

## 64-Channel Serial to Parallel Converter With High Voltage Push-Pull Outputs

### Features

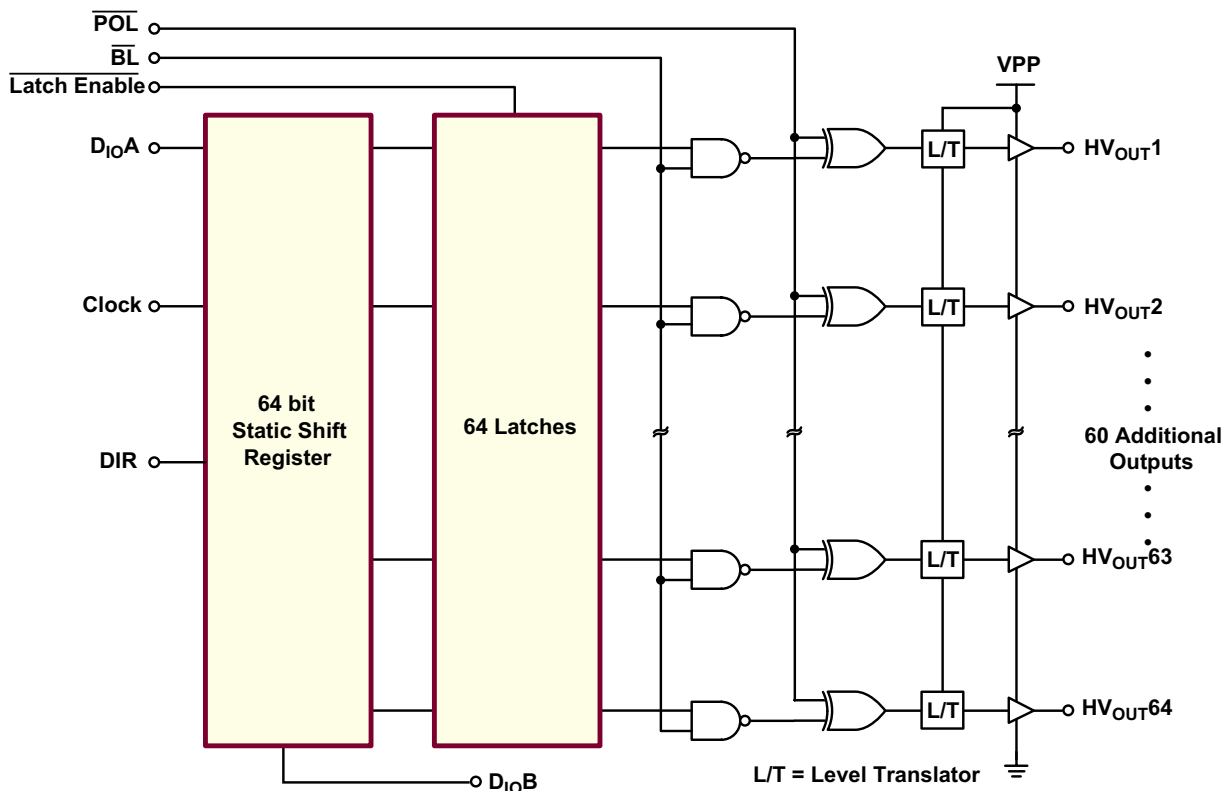
- ▶ Processed with HVCMOS® technology
- ▶ Operating output voltages to 300V
- ▶ Low power level shifting from 5.0 to 300V
- ▶ Shift register speed: 8.0MHz @  $V_{DD} = 5.0V$
- ▶ 64 latched data outputs
- ▶ Output polarity and blanking
- ▶ CMOS compatible inputs
- ▶ Foreward and reverse shifting options

### General Description

The HV507 is a low voltage serial to high voltage parallel converter with 64 push-pull outputs. This device has been designed for use as a printer driver for electrostatic applications. It can also be used in any application requiring multiple output, high voltage, low current sourcing and sinking capabilities.

The device consists of a 64-bit shift register, 64 latches, and control logic to perform the polarity select and blanking of the outputs. A DIR pin controls the direction of data shift through the device. With DIR grounded,  $D_{IOA}$  is Data-In and  $D_{IOB}$  is Data-Out; data is shifted from  $HV_{OUT64}$  to  $HV_{OUT1}$ . When DIR is at logic high,  $D_{IOB}$  is Data-In and  $D_{IOA}$  is Data-Out: data is then shifted from  $HV_{OUT1}$  to  $HV_{OUT64}$ . Data is shifted through the shift register on the low to high transition of the clock. Data output buffers are provided for cascading devices. 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 register to the latch occurs when the  $\overline{LE}$  is high. The data in the latch is stored during  $\overline{LE}$  transition from high to low.

### Functional Block Diagram



## Ordering Information

Device	Package Option
	<b>80-Lead Quad Plastic Gullwing</b> 20.00x14.00mm body 3.40mm height (max) 0.65mm pitch
HV507	HV507PG-G

-G indicates package is RoHS compliant ("Green")



## Absolute Maximum Ratings

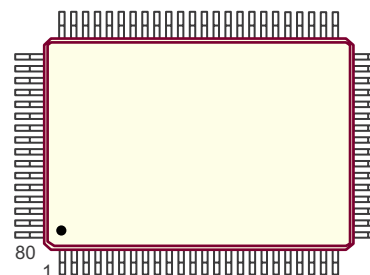
Parameter	Value
Supply voltage, $V_{DD}$	-0.5V to +6.0V
Supply voltage, $V_{PP}$	$V_{DD}$ to +320V
Logic input levels	-0.5V to $V_{DD}$ +0.5V
Ground current <sup>2</sup>	0.5A
High voltage supply current <sup>1</sup>	0.5A
Continuous total power dissipation <sup>2</sup>	1200mW
Operating temperature range	0°C to +70°C
Storage temperature range	-65°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 GND.

### Notes:

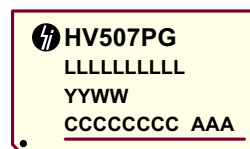
1. Connection to all power and ground pads is required. Duty cycle is limited by the total power dissipated in the package.
2. For operation above 25°C ambient derate linearly to 70°C at 26.7mW/°C.

## Pin Configuration



80-Lead Quad Plastic Gullwing (PG)  
(top view)

## Product Marking



L = Lot Number  
 YY = Year Sealed  
 WW = Week Sealed  
 C = Country of Origin  
 A = Assembler ID  
 — = "Green" Packaging

80-Lead Quad Plastic Gullwing (PG)

## Recommended Operating Conditions

Sym	Parameter	Min	Typ	Max	Units
$V_{DD}$	Logic supply voltage	4.5	5.0	5.5	V
$V_{PP}$	High voltage supply	60	-	300	V
$V_{IH}$	High-level input voltage	$V_{DD}$ -0.9	-	$V_{DD}$	V
$V_{IL}$	Low-level input voltage	0	-	0.9	V
$T_A$	Operating free-air temperature	0	-	+70	°C

### 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.

## Electrical Characteristics

### DC Characteristics (For $V_{DD} = 5.0V$ , $V_{PP} = 300V$ , $T_A = 25^\circ C$ )

Sym	Parameter	Min	Max	Units	Conditions	
$I_{DD}$	$V_{DD}$ supply current	-	15	mA	$f_{CLK} = 8.0MHz$ , $F_{DATA} = 4.0MHz$ , $\overline{LE} = low$	
$I_{DDQ}$	Quiescent $V_{DD}$ supply current	-	200	$\mu A$	All $V_{IN} = 0$ or $V_{DD}$	
$I_{PP}$	High voltage supply current	-	0.50	mA	$V_{PP} = 300V$ . All outputs high.	
		-	0.50		$V_{PP} = 300V$ . All outputs low.	
$I_{IH}$	High-level logic input current	-	10	$\mu A$	$V_{IH} = V_{DD}$	
$I_{IL}$	Low-level logic input current	-	-10	$\mu A$	$V_{IL} = 0V$	
$V_{OH}$	High level output	HV <sub>OUT</sub>	265	-	V	$V_{PP} = 300V$ , IHV <sub>OUT</sub> = -1.0mA, ID <sub>OUT</sub> = -100 $\mu A$
		Data Out	$V_{DD} - 1.0V$	-		
$V_{OL}$	Low level output	HV <sub>OUT</sub>	-	35	V	$V_{DD} = 5.0V$ , IHV <sub>OUT</sub> = +1.0mA, ID <sub>OUT</sub> = +100 $\mu A$
		Data Out	-	1.0		
$V_{OC}$	HV <sub>OUT</sub> clamp voltage	-	$V_{PP} + 1.5V$	V	$I_{OC} = +1.0mA$	
		-	-30		$I_{OC} = -1.0mA$	

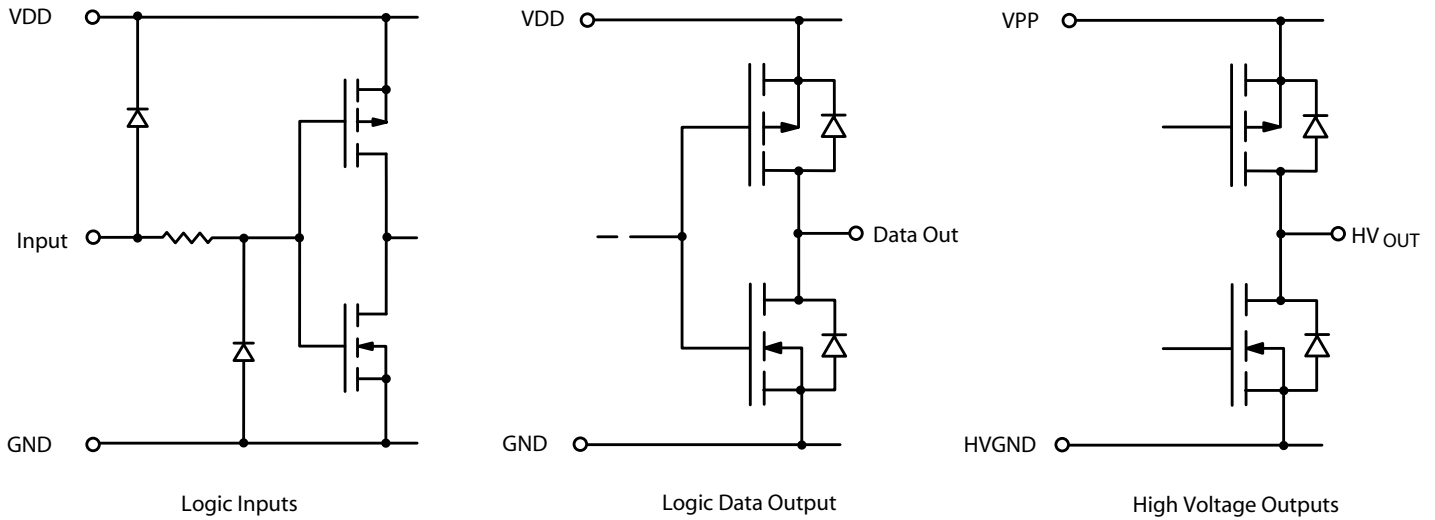
### AC Characteristics<sup>1</sup> (For $V_{DD} = 5.0V$ , $V_{PP} = 300V$ , $T_A = 25^\circ C$ )

Sym	Parameter	Min	Max	Units	Conditions
$f_{CLK}$	Clock frequency	-	8.0	MHz	---
$t_W$	Clock width high or low	62	-	ns	---
$t_{SU}$	Data set-up time before clock rises	35	-	ns	---
$t_H$	Data hold time after clock rises	30	-	ns	---
$t_{WLE}$	$\overline{LE}$ pulse width	80	-	ns	---
$t_{DLE}$	Delay time clock to $\overline{LE}$ high to low	35	-	ns	---
$t_{SLE}$	$\overline{LE}$ set-up time before clock rises	40	-	ns	---
$t_{ON}, t_{OFF}$	Time from $\overline{LE}$ to HV <sub>OUT</sub>	-	4.0	$\mu s$	$C_L = 20pF$
$t_{DHL}$	Delay time clock to data high to low	-	125	ns	$C_L = 20pF$
$t_{DLH}$	Delay time clock to data low to high	-	125	ns	$C_L = 20pF$
$t_R, t_F$	All logic inputs	-	5.0	ns	---

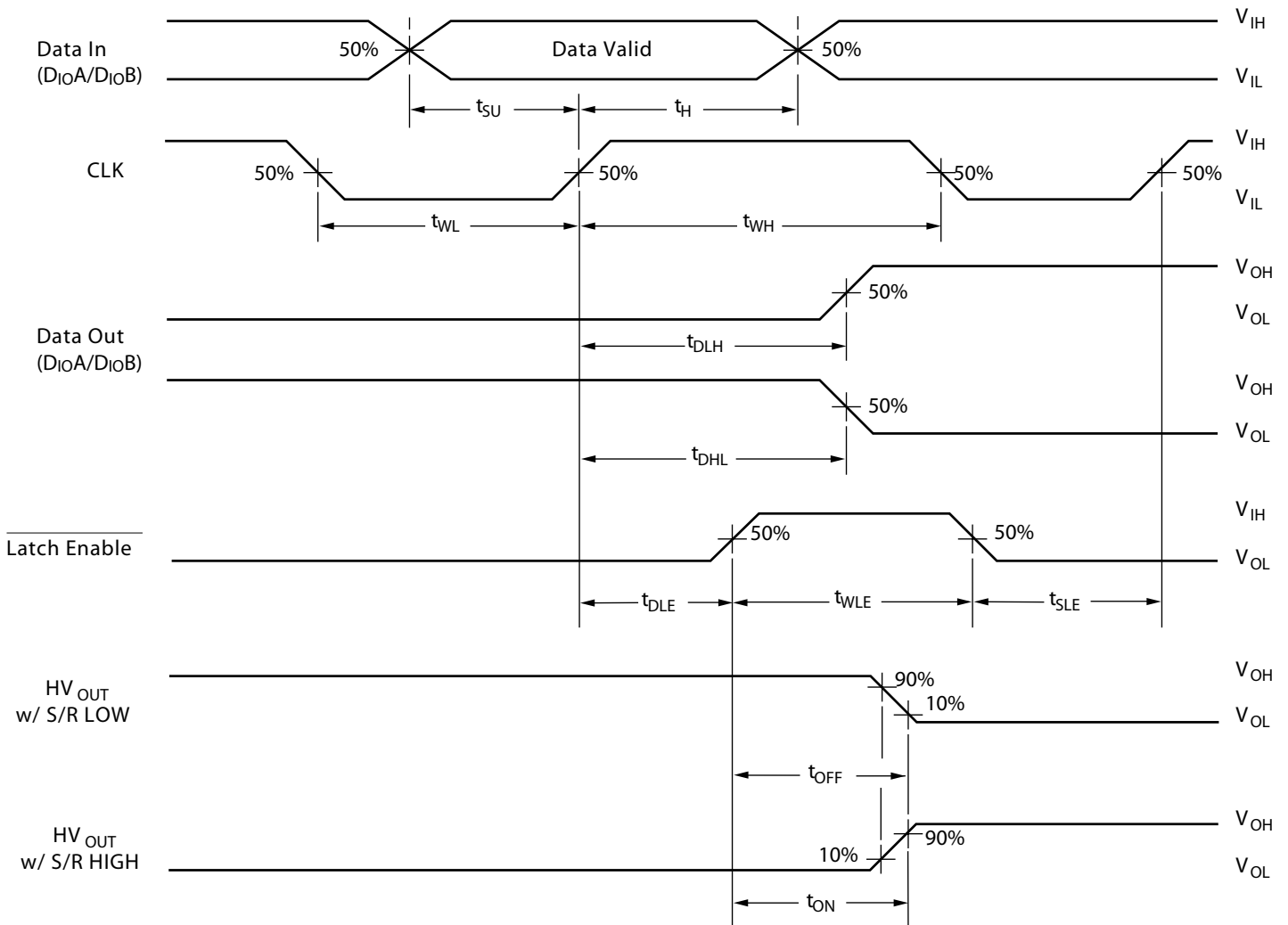
**Note:**

- Shift register speed can be as low as DC as long as data set-up and hold time meet the spec.

### Input and Output Equivalent Circuits



### Switching Waveforms



## Function Table

Function	Inputs						Outputs				
	Data	CLK	$\overline{LE}$	$\overline{BL}$	$\overline{POL}$	DIR	Shift Reg		HV Outputs		Data Out
							1	2...64	1	2...64	
All on	X	X	X	L	L	X	*	*...*	H	H...H	*
All off	X	X	X	L	H	X	*	*...*	L	L...L	*
Invert mode	X	X	L	H	L	X	*	*...*	$\overline{*}$	$\overline{*...*}$	*
Load S/R	H or L	↑	L	H	H	X	H or L	*...*	*	*...*	*
Store data in latches	X	X	↓	H	H	X	*	*...*	*	*...*	*
	X	X	↓	H	L	X	*	*...*	$\overline{*}$	$\overline{*...*}$	*
Transparent latch mode	L	↑	H	H	H	X	L	*...*	L	*...*	*
	H	↑	H	H	H	X	H	*...*	H	*...*	*
I/O Relation	$D_{IO}A$	↑	X	X	X	L	$Q_N \rightarrow$	$Q_{N+1}$	-	-	$D_{IO}B$
	$D_{IO}B$	↑	X	X	X	H	$Q_N \rightarrow$	$Q_{N+1}$	-	-	$D_{IO}A$

**Notes:**

H = high level, L = low level = 0V, X = irrelevant, ↓ = high-to-low transition, ↑ = low-to-high transition.

\* = dependent on previous stage's state before the last CLK high-to-low transition or last  $\overline{LE}$  high.

## Pin Description (80-Lead PQFP)

Pin #	Function
1	HV <sub>OUT</sub> 41
2	HV <sub>OUT</sub> 42
3	HV <sub>OUT</sub> 43
4	HV <sub>OUT</sub> 44
5	HV <sub>OUT</sub> 45
6	HV <sub>OUT</sub> 46
7	HV <sub>OUT</sub> 47
8	HV <sub>OUT</sub> 48
9	HV <sub>OUT</sub> 49
10	HV <sub>OUT</sub> 50
11	HV <sub>OUT</sub> 51
12	HV <sub>OUT</sub> 52
13	HV <sub>OUT</sub> 53
14	HV <sub>OUT</sub> 54
15	HV <sub>OUT</sub> 55
16	HV <sub>OUT</sub> 56
17	HV <sub>OUT</sub> 57
18	HV <sub>OUT</sub> 58
19	HV <sub>OUT</sub> 59
20	HV <sub>OUT</sub> 60
21	HV <sub>OUT</sub> 61
22	HV <sub>OUT</sub> 62
23	HV <sub>OUT</sub> 63
24	HV <sub>OUT</sub> 64
25	VPP
26	D <sub>IO</sub> A
27	N/C
28	N/C
29	$\overline{BL}$
30	$\overline{POL}$
31	VDD
32	DIR
33	GND
34	HVGND
35	N/C
36	N/C
37	CLK
38	$\overline{LE}$
39	D <sub>IO</sub> B
40	VPP

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