

128-Channel Serial to Parallel Converter with Push-Pull Outputs

Features

- ▶ Processed with HVCMOS technology
- ▶ 128 Channels
- ▶ 4 Separate shift registers
- ▶ 5V CMOS logic
- ▶ Output voltages up to 80V
- ▶ ±30mA output current capability
- ▶ Low power level shifting
- ▶ 40MHz data shifting
- ▶ Latched data outputs
- ▶ Forward and reverse shifting option via DIR pin
- ▶ Output diode to ground and VPP for efficient power recovery
- ▶ Outputs can be hot switched

General Description

The Supertex HV583 is a 128-channel low voltage serial to high voltage parallel converter with push-pull outputs. This device has been designed for use as a display driver. It can also be used in any application requiring multiple output, high voltage current sourcing and sinking capability, such as plasma displays and inkjet printers. The device has 4 parallel 32-bit shift registers, permitting data rates 4X the speed of one.

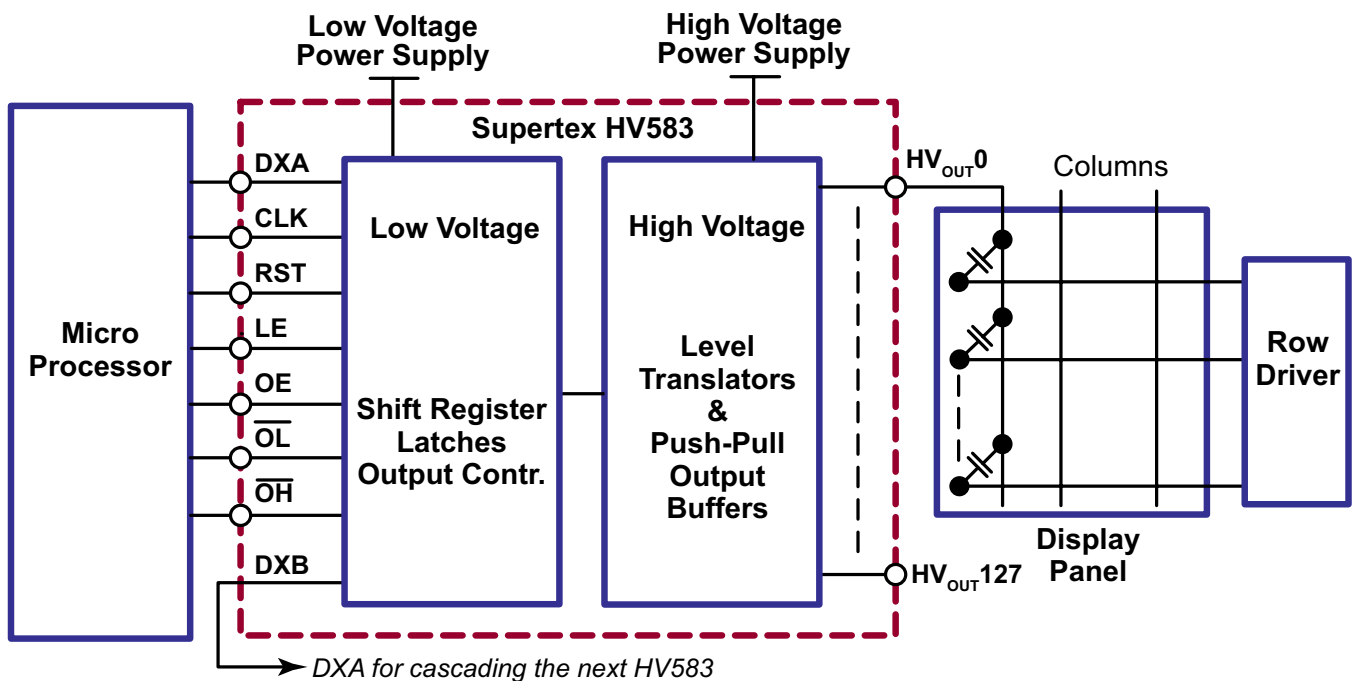
The data is shifted in during the low to high clock transition. There are also 128 latches and control logic to shift clockwise or counterclockwise. In conjunction with the CLK and LE pins, the RST pin can be used to clear the contents of the shift registers and the output latch.

The HV_{OUT} can also be set to a high impedance state by using the OE pin.

Applications

- ▶ Plasma displays
- ▶ Inkjet printer driver

Typical Application Circuit



Ordering Information

Device	Wafer/Die Options		
	Die in Wafer Form	Die on Adhesive Tape	Die in Waffle Pack
HV583	HV583XW	HV583XJ	HV583X

Devices in Wafer/Die form are RoHS compliant ('Green')



Absolute Maximum Ratings

Parameter	Value
Logic supply voltage, V_{DD}	-0.5V to +6.5V
High voltage supply, V_{PP}	-0.5V to +90V
Output source and sink current, I_{OUT}	-65mA to +40mA
Output body diode current, I_{DIODE}	-65mA to +65mA
Logic input voltages	-0.5V to $V_{DD} + 0.5V$
Operating junction temperature, T_J	-25°C to +150°C
Storage temperature	-40°C to +150°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied. Continuous operation of the device at the absolute rating level may affect device reliability. All voltages are referenced to device ground.

Recommended Operating Conditions

Sym	Parameter	Min	Typ	Max	Units	Conditions
V_{PP}	High voltage supply	15	-	80	V	$C_{LOAD} = 300pF$
V_{DD}	Low voltage supply	4.5	5.0	5.5	V	---
I_{OUT}	HV _{OUT} peak output current	-30	-	30	mA	---
SR	V_{PP} power supply slew rate	-	-	8.0	V/ μs	---
f_{CLK}	Clock frequency	-	-	40	MHz	Data read
		-	-	25	MHz	Cascade connection
T_J	Operating junction temperature	-25	-	+125	°C	---

Power-up sequence should be the following:

1. Connect ground
2. Apply V_{DD}
3. Set all inputs (Data, CLK, etc.) to a known state
4. Apply V_{PP}

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

DC Electrical Characteristics ($T_j = 25^\circ\text{C}$, $V_{DD} = 5.0\text{V}$, $V_{PP} = 80\text{V}$, unless otherwise specified)

Sym	Parameter	Min	Typ	Max	Units	Conditions
I_{PPQ}	V_{PP} quiescent supply current	-	-	10	μA	---
I_{DDQ}	V_{DD} quiescent supply current	-	-	10	μA	---
HV_{OH}	High level output voltage	73	76	-	V	$I_{OUT} = 15\text{mA}$, $V_{PP} = 80\text{V}$
		10	-	-		$I_{OUT} = 10\text{mA}$, $V_{PP} = 20\text{V}$
HV_{OHD}	Output p-channel body diode	-	-	81.5	V	$I_{OUT} = -30\text{mA}$, $V_{PP} = 80\text{V}$
HV_{OL}	Low level output voltage	-	3.0	6.0	V	$I_{OUT} = -15\text{mA}$
HV_{OLD}	Output n-channel body diode	-1.5	-	-	V	$I_{OUT} = 30\text{mA}$
V_{IH}	Logic input high voltage	2.3	-	V_{DD}	V	$V_{DD} = 4.5\text{V}$ to 5.5V
V_{IL}	Logic input low voltage	0	-	0.7	V	$V_{DD} = 4.5\text{V}$ to 5.5V
I_{IH}	Logic input high current	-	-	1.0	μA	$V_{IH} = 5.3\text{V}$, $V_{DD} = 5.0\text{V}$
		10	30	60		$V_{IH} = 5.0\text{V}$, For DIR only
I_{IL}	Logic input low current	-1.0	-	-	μA	$V_{IL} = -0.3\text{V}$
V_{OH}	Logic output high	4.5	-	-	V	$I_{OUT} = 1.0\text{mA}$
V_{OL}	Logic output low	-	-	0.5	V	$I_{OUT} = -1.0\text{mA}$

AC Electrical Characteristics ($T_j = 25^\circ\text{C}$, $V_{DD} = 5.0\text{V}$, $V_{PP} = 80\text{V}$, unless otherwise specified)

Sym	Parameter	Min	Typ	Max	Units	Conditions
twCLK	Clock pulse width, high and low	10	-	-	ns	$V_{DD} = 4.5\text{V}$ to 5.5V , $T_j = -25^\circ\text{C}$ to 125°C
twLE	LE pulse width, high and low	10	-	-		
tsu1	Setup time, DXAs, DXBs to CLK	5.0	-	-		
tsu2	Setup time, CLK to LE	10	-	-		
tsu3	Setup time, LE to \overline{OL} , \overline{OH}	25	-	-		
th1	Hold time, CLK to DXAs, DXBs	5.0	-	-		
th2	Hold time, LE to CLK	10	-	-	ns	---
tpdHL	CLK to DXAs, DXBs	-	-	25	ns	$C = 15\text{pF}$
tpdLH	CLK to DXAs, DXBs	-	-	25	ns	$C = 15\text{pF}$
tpHL	LE, \overline{OL} , \overline{OH} to HV_{OUT}	-	-	150	ns	$C = 50\text{pF}$
tpLH	LE, \overline{OL} , \overline{OH} to HV_{OUT}	Typ -40	tpHL +tf	Typ +40	ns	$C = 80\text{pF}$
tpHZL	OE to HV_{OUT}	-	-	150	ns	$C = 50\text{pF}$
tpLZH	OE to HV_{OUT}	Typ -40	tpHL +tf	Typ +40	ns	$C = 80\text{pF}$
tpHZ	OE to HV_{OUT}	-	-	300	ns	$R_I = 10\text{K}$, $C = 50\text{pF}$
tpLZ	OE to HV_{OUT}	-	-	300	ns	$R_I = 10\text{K}$, $C = 50\text{pF}$
tr	HV_{OUT}	-	-	120	ns	$C = 50\text{pF}$
tf	HV_{OUT}	-	-	120	ns	$C = 50\text{pF}$

Shift Register Truth Table

DIR	CLK	State of Shift Register	Shift Direction
L or open	\uparrow	Shift	DXB to DXA
L or open	\downarrow	Hold	DXB to DXA
H	\uparrow	Shift	DXA to DXB
H	\downarrow	Hold	DXA to DXB

Latch Truth Table

LE	Output State of Latch
L to H	Latch execution
H to L	Hold

HV_{OUT} Truth Table

OE	\overline{OL}	\overline{OH}	DXA/DXB	HV _{OUT}
L	X	X	X	Z
H	L	X	X	L
H	H	L	X	H
H	H	H	L	L
H	H	H	H	H

RESET Truth Table

RST	CLK	LE	Shift Registers	Latches
0	\uparrow	X	No Change	X
0	X	\uparrow	X	No Change
1	\uparrow	X	Clear	X
1	X	\uparrow	X	Clear

Output Shift Operation

Input	Output	D/R	Shift Operation
D1A = D	D1B	H	D → D124 → ... → D0 → D1B
D2A = D	D2B	H	D → D125 → ... → D1 → D2B
D3A = D	D3B	H	D → D126 → ... → D2 → D3B
D4A = D	D4B	H	D → D127 → ... → D3 → D4B
D1B = D	D1A	L or open	D → D0 → ... → D124 → D1A
D2B = D	D2A	L or open	D → D1 → ... → D125 → D2A
D3B = D	D3A	L or open	D → D2 → ... → D126 → D3A
D4B = D	D4A	L or open	D → D3 → ... → D127 → D4A

D = Data

H = Level High.

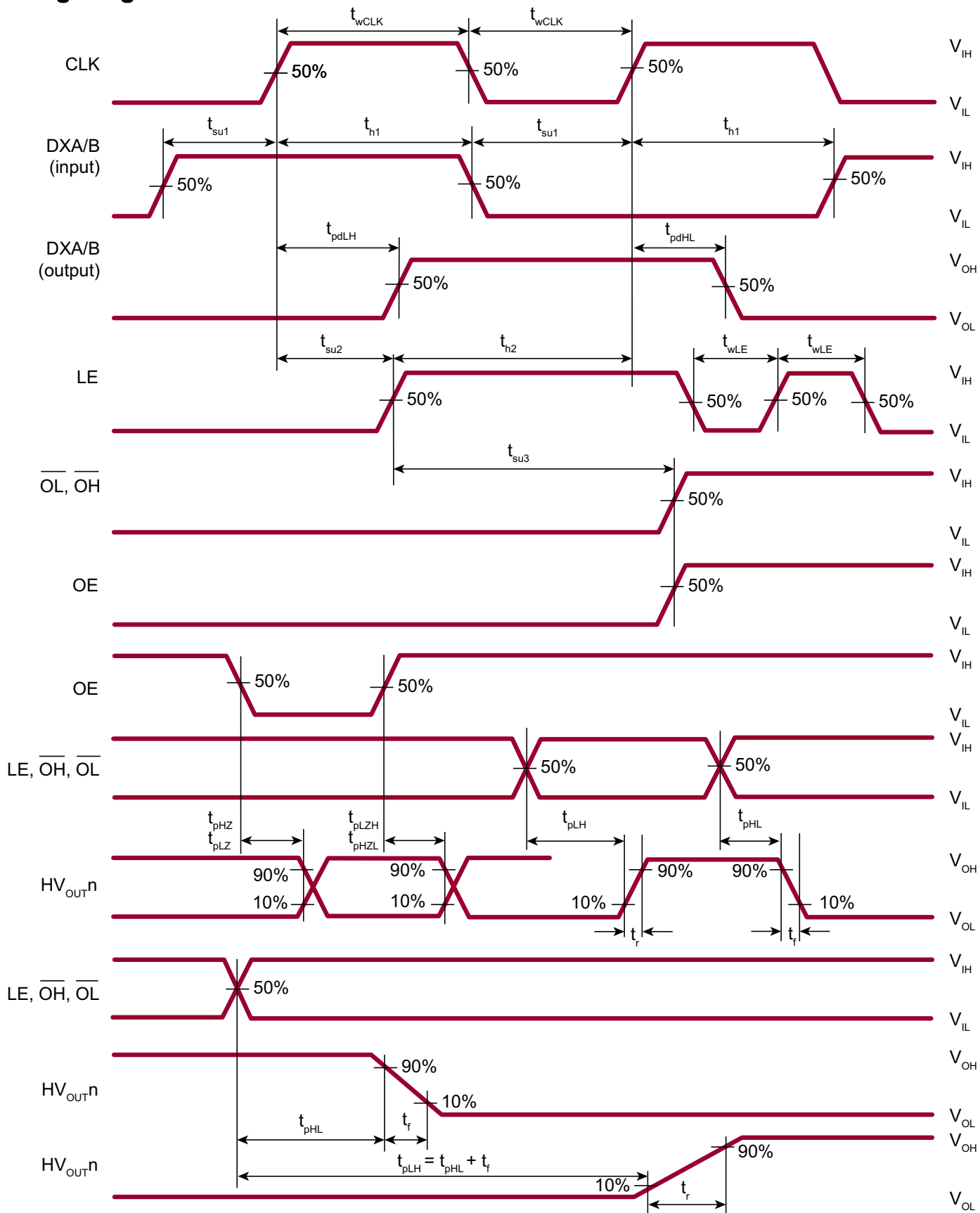
L = Level Low.

X = Don't care. Can be High or Low.

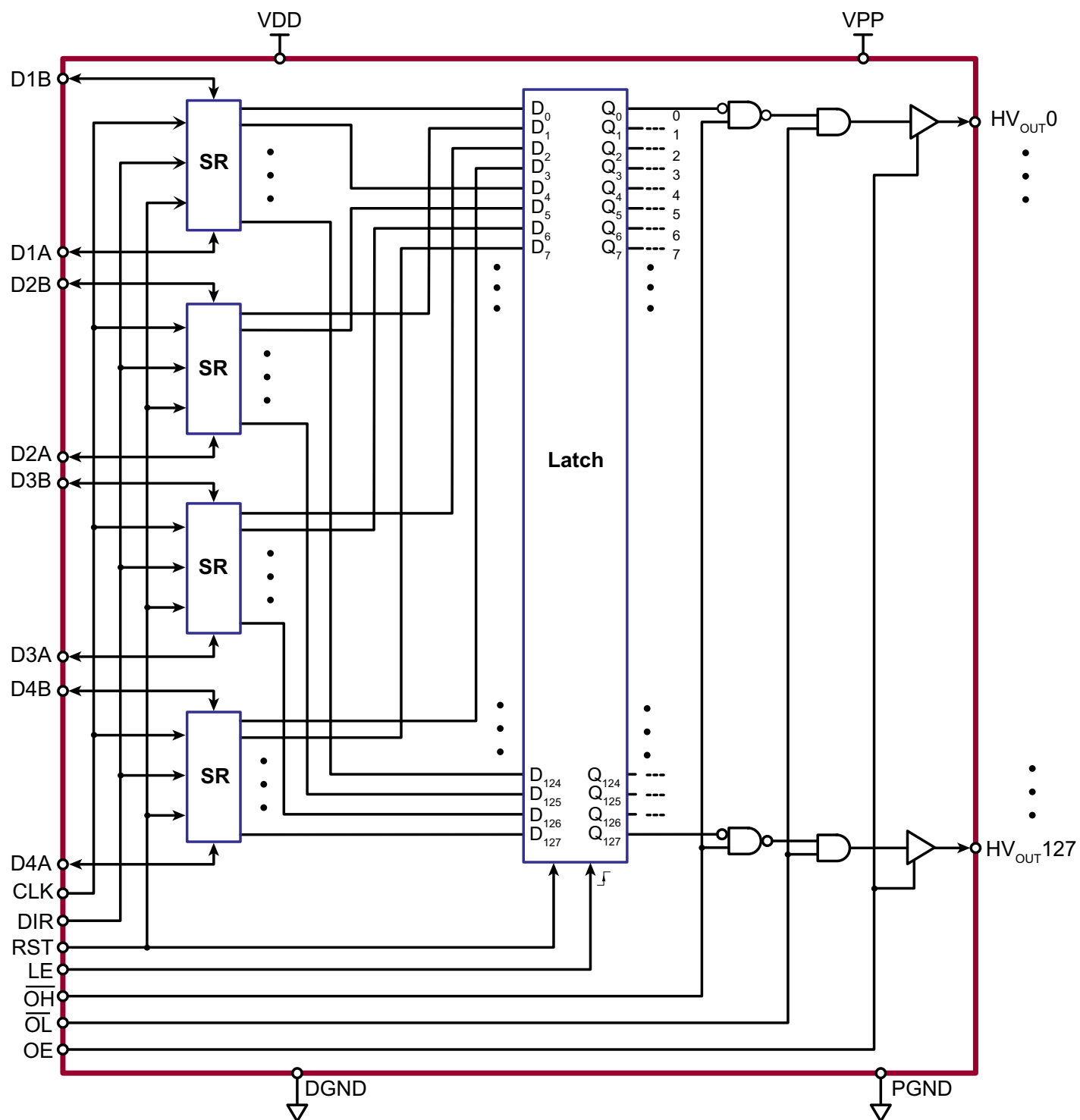
Z = High impedance. Open circuit.

 \uparrow = Low to High transition. \downarrow = High to Low transition.

Timing Diagram



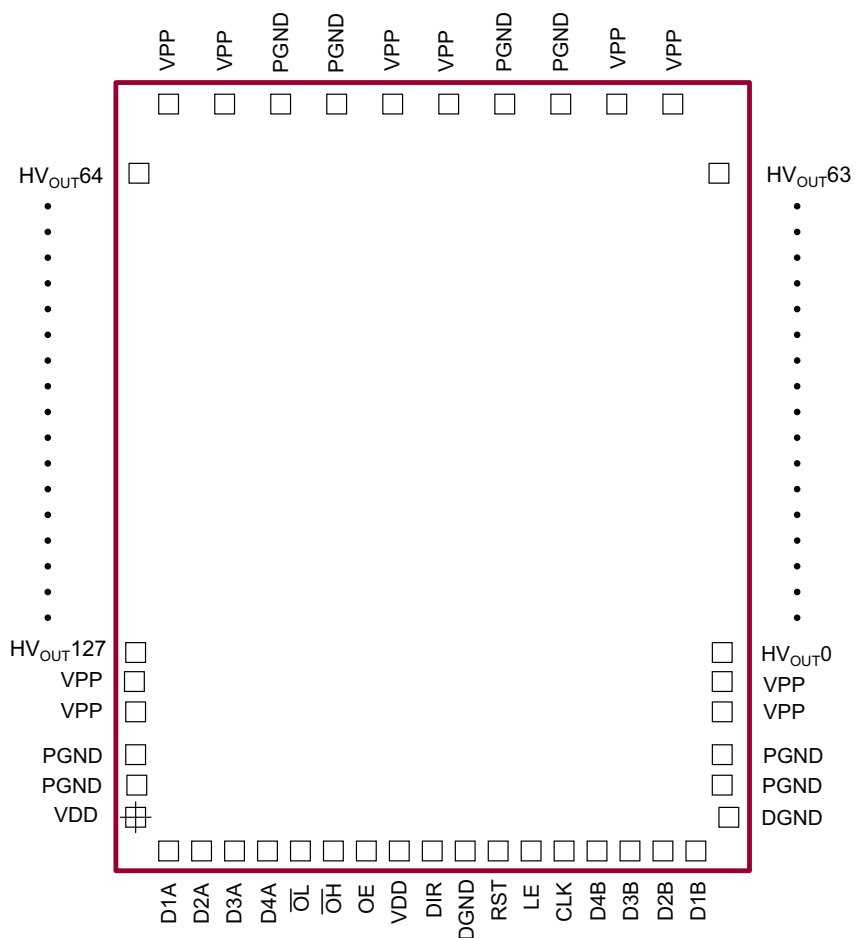
Block Diagram



Pad Description

Function	Description
VPP	High voltage supply for outputs.
VDD	Low voltage logic supply
D1A to D4A	Right data input/output. Input when DIR = H, Output when DIR = L.
D1B to D4B	Left data input/output. Input when DIR = L, Output when DIR = H.
DIR	DIR = L or open, DXB to DXA shift. DIR = H, DXA to DXB shift.
CLK	Clock input. Data shifted from low to high transition.
RST	Reset latches.
LE	Latch enable. Data latches during rising edge LE.
OE	Output enable. HV _{OUT} high impedance control.
\overline{OL}	Output low bar. All HV _{OUT} = low when this pin is low.
\overline{OH}	Output high bar. All HV _{OUT} = high when this pin is low.
DGND	Digital logic ground.
PGND	High voltage ground.
HV _{OUT} 0 to HV _{OUT} 127	High voltage outputs.

Pad Location



Pad Coordinates

Pad #	Name	X	Y
1	VDD	0	0
2	PGND	0	150
3	PGND	0	260
4	VPP	0	410
5	VPP	0	520
6	HV _{OUT} 127	0	670
7	HV _{OUT} 126	0	780
8	HV _{OUT} 125	0	890
9	HV _{OUT} 124	0	1000
10	HV _{OUT} 123	0	1110
11	HV _{OUT} 122	0	1220
12	HV _{OUT} 121	0	1330
13	HV _{OUT} 120	0	1440
14	HV _{OUT} 119	0	1550
15	HV _{OUT} 118	0	1660
16	HV _{OUT} 117	0	1770
17	HV _{OUT} 116	0	1880
18	HV _{OUT} 115	0	1990
19	HV _{OUT} 114	0	2100
20	HV _{OUT} 113	0	2210
21	HV _{OUT} 112	0	2320
22	HV _{OUT} 111	0	2430
23	HV _{OUT} 110	0	2540
24	HV _{OUT} 109	0	2650
25	HV _{OUT} 108	0	2760
26	HV _{OUT} 107	0	2870
27	HV _{OUT} 106	0	2980
28	HV _{OUT} 105	0	3090
29	HV _{OUT} 104	0	3200
30	HV _{OUT} 103	0	3310
31	HV _{OUT} 102	0	3420
32	HV _{OUT} 101	0	3530

Pad #	Name	X	Y
33	HV _{OUT} 100	0	3640
34	HV _{OUT} 99	0	3750
35	HV _{OUT} 98	0	3860
36	HV _{OUT} 97	0	3970
37	HV _{OUT} 96	0	4080
38	HV _{OUT} 95	0	4190
39	HV _{OUT} 94	0	4300
40	HV _{OUT} 93	0	4410
41	HV _{OUT} 92	0	4520
42	HV _{OUT} 91	0	4630
43	HV _{OUT} 90	0	4740
44	HV _{OUT} 89	0	4850
45	HV _{OUT} 88	0	4960
46	HV _{OUT} 87	0	5070
47	HV _{OUT} 86	0	5180
48	HV _{OUT} 85	0	5290
49	HV _{OUT} 84	0	5400
50	HV _{OUT} 83	0	5510
51	HV _{OUT} 82	0	5620
52	HV _{OUT} 81	0	5730
53	HV _{OUT} 80	0	5840
54	HV _{OUT} 79	0	5950
55	HV _{OUT} 78	0	6060
56	HV _{OUT} 77	0	6170
57	HV _{OUT} 76	0	6280
58	HV _{OUT} 75	0	6390
59	HV _{OUT} 74	0	6500
60	HV _{OUT} 73	0	6610
61	HV _{OUT} 72	0	6720
62	HV _{OUT} 71	0	6830
63	HV _{OUT} 70	0	6940
64	HV _{OUT} 69	0	7050

Pad #	Name	X	Y
65	HV _{OUT} 68	0	7160
66	HV _{OUT} 67	0	7270
67	HV _{OUT} 66	0	7380
68	HV _{OUT} 65	0	7490
69	HV _{OUT} 64	0	7600
70	VPP	263.1	7963.5
71	VPP	373.1	7963.5
72	PGND	607.1	7963.5
73	PGND	717.1	7963.5
74	VPP	977.1	7963.5
75	VPP	1087.1	7963.5
76	PGND	1347.1	7963.5
77	PGND	1457.1	7963.5
78	VPP	1691.1	7963.5
79	VPP	1801.1	7963.5
80	HV _{OUT} 63	2064.2	7600
81	HV _{OUT} 62	2064.2	7490
82	HV _{OUT} 61	2064.2	7380
83	HV _{OUT} 60	2064.2	7270
84	HV _{OUT} 59	2064.2	7160
85	HV _{OUT} 58	2064.2	7050
86	HV _{OUT} 57	2064.2	6940
87	HV _{OUT} 56	2064.2	6830
88	HV _{OUT} 55	2064.2	6720
89	HV _{OUT} 54	2064.2	6610
90	HV _{OUT} 53	2064.2	6500
91	HV _{OUT} 52	2064.2	6390
92	HV _{OUT} 51	2064.2	6280
93	HV _{OUT} 50	2064.2	6170
94	HV _{OUT} 49	2064.2	6060
95	HV _{OUT} 48	2064.2	5950
96	HV _{OUT} 47	2064.2	5840

Notes:

Units in μm .

Pad position referenced to pad #1 (VDD).

Pad Coordinates

Pad #	Name	X	Y
97	HV _{OUT} 46	2064.2	5730
98	HV _{OUT} 45	2064.2	5620
99	HV _{OUT} 44	2064.2	5510
100	HV _{OUT} 43	2064.2	5400
101	HV _{OUT} 42	2064.2	5290
102	HV _{OUT} 41	2064.2	5180
103	HV _{OUT} 40	2064.2	5070
104	HV _{OUT} 39	2064.2	4960
105	HV _{OUT} 38	2064.2	4850
106	HV _{OUT} 37	2064.2	4740
107	HV _{OUT} 36	2064.2	4630
108	HV _{OUT} 35	2064.2	4520
109	HV _{OUT} 34	2064.2	4410
110	HV _{OUT} 33	2064.2	4300
111	HV _{OUT} 32	2064.2	4190
112	HV _{OUT} 31	2064.2	4080
113	HV _{OUT} 30	2064.2	3970
114	HV _{OUT} 29	2064.2	3860
115	HV _{OUT} 28	2064.2	3750
116	HV _{OUT} 27	2064.2	3640
117	HV _{OUT} 26	2064.2	3530
118	HV _{OUT} 25	2064.2	3420
119	HV _{OUT} 24	2064.2	3310
120	HV _{OUT} 23	2064.2	3200

Pad #	Name	X	Y
121	HV _{OUT} 22	2064.2	3090
122	HV _{OUT} 21	2064.2	2980
123	HV _{OUT} 20	2064.2	2870
124	HV _{OUT} 19	2064.2	2760
125	HV _{OUT} 18	2064.2	2650
126	HV _{OUT} 17	2064.2	2540
127	HV _{OUT} 16	2064.2	2430
128	HV _{OUT} 15	2064.2	2320
129	HV _{OUT} 14	2064.2	2210
130	HV _{OUT} 13	2064.2	2100
131	HV _{OUT} 12	2064.2	1990
132	HV _{OUT} 11	2064.2	1880
133	HV _{OUT} 10	2064.2	1770
134	HV _{OUT} 9	2064.2	1660
135	HV _{OUT} 8	2064.2	1550
136	HV _{OUT} 7	2064.2	1440
137	HV _{OUT} 6	2064.2	1330
138	HV _{OUT} 5	2064.2	1220
139	HV _{OUT} 4	2064.2	1110
140	HV _{OUT} 3	2064.2	1000
141	HV _{OUT} 2	2064.2	890
142	HV _{OUT} 1	2064.2	780
143	HV _{OUT} 0	2064.2	670
144	VPP	2064.2	520

Pad #	Name	X	Y
145	VPP	2064.2	410
146	PGND	2064.2	260
147	PGND	2064.2	150
148	DGND	2064.2	0
149	D1B	1940.2	-210.1
150	D2B	1825.5	-210.1
151	D3B	1710.8	-210.1
152	D4B	1596.1	-210.1
153	CLK	1481.5	-210.1
154	LE	1366.8	-210.1
155	RST	1252.1	-210.1
156	DGND	1142.1	-210.1
157	DIR	1032.1	-210.1
157	VDD	922.1	-210.1
159	OE	812.1	-210.1
160	$\overline{\text{OH}}$	697.4	-210.1
161	$\overline{\text{OL}}$	582.7	-210.1
162	D4A	468.0	-210.1
163	D3A	355.3	-210.1
164	D2A	238.6	-210.1
165	D1A	123.9	-210.1

Notes:

Units in μm .

Pad position referenced to pad #1 (VDD).

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