

## 32 MHz, 64-Channel Serial To Parallel Converter With Push-Pull Outputs

### Ordering Information

Device	Package Options			
	80 Lead Quad Ceramic Gullwing	80 Lead Quad Plastic Gullwing (MIL-STD-883 Processed*)	80 Lead Quad Ceramic Gullwing (MIL-STD-883 Processed*)	Die
HV57708	HV57708DG	HV57708PG	RBHV57708DG	HV57708X

\* For Hi-Rel process flows, refer to page 5-3 of the Databook.

### Features

- Processed with HVCMOS® technology
- 5V CMOS logic
- Output voltages up to 80V
- Low power level shifting
- 32MHz equivalent data rate
- Latched data outputs
- Forward and reverse shifting options (DIR pin)
- Diode to  $V_{PP}$  allows efficient power recovery
- Outputs may be hot switched
- Hi-Rel processing available

### Absolute Maximum Ratings

Supply voltage, $V_{DD}$ <sup>1</sup>	-0.5V to +7.5V	
Output voltage, $V_{PP}$ <sup>1</sup>	-0.5V to +90V	
Logic input levels <sup>1</sup>	-0.3V to $V_{DD}$ +0.3V	
Ground current <sup>2</sup>	1.5A	
Continuous total power dissipation <sup>3</sup>	Plastic	1200mW
	Ceramic	1900mW
Operating temperature range	Plastic	-40 to 85°C
	Ceramic	-55°C 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. 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 19mW/°C for ceramic.

### General Description

The HV577 is a low-voltage serial to high-voltage parallel converter with push-pull outputs. This device has been designed for use as a driver for electroluminescent displays. It can also be used in any application requiring multiple output high-voltage current sourcing and sinking capability such as driving plasma panels, vacuum fluorescent displays, or large matrix LCD displays.

The device has 4 parallel 16-bit shift registers, permitting data rates 4X the speed of one (they are clocked together). There are also 64 latches and control logic to perform the polarity select and blanking of the outputs. HVout1 is connected to the first stage of the first shift register through the polarity and blanking logic. Data is shifted through the shift registers on the logic low to high transition of the clock. The DIR pin causes CCW shifting when connected to GND, and CW shifting when connected to  $V_{DD}$ . A data output buffer is provided for cascading devices. This output reflects the current status of the last bit of the shift register (HV<sub>OUT64</sub>). Operation of the shift register is not affected by the  $\overline{LE}$  (latch enable),  $\overline{BL}$  (blanking), or the  $\overline{POL}$  (polarity) inputs. Transfer of data from the shift registers to the latches occurs when the  $\overline{LE}$  (latch enable) input is high. The data in the latches is stored when  $\overline{LE}$  is low.

For detailed circuit and application information, please refer to application note AN-H3.

# Electrical Characteristics

(over recommended operating conditions unless noted,  $T_A = -40^\circ\text{C}$  to  $+85^\circ\text{C}$ )

## DC Characteristics

Symbol	Parameter	Min	Max	Units	Conditions
$I_{DD}$	$V_{DD}$ supply current		15	mA	$V_{DD} = V_{DD\ max}$ $f_{CLK} = 8\text{MHz}$
$I_{PP}$	High voltage supply current		100	$\mu\text{A}$	Outputs high
			100	$\mu\text{A}$	Outputs low
$I_{DDQ}$	Quiescent $V_{DD}$ supply current		100	$\mu\text{A}$	All $V_{IN} = V_{DD}$
$V_{OH}$	High-level output	HV <sub>OUT</sub>	65	V	$I_O = -15\text{mA}$ , $V_{PP} = 80\text{V}$
		Data out	$V_{DD} - 0.5$	V	$I_O = -100\mu\text{A}$
$V_{OL}$	Low-level output	HV <sub>OUT</sub>	7	V	$I_O = 12\text{mA}$ , $V_{PP} = 80\text{V}$
		Data out	0.5	V	$I_O = 100\mu\text{A}$
$I_{IH}$	High-level logic input current		1	$\mu\text{A}$	$V_{IH} = V_{DD}$
$I_{IL}$	Low-level logic input current		-1	$\mu\text{A}$	$V_{IL} = 0\text{V}$
$V_{OC}$	High voltage clamp diode		1	V	$I_{OC} = 1\text{mA}$

## AC Characteristics

( $T_A = 85^\circ\text{C}$  max. Logic signal inputs and Data inputs have  $t_r$ ,  $t_f \leq 5\text{ns}$  [10% and 90% points])

Symbol	Parameter	Min	Max	Units	Conditions
$f_{CLK}$	Clock frequency		8	MHz	Per Register
$t_{WL}, t_{WH}$	Clock width high or low	62		ns	
$t_{SU}$	Data set-up time before clock rises	10		ns	
$t_H$	Data hold time after clock rises	15		ns	
$t_{ON}, t_{OFF}$	Time from latch enable to HV <sub>OUT</sub>		500	ns	$C_L = 15\text{pF}$
$t_{DHL}$	Delay time clock to data high to low		70	ns	$C_L = 15\text{pF}$
$t_{DLH}$	Delay time clock to data low to high		70	ns	$C_L = 15\text{pF}$
$t_{DLE}^*$	Delay time clock to $\overline{LE}$ low to high	25		ns	
$t_{WLE}$	Width of $\overline{LE}$ pulse	25		ns	
$t_{SLE}$	$\overline{LE}$ set-up time before clock rises	0		ns	

\*  $t_{DLE}$  is not required but is recommended to produce stable HV outputs and thus minimize power dissipation and current spikes (allows internal SR output to stabilize).

## Recommended Operating Conditions

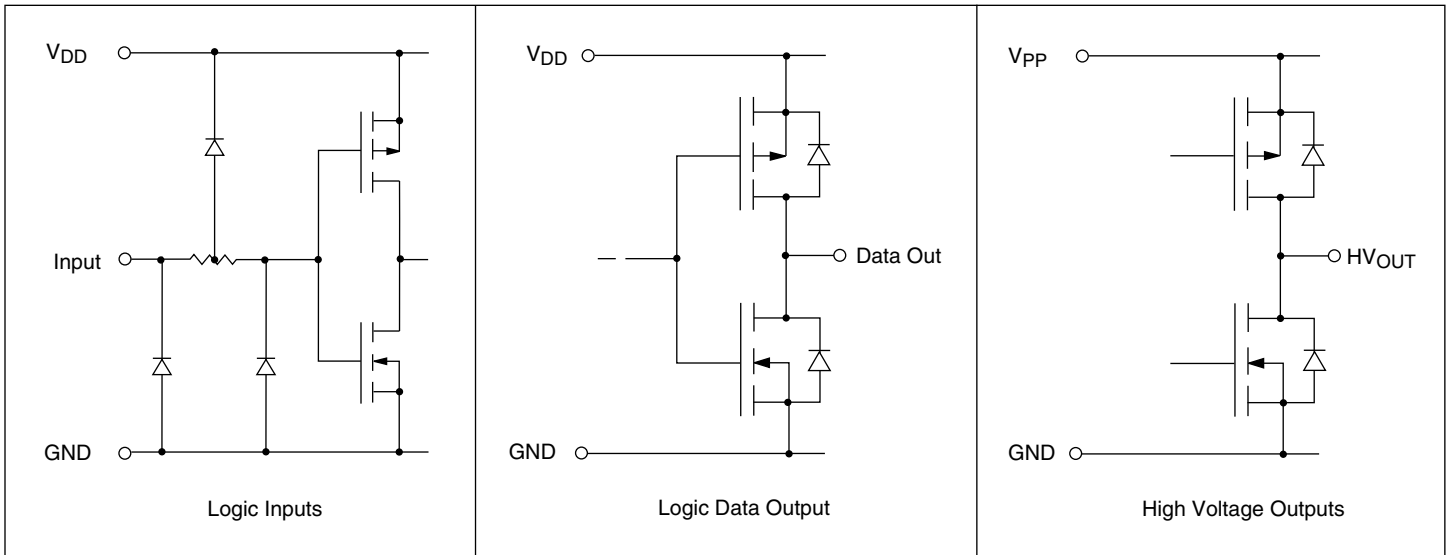
Symbol	Parameter	Min	Max	Units	
$V_{DD}$	Logic supply voltage	4.5	5.5	V	
$V_{PP}$	Output voltage	8	80	V	
$V_{IH}$	High-level input voltage	$V_{DD} - 0.5\text{V}$		V	
$V_{IL}$	Low-level input voltage	0	0.5	V	
$f_{CLK}$	Clock frequency per register		8	MHz	
$T_A$	Operating free-air temperature	Plastic	-40	+85	°C
		Ceramic	-55	+125	

**Note:** Power-up sequence should be the following:

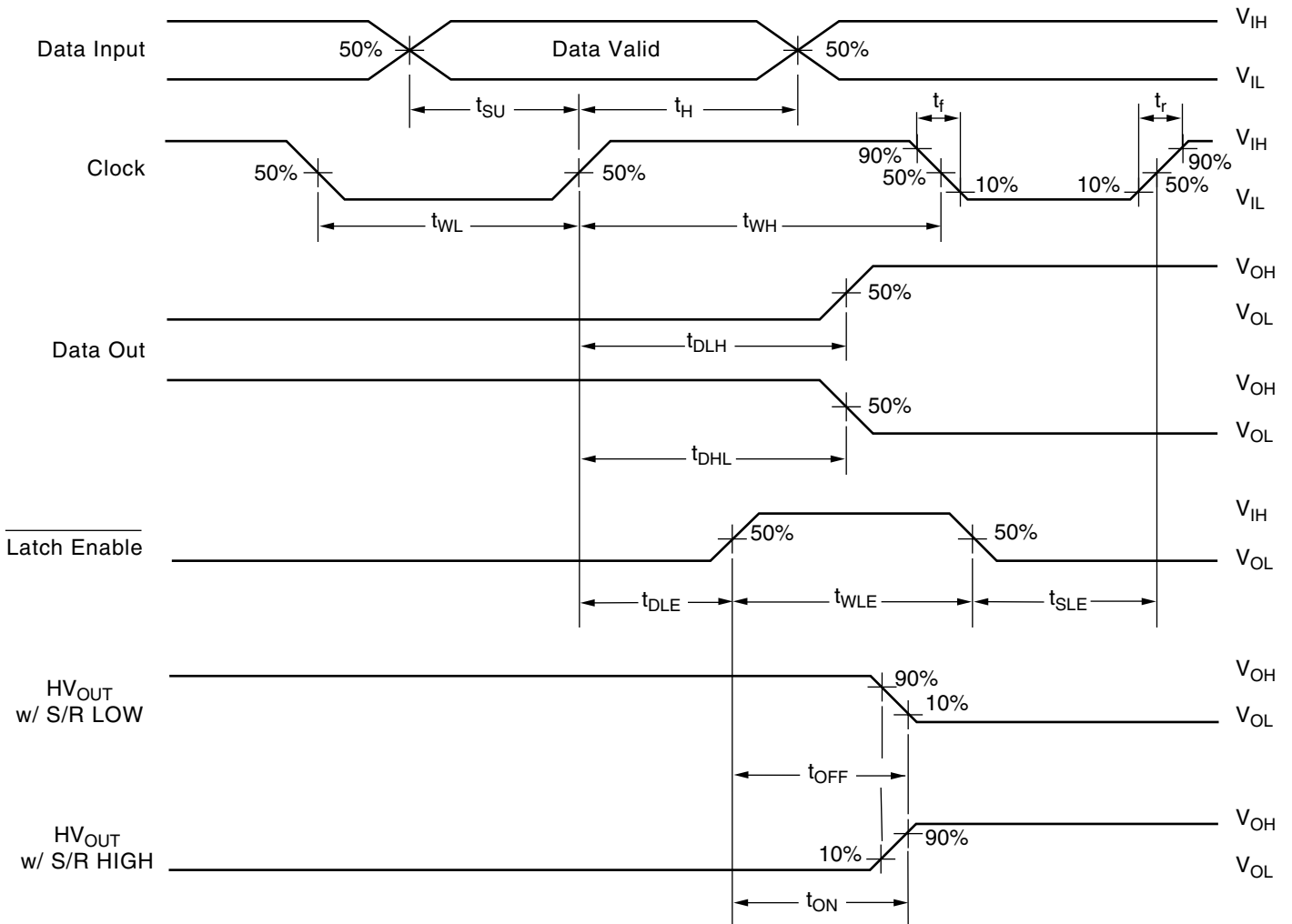
1. Connect ground.
2. Apply  $V_{DD}$ .
3. Set all inputs (Data, CLK, Enable, etc.) to a known state.
4. Apply  $V_{PP}$ .
5. The  $V_{PP}$  should not drop below  $V_{DD}$  or float during operation.

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

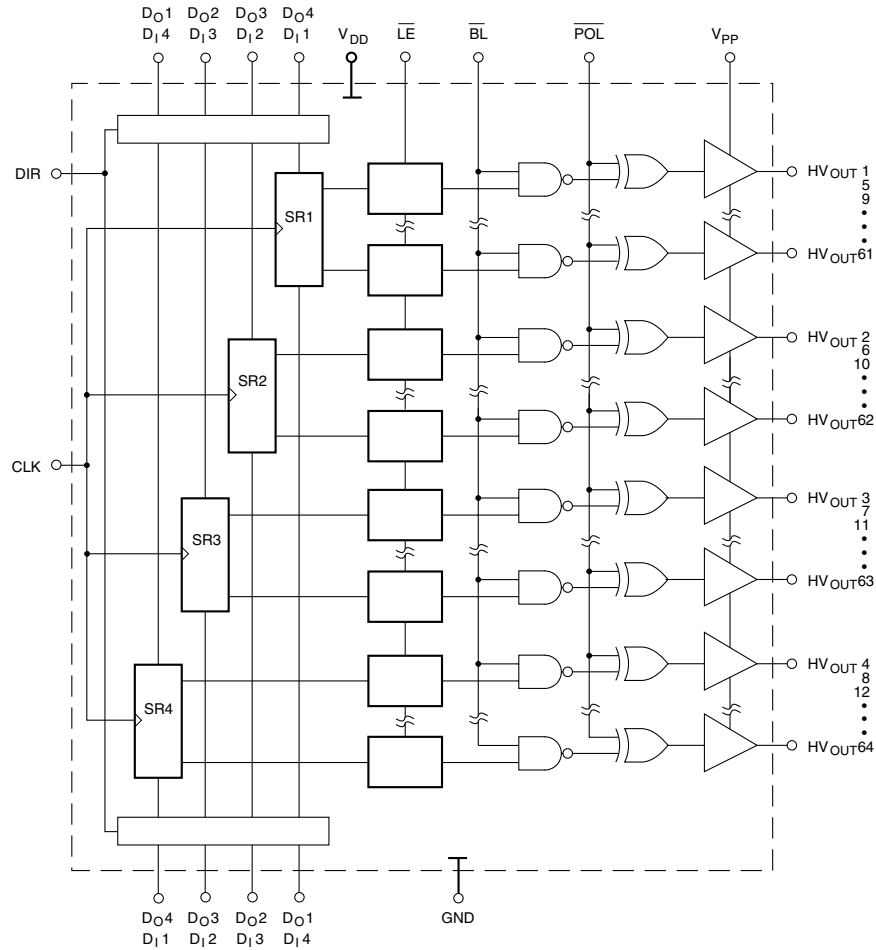
# Input and Output Equivalent Circuits



# Switching Waveforms



# Functional Block Diagram



Note: Each SR (shift register) provides 16 outputs. SR1 supplies every fourth output starting with 1; SR2 supplies every fourth output with 2, etc.

# Function Table

Function	Inputs						Outputs		
	Data	CLK	$\overline{LE}$	$\overline{BL}$	$\overline{POL}$	DIR	Shift Reg	HV Outputs	Data Out
All O/P High	X	X	X	L	L	X		H	
All O/P Low	X	X	X	L	H	X		L	
O/P Normal	X	X	X	H	H	X		No inversion	
O/P Inverted	X	X	X	H	L	X		Inversion	
Data Falls Through (Latches Transparent)	L	$\uparrow$	H	H	H	X	L	L	
	H	$\uparrow$	H	H	H	X	H	H	
	L	$\uparrow$	H	H	L	X	L	H	
	H	$\uparrow$	H	H	L	X	H	L	
Data Stored/ Latches Loaded	X	X	L	H	H	X	*	Stored Data	
	X	X	L	H	L	X	*	Inversion of Stored Data	
I/O Relation	$D_{I/O}1-4A$	$\uparrow$	H	H	H	H	$Q_n \rightarrow Q_{n+1}$	New H or L	$D_{I/O}1-4B$
	$D_{I/O}1-4A$	$\uparrow$	L	H	H	H	$Q_n \rightarrow Q_{n+1}$	Previous H or L	$D_{I/O}1-4B$
	$D_{I/O}1-4B$	$\uparrow$	L	H	H	L	$Q_n \rightarrow Q_{n-1}$	Previous H or L	$D_{I/O}1-4A$
	$D_{I/O}1-4B$	$\uparrow$	H	H	H	L	$Q_n \rightarrow Q_{n-1}$	New H or L	$D_{I/O}1-4A$

Note: \* = dependent on previous stage's state. See Pin configuration for  $D_{IN}$  and  $D_{OUT}$  pin designation for CW and CCW shift.

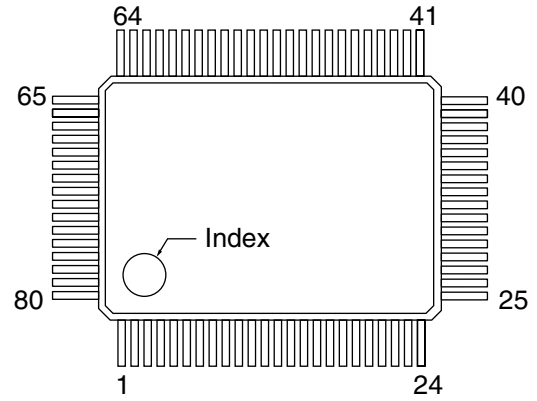
# Pin Configurations

# Package Outline

## HV577

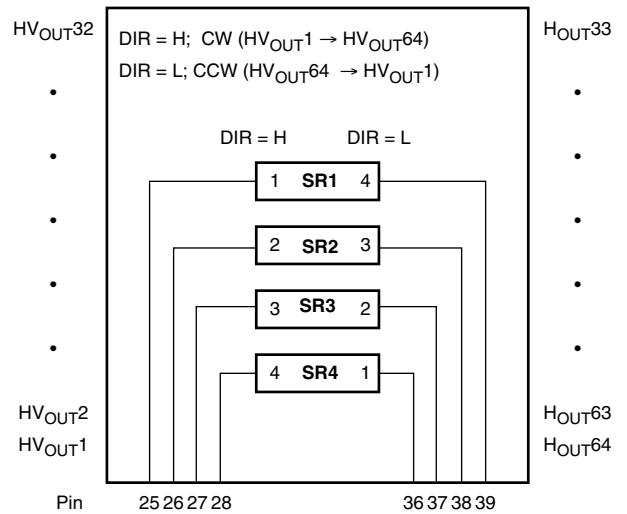
### 80-pin Gullwing

Pin	Function	Pin	Function
1	HV <sub>OUT</sub> 24/41	41	HV <sub>OUT</sub> 64/1
2	HV <sub>OUT</sub> 23/42	42	HV <sub>OUT</sub> 63/2
3	HV <sub>OUT</sub> 22/43	43	HV <sub>OUT</sub> 62/3
4	HV <sub>OUT</sub> 21/44	44	HV <sub>OUT</sub> 61/4
5	HV <sub>OUT</sub> 20/45	45	HV <sub>OUT</sub> 60/5
6	HV <sub>OUT</sub> 19/46	46	HV <sub>OUT</sub> 59/6
7	HV <sub>OUT</sub> 18/47	47	HV <sub>OUT</sub> 58/7
8	HV <sub>OUT</sub> 17/48	48	HV <sub>OUT</sub> 57/8
9	HV <sub>OUT</sub> 16/49	49	HV <sub>OUT</sub> 56/9
10	HV <sub>OUT</sub> 15/50	50	HV <sub>OUT</sub> 55/10
11	HV <sub>OUT</sub> 14/51	51	HV <sub>OUT</sub> 54/11
12	HV <sub>OUT</sub> 13/52	52	HV <sub>OUT</sub> 53/12
13	HV <sub>OUT</sub> 12/53	53	HV <sub>OUT</sub> 52/13
14	HV <sub>OUT</sub> 11/54	54	HV <sub>OUT</sub> 51/14
15	HV <sub>OUT</sub> 10/55	55	HV <sub>OUT</sub> 50/15
16	HV <sub>OUT</sub> 9/56	56	HV <sub>OUT</sub> 49/16
17	HV <sub>OUT</sub> 8/57	57	HV <sub>OUT</sub> 48/17
18	HV <sub>OUT</sub> 7/58	58	HV <sub>OUT</sub> 47/18
19	HV <sub>OUT</sub> 6/59	59	HV <sub>OUT</sub> 46/19
20	HV <sub>OUT</sub> 5/60	60	HV <sub>OUT</sub> 45/20
21	HV <sub>OUT</sub> 4/61	61	HV <sub>OUT</sub> 44/21
22	HV <sub>OUT</sub> 3/62	62	HV <sub>OUT</sub> 43/22
23	HV <sub>OUT</sub> 2/63	63	HV <sub>OUT</sub> 42/23
24	HV <sub>OUT</sub> 1/64	64	HV <sub>OUT</sub> 41/24
25	D <sub>IN</sub> 1/D <sub>OUT</sub> 4(A)	65	HV <sub>OUT</sub> 40/25
26	D <sub>IN</sub> 2/D <sub>OUT</sub> 3(A)	66	HV <sub>OUT</sub> 39/26
27	D <sub>IN</sub> 3/D <sub>OUT</sub> 2(A)	67	HV <sub>OUT</sub> 38/27
28	D <sub>IN</sub> 4/D <sub>OUT</sub> 1(A)	68	HV <sub>OUT</sub> 37/28
29	LE	69	HV <sub>OUT</sub> 36/29
30	CLK	70	HV <sub>OUT</sub> 35/30
31	BL	71	HV <sub>OUT</sub> 34/31
32	V <sub>DD</sub>	72	HV <sub>OUT</sub> 33/32
33	DIR	73	HV <sub>OUT</sub> 32/33
34	GND	74	HV <sub>OUT</sub> 31/34
35	POL	75	HV <sub>OUT</sub> 30/35
36	D <sub>OUT</sub> 4/D <sub>IN</sub> 1(B)	76	HV <sub>OUT</sub> 29/36
37	D <sub>OUT</sub> 3/D <sub>IN</sub> 2(B)	77	HV <sub>OUT</sub> 28/37
38	D <sub>OUT</sub> 2/D <sub>IN</sub> 3(B)	78	HV <sub>OUT</sub> 27/38
39	D <sub>OUT</sub> 1/D <sub>IN</sub> 4(B)	79	HV <sub>OUT</sub> 26/39
40	V <sub>PP</sub>	80	HV <sub>OUT</sub> 25/40



top view

80-pin Gullwing Package



**Note:** Pin designation for DIR = H/L.

Example: For DIR = H, pin 41 is HV<sub>OUT</sub> 64.

For DIR = L, pin 41 is HV<sub>OUT</sub> 1.

For CW/CCW Shift see function table Q<sub>N</sub> → Q<sub>N+1</sub>.