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

Features

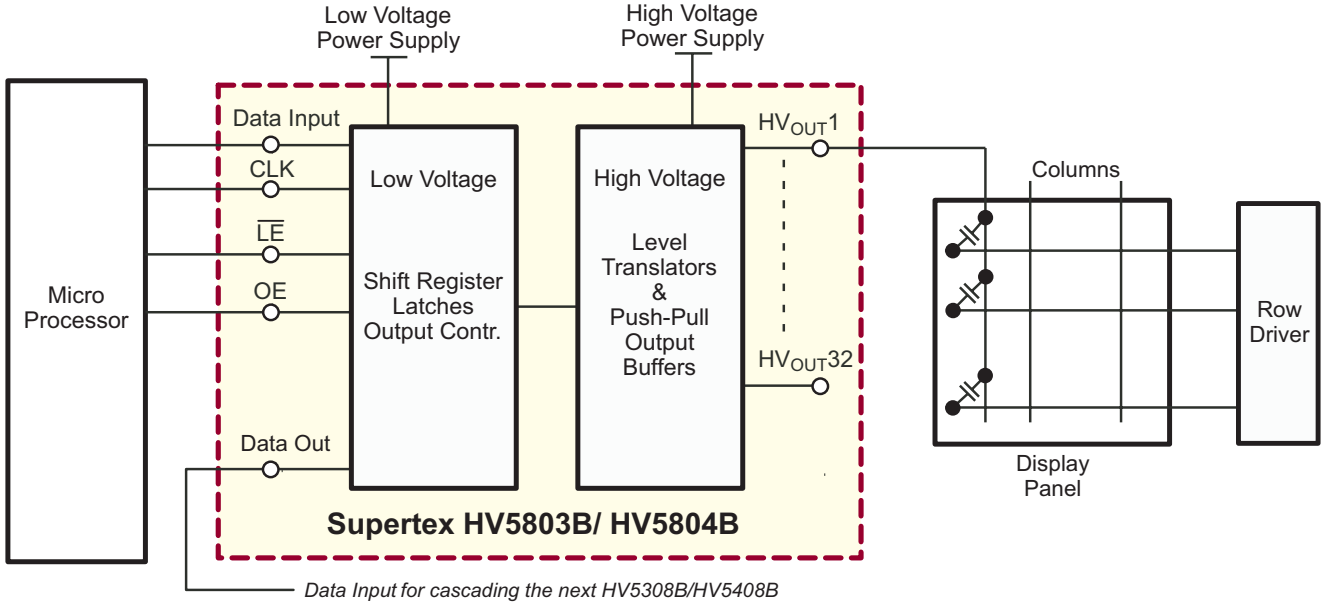
- Processed with HVCMOS® technology
- Low power level shifting
- Source/sink current minimum 20mA
- Shift register speed 8MHz
- Latched data outputs
- CMOS compatible inputs
- Forward and reverse shifting options
- Diode to V_{PP} allows efficient power recovery

General Description

The HV5308B and HV5408B are low voltage serial to high voltage parallel converters with push-pull 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 sourcing and sinking capabilities, such as driving plasma panels, vacuum fluorescent, or large matrix LCD displays.

These devices consist of a 32-bit shift register, 32 latches, and control logic to enable outputs. Q1 is connected to the first stage of the shift register through the Output Enable logic. Data is shifted through the shift register on the low to high transition of the clock. The HV5408B shifts in the counterclockwise direction when viewed from the top of the package, while the HV5308B 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 (32). Operation of the shift register is not affected by the $\overline{LE}$ (latch enable) or the OE (output enable) inputs. Transfer of data from the shift register to the latch occurs when the $\overline{LE}$ input is high. The data in the latch is retained when $\overline{LE}$ is low.

Typical Application Circuit



Ordering Information

Device	Package Options			
	44-J Lead Quad Ceramic Chip Carrier	44-J Lead Quad Ceramic Chip Carrier (MIL-STD-883 Processed)	44-J Lead Quad Plastic Chip Carrier	44-Lead Quad Plastic Gullwing
HV5308B	HV5308DJ-B	HV5308DJ-B	HV5308PJ-B	HV5308PG-B
	-	-	HV5308BPJ-B-G	HV5308PG-B-G
HV5408B	HV5408DJ-B	HV5408DJ-B	HV5408PJ-B	HV5408PG-B
	-	-	HV5408PJ-B-G	HV5408PG-B-G

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

Absolute Maximum Ratings

Parameter	Value
Supply voltage, V_{DD}[2]	-0.5V to +16V
Supply voltage, V_{PP}	-0.5V to +90V
Logic input levels[2]	-0.5V to VDD + 0.5V
Ground current[3]	1.5A
Continuous total power dissipation[1]	Plastic 1200W Ceramic 1500W
Operating temperature range	Plastic -40°C 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. Device will survive (but operation may not be specified or guaranteed) at these extremes.

2. All voltages are referenced to GND.

3. Duty cycle is limited by the total power dissipated in the package.

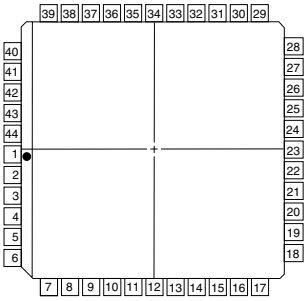
4. For operation above 25°C ambient derate linearly to maximum operating temperature at 20mW/°C for plastic and at 15mW/°C for ceramic.

Recommended Operating Conditions

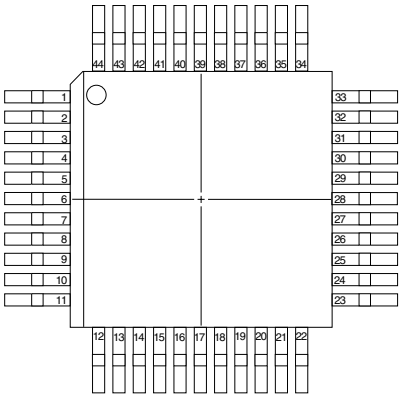
(Over -40°C to 85°C for plastic and -55°C to 125°C for ceramic)

Symbol	Parameter	Min	Max	Units
V_{DD}	Logic voltage supply	10.8	13.2	V
V_{PP}	High voltage supply	8.0	80	V
V_{IH}	Input HIGH voltage	V_{DD} - 2	V_{DD}	V
V_{IL}	Input Low voltage	0	2	V
f_{CLK}	Clock frequency	0	8	MHz

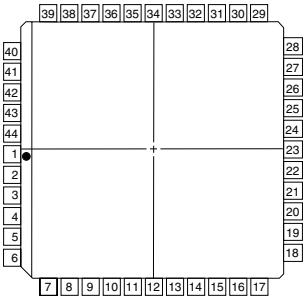
Pin Configurations



44-J Lead Quad Ceramic Chip Carrier (DJ)



44-Lead Quad Plastic Gullwing (PG)



44-J Lead Quad Plastic Chip Carrier (PJ)

Power-Up Sequence

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

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

Electrical Characteristics *(V_{PP} = 60V, V_{DD} = 12V, T_A = 25°C)*

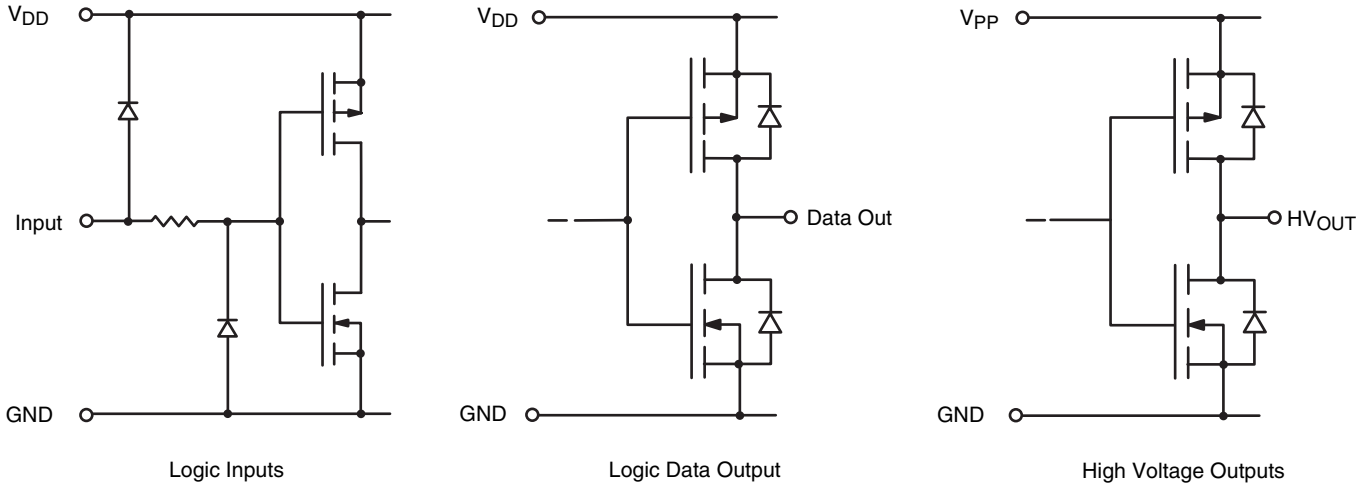
DC Characteristics

Symbol	Parameter	Min	Max	Units	Conditions
I_{PP}	V_{PP} supply current	-	0.5	mA	$HV_{OUTPUTS}$ HIGH to LOW
I_{DDQ}	I_{DD} supply current (quiescent)	-	100	µA	All inputs = V_{DD} or GND
I_{DD}	I_{DD} supply current (operating)	-	15	mA	V_{DD} = V_{DD} max, f_{CLK} = 8 MHz
V_{OH} (Data)	Shift register output voltage	10.5	-	V	I_O = 100µA
V_{OL} (Data)	Shift register output voltage	-	1	V	I_O = 100µA
I_{IH}	Current leakage, any input	-	1	µA	V_{IN} = V_{DD}
I_{IL}	Current leakage, any input	-	-1	µA	V_{IN} = 0
V_{OC}	HV output clamp diode voltage	-	-1.5	V	I_{OL} = -100mA
V_{OH}	HV output when sourcing	52	-	V	I_{OH} = -20mA, -40 to 85°C
V_{OL}	HV output when sinking	-	8	V	I_{OL} = 20mA, -40 to 85°C
V_{OH}	HV output when sourcing	52	-	V	I_{OH} = -15mA, -55 to 125°C
V_{OL}	HV output when sinking	-	8	V	I_{OL} = 15mA, -55 to 125°C

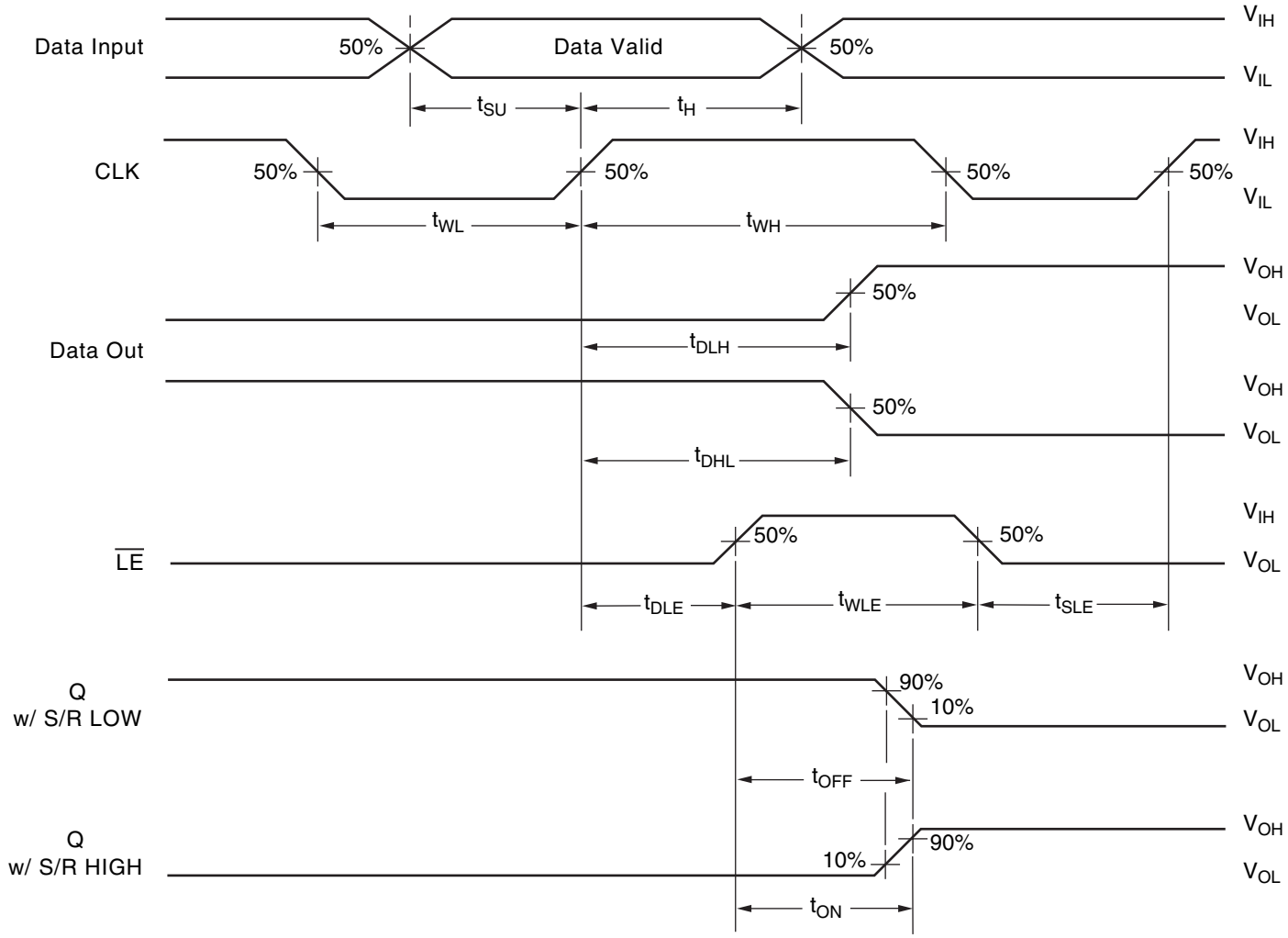
AC Characteristics

Symbol	Parameter	Min	Max	Units	Conditions
f_{CLK}	Clock frequency	-	8	MHz	---
t_{WL} or t_{WH}	Clock width, HIGH or LOW	62	-	ns	---
t_{SU}	Setup time before CLK rises	25	-	ns	---
t_H	Hold time after CLK rises	10	-	ns	---
t_{DLH} (Data)	Data output delay after L to H CLK	-	110	ns	CL = 15pF
t_{DHL} (Data)	Data output delay after H to L CLK	-	110	ns	CL = 15pF
t_{DLE}	$\underline{LE}$ delay after L to H CLK	50	-	ns	---
t_{WLE}	Width of $\underline{LE}$ pulse	50	-	ns	---
t_{SLE}	$\underline{LE}$ setup time before L to H CLK	50	-	ns	---
t_{ON}	Delay from $\underline{LE}$ to HV_{OUT}, L to H	-	500	ns	---
t_{OFF}	Delay from $\underline{LE}$ to HV_{OUT}, H to L	-	500	ns	---

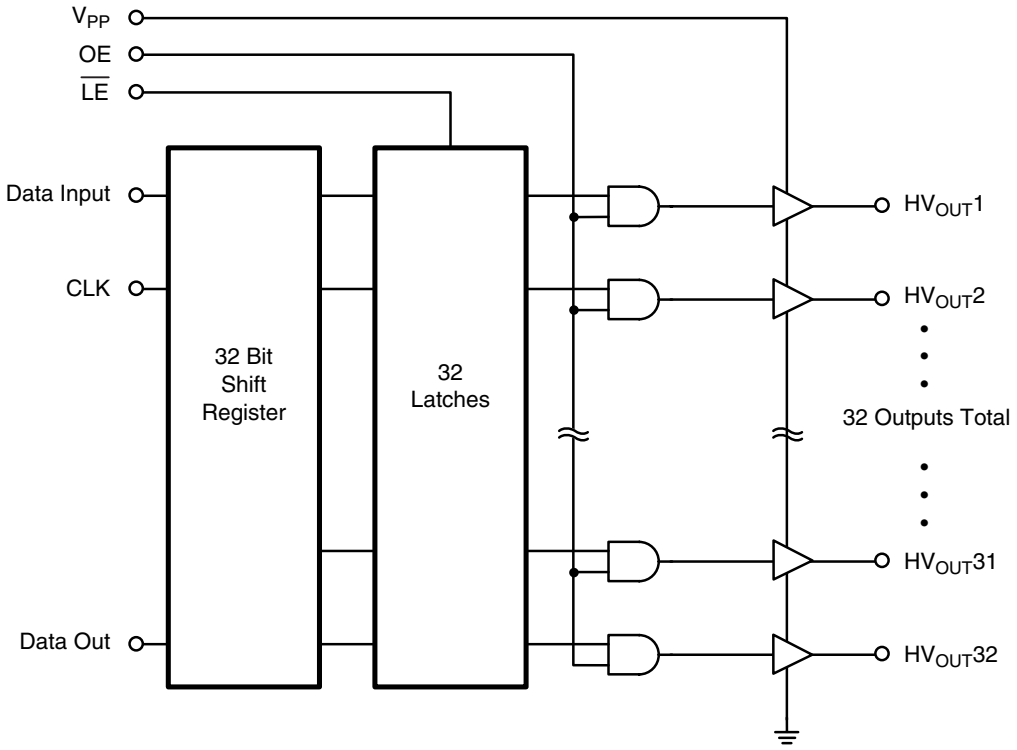
Input and Output Equivalent Circuits



Switching Waveforms



Functional Block Diagram



Function Tables

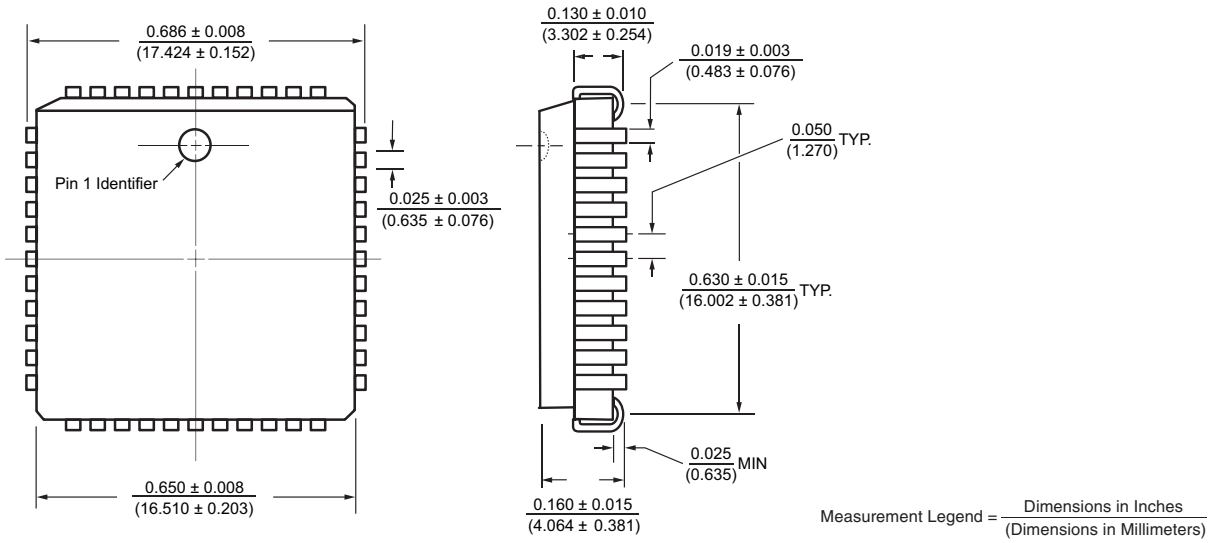
Data Input	CLK	Data Output
X	↓	H
X	↓	L
H	No ↓	No change

Data Input	$\overline{LE}$	OE	HV Output
X	X	L	All HV_{OUT} = LOW
X	L	H	Previous latched data
H	H	H	H
L	H	H	L

Pin Description

Pin Name	Function	Description
CLK	Data shift register clock	Input are shifted into the shift register on the positive edge of the clock.
$\overline{LE}$	Latch enable input	When $\overline{LE}$ is HIGH, shift register data is transferred into a data latch. When $\overline{LE}$ is LOW, data is latched, and new data can be clocked into the shift register.
OE	Output enable input	When OE is LOW, all HV outputs are forced into a LOW state, regardless of data in each channel. When OE is HIGH, all HV outputs reflect data latched.
Data input	Serial data input	Data needs to be present before each rising edge of the clock.
Data output	Serial data output	Data output for cascading to the data input of the next device.
HV_{OUT} (1-32)	High voltage outputs	High voltage push-pull outputs, which, depending on controlling low voltage data, can drive loads either to a GND, or to V_{PP} rail levels.
GND	Logic and high voltage ground	---
V_{DD}	Low voltage logic power rail	---
V_{PP}	High voltage power rail	---

44-J Lead Quad Ceramic Chip Carrier (DJ)

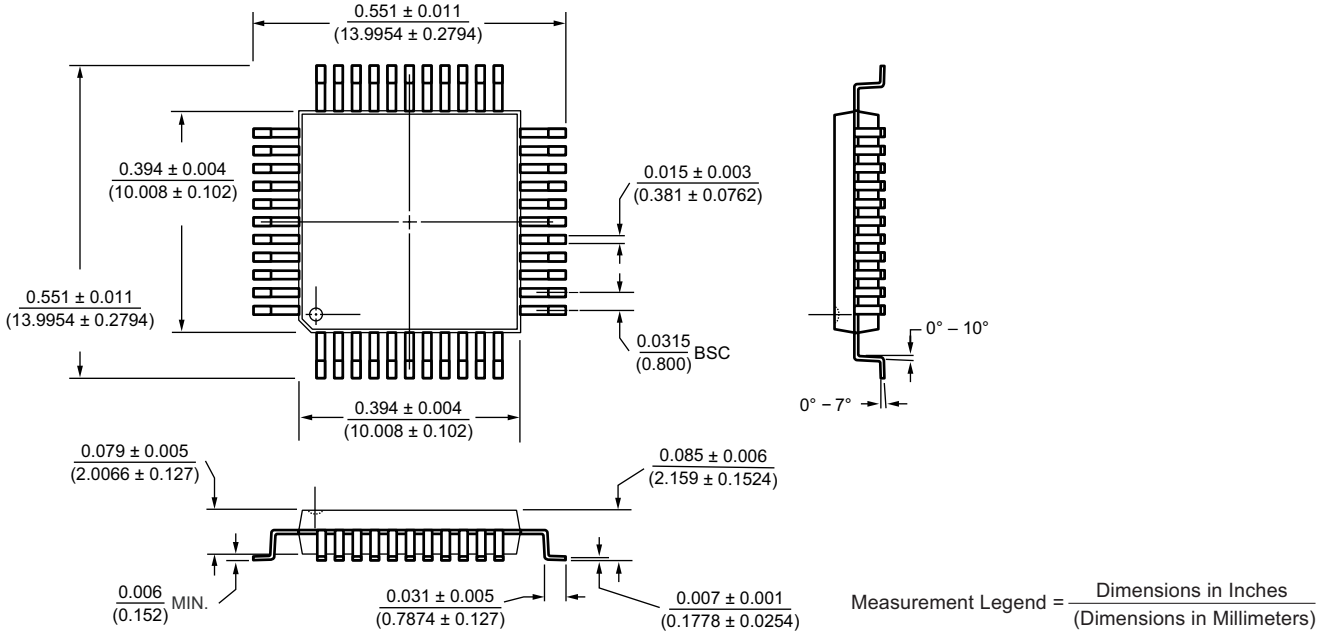


Pin Assignment

HV5308DJ-B			
Pin	**Function**	**Pin**	**Function**
1	$HV_{OUT}17$	23	GND
2	$HV_{OUT}16$	24	V_{PP}
3	$HV_{OUT}15$	25	V_{DD}
4	$HV_{OUT}14$	26	$\overline{LE}$
5	$HV_{OUT}13$	27	Data In
6	$HV_{OUT}12$	28	OE
7	$HV_{OUT}11$	29	NC
8	$HV_{OUT}10$	30	$HV_{OUT}32$
9	$HV_{OUT}9$	31	$HV_{OUT}31$
10	$HV_{OUT}8$	32	$HV_{OUT}30$
11	$HV_{OUT}7$	33	$HV_{OUT}29$
12	$HV_{OUT}6$	34	$HV_{OUT}28$
13	$HV_{OUT}5$	35	$HV_{OUT}27$
14	$HV_{OUT}4$	36	$HV_{OUT}26$
15	$HV_{OUT}3$	37	$HV_{OUT}25$
16	$HV_{OUT}2$	38	$HV_{OUT}24$
17	$HV_{OUT}1$	39	$HV_{OUT}23$
18	Data Out	40	$HV_{OUT}22$
19	N/C	41	$HV_{OUT}21$
20	N/C	42	$HV_{OUT}20$
21	N/C	43	$HV_{OUT}19$
22	CLK	44	$HV_{OUT}18$

HV5408DJ-B			
Pin	**Function**	**Pin**	**Function**
1	$HV_{OUT}16$	23	GND
2	$HV_{OUT}17$	24	V_{PP}
3	$HV_{OUT}18$	25	V_{DD}
4	$HV_{OUT}19$	26	$\overline{LE}$
5	$HV_{OUT}20$	27	Data In
6	$HV_{OUT}21$	28	OE
7	$HV_{OUT}22$	29	NC
8	$HV_{OUT}23$	30	$HV_{OUT}1$
9	$HV_{OUT}24$	31	$HV_{OUT}2$
10	$HV_{OUT}25$	32	$HV_{OUT}3$
11	$HV_{OUT}26$	33	$HV_{OUT}4$
12	$HV_{OUT}27$	34	$HV_{OUT}5$
13	$HV_{OUT}28$	35	$HV_{OUT}6$
14	$HV_{OUT}29$	36	$HV_{OUT}7$
15	$HV_{OUT}30$	37	$HV_{OUT}8$
16	$HV_{OUT}31$	38	$HV_{OUT}9$
17	$HV_{OUT}32$	39	$HV_{OUT}10$
18	Data Out	40	$HV_{OUT}11$
19	N/C	41	$HV_{OUT}12$
20	N/C	42	$HV_{OUT}13$
21	N/C	43	$HV_{OUT}14$
22	CLK	44	$HV_{OUT}15$

44-Lead Quad Plastic Gullwing (PG)

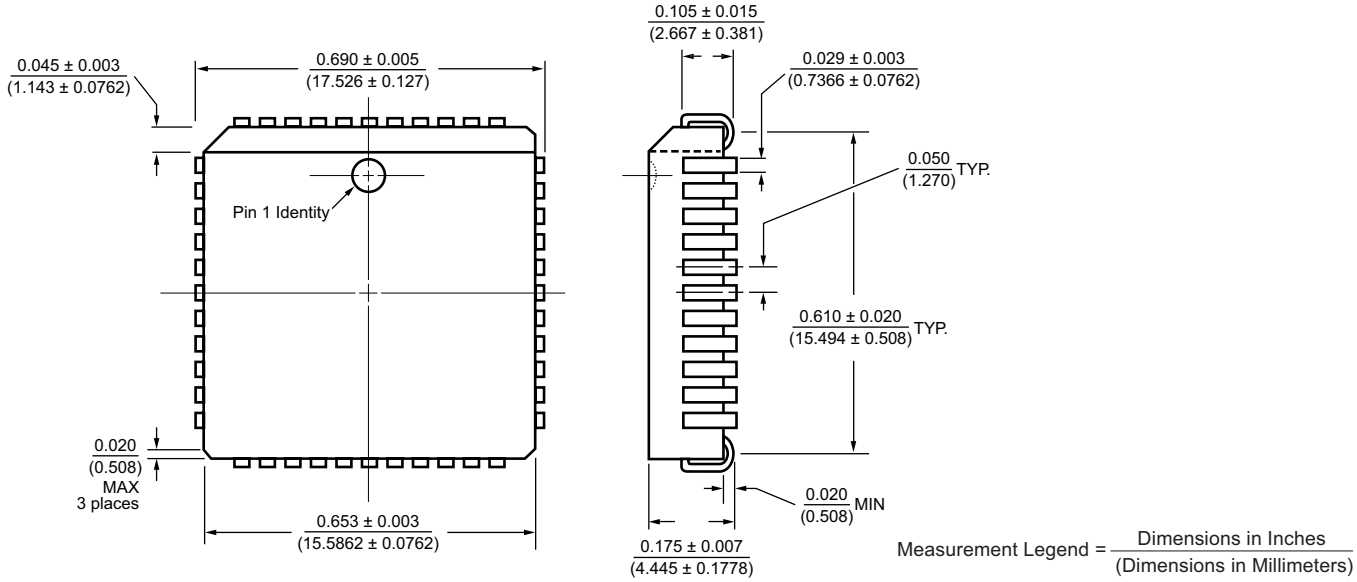


Pin Assignment

HV5308PG-B			
Pin	**Function**	**Pin**	**Function**
1	$HV_{OUT}22$	23	Data Out
2	$HV_{OUT}21$	24	N/C
3	$HV_{OUT}20$	25	N/C
4	$HV_{OUT}19$	26	N/C
5	$HV_{OUT}18$	27	CLK
6	$HV_{OUT}17$	28	GND
7	$HV_{OUT}16$	29	V_{PP}
8	$HV_{OUT}15$	30	V_{DD}
9	$HV_{OUT}14$	31	$\overline{LE}$
10	$HV_{OUT}13$	32	Data In
11	$HV_{OUT}12$	33	OE
12	$HV_{OUT}11$	34	N/C
13	$HV_{OUT}10$	35	$HV_{OUT}32$
14	$HV_{OUT}9$	36	$HV_{OUT}31$
15	$HV_{OUT}8$	37	$HV_{OUT}30$
16	$HV_{OUT}7$	38	$HV_{OUT}29$
17	$HV_{OUT}6$	39	$HV_{OUT}28$
18	$HV_{OUT}5$	40	$HV_{OUT}27$
19	$HV_{OUT}4$	41	$HV_{OUT}26$
20	$HV_{OUT}3$	42	$HV_{OUT}25$
21	$HV_{OUT}2$	43	$HV_{OUT}24$
22	$HV_{OUT}1$	44	$HV_{OUT}23$

HV5408PG-B			
Pin	**Function**	**Pin**	**Function**
1	$HV_{OUT}11$	23	Data Out
2	$HV_{OUT}12$	24	N/C
3	$HV_{OUT}13$	25	N/C
4	$HV_{OUT}14$	26	N/C
5	$HV_{OUT}15$	27	CLK
6	$HV_{OUT}16$	28	GND
7	$HV_{OUT}17$	29	V_{PP}
8	$HV_{OUT}18$	30	V_{DD}
9	$HV_{OUT}19$	31	$\overline{LE}$
10	$HV_{OUT}20$	32	Data In
11	$HV_{OUT}21$	33	OE
12	$HV_{OUT}22$	34	N/C
13	$HV_{OUT}23$	35	$HV_{OUT}1$
14	$HV_{OUT}24$	36	$HV_{OUT}2$
15	$HV_{OUT}25$	37	$HV_{OUT}3$
16	$HV_{OUT}26$	38	$HV_{OUT}4$
17	$HV_{OUT}27$	39	$HV_{OUT}5$
18	$HV_{OUT}28$	40	$HV_{OUT}6$
19	$HV_{OUT}29$	41	$HV_{OUT}7$
20	$HV_{OUT}30$	42	$HV_{OUT}8$
21	$HV_{OUT}31$	43	$HV_{OUT}9$
22	$HV_{OUT}32$	44	$HV_{OUT}10$

44-J Lead Quad Plastic Chip Carrier (PJ)



Pin Assignment

HV5308PJ-B			
Pin	Function	Pin	Function
1	$HV_{OUT}17$	23	GND
2	$HV_{OUT}16$	24	V_{PP}
3	$HV_{OUT}15$	25	V_{DD}
4	$HV_{OUT}14$	26	$\overline{LE}$
5	$HV_{OUT}13$	27	Data In
6	$HV_{OUT}12$	28	OE
7	$HV_{OUT}11$	29	NC
8	$HV_{OUT}10$	30	$HV_{OUT}32$
9	$HV_{OUT}9$	31	$HV_{OUT}31$
10	$HV_{OUT}8$	32	$HV_{OUT}30$
11	$HV_{OUT}7$	33	$HV_{OUT}29$
12	$HV_{OUT}6$	34	$HV_{OUT}28$
13	$HV_{OUT}5$	35	$HV_{OUT}27$
14	$HV_{OUT}4$	36	$HV_{OUT}26$
15	$HV_{OUT}3$	37	$HV_{OUT}25$
16	$HV_{OUT}2$	38	$HV_{OUT}24$
17	$HV_{OUT}1$	39	$HV_{OUT}23$
18	Data Out	40	$HV_{OUT}22$
19	N/C	41	$HV_{OUT}21$
20	N/C	42	$HV_{OUT}20$
21	N/C	43	$HV_{OUT}19$
22	CLK	44	$HV_{OUT}18$

HV5408PJ-B			
Pin	Function	Pin	Function
1	$HV_{OUT}16$	23	GND
2	$HV_{OUT}17$	24	V_{PP}
3	$HV_{OUT}18$	25	V_{DD}
4	$HV_{OUT}19$	26	$\overline{LE}$
5	$HV_{OUT}20$	27	Data In
6	$HV_{OUT}21$	28	OE
7	$HV_{OUT}22$	29	NC
8	$HV_{OUT}23$	30	$HV_{OUT}1$
9	$HV_{OUT}24$	31	$HV_{OUT}2$
10	$HV_{OUT}25$	32	$HV_{OUT}3$
11	$HV_{OUT}26$	33	$HV_{OUT}4$
12	$HV_{OUT}27$	34	$HV_{OUT}5$
13	$HV_{OUT}28$	35	$HV_{OUT}6$
14	$HV_{OUT}29$	36	$HV_{OUT}7$
15	$HV_{OUT}30$	37	$HV_{OUT}8$
16	$HV_{OUT}31$	38	$HV_{OUT}9$
17	$HV_{OUT}32$	39	$HV_{OUT}10$
18	Data Out	40	$HV_{OUT}11$
19	N/C	41	$HV_{OUT}12$
20	N/C	42	$HV_{OUT}13$
21	N/C	43	$HV_{OUT}14$
22	CLK	44	$HV_{OUT}15$

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