Supertex inc.

Preliminary

16 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	Die	80 Lead Quad Ceramic Gullwing (MIL-STD-883 Processed*)
HV78	HV7808DG	HV7808PG	HV7808X	RBHV7808DG

* 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
- Source/sink current minimum 15mA
- 16MHz 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

General Description

The HV78 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 2 parallel 32-bit shift registers, permitting data rates 2X 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. $HV_{OUT}1$ 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 ($HV_{OUT}64$). 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.

Absolute Maximum Ratings

Supply voltage, V_{DD}[1]		-0.5V to +7.5V
Output voltage, V_{PP}[1]		-0.5V to +90V
Logic input levels[1]		-0.3V to V_{DD} +0.3V
Ground current[2]		1.5A
Continuous total power dissipation[3]	Ceramic	1500mW
	Plastic	1200mW
Operating temperature range		0 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 are referenced to GND.
2. Limited by the total power dissipated in the package.
3. For operation above 25°C ambient, derate linearly to 70°C at 12mW/°C.

Electrical Characteristics (over recommended operating conditions unless noted)

DC Characteristics

Symbol	Parameter		Min	Max	Units	Conditions
I_{DD}	V_{DD} supply current			15	mA	$V_{DD} = V_{DD}$ max f_{CLK} = 8MHz
I_{PP}	High voltage supply current			100	µA	Outputs high
				100	µA	Outputs low
I_{DDQ}	Quiescent V_{DD} supply current			100	µA	All $V_{IN} = V_{DD}$
V_{OH}	High-level output	HV_{OUT}	72		V	I_O= -15mA, V_{PP} = 80V
		Data out	V_{DD} - 0.5		V	I_O= -100µA
V_{OL}	Low-level output	HV_{OUT}		8	V	I_O= 15mA, V_{PP} = 80V
		Data out		0.5	V	I_O= 100µA
I_{IH}	High-level logic input current			1	µA	$V_{IH} = V_{DD}$
I_{IL}	Low-level logic input current			-1	µA	V_{IL} = 0V

AC Characteristics (T_A = 85°C max. Logic signal inputs and Data inputs have t_r, $t_f \leq$ 5ns [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_{OUT}		500	ns	C_L = 15pF
t_{DHL}	Delay time clock to data high to low		70	ns	C_L = 15pF
t_{DLH}	Delay time clock to data low to high		70	ns	C_L = 15pF
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).

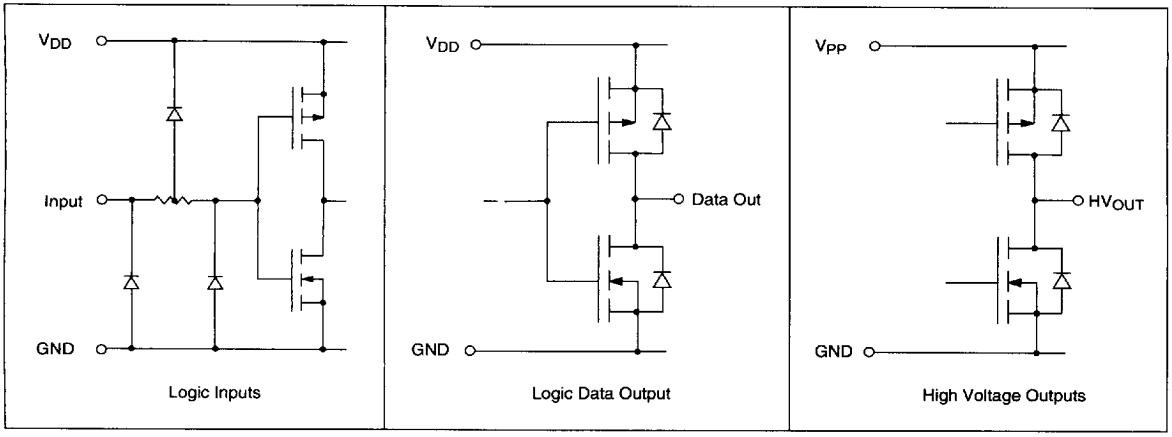
Recommended Operating Conditions

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} -0.5V		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	Commercial	0	+70	°C
		Military Hi-Rel (RB)	-55	+125	

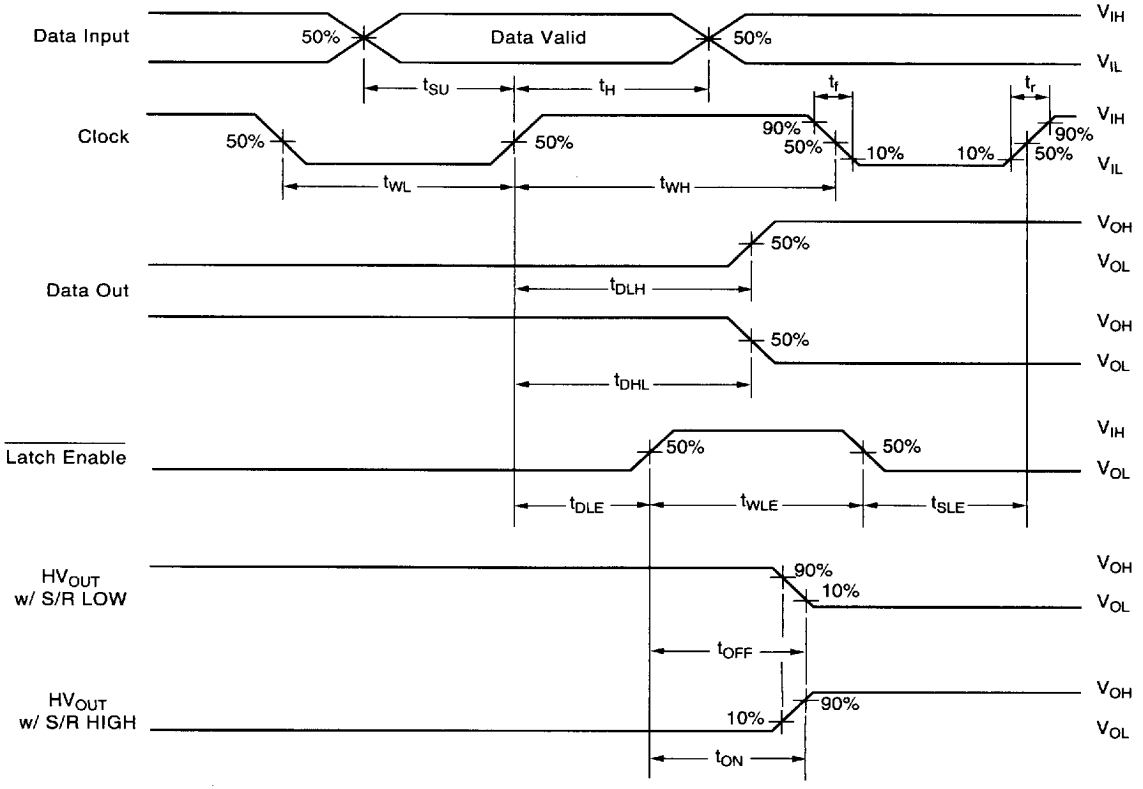
Note:
Power-up sequence should be the following:
1. Connect ground.
2. Apply V_{DD}.
3. Set all inputs (Data, CLK, Enable, etc.) to a known state.
4. Apply V_{PP}.

Power-down sequence should be the reverse of the above.
The V_{PP} should not drop below V_{DD} during operations.

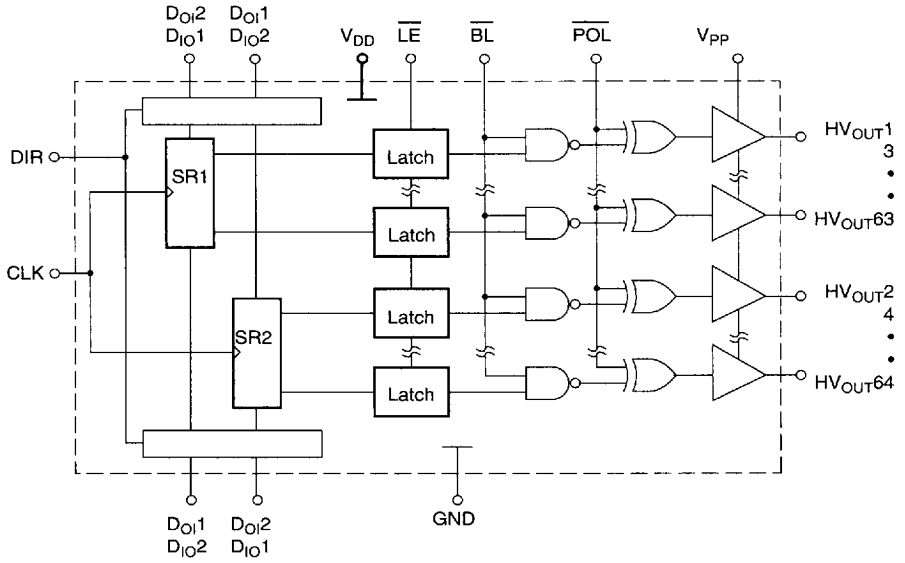
Input and Output Equivalent Circuits



Switching Waveforms



Functional Block Diagram



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	↑	H	H	H	X	L	L	
	H	↑	H	H	H	X	H	H	
	L	↑	H	H	L	X	L	H	
	H	↑	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_{IO}1-2A	↑	H	H	H	H	$Q_n \rightarrow Q_{n+1}$B	New H or L	D_{OI}1-2B
	D_{IO}1-2B	↑	L	H	H	L	$Q_n \rightarrow Q_{n+1}$A	Previous H or L	D_{OI}1-2A

Notes: * = dependent on previous stage's state.

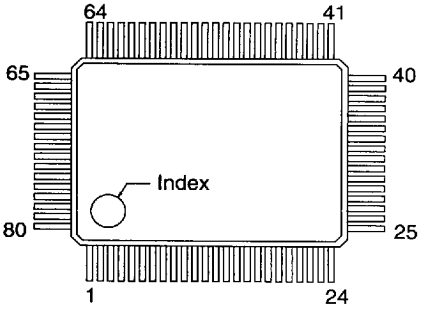
Pin Configurations

HV78
80-pin Gullwing

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

Note:
Pin designation for DIR = H/L.
Example: For DIR = H, pin 41 is HV_{OUT} 64.
For DIR = L, pin 41 is HV_{OUT} 1.
For CW/CCW Shift see function table for $Q_N \rightarrow Q_{N+1}$.

Package Outline



top view

80-pin Gullwing Package