

## 32-Channel Serial To Parallel Converter With Open Drain Outputs

### Ordering Information

Device	Recommended Operating $V_{PP}$ max	Package Options			
		44 J-Lead Quad Ceramic Chip Carrier	44 J-Lead Quad Plastic Chip Carrier	44 Lead Quad Plastic Gullwing	Die
HV5522	220V	HV5522DJ	HV5522PJ	HV5522PG	HV5522X
HV5530	300V	HV5530DJ	HV5530PJ	HV5530PG	HV5530X
HV5622	220V	HV5622DJ	HV5622PJ	HV5622PG	HV5622X
HV5630	300V	HV5630DJ	HV5630PJ	HV5630PG	HV5630X

### Features

- Processed with HVCMOS<sup>®</sup> technology
- Sink current minimum 100mA
- Shift register speed 8MHz
- Polarity and Blanking inputs
- CMOS compatible inputs
- Forward and reverse shifting options
- Diode to  $V_{PP}$  allows efficient power recovery
- 44-lead ceramic surface mount package
- Hi-Rel processing available

### Absolute Maximum Ratings

Supply voltage, $V_{DD}$ <sup>1</sup>	-0.5V to +15V	
Output voltage, $V_{PP}$ <sup>1</sup>	HV5530/HV5630	-0.5V to +315V
	HV5522/HV5622	-0.5V to +230V
Logic input levels <sup>1</sup>	-0.5V to $V_{DD} + 0.5V$	
Ground current <sup>2</sup>	1.5A	
Continuous total power dissipation <sup>3</sup>	Ceramic	1500mW
	Plastic	1200mW
Operating temperature range	Ceramic	-55°C to +125°C
	Plastic	-40°C 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  $V_{SS}$ .
2. Duty cycle is limited by the total power dissipated in the package.
3. For operation above 25°C ambient derate linearly to maximum operating temperature at 20°C for plastic and at 15mW/°C for ceramic.

12/13/01

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### General Description

The HV55 and HV56 are low-voltage serial to high-voltage parallel converters with open drain 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 sinking capabilities such as driving inkjet and electrostatic print heads, plasma panels, vacuum fluorescent, or large matrix LCD displays.

These devices consist of a 32-bit shift register, 32 latches, and control logic to perform the polarity select and blanking of the outputs. Data is shifted through the shift register on the high to low transition of the clock. The HV55 shifts in the counterclockwise direction when viewed from the top of the package, and the HV56 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. 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  $\overline{LE}$  (latch enable) input is high. The data in the latch is stored when  $\overline{LE}$  is low.

# Electrical Characteristics (over recommended operating conditions unless noted)

## DC Characteristics

Symbol	Parameter	Min	Max	Units	Conditions	
$I_{DD}$	$V_{DD}$ supply current		15	mA	$f_{CLK} = 8\text{MHz}$ $F_{DATA} = 4\text{MHz}$	
$I_{DDQ}$	Quiescent $V_{DD}$ supply current		100	$\mu\text{A}$	$V_{IN} = 0\text{V}$	
$I_{O(OFF)}$	Off state output current		10	$\mu\text{A}$	All outputs high All SWS parallel	
$I_{IH}$	High-level logic input current		1	$\mu\text{A}$	$V_{IH} = V_{DD}$	
$I_{IL}$	Low-level logic input current		-1	$\mu\text{A}$	$V_{IL} = 0\text{V}$	
$V_{OH}$	High-level output data out	$V_{DD} - 1.0\text{V}$		V	$I_{Dout} = -100\mu\text{A}$	
$V_{OL}$	Low-level output voltage	HV <sub>OUT</sub>		15.0	V	$I_{HVout} = +100\text{mA}$
		Data out		1.0	V	$I_{Dout} = +100\mu\text{A}$
$V_{OC}$	HV <sub>OUT</sub> clamp voltage		-1.5	V	$I_{OL} = -100\text{mA}$	

## AC Characteristics ( $V_{DD} = 12\text{V}$ , $T_C = 25^\circ\text{C}$ )

Symbol	Parameter	Min	Max	Units	Conditions
$f_{CLK}$	Clock frequency		8	MHz	
$t_W$	Clock width high or low	62		ns	
$t_{SU}$	Data set-up time before clock falls	25		ns	
$t_H$	Data hold time after clock falls	10		ns	
$t_{ON}$	Turn on time, HV <sub>OUT</sub> from enable		500	ns	$R_L = 2\text{K}\Omega$ to $V_{PP}$ MAX
$t_{DHL}$	Delay time clock to data high to low		100	ns	$C_L = 15\text{pF}$
$t_{DLH}$	Delay time clock to data low to high		100	ns	$C_L = 15\text{pF}$
$t_{DLE}$	Delay time clock to $\overline{LE}$ low to high	50		ns	
$t_{WLE}$	Width of $\overline{LE}$ pulse	50		ns	
$t_{SLE}$	$\overline{LE}$ set-up time before clock falls	50		ns	

## Recommended Operating Conditions

Symbol	Parameter	Min	Max	Units	
$V_{DD}$	Logic supply voltage	10.8	13.2	V	
HV <sub>OUT</sub>	High voltage output	HV5530 and HV5630	-0.3	+300	V
		HV5522 and HV5622	-0.3	+220	V
$V_{IH}$	High-level input voltage	$V_{DD} - 2\text{V}$	$V_{DD}$	V	
$V_{IL}$	Low-level input voltage	0	2.0	V	
$f_{CLK}$	Clock frequency		8	MHz	
$T_A$	Operating free-air temperature	Plastic	-40	+85	$^\circ\text{C}$
		Ceramic	-55	+125	$^\circ\text{C}$

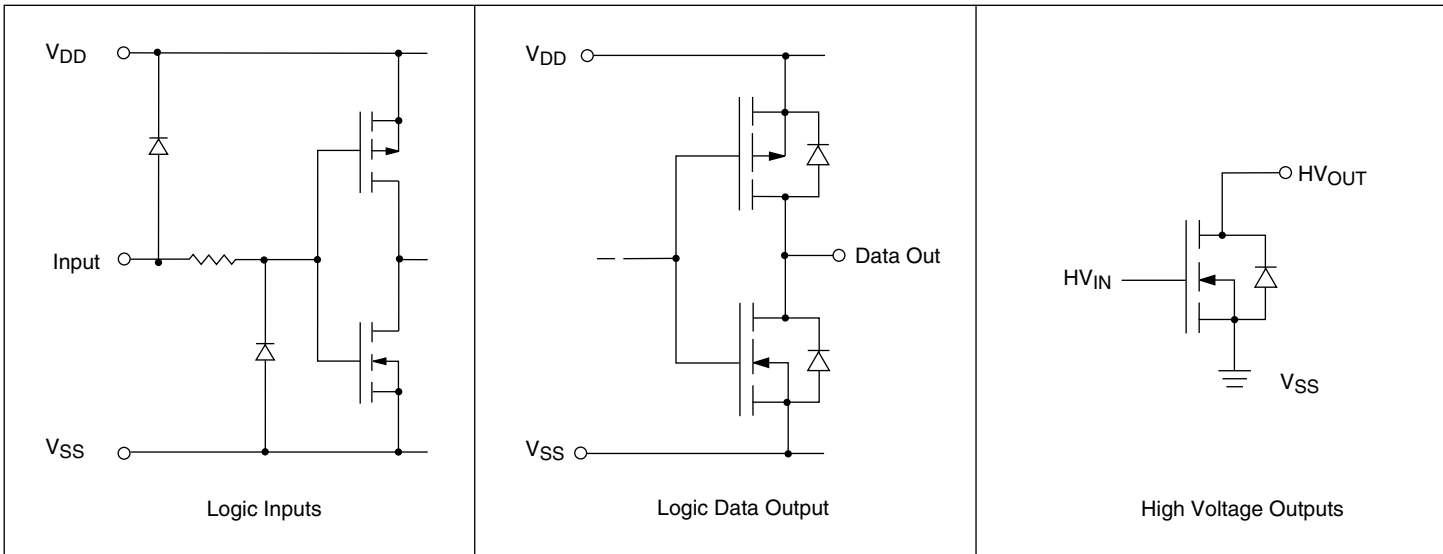
### Note:

Power-up sequence should be the following:

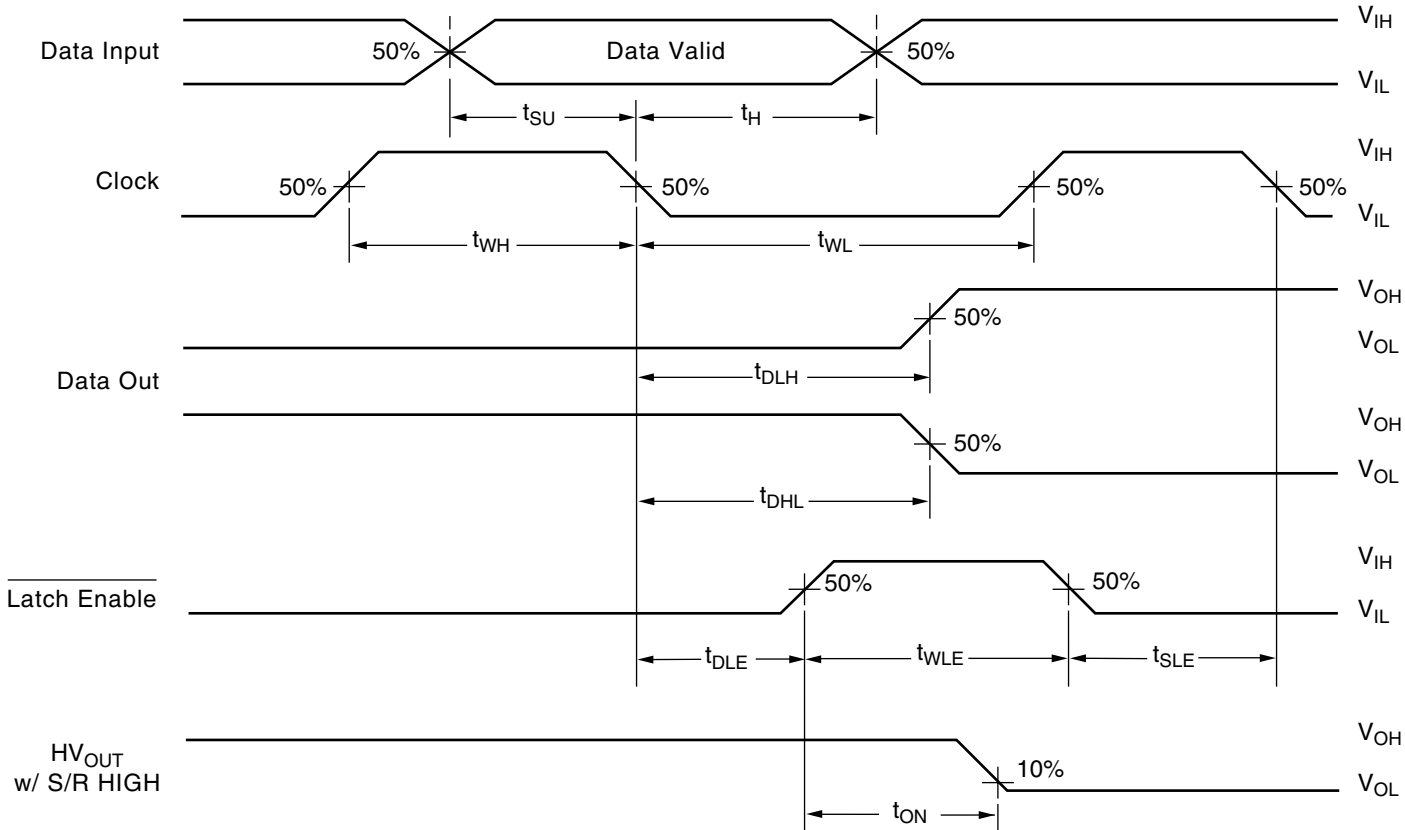
1. Connect ground.
2. Apply  $V_{DD}$ .
3. Set all inputs to a known state.

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

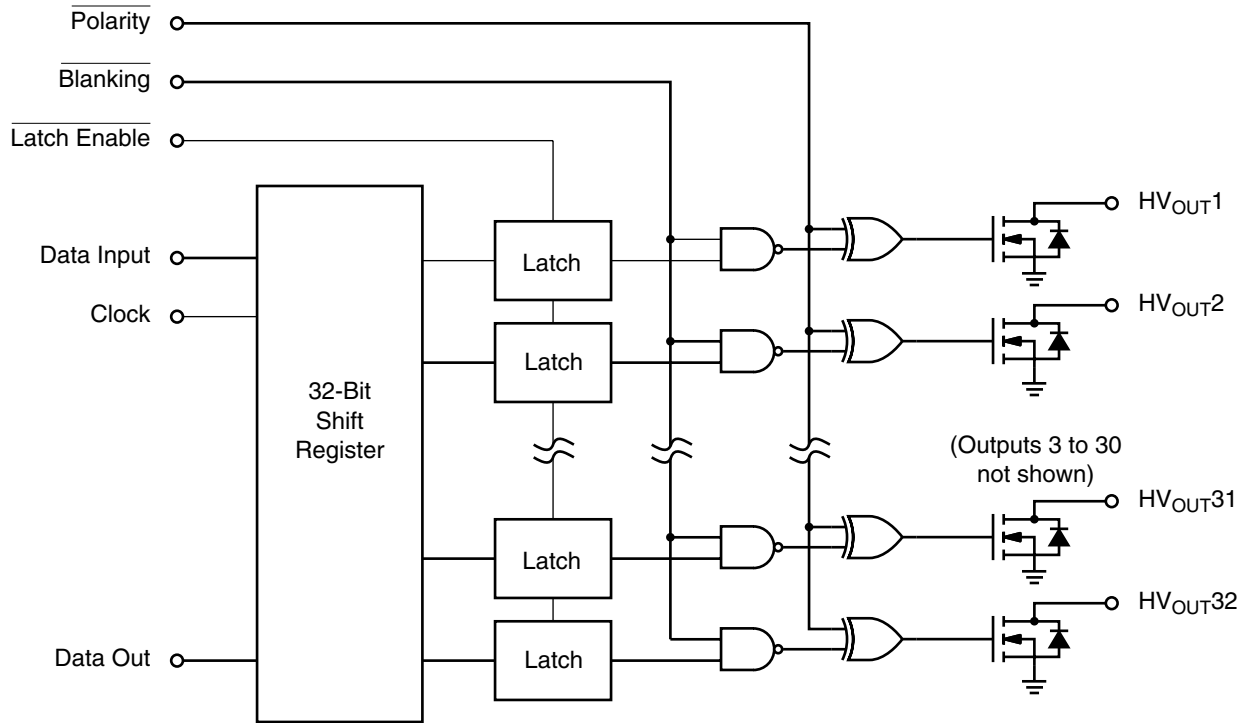
# Input and Output Equivalent Circuits



# Switching Waveforms



# Functional Block Diagram



# Function Table

Function	Inputs					Outputs		
	Data	CLK	$\overline{LE}$	$\overline{BL}$	$\overline{POL}$	Shift Reg 1 2...32	HV Outputs 1 2...32	Data Out *
All on	X	X	X	L	L	* *...*	On On...On	*
All off	X	X	X	L	H	* *...*	Off Off...Off	*
Invert mode	X	X	L	H	L	* *...*	$\overline{*}$ $\overline{*}$ ...	*
Load S/R	H or L	↓	L	H	H	H or L *...*	* *...*	*
Load Latches	X	H or L	↑	H	H	* *...*	* *...*	*
	X	H or L	↑	H	L	* *...*	$\overline{*}$ $\overline{*}$ ...	*
Transparent Latch mode	L	↓	H	H	H	L *...*	Off *...*	*
	H	↓	H	H	H	H *...*	On *...*	*

Notes:  
 H = high level, L = low level, X = irrelevant, ↓ = high-to-low transition, ↑ = low-to-high transition.  
 \* = dependent on previous stage's state before the last CLK ↓ or last  $\overline{LE}$  high.

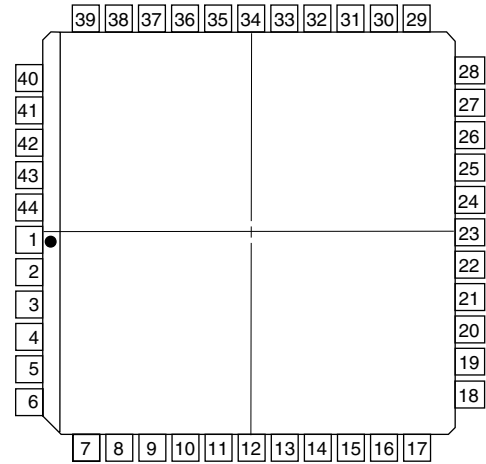
## Pin Configurations

## Package Outline

### HV55

#### 44 Pin J-Lead Package

Pin	Function	Pin	Function
1	HV <sub>OUT</sub> 16	23	Clock
2	HV <sub>OUT</sub> 17	24	V <sub>SS</sub>
3	HV <sub>OUT</sub> 18	25	V <sub>DD</sub>
4	HV <sub>OUT</sub> 19	26	Latch Enable
5	HV <sub>OUT</sub> 20	27	Data In
6	HV <sub>OUT</sub> 21	28	Blanking
7	HV <sub>OUT</sub> 22	29	N/C
8	HV <sub>OUT</sub> 23	30	HV <sub>OUT</sub> 1
9	HV <sub>OUT</sub> 24	31	HV <sub>OUT</sub> 2
10	HV <sub>OUT</sub> 25	32	HV <sub>OUT</sub> 3
11	HV <sub>OUT</sub> 26	33	HV <sub>OUT</sub> 4
12	HV <sub>OUT</sub> 27	34	HV <sub>OUT</sub> 5
13	HV <sub>OUT</sub> 28	35	HV <sub>OUT</sub> 6
14	HV <sub>OUT</sub> 29	36	HV <sub>OUT</sub> 7
15	HV <sub>OUT</sub> 30	37	HV <sub>OUT</sub> 8
16	HV <sub>OUT</sub> 31	38	HV <sub>OUT</sub> 9
17	HV <sub>OUT</sub> 32	39	HV <sub>OUT</sub> 10
18	Data Out	40	HV <sub>OUT</sub> 11
19	N/C	41	HV <sub>OUT</sub> 12
20	N/C	42	HV <sub>OUT</sub> 13
21	N/C	43	HV <sub>OUT</sub> 14
22	Polarity	44	HV <sub>OUT</sub> 15



top view  
44-pin J-Lead Package

### HV56

#### 44 Pin J-Lead Package

Pin	Function	Pin	Function
1	HV <sub>OUT</sub> 17	23	Clock
2	HV <sub>OUT</sub> 16	24	V <sub>SS</sub>
3	HV <sub>OUT</sub> 15	25	V <sub>DD</sub>
4	HV <sub>OUT</sub> 14	26	Latch Enable
5	HV <sub>OUT</sub> 13	27	Data In
6	HV <sub>OUT</sub> 12	28	Blanking
7	HV <sub>OUT</sub> 11	29	N/C
8	HV <sub>OUT</sub> 10	30	HV <sub>OUT</sub> 32
9	HV <sub>OUT</sub> 9	31	HV <sub>OUT</sub> 31
10	HV <sub>OUT</sub> 8	32	HV <sub>OUT</sub> 30
11	HV <sub>OUT</sub> 7	33	HV <sub>OUT</sub> 29
12	HV <sub>OUT</sub> 6	34	HV <sub>OUT</sub> 28
13	HV <sub>OUT</sub> 5	35	HV <sub>OUT</sub> 27
14	HV <sub>OUT</sub> 4	36	HV <sub>OUT</sub> 26
15	HV <sub>OUT</sub> 3	37	HV <sub>OUT</sub> 25
16	HV <sub>OUT</sub> 2	38	HV <sub>OUT</sub> 24
17	HV <sub>OUT</sub> 1	39	HV <sub>OUT</sub> 23
18	Data Out	40	HV <sub>OUT</sub> 22
19	N/C	41	HV <sub>OUT</sub> 21
20	N/C	42	HV <sub>OUT</sub> 20
21	N/C	43	HV <sub>OUT</sub> 19
22	Polarity	44	HV <sub>OUT</sub> 18

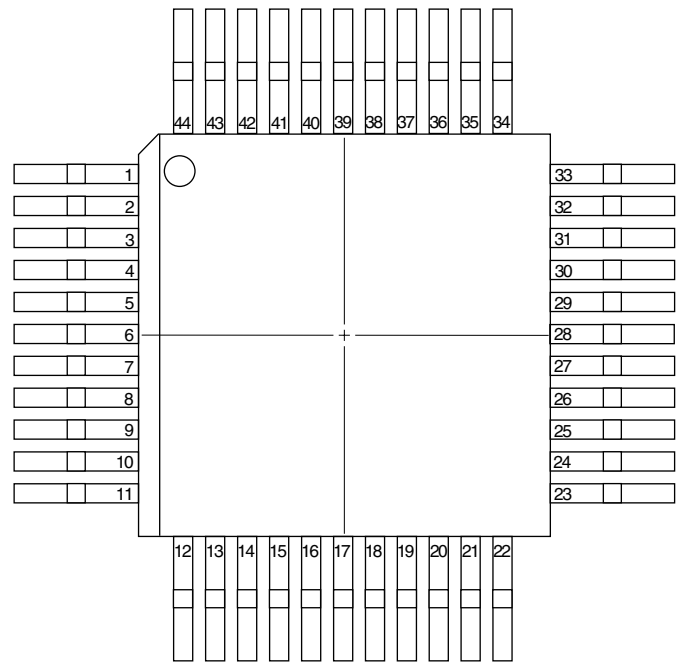
## Pin Configurations

### HV55

#### 44-Pin Quad Plastic Gullwing Package

Pin	Function	Pin	Function
1	HV <sub>OUT</sub> 11	23	Data Out
2	HV <sub>OUT</sub> 12	24	N/C
3	HV <sub>OUT</sub> 13	25	N/C
4	HV <sub>OUT</sub> 14	26	N/C
5	HV <sub>OUT</sub> 15	27	Polarity
6	HV <sub>OUT</sub> 16	28	Clock
7	HV <sub>OUT</sub> 17	29	V <sub>SS</sub>
8	HV <sub>OUT</sub> 18	30	V <sub>DD</sub>
9	HV <sub>OUT</sub> 19	31	Latch Enable
10	HV <sub>OUT</sub> 20	32	Data In
11	HV <sub>OUT</sub> 21	33	Blanking
12	HV <sub>OUT</sub> 22	34	N/C
13	HV <sub>OUT</sub> 23	35	HV <sub>OUT</sub> 1
14	HV <sub>OUT</sub> 24	36	HV <sub>OUT</sub> 2
15	HV <sub>OUT</sub> 25	37	HV <sub>OUT</sub> 3
16	HV <sub>OUT</sub> 26	38	HV <sub>OUT</sub> 4
17	HV <sub>OUT</sub> 27	39	HV <sub>OUT</sub> 5
18	HV <sub>OUT</sub> 28	40	HV <sub>OUT</sub> 6
19	HV <sub>OUT</sub> 29	41	HV <sub>OUT</sub> 7
20	HV <sub>OUT</sub> 30	42	HV <sub>OUT</sub> 8
21	HV <sub>OUT</sub> 31	43	HV <sub>OUT</sub> 9
22	HV <sub>OUT</sub> 32	44	HV <sub>OUT</sub> 10

## Package Outline



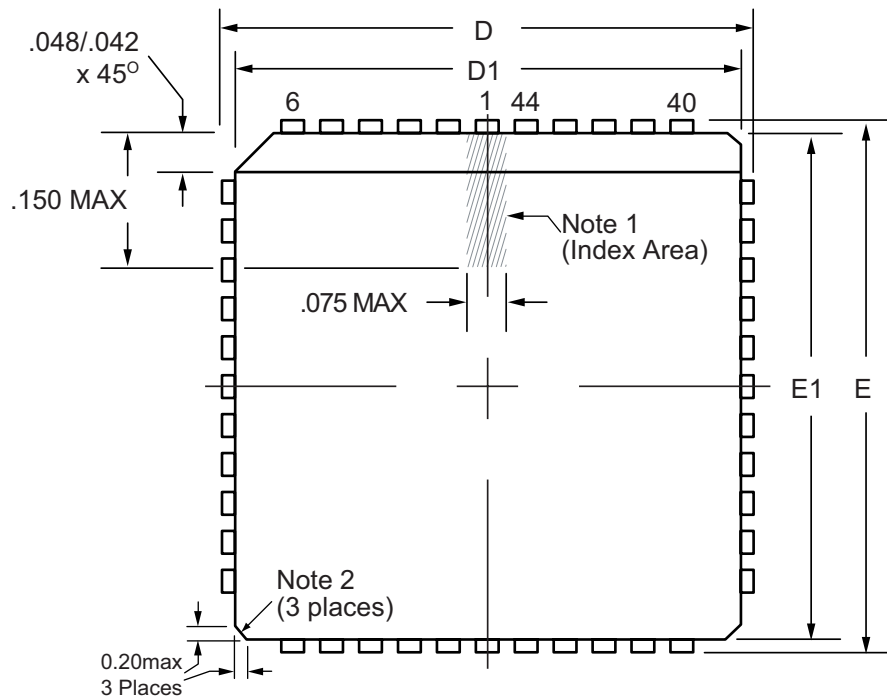
top view  
44-pin Quad Plastic Gullwing Package

### HV56

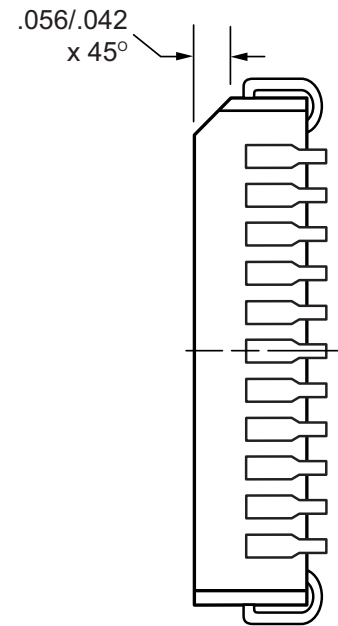
#### 44-Pin Quad Plastic Gullwing Package

Pin	Function	Pin	Function
1	HV <sub>OUT</sub> 22	23	Data Out
2	HV <sub>OUT</sub> 21	24	N/C
3	HV <sub>OUT</sub> 20	25	N/C
4	HV <sub>OUT</sub> 19	26	N/C
5	HV <sub>OUT</sub> 18	27	Polarity
6	HV <sub>OUT</sub> 17	28	Clock
7	HV <sub>OUT</sub> 16	29	V <sub>SS</sub>
8	HV <sub>OUT</sub> 15	30	V <sub>DD</sub>
9	HV <sub>OUT</sub> 14	31	Latch Enable
10	HV <sub>OUT</sub> 13	32	Data In
11	HV <sub>OUT</sub> 12	33	Blanking
12	HV <sub>OUT</sub> 11	34	N/C
13	HV <sub>OUT</sub> 10	35	HV <sub>OUT</sub> 32
14	HV <sub>OUT</sub> 9	36	HV <sub>OUT</sub> 31
15	HV <sub>OUT</sub> 8	37	HV <sub>OUT</sub> 30
16	HV <sub>OUT</sub> 7	38	HV <sub>OUT</sub> 29
17	HV <sub>OUT</sub> 6	39	HV <sub>OUT</sub> 28
18	HV <sub>OUT</sub> 5	40	HV <sub>OUT</sub> 27
19	HV <sub>OUT</sub> 4	41	HV <sub>OUT</sub> 26
20	HV <sub>OUT</sub> 3	42	HV <sub>OUT</sub> 25
21	HV <sub>OUT</sub> 2	43	HV <sub>OUT</sub> 24
22	HV <sub>OUT</sub> 1	44	HV <sub>OUT</sub> 23

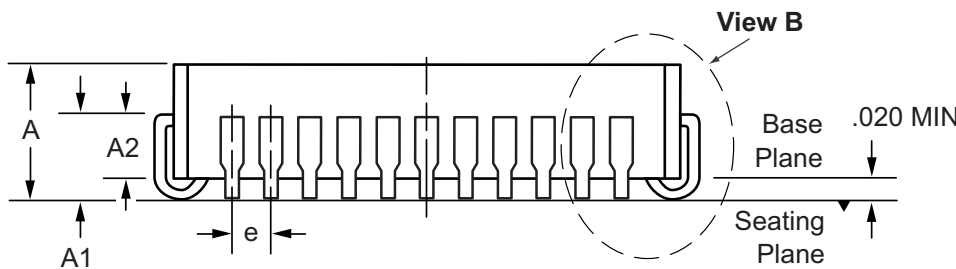
**44-Lead PLCC Package Outline (PJ)**  
*.653x.653in body, .180in height (max.), .050in pitch*



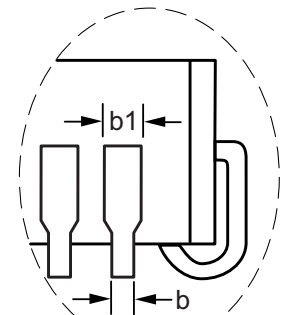
**Top View**



**Side View**



**Side View**



**View B**

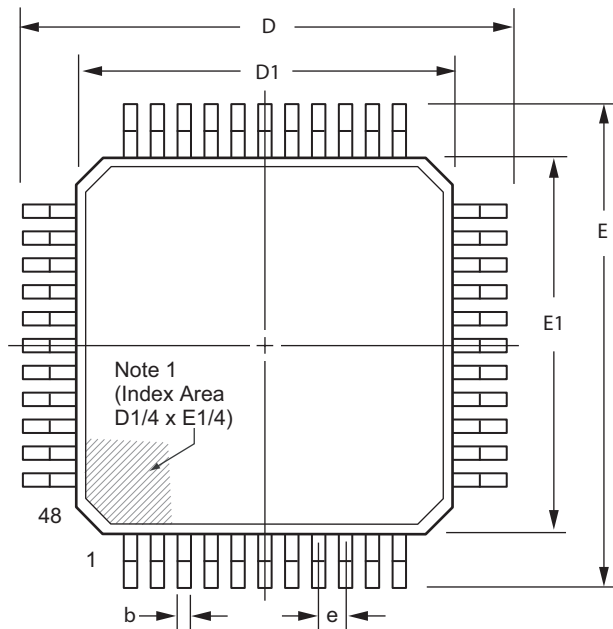
- Note:**
1. A Pin 1 identifier must be located in the index area indicated. The Pin 1 identifier may be either a mold, or an embedded metal or marked feature.
  2. Exact shape of this feature is optional.

Symbol	A	A1	A2	b	b1	D	D1	E	E1	e	
Dimension (inches)	MIN	.165	.090	.062	.013	.026	.685	.650	.685	.650	.050 BSC
	NOM	.172	.105	-	-	-	.690	.653	.690	.653	
	MAX	.180	.120	.083	.021	.036	.695	.656	.695	.656	

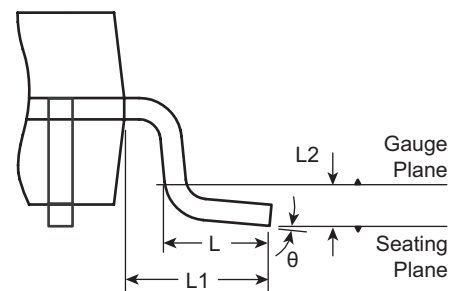
JEDEC Registration MS-018, Variation AC, Issue A, June, 1993.  
 Drawings are not to scale.

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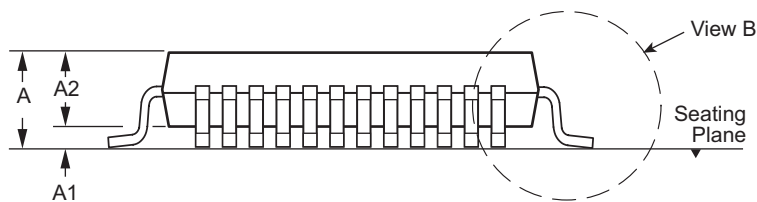
**44-Lead PQFP Package Outline (PG)**



**Top View**



**View B**



**Side View**

**Note 1:**

A Pin 1 identifier must be located in the index area indicated. The Pin 1 identifier may be either a mold, or an embedded metal or marked feature.

Symbol	A	A1	A2	b	D	D1	E	E1	e	L	L1	L2	θ	θ1	
Dimension (mm)	MIN	-	0.25	1.95	0.30	13.65	9.80	13.65	9.80	0.80 BSC	0.73	1.95 REF	0.25 BSC	3.5°	5°
	NOM	-	-	2.00	-	13.90	10.00	13.90	10.00		0.88			-	-
	MAX	2.45	-	2.10	0.45	14.15	10.20	14.15	10.20		1.03			7°	16°

JEDEC Registration M0-112, Variation AA-2, Issue B, Sep. 1995.

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