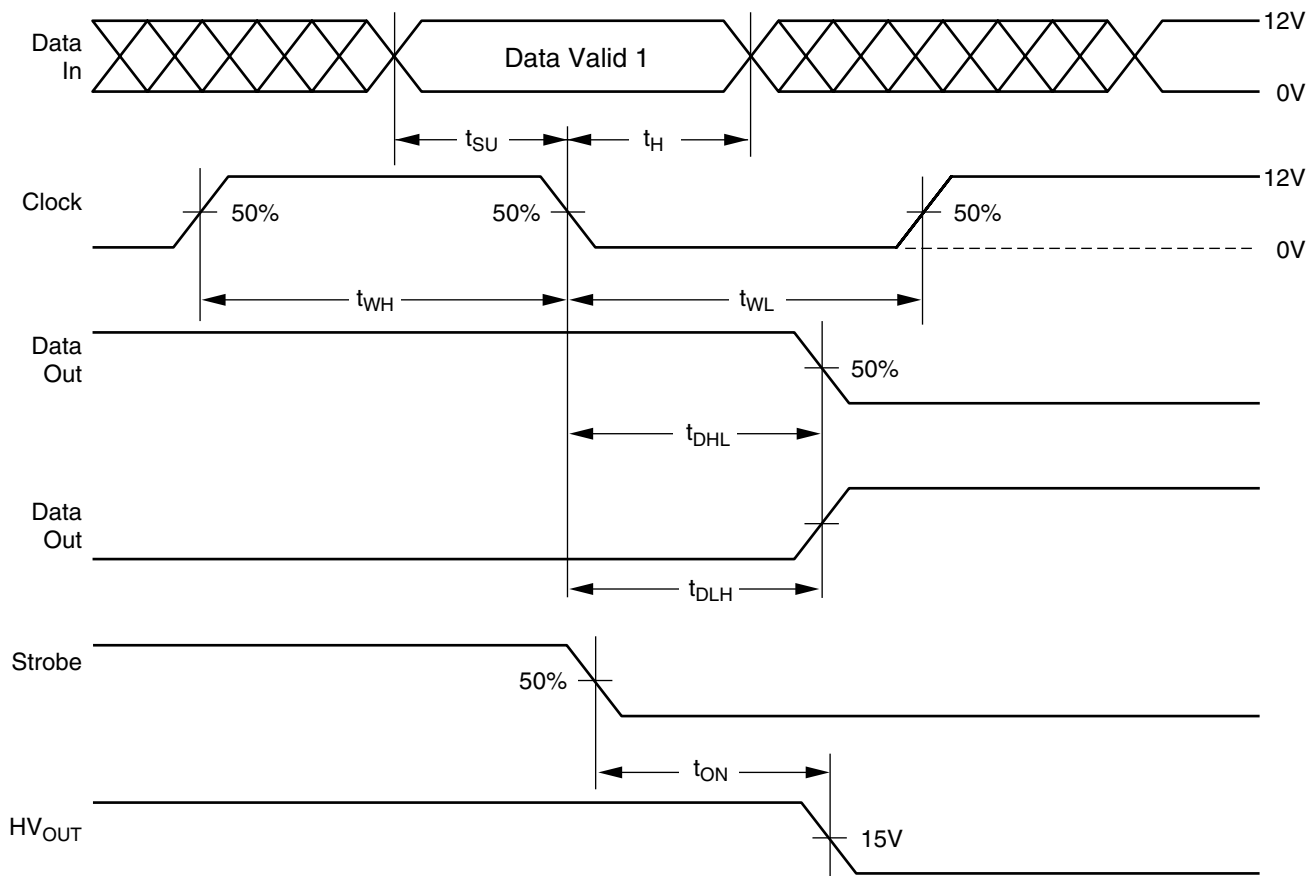
1. Connect ground.
2. Apply  $V_{DD}$ .
3. Connect all inputs to a known state.

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

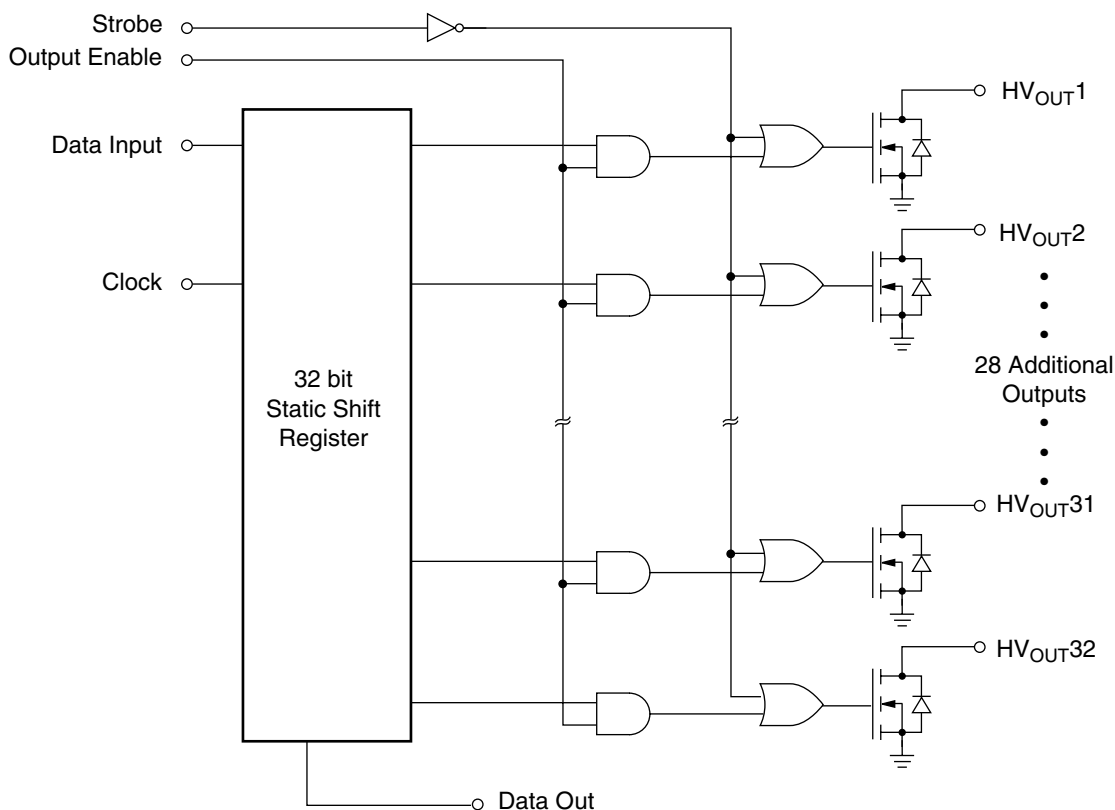
# Input and Output Equivalent Circuits



# Switching Waveforms



# Functional Block Diagram



# Function Table

Function	Inputs				Outputs			
	Data In	CLK	OE	Strobe	Shift Reg 1 2...32	HV Outputs 1 2...32		Data Out *
All on	X	X	X	L	* *...*	ON ON...ON		*
All off	X	X	L	H	* *...*	OFF OFF...OFF		*
Load S/R	H or L	↓	L	H	H or L *...*	OFF OFF...OFF		
Output enable	X	H or L	H	H	H or L *...*	ON or OFF *...*		*

**Notes:**

- X = Don't care
- \* = Dependent on previous stage's state before the last CLK : High to low transition.
- ↓ = High to low transition
- H = High level
- L = Low level

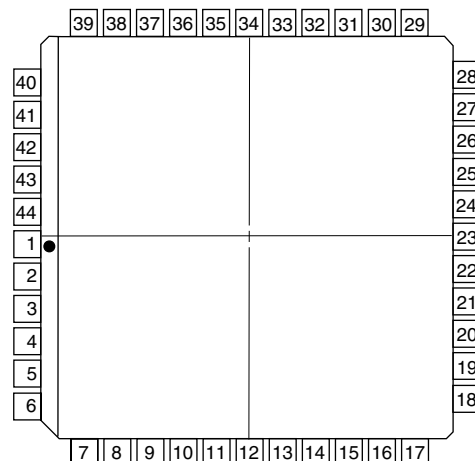
## Pin Configurations

## Package Outline

### HV51

#### 44 Pin J-Lead Package

Pin	Function	Pin	Function
1	HV <sub>OUT</sub> 16	23	Output Enable
2	HV <sub>OUT</sub> 17	24	Clock
3	HV <sub>OUT</sub> 18	25	GND
4	HV <sub>OUT</sub> 19	26	V <sub>DD</sub>
5	HV <sub>OUT</sub> 20	27	Strobe
6	HV <sub>OUT</sub> 21	28	Data In
7	HV <sub>OUT</sub> 22	29	N/C
8	HV <sub>OUT</sub> 23	30	HV <sub>OUT</sub> 1
9	HV <sub>OUT</sub> 24	31	HV <sub>OUT</sub> 2
10	HV <sub>OUT</sub> 25	32	HV <sub>OUT</sub> 3
11	HV <sub>OUT</sub> 26	33	HV <sub>OUT</sub> 4
12	HV <sub>OUT</sub> 27	34	HV <sub>OUT</sub> 5
13	HV <sub>OUT</sub> 28	35	HV <sub>OUT</sub> 6
14	HV <sub>OUT</sub> 29	36	HV <sub>OUT</sub> 7
15	HV <sub>OUT</sub> 30	37	HV <sub>OUT</sub> 8
16	HV <sub>OUT</sub> 31	38	HV <sub>OUT</sub> 9
17	HV <sub>OUT</sub> 32	39	HV <sub>OUT</sub> 10
18	Data Out	40	HV <sub>OUT</sub> 11
19	N/C	41	HV <sub>OUT</sub> 12
20	N/C	42	HV <sub>OUT</sub> 13
21	N/C	43	HV <sub>OUT</sub> 14
22	N/C	44	HV <sub>OUT</sub> 15



top view  
44-pin J-Lead Package

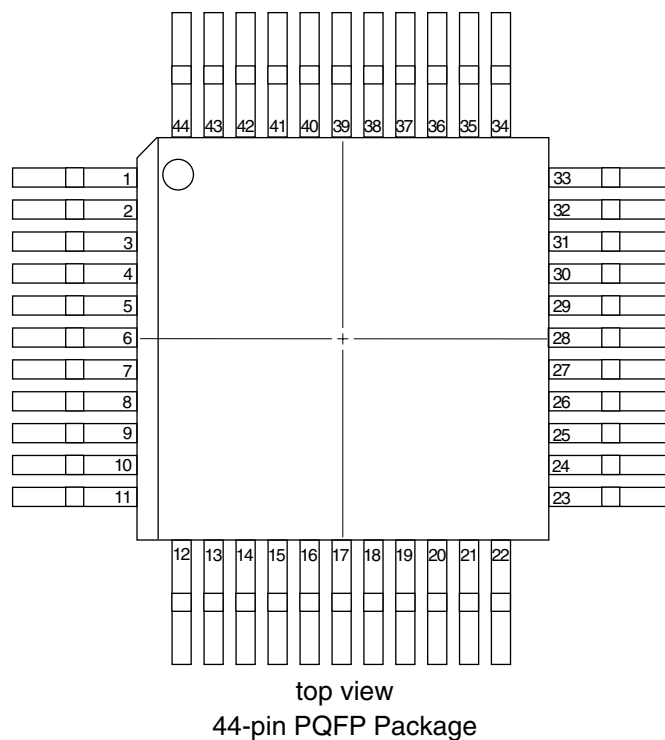
## Pin Configurations

### HV51

#### 44-Pin Quad Plastic Package

Pin	Function	Pin	Function
1	HV <sub>OUT</sub> 11	23	Data Out
2	HV <sub>OUT</sub> 12	24	N/C
3	HV <sub>OUT</sub> 13	25	N/C
4	HV <sub>OUT</sub> 14	26	N/C
5	HV <sub>OUT</sub> 15	27	N/C
6	HV <sub>OUT</sub> 16	28	Output Enable
7	HV <sub>OUT</sub> 17	29	CLK
8	HV <sub>OUT</sub> 18	30	GND
9	HV <sub>OUT</sub> 19	31	V <sub>DD</sub>
10	HV <sub>OUT</sub> 20	32	Strobe
11	HV <sub>OUT</sub> 21	33	Data In
12	HV <sub>OUT</sub> 22	34	N/C
13	HV <sub>OUT</sub> 23	35	HV <sub>OUT</sub> 1
14	HV <sub>OUT</sub> 24	36	HV <sub>OUT</sub> 2
15	HV <sub>OUT</sub> 25	37	HV <sub>OUT</sub> 3
16	HV <sub>OUT</sub> 26	38	HV <sub>OUT</sub> 4
17	HV <sub>OUT</sub> 27	39	HV <sub>OUT</sub> 5
18	HV <sub>OUT</sub> 28	40	HV <sub>OUT</sub> 6
19	HV <sub>OUT</sub> 29	41	HV <sub>OUT</sub> 7
20	HV <sub>OUT</sub> 30	42	HV <sub>OUT</sub> 8
21	HV <sub>OUT</sub> 31	43	HV <sub>OUT</sub> 9
22	HV <sub>OUT</sub> 32	44	HV <sub>OUT</sub> 10

## Package Outline



### HV52

#### 44-Pin Quad Plastic Package

Pin	Function	Pin	Function
1	HV <sub>OUT</sub> 22	23	Data Out
2	HV <sub>OUT</sub> 21	24	N/C
3	HV <sub>OUT</sub> 20	25	N/C
4	HV <sub>OUT</sub> 19	26	N/C
5	HV <sub>OUT</sub> 18	27	N/C
6	HV <sub>OUT</sub> 17	28	Output Enable
7	HV <sub>OUT</sub> 16	29	CLK
8	HV <sub>OUT</sub> 15	30	GND
9	HV <sub>OUT</sub> 14	31	V <sub>DD</sub>
10	HV <sub>OUT</sub> 13	32	Strobe
11	HV <sub>OUT</sub> 12	33	Data In
12	HV <sub>OUT</sub> 11	34	N/C
13	HV <sub>OUT</sub> 10	35	HV <sub>OUT</sub> 32
14	HV <sub>OUT</sub> 9	36	HV <sub>OUT</sub> 31
15	HV <sub>OUT</sub> 8	37	HV <sub>OUT</sub> 30
16	HV <sub>OUT</sub> 7	38	HV <sub>OUT</sub> 29
17	HV <sub>OUT</sub> 6	39	HV <sub>OUT</sub> 28
18	HV <sub>OUT</sub> 5	40	HV <sub>OUT</sub> 27
19	HV <sub>OUT</sub> 4	41	HV <sub>OUT</sub> 26
20	HV <sub>OUT</sub> 3	42	HV <sub>OUT</sub> 25
21	HV <sub>OUT</sub> 2	43	HV <sub>OUT</sub> 24
22	HV <sub>OUT</sub> 1	44	HV <sub>OUT</sub> 23