

32MHz, 64-Channel Serial to Parallel Converter with Push-Pull Outputs

Features

- ▶ HVCMOS® technology
- ▶ 5.0V CMS Logic
- ▶ Output voltage up to +80V
- ▶ Low power level shifting
- ▶ 32MHz equivalent data rate
- ▶ Latched data outputs
- ▶ Forward and reverse shifting options (DIR pin)
- ▶ Diode to VPP allows efficient power recovery
- ▶ Outputs may be hot switched

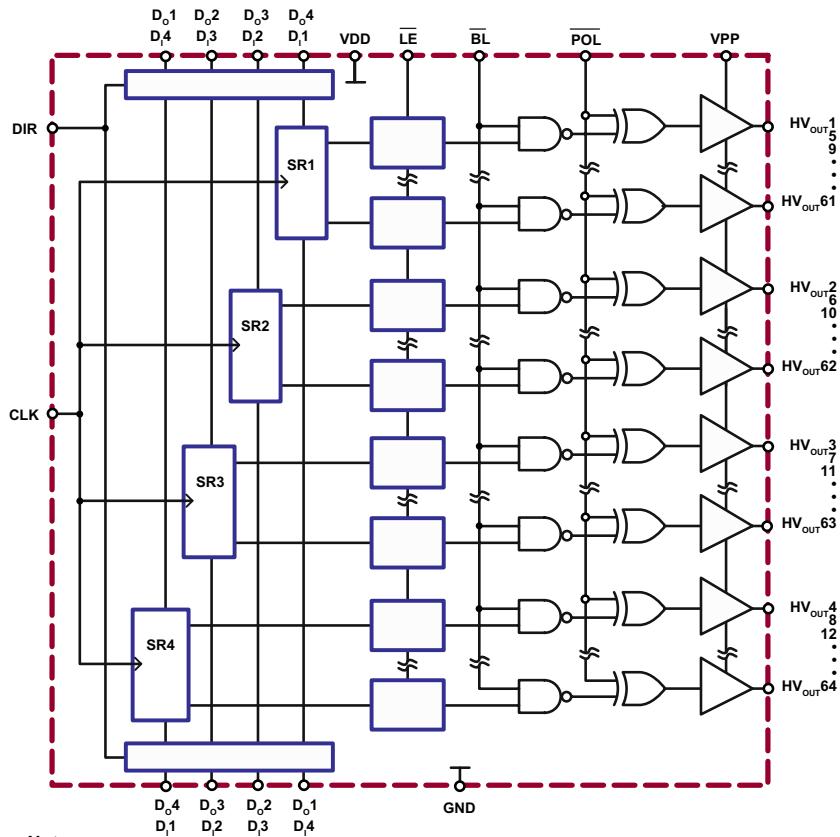
General Description

The HV57708 is a low voltage serial to high voltage parallel converter with push-pull outputs. The device has been designed for use as a driver for EL 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 4 parallel 16-bit registers, permitting data rates 4x 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 VDD. 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 LE (latch enable), BL (blanking), or the POL (polarity) inputs. Transfer of data from the shift registers to the latches occurs when the LE input is high. The data in the latches is stored when the LE is low.

Functional Block Diagram



Each SR (shift register) provides 16 outputs. SR1 supplies every fourth output starting with 1; SR2 supplies every fourth output with 2, etc.

Ordering Information

| Part Number | Package Option | Packing |
|-------------|----------------|---------|
| HV57708PG-G | 80-Lead PQFP | 66/Tray |

-G denotes a lead (Pb)-free / RoHS compliant package

Absolute Maximum Ratings

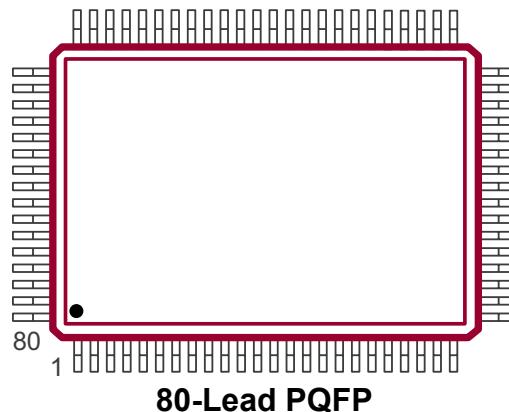
| Parameter | Value |
|---|-------------------------|
| Supply voltage, V_{DD} | -0.5V to +7.5V |
| Output voltage, V_{PP} | -0.5V to +90V |
| Logic input levels | -0.3V to V_{DD} +0.3V |
| Ground current ¹ | 1.5A |
| Continuous total power dissipation ² | 1200mW |
| Operating temperature range | -40°C to +85°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 device ground.

Notes:

1. Limited by the total power dissipated in the package.
2. For operation above 25°C ambient derate linearly to maximum operating temperature at 20mW/°C.

Pin Configuration



Product Marking

| |
|---|
|  HV57708PG |
| LLLLLLLLLL |
| YYWW |
| CCCCCC AAA |
| • |

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

Package may or may not include the following marks: Si or 

80-Lead PQFP

Typical Thermal Resistance

| Package | θ_{ja} |
|--------------|---------------|
| 80-Lead PQFP | 37°C/W |

Recommended Operating Conditions

| Sym | Parameter | Min | Max | Units |
|-----------|--------------------------------|----------------|-----|-------|
| V_{DD} | Logic supply voltage | 4.5 | 5.5 | V |
| V_{PP} | Output voltage | 8.0 | 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 | - | 8.0 | MHz |
| T_A | Operating free-air temperature | -40 | +85 | °C |

Notes:

Power-up sequence should be the following:

1. Apply ground.
2. Apply V_{DD} .
3. Set all inputs (D_{IN} , 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.

DC Electrical Characteristics (Over recommended operating conditions unless otherwise noted)

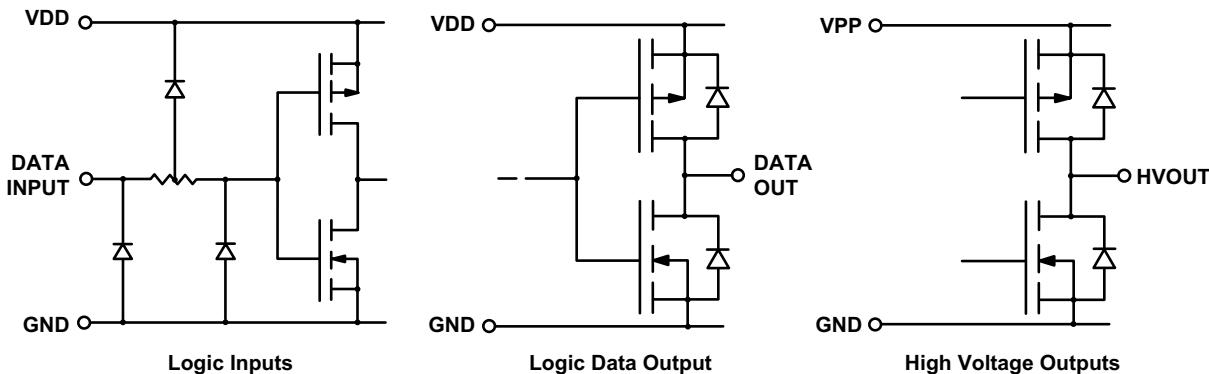
| Sym | Parameter | | Min | Max | Units | Conditions |
|-----------|-----------------------------------|------------|----------------|------|---------------|--|
| I_{DD} | V_{DD} supply current | | - | 15 | mA | $V_{DD} = V_{PP}$ max, $f_{CLK} = 8.0\text{MHz}$ |
| I_{PP} | High voltage supply current | | - | 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} | 65 | - | V | $I_O = -15\text{mA}$, $V_{PP} = +80\text{V}$ |
| | | Data out | $V_{DD} - 0.5$ | - | V | $I_O = -100\mu\text{A}$ |
| V_{OL} | Low level output | HV_{OUT} | - | 7.0 | V | $I_O = 12\text{mA}$, $V_{PP} = +80\text{V}$ |
| | | Data out | - | 0.5 | V | $I_O = 100\mu\text{A}$ |
| I_{IH} | High-level logic input current | | - | 1.0 | μA | $V_{IH} = V_{DD}$ |
| I_{IL} | Low-level logic input current | | - | -1.0 | μA | $V_{IL} = 0\text{V}$ |
| V_{OC} | High voltage clamp diode | | - | 1.0 | V | $I_{OC} = 1.0\text{mA}$ |

AC Electrical Characteristics ($T_A = 85^\circ\text{C}$ max. Logic signal inputs and Data inputs have $t_r, t_i \leq 5\text{ns}$ [10% and 90% points])

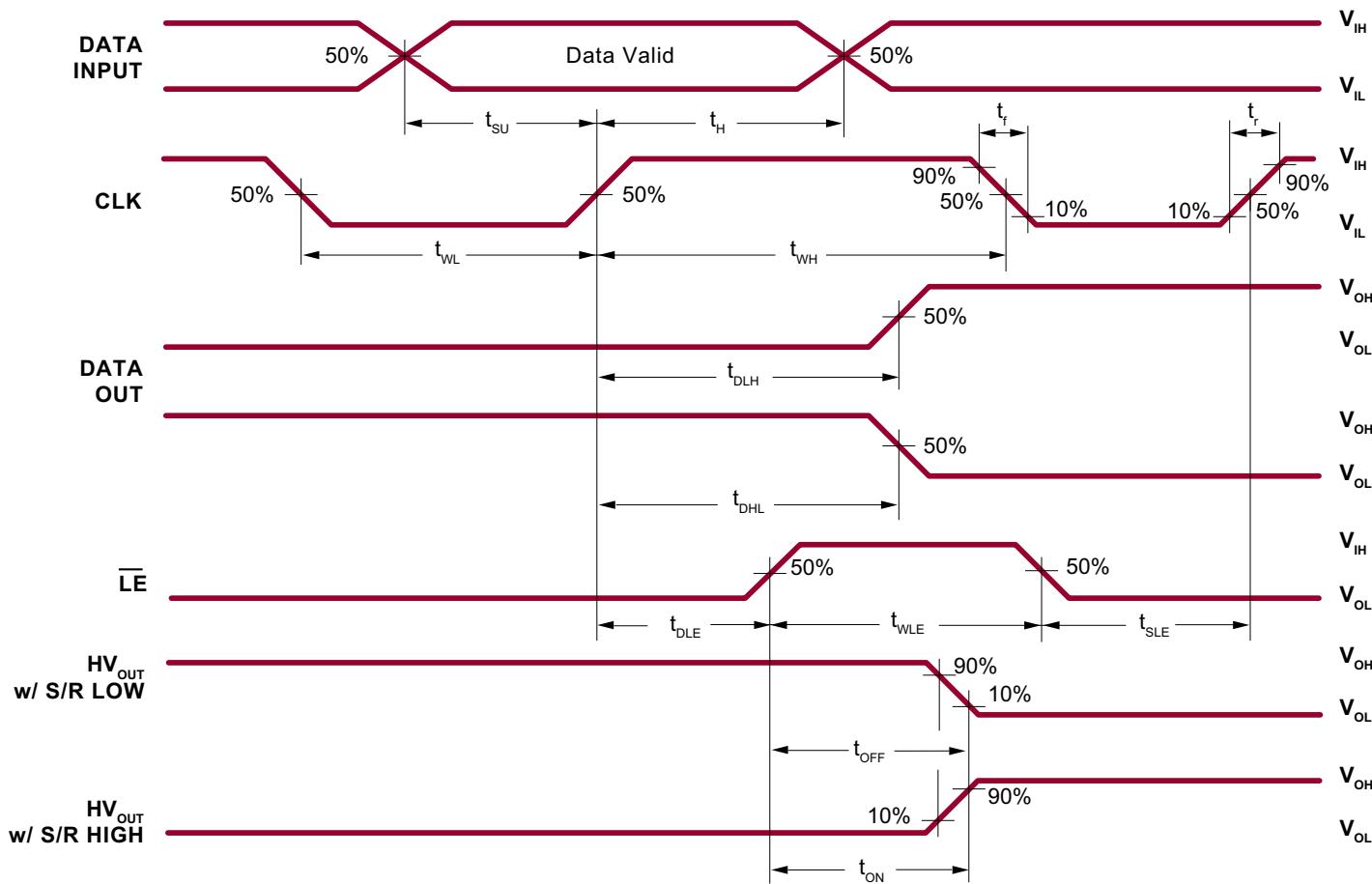
| Sym | Parameter | | Min | Max | Units | Conditions |
|-------------------|---|--|-----|-----|-------|---------------------|
| f_{CLK} | Clock frequency | | - | 8.0 | MHz | Per register |
| t_{WL}, t_{WH} | Clock width high or low | | 62 | - | ns | --- |
| t_{SU} | Data set-up time before clock rises | | 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 | $C_L = 15\text{pF}$ |
| t_{DHL} | Delay time clock to data high to low | | - | 70 | ns | $C_L = 15\text{pF}$ |
| t_{DLH} | Delay time clock to data low to high | | - | 70 | ns | $C_L = 15\text{pF}$ |
| t_{DLE}^* | Delay time clock to \overline{LE} low to high | | 25 | - | ns | --- |
| t_{WLE} | \overline{LE} pulse width | | 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).

Input and Output Equivalent Circuits



Switching Waveforms



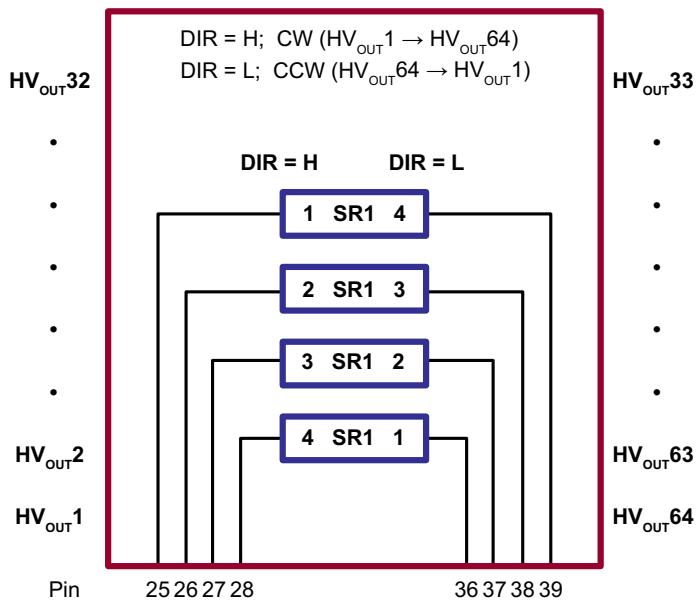
Function Table

| Function | Inputs | | | | | | Outputs | | |
|---|----------------|-----------------|-----------------|-----------------|------------------|-----|---------------------------|-----------------------------|----------------|
| | Data | CLK | \overline{LE} | \overline{BL} | \overline{POL} | DIR | Shift Reg | HV Outputs | Data Out |
| 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 | $_{\uparrow}^-$ | H | H | H | X | L | L | - |
| | H | $_{\uparrow}^-$ | H | H | H | X | H | H | - |
| | L | $_{\uparrow}^-$ | H | H | L | X | L | H | - |
| | H | $_{\uparrow}^-$ | 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 | $D_{I/O}$ 1-4A | $_{\uparrow}^-$ | H | H | H | H | $Q_n \rightarrow Q_{n+1}$ | New H or L | $D_{I/O}$ 1-4B |
| | $D_{I/O}$ 1-4A | $_{\uparrow}^-$ | L | H | H | H | $Q_n \rightarrow Q_{n+1}$ | Previous H or L | $D_{I/O}$ 1-4B |
| | $D_{I/O}$ 1-4B | $_{\uparrow}^-$ | L | H | H | L | $Q_n \rightarrow Q_{n-1}$ | Previous H or L | $D_{I/O}$ 1-4A |
| | $D_{I/O}$ 1-4B | $_{\uparrow}^-$ | H | H | H | L | $Q_n \rightarrow Q_{n-1}$ | New H or L | $D_{I/O}$ 1-4A |

Note:

* = dependent on previous stage's state. See Pin configuration for DIN and DOUT pin designation for CW and CCW shift.

Shift Register Operation



Pin Function

| Pin # | Function |
|-------|-------------------------|
| 1 | HV _{OUT} 24/41 |
| 2 | HV _{OUT} 23/42 |
| 3 | HV _{OUT} 22/43 |
| 4 | HV _{OUT} 21/44 |
| 5 | HV _{OUT} 20/45 |
| 6 | HV _{OUT} 19/46 |
| 7 | HV _{OUT} 18/47 |
| 8 | HV _{OUT} 17/48 |
| 9 | HV _{OUT} 16/49 |
| 10 | HV _{OUT} 15/50 |
| 11 | HV _{OUT} 14/51 |
| 12 | HV _{OUT} 13/52 |
| 13 | HV _{OUT} 12/53 |
| 14 | HV _{OUT} 11/54 |
| 15 | HV _{OUT} 10/55 |
| 16 | HV _{OUT} 9/56 |
| 17 | HV _{OUT} 8/57 |
| 18 | HV _{OUT} 7/58 |
| 19 | HV _{OUT} 6/59 |
| 20 | HV _{OUT} 5/60 |

| Pin # | Function |
|-------|---|
| 21 | HV _{OUT} 4/61 |
| 22 | HV _{OUT} 3/62 |
| 23 | HV _{OUT} 2/63 |
| 24 | HV _{OUT} 1/64 |
| 25 | D _{IN} 1/D _{OUT} 4(A) |
| 26 | D _{IN} 2/D _{OUT} 3(A) |
| 27 | D _{IN} 3/D _{OUT} 2(A) |
| 28 | D _{IN} 4/D _{OUT} 1(A) |
| 29 | LE |
| 30 | CLK |
| 31 | BL |
| 32 | VDD |
| 33 | DIR |
| 34 | GND |
| 35 | POL |
| 36 | D _{OUT} 4/D _{IN} 1(B) |
| 37 | D _{OUT} 3/D _{IN} 2(B) |
| 38 | D _{OUT} 2/D _{IN} 3(B) |
| 39 | D _{OUT} 1/D _{IN} 4(B) |
| 40 | VPP |

| Pin # | Function |
|-------|-------------------------|
| 41 | HV _{OUT} 64/1 |
| 42 | HV _{OUT} 63/2 |
| 43 | HV _{OUT} 62/3 |
| 44 | HV _{OUT} 61/4 |
| 45 | HV _{OUT} 60/5 |
| 46 | HV _{OUT} 59/6 |
| 47 | HV _{OUT} 58/7 |
| 48 | HV _{OUT} 57/8 |
| 49 | HV _{OUT} 56/9 |
| 50 | HV _{OUT} 55/10 |
| 51 | HV _{OUT} 54/11 |
| 52 | HV _{OUT} 53/12 |
| 53 | HV _{OUT} 52/13 |
| 54 | HV _{OUT} 51/14 |
| 55 | HV _{OUT} 50/15 |
| 56 | HV _{OUT} 49/16 |
| 57 | HV _{OUT} 48/17 |
| 58 | HV _{OUT} 47/18 |
| 59 | HV _{OUT} 46/19 |
| 60 | HV _{OUT} 45/20 |

| Pin # | Function |
|-------|-------------------------|
| 61 | HV _{OUT} 44/21 |
| 62 | HV _{OUT} 43/22 |
| 63 | HV _{OUT} 42/23 |
| 64 | HV _{OUT} 41/24 |
| 65 | HV _{OUT} 40/25 |
| 66 | HV _{OUT} 39/26 |
| 67 | HV _{OUT} 38/27 |
| 68 | HV _{OUT} 37/28 |
| 69 | HV _{OUT} 36/29 |
| 70 | HV _{OUT} 35/30 |
| 71 | HV _{OUT} 34/31 |
| 72 | HV _{OUT} 33/32 |
| 73 | HV _{OUT} 32/33 |
| 74 | HV _{OUT} 31/34 |
| 75 | HV _{OUT} 30/35 |
| 76 | HV _{OUT} 29/36 |
| 77 | HV _{OUT} 28/37 |
| 78 | HV _{OUT} 27/38 |
| 79 | HV _{OUT} 26/39 |
| 80 | HV _{OUT} 25/40 |

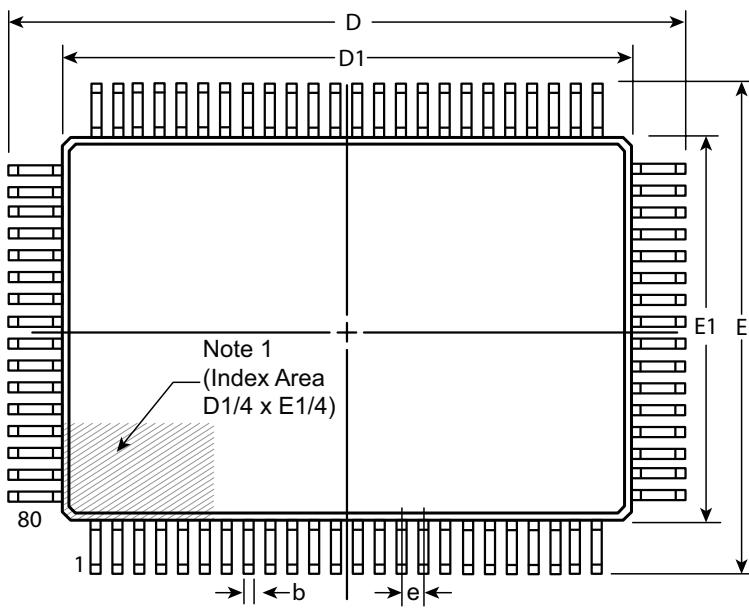
Note:

Pin designation for DIR = H/L.

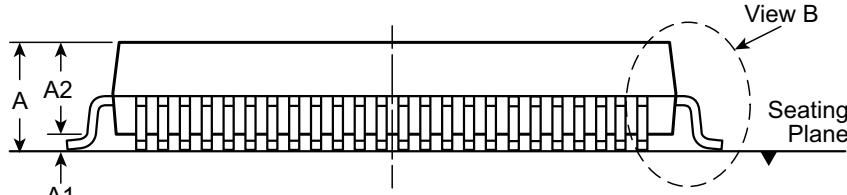
Example: For DIR = H, pin 41 is HV_{OUT}64.For DIR = L, pin 41 is HV_{OUT}1.For CW/CCW Shift see function table $Q_N \rightarrow Q_{N+1}$.

80-Lead PQFP Package Outline (PG)

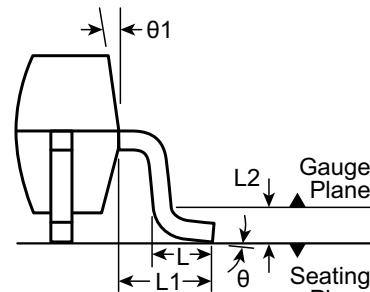
20.00x14.00mm body, 3.40mm height (max), 0.80mm pitch, 3.90mm footprint



Top View



Side View



View B

Note:

1. A Pin 1 identifier must be located in the index area indicated. The Pin 1 identifier can be: a molded mark/identifier; an embedded metal marker; or a printed indicator.

| Symbol | A | A1 | A2 | b | D | D1 | E | E1 | e | L | L1 | L2 | θ | θ1 | |
|----------------|-----|-------|-------|------|------|--------|--------|--------|--------|----------|------|----------|----------|------|-----|
| Dimension (mm) | MIN | 2.80* | 0.25 | 2.55 | 0.30 | 23.65* | 19.80* | 17.65* | 13.80* | 0.80 BSC | 0.73 | 1.95 REF | 0.25 BSC | 0° | 5° |
| | NOM | - | - | 2.80 | - | 23.90 | 20.00 | 17.90 | 14.00 | | 0.88 | | | 3.5° | - |
| | MAX | 3.40 | 0.50* | 3.05 | 0.45 | 24.15* | 20.20* | 18.15* | 14.20* | | 1.03 | | | 7° | 16° |

JEDEC Registration MO-112, Variation CB-1, Issue B, Sept. 1995.

* This dimension is not specified in the JEDEC drawing.

Drawings not to scale.

Supertex Doc. #: DSPD-80PQFPPG, Version C041309.

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information go to <http://www.supertex.com/packaging.html>.)

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